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OPTIONS REPORT

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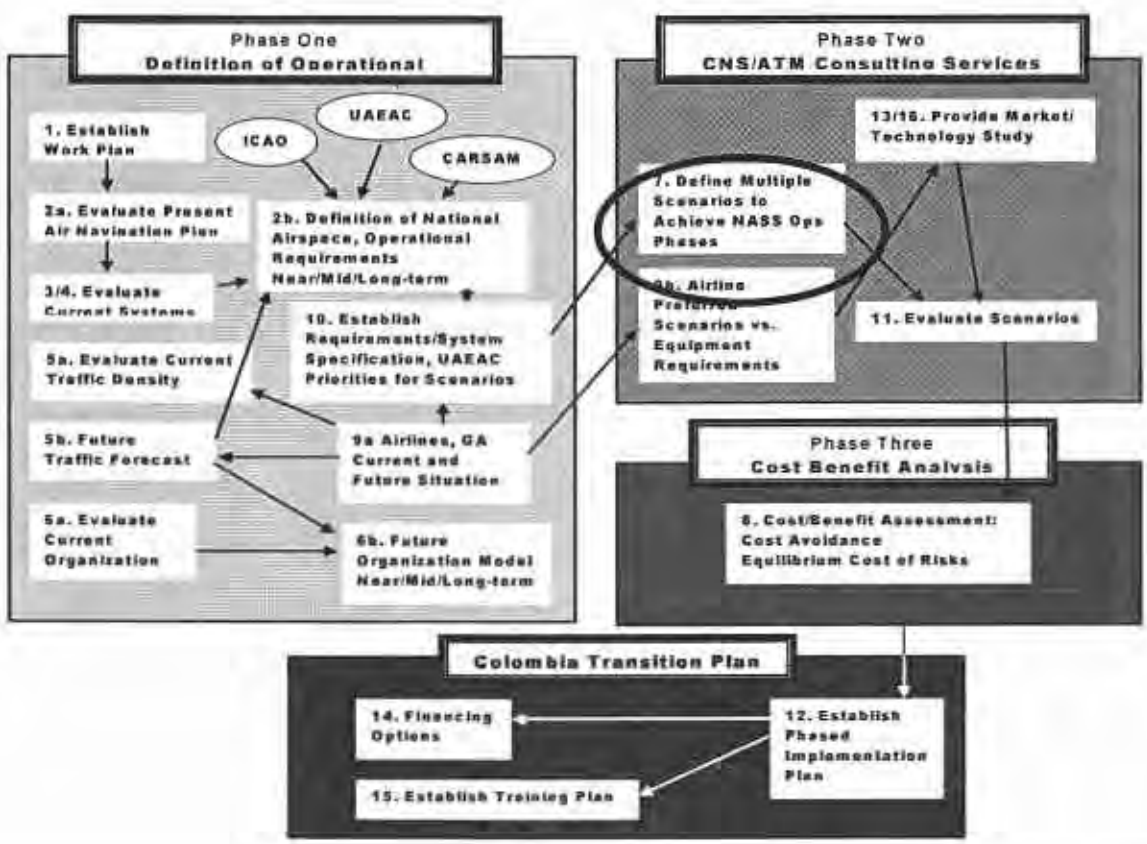
I. INTRODUCTION AND EXECUTIVE SUMMARY

A. Scope of This Document

This document is the fourth deliverable in the development of the Colombian ATM/CNS Transition Plan, the Options Report. This document contains the descriptions, locations, and numbers of systems required to meet the requirements established earlier in the Definition of the Operational Requirements for Civil Aviation in Colombia, Volumes 1 & 2, according to the following definitions of Options I and II.

- Option One: Evolutionary – UAEAC will provide ATM/CNS services for Colombian airspace, and for over-flights of Colombian airspace from other nations. This option meets all of the mandates of ICAO and the CAR/SAM Region, addresses the forecast traffic needs of Colombia through the year 2019, and satisfies the requirements for aviation described in Vision 2019 for Colombia.
- Option Two: Accelerated – In addition to addressing all of the requirements of Option 1, Option 2 will put the UAEAC in a position to offer (on a fee for service basis) ATM/CNS services for all international flights into and out of neighboring Andean nations. The Andean nations for which ATM/CNS services could potentially be provided are Colombia, Peru, Bolivia, Ecuador, and Venezuela.

The following chart indicates where we are in the ATM/CNS analysis process. The data developed for this document will be used in Phase Three – Cost Benefit Analysis – and subsequently to make a choice between options for development of the Phased Implementation Plan.



B. Background

The Colombian Civil Aviation Authority, in conjunction with the International Civil Aviation Organization (ICAO) and other members of the civil aviation community, has recognized that ATM/CNS Services are moving rapidly toward satellite-based operations that present the opportunity for significant improvements in safety, capacity and service flexibility. Satellite communications and navigation have rapidly developed into global utilities. The ability to provide extremely precise position, velocity, and time has enabled satellite navigation to be applied to every mode of transportation, created new methods of surveillance, and enhanced safety and efficiency. To that end the following goals for the implementation of satellite navigation have been developed: 1) Global 3D/4D RNAV capability; 2) Vertical guidance for all terminal area operations including precision approach; and 3) High integrity position, velocity and timing information for future ATM/CNS and surface navigation applications.

GNSS technology has become the backbone of numerous commercial successes through the incorporation of services provided to aviation, the surveying community, maritime operations, agriculture, and multi-modal transportation. Markets for GNSS-based goods and services are exploding, and are likely to continue their rapid growth patterns well into the future. The technology is now used to guide everything from single seat general aviation aircraft to jumbo jets and sailboats to supertankers, and will increasingly help ground transportation vehicles navigate efficiently and safely.

Heavily used en-route corridors and the airspace surrounding large cities and airports are nearly always adversely impacted as weather deteriorates. The result is flight delays, schedule disruptions, passenger anger and inconvenience, and an increase in costs. With many new airlines trying to make a profit and older airlines struggling to cut costs, the burden is falling more and more upon the CAA's to provide "better" and more efficient service to their customers, and to provide "better" and more capable tools with which to manage their airspace.

GPS/Galileo/GLONASS provide basic global RNAV capability; SBAS potentially provides system integrity and higher accuracy enabling near CAT I operations in some locations; and GBAS provides a level of system redundancy and extremely high accuracy within its coverage area to enable CAT II/III operations and high availability CAT I.

The combination of all three technologies will bring a capability to the international aviation community that has previously been unattainable. In addition, these technologies provide the foundation for Automatic Dependent Surveillance (ADS) operations. Figure 1 depicts the long-term desired capability.

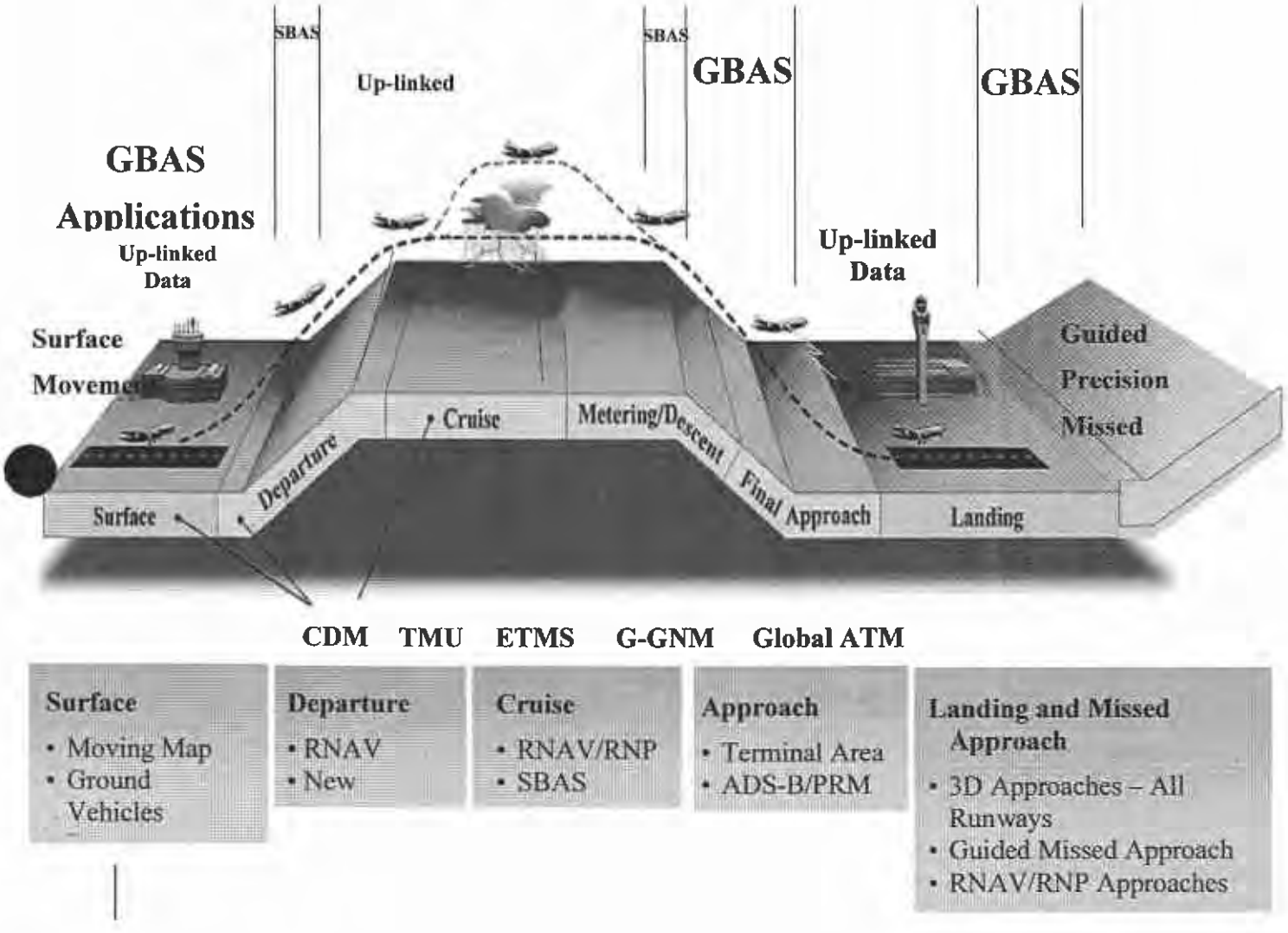


Figure 1. ATM/CNS Strategic Vision

1. Colombian Strategy for ATM Implementation

Air traffic management implementation in Colombia should be a gradual process integrating air traffic services and airspace safety, easing in the transition both economically and efficiently. That means that UAEAC must perform a systemic analysis to identify the things that are affecting the most important system goals: safety, efficiency, and regularity. This analysis will lead to actions to fix these within the range of possibilities that are feasible from the perspective of budget, technical availability of new technology solutions and human resources. That process will also define the sequence for implementing ATM components. Ultimately, implementation plans should stress not using the operational concept as a mere theoretical concept, but rather deploying the operational concept as a practical tool for solving the real problems of the Colombian air navigation system.

There are several areas of concern that Colombia must address prior starting its implementation of ATM components. These are as follows:

- Safety Management Program

  An effective safety management program will enable the UAEAC to achieve more efficient and effective outcomes from its technology adoption process. It will target establishing safety procedures to protect Colombia's airspace and the safety of the ATM system, from concept through to design. Development, operation and maintenance concerns will remain the highest priority.

  It is expected that maximum effectiveness and efficiency of actions can be obtained through undertaking safety program activities in the early phases of a system's life cycle, by means of correcting problems during requirements definition and design. Each element of the ATM system will be subject to specific safety analysis procedures. The implementation of any new element of the system will be subject to appropriate safety assurance processes.

- **Human Factors Program**

  Pilots and air traffic controllers play an essential role in the ATM system. Directors are responsible for managing the system; technicians coordinate monitoring its performance, as well as providing effective interventions to ensure desired system outcomes. While it is clear that humans can never be replaced by machines in aviation critical tasks, relations with the hardware and procedures play a critical role in determining the success of air operations. Human centered automation, intensive training (including English language proficiency) and error management programs must be conducted as a prerequisite of new ATM component adoption.

- **Information Management**

  Colombian air operations could reduce risk and delays by providing timely, relevant, accurate, accredited and quality assured information. This would allow users and providers to collaborate and to make informed decisions. UAEAC must share information on a system wide basis that will allow users to conduct operations in safe and efficient ways using an advanced information management technology.

- **CDM**

  Air space users and the UAEAC must collaborate to maximize system efficiency by sharing information leading to dynamic and flexible decision making. Strategic and tactical teamwork between members can be useful in the definition of the types and levels of service that Aeronautica Civil will bring in the future.

- **Continuity Assurance**

  It is mandatory to implement contingency measures to provide maximum continuity of service in the face of major outages, civil unrest, security threats, natural disasters, or other circumstances.

  New surveillance, navigation and communication systems must be gradually implemented to build a fully integrated, interoperable and robust system.

2. Specific Objectives of Air Traffic Management in Colombia

Operational concept and the Colombia ATM system

The ATM system provides services through the collaborative integration of humans, information, technology, facilities and services, supported by air, ground and/or space-based communications, navigation and surveillance. This means that some elements of ATM are strongly dependant on the implementation of new technology while others can be started right now because they do not require big investments or industry development.

As a first step toward CONOPS implementation the UAEAC needs to increase user flexibility and maximize operating efficiencies in order to increase system capacity and improve safety levels.

Environmental Protection

The introduction of ATM systems will have a positive impact on the Colombian environment by reducing operating times on the ground and in the air (reduced air pollution). It will also spread traffic over broader areas, reducing the concentration of noise. A separate environmental assessment will be submitted as part of the Final Report.

Air Safety

The implementation of safety management in Colombia will ensure that safety remains the highest priority, avoiding unnecessary risks and costly accidents. In the long term scenario, management by trajectory will improve conflict management and facilitate user preferred trajectories.

3. ATM Operational Concept in Colombia

Airspace Organization and Management

The UAEAC strategies, rules and procedures ought to include the following:

Short term:

- To implement an airspace management program that is dynamic, flexible and based on services demanded.
- To adapt airspace organizational boundaries, divisions and categories to traffic patterns and changing situations.
- To organize airspace that is easily learnable, understandable and used by the air traffic management community as appropriate.

Medium term:

- To plan the airspace based on accommodating dynamic flight trajectories whenever practicable. Structured route systems will continue only in areas where the demand for dynamic trajectories cannot be accommodated.

Long term:

- To organize airspace to facilitate the seamless handling of flights and the ability for flights to be conducted along optimal flight trajectories from gate to gate without undue restriction or delay.

Airspace management should reflect the following objectives:

Short term:

- Manage all airspace flexibly. Airspace boundaries should be adjusted to different traffic flows, obtain agreements with military users to get the flexibility required for special use airspace. In addition RNAV must be implemented to allow aircrafts to fly directly from one airport to another eliminating gradually the use of the current route structure.
- Design airspace management processes to accommodate dynamic flight trajectories and to provide optimum system solutions. Route structure must be evaluated and most important RNAV routes should be implemented.

Medium term:

- Redesign airspace to minimize the impact on operations of setting airspace size, shape and time regulations (when conditions require that different types of traffic be segregated).
- Coordinate and monitor airspace use in order to accommodate any conflicting legitimate user requirements and to minimize constraints on operations. Radar signal sharing is an important step to achieve this goal.
- Plan future airspace reservations in advance, with changes made dynamically whenever possible. The system must accommodate unplanned requirements.

To accomplish these goals, it is highly recommended that the UAEAC consider the ICAO regional model of traffic flows and homogeneous areas in Colombia as Regional Planning group has planned.

Aerodrome Operations Strategies

Short term:

- Reduce runway occupancy time by allowing aircraft to enter and exit the runway at any location at the most congested Colombian airports. This applies especially to Eldorado Airport where system capability is affected by the following:
    - Aircraft separation
    - Air traffic controller workload
    - Delays related to taxiways availability and holding point limitations (reduced dimensions)
    - Lack of air traffic flow control
    - Slot assignation problems
    - Frequency congestion
    - Environmental restrictions for the south runway

All of these factors must be optimized gradually to improve the International airports operational capability.

At National airdromes, the main concern is related to safety areas and apron capacity. This limits the possibility to implement precision approach procedures and affects directly the number of operations that can be conducted. It is strongly recommended that the UAEAC implement the Standards and Recommended Practices (SARPS) of ICAO Annex 14 to achieve certification of airdromes, improving safety and efficiency.

- Increase safety maneuver capabilities in all weather conditions while maintaining capacity in most important Colombian airports.
- Consider all activities that take place on the maneuvering area (or apron on which aircraft and other vehicles move) as having a direct influence on ATM.

Medium term:

- Implement runway geometries that permit fast runway entries and exits, minimizing runway occupancy and holding time in the most congested Colombian airports.
- Implement precise surface guidance systems at major airports.
- Optimize activities not directly related to the ATM system (i.e., customs, security, baggage handlers, fuel supply, etc.), through the collaborative exchange of information.
- Consider environmental issues (i.e., noise, gaseous emissions and visual intrusions) in the design, development and operation of aerodromes.

Demand and Capacity Balancing

Short term:

- Optimize the slot allocations used by UAEAC.
- Determine the capacity of each airspace and airport.
- Accommodate unplanned situations.
- Provide tactical flexibility to guarantee optimal airspace availability.

After The UAEAC has determined the capacity of the Airspace and airports, a capacity management plan must be developed to improve capacity while maintaining the safety level.

To achieve these goals it is necessary:

- To reduce required separations. This can be done by implementing full radar control (actually in Colombia there's a mixture between non radar and radar control). In this aspect it is necessary to reinforce surveillance in high density areas such as Bogotá Terminal Area to guarantee continuity.
- To implement accurate navigation systems and the RNP concept which will enable reduced separation in upper control and terminal areas.
- To reduce the frequency occupancy time. This can be done using CPDLC and DATIS, and by improving the surveillance systems to reduce position reports requirements.
- To reduce the controller workload. This will require ATFM implementation as suggested
- To maintain or improve the safety level. This will require the elimination or reduction of the consequences of human error (pilots and controllers). That can be achieved by segregating traffic, implementing ETMS and synchronization. Note that while the RNAV capabilities of properly equipped aircraft allows a pilot to estimate his future position with an accuracy of 10 seconds, the controller is still working with a minutes time scale in a non radar control scenario. This could be fixed by using the datalink between the aircraft and the ATC system to download present and future position information. In addition, fatal errors due to communication problems can be reduced or eliminated.

Medium term:

- Use wide balancing techniques to resolve local demand and capacity balancing problems.

Long term

- Perform the balancing of demand and capacity from gate to gate.

CDM and information management will enable airspace user participation in balancing demands on the ATM system, also providing flexibility and predictability.

Information exchange and CDM, using information on demand and system capabilities will prevent system overloads and ensure manageable workloads for air traffic controllers.

Provision of timely and accredited quality assured information will allow an informed decision making process for pilots and air traffic controllers. All Colombian airspace will become available, improving access and increasing the opportunity for airlines and pilots to receive

preferred trajectories and obtaining increased capacity. Reducing separation modes will improve Colombian air space capacity. This reduction can be obtained by gradually implementing the required navigation performance (RNP) concept.

Airdrome operation optimization will provide predictable departure and gate arrival times, improving system predictability and subsequent capacity. In addition, improved runway design and all weather operations will increase capacity.

Traffic Synchronization

Short term:

- Provide an ability to tactically and collaboratively modify sequences to optimize aerodrome operations including gate management and/or airspace user operations.

Medium term:

- Evolve into 4-D control where a flight is given a time profile to follow to optimize throughput. This will avoid delays over congested points and reduce or eliminate the consequences of human errors (pilots and controllers).

Long term:

- Delegate spacing maintenance to flight decks to increase traffic throughput while reducing ground system workload.

Airspace User Operations

Medium term:

- Relevant ATM data must be fused for an airspace user's general, tactical and strategic situational awareness and conflict management.
- Relevant airspace user operational information must be made available to the ATM system.

Long term:

- Implement dynamically optimized 4 D trajectory management.

This will require that relevant airline data, updated itineraries and present and future position information will be shared with the ATC by mean of data link and information management systems using new communication technologies. The accuracy of the position information is directly dependant of the aircraft navigation performance (RNP) and can be validated by means of improved surveillance systems, such as ADS and Multilateration.

Conflict Management

Short term:

- Strategic conflict management will be achieved through improved airspace organization and management, demand and capacity balancing and the introduction of the traffic synchronization component. This will also reduce or eliminate choke points.

This can reduce or eliminate the collision risk and reduce to a minimum the consequences of human errors. The first step will be to redesign the aircraft trajectories to segregate landing and departure traffic as much as possible (as established in ICAO Annex 11). A next step could be to modify the design of Bogotá Terminal Sectors to improve traffic management and reduce coordination requirements. Design of the sectors must allow the activation of feeder sectors in high traffic periods and sector fusion in low density periods.

Medium term:

- Collision avoidance (ACAS) must activate when the separation mode has been compromised.

CDM, TMU and ETMS implementation will contribute to the reduction or elimination of collision risk events, maintain controller workload within safety parameters and avoid airborne delays, thereby obtaining high levels of efficiency with environmental benefits.

ATM Service Delivery Management

Medium Term:

- Increased integration of information systems is required to provide better use of available capacity at airports. Improved information exchange between systems and enhanced computer capability will allow more accurate information on aircraft position that will be updated at faster rates with the ability to predict operations through modeling for the next hour and beyond for that traffic day.

Long Term:

- ATM service delivery management is a seamless process for system operations from gate-to-gate for all phases of flight. The system design will be determined by all stakeholders through collaborative decision-making that supports a strong business case and required safety assessments. System balancing will be accomplished through agreements between the stakeholders to assure optimized user preferred trajectories through all phases of flight.

The information required to implement this concept is:

- Airline updated itinerary data
- Delays related to dispatch problems (last minute problems).
- Delays related to technical problems (aircraft or ground equipment).
- Aircraft type changes in a planned flight.
- Current and future position updated information. (rate of climb, speed limitations, angle of turns limitation).
- Delays related to meteorological conditions and operational capabilities.
- Preferred trajectories.
- Performance limitations related to load. (limited rate of climb or MDA).

To implement this, the ATN must be implemented, and a human center automation and information management system must be available.

To monitor the ATM performance UAEAC must:

- Evaluate the airspace management and organization and take the actions necessary to reach the goals.
- Evaluate airdrome operations (capabilities and limitations) and take the actions necessary to resolve the problems. (reduce ground delays and missed approach due to weather)
- Evaluate the capacity and demand balance and take the necessary action to reach the goals. (air delays)
- Evaluate the conflict management program (strongly related with the safety management program) and conduct the actions to reach the Safety Required Performance.
- Evaluate the satisfaction of user demands.

Information services

Short term:

- The UAEAC's information management system must provide accredited quality – assured, timely information to support ATM operations. The UAEAC must also monitor and control the quality of the shared information and provide information on the sharing mechanisms that support the ATM community.
- For the ATM system to operate at full potential, pertinent information must be available when and where required.
- Information may be personalized, filtered and accessed as needed. The initial quality of the information provided will be the responsibility of the originator, although subsequent handling must not compromise its quality.
- The reference medium for aeronautical data will be a fully electronic and networked environment, with printouts used only as needed for reference, temporary memorization and visualization support to human operators.

Medium term:

- Meteorological services must provide aviation weather information for all ATM operations. Automated meteorological measurements provided by airborne sensors will be a source of data. This information will provide timely notification of weather conditions that can be deemed pertinent to air and ground operations.
- Provide information to, or may receive information from air defense systems and military control systems, search and rescue organizations , aviation accident/incident investigation authorities, and law enforcement (including customs and police authorities).

Long term

- Information management will use globally harmonized information attributes related to AIS:
- Aeronautical Data and information exchange and broadcast
- Integrated documentation of aeronautical information and charts to satisfy all different national and international civil aviation categories

3. Recommendation Regarding Aeronautical Information Services

Aeronautical Data and information exchange and broadcast

The AIS must support ATM implementation in order to maximize system efficiency by sharing information leading to dynamic and flexible decision-making. Efficient and effective Air operations will depend on the provision of accurate, timely and quality-assured information to enable effective collaboration and to make informed decisions. When shared, information will allow the conduct of air operations in an efficient and safe manner.

Electronic data sets must satisfy user requirements to support the following air navigation applications:

- aeronautical chart production and data bases
- analysis of aircraft operating limitations
- A-SMGCS, GPWS and MSAW
- contingency procedures design
- design of IFR procedures
- flight simulator

Quality management for AIS/MAP services

The Aeronautical Information Services must consider the following:

Temporality

- The information contained in the "Manual de rutas normas y procedimientos" printed by Legis, must be issued with AIRAC requirements.
- Any valid and relevant information will be made available, as soon as it becomes available.
- To avoid waste of resources, satisfying the requirements of all information users, AIS must use a variety of information issuance concepts in relation to the application using it and the media used to carry it.
- The information relevant to a flight must be tailored and filtered, and accessible dynamically as the flight is planned and then progresses.

Media

The reference medium for aeronautical data must be a fully electronic and networked environment, with printouts as needed for reference, temporary memorization and visualization support.

Information will use a variety of channels. The best information routing must be selected for use on the basis of quality of service, when possible in real-time.

Meteorological information

Meteorological services must provide aviation weather information for all ATM operations. Sources of meteorological information must include airborne, space-based and ground-based sensors.

By improving the accuracy and timeliness of meteorological information, the UAEAC can provide increased efficiency to ATM and aircraft operations and optimize flight trajectory prediction.

UAEAC aeronautical meteorological data will progressively improve the coordination of activities as follows:

- the provision of appropriate meteorological facilities at all aerodromes
- en-route capacity optimization during adverse weather for all flights
- minimization of environmental impact of aircrafts
- on-board aircraft meteorological data gathering for real-time meteorological data updating
- assessment of emerging capabilities and the changes necessary and sufficient to meet current and future operational needs.

4. WGS-84 Implementation

The traditional techniques of navigation had depended until today on the capacity to fly to or from points that constitute navigation aids.

RNAV navigation determines the position of the aircraft from sources such as the inertial navigation systems (INS), VOR/DME, dual or multiple DME's and GNSS. Based on the aeronautical data (latitude longitude coordinates), RNAV systems generate appropriate instructions sent to the positioning systems of the aircrafts so that they can follow the route anticipated during the phases of departure, en route, approach and landing.

In order to be able to introduce the RNAV/GNNS routes and terminal control area (TCA) procedures, greater precision is needed, and it is also necessary to guarantee precision, resolution and integrity of the data.

Implementation of the WGS84 as specified in ICAO annex 15 is mandatory to all countries.

5. Conclusions Regarding the Analysis of Colombian Airspace

Regarding the tables showed on appendix F, we could summarize the analysis by the following:

- Humans still being the main element of ATM and qualified training are required.
- Most congested airspaces will need to be redesigned when necessary to reduce air traffic controller workload, increasing safety and capacity.
- Surveillance must be increased to accomplish growing traffic, reducing separation between aircrafts and increasing capacity.
- Airspace categorization must be gradually changed where required, to improve ATM services and demand capacity balance.
- Automation must be human centered and must reduce the pilots and air traffic controllers workload increasing safety.
- Landing and departing traffic must be segregated, eliminating choke points as possible as part of an Error management program.
- New design of Upper control areas and letters of agreement (LOA) could reduce frequency changes and air traffic controller's coordination needs.
- Reduced phraseology and communications procedures can reduce pilot and ontrollers workload increasing safety and capacity.
- Safety program must be implemented as Global Air Navigation Plan requires.
- Communications improvements will bring flexibility, efficiency and safety for all airspaces.
- Air traffic flow management must be implemented to improve safety and demand capacity balance in most congested airports.

6. Environmental Protection

The introduction of ATM systems will have a positive impact on the Colombian environment by reducing operating times on the ground and in the air (reduced air pollution). It will also spread traffic over broader areas, reducing the concentration of noise. A separate environmental assessment will be submitted as part of the Final Report.

Air Safety

The implementation of safety management in Colombia will ensure that safety remains the highest priority, avoiding unnecessary risks and costly accidents. In the long term scenario, management by trajectory will improve conflict management and facilitate user preferred trajectories.

Operational concept and the Colombia ATM system

The ATM system provides services through the collaborative integration of humans, information, technology, facilities and services, supported by air, ground and/or space-based communications, navigation and surveillance. That means that some elements of ATM are strongly dependant of the technology implementation while some can be started right now because they do not require big investments or industry development.

For CONOPS implementation the UAEAC needs to increase user flexibility and maximize operating efficiencies in order to increase system capacity and improve safety levels as a first step.

4. Considerations for Required Communications Performance

The emergence of several types of data links for the conduct of air-air and air-ground data exchange as well as the support of navigation, surveillance and other operational functions raised concern within the international community that the overall air navigation system is becoming extremely complex. Obviously it would be ideal to have a single air-air and air-ground communications system capable of handling all communications, navigation and surveillance requirements for all types of airspace and phases of flight. However, there are several systems in existence today and the probability of having a single system designed and implemented to replace all of those systems is considered to be low to zero.

The availability of several communications systems does provide airspace flexibility planning, however, the proliferation of sub-networks adds to the complexity of the operation, as well as impacting its maintenance and administration. Although having the choice between several types of communications systems has some advantages from the implementation point of view, it does make the regional planning for air navigation systems more complex, particularly when it comes to making contiguous FIRs harmonious and synchronous from the communications point of view.

A recommended solution to the problem of having multiple communications systems is to do away with the specific requirements for individual systems (such as VHF, HF, etc.) and instead, translate all relevant requirements in certain airspaces and scenarios into a series of communications performance parameters. This approach is commonly referred to as Required Communications Performance (RCP).

ICAO recommends the adoption of RCP. RCP refers to a set of well quantified communications performance requirements, such as capacity, availability, error rate, and transit delay. Once RCP has been specified for an operational scenario in a given airspace, any single communications system, or combination of systems meeting the set parameters, can be considered as operationally acceptable and adequate for safe and efficient communications.

From an overall architectural perspective, the approach envisioned for a "total communications system" based on RCP is to develop and implement a comprehensive aeronautical telecommunications network (ATN) to enable the optimization of communications functions for all appropriate ATM/CNS operations.

At the backbone of the ATN are multiple independent sub-networks, or air/ground data links including Mode-S, Secondary Surveillance Radar, Satellites, and VHF links. Each of these links can be used to exchange data between aircraft and ground systems, independent of the other links (allowing users many choices in how best to meet their needs). The actual exchange of information can be either via voice, data or both. "Full ATN data" is the desired end-state and is a fully compliant and operational ATN capable of providing both voice and data services. An illustration of such a system is as follows:

From the perspective of the airspace service provider and the airspace user, an ATN architecture will also improve communications efficiencies thereby reducing the need to simply "buy more equipment" to meet projected growth in airspace demands. For instance, the efficiencies of transmitting information via data link as opposed to voice services will enable the controller to "control" more aircraft and at the same time reduce the probability of transmission errors (e.g. language and/or translation of instructions) thereby also increasing safety.

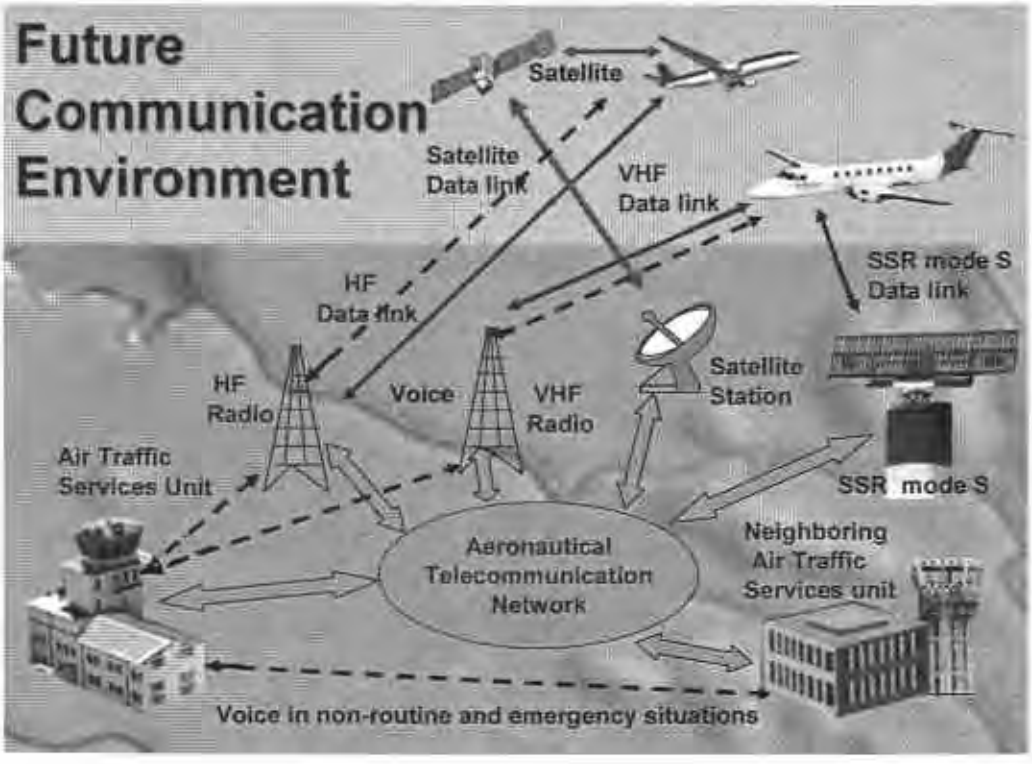
Functionally, the ATN and its associated application processes have been specifically designed to provide, in a manner transparent to the end-user, a reliable end-to-end communications service over dissimilar networks in support of air traffic services. ATN can also carry other communications service types such as AOC (aeronautical operational control), AAC (aeronautical administrative communications), and APC (aeronautical passenger communications).

Typical ATN service oriented sub-networks may include (reference figure below):

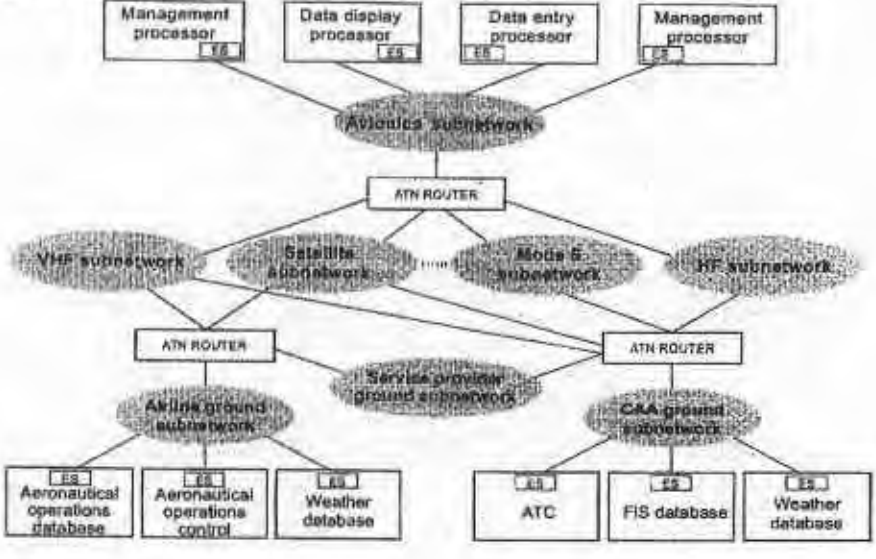
- An airline ground sub-network to provide aeronautical operations control, weather information and aeronautical operations data for each aircraft.
- A service provider network enabling air traffic control, flight information services and the relay of weather data.

An avionics sub-network for aircraft management, data displays and data entry functions.

The key element of an ATN is the ATN Router. Routers will serve as the interface between each of the sub-networks and determine the mode of communications connectivity. To date a fully developed and standards compliant Router is not commercially available.



However, it is possible to develop a communications infrastructure capable of accommodating ATN Routers when they become available. This infrastructure will include the essential sub-network elements, such as the VHF sub-network. This building of the underlying ATN infrastructure is commonly referred to as "pre-ATN" development.



5 Aeronautical Meteorological Information Systems

Concurrent with the conduct of ISI's ATM/CNS Feasibility Study, Earth Satellite Corporation (now known as MDA Federal Inc.) of Rockville, Maryland, conducted an evaluation to modernize the Colombia Aviation Meteorological System, an effort also funded by the US Trade and Development Agency. EarthSat developed several options for modernization, with Option 2 being selected as both the best technical solution and the one yielding the greatest benefit/cost ratio. Option 2 provides the following at all 48 controlled airports in Colombia:

- AWOS
- Runway visual range (RVR) and ceilometers for each instrument landing system runway
- Expanded radiosonde and upper air soundings program
- GOES receiving station
- World area forecast system (WAFS) workstation
- Forecaster workstations
- Software templates for AIREPs and SIGMETs
- Pre-flight briefing system including software
- Local airport pre-flight briefing workstation
- Weather systems for calibration and training
- Modernization and increased capacities of electronic data communication links

The benefit/cost ratio for Option 2, expressed in US$ benefits per US$1 of implementation costs was calculated at 347:1.

Because Technical Option 2 yields the highest benefit/cost ratio, it is the most appealing and preferred technical option. Technical Option 2 provides for improving weather observations and the dissemination of METARs and TAFs at all 48 controlled airports and the full core set of system upgrades.

Option 2 also calls for the negotiation of a new agreement between AeroCivil and IDEAM that follows the United States or Canadian model.

This option elevates aviation meteorological services within IDEAM to meet international needs and expectations by having that agency responsible for upper air soundings and forecasting. In this case, responsibility for providing and maintaining the basic airport observing systems and staffing the observation function could be assigned to AeroCivil, and IDEAM employees could be transferred to AeroCivil to carry out the observation role. The staffing and operation of the CAMC could be assigned to IDEAM.

A clear division of responsibility is needed to simplify the full integration of the meteorological systems into the airport infrastructure, communication links and operational support. The United States or Canadian models offer some guidance to implementing this option. The United States model would provide for AeroCivil to retain the surface observation and flight service

station program and identify which services IDEAM would provide. Under the Canadian model, all airport observations would stay with AeroCivil and all other services would be provided by IDEAM

Benefit/cost ratios were also developed for the organization and management options with the results for the selected option shown below:

Organization and Management Option	**Benefit / Cost Ratio**
Renegotiate AeroCivil – IDEAM Agreement	
United States Model	317:1
Canadian Model	328:1

A renegotiation of the AeroCivil-IDEAM agreement is recommended as the preferred organization and management solution because it yields the highest benefit/cost ratio. Implementation of this option is, however, dependent on a successful negotiation process that clearly defines the roles, responsibilities, payments, dispute resolution and penalties associated with the delivery of the aeronautical meteorological data and services in accordance with ICAO standards.

Overall Study Recommendations

The EarthSat Team recommends the following:

1. Technical Option 2 should be implemented over a 10-year time frame with periodic program reviews to update and adjust priorities to reflect funding realities, technological advances, and changing operational requirements.

2. The current Inter-Administrative Agreement between AeroCivil and IDEAM should be terminated and a new agreement negotiated stating specific performance, accountability, monitoring and enforcement measures.

3. A cost recovery system involving landing fees and overflight fees should be established in accordance with ICAO policies and guidance. A dedicated fund account that is utilized only for the purposes of implementing the improvements for which such cost recovery funds are collected should be established. These funds may also be used for projects that contribute to enhanced flight safety and efficiency in Colombia.

4. The recommended aeronautical meteorological program should be funded with loans taken as needed in the first two years or, alternatively, from the operating budget of AeroCivil.

The ISI Team has taken into consideration the recommendations of the EarthSat evaluation and finds them to be both compatible and supportive of the ATM/CNS Feasibility Study.

II. OPTIONS FOR MODERNIZATION

Both Options 1 and 2 are designed to be implemented incrementally. This is accomplished through a phased approach with three distinct phases. Each phase is initially divided by time, capability, and phase of flight, and subsequently by location. The phased timeframes have been established as follows:

- Phase I – Present – 2010
- Phase II – 2011 – 2015
- Phase III – 2016 - 2019

The Evolutionary option calls for a graduated, measured acquisition, implementation, and transition of ATM/CNS technologies over a period of 13 years (present – 2019). The focus of this option is the transition of Colombian National Airspace only with no effort expended on regional implementation. This approach will allow for the most cost effective transition from the present infrastructure to the new infrastructure, meet all ICAO and CAR/SAM mandated requirements, provide for all of Colombia's current and forecast operational needs, satisfies the aviation requirements outlined in Vision 2019 for Colombia, and provides ample time for the various user communities to equip and begin to use the capabilities being offered.

Advantages:

- Least cost per year throughout the transition
- Ample time for user equipage
- International standards more firmly established

Disadvantages:

- Loss of potential revenue as Regional Service Provider
- Loss of potential revenue from increased airline traffic
- Longer period of time during which users may be required to maintain dual equipage

The Accelerated option calls for a more aggressive approach with the primary goal of completion of the acquisition, implementation, and transition of Colombian airspace to ATM/CNS by 2015 and the subsequent ability to expand to become a Regional Service Provider to the neighboring Andean nations by 2019. This approach naturally carries some risk associated with becoming a regional service provider and could potentially place Colombia in competition with the other nations or companies desiring to capture that same business. While the up front cost associated with this option may be slightly higher the potential to not only re-coup those costs but provide a profitable revenue stream merits consideration.

Advantages:

- Potential to generate a significantly higher revenue stream
- Establishes Colombia as a regional leader in the transition to ATM/CNS

- Decreases the cost of maintaining the current (aging) aviation infrastructure
- Increases availability, coverage, and continuity of service within the Andean region
- Potential to generate additional tourism dollars
- Increase safety and efficiency of operations
- Airlines will realize benefits of direct routing, improved scheduling, and reduced separation sooner

Disadvantages:

- Increased risk
- More aggressive schedule
- Requires close coordination and consent from other Andean partners

III. OBJECTIVES BY PHASE OF FLIGHT

A. Airport Surface Movement Operations and Services

- Future Characteristics. The service provider's objective is to remove system constraints on flights from gate pushback to the runway and from the runway to the gate. Controlling and monitoring airport surface movement becomes increasingly difficult, especially as visibility decreases.

Specific Goals:

- Where feasible/needed, provide surface movement guidance and control thereby increasing the safety and efficiency of airport operations.

B. Departure and Arrival Operations Services

- **Future Characteristics.** Departure and arrival route structures are expanded, within environmental constraints, to allow increased usage of area navigation (RNAV), SATNAV, and routes flown automatically by onboard Flight Management Systems (FMS).

Specific Goals:

- Establish ATC procedures to provide improved service to GNSS-equipped aircraft operating in a mixed satellite- and ground-based navigation system environment.
- Structure a flexible system of departure procedures (DP), Standard Terminal Arrival Routes (STAR) and profile descents to more efficiently transition to/from the en route structure.
- Reduce terminal separation standards.
- Develop exclusive GNSS procedures/routes between major metropolitan areas at all available altitudes.
- Provide VFR waypoints for visual reporting, flyways, corridors and transitions.
- Establish and certify "rotorcraft only" instrument approach procedures (IAP), DPs and STARs to enhance the flow of both fixed-wing and rotorcraft traffic within terminal areas.
- Develop flexible, alternative GNSS route capabilities and procedures that will permit flight through and/or around special use airspace (SUA).
- Transition approaches to GNSS-based procedures.
- Develop a GNSS-based terminal airspace system to include procedures/routes for instrument flight rules (IFR), visual flight rules (VFR), and special VFR operations.
- Develop precision missed approach procedures.

- Implementation of RNP and RCP
- Develop pre-ATN sub-networks capable of assuring the availability and sustainability of airspace communications.
- Establish and ensure inter and intra coordination between airspace users and facilities to enhance airspace operations for all ATM/CNS requirements.

C. En-route Operations and Services

- **Future Characteristics.** By the year 2015, en route structures and boundary restrictions are expected to be unconstrained by communications and computer systems and aircraft are not normally required to fly directly between NAVAID's along routes defined by the CAA. As a result, en route operations are characterized by the following:

Specific Goals:

- Traffic flies optimum descent profiles, remaining at higher altitudes for longer periods during the arrival phase of flight.
- Automated, seamless inter-/intra-coordination and communications within and between facilities will enable airspace structure flexibility and reduced boundary restrictions.
- Structured routes are the exception rather than the rule, and exist only when required by high density traffic environments, to provide for terrain avoidance and active SUAs, and to facilitate the transition between areas with differing separation minima. Demand and capacity imbalances have been resolved, in collaboration with the users, via voluntary changes in trajectories or through the establishment of temporary routes and transition points in the affected area.
- Establish lower minimum en route altitudes (MEA) in mountainous areas using GNSS as the navigation aid.
- Develop flexible routes to accommodate GNSS-based direct routings (fixed wing and helicopter)
- Establish an altitude stratum in domestic airspace designated for GNSS-equipped aircraft.
- Develop a non-radar, ADS-based low altitude route structure.
- Develop GNSS low altitude route structure and air traffic procedures to support non-radar IFR offshore helicopter operations.
- Establish ATC procedures for providing improved service to GNSS-equipped aircraft operating in a mixed environment.
- Develop GNSS-based direct routes overlaying portions of airways as well as through un-used airspace.

- Develop flexible alternative GNSS route capabilities and procedures that will permit flight through or around SUA.
- Use GNSS capabilities to reduce Andean Region and domestic en route separation standards.
- Implementation of RNP and RCP
- Develop pre-ATN sub-networks capable of assuring the availability and sustainability of airspace communications.
- Establish and ensure inter- and intra-coordination between airspace users and facilities to enhance airspace operations for all ATM/CNS requirements.

D. Oceanic Operations and Services

- **Future Characteristics.** GNSS is used as a primary means of navigation in the oceanic environment. To accommodate the growth in air traffic loads, improvements in air traffic management tools, navigation, communication, and surveillance, will be paramount enablers of capacity enhancement in oceanic airspace. Additionally, procedural reductions in separation standards are facilitated through an improved infrastructure. Automation and procedural changes help service providers become strategically involved in solving potential conflicts, traffic congestion, and the demand for user preferred trajectories.

Specific Goals:

- Increase system capacity by reducing longitudinal, lateral, and vertical (RVSM) separation minima.
- Increase system flexibility by replacing oceanic track systems with user-preferred routes.
- Develop automated surveillance and traffic information capabilities.
- Implementation of RNP and RCP
- Develop pre-ATN sub-networks capable of assuring the availability and sustainability of airspace communications.
- Expand AMSS for areas/regions that are out of range of ground-based communication systems.

IV. CANDIDATE TECHNOLOGIES

The following section will provide a high level overview of the technologies required to effect the transition to ATM/CNS without regard to the option chosen above. If a particular technology does not apply to providing service in Colombian airspace because of proximity or capability it is so stated.

A. Communications: Air-to-Ground

- VHF – Both VHF voice and VHF data link will provide additional flexibility and functionality for both the airspace users and service provider. The current 25 KHz radios are slowly moving out of the manufacturing inventory and being replaced by 8.33 KHz radios. When the prices of 8.33 KHz radios are comparable to 25 KHz radios then a decision should be made to purchase 8.33 KHz radios. Additionally, current technologies support VHF transmitters and receivers to be combined in a single "box" (transceiver) and collocated at the same facility. New VHF purchases should be structured to enable the acquisition of transceivers.

- VDL 2 – The VDL Mode 2 digital data link is an evolution from Mode 1 that uses a digital, 8-phase shift keying (D8PSK) modulation scheme at a data rate of 31.5 kilobits per second. It is ATN compliant, providing a bit oriented protocol that may also handle character oriented messages that are compatible with non-ATN infrastructures. It has limitations in its support of time critical applications in high air traffic density areas because of its CSMA channel access protocol that exhibits a non-deterministic behavior. It does not support message priorities and it cannot guarantee the message transfer time. VDL Mode 2 employs a globally dedicated common signaling channel at 136.975 MHz. VDL 3 & 4 are designed to provide incremental enhancements to this capability.

- VDL-3 - The VDL Mode 3 uses the same physical layer as Mode 2 with a time division multiple access (TDMA) technique. This enables up to four 4.8 kilobit per second circuits for voice or data on each 25 kHz channel that may be assigned anywhere in the band. The data capability provides a mobile sub-network that is compliant with the ATN. ICAO SARPs became applicable in November 2001. Guidance material is provided in ICAO Doc 9805, *Manual on VHF Digital Link (VDL) Mode 3.* There is currently no operational use of VDL Mode 3. Implementation plans in the United States (NEXCOM program) are presently delayed.

- VDL-4 – This VHF data link is intended for surveillance. It is based on a self-organizing time division multiple access (STDMA) scheme, using 19.2 kilobit per second Gaussian frequency shift keying (GFSK) modulation. Broadcast surveillance data applications are supported by non-ATN compliant specific services, and point-to-point data surveillance applications are supported both on ATN and non-ATN compliant basis. VDL Mode 4 requires the assignment of two global signaling channels and additional regional and local channels to support service requirements. ICAO SARPs for the VDL Mode 4 became applicable in November 2001.

- HFDL - HF data link (HFDL) was developed for use in the aeronautical HF band and thus makes use of the same frequencies and equipment as HF voice. It operates in the same 3 kHz channels with a single side band digital modulation scheme, providing up to 2.4 kilobits per second data throughput. HFDL is less sensitive to varying propagation conditions than is HF voice because it is automatically adaptive both in radio frequency and data rate and it includes extensive error detection and correction algorithms in the protocol. This system uses a bit-oriented data protocol designed to function as a sub-network of the ATN. In order to be compatible with present airline data communications infrastructures, it also supports character oriented ACARS messages. HFDL provides an average transfer delay of 75 seconds and a 95th percentile delay of 200 seconds. It is presently used for AOC applications globally. It is also being used in pre-operational trials for ATS applications in the North Pacific and North Atlantic. Several studies indicate that HFDL can also be a backup to satellite communications, notably in Polar Regions where geostationary satellites have reduced or no coverage. Standards and recommended practices for HFDL were developed by the ICAO Aeronautical Mobile Communications Panel (AMCP) and became applicable in 1999. A global commercial service is presently operating.
- AMSS – Aeronautical Mobile Satellite Service (AMSS): AMSS provides digital voice and data services using geostationary satellites and operates in the mobile satellite service bands 1545 MHz - 1555 MHz and 1646.5 - 1656.5 MHz. It is projected that AMSS coverage will be superior to coverage provided by traditional ground-based systems. Clearly ground-based systems cannot be deployed in oceanic airspace and are not practical for low density airspace. It has also been projected that the cost of AMSS "transmissions" could be competitive with traditional ground-based systems when you factor in the costs of purchasing, operating and maintaining the ground-based systems. However, this financial "benefit" has not been proven.

B. Communications: Ground-to-Ground

Several candidate technology options are available to support the requirement to efficiently and effectively communicate between ground facilities. The selection of the specific technology will be a function of several variables, such as operational demand, reliability, availability, volume of service, cost, maintenance, support infrastructure, etc. The most commonly used technologies include Microwave, Fiber Optic and Satellite and/or a combination of each of these technologies.

A reliable satellite communication system is the VSAT-- (very small aperture terminal). VSAT consists of two parts, a transceiver that is placed outdoors in direct line of sight to the satellite and a device that is placed indoors to interface the transceiver with the end user's communications device. The transceiver receives or sends a signal to a satellite transponder in the sky. The satellite sends and receives signals from a ground station computer that acts as a hub for the system. Each end user is interconnected with the hub station via the satellite, forming a star topology. The hub controls the entire operation of the network. For one end user to communicate with another, each transmission has to first go to the hub station that then retransmits it via the satellite to the other end user's VSAT. VSAT can handle up to 56 Kbps.

It must be noted that all of these candidate technologies are taken into consideration during the building of an aeronautical telecommunications network (ATN).

C. Communications: Airport and Terminal

Aerocivil owns many of the airports in Colombia and is responsible for providing communications systems and services that are not directly related to the movement of aircraft and/or a phase of flight. One such system, the ARINC Gate-Aircraft Terminal Environment Link (Gatelink) is a high-speed, two-way communication link between a parked aircraft and a ground-based communications system.

D. Navigation: Satellite Navigation Components

The foundation of global navigation, positioning, and timing is provided by three basic systems: The Global Positioning System (GPS-United States), Galileo (Europe, operational [est.] 2008), and GLONASS (Russian [currently partially operational]). The satellites orbit at approximately 11,000 miles of altitude inclined off the equator at about 50 to 65 degrees. This is the optimum orbit for whole earth coverage with the minimum number of satellites. The constellations provide users with worldwide navigation capability down to and including non-precision approach.

There are several augmentation technologies used to alleviate accuracy, integrity, availability, and continuity of service limitations for GNSS in order to meet civil aviation's requirements. The deployment of these capabilities will allow for the decommissioning of ground-based navigational aids. Two such possibilities are discussed below.

Space Based Augmentation System (SBAS) – used for aviation en-route, terminal area, and non-precision approach (including NPA with vertical guidance). An SBAS will cover a wide area in support of civil air operations. Although two satellites provide hemispheric coverage, additional satellites will be required for redundancy. The SBAS will provide integrity for GPS, Galileo, and GLONASS constellations, precision approach accuracy, and increased availability. The systems will also provide the basis for Automatic Dependent Surveillance-Broadcast (ADS-B/C) and surface navigation. The purpose of SBAS is threefold;

- Enhance the basic navigation service to provide a highly accurate safety certified navigation capability for application to all aspects of a national transportation infrastructure.
- Allow de-commissioning of older, more expensive aids to navigation.
- Provide the capability to generate revenue through various levels of navigation and communication services.

The following are SBAS-type projects are underway in different regions of the world;

- WAAS – Wide Area Augmentation System – FAA owned and operated
- EGNOS - European Geostationary Navigation Overlay Service - EGNOS is being developed by European industry (Alcatel and Thales) under the guidance of the European Tripartite Group (European Space Agency, European Community, and EUROCONTROL).

- MSAS - Multi-function Transport Satellite [MTSAT] Satellite Augmentation System (MSAS) – Japanese version of WAAS
- GAGAN – India – WAAS compatible SBAS
- It is anticipated that future SBAS will satisfy all phases of flight down to precision approaches. For surface and taxi, even the current WAAS has the capability to satisfy this requirement since the horizontal accuracy is normally about one meter. With the additional Galileo satellites and interoperability, it is expected to have a horizontal accuracy of less than one meter.

Ground Based Augmentation System (GBAS) – The third tier of GNSS capability is for all categories of aviation precision approach, landing, guided departures, missed approaches and surface operations within GBAS coverage (approximately 20 nautical miles for approach service). GBAS can reduce separation standards in terminal areas and provide better margins of safety. GBAS affords similar benefits to SBAS and the same potential benefits (noted above for approach and landing). In addition to these substantive benefits, GBAS can provide:

- CAT I service at locations where SBAS is not available, e.g. mountainous terrain and areas outside SBAS precision approach coverage.
- CAT II/III operations, including rollout, may be possible for multiple runways with a single GBAS installation.
- High accuracy position information allowing surface navigation in low visibility
- GRAS - Ground Based Regional Augmentation System (GRAS) is another type ground-based augmentation system being developed by Australia. This system will use a nationwide grid of reference stations and broadcast correction messages over ground antennas instead of by satellite communication link. GRAS has its own SARPS. MOPS and ICAO designation.

Real Time Performance Monitoring – The impact of a satellite outage is not intuitive due to the dynamics of the constellations. A real-time performance monitoring and prediction capability is required as an essential tool to ensure the safe operation of all satellite navigation systems authorized to operate in the any National Airspace. This capability is required in order to achieve the following goals:

- The ability to offer GNSS service to users per the ICAO Chicago Convention (which mandates national liability for authorizing the use of GNSS in national airspace).
- The ability to monitor the GNSS service and archive performance data to support accident investigation.
- The ability to provide aeronautical information required to generate NOTAMs, which is legally necessary in order to provide the GNSS/SBAS service to users.

Based on the work being done in China, Brazil, Germany, and several other ICAO member states, the Real Time Performance Monitoring System will be generically called the GNSS Performance Monitoring System (GPMS). A generic GPMS is designed to satisfy the following

four ICAO Annex 10 requirements in order to operationally approve the use of GNSS in any national airspace:

1. Continuous real-time status monitoring of GNSS for airport landing applications (ICAO Annex 10, Chapter 2.8)
2. Continuous real-time data storage of GNSS performance for liability and accident investigations (ICAO Annex 10, Chapter 2.4.3)
3. Provide Notice to Airmen (NOTAM) to users when GNSS cannot be used for specific safety applications (ICAO Annex 10, Chapter 3.7.6)
4. 4. Verification that the local interference environment is not harmful to GNSS users (ICAO Annex 10, Chapter 3.7.4)

For Colombia, it is recommended that GPMS is implemented incrementally in the following increments for Phases I, II, and III. The rationale for this incremental implementation is as described in the front of this chapter.

GPMS I consists of two master stations to be installed at Baranquilla and Bogota FIRs. This will provide Colombia with a capability to monitor the performance of GNSS and approve GNSS for use in the following phases of flight within all of Colombian airspace: Oceanic and Continental En Route.

GPMS II adds six reference stations to provide coverage throughout Colombia, which are installed at Bogota, Leticia, Puerto Carreno, San Andres, Santa Marta, and Tumaco. GPMS II will provide Colombia with a capability to monitor the performance of GNSS and approve its use for the following phases of flight within all of Colombian airspace: Oceanic En Route; Continental En Route; Terminal Area; Approach/Departure Procedures; and Non-Precision Approaches.

GPMS III adds real-time integrity for the users, by providing GPMS with a capability to deliver the integrity messages to aircraft in real time. This can be accomplished with an SBAS-like message through a satellite or as simple as transmitting the integrity message over the airlines ACARS messaging system (If ACARS is used, it may not satisfy all the requirements for integrity unless the ACARS has been modified for airline data link such as VDL-2). GPMS III will provide Colombia with a capability to monitor the performance of GNSS and approve the following phases of flight with a real-time integrity message to all users within the Colombian airspace: Oceanic En Route; Continental En Route; Terminal Area; Approach/Departure Procedures; Non-Precision Approaches; and Precision Approach. In addition, it is important to note that this integrity capability will only serve as a backup to the real integrity that should be provided by the GNSS service provider and the certified avionics.

E. Navigation: Ground Based Components

- VOR – Very High Frequency Omni-directional Range. This system provides the basic guidance for en route and terminal area navigation, and non-precision approach for many parts of the world. Information provided to the aircraft by the VOR is the magnetic azimuth relative to the VOR ground station.

- DME – Distance Measuring Equipment. The operation of DME is accomplished by paired pulse signals and the recognition of the desired pulse spacings accomplished by use of a decoder. The transponder must reply to all interrogators. The interrogator must measure elapsed time between interrogation and reply pulse pairs and translate this into distance.
- ILS – Instrument Landing System is a precision approach system normally consisting of a localizer facility, a glide slope facility, and associated VHF marker beacons. It provides vertical and horizontal navigation (guidance) information during an approach to landing at an airport runway. At present, ILS is one of the primary worldwide, ICAO-approved, precision landing systems. This system is presently adequate, but has limitations in siting, frequency allocation, cost, and performance.
- NDB – Non-Directional Radio Beacon. Aeronautical radio beacons are non-directional radio transmitting stations that operate in low and medium frequency bands to provide ground wave signals to aircraft receivers. Aircraft non-directional beacons are used to supplement VOR-DME for transition from en route to airport approach facilities and as a non-precision approach aid at many airports.

F. Surveillance

- The most rudimentary kind of surveillance is the voice report, where pilots provide dependent surveillance verbally, by determining aircraft position from on-board navigation systems and communicating it back to the control facility over the radio. Secondary surveillance radar (SSR) provides data to air traffic control through the interrogation of airborne transponder equipment. There are presently two types of SSRs: Mode A, which provides aircraft identification, bearing and distance data, and Mode C, which provides all the data of Mode A plus pressure-altitude information. SSRs are also improved by application of monopulse, large vertical aperture antennas and advanced processing techniques.
- Mode S - The SSR Mode S is the latest generation ground-based secondary radar surveillance system. In addition to SSR Mode A/C and Mode S surveillance capability, Mode S supports data link transactions and is defined as an ATN-compliant sub-network. The operating frequencies are 1030 MHz from ground to air and 1090 MHz from air to ground. Extended squitter is an addition to the Mode S system designed to support automatic dependent surveillance broadcast (ADS-B), which will also allow enhancements to the airborne collision avoidance system (ACAS). The extended squitter consists of a set of broadcast messages that provide information regarding the aircraft position, velocity, and identification. It uses the same format as the current Mode S data link and operates on the Mode S downlink frequency of 1090 MHz.

G. Phased Application of Technologies

In considering candidate technologies for Colombia's future development options, our team considered all applicable systems. Then the team identified whether or not the different technologies complied with the requirements established for the Evolutionary and Accelerated options. Results of this evaluation are synthesized in the following tables.

1. Air Traffic Management

Phase I	
Oceanic En route	CDM, TMU, ETMS, G-GNM
Continental En Route	CDM, TMU, ETMS, Eliminate Choke Points, G-GNM (HD)
Terminal	CDM, TMU, ETMS, Eliminate Choke Points, G-GNM (HD)
Approach Procedures	CDM, TMU, ETMS, Benchmark Airports, G-GNM (HD)
Approach NPA	CDM, TMU, ETMS, Benchmark Airports
Approach APV-I	CDM, TMU, ETMS, Benchmark Airports

Approach APV-II	CDM, TMU, ETMS, Benchmark Airpors
Approach PA	CDM, TMU, ETMS, Benchmark Airports, G-GNM
Surface and Taxi	CDM, TMU, ETMS
Phase II	
Oceanic En route	Global ATM
Continental En Route	G-GNM/ Global ATM (HD)
Terminal	G-GNM/ Global ATM (HD)
Approach Procedures	G-GNM/ Global ATM (HD)
Approach NPA	G-GNM
Approach APV-I	G-GNM
Approach APV-II	G-GNM
Approach PA	G-GNM/ Global ATM (HD)
Surface and Taxi	G-GNM
Phase III	
Oceanic En route	Global ATM
Continental En Route	Global ATM
Terminal	Global ATM
Approach Procedures	Global ATM
Approach NPA	Global ATM
Approach APV-I	Global ATM
Approach APV-II	Global ATM
Approach PA	Global ATM
Surface and Taxi	Global ATM

2. Communications

Phase I	
Oceanic En route	HF Voice, AMSS1
Continental En Route	VHF Voice, VDL-2
Terminal	VHF Voice, VDL-2
Approach Procedures	VHF Voice, VDL-2
Approach NPA	VHF Voice, VDL-2
Approach APV-I	VHF Voice, VDL-2
Approach APV-II	VHF Voice, VDL-2
Approach PA	VHF Voice, VDL-2
Surface and Taxi	VHF Voice, VDL-2
Phase II	
Oceanic En route	HF Voice, HFDL, AMSS
Continental En Route	VHF Voice, VDL 2/3[2]
Terminal	VHF Voice, VDL 2/3

[1] AMSS has been added to this table, however it is questionable whether a solid business case can be made for acquiring AMSS at these phases.

[2] The decision whether or not to acquire and implement VDL2 and VDL 2/3 will be location dependent. For those airports (e.g. international airports) that have high traffic demands and aircraft capable of utilizing VDL, it may be economically viable to acquire and implement VDL. The final decision must be based on a comprehensive cost-benefit analysis.

Specifically, VDL 2 is a data link service provided by ARINC via ACARS (Aircraft Communication Addressing and Reporting System). ACARS is a digital data link system for transmission of small messages between aircraft and ground stations via radio or satellite. The protocol was defined in the 1970s and uses telex formats. It will be superseded by the Aeronautical Telecommunications Network (ATN) protocol. It may be reasonable to establish a working relationship with ARINC to determine the air traffic control options for VDL 2 services at select airports (e.g. pre-departure clearance) and the benefits of VDL 2 with respect to pre-ATN.

Approach Procedures	VHF Voice, VDL 2/3
Approach NPA	VHF Voice, VDL 2/3
Approach APV-I	VHF Voice, VDL 2/3
Approach APV-II	VHF Voice, VDL 2/3
Approach PA	VHF Voice, VDL 2/3
Surface and Taxi	VHF Voice, VDL 2/3
Phase III	
Oceanic En route	VHF/AMSS (voice/data)[3] HF Voice, HFDL, Full ATN data
Continental En Route	VHF Voice, VHF (voice/data), Full ATN data
Terminal	VHF Voice, VHF (voice/data), Full ATN data
Approach Procedures	VHF Voice, VHF (voice/data), Full ATN data
Approach NPA	VHF Voice, VHF (voice/data), Full ATN data
Approach APV-I	VHF Voice, VHF (voice/data), Full ATN data
Approach APV-II	VHF Voice, VHF (voice/data), Full ATN data
Approach PA	VHF Voice, VHF (voice/data), Full ATN data
Surface and Taxi	VHF Voice, VHF (voice/data), Full ATN data

3. Navigation

The following diagram shows the full range of possible technologies relevant to phase of flight. This is a high level list. It does not take into consideration the specific requirements of the evolutionary and accelerated options for future growth (that is elaborated later in this report).

Candidate technology does not include the backup requirements that may be needed for future sole means operations. It is recommended that the VOR/DME (if available) should be retained as

[3] For Oceanic operations HF Voice, HFDL and AMSS are recommended candidate technologies. However, it will likely not be necessary to have all three systems. The decision as to what system(s) to use will depend upon the level of equipage of the airspace user. For instance, if a majority of the airspace users have an AMSS capability and do not rely on HF Voice or HFDL, then HF Voice and HFDL services are not required and should not be implemented.

the backup systems at the major airports to provide a basic navigation capability throughout the nation if the future GNSS systems all fail together (extremely unlikely). VOR/DME is recommended since almost all aircraft flying today carry at least a VOR system. The NDB is not recommended as the backup system since it is not accurate and is prone to other errors. Therefore, any NDB reaching the end of its life will not be replaced. The DME/DME only option as a backup is not recommended since not all users carry DME, and with GNSS the general aviation users are not going to buy DME in the future. DME/DMEs are also difficult to use, requires a FMS (not on most general aviation aircraft), and minimums and procedures may change if one or more DMEs fail. Errors of DME/DME systems are location specific making it more difficult to implement RNP everywhere, and more difficult to develop the required STAR, SID, or approach procedures.

Phase I	
Oceanic En route	GPS/IRS, GPS, GPMS[4], SBAS
Continental En Route	GPS/IRS, GPS, GPMS, SBAS, GRAS, VOR/DME
Terminal	GPS/IRS, GPS, GPMS, SBAS, GRAS, VOR/DME
Approach Procedures	GPS/IRS, GPS, GPMS, SBAS, GRAS, VOR/DME, GBAS
Approach NPA	GPS/IRS, GPS, GPMS, SBAS, GRAS, VOR/DME, GBAS
Approach APV-I	GPS/BARO, GPMS, SBAS, GRAS, GBAS, ILS
Approach APV-II	GPMS, SBAS, GBAS, ILS

[4] The GNSS Performance Monitoring System (GPMS) is needed to operationally approve the use of GNSS in any national airspace to satisfy the following ICAO requirements:

1. Continuous real-time status monitoring of GNSS for airport landing applications (ICAO Annex 10, Chapter 2.8)

2. Continuous real-time data storage of GNSS performance for liability and accident investigations (ICAO Annex 10, Chapter 2.4.3)

3. Provide Notice to Airmen (NOTAM) to users when GNSS cannot be used for specific safety applications (ICAO Annex 10, Chapter 3.7.6)

4. Verification that the local interference environment is not harmful to GNSS users (ICAO Annex 10, Chapter 3.7.4)

Approach PA	GPMS, GBAS, ILS
Surface and Taxi	GPMS, SBAS, GBAS, GRAS, MDS**
Phase II	
Oceanic En Route	GPS/IRS, GPS, Galileo, GPMS, SBAS
Continental En Route	GPS/IRS, GPS, Galileo, GPMS, SBAS, GRAS, VOR/DME
Terminal	GPS/IRS, GPS, Galileo, GPMS, SBAS, GRAS, VOR/DME
Approach Procedures	GPS/IRS, GPS, Galileo, GPMS, SBAS, GRAS, VOR/DME, GBAS
Approach NPA	GPS/IRS, GPS, Galileo, GPMS, SBAS, GRAS, VOR/DME, GBAS
Approach APV-I	GPS/BARO, Galileo, GPMS, SBAS, GRAS, GBAS, ILS
Approach APV-II	GPMS, SBAS, GBAS, Galileo/BARO, GRAS, ILS
Approach PA	GPMS, GBAS, SBAS, ILS
Surface and Taxi	GPMS, GPS, Galileo, SBAS, GBAS, GRAS, MDS**
Phase III	
Oceanic En route	GPS III GALILEO, GPMS, SBAS
Continental En Route	GPS III, GALILEO, GPMS, SBAS, GRAS, VOR/DME
Terminal	GPS III, GALILEO, GPMS, SBAS, GRAS, VOR/DME
Approach Procedures	GPS III, GALILEO, GPMS, SBAS, GRAS, VOR/DME, GBAS
Approach NPA	GPS III, GALILEO, GPMS, SBAS, GRAS, VOR/DME, GBAS
Approach APV-I	GPS III, GALILEO, GPMS, SBAS, GRAS, GBAS, ILS
Approach APV-II	GPS III, GALILEO, GPMS, SBAS, GBAS, GRAS, ILS

Approach PA	GPS III, GALILEO, GPMS, SBAS, GBAS, GRAS, ILS
Surface and Taxi	GPS III, GALILEO, GPMS, SBAS, GBAS, GRAS, MDS[5]

[5] MDS can be used by sending the surveillance information back to the aircraft for navigation

4. Surveillance

Phase I	
Oceanic En route	Multilateration with ADS-B (transition airspace); ADS-C
Continental En Route	Multilateration with ADS-B;
Terminal	ADS-B (UAT or Mode-S) Secondary radar, both MSSR and Mode S Primary radar Multilateration
Approach Procedures	ADS-B (UAT or Mode-S) Secondary radar, both MSSR and Mode S Primary radar Multilateration
Approach NPA	ADS-B (UAT or Mode-S) Secondary radar, both MSSR and Mode S Primary radar Multilateration
Approach APV-I	ADS-B (UAT or Mode-S) Secondary radar, both MSSR and ATCRBS Primary radar Multilateration
Approach APV-II	ADS-B (UAT or Mode-S) Secondary radar, both MSSR and Mode S Primary radar Surface movement radar Multilateration
Approach PA	ADS-B (UAT or Mode-S) Secondary radar, both MSSR and Mode S Primary radar Multilateration
Surface and Taxi	Surface Movement Radar (ASDE)
Phase II	
Oceanic En route	Multilateration with ADS-B (transition airspace); ADS-B (air to air); ADS-C
Continental En Route	ADS-B (UAT or Mode-S) Secondary radar, both MSSR and Mode S Primary radar Multilateration
Terminal	ADS-B (UAT or Mode-S) Secondary radar, both MSSR and Mode S

	Primary radar Multilateration
Approach Procedures	ADS-B (UAT or Mode-S) Secondary radar, both MSSR and Mode S Primary radar Multilateration
Approach NPA	ADS-B (UAT or Mode-S) Secondary radar, both MSSR and Mode S Primary radar Multilateration
Approach APV-I	ADS-B (UAT or Mode-S) Secondary radar, both MSSR and Mode S Primary radar Multilateration
Approach APV-II	ADS-B (UAT or Mode-S) Secondary radar, both MSSR and Mode S Primary radar Multilateration
Approach PA	ADS-B (UAT or Mode-S) Secondary radar, both MSSR and Mode S Primary radar Multilateration
Surface and Taxi	ADS-B (UAT or Mode-S) Surface movement radar Multilateration
Phase III	
Oceanic En route	Multilateration with ADS-B (transition airspace), ADS-B (air to air); ADS-C
Continental En Route	ADS-B (UAT or Mode-S) Secondary radar, both MSSR and Mode S Primary radar Multilateration
Terminal	ADS-B (UAT or Mode-S) Secondary radar, both MSSR and Mode S Primary radar Multilateration
Approach Procedures	ADS-B (UAT or Mode-S) Secondary radar, both MSSR and Mode S Primary radar Multilateration
Approach NPA	ADS-B (UAT or Mode-S) Secondary radar, both MSSR and Mode S Primary radar Multilateration

Approach APV-I	ADS-B (UAT or Mode-S) Secondary radar, both MSSR and Mode S Primary radar Multilateration
Approach APV-II	ADS-B (UAT or Mode-S) Secondary radar, both MSSR and Mode S Primary radar Multilateration
Approach PA	ADS-B (UAT or Mode-S) Secondary radar, both MSSR and Mode S Primary radar Multilateration
Surface and Taxi	ADS-B (UAT or Mode-S) Surface movement radar Multilateration

V. ANALYSIS OF BOGOTA AND BARRANQUILLA AREA CONTROL CENTERS

A. Purpose

The purpose of this evaluation is to consider the method of providing en route services for Colombia airspace using two Area Control Centers; to consider the option of consolidating the two Area Control Centers into one Area Control Center and; make a recommendation on how to proceed.

B. Background

The current en route airspace operation in Colombia is accomplished by two Area Control Centers: Barranquilla Area Control Center to the north and Bogota Area Control Center to the south. Upper airspace is classified as Class A. Radar separation services are provided over the land areas and non-radar services are provided in oceanic airspace overlying the Atlantic and Pacific Oceans. En route airspace overlies a series of airports that have control towers: Andes, Barranquilla, Bogota, Bucaramanga, Cali, Cartegena, Cerrejon, Cucuta, Leticia, Medellin, Neiva, Pereira, Rio Negro, San Andres and Villavicencio. Approach control service is provided by a parent approach control at the airport or by one of the Area Control Centers. Airspace classification for these airports is Class A for Bogota and Class D for the others.

There are a total of 30 Flight Information regions (FIRs) in South America:

- Argentina - 5 (Ezeiza, Comodoro, Cordoba, Mendoza, Resistencia)
- Brazil - 7 (Belem, Brasilia, Curitiba, Manaus, Porto Velho, Recife, Atlantico)
- Chile - 4 (Antofagista, Puerto Montt, Punta Arenas, Santiago)
- Colombia - 2 (Santa Fe de Bogota and Barranquilla)
- Ecuador, French Guyana, Guyana, Netherlands Antilles, Panama, Paraguay, Peru, Surinam, Trinidad/Tobago, Uruguay, Bolivia and Venezuela all have one FIR.

C. Discussion

Many air navigation service providers around the world have considered the need to consolidate Area Control Center functions. The primary reasons to consolidate air traffic control facilities is to reduce operating cost for the service provider and to provide improved services to system users in the form of efficiency, reduced delays and increased capacity for airspace and airport operations, while enhancing safety.

In making decisions to consolidate, two major factors to consider are the cost versus benefit of consolidating facilities, and the need to provide for redundancy for operations in the event of catastrophic failure of critical components in the operating infrastructure.

There are certain operating characteristics that are realized through consolidation of air traffic facilities that achieve the capacity, efficiency and safety enhancements desired:

- Removal of existing boundaries will increase traffic management flexibility and reduce potential procedural delays.
- Creates a single automation platform environment resulting in enhanced usage of controller decision support tools.
- Eliminates redundant equipment purchases, reduces infrastructure and maintenance costs.
- Provides consistent communication and procedural application between service points.
- Allows for better managerial control and tracking of human resource allocations.
- Provides for transparent application of quality standards for service and controller training.
- Allows for more direct routing, shorter routes resulting in lower operating costs for airspace users.
- Provides availability of all routes during weather and or congestion resulting in enhanced traffic management flows.
- Requires less staffing.

D. Operations in the Caribbean, South American (CAR/SAM) Region

Consideration must also be given to Colombia's operating capability and the provision of air traffic services in the CAR/SAM Region. The CAR/SAM Regional Plan has been developed under the auspices of the CAR/SAM Regional Planning and Implementation Group (GREPECAS) for the implementation of Communications, Navigation, Surveillance and Air Traffic Management (ATM/CNS) Systems. ISI has completed a detailed analysis to the CAR/SAM Regional Plan in working with UAEAC over the last several years. The concept of operations for Colombia for the future is being looked at as UAEAC operating as a Regional Leader where UAEAC will provide air navigation services not only for Colombian airspace, but also provide services for all international flights into and out of other Andean nations.

E. Comparison of UAEAC to Other Air Navigation Service Providers

In general terms, the Republic of Columbia is comparable in size to the U.S. state of Texas, covering 440, 000 square miles and is the fourth largest country in South America. As stated above, Columbia also controls a portion above the Atlantic and Pacific oceans. Colombia airspace is the second most congested airspace in South America, strategically merging air traffic from mainly South-North American routes and European-South American routes. Also as another comparison, the Federal Republic of Germany provides air navigation services over an area of 137,846 square miles. The complexity of operations in these three environments is similar even though the number of operations within the airspace is not.

The U.S. operates 20 Area Control Centers in the 48 contiguous states and uses procedures to ensure continuity of service in the event of catastrophic failure of a critical component of the

infrastructure; i.e., failure of one of the Area Control Centers. The U.S. has not consolidated an Area Control Center since initial consolidation with the advent of radar more than forty years ago. The Federal Republic of Germany operates five Area Control Centers and recently consolidated Düsseldorf Area Control Center into the Frankfurt Area Control Center at Langen. Germany is also represented in Maastricht at its branch in the Eurocontrol Centre. Canada operates seven Area Control Centers and has determined not to consolidate them. In these examples, it is evident that each air navigation service provider has chosen different methods in determining the number of Area Control Centers used for delivery of services, and the process for consolidation. It is also apparent that each has done so in consideration of the ICAO Global ATM Operational Concept. UAEAC is also using a disciplined process to make decisions regarding consolidation of Area Control Centers.

F. Recommendation

It is recommended that UAEAC continue to provide en route services for Colombia airspace using the two Area Control Centers at Bogota and Barranquilla. This configuration supports the ICAO Global Operational Concept and the CAR/SAM Regional Plan. This configuration also allows UAEAC to continue on the path of becoming a Regional Leader and supports Options One and Two contained in the ISI Definition of Operational Requirements for Civil Aviation in Colombia, Volume 1.

From an operational concept point of view, the ability to maintain redundancy between the two Area Control Centers in the event of catastrophic failure of a critical component of the infrastructure is paramount as UAEAC continues to meet the challenges of increased operations and more complex operating requirements.

Using a model for consolidation to reduce operating cost for the air navigation service provider certainly makes sense in the case of consolidating multiple air traffic control facilities into a smaller number. It is logical to assume that the number of facilities should not be less than two because of the redundancy factor.

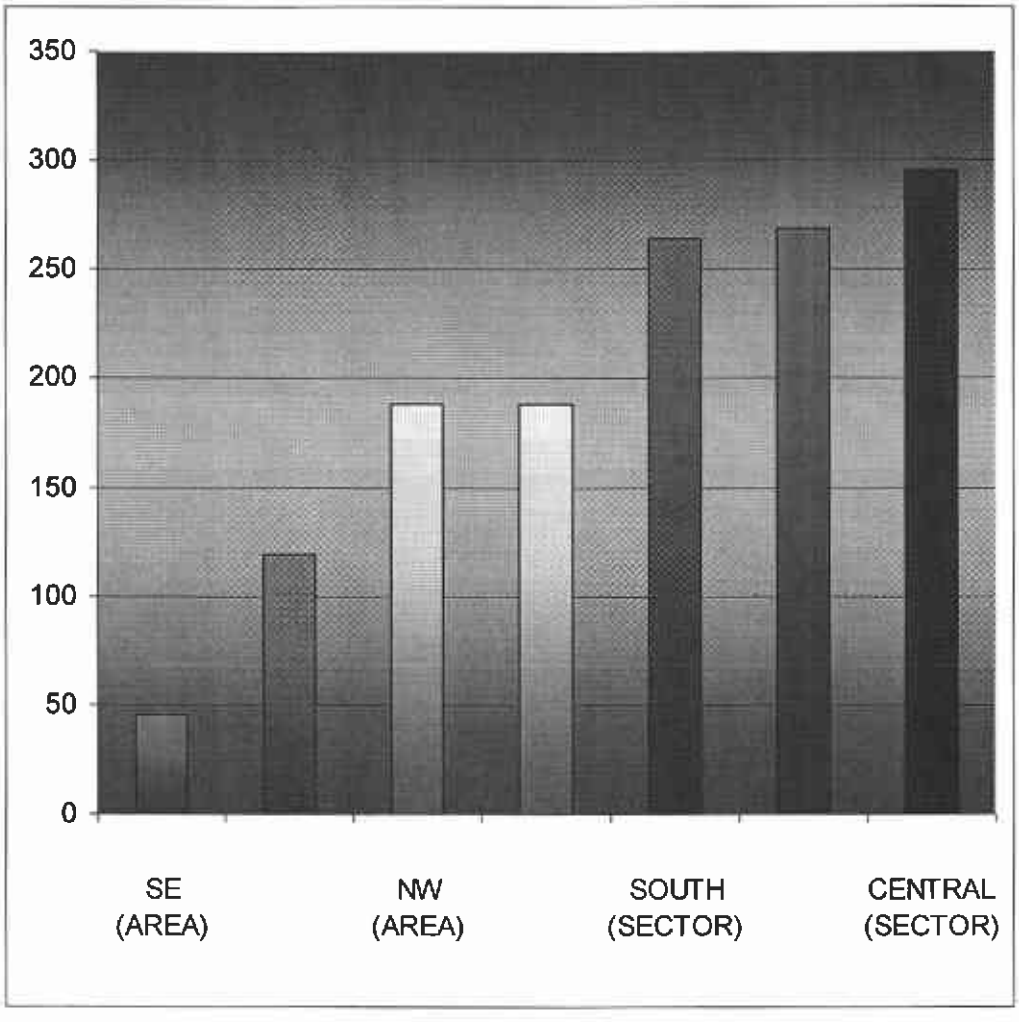
Accordingly, the capacity, efficiency and safety outcomes realized through consolidation, must still be achieved and for UAEAC this is achievable through modernization of Air Traffic Control systems and ATM/CNS infrastructure. As such, it is further recommended that UAEAC continue to move forward on the modernization of Colombia's Air Traffic Control System and ATM/CNS infrastructure.

G. Bogota Congested Airspace Analysis

The following Tables showing and analysis of Colombian Airport Operations and an Analysis of Colombian TMAs, CTAs and FIRs (upper airspace) were used to determine the density of operations classification for each of the airspace areas in Colombia:

BOGOTA AIRSPACES CONGESTION ANALISIS							
	UPPER CONTROL AREAS				BOGOTA TERMINAL AREA		
DATE	BOGOTA SE (AREA)	BOGOTA SW (AREA)	BOGOTA NW (AREA)	BOGOTA NE (AREA)	BOGOTA SOUTH (SECTOR)	BOGOTA NORTH (SECTOR)	BOGOTA CENTRAL (SECTOR)
	OPS	OPS	OPS	OPS	OPS	OPS	OPS
01/04/06	41	143	188	198	**250**	**275**	**304**
02/04/06	49	101	189	171	**213**	**257**	**254**
03/04/06	51	128	175	164	**268**	**267**	**281**
04/04/06	**41**	130	192	**184**	**291**	**271**	**302**
05/04/06	30	126	194	198	**298**	**256**	**324**
06/04/06	55	119	194	185	**319**	**318**	**348**
07/04/06	45	139	**206**	**205**	**312**	**311**	**332**
08/04/06	48	126	**215**	**231**	**285**	**299**	**319**
09/04/06	49	126	**205**	187	**228**	**249**	**273**
10/04/06	45	108	189	172	**253**	**252**	**283**
11/04/06	32	126	187	**217**	**274**	**263**	**308**
12/04/06	42	122	195	181	**267**	**269**	**304**
13/04/06	44	95	185	157	**210**	**234**	**262**
14/04/06	41	93	161	135	119	161	147
15/04/06	41	95	150	175	199	**219**	**223**
16/04/06	48	107	**210**	195	**227**	**271**	**280**
17/04/06	48	117	194	175	**260**	**276**	**289**
18/04/06	50	123	170	**206**	**305**	**282**	**311**
19/04/06	30	111	179	178	**306**	**280**	**326**
20/04/06	30	124	186	**205**	**294**	**291**	**339**

	UPPER CONTROL AREAS				BOGOTA TERMINAL AREA		
DATE	**BOGOTA SE (AREA)**	**BOGOTA SW (AREA)**	**BOGOTA NW (AREA)**	**BOGOTA NE (AREA)**	**BOGOTA SOUTH (SECTOR)**	**BOGOTA NORTH (SECTOR)**	**BOGOTA CENTRAL (SECTOR)**
21/04/06	45	124	196	**206**	**316**	**304**	**341**
22/04/06	60	129	183	**202**	**271**	**274**	**298**
23/04/06	57	109	184	179	**229**	**240**	**269**
24/04/06	48	106	163	176	**248**	**273**	**280**
25/04/06	42	121	173	**208**	**289**	**286**	**327**
26/04/06	39	121	**210**	195	**284**	**280**	**307**
27/04/06	46	116	192	194	**312**	**287**	**335**
28/04/06	51	145	**206**	**208**	**332**	**312**	**354**
29/04/06	59	130	198	**202**	**262**	**270**	**305**
30/04/06	50	119	182	176	192	**234**	**246**
MONTHLY OPERATIONS	**1357**	**3579**	**5651**	**5665**	**7913**	**8061**	**8871**
OPERATIONS AVERAGE	45.2	119.3	188.4	188.8	**263.8**	**268.7**	**295.7**
CONSIDERATIONS	The month of April is probably the most congested period in the year, due to the **Holy week.**						
	The number of operations includes landing traffic, departing traffic and overflights.						
	Operations data exceeding 200 appears in **BOLD**.						
CONCLUSIONS /Recommendation	A redesign of upper areas to obtain a better distribution of workload is recommended.						
	When the SE area is absorbed by another sector, the best fusion could be obtained with the SW area.						


350
300
250
200
150
100
50
0
SE (AREA)
NW (AREA)
SOUTH (SECTOR)
CENTRAL (SECTOR)

VI. TECHNOLOGY AVAILABILITY

The classification of airspace as high or low density significantly influences the selection and implementation of technology in that airspace. In the tables which follow we have therefore defined availability in terms of density as it applies to the Colombia National Airspace System (NAS). Several high density airspace areas have been designated within the Colombia NAS. The following criteria describe when additional airspace areas should be designated as High Density.

A. Discussion.

The International Civil Aviation Organization (ICAO) does not define airspace in terms of density. For planning purposes, the Global Air Traffic Management Operational Concept introduces airspace areas as being high density or low density. This allows for Air Traffic Service Providers to make capital investment decisions based upon user needs; and to ensure safety and efficiency of air traffic operations.

B. Analysis.

Innovative Solutions, Inc. (ISI) has completed an analysis of Colombia air traffic operations for Oceanic, Continental and Terminal Area Airspace. ISI has also considered infrastructure requirements necessary to provide safe and efficient air traffic services for Colombia. Through site visits to air traffic control facilities, interviews with air traffic controllers, supervisors, managers and airspace and procedures staff personnel; mathematical modeling of Colombia air traffic operations for base year and future year 2010, ISI recommends the following airspace definitions for the Colombia National Airspace System. This analysis considered the total number of movements, the number of Instrument Flight Rule (IFR) operations, and the number of Visual Flight Rule (VFR) operations. Additional considerations such as unusual weather phenomenon, obstructions/terrain impeding air operations, and the overall complexity of the area of operation are additional considerations in making a final designation. It must be understood that beyond a strict number of operations calculation this is a highly subjective decision.

- Oceanic En Route High Density

  Radar Sector

  200 or more IFR movements a day.

- Oceanic En Route Low density

  Non Radar Sector

  Less than 200 IFR movements a day.

- Continental High Density

  Radar Sector

  200 or more IFR movements a day.

- Continental Low Density

Non Radar Sector

Less than 200 IFR movements a day

- Terminal High Density

  Radar Sector

  100,000 or more IFR movements a year.

- Terminal Low Density

  Radar or Non Radar Sector

  Less than 100,000 IFR movements a year.

The following Table showing Colombian Air Operations was used to help determine the density of operations for terminal areas and individual airports in Colombia:

2005 COLOMBIAN AIRPORTS AIR OPERATIONS						
	INTERNATIONAL		DOMESTIC			
AIRPORT NAME	ARRIVALS	DEPARTURES	ARRIVALS	DEPARTURES	TOTAL	AVERAGE
BOGOTA	22.696	22.408	75.731	75.992	196.827	539
MEDELLIN OLAYA HERRERA	0	0	32.732	32.753	65.485	179
CALI	2.918	2.635	23.819	24.123	53.495	147
GUAYMARAL	0	0	24.645	24.622	49.267	135
RIONEGRO	3.585	3.853	18.907	18.655	45.000	123
CARTAGENA	2.388	2.231	9.752	9.885	24.256	66
BARRANQUILLA	2.192	2.498	9.884	9.558	24.132	66
VILLAVICENCIO	0	0	11.616	11.689	23.305	64
BUCARAMANGA	0	0	11.452	11.408	22.860	63
PEREIRA	0	0	10.619	10.616	21.235	58
MARIQUITA	0	0	10.013	10.027	20.040	55
FLANDES	0	0	9.541	9.537	19.078	52
NEIVA	0	0	9.074	9.003	18.077	50
CUCUTA	114	132	7.361	7.340	14.947	41
QUIBDO	0	0	7.119	7.134	14.253	39
SANTA MARTA	0	0	6.923	6.915	13.838	38
IBAGUE	0	0	6.346	6.340	12.686	35

2005 COLOMBIAN AIRPORTS AIR OPERATIONS						
	INTERNATIONAL		DOMESTIC			
AIRPORT NAME	ARRIVALS	DEPARTURES	ARRIVALS	DEPARTURES	TOTAL	AVERAGE
SAN JOSE DEL GUAVIARE	0	0	5.926	6.013	11.939	33
ARMENIA	0	0	5.555	5.560	11.115	30
YOPAL	0	0	5.442	5.443	10.885	30
MONTERIA	0	0	5.398	5.399	10.797	30
SAN ANDRES	797	801	4.439	4.436	10.473	29
BARRANCABERMEJA	0	0	5.146	5.201	10.347	28
TUMACO	0	0	4.618	4.616	9.234	25
APARTADO	0	0	4.507	4.508	9.015	25
ARAUCA	0	0	4.240	4.229	8.469	23
PUERTO ASIS	0	0	3.897	3.894	7.791	21
MANIZALES	0	0	3.837	3.838	7.675	21
POPAYAN	0	0	3.403	3.410	6.813	19
SARAVENA	0	0	3.379	3.392	6.771	19
FLORENCIA	0	0	2.918	2.869	5.787	16
PASTO	0	0	2.742	2.778	5.520	15
VALLEDUPAR	0	0	2.520	2.587	5.107	14
COROZAL	0	0	2.151	2.131	4.282	12
BAHIA SOLANO	0	0	2.106	2.122	4.228	12
LETICIA	362	347	1.228	1.240	3.177	9
TAME	0	0	1.378	1.374	2.752	8
MITU	0	0	1.361	1.345	2.706	7
SAN VICENTE DEL CAGUAN	0	0	1.304	1.366	2.670	7
OTU	0	0	1.241	1.235	2.476	7
NUQUI	0	0	1.211	1.216	2.427	7
PROVIDENCIA	0	0	1.190	1.189	2.379	7
CARTAGO	0	0	1.062	1.062	2.124	6
TURBO	0	0	781	783	1.564	4

2005 COLOMBIAN AIRPORTS AIR OPERATIONS						
	INTERNATIONAL		DOMESTIC			
AIRPORT NAME	ARRIVALS	DEPARTURES	ARRIVALS	DEPARTURES	TOTAL	AVERAGE
CONDOTO	0	0	775	775	1.550	4
PUERTO CARRENO	0	0	748	732	1.480	4
IPIALES	0	0	723	719	1.442	4
BUENAVENTURA	0	0	740	701	1.441	4
GUAPI	0	0	641	642	1.283	4
RIOHACHA	0	0	639	635	1.274	3
PUERTO BERRIO	0	0	615	615	1.230	3
OCANA	0	0	366	368	734	2
URRAO	0	0	192	187	379	1
PITALITO	0	0	147	146	293	1
TOLU	0	0	142	144	286	1
AMALFI	0	0	110	110	220	1
MAGANGUE	0	0	109	107	216	1
PAZ DE ARIPORO	0	0	88	91	179	0
TRINIDAD	0	0	82	79	161	0
CHAPARRAL	0	0	77	81	158	0
CIMITARRA	0	0	56	57	113	0
GARZON	0	0	5	5	10	0
CARMEN DE BOLIVAR	0	0	0	0	0	0
MOMPOS	0	0	0	0	0	0
TULUA	0	0	0	0	0	0

C. Technology Insertion

The following tables provides an indication when ATM/CNS technologies will be available for use and can be inserted into the transition. The table does not indicate when we suggest that technologies are implemented, merely the current estimate when they will be operable.

Some items on this table are still in the developmental stages, so their commercial availability will lag later than the dates indicated on this chart. For most systems, Colombia should plan that there will be a lag of two years before the systems are available commercially. That is reflected later in this report in our implementation scenarios.

1. ATM

	Oceanic and En route Low Density	Oceanic En route High Density	Continental High Density	Continental Low	Terminal High Density	Terminal Low Density	Surface and Taxi
CDM	Now	Now	Now	Now	Now	Now	Now
ETMS	Now	Now	Now	Now	Now	Now	Now
TMU	Now	Now	Now	Now	Now	Now	Now
Eliminate Chokepoints	Now	Now	Now	Now	Now	Now	Now
G-GNM	2010	2010	2010	2010	2010	2010	2010
Global ATM	2011	2011	2011	2011	2011	2011	2011

2. Communications

	Oceanic and En route Low Density	Oceanic En route High Density	Continental High Density	Continental Low	Terminal High Density	Terminal Low Density	Surface and Taxi
HF Voice	Now	Now	Now	Now	Now	Now	Now
HFDL	Now	Now	Now	Now	Now	Now	Now
VHF/AMSS (voice/data)	Now	Now	Now	Now	Now	Now	Now
Pre-ATN	Now	Now	Now	Now	Now	Now	Now
ATN (full data)	2015	2015	2015	2015	2015	2015	2015
VHF Voice	Now	Now	Now	Now	Now	Now	Now
VDL-2	Now	Now	Now	Now	Now	Now	Now
VDL 3	2010	2010	2010	2010	2010	2010	2010
VDL-4	Now	Now	Now	Now	Now	Now	Now

CPDLC is a data link application available via VDL-2/3 that allows for the direct exchange of text-based messages between a controller and a pilot.

CPDLC greatly improves communication capabilities in oceanic areas, especially in situations where controllers and pilots have previously had to rely on a Third Party HF communications relay.

Apart from the direct link, CPDLC adds a number of other benefits to the ATS system, such as:

- Allowing the flight crew to print messages.
- Allowing the auto load of specific uplink messages into the Flight Management System (FMS). This will reduce crew-input errors.
- Allowing the crew to downlink a complex route clearance request, which the controller can re-send when approved without having to type a long string of coordinates.
- Specific uplink messages arm the FMS to automatically downlink a report when an event, such as crossing a waypoint, occurs. This automation assists with workload management for the flight crew and the controller.
- Specific downlink messages, and the response to some uplink messages will automatically update the Flight Data Record in some ground systems

CPDLC Phase 1 is intended to be used for non time-critical messages. The ATN/VDL Mode 2 service will likely be implemented.

CPDLC Phase 2 services are intended for time critical messages, VDL Mode 3 or VDL Mode 4 services could be provided on the basis of regional agreements.

ATN: As discussed in the background section, it is possible to begin the development of an ATN by implementing properly designed sub-networks (e.g. VHF sub-network) in accordance with approved standards. When an ATN Router is available, these sub-networks could be "connected" thereby enabling a full ATN.[6]

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6 Ground to Ground Communications:

Adequate ground to ground or point to point communications are essential to accommodate the safe and efficient flow of aircraft within Colombia and between Colombia and adjoining countries.

Colombia already has relatively well developed ground to ground systems capable of meeting current airspace requirements. However, as airspace traffic demands increase, consideration should be given to expanding the existing services by adding additional capabilities commensurate with airspace user requirements and capabilities. The degree and rate of expansion should be paced based upon the economic viability for both the airspace service provider and the airspace user and the degree of maturity of the technologies to be used. The most commonly used technologies include Microwave, Fiber Optic and Satellite and/or a combination of each of these technologies. A reliable satellite communication system is the VSAT-- (very small aperture terminal).

Within Colombia the selection of technologies to be installed at each location will be an internal UAEAC decision. With respect to technologies and systems to be implemented for ground to ground communications between adjoining countries, it will be necessary to ensure full and comprehensive coordination has been successfully completed between those entities responsible for communications procurement in the corresponding countries. Consideration should also be given to the potential difficulties and problems associated with integrating similar systems (such as Microwave) that are produced by different manufacturers. One method to minimize this problem is for countries to procure systems from the same manufacturer and ensure that the bases for procurement are functional specifications rather than simply technical specifications.

3. Navigation

	Oceanic and En route Low Density	Oceanic En route High Density	Continental High Density	Continental Low	Terminal High Density	Terminal Low Density	Surface and Taxi
NDB	Now	Now	Now	Now	Now	Now	N/A
VOR/DME	N/A	N/A	Now	Now	Now	Now	N/A
ILS	N/A	N/A	N/A	N/A	Now	Now	N/A
Basic GPS	Now	Now	Now	Now	Now	Now	Now
GNSS Performance Monitoring System (GPMS)	2006	2006	2006	2006	2006	2006	2006
SBAS Ground Integrity Channel*	Now	Now	Now	Now	Now	Now	Now
SBAS (precision)	N/A	N/A	N/A	N/A	2012	2012	2012
EGNOS7	N/A	N/A	2007	2007	2007	2007	2007

[7] Range of coverage does not currently include Colombia * Currently WAAS can be purchased for just the integrity function but it may not be cost effective

	Oceanic and En route Low Density	Oceanic En route High Density	Continental High Density	Continental Low	Terminal High Density	Terminal Low Density	Surface and Taxi
Galileo	2009	2009	2009	2009	2009	2009	2012
SCAT I	N/A	N/A	N/A	N/A	Now	Now	Now
LAAS CAT I	N/A	N/A	N/A	N/A	2008	2008	2008
LAAS CAT II/III	N/A	N/A	N/A	N/A	2012	2012	2012

4. Surveillance

	Oceanic and En route Low Density	Oceanic En route High Density	Continental High Density	Continental Low	Terminal High Density	Terminal Low Density	Surface and Taxi
Multilateration	Now (transition airspace)	Now (transition airspace)	Now	Now	Now	Now	Now
Mode S8	N/A	N/A	Now	Now	Now	Now	Now
ADS-B	Air to Air Now	Air to Air Now	Now	Now	Now	Now	N/A
UAT	N/A	N/A	Now	Now	Now	Now	Now
ADS-C	Now	Now	N/A	N/A	N/A	N/A	N/A
Surveillance Fusion9	N/A	N/A	Now	Now	Now	Now	Now
Primary Radar	N/A	N/A	Now	Now	Now	Now	N/A
Secondary Radar (MSSR)	N/A	N/A	Now	Now	Now	Now	N/A

[8] This refers to ADS compatible ground stations and secondary radars, it will utilize inputs from MOPS compliant Mode A/C/S

[9] Fusion is NOT the same as an RDP IT takes the output of an RDP and "fuses" that data with other data from other source.. It is similar to a surveillance data processor. IT has relevance to ALL areas of operation but would not be called "surface" fusion, just surveillance fusion

	Oceanic and En route Low Density	Oceanic En route High Density	Continental High Density	Continental Low	Terminal High Density	Terminal Low Density	Surface and Taxi
Secondary Radar (ATCRBS)10	N/A	N/A	Now	Now	Now	Now	N/A
Surface Movement Radar	N/A	N/A	N/A	N/A	N/A	N/A	Now

[10] MSSR stands for "monopulse secondary surveillance radar". Mode-S ground equipment uses monopulse. Two mentions of Mode-S are meant to imply mode-S format that is ICAO compliant. And Mode-S based hardware....formats and hardware are distinctly different

VII. EVOLUTIONARY OPTION ADOPTION PLAN AND MATRIX

The following Evolutionary Adoption Plan shows a conservative approach to fostering systems adoption. It is a path that provides for compliance with ICAO mandates and meets the forecast needs of Colombia over the study period. It is not a plan that distinguishes a country as a technology leader and potential regional service provider. That will come with the Accelerated Option

A. Air Traffic Management

Evolutionary Implementation			
Phases of Flight	**2010**	**2015**	**2019**
Oceanic En route Low Density	CDM, TMU, ETMS	G-GNM	All elements of Global ATM achieved
Oceanic En route High Density	CDM, TMU, ETMS, Eliminate Chokepoints	G-GNM	Global ATM
Continental High	CDM, TMU, ETMS, Eliminate Chokepoints	G-GNM	Global ATM
Continental Low	CDM, TMU, ETMS	G-GNM	Global ATM
Terminal High Density	CDM, TMU, ETMS, Eliminate Chokepoints	G-GNM	Global ATM
Terminal Low Density		CDM, G-GNM	Global ATM
Approach High Density	CDM, TMU, ETMS, Benchmark Airports	G-GNM	Global ATM
Approach Low Density		CDM, G-GNM	Global ATM
Surface and Taxi	CDM, TMU, ETMS	G-GNM	Global ATM

B. Communications

Evolutionary Implementation			
Phases of Flight	**2010**	**2015**	**2019**
Oceanic and En route Low Density	HF Voice	HF Voice HFDL	VDL for data (en route) AMSS(voice/data) HF Voice HFDL Full ATN data
Oceanic En route High Density	HF Voice	HF Voice HFDL VHF/AMSS (voice/data)	AMSS(voice/data) HF Voice HFDL Full ATN data
Continental High Density	VHF Voice VDL-2 CPDLC—Phase 1	VHF Voice VDL-2/3 CPDLC—Phase 1&2	VHF Voice VDL for data AMSS(voice/data) VDL-2/3 Full ATN data
Continental Low	VHF Voice	VHF Voice	VDL for data AMSS(voice/data) VHF Voice Full ATN data
Terminal High Density11	VHF Voice VDL-2 CPDLC—Phase 1	VHF Voice VDL-2/3 CPDLC—Phase 1&2	VHF Voice VDL for data AMSS(voice/data) Full ATN data

[11] Includes arrival approach, missed approach and departure

Phases of Flight	2010	2015	2019
Terminal Low Density	VHF Voice	VHF Voice VDL-2 CPDLC—Phase 1	VHF Voice VDL-2/3 CPDLC—Phase 1&2
Surface and Taxi	VHF Voice	VHF Voice VDL-2 CPDLC-Phase 1	VHF Voice VDL-2/3 CPDLC Phase 1&2

For Oceanic operations HF Voice, HFDL and AMSS are recommended candidate technologies. However, it will likely not be necessary to have all three systems. The decision as to what system(s) to use will depend upon the level of equipage of the airspace user. For instance, if a majority of the airspace users have an AMSS capability and do not rely on HF Voice or HFDL, then HF Voice and HFDL services are not required and should not be implemented.

The decision whether or not to acquire and implement VDL2 and VDL 2/3 will be location dependent. For those airports (e.g. international airports) that have high traffic demands and aircraft capable of utilizing VDL, it may be economically viable to acquire and implement VDL. The final decision must be based on a comprehensive cost-benefit analysis.

VDL 4 is intentionally not recommended because it is a "proprietary" system and is not being widely (internationally) accepted and implemented. [12]

12 Ground to Ground Communications:

Adequate ground to ground or point to point communications are essential to accommodate the safe and efficient flow of aircraft within Colombia and between Colombia and adjoining countries.

Colombia already has relatively well developed ground to ground systems capable of meeting current airspace requirements. However, as airspace traffic demands increase, consideration should be given to expanding the existing services by adding additional capabilities commensurate with airspace user requirements and capabilities. The degree and rate of expansion should be paced based upon the economic viability for both the airspace service provider and the airspace user and the degree of maturity of the technologies to be used. The most commonly used technologies include Microwave, Fiber Optic and Satellite and/or a combination of each of these technologies. A reliable satellite communication system is the VSAT-- (very small aperture terminal).

Within Colombia the selection of technologies to be installed at each location will be an internal UAEAC decision. With respect to technologies and systems to be implemented for ground to ground communications between adjoining countries, it will be necessary to ensure full and comprehensive coordination has been successfully completed between those entities responsible for communications procurement in the corresponding countries. Consideration should also be given to the potential difficulties and problems associated with integrating similar systems (such as Microwave) that are produced by different manufacturers. One method to minimize this problem is for countries to procure systems from the same manufacturer and ensure that the bases for procurement are functional specifications rather than simply technical specifications.

C. Navigation

Evolutionary Implementation				
Phases of Flight		**2010**	**2015**	**2019**
Oceanic En route High Density		GPMS I RNP-10	GPMS II RNP-4	GPMS III RNP-2
Oceanic En route Low Density		GPMS I RNP-12	GPMS II RNP-10	GPMS III RNP-4
Continental High Density		GPMS I RNP-10	GPMS II RNP-4	GPMS III RNP-2
Continental Low Density		GPMS I RNP-12	GPMS II RNP-10	GPMS III RNP-4
Terminal High Density		GPMS I RNP-2	GPMS II RNP-1	GPMS III RNP-0.3
Terminal Low Density		GPMS I RNP-4	GPMS II RNP-2	GPMS III RNP-2
Approach High Density	**Approach/ Departure Procedures**	GPMS I (Except Cali) RNP-2	GPMS II RNP-1	GPMS III RNP-0.3
	NPA	GPMS I (Except Cali)* APV-I	GPMS II APV-I	GPMS III APV-1
	Precision Approach	GPMS I ILS CAT I	GPMS II ILS CAT-I	GPMS III ILS CAT I

*GPMS I will only provide coverage for approaches in Bogota and Barranquilla

Phases of Flight		2010	2015	2019
Approach Low Density	Approach/ Departure Procedures	GPMS I VOR/DME RNP-4	GPMS II RNP-2	GPMS III RNP-1
	NPA	GPMS I VOR/DME RNP-0.3	GPMS II APV-I	GPMS III APV-I
	Precision Approach	GPMS I ILS APV-II	GPMS III ILS CAT-I	GPMS III ILS CAT I
Surface and Taxi		Not determined	Not determined	Not determined

For Colombia, it is recommended that GPMS is implemented incrementally in the following increments for Phases I, II, and III. The rationale for this incremental implementation is as described in the front of this chapter.

GPMS I consists of two master stations to be installed at Baranquilla and Bogota FIRs. This will provide Colombia with a capability to monitor the performance of GNSS and approve GNSS for use in the following phases of flight within all of Colombian airspace: Oceanic and Continental En Route.

GPMS II adds six reference stations to provide coverage throughout Colombia, which are installed at Bogota, Leticia, Puerto Carreno, San Andres, Santa Marta, and Tumaco. GPMS II will provide Colombia with a capability to monitor the performance of GNSS and approve its use for the following phases of flight within all of Colombian airspace: Oceanic En Route; Continental En Route; Terminal Area; Approach/Departure Procedures; and Non-Precision Approaches.

GPMS III adds real-time integrity for the users, by providing GPMS with a capability to deliver the integrity messages to aircraft in real time. This can be accomplished with an SBAS-like message through a satellite or as simple as transmitting the integrity message over the airlines ACARS messaging system (If ACARS is used, it may not satisfy all the requirements for integrity unless the ACARS has been modified for airline data link such as VDL-2). GPMS III will provide Colombia with a capability to monitor the performance of GNSS and approve the following phases of flight with a real-time integrity message to all users within the Colombian airspace: Oceanic En Route; Continental En Route; Terminal Area; Approach/Departure Procedures; Non-Precision Approaches; and Precision Approach. In addition, it is important to

note that this integrity capability will only serve as a backup to the real integrity that should be provided by the GNSS service provider and the certified avionics.

GPMS I, II, and III are very different from SBAS since SBAS provides improvements in accuracy, integrity and availability. GPMS will only provide integrity information.

D. Surveillance

Evolutionary Implementation			
Phases of Flight	**2010**	**2015**	**2019**
Oceanic En route Low Density	None	Multilateration with ADS-B (transition airspace) ADS-B (Air to Air)	ADS-B (transition airspace) ADS-B (Air to Air)
Oceanic En route High Density	None	Multilateration with ADS-B (transition airspace) ADS-B (Air to Air)	ADS-B (transition airspace) ADS-B (Air to Air)
Continental High	PSR/SSR Where available	Wide area Multilateration with Mode S ADS-B Sensor Fusion Remove Primary Remove secondary following full user equipage with ADS-B	All ADS-B (requires mandatory equipage with Mode-S ADS-B
Continental Low	PSR/SSR Where available	Wide area Multilateration with Mode S ADS-B Sensor Fusion Remove Primary Remove secondary following full user equipage with ADS-B	All ADS-B (requires mandatory equipage with Mode-S ADS-B

Evolutionary Implementation			
Phases of Flight	**2010**	**2015**	**2019**
Terminal High Density	PSR/SSR Where available	Multilateration with Mode S ADS-B Sensor Fusion Remove Primary Remove secondary following full user equipage with ADS-B	All ADS-B (requires mandatory equipage with Mode-S ADS-B
Terminal Low Density	PSR/SSR Where available	Multilateration with Mode S ADS-B Sensor Fusion Remove secondary following full user equipage with ADS-B	All ADS-B (requires mandatory equipage with Mode-S ADS-B -B
Approach High Density	PSR/SSR Where available	Multilateration with Mode S ADS-B Sensor Fusion Remove Primary Remove secondary following full user equipage with ADS-B	All ADS-B (requires mandatory equipage with Mode-S ADS-B
Approach Low Density	PSR/SSR Where available	Multilateration with Mode S ADS-B Sensor Fusion Remove secondary following full user equipage with ADS-B	All ADS-B (requires mandatory equipage with Mode-S ADS-B
Surface and Taxi	None	Surface Movement Radar/Multilateration/Fusion/ADS-B (including vehicles)	Surface Movement radar/ADS-B and Fusion

VIII. ACCELERATED OPTION ADOPTION PLAN AND MATRIX

The Accelerated Adoption Plan considers all of the known next generation ATM/CNS technologies. There are risks for planning based on expected technologies. Clearly, new systems could emerge within the timeframe that could be appropriate for Colombian consideration. Also, some of the functionalities, such as VDL Modes 3 and 4; UAT, LAAS and ADS-B, which have been chosen for implementation, may be expanded or delayed.

A. Air Traffic Management

Accelerated Implementation			
Phases of Flight	**2010**	**2015**	**2019**
Oceanic En route Low Density	CDM, TMU, ETMS, G-GNM	Global ATM	Global ATM+
Oceanic En route High Density	CDM, TMU, ETMS, Eliminate Chokepoints, G-GNM	Global ATM	Global ATM+
Continental High	CDM, TMU, ETMS, Eliminate Chokepoints, G-GNM	Global ATM	Global ATM+
Continental Low	CDM, TMU, ETMS, Eliminate Chokepoints, G-GNM	Global ATM	Global ATM+
Terminal High Density	CDM, TMU, ETMS, Eliminate Chokepoints, G-GNM	Global ATM	Global ATM+
Terminal Low Density	CDM, TMU, ETMS, Eliminate Chokepoints, G-GNM	Global ATM	Global ATM+
Approach High Density	CDM, TMU, ETMS, Benchmark Airports, G-GNM	Global ATM	Global ATM+
Approach Low Density	CDM, TMU, ETMS, Benchmark Airports, G-GNM	Global ATM	Global ATM+
Surface and Taxi	CDM, TMU, ETMS, G-GNM	Global ATM	Global ATM+

B. Communications

Accelerated Implementation[13]			
Phases of Flight	**2010**	**2015**	**2019**
Oceanic En route Low Density	HF Voice HFDL	AMSS(voice/data) HF Voice HFDL Full ATN data	AMSS(voice/data) HF Voice HFDL Full ATN data
Oceanic En route High Density	HF Voice HFDL VHF(voice/data) AMSS(voice/data)	AMSS(voice/data) HF Voice VHF Voice HFDL Full ATN data	AMSS(voice/data) HF Voice VHF Voice HFDL Full ATN data
Continental High	VHF Voice VDL-2 CPDLC—Phase 1&2	VHF Voice AMSS(voice/data) VDL-2/3 Full ATN data	VHF Voice AMSS(voice/data) VDL-2/3 Full ATN data
Continental Low	VHF Voice	VDL-2/3 AMSS(voice/data) VHF Voice Full ATN data	VDL for data AMSS(voice/data) Full ATN data

13 Ground to Ground Communications:

Adequate ground to ground or point to point communications are essential to accommodate the safe and efficient flow of aircraft within Colombia and between Colombia and adjoining countries.

Colombia already has relatively well developed ground to ground systems capable of meeting current airspace requirements. However, as airspace traffic demands increase, consideration should be given to expanding the existing services by adding additional capabilities commensurate with airspace user requirements and capabilities. The degree and rate of expansion should be paced based upon the economic viability for both the airspace service provider and the airspace user and the degree of maturity of the technologies to be used. The most commonly used technologies include Microwave, Fiber Optic and Satellite and/or a combination of each of these technologies. A reliable satellite communication system is the VSAT-- (very small aperture terminal).

Within Colombia the selection of technologies to be installed at each location will be an internal UAEAC decision. With respect to technologies and systems to be implemented for ground to ground communications between adjoining countries, it will be necessary to ensure full and comprehensive coordination has been successfully completed between those entities responsible for communications procurement in the corresponding countries. Consideration should also be given to the potential difficulties and problems associated with integrating similar systems (such as Microwave) that are produced by different manufacturers. One method to minimize this problem is for countries to procure systems from the same manufacturer and ensure that the bases for procurement are functional specifications rather than simply technical specifications.

Accelerated Implementation[13]			
Phases of Flight	**2010**	**2015**	**2019**
Terminal High Density14	VHF Voice VDL-2 CPDLC—Phase 1&2	VHF Voice VDL-2/3 AMSS(voice/data) Full ATN data	VHF Voice VDL-2/3 AMSS(voice/data) Full ATN data
Terminal Low Density	VHF Voice VDL-2 CPDLC—Phase 1	VHF Voice VDL-2/3 CPDLC—Phase 1&2	VHF Voice VDL-2/3 AMSS(voice/data) Full ATN data
Surface and Taxi15	VHF Voice VDL-2 CPDLC—Phase 1	VHF Voice VDL-2/3 CPDLC—Phase 1&2	VHF Voice VDL-2/3 AMSS(voice/data) Full ATN data

AMSS: Aeronautical Mobile Satellite Service

HFDL: High Frequency Data Link

Voice: 25 kHz spacing to 2011; then 8.33 kHz spacing should it be economically viable

VDL: VHF Data Link—note: VDL Mode 4: consideration for 2015, based on technological progress; VDL Mode 3, assuming implementation in other Regions

HFDL, AMSS, VDL Modes 2,3,4, are ATN compliant (data only)

VDL 4 is intentionally not recommended because it is a "proprietary" system and is not being widely (internationally) accepted and implemented.

[14] Includes arrival approach, missed approach and departure

There are published standards for Gatelink ARINC 632 for the ground side and 751 for the aircraft side. Gatelink is a 100 Mbps full-duplex communication link between a communication system inside the airport terminal (or at the maintenance post) and a communication system onboard a parked aircraft. Gatelink is not used for a "phase of flight"..

C. Navigation

Accelerated Implementation				
Phases of Flight		**2010**	**2015**	**2019**
Oceanic En route High Density		GPMS II RNP - 4	SBAS RNP - 2	SBAS RNP – 1
Oceanic En route Low Density		GPMS II RNP - 10	SBAS RNP - 4	SBAS RNP – 2
Continental High Density		GPMS II RNP - 4	SBAS RNP - 2	SBAS RNP – 1
Continental Low Density		GPMS II RNP - 10	SBAS RNP - 4	SBAS RNP – 2
Terminal High Density		GPMS II RNP - 1	SBAS RNP - 0.3	SBAS RNP - 0.1
Terminal Low Density		GPMS II RNP - 2	SBAS RNP - 1	SBAS RNP – 1
Approach High Density	**Approach/ Departure Procedures**	GPMS II RNP - 1	SBAS RNP - 0.3	SBAS RNP - 0.1
	NPA	GPMS II APV - 1	SBAS APV - II	SBAS APV - II
	Precision Approach	GPMS II CAT - I	GBAS II CAT - II	GBAS III CAT – III
Approach Low Density	**Approach/ Departure Procedures**	GBAS I RNP - 2	SBAS or GRAS RNP - 1	SBAS or GRAS RNP - 0.3
	NPA	GPMS II APV - I	SBAS or GRAS APV - II	SBAS or GRAS APV – II
	Precision Approach	GBAS I CAT-I	SBAS CAT-I	SBAS or GRAS CAT-I

Phases of Flight	2010	2015	2019
Surface and Taxi	Not determined	Not determined	Not determined

D. Surveillance

Accelerated Implementation			
Phases of Flight	**2010**	**2015**	**2019**
Oceanic En route Low Density	Multilateration with ADS-B Mode-S Surveillance Fusion (transition airspace)	ADS-B Surveillance Fusion (transition airspace) ADS-B (Air to Air)	ADS-B (transition airspace) ADS-B (Air to Air)
Oceanic En route High Density	Multilateration with ADS-B Mode-S Surveillance Fusion (transition airspace)	ADS-B Surveillance Fusion (transition airspace) ADS-B (Air to Air)	ADS-B (transition airspace) ADS-B (Air to Air)
Continental High	Multilateration with ADS-B Mode-S Surveillance Fusion (transition airspace)	Remove Primary ADS-B Surveillance Fusion	All ADS-B
Continental Low	Multilateration with ADS-B Mode-S Surveillance Fusion (transition airspace)	Remove Primary ADS-B Surveillance Fusion	All ADS-B
Terminal High Density	Multilateration with ADS-B Mode-S Surveillance Fusion (transition airspace)	Remove Primary ADS-B Surveillance Fusion	All ADS-B
Terminal Low Density	Multilateration with ADS-B Mode-S Surveillance Fusion (transition airspace)	ADS-B Surveillance Fusion	All ADS-B
Approach High Density	Multilateration with ADS-B Mode-S Surveillance Fusion (transition airspace)	Remove Primary ADS-B Surveillance Fusion	All ADS-B
Approach Low Density	Multilateration with ADS-B Mode-S Surveillance Fusion (transition airspace)	ADS-B Surveillance Fusion	All ADS-B
Surface and Taxi	SMR/Fusion/MLAT.(ASDE-X FAA) implementation	all ADS-B (Remove SMR)	All ADS-B

IX. PHASED TECHNOLOGY RECOMMENDATIONS BY OPTION

The tables in this section provide a high-level overview of the specific technologies we recommend for each phase of the two transition options--evolutionary and accelerated. For each element, Communications, Navigation, Surveillance, and Air Traffic Management we have provided, by Option: a Technology Comparison by Phase of Flight; a spreadsheet showing all of the equipment currently employed in Colombia (inventory); and a location specific Plan for Implementation, and where applicable, Discontinuance of equipment operation.

Technology used in the tables is defined as follows:

- Legacy – refers to the equipment or capability in place at the beginning of the period.
- Future – refers to what would be acquired during that period if that option was being pursued.
- Rationale – is the reason why that technology is selected for that time period/phase of flight.

As a phase is completed it its assumed for the next phase that those items called for (future) were in fact acquired and for this new phase become legacy (in place) at the beginning of the period.

We would like to point out that there were minor discrepancies between the inventory data gathered for the Consulting Advice Report and the data shown here (primarily communications). We have used the most recently obtained, UAEAC approved, data here and in the CBA which follows.

A. Air Traffic Management

1. Phased Technology Comparison – by Option and Phase of Flight

Phase I (present-2010)	Option 1: Evolutionary Implementation			Option 2: Accelerated Implementation		
Phases of Flight	**Legacy**	**Modern**	**Rationale**	**Legacy**	**Modern**	**Rationale**
Oceanic En route H/D	None	CDM, TMU, ETMS	Initial Traffic Flow Management Effort Needed	None	CDM, TMU, ETMS, G-GNM	Initial Traffic Flow Management Effort Needed
Oceanic En route L/D	None	CDM, TMU, ETMS	Initial Traffic Flow Management Effort Needed	None	CDM, TMU, ETMS, G-GNM	Initial Traffic Flow Management Effort Needed
Continental High Density	None	CDM, TMU, ETMS, Eliminate Chokepoints	Initial Traffic Flow Management Effort Needed	None	CDM, TMU, ETMS, G-GNM, Eliminate Chokepoints	Initial Traffic Flow Management Effort Needed
Continental Low Density	None	CDM, TMU, ETMS, Eliminate Chokepoints	Initial Traffic Flow Management Effort Needed	None	CDM, TMU, ETMS, Eliminate Chokepoints	Initial Traffic Flow Management Effort Needed
Terminal High Density	None	CDM, TMU, ETMS, Eliminate Chokepoints	Initial Traffic Flow Management Effort Needed	None	CDM, TMU, ETMS, G-GNM, Eliminate Chokepoints	Initial Traffic Flow Management Effort Needed
Terminal Low Density	None	CDM, TMU, ETMS, Eliminate Chokepoints	Initial Traffic Flow Management Effort Needed	None	CDM, TMU, ETMS, Eliminate Chokepoints	Initial Traffic Flow Management Effort Needed
Approach H/D-Procedures	None	CDM, TMU, ETMS, Benchmark Airports	Initial Traffic Flow Management Effort Needed	None	CDM, TMU, ETMS, G-GNM, Benchmark Airports	Initial Traffic Flow Management Effort Needed

Phase I (present-2010)	Option 1: Evolutionary Implementation			Option 2: Accelerated Implementation		
Phases of Flight	**Legacy**	**Modern**	**Rationale**	**Legacy**	**Modern**	**Rationale**
App H/D-NPA	None	CDM, TMU, ETMS, Benchmark Airports	Initial Traffic Flow Management Effort Needed	None	CDM, TMU, ETMS, Benchmark Airports	Initial Traffic Flow Management Effort Needed
App H/D-PA	None	CDM, TMU, ETMS, Benchmark Airports	Initial Traffic Flow Management Effort Needed	None	CDM, TMU, ETMS, G-GNM, Benchmark Airports	Initial Traffic Flow Management Effort Needed
App L/D-Procedures	None	CDM, TMU, ETMS, Benchmark Airports	Initial Traffic Flow Management Effort Needed	None	CDM, TMU, ETMS, Benchmark Airports	Initial Traffic Flow Management Effort Needed
App L/D-NPA	None	CDM, TMU, ETMS, Benchmark Airports	Initial Traffic Flow Management Effort Needed	None	CDM, TMU, ETMS, Benchmark Airports	Initial Traffic Flow Management Effort Needed
App L/D-PA	None	CDM, TMU, ETMS, Benchmark Airports	Initial Traffic Flow Management Effort Needed	None	CDM, TMU, ETMS, Benchmark Airports	Initial Traffic Flow Management Effort Needed
Surface and Taxi	None	CDM, TMU, ETMS	Initial Traffic Flow Management Effort Needed	None	CDM, TMU, ETMS	Initial Traffic Flow Management Effort Needed

There are two systems currently in place to provide automation of air traffic control services. The Indra Automation System in Bogota and the upgraded Barranquilla Automation System.. Subsets of these automation systems are also operational at Rio Negro and Cali. The automation capability provides for integration of the flight data processor and surveillance data processor allowing automated transfer of information within the area control center, approach control and tower facilities. Interface capability exists with the Aeronautical Fixed Telecommunications Network. The On Line Data Interchange (OLDI) function provides interface notification and coordination message exchange in accordance with Eurocontrol Standards. Configuration Management policies and procedures are in place to assure required system operation performance.

Phase II (2011-2015)	Option 1: Evolutionary Implementation			Option 2: Accelerated Implementation		
Phases of Flight	**Legacy**	**Modern**	**Rationale**	**Legacy**	**Modern**	**Rationale**
Oceanic En route H/D	CDM TMU ETMS	G-GNM Global ATM	Accommodate Increased Demand Flexible Airspace Management	CDM TMU ETMS G-GNM	Global ATM	Accommodate Increased Demand Flexible Airspace Management
Oceanic En route L/D	CDM TMU ETMS	G-GNM Global ATM	Accommodate Increased Demand Flexible Airspace Management	CDM TMU ETMS G-GNM	Global ATM	Accommodate Increased Demand Flexible Airspace Management
Continental High Density	CDM, TMU, ETMS Eliminate Choke Points	G-GNM Global ATM	Accommodate Increased Demand Flexible Airspace Management	CDM, TMU, ETMS, G-GNM Eliminate Choke Points	Global ATM	Accommodate Increased Demand Flexible Airspace Management
Continental Low Density	CDM, TMU, ETMS Eliminate Choke Points	G-GNM Global ATM	Accommodate Increased Demand Flexible Airspace Management	CDM, TMU, ETMS, G-GNM Eliminate Choke Points	Global ATM	Accommodate Increased Demand Flexible Airspace Management
Terminal High Density	CDM, TMU, ETMS Eliminate Choke Points	G-GNM Global ATM	Accommodate Increased Demand Flexible Airspace Management	CDM, TMU, ETMS, G-GNM Eliminate Choke Points	Global ATM	Accommodate Increased Demand Flexible Airspace Management

Phase II (2011-2015)	Option 1: Evolutionary Implementation			Option 2: Accelerated Implementation		
Phases of Flight	**Legacy**	**Modern**	**Rationale**	**Legacy**	**Modern**	**Rationale**
Terminal Low Density	CDM, TMU, ETMS Eliminate Choke Points	G-GNM Global ATM	Accommodate Increased Demand Flexible Airspace Management	CDM, TMU, ETMS, G-GNM Eliminate Choke Points	Global ATM	Accommodate Increased Demand Flexible Airspace Management
Approach H/D-Procedures	CDM, TMU, ETMS Benchmark Airports	G-GNM Global ATM	Accommodate Increased Demand Flexible Airspace Management	CDM, TMU, EMTS, G-GNM	Global ATM	Accommodate Increased Demand Flexible Airspace Management
App H/D-NPA	CDM, TMU, ETMS Benchmark Airports	G-GNM Global ATM	Accommodate Increased Demand Flexible Airspace Management	CDM, TMU, EMTS, G-GNM Benchmark Airports	Global ATM	Accommodate Increased Demand Flexible Airspace Management
App H/D-PA	CDM, TMU, ETMS Benchmark Airports	G-GNM Global ATM	Accommodate Increased Demand Flexible Airspace Management	CDM, TMU, EMTS, G-GNM Benchmark Airports	Global ATM	Accommodate Increased Demand Flexible Airspace Management
App L/D-Procedures	CDM, TMU, ETMS Benchmark Airports	G-GNM Global ATM	Accommodate Increased Demand Flexible Airspace Management	CDM, TMU, EMTS, G-GNM Benchmark Airports	Global ATM	Accommodate Increased Demand Flexible Airspace Management
App L/D-NPA	CDM, TMU, ETMS Benchmark Airports	G-GNM Global ATM	Accommodate Increased Demand Flexible Airspace Management	CDM, TMU, EMTS, G-GNM Benchmark Airports	Global ATM	Accommodate Increased Demand Flexible Airspace Management

Phase II (2011-2015)	Option 1: Evolutionary Implementation			Option 2: Accelerated Implementation		
Phases of Flight	**Legacy**	**Modern**	**Rationale**	**Legacy**	**Modern**	**Rationale**
App L/D-PA	CDM, TMU, ETMS Benchmark Airports	G-GNM Global ATM	Accommodate Increased Demand Flexible Airspace Management	CDM, TMU, EMTS, G-GNM Benchmark Airports	Global ATM	Accommodate Increased Demand Flexible Airspace Management
Surface and Taxi	CDM, TMU, ETMS	G-GNM Global ATM	Accommodate Increased Demand Flexible Airspace Management	CDM, TMU ETMS, G-GNM	Global ATM	Accommodate Increased Demand Flexible Airspace Management

Phase III (2016-2019)[16]	Option 1: Evolutionary Implementation			Option 2: Accelerated Implementation		
Phases of Flight	**Legacy**	**Modern**	**Rationale**	**Legacy**	**Modern**	**Rationale**
Oceanic En route H/D	G-GNM Global ATM	Global ATM	Accommodate Increased Demand Dynamic Airspace Management	Global ATM	Global ATM+	Accommodate Increased Demand Dynamic Airspace Management
Oceanic En route L/D	G-GNM Global ATM	Global ATM	Accommodate Increased Demand Dynamic Airspace Management	Global ATM	Global ATM+	Accommodate Increased Demand Dynamic Airspace Management
Continental High Density	G-GNM Global ATM	Global ATM	Accommodate Increased Demand Dynamic Airspace Management	Global ATM	Global ATM+	Accommodate Increased Demand Dynamic Airspace Management
Continental Low Density	G-GNM Global ATM	Global ATM	Accommodate Increased Demand Dynamic Airspace Management	Global ATM	Global ATM+	Accommodate Increased Demand Dynamic Airspace Management
Terminal High Density	G-GNM Global ATM	Global ATM	Accommodate Increased Demand Dynamic Airspace Management	Global ATM	Global ATM+	Accommodate Increased Demand Dynamic Airspace Management

[16] By Phase III, it is assumed that infrastructure modernization for ATM will be achieved to the level that Option 1 and Option 2 paths are the same

Phase III (2016-2019)	Option 1: Evolutionary Implementation			Option 2: Accelerated Implementation		
Phases of Flight	**Legacy**	**Modern**	**Rationale**	**Legacy**	**Modern**	**Rationale**
Terminal Low Density	G-GNM Global ATM	Global ATM	Accommodate Increased Demand Dynamic Airspace Management	Global ATM	Global ATM+	Accommodate Increased Demand Dynamic Airspace Management
Approach H/D-Procedures	G-GNM Global ATM	Global ATM	Accommodate Increased Demand Dynamic Airspace Management	Global ATM	Global ATM+	Accommodate Increased Demand Dynamic Airspace Management
App H/D-NPA	G-GNM Global ATM	Global ATM	Accommodate Increased Demand Dynamic Airspace Management	Global ATM	Global ATM+	Accommodate Increased Demand Dynamic Airspace Management
App H/D-PA	G-GNM Global ATM	Global ATM	Accommodate Increased Demand Dynamic Airspace Management	Global ATM	Global ATM+	Accommodate Increased Demand Dynamic Airspace Management

Phase III (2016-2019)	Option 1: Evolutionary Implementation			Option 2: Accelerated Implementation		
Phases of Flight	**Legacy**	**Modern**	**Rationale**	**Legacy**	**Modern**	**Rationale**
App L/D-Procedures	G-GNM Global ATM	Global ATM	Accommodate Increased Demand Dynamic Airspace Management	Global ATM	Global ATM+	Accommodate Increased Demand Dynamic Airspace Management
App L/D-NPA	G-GNM Global ATM	Global ATM	Accommodate Increased Demand Dynamic Airspace Management	Global ATM	Global ATM+	Accommodate Increased Demand Dynamic Airspace Management
App L/D-PA	G-GNM Global ATM	Global ATM	Accommodate Increased Demand Dynamic Airspace Management	Global ATM	Global ATM+	Accommodate Increased Demand Dynamic Airspace Management
Surface and Taxi	G-GNM Global ATM	Global ATM	Accommodate Increased Demand Dynamic Airspace Management	Global ATM	Global ATM+	Accommodate Increased Demand Dynamic Airspace Management

2. System Implementation – Air Traffic Management

See Appendix D.

The tables in Appendix D identify, by Option (1 or 2), by technology/capability

1 When and where systems are to be acquired/implemented - shown in blue

2 Which systems/functions are being replaced (if applicable) – explained in the notes column

3 Which legacy systems will continue to be used and require replacement on their normal time schedule (shown in green)

4 Which systems may require extension of their current life to meet with planned replacement times - shown in green followed by discontinuance (red with strikethrough)

5 Which systems can discontinue operation (and when) if applicable – shown in red with strikethrough.

6 The quantities indicated and their respective locations are factored into the Cost Benefit Analysis.

B. Communications

1. Phased Technology Comparison – by Option and Phase of Flight

Phase I (present-2010)	Option 1: Evolutionary Implementation			Option 2: Accelerated Implementation		
Phases of Flight	**Legacy**	**Future**	**Rationale**	**Legacy**	**Future**	**Rationale**
Oceanic En route H/D	HF Voice10	No new technology	HF voice technology is proven and cost effective, aircraft are equipped	HF Voice	HF Data Link10 VHF/AMSS (voice/data	HF technology is proven and cost effective, aircraft are equipped; HFDL capability will likely be limited VHF/AMSS is available, but many aircraft will likely not be equipped.
Oceanic En route L/D	HF Voice	No new technology	HF technology is proven and cost effective—aircraft are equipped	HF Voice	HF Data Link	HF technology is proven and cost effective—aircraft are equipped. HFDL capability will likely be limited
Continental High Density	VHF Voice11	VDL-2, Non-Critical	VHF technology is proven and cost effective—aircraft are equipped; VDL-2 is available	VHF Voice	VDL-212, Non-Critical and Critical,	VHF technology is proven and cost effective—aircraft are equipped; VDL-2 is available from ARINC.

[10] **HF Voice and HF Data Link (HFDL)**: it will be necessary to consider upgrading current transmitters and receivers to be able to accommodate data link services. Also, additional antennas and ground communications systems/links will be necessary to expand coverage based upon the airspace for which services are provided.

[11] **VHF Voice, VHF Data Link Modes 2/3:** should traffic congestion and cost-benefits dictate, consideration should be given to 8.33 KHz channel spacing vice 25 KHz spacing; VDL-2 will require obtaining services from a service provider (i.e. ARINC and SITA) and the installation of ground based terminals/equipment and associated point-to-point communications systems to support VDL-2 over land. Data link services via satellite are possible today. VDL-3 is currently on hold, but projections are that the program will resume and be implemented post 2010. Should VDL-3 be adopted, then new ground-air radios will be required; preferably a "software" radio that will be able to support all modes of VHF data link, to include VDL-4. It must also be noted that VDL-2 is the current system of choice for the International Air Transport Association (IATA)

Phase I (present-2010)	Option 1: Evolutionary Implementation			Option 2: Accelerated Implementation		
Phases of Flight	**Legacy**	**Future**	**Rationale**	**Legacy**	**Future**	**Rationale**
Continental Low Density	VHF Voice	No new technology	VHF technology is proven and cost effective—aircraft are equipped	VHF Voice	No new technology	VHF technology is proven and cost effective—aircraft are equipped
Terminal High Density	VHF Voice	VDL-2, Non-Critical	VHF technology is proven and cost effective—aircraft are equipped; VDL-2 is available	VHF Voice	VDL-2, Non-Critical and Critical	VHF technology is proven and cost effective—aircraft are equipped; VDL-2 is available.
Terminal Low Density	VHF Voice	No new technology	VHF technology is proven and cost effective—aircraft are equipped	VHF Voice	VDL-2, Non-Critical	VHF technology is proven and cost effective—aircraft are equipped; VDL-2 is available.
Surface and Taxi	VHF Voice	No new technology	VHF technology is proven and cost effective—aircraft are equipped	VHF Voice	VDL-2, Non-Critical	VHF technology is proven and cost effective—aircraft are equipped; VDL-2 is available

[12] **VDL-Mode 2** has limitations in its support of time critical applications in high air traffic density areas because of its CSMA channel access protocol that exhibits a non-deterministic behavior. It does not support message priorities and it cannot guarantee the message transfer time. VDL Mode 2 employs a globally dedicated common signaling channel at 136.975 MHz. Since message transfer time cannot be guaranteed, time sensitive critical air traffic control messages, such as "descend immediately" or a change in heading to avoid traffic conflicts, etc. cannot be supported via VDL Mode 2.

Phase II (2011-2015)	Option 1: Evolutionary Implementation			Option 2: Accelerated Implementation		
Phases of Flight	**Legacy**	**Future**	**Rationale**	**Legacy**	**Future**	**Rationale**
Oceanic En route H/D	HF Voice	HFDL, VHF/AMSS (voice and data)14	HF technology is proven and cost effective—aircraft are equipped. HFDL capability will likely be limited; VHF/AMSS is available, but many aircraft will likely not be equipped	HF Voice	HFDL, VHF/AMSS (voice/data), Full ATN Data	HF technology is proven and cost effective—aircraft are equipped. HFDL capability will likely be limited; VHF/AMSS is available, but many aircraft will likely not be equipped. The ATN should be available
Oceanic En route L/D	HF Voice	HFDL	HF technology is proven and cost effective—aircraft are equipped. HFDL capability will likely be limited	HF Voice	VHF/AMSS (voice/data) HFDL, Full ATN data	HF technology is proven and cost effective—aircraft are equipped. HFDL capability will likely be limited; VHF/AMSS is available, but many aircraft will likely not be equipped. The ATN should be available
Continental High Density	VHF Voice	VDL-2/3 Critical and Non-Critical;	VHF technology is proven and cost effective—aircraft are equipped; VDL-2 is available from ARINC; VDL-3 is currently delayed but should be available at this time,	VHF Voice	VHF/AMSS (voice/data); VDL 2/3; Full ATN data;	VHF technology is proven and cost effective—aircraft are equipped. VHF/AMSS is available, but many aircraft will likely not be equipped, VDL 2 is available from ARINC; VDL-3 is currently delayed, but should be available at this time;

Phase II (2011-2015)	Option 1: Evolutionary Implementation			Option 2: Accelerated Implementation		
Phases of Flight	**Legacy**	**Future**	**Rationale**	**Legacy**	**Future**	**Rationale**
Continental Low Density	VHF Voice	No new technology	VHF technology is proven and cost effective—aircraft are equipped.	VHF Voice	VHF/AMSS (voice/data) , Full ATN data	VHF technology is proven and cost effective—aircraft are equipped. VHF/AMSS is available, but many aircraft will likely not be equipped. The ATN should be available
Terminal High Density	VHF Voice	VDL 2/3 Critical and Non-Critical;	VHF technology is proven and cost effective—aircraft are equipped; VDL-2 is available from ARINC; VDL-3 is currently delayed but should be available at this time,	VHF Voice	VHF/AMSS15 (voice/data) Full ATN data	VHF technology is proven and cost effective—aircraft are equipped. VHF/AMSS is available, but many aircraft will likely not be equipped, The ATN should be available

[14] **VHF/AMSS; ATN:** The aeronautical mobile satellite service (AMSS) provides digital voice and data services using geostationary satellites. Should AMSS be considered, it will be necessary to make arrangements with a satellite service provider for satellite links and the associated equipment/services to operate/maintain those links I.e. lease/purchase) In addition arrangements will be necessary to establish cost effective message services (e.g. per message, open channel, etc.). AMSS is ATN compliant. ATN—Aeronautical Telecommunications Network: the backbone of data link's communication infrastructure is comprised of multiple independent sub-networks, or air/ground data links including Mode-S, Secondary Surveillance Radar, Satellites, and VHF links. Each of these links can be used to exchange data between aircraft and ground systems, independent of the other links (allowing users many choices in how best to suit their needs). The "global" network of systems is known as the ATN. Systems that are ATN compliant include: HFDL, AMSS (voice/data), VDL-2, VDL-3 (voice/data), VDL-4, and Mode-S.

[15] This is the 2011-2015 timeframe. Fundamentally, we agree that in today's world it may not be appropriate in most, if not all terminal cases to consider AMSS. However, in the future AMSS services may be reasonably affordable when compared with VHF, particularly for those locations that may not be practically supported by ground-based VHF services due to extreme conditions, such as local disturbances, military activities, etc.

Phase II (2011-2015)	Option 1: Evolutionary Implementation			Option 2: Accelerated Implementation		
Phases of Flight	**Legacy**	**Future**	**Rationale**	**Legacy**	**Future**	**Rationale**
Terminal Low Density	VHF Voice	VDL 2 Non-critical	VHF technology is proven and cost effective—aircraft are equipped; VDL-2 is available from ARINC;	VHF Voice	VDL-2/3, Non-Critical and Critical	VHF technology is proven and cost effective—aircraft are equipped; VDL-2 is available from ARINC; VDL-3 is currently delayed but should be available at this time,
Surface and Taxi	VHF Voice	VDL 2 Non-critical	VHF technology is proven and cost effective—aircraft are equipped; VDL-2 is available from ARINC;	VHF Voice	VDL-2/3, Non-Critical and Critical	VHF technology is proven and cost effective—aircraft are equipped; VDL-2 is available from ARINC; VDL-3 is currently delayed but should be available at this time,

Phase III (2016-2019)16	Option 1: Evolutionary Implementation			Option 2: Accelerated Implementation		
Phases of Flight	**Legacy**	**Future**	**Rationale**	**Legacy**	**Future**	**Rationale**
Oceanic En route H/D	HF Voice	VHF/AMSS (voice/data) HFDL, Full ATN data	VHF/AMSS is available and should be proven ; HF is proven technology and cost effective; HFDL should be available; ATN should be fully operational	HF Voice	VHF/AMSS (voice/data) HFDL, Full ATN data	VHF/AMSS is available and should be proven ; HF is proven technology and cost effective; HFDL should be available; ATN should be fully operational
Oceanic En route L/D	HF Voice	VHF/AMSS (voice/data) HFDL, Full ATN data	VHF/AMSS is available and should be proven ; HF is proven technology and cost effective; HFDL should be fully operational; ATN should be fully operational	HF Voice	VHF/AMSS (voice/data) HFDL, Full ATN data	VHF/AMSS is available and should be proven ; HF is proven technology and cost effective; HFDL should be fully operational; ATN should be fully operational;
Continental High Density	VHF Voice	VHF/AMSS (voice/data) VDL-2/3, Full ATN data	VHF Voice is proven and cost effective, VHF/AMSS is available and should be proven; VDL 2/3 should be fully operational;; ATN should be fully operational	VHF Voice	VHF/AMSS (voice/data); VDL 2/3; Full ATN data	VHF Voice is proven and cost effective, VHF/AMSS is available and should be proven; VDL 2/3 should be fully operational;; ATN should be fully operational
Continental Low Density	VHF Voice	VHF/AMSS (voice/data) L, Full ATN data	VHF/AMSS is available and should be proven; ATN should be fully operational	VHF Voice	VHF/AMSS (voice/data) Full ATN data	VHF/AMSS is available and should be proven ; ATN should be fully operational

[16] This is the 2016-2019 timeframe. Given the current state of communications technology, the planned communications systems, and assuming the evolutionary versus accelerated options as noted in the 2011-2015 timeframe are somewhat realized, then there is really no significant differentiation between the evolutionary and accelerated options for the 2016-2019 timeframe.

Phase III (2016-2019)16	Option 1: Evolutionary Implementation			Option 2: Accelerated Implementation		
Phases of Flight	**Legacy**	**Future**	**Rationale**	**Legacy**	**Future**	**Rationale**
Terminal High Density	VHF Voice	VHF/AMSS (voice/data) Full ATN data	VHF Voice is proven and cost effective, VHF/AMSS is available and should be fully operational; ATN should be fully operational	VHF Voice	VHF/AMSS (voice/data) Full ATN data	VHF Voice is proven and cost effective, VHF/AMSS is available and should be fully operational;; ATN should be fully operational
Terminal Low Density	VHF Voice	VDL 2/3 Critical and Non-Critical	VHF technology is proven and cost effective—aircraft are equipped; VDL-2 is available from ARINC; VDL-3 is currently delayed but should be available at this time,	VHF Voice	VHF/AMSS (voice/data) Full ATN data	VHF Voice is proven and cost effective, VHF/AMSS is available and should be fully operational;; ATN should be fully operational
Surface and Taxi	VHF Voice	VDL 2/3 Critical and Non-Critical	VHF technology is proven and cost effective—aircraft are equipped; VDL-2 is available from ARINC; VDL-3 is currently delayed but should be available at this time,	VHF Voice	VHF/AMSS (voice/data) Full ATN data	VHF Voice is proven and cost effective, VHF/AMSS is available and should be fully operational;; ATN should be fully operational

2. Systems Implementation –Communications

See Appendix A.

The tables in Appendix A identify, by Option (1 or 2), by technology/capability

- When and where systems are to be acquired/implemented - shown in blue
- Which systems/functions are being replaced (if applicable) – explained in the notes column
- Which legacy systems will continue to be used and require replacement on their normal time schedule (shown in green)
- Which systems may require extension of their current life to meet with planned replacement times - shown in green followed by discontinuance (red with strikethrough)
- Which systems can discontinue operation (and when) if applicable – shown in red with strikethrough.

The quantities indicated and their respective locations are factored into the Cost Benefit Analysis.

C. Navigation

The operational requirements have been established in previous reports provided by ISI. In this report we restate the operational requirements for the different phases of flight and also readdress the criteria and rationale for the selection of the different requirements in the different phases. The general criteria for the selection of operational requirements as they apply to navigation are as follows:

- The requirements for the different RNPs are a modern definition of the old separation criteria or route widths. Therefore, even though RNP normally refers to GNSS-type systems, they can also be satisfied using exiting ground-based navigation aids such as VOR/DME or DME/DME systems. The RNP performance requirements are as defined for GNSS type systems in ICAO Annex 10, Section 3.0. As mentioned above an RNP requirement does not necessarily imply that they can only be satisfied by GNSS type systems.

- Operational requirements and their derived plans of implementation must be realizable within the time frame specified by the different phases. Consequently, we have defined numbers that are currently achievable and those that are predicted to be achievable in the future phases. However, we are also realistic and if a RNP performance capability is easily achievable such as RNP 0.3 today based on the current GPS, then we will define this as an operational requirement even though a lesser requirement may be acceptable to satisfy the operational requirement. The reason we specified a tougher requirement is that if it is easily achievable then we want to specify that requirement so that the navigation component of the total ATM/CNS performance requirement is smaller. If the navigation component takes up a smaller percentage of the total allowable error for ATM/CNS, then the other components such as the communications, surveillance or ATM can have a lesser requirement and still meet the overall ATM/CNS requirement.

- We have also developed an evolutionary approach to the definition of the different operational requirements for the different phases. For example for Oceanic airspace we have defined an evolution from RNP-10 to RNP-4 to RNP-2. Operationally it is very difficult for any civil aviation organization to convince and train operationally personnel to jump from an RNP-10 requirement directly to an RNP-2 requirement. It is prudent and logical to go from 10 to 4, then from 4 to 2. This will also provide time to train the various operational personnel and to obtain some operational experience at the different levels of RNP before going to the next level of performance.

- In addition, all of civil aviation requirements are based on precedent and safety. It has been generally accepted that the current accepted level of RNP for use with non GNSS type of systems is about RNP-10. This has been proved over time to be operationally safe. Therefore, the safety certification authorities within the civil aviation authority is not going to make a dramatic change from RNP-10 to RNP-2 until it has been proved to be safe at RNP-4 before moving on to RNP-2.

- It is always better to operate with a smaller RNP performance number since it will imply additional capacity as the routes can be placed closer to each other if all the other communications, surveillance, and air traffic management capabilities and tools are available. Convergence points and conflict points can be reduced if the RNP criteria can be reduced and routes, (such as airways, SIDS, STARS, and different types of RNAV approaches), can be placed closer to each other without conflicting with each other and/or resulting in conflict points. This will provide a more efficient air traffic control system and optimize the capacity and utility of the Colombian airspace. Therefore, within limits we have defined the RNP to be as small as possible consistent with the capabilities of the air traffic control systems for the applicable volumes of traffic and the complexity of the airspace as seen in Colombia, and with the possible implementation of user avionics.

- We have also taken the weather as a limiting criterion so that we do not over specific systems where they are not needed. For example, we have agreed with Aerocivil that there is no operational requirement for Cat III types of systems since the weather in Colombia is always better than that. It would not be cost effective to specific Cat III types of precision approach systems for the short amount of time that the weather may be lower or equal to Cat III minimums. The single exception is in 2019 (Phase III) where we have defined an operational requirement for Cat III because we feel that it may be easily achievable by then.

- For the Oceanic En Route High Density Airspace identified below we have defined the RNP requirements based on the following criteria and rationale. The current generally accepted level of RNP for use with non GNSS type of systems is RNP-10. Therefore, we will start with a requirement of RNP-10 since that can be satisfied today. As mentioned above we want to define an RNP as low as possible so that we can maximize the efficient of the airspace and optimize the capacity of the airspace. A higher RNP is not prudent since it can be satisfied today and a lower RNP is not realistic since perceived safety, training and acceptance will be a concern as mentioned above. For the same reasons we have defined an evolutionary tightening of the RNP, so that finally in 2019, we have achieved an RNP-2 for Oceanic Airspace.

- For the Oceanic En Route Low Density Airspace identified below we have even relaxed the above RNP-10 requirement in order to accommodate the use of legacy inertial systems that are typical on many aircraft today. The typical drift rate and flight length in oceanic airspace using inertia systems normally recommend an RNP of 12.5 nautical miles, therefore an RNP-12 was defined for low density oceanic airspace in order to accommodate those legacy aircraft. Using the same rationale as above, we have developed an evolutionary approach to tighten the RNP requirements from 12 to 10, and finally to RNP-4. In low density airspace there is no requirement to tighten the RNP any further since by definition there will not be a significant amount of air traffic in low density oceanic en route airspace. If the density of air traffic increase to high density then the operational requirements to those of number 7 above.

- For the Continental High Density Airspace identified below we have used the same operational requirements as for the Oceanic High Density Airspace since users are expected to use the same navigation systems (GNSS) for both Oceanic and Continental airspace and therefore they can satisfy the same RNP requirements. There is no reason to assume that the oceanic and continental airspace will not be the same in the future.

- For the Continental Low Density Airspace identified below we have used the same operational requirements as for the Oceanic Low Density Airspace since users are expected to use the same navigation systems (GNSS) for both Oceanic and Continental airspace and therefore they can satisfy the same RNP requirements. Where other systems are used such as inertial systems, there is no reason to specify a tougher requirement for low density continental airspace since there is a minimum amount of air traffic. There is no reason to assume that the oceanic and continental airspace will not be the same in the future.

- For the Terminal High Density Airspace identified below we have defined the RNP requirements based on the following criteria and rationale. The current generally accepted level of RNP for use with non GNSS type of systems in the terminal area is RNP-4. However, with GNSS, even today we can achieve an RNP level of 0.3. But consistent with the 6 criteria described above we need an evolutionary approach that is minimally different than today's environment. However, since the high density terminal areas are already crowded today, we will choose a compromise of RNP-2 as the starting point in 2010. During the time from now to 2010, Aerocivil can gradually go from RNP-4 today to RNP-2 in 2010. As mentioned above we want to define an RNP as low as possible so that we can maximize the efficient of the airspace and optimize the capacity of the airspace. A higher RNP is not prudent since it can be satisfied today and a lower RNP is not realistic since perceived safety, training and acceptance will be a concern as mentioned above. For the same reasons we have defined an evolutionary tightening of the RNP, so that finally in 2019, we have achieved an RNP-0.3 for the entire high density terminal airspace.

- For the Terminal Low Density Airspace identified below we have defined the RNP requirements based on the following criteria and rationale. The current generally accepted level of RNP for use with non GNSS type of systems is RNP-4. Therefore, we will start with a requirement of RNP-4 since that can be satisfied today. As mentioned above we want to define an RNP as low as possible so that we can maximize the efficient of the airspace and optimize the capacity of the airspace. A higher RNP is not prudent since RNP-4 can be satisfied today with existing systems and a lower RNP is not realistic since perceived safety, training and acceptance will be a concern as mentioned above. A lower RNP is also not needed since this is for a low density terminal area, where efficiency and optimization is not of a concern. For the same reasons as above we have defined an evolutionary tightening of the RNP, so that finally in 2019, we have achieved an RNP-2 for Terminal Low Density Airspace.

- For the High Density Approaches we have applied the same criteria and the same rationale to arrive at the operational requirements for Approach/Departure Procedures, Non-Precision Approaches, and Precision Approaches. For Approach/Departure Procedures we have defined RNP from an easily obtained 2 to 0.3 in 2019. For Non-Precision Approaches we have defined a requirement of APV-I as defined by ICAO in Annex 10, for all future phases. For Precision Approaches, we have defined a current achieved Cat I operational requirement since the weather in Colombia does not justify a lower minimum type of requirement.
- For the Low Density Approaches we have applied the same criteria and the same rationale to arrive at the operational requirements for Approach/Departure Procedures, Non-Precision Approaches, and Precision Approaches as we have used for other low density applications. For Approach/Departure Procedures we have defined RNP from the currently used and achieved level of RNP-4 to RNP-1 in 2019. For Non-Precision Approaches we have defined a requirement of RNP-0.3 since that is achievable today based only on GPS, and then lowered it to APV-I as defined by ICAO in Annex 10, for all future phases. A more stringent requirement is not needed for low density airports because of the availability of good weather. For Precision Approaches, we have defined a requirement of APV-II as defined by ICAO even though it is less than the current requirement satisfied by ILS Cat I. The reason for this is so that if there are options to use an SBAS, Colombia could satisfy an APV-II requirement everywhere in Colombia with the implementation of SBAS in Colombia or Colombia can join an existing and operational SBAS. Again, in future years it is recommended that Cat I is the operational requirement since in that time frame, the future SBAS will be able to satisfy an equivalent Cat I performance everywhere within its coverage volume.
- Finally, even though Colombia will not be implementing an SBAS system in the near future or at all, it is always possible for aviation users to use the SBAS of other nations as long as they have certified receivers and can receive the SBAS broadcast over the Colombian FIRs. By approving the use of any certified SBAS system in Colombian FIRs, such as WAAS now, and EGNOS, GAGAN, or MSAS in the future; users can improve their performance over the basic GPS or Galileo satellites when flying in Colombian airspace.

1. Phased Technology Comparison – by Option and Phase of Flight

Phase I (present-2010)	Option 1: Evolutionary Implementation (Lowest Risks Implementation)			Option 2: Accelerated Implementation (Highest probability of Becoming Service Provider)		
Phases of Flight	**Legacy**	**Modern**	**Rationale**	**Legacy**	**Modern**	**Rationale**
Oceanic En route H/D	None	GPMS I Approve other SBAS[17]	GPS by itself can serve as a primary navigation for oceanic airspace	None	SBAS (integrity only) or GPMS for operational approval	SBAS is needed for any nation to become a leader in the provision of ATM/CNS services.
Oceanic En route L/D	None	GPMS I Approve other SBAS	GPS by itself can serve as a primary navigation for oceanic airspace	None	SBAS (integrity only) or GPMS for operational approval	SBAS is needed for any nation to become a leader in the provision of ATM/CNS services.
Continental High Density	VOR/DME	GPMS I Approve other SBAS	GPS by itself can serve as a supplemental navigation for continental airspace with VOR/DME serving as the primary navigation	VOR/DME	SBAS or GRAS A GPMS is needed for operational approval for primary navigation and can serve as a transition to SBAS	SBAS is needed for any nation to become a leader in the provision of ATM/CNS services. However VOR/DME still needed as backup

[17] Any SBAS providing coverage over Colombia can be used for integrity and to improve performance. Therefore, even though the SBASs are not controlled by Colombia, they can be approved for use in Colombian airspace.

Phase I (present-2010)	Option 1: Evolutionary Implementation (Lowest Risks Implementation)			Option 2: Accelerated Implementation (Highest probability of Becoming Service Provider)		
Phases of Flight	**Legacy**	**Modern**	**Rationale**	**Legacy**	**Modern**	**Rationale**
Continental Low Density	VOR/DME	GPMS I Approve other SBAS	GPS by itself can serve as a supplemental navigation for continental airspace with VOR serving as the primary navigation	VOR	SBAS or GRAS A GPMS is needed for operational approval for primary navigation and can serve as a transition to SBAS	SBAS is needed for any nation to become a leader in the provision of ATM/CNS services. SBAS can be enhanced to provide primary navigation
Terminal High Density	VOR/DME	GPMS I Approve other SBAS	GPS by itself can serve as a supplemental navigation for terminal airspace with VOR/DME serving as the primary navigation	VOR/DME	SBAS or GRAS A GPMS is needed for operational approval for primary navigation and can serve as a transition to SBAS	SBAS is needed for any nation to become a leader in the provision of ATM/CNS services. However VOR/DME still needed as backup
Terminal Low Density	VOR/DME	GPMS I Approve other SBAS	GPS by itself can serve as a supplemental navigation for terminal airspace with VOR serving as the primary navigation	VOR	SBAS or GRAS A GPMS is needed for operational approval for primary navigation and can serve as a transition to SBAS	SBAS is needed for any nation to become a leader in the provision of ATM/CNS services. SBAS can be enhanced to provide primary navigation
Approach H/D-Procedures	VOR/DME	GPMS I Approve other SBAS	GPS by itself can serve as a supplemental navigation for approaches with VOR/DME serving as the primary navigation	VOR/DME	SBAS or GRAS A GPMS is needed for operational approval for primary navigation and can serve as a transition to SBAS	SBAS is needed for any nation to become a leader in the provision of ATM/CNS services. However VOR/DME still needed as backup

Phase I (present-2010)	Option 1: Evolutionary Implementation (Lowest Risks Implementation)			Option 2: Accelerated Implementation (Highest probability of Becoming Service Provider)		
Phases of Flight	**Legacy**	**Modern**	**Rationale**	**Legacy**	**Modern**	**Rationale**
App H/D-NPA	VOR/DME	GPMS I Approve other SBAS	GPS by itself can serve as a supplemental navigation for approaches with VOR/DME serving as the primary navigation	VOR/DME	SBAS or GRAS A GPMS is needed for operational approval for primary navigation and can serve as a transition to SBAS	SBAS is needed for any nation to become a leader in the provision of ATM/CNS services. However VOR/DME still needed as backup
App H/D-PA	ILS CAT 1	GPMS I ILS Cat I can be replaced with a GBAS Cat I if the risks, costs, and airline equipage are the same for both systems	ILS can be implemented with least risk	ILS Cat I/II	GBAS A GPMS is needed for operational approval for primary navigation and can serve as a transition to SBAS	GBAS is needed for any nation to become a leader in the provision of ATM/CNS services. However ILS still needed as backup
App L/D-Procedures	VOR/DME	GPMS I Approve other SBAS	GPS by itself can serve as a supplemental navigation for approaches with VOR serving as the primary navigation	VOR	SBAS or GRAS A GPMS is needed for operational approval for primary navigation and can serve as a transition to SBAS	SBAS is needed for any nation to become a leader in the provision of ATM/CNS services. SBAS can be enhanced to provide primary navigation

Phase I (present-2010)	Option 1: Evolutionary Implementation (Lowest Risks Implementation)			Option 2: Accelerated Implementation (Highest probability of Becoming Service Provider)		
Phases of Flight	**Legacy**	**Modern**	**Rationale**	**Legacy**	**Modern**	**Rationale**
App L/D-NPA	VOR/DME	GPMS I Approve other SBAS	GPS by itself can serve as a supplemental navigation for approaches with VOR serving as the primary navigation	VOR	SBAS or GRAS A GPMS is needed for operational approval for primary navigation and can serve as a transition to SBAS	SBAS is needed for any nation to become a leader in the provision of ATM/CNS services. SBAS can be enhanced to provide primary navigation
App L/D-PA	ILS CAT 1	GPMS I ILS Cat I can be replaced with a GBAS Cat I if the risks, costs, and airline equipage are the same for both systems	ILS can be implemented with least risks	ILS CAT I	GBAS A GPMS is needed for operational approval for primary navigation and can serve as a transition to SBAS	SBAS is needed for any nation to become a leader in the provision of ATM/CNS services. And SBAS can be enhanced to provide a precision approach capability
Surface and Taxi	MDS	GPMS Approve other SBAS	MDS can be implemented with least risk	MDS	SBAS/GBAS or GRAS A GPMS is needed for operational approval for primary navigation and can serve as a transition to SBAS	SBAS is needed for any nation to become a leader in the provision of ATM/CNS services. And SBAS can be enhanced to provide surface and taxi navigation

Phase II (2011-2015)	Option 1: Evolutionary Implementation (Least Risk Implementation)			Option 2: Accelerated Implementation (Highest probability of Becoming Service Provider)		
Phases of Flight	**Legacy**	**Modern**	**Rationale**	**Legacy**	**Modern**	**Rationale**
Oceanic En route H/D	GPMS I	GPMS II Approve other SBAS	GPS with Galileo can serve as a primary (sole) navigation for oceanic airspace. However, a GPMS is needed for operational approval.	GPMS III or SBAS (integrity only)	SBAS	SBAS is needed for any nation to become a leader in the provision of ATM/CNS services.
Oceanic En route L/D	GPMS I	GPMS II Approve other SBAS	GPS with Galileo can serve as a primary (sole) navigation for oceanic airspace. However, a GPMS is needed for operational approval	GPMS III or SBAS (integrity only)	SBAS	SBAS is needed for any nation to become a leader in the provision of ATM/CNS services.
Continental High Density	GPMS I Minimal set of VOR/DME as Backup	GPMS II Approve other SBAS	GPS with Galileo can serve as a primary (sole) navigation for continental airspace with VOR/DME serving as the backup navigation. However, a GPMS is needed for operational approval	GPMS II/III, SBAS or GRAS	SBAS	SBAS is needed for any nation to become a leader in the provision of ATM/CNS services. However VOR/DME backup is not needed with joint use of both GPS and Galileo
Continental Low Density	VOR/DME	GPMS I/II Approve other SBAS	GPS with Galileo can serve as a primary (sole) navigation for continental airspace. However, a GPMS is needed for operational approval.	GPMS II/III, SBAS or GRAS	SBAS	SBAS is needed for any nation to become a leader in the provision of ATM/CNS services.

Phase II (2011-2015)	Option 1: Evolutionary Implementation (Least Risk Implementation)			Option 2: Accelerated Implementation (Highest probability of Becoming Service Provider)		
Phases of Flight	**Legacy**	**Modern**	**Rationale**	**Legacy**	**Modern**	**Rationale**
Terminal High Density	GPMS I Minimal set of VOR/DME as backbone	GPMS II Approve other SBAS	GPS with Galileo can serve as a primary (sole) navigation for terminal airspace with VOR/DME serving as the backup navigation. However, a GPMS is needed for operational approval.	GPMS II/III, SBAS or GRAS	SBAS	SBAS is needed for any nation to become a leader in the provision of ATM/CNS services. However VOR/DME backup is not needed with joint use of both GPS and Galileo
Terminal Low Density	VORDME	GPMS I/II Approve other SBAS	GPS with Galileo can serve as a primary (sole) navigation for terminal airspace. However, a GPMS is needed for operational approval.	GPMS II/III, SBAS or GRAS	SBAS	SBAS is needed for any nation to become a leader in the provision of ATM/CNS services.
Approach H/D-Procedures	GPMS I VOR/DME as backup	GPMS II Approve other SBAS	GPS with Galileo can serve as a primary (sole) navigation for approaches with VOR/DME serving as the backup navigation. However, a GPMS is needed for operational approval.	GPMS II/III, SBAS or GRAS	SBAS	SBAS is needed for any nation to become a leader in the provision of ATM/CNS services. However VOR/DME backup is not needed with joint use of both GPS and Galileo

Phase II (2011-2015)	Option 1: Evolutionary Implementation (Least Risk Implementation)			Option 2: Accelerated Implementation (Highest probability of Becoming Service Provider)		
Phases of Flight	**Legacy**	**Modern**	**Rationale**	**Legacy**	**Modern**	**Rationale**
App H/D-NPA	GPMS I VOR/DME as backup	GPMS II	GPS with Galileo can serve as a primary (sole) navigation for approaches with VOR/DME serving as the backup navigation. However, a GPMS is needed for operational approval.	GPMS II/III, SBAS or GRAS	SBAS	SBAS is needed for any nation to become a leader in the provision of ATM/CNS services. However VOR/DME backup is not needed with joint use of both GPS and Galileo
App H/D-PA	ILS Cat I	None ILS Cat I can be replaced with a GBAS Cat I if the risks, costs, and airline equipage are the same for both systems. However, both GPS III and Galileo can provide a Cat I performance requirement for all of Colombian airspace.	ILS can be implemented with least risk	GPMS II/III, SBAS or GRAS	SBAS	GBAS is needed for any nation to become a leader in the provision of ATM/CNS services. However ILS is not needed as backup with use of GPS and Galileo
App L/D-Procedures	VOR/DME	GPMS I/ II Approve other SBAS	GPS with Galileo can serve as a primary (sole) navigation for approaches. However, a GPMS is needed for operational approval.	GPMS II/III, SBAS or GRAS	SBAS	SBAS is needed for any nation to become a leader in the provision of ATM/CNS services. SBAS can be enhanced to provide primary navigation

Phase II (2011-2015)	Option 1: Evolutionary Implementation (Least Risk Implementation)			Option 2: Accelerated Implementation (Highest probability of Becoming Service Provider)		
Phases of Flight	**Legacy**	**Modern**	**Rationale**	**Legacy**	**Modern**	**Rationale**
App L/D-NPA	VOR/DME	GPMS I/ II Approve other SBAS	GPS with Galileo can serve as a primary (sole) navigation for approaches. However, a GPMS is needed for operational approval.	GPMS II/III, SBAS or GRAS	SBAS	SBAS is needed for any nation to become a leader in the provision of ATM/CNS services.
App L/D-PA	ILS Cat I	None ILS Cat I can be replaced with a GBAS Cat I if the risks, costs, and airline equipage are the same for both systems. However, both GPS III and Galileo can provide a Cat I performance requirement for all of Colombian airspace.	ILS can be implemented with least risks	GPMS II/ GBAS I	SBAS	SBAS is needed for any nation to become a leader in the provision of ATM/CNS services.
Surface and Taxi	MDS	None Approve other SBAS	MDS can be implemented with least risk	MDS	SBAS	SBAS is needed for any nation to become a leader in the provision of ATM/CNS services. And SBAS will provide surface and taxi navigation

Phase III (2016-2019)	Option 1: Evolutionary Implementation (Least Risk Implementation)			Option 2: Accelerated Implementation (Highest probability of Becoming Service Provider)		
Phases of Flight	**Legacy**	**Modern**	**Rationale**	**Legacy**	**Modern**	**Rationale**
Oceanic En route H/D	GPMS II	None Approve other SBAS	GPS with Galileo can serve as a primary (sole) navigation for oceanic airspace. However, a GPMS is needed for operational approval.	SBAS		SBAS is needed for any nation to become a leader in the provision of ATM/CNS services.
Oceanic En route L/D	GPMS II	None Approve other SBAS	GPS with Galileo can serve as a primary (sole) navigation for oceanic airspace. However, a GPMS is needed for operational approval.	SBAS		SBAS is needed for any nation to become a leader in the provision of ATM/CNS services.
Continental High Density	GPMS II	None Approve other SBAS	GPS with Galileo can serve as a primary (sole) navigation for continental airspace. However, a GPMS is needed for operational approval.	SBAS		SBAS is needed for any nation to become a leader in the provision of ATM/CNS services. However VOR/DME backup is not needed with joint use of both GPS and Galileo
Continental Low Density	GPMS II	None Approve other SBAS	GPS with Galileo can serve as a primary (sole) navigation for continental airspace. However, a GPMS is needed for operational approval.	SBAS		SBAS is needed for any nation to become a leader in the provision of ATM/CNS services.

Phase III (2016-2019)	Option 1: Evolutionary Implementation (Least Risk Implementation)			Option 2: Accelerated Implementation (Highest probability of Becoming Service Provider)		
Phases of Flight	**Legacy**	**Modern**	**Rationale**	**Legacy**	**Modern**	**Rationale**
Terminal High Density	GPMS II	None Approve other SBAS	GPS with Galileo can serve as a primary (sole) navigation for terminal airspace. However, a GPMS is needed for operational approval.	SBAS		SBAS is needed for any nation to become a leader in the provision of ATM/CNS services. However VOR/DME backup is not needed with joint use of both GPS and Galileo
Terminal Low Density	GPMS II	None Approve other SBAS	GPS with Galileo can serve as a primary (sole) navigation for terminal airspace. However, a GPMS is needed for operational approval.	SBAS		SBAS is needed for any nation to become a leader in the provision of ATM/CNS services.
Approach H/D-Procedures	GPMS II	None Approve other SBAS	GPS with Galileo can serve as a primary (sole) navigation for approaches. However, a GPMS is needed for operational approval.	SBAS		SBAS is needed for any nation to become a leader in the provision of ATM/CNS services. However VOR/DME backup is not needed with joint use of both GPS and Galileo

Phase III (2016-2019)	Option 1: Evolutionary Implementation (Least Risk Implementation)			Option 2: Accelerated Implementation (Highest probability of Becoming Service Provider)		
Phases of Flight	**Legacy**	**Modern**	**Rationale**	**Legacy**	**Modern**	**Rationale**
App H/D-NPA	GPMS II	None Approve other SBAS	GPS with Galileo can serve as a primary (sole) navigation for approaches. However, a GPMS is needed for operational approval.	SBAS		SBAS is needed for any nation to become a leader in the provision of ATM/CNS services. However VOR/DME backup is not needed with joint use of both GPS and Galileo
App H/D-PA	ILS Cat I	None ILS Cat I can be replaced with a GBAS Cat I if the risks, costs, and airline equipage are the same for both systems. However, both GPS III and Galileo can provide a Cat I performance requirement for all of Colombian airspace.	ILS can be implemented with least risk	SBAS		GBAS is needed for any nation to become a leader in the provision of ATM/CNS services. However ILS is not needed as backup with use of GPS and Galileo
App L/D-Procedures	GPMS II	None Approve other SBAS	GPS with Galileo can serve as a primary (sole) navigation for approaches. However, a GPMS is needed for operational approval.	SBAS		SBAS is needed for any nation to become a leader in the provision of ATM/CNS services. SBAS can be enhanced to provide primary navigation

Phase III (2016-2019)	Option 1: Evolutionary Implementation (Least Risk Implementation)			Option 2: Accelerated Implementation (Highest probability of Becoming Service Provider)		
Phases of Flight	**Legacy**	**Modern**	**Rationale**	**Legacy**	**Modern**	**Rationale**
App L/D-NPA	GPMS II	None Approve other SBAS	GPS with Galileo can serve as a primary (sole) navigation for approaches. However, a GPMS is needed for operational approval.	SBAS		SBAS is needed for any nation to become a leader in the provision of ATM/CNS services.
App L/D-PA	GPMS II	None ILS Cat I can be replaced with a GBAS Cat I if the risks, costs, and airline equipage are the same for both systems. However, both GPS III and Galileo can provide a Cat I performance requirement for all of Colombian airspace.	ILS can be implemented with least risks	SBAS		SBAS is needed for any nation to become a leader in the provision of ATM/CNS services.
Surface and Taxi	MDS	None Approve other SBAS	MDS can be implemented with least risk	MDS		

2. Systems Implementation – Navigation

See Appendix B

- The tables in Appendix B identify, by Option (1 or 2), by technology/capability
- When and where systems are to be acquired/implemented - shown in blue
- Which systems/functions are being replaced (if applicable) – explained in the notes column
- Which legacy systems will continue to be used and require replacement on their normal time schedule (shown in green)
- Which systems may require extension of their current life to meet with planned replacement times - shown in green followed by discontinuance (red with strikethrough)
- Which systems can discontinue operation (and when) if applicable – shown in red with strikethrough.

The quantities indicated and their respective locations are factored into the Cost Benefit Analysis.

D. Surveillance

The following criteria maps to the recommended implementation plan described in the following charts and the conclusion reached regarding the maintenance of the primary and secondary radar until the end of their useful life. The charts also take into consideration the combination of current and proposed equipments to provide essential surveillance capability during each of the selected periods – present to 2010, 2011 – 2015, and 2016 – 2019.

Because of the various ages of the currently installed surveillance equipment suites, the general installation plan takes into account their expected "end of useful life"

Typically, all Air Navigation Service Providers purchase equipment that has at least a 20-year useful life. This is defined as the length of time the equipment can be logistically supported and continue to meet its original operational performance requirements. These requirements include the operational availability, the accuracy, resolution, detection characteristics, Mean-time-to-repair (MTTR) and Mean-time-between-failure (MTBF).

Colombia has purchased and installed quality equipment from major original equipment manufactures such as Raytheon, Airsys, and Alenia. The general plan therefore takes into account when these various equipments were purchased and installed, and upgrades that have occurred at some locations. This information was used to create the following proposed installation plan. A sound installation plan should also take into account the condition of the current inventory of equipments. The following questions must be addressed regarding current equipments:

Are needed spare parts readily available?

Are maintenance technicians trained and available to repair the equipment?

Is the software still supported by the original equipment manufacturer?

Does the equipment continue to meet the current operational requirement "AS INSTALLED" such as Coverage Volume, Accuracy, Availability, Capacity, Resolution, Latency, and Update rate (see definitions below)?

Rationale

The proposed surveillance architecture assumes that Aerocil desires to move toward a space-based surveillance system infrastructure, consistent with the global and regional CNS-ATM system plans (the underlying basis for this study). We also assume that certain legacy systems will remain in service during the transition to space-based operations.

A concurrent consideration is the rate of aircraft equipage (if/when) required before ADS-B can replace current radar-based surveillance functions.

The new ADS-B electronics packages, which in most cases will replace existing mode-S transponders, have a substantially different functionality than the systems in use today. In the ADS-B architecture, the GPS constellation is utilized to derive or calculate a position. This position is then fed to the new ADS-B-capable transponder. The transponder then "squits" the position information in a 112 bit message format several times per second. The message format

is consistent with the Minimum Operating Performance Standard (MOPS) document and appropriate Technical Standard Order (TSO) that supports the application.

Today three major avionics manufacturers build ADS-B equipment;

Rockwell Collins

Honeywell

ACSS

These are the same manufactures that provide most of the transponders used today in Air Transport category aircraft.

For General aviation, GARMIN Corporation builds UAT-based ADS-B avionics.

These avionics will also reply to the standard interrogations from today's secondary radars and the already installed TCAS systems.

In order to provide surveillance service that allows a transition to ADS-B, Aerocivil should maintain a capability to receive secondary radar reports and the new ADS-B reports. Because today's Secondary Radars cannot receive ADS-B, our recommendation is for initial implementation of a multilateration system that can accommodate both. The same system will be capable of receiving all beacon returns and all ADS-B messages. Both formats can be provided by the identical equipment. So when Aerocivil begins deploying new equipment to provide secondary radar coverage they should choose Multilateration because it will also provide ADS-B as the airlines equip.

In the transition period it is therefore important to invest in new equipment that operates with both the "old and the new" formats - that is Modes-A, C, S and ADS-B.

There are currently at least six vendors in the world who build multilateration subsystems.

Multilateration is designed to function as a secondary radar, with the following advantages:

- No moving parts
- Scaleable (can be expandable over the coverage volume)
- Decodes all current avionics messages from legacy SSR-type systems
- Decodes the new 1090 extended squitter formats.

We have therefore recommended multilateration as the preferred technical solution that will provide Aerocivil the capability to "see" all the aircraft equipped with legacy transponders and those with ADS-B, as they equip.

Multilateration is widely deployed in the United States and throughout the world. It has been CERTIFIED as a terminal radar replacement according to ICAO standards for secondary radar for approach control applications. It has also been tested in the Gulf of Mexico and meets all the requirements of en route secondary radar.

The conclusion from our analysis is that Aerocivil should incrementally acquire surveillance capabilities that take advantage of the existing surveillance infrastructure that exists in Colombia,

undertakes strategic replacement of those systems that are at or approaching the end of their useful life, and acquire new technology to accommodate the eventual transition to space-based systems.

We are also recommending that Aerocivil continue to use its serviceable secondary radars until the end of their useful life, and after completing its system backup analysis, determine whether to continue with a normal replacement program or shut them down in favor of an alternative backup solution.

C2. Definitions: The Following definitions are provided for clarification of the Surveillance discussions in this document:

Coverage Volume: Coverage volume means that there are surveillance reports that meet the minimum requirements available to the controller for every place the controller needs to see.

Accuracy: The position reported, when referenced to "truth", or the reference position, will always fall within the limits of a distribution function. A Poisson function is typically specified for surveillance sources. One Sigma, for instance means that the position reported is within the reference location at least 68 % of the time. Two sigma means that the position reported is within the reference location at least 95% of the time.

Availability: Operational availability is typically given in a decimal format with some number of "nines". This number is normalized to one (1), where 1 is perfect, meaning that it is available 100% of the time. An operational availability of .999 means that is can only fail .001 of a year, (8.76 hours).

Capacity: The maximum number of targets that can be tracked while meeting all of the performance requirements.

Resolution: The ability of the surveillance system to "Resolve" two targets. This means that the surveillance equipment can distinguish that there are separate aircraft that are very close together. This term originated with Primary radar where this term was used to describe the ability of a radar beam to illuminate the target and the receiver to distinguish between two targets which is important for the establishment of separation criteria. Radar equipment is typically designed to separate at three and five miles. This is historically based on the ability of fifty year old radars to show two closely spaced targets on a display.

Latency: Latency in surveillance system is typically a measure of time that elapses from when the position is sampled to the time that it is made available to the controller.

Update rate: The rate which new (updated) position reports are provided to the automation platform.

There are also several new Acronyms appearing in documents currently being developed:

NUC: Navigation Uncertainty Category
NIC: Navigation Integrity Category
NAC: Navigation Accuracy Category
SIL: Surveillance Integrity Level

DO260, An RTCA MOPS that describes the characteristics of airborne equipment initiated a term called NUC, Navigation uncertainty category. This means that when the position report from an ADS-B message is received by a ground station or another aircraft, embedded in the message is a NUC value of 1 to 11. A high NUC means there is greater certainty regarding the position information. A high NUC is therefore good. A low NUC means you cannot trust the report to be as "certain". It has however been agreed that this was generally not a good way to characterize the veracity of the position report so the next version, DO260A will use three separate measurements to more accurately reflect the specific reason for the uncertainty:

NIC Navigation Integrity Category

NAC Navigation Accuracy Category

SIL Surveillance Integrity Level.

The combination of all three, when used in the design of the SYSTEM, allows the Certification authority to make a determination that the data is Believable.

The US will most likely precede using DO260A certified equipment, although other countries may choose to use DO260. Each must decide based on its particular safety case.

Our Team recommends DO260A for the Colombian rulemaking that should take place to mandate ADS-B.

1. Phased Technology Comparison – by Option and Phase of Flight

Phase I (present-2010)	Option 1: Evolutionary Implementation			Option 2: Accelerated Implementation		
Phases of Flight	**Legacy**	**Modern**	**Rationale**	**Legacy**	**Modern**	**Rationale**
Oceanic En route H/D	None	Multilateration with Mode –S ADS-B Surveillance Fusion (transition airspace) ADS-B (Air to Air)	Equipage must be universal therefore; rulemaking is required to mandate equipment.	Multilateration with Mode – S ADS-B Surveillance Fusion (transition airspace)	Multilateration with Mode –S ADS-B Surveillance Fusion ADS-B (Air to Air)	Equipage must be universal therefore; rulemaking is required to mandate equipment.
Oceanic En route L/D	None	Multilateration with Mode –S ADS-B Surveillance Fusion (transition airspace) ADS-B (Air to Air)	Equipage must be universal therefore; rulemaking is required to mandate equipment.	Multilateration with Mode – S ADS-B Surveillance Fusion (transition airspace)	Multilateration with Mode –S ADS-B Surveillance Fusion ADS-B (Air to Air)	Equipage must be universal therefore; rulemaking is required to mandate equipment.
Continental High Density	PSR/ SSR where available	Multilateration with Mode –S ADS-B Surveillance Fusion Let primary expire at end of life	The incremental cost to add the ADS-B functionality to an MSSR will support ADS-B centric ICAO plans	Multilateration with Mode – S ADS-B Surveillance Fusion Let primary expire at end of life or remove for cost savings	Multilateration with Mode –S ADS-B Surveillance Fusion	The incremental cost to add the ADS-B functionality to an MSSR will support ADS-B centric ICAO plans.
Continental Low Density	PSR/ SSR where available	Multilateration with Mode –S ADS-B Surveillance Fusion Let primary expire at end of life	The incremental cost to add the ADS-B functionality to an MSSR will support ADS-B centric ICAO plans	Multilateration with Mode –S ADS-B Surveillance Fusion Let primary expire at end of life or remove for cost savings	Multilateration with Mode –S ADS-B Surveillance Fusion	The incremental cost to add the ADS-B functionality to an MSSR will support ADS-B centric ICAO plans

Phase I (present-2010)	Option 1: Evolutionary Implementation			Option 2: Accelerated Implementation		
Phases of Flight	**Legacy**	**Modern**	**Rationale**	**Legacy**	**Modern**	**Rationale**
Terminal High Density	PSR/ SSR where available	Multilateration Mode – S ADS-B Surveillance Fusion Let primary expire at end of life	The incremental cost to add the ADS-B functionality to an MSSR will support ADS-B centric ICAO plans	Multilateration with Mode – S ADS-B Surveillance Fusion Let primary expire at end of life or remove for cost savings	Multilateration with Mode –S ADS-B Surveillance Fusion	The incremental cost to add the ADS-B functionality to an MSSR will support ADS-B centric ICAO plans
Terminal Low Density	PSR/ SSR where available	Multilateration with Mode –S ADS-B Surveillance Fusion	The incremental cost to add the ADS-B functionality to an MSSR will support ADS-B centric ICAO plans	Multilateration with Mode – S ADS-B Surveillance Fusion	Multilateration with Mode –S ADS-B Surveillance Fusion	The incremental cost to add the ADS-B functionality to an MSSR will support ADS-B centric ICAO plans
Approach H/D-Procedures	PSR/ SSR where available	Multilateration with Mode –S ADS-B Surveillance Fusion Let primary expire at end of life	The incremental cost to add the ADS-B functionality to an MSSR will support ADS-B centric ICAO plans	Multilateration with Mode – S ADS-B Surveillance Fusion Let primary expire at end of life or remove for cost savings	Multilateration with Mode –S ADS-B Surveillance Fusion	The incremental cost to add the ADS-B functionality to an MSSR will support ADS-B centric ICAO plans
App H/D-NPA	PSR/ SSR where available	Multilateration with Mode –S ADS-B Surveillance Fusion Let primary expire at end of life	The incremental cost to add the ADS-B functionality to an MSSR will support ADS-B centric ICAO plans	Multilateration with Mode – S ADS-B Surveillance Fusion Let primary expire at end of life or remove for cost savings	Multilateration with Mode –S ADS-B Surveillance Fusion	The incremental cost to add the ADS-B functionality to an MSSR will support ADS-B centric ICAO plans

Phase I (present-2010)	Option 1: Evolutionary Implementation			Option 2: Accelerated Implementation		
Phases of Flight	**Legacy**	**Modern**	**Rationale**	**Legacy**	**Modern**	**Rationale**
App H/D-PA	PSR/ SSR where available	Multilateration with Mode –S ADS-B Surveillance Fusion Let primary expire at end of life	The incremental cost to add the ADS-B functionality to an MSSR will support ADS-B centric ICAO plans	Multilateration with Mode – S ADS-B Surveillance Fusion Let primary expire at end of life or remove for cost savings	Multilateration with Mode –S ADS-B Surveillance Fusion	The incremental cost to add the ADS-B functionality to an MSSR will support ADS-B centric ICAO plans
App L/D-Procedures	PSR/ SSR where available	Multilateration Mode-S ADS-B Surveillance Fusion	The incremental cost to add the ADS-B functionality to an MSSR will support ADS-B centric ICAO plans	Multilateration with Mode – S ADS-B Surveillance Fusion	Multilateration with Mode –S ADS-B Surveillance Fusion	The incremental cost to add the ADS-B functionality to an MSSR will support ADS-B centric ICAO plans
App L/D-NPA	PSR/ SSR where available	Multilateration Mode-S ADS-B Surveillance Fusion	The incremental cost to add the ADS-B functionality to an MSSR will support ADS-B centric ICAO plans	Multilateration with Mode – S ADS-B Surveillance Fusion	Multilateration with Mode –S ADS-B Surveillance Fusion	The incremental cost to add the ADS-B functionality to an MSSR will support ADS-B centric ICAO plans
App L/D-PA	PSR/ SSR where available	Multilateration Mode-S ADS-B Surveillance Fusion	The incremental cost to add the ADS-B functionality to an MSSR will support ADS-B centric ICAO plans	Multilateration with Mode – S ADS-B Surveillance Fusion	Multilateration with Mode –S ADS-B Surveillance Fusion	The incremental cost to add the ADS-B functionality to an MSSR will support ADS-B centric ICAO plans
Surface and Taxi		Install surface primary and secondary with vehicle ADS-B	There is no surface surveillance today, implementing a staged deployment of a surface surveillance system	Install surface primary and secondary with vehicle ADS-B	Multilateration with Mode –S ADS-B Surveillance Fusion	There is no surface surveillance today, implementing a staged

Phase I (present-2010)	Option 1: Evolutionary Implementation			Option 2: Accelerated Implementation		
Phases of Flight	**Legacy**	**Modern**	**Rationale**	**Legacy**	**Modern**	**Rationale**
			is a rational approach to achieving safety benefits not realized			deployment of a surface surveillance system is a rational approach to achieving safety benefits not realized

Phase II (2011-2015)	Option 1: Evolutionary Implementation			Option 2: Accelerated Implementation		
Phases of Flight	**Legacy**	**Modern**	**Rationale**	**Legacy**	**Modern**	**Rationale**
Oceanic En route H/D	Multilateration with Mode –S ADS-B Surveillance Fusion (transition airspace) ADS-B (Air to Air)	ADS-B (transition airspace)	As secondary radars reach the end-of-life, a simple addition of ADS-B capability will allow the control of ADS-B equipped aircraft.	Multilateration with Mode – S ADS-B Surveillance Fusion ADS-B (Air to Air)	ADS-B (transition airspace	Equipage must be universal therefore, rulemaking is required to mandate equipment.
Oceanic En route L/D	Multilateration with Mode –S ADS-B Surveillance Fusion (transition airspace) ADS-B (Air to Air)	ADS-B (transition airspace	As secondary radars reach the end-of-life, a simple addition of ADS-B capability will allow the control of ADS-B equipped aircraft	Multilateration with Mode – S ADS-B Surveillance Fusion ADS-B (Air to Air)	ADS-B (transition airspace	Equipage must be universal therefore, rulemaking is required to mandate equipment.
Continental High Density	Multilateration with Mode –S ADS-B Surveillance Fusion Let Primary expire at end of life	ADS-B	As secondary radars reach the end-of-life, a simple addition of ADS-B capability will allow the control of ADS-B equipped aircraft	Multilateration with Mode – S ADS-B Surveillance Fusion	ADS-B	Equipage must be universal therefore, rulemaking is required to mandate equipment.

Phase II (2011-2015)	Option 1: Evolutionary Implementation			Option 2: Accelerated Implementation		
Phases of Flight	**Legacy**	**Modern**	**Rationale**	**Legacy**	**Modern**	**Rationale**
Continental Low Density	Multilateration with Mode –S ADS-B Surveillance Fusion Let Primary expire at end of life	ADS-B	As secondary radars reach the end-of-life, a simple addition of ADS-B capability will allow the control of ADS-B equipped aircraft	Multilateration with Mode – S ADS-B Surveillance Fusion	ADS-B	Equipage must be universal therefore, rulemaking is required to mandate equipment.
Terminal High Density	Multilateration with Mode –S ADS-B Surveillance Fusion Let Primary expire at end of life	ADS-B	As secondary radars reach the end-of-life, a simple addition of ADS-B capability will allow the control of ADS-B equipped aircraft	Multilateration with Mode – S ADS-B Surveillance Fusion	ADS-B	Equipage must be universal therefore, rulemaking is required to mandate equipment.
Terminal Low Density	Multilateration with Mode –S ADS-B Surveillance Fusion	Multilateration with Mode –S ADS-B Surveillance Fusion	As secondary radars reach the end-of-life, a simple addition of ADS-B capability will allow the control of ADS-B equipped aircraft	Multilateration with Mode – S ADS-B Surveillance Fusion	ADS-B	Equipage must be universal therefore, rulemaking is required to mandate equipment.

Phase II (2011-2015)	Option 1: Evolutionary Implementation			Option 2: Accelerated Implementation		
Phases of Flight	**Legacy**	**Modern**	**Rationale**	**Legacy**	**Modern**	**Rationale**
Approach H/D-Procedures	Multilateration with Mode –S ADS-B Surveillance Fusion Let Primary expire at end of life	ADS-B	As secondary radars reach the end-of-life, a simple addition of ADS-B capability will allow the control of ADS-B equipped aircraft	Multilateration with Mode –S ADS-B Surveillance Fusion	ADS-B	Equipage must be universal therefore, rulemaking is required to mandate equipment.
App H/D-NPA	Multilateration with Mode –S ADS-B Surveillance Fusion Let Primary expire at end of life	ADS-B	As secondary radars reach the end-of-life, a simple addition of ADS-B capability will allow the control of ADS-B equipped aircraft	Multilateration with Mode –S ADS-B Surveillance Fusion	ADS-B	Equipage must be universal therefore, rulemaking is required to mandate equipment.
App H/D-PA	Multilateration with Mode –S ADS-B Surveillance Fusion Let Primary expire at end of life	ADS-B	As secondary radars reach the end-of-life, a simple addition of ADS-B capability will allow the control of ADS-B equipped aircraft	Multilateration with Mode –S ADS-B Surveillance Fusion	ADS-B	Equipage must be universal therefore, rulemaking is required to mandate equipment.
App L/D-Procedures	Multilateration with Mode –S ADS-B Surveillance Fusion	Multilateration with Mode –S ADS-B Surveillance Fusion	As secondary radars reach the end-of-life, a simple addition of ADS-B capability will allow the control of ADS-B equipped aircraft	Multilateration with Mode –S ADS-B Surveillance Fusion	ADS-B	Equipage must be universal therefore, rulemaking is required to mandate equipment.
Phase II (2011-	Option 1: Evolutionary Implementation			Option 2: Accelerated Implementation		

2015)						
Phases of Flight	**Legacy**	**Modern**	**Rationale**	**Legacy**	**Modern**	**Rationale**
Surface and Taxi	Surface primary and secondary with vehicle ADS-B	Secondary for surface, (A multilateration based solution with ADS-B compatibility) requires avionics mandate	This approach should be considered as an option. It allows the realization of capacity benefits not available today while meeting future ADS-B requirements	Surface primary and secondary with vehicle ADS-B	Multilateration with Mode –S ADS-B Surveillance Fusion	Equipage must be universal therefore, rulemaking is required to mandate equipment.

Phase III (2016-2019)	Option 1: Evolutionary Implementation			Option 2: Accelerated Implementation		
Phases of Flight	**Legacy**	**Modern**	**Rationale**	**Legacy**	**Modern**	**Rationale**
Oceanic En route H/D	ADS-B (transition airspace) ADS-B (Air to Air)		Equipage must be universal therefore, rulemaking is required to mandate equipment.	ADS-B (transition airspace) ADS-B (Air to Air)		Equipage must be universal therefore, rulemaking is required to mandate equipment.
Oceanic En route L/D	ADS-B (transition airspace) ADS-B (Air to Air)		Equipage must be universal therefore, rulemaking is required to mandate equipment.	ADS-B (transition airspace) ADS-B (Air to Air)		Equipage must be universal therefore, rulemaking is required to mandate equipment.
Continental High Density	ADS-B.		Equipage must be universal therefore, rulemaking is required to mandate equipment.	ADS-B		Equipage must be universal therefore, rulemaking is required to mandate equipment.
Continental Low Density	ADS-B		Equipage must be universal therefore, rulemaking is required to mandate equipment.	ADS-B		Equipage must be universal therefore, rulemaking is required to mandate equipment.
Terminal High Density	ADS-B		Equipage must be universal therefore, rulemaking is required to mandate equipment.	.ADS-B		Equipage must be universal therefore, rulemaking is required to mandate equipment.

Phase III (2016-2019)	Option 1: Evolutionary Implementation			Option 2: Accelerated Implementation		
Phases of Flight	**Legacy**	**Modern**	**Rationale**	**Legacy**	**Modern**	**Rationale**
Terminal Low Density	ADS-B		Equipage must be universal therefore, rulemaking is required to mandate equipment.	ADS-B		Equipage must be universal therefore, rulemaking is required to mandate equipment.
Approach H/D-Procedures	ADS-B		Equipage must be universal therefore, rulemaking is required to mandate equipment.	ADS-B		Equipage must be universal therefore, rulemaking is required to mandate equipment.
App H/D-NPA	ADS-B		Equipage must be universal therefore, rulemaking is required to mandate equipment.	ADS-B		Equipage must be universal therefore, rulemaking is required to mandate equipment.
App H/D-PA	ADS-B		Equipage must be universal therefore, rulemaking is required to mandate equipment.	ADS-B		Equipage must be universal therefore, rulemaking is required to mandate equipment.
App L/D-Procedures	Multilateration with Mode – S ADS-B Surveillance Fusion	ADS-B	Equipage must be universal therefore, rulemaking is required to mandate equipment.	ADS-B		Equipage must be universal therefore, rulemaking is required to mandate equipment.

Phase III (2016-2019)	Option 1: Evolutionary Implementation			Option 2: Accelerated Implementation		
Phases of Flight	**Legacy**	**Modern**	**Rationale**	**Legacy**	**Modern**	**Rationale**
App L/D-NPA	Multilateration with Mode – S ADS-B Surveillance Fusion	ADS-B	Equipage must be universal therefore, rulemaking is required to mandate equipment.	ADS-B		Equipage must be universal therefore, rulemaking is required to mandate equipment.
App L/D-PA	ADS-B		Equipage must be universal therefore, rulemaking is required to mandate equipment.	ADS-B		Equipage must be universal therefore, rulemaking is required to mandate equipment.
Surface and Taxi	Secondary for surface, (A multilateration based solution with ADS-B compatibility) Mode-S ES (extended squitter requires avionics mandate	Mandate vehicle equipage on movement area once ADS-B infrastructure is in place	This approach should be considered as an option because it allows the realization of capacity benefits not available today, while meeting future ADS-B requirements	ADS-B		Equipage must be universal therefore, rulemaking is required to mandate equipment.

2. Systems Implementation - Surveillance

See Appendix C.

The tables in Appendix C identify, by Option (1 or 2), by technology/capability

1. When and where systems are to be acquired/implemented - shown in blue
2. Which systems/functions are being replaced (if applicable) – explained in the notes column
3. Which legacy systems will continue to be used and require replacement on their normal time schedule (shown in green)
4. Which systems may require extension of their current life to meet with planned replacement times - shown in green followed by discontinuance (red with strikethrough)
5. Which systems can discontinue operation (and when) if applicable – shown in red with strikethrough.
6. In certain instances, systems that could be turned off earlier than the end of their useful life have that period of potential cost savings shown in yellow.

The quantities indicated and their respective locations are factored into the Cost Benefit Analysis.

Implementation for all phases and domains of flight are the same EXCEPT for Surface applications. It should be noted that for the Oceanic domain there is some radar coverage in the transition areas where Oceanic services are provided. This is where aircraft begin to be tracked, while under Oceanic Control, by the en route radar, and where air traffic control begins providing en route separation. The fusion of the position reports from en route Primary and Secondary radar, and Multilateration, should be accomplished so that when ADS-B reports become available, ATC will have the distant ADS-B position reports available to them. ADS-B reports can be seen as far as three hundred miles from ground stations under the right circumstances.

Basic criteria for Surveillance system implementation is as follows:

- 2010 – Multilateration with Mode-S, ADS-B, sensor fusion. Multilateration is recommended to replace aging secondary radar and surveillance fusion is deployed to combine legacy surveillance data with the modern electronic equipment. Electronic formats and protocols are specified in an Interface Control Document to be consistent with standard surveillance formats. Fusion is recommended so that when new surveillance sources are integrated, they are combined to improve surveillance quality WITHOUT changing the automation input formats.

Since Multilateration can provide surveillance on both new and the old avionics equipment, this is the recommended surveillance system.

- In 2015, consideration may be given to removing Primary Radar surveillance systems. ADS-B becomes available from Aircraft and is integrated into the fusion platform. Primary surveillance reports no longer needed.
- In 2019, when ADS-B is available on ALL civil aircraft, all radar generated surveillance reports are removed and there will be full ADS-B surveillance.
- SURFACE and TAXI: The use of Surface Movement Radar with Multilateration and a Surveillance Fusion Processor is recommended for implementation today.

During the timeframe 2015 - 2019, ADS-B should be available on all aircraft and the surface movement radar may be considered for removal.

- In 2019 ALL surveillance should be accomplished by ADS-B, including vehicles.

X. USERS PERSPECTIVE

A. Regulatory Environment

From the outset, it is important to understand that it is inappropriate for the State, and in this particular case, UAEAC, to make recommendations regarding particular types of avionics or avionics manufacturers. In this document, references to sources of avionics (manufacturers) or specific pieces of avionics equipment are for illustrative purposes only and are not recommendations.

The State has an obligation to provide a regulatory environment that allows the efficient and effective personal and commercial use of aviation while at the same time providing for the safety of the aircrews that operate them, the passengers that fly on them, and the public below over whom they fly. This often involves difficult decisions/choices when the State's desire to aid commerce conflicts with its safety obligation to the flying and non-flying public.

These decisions most often involve three distinct areas of concern: the minimum capability and/or equipment required for the aircraft to fly safely within the State's sovereign airspace; the minimum capability and/or equipment required for the aircraft to safely perform the proposed mission/operation (whether it be a commercial passenger carrying airline or a privately owned crop duster); and the minimum capability and/or equipment required for the aircraft to operate in a designated portion of the airspace (e.g. in a busy terminal area, over a specific route, or to conduct RNAV operations, etc.) where specific requirements to do so have been established. It is the State's obligation to define these parameters for operation within its overall sovereign airspace. It is up to the User/Operator to decide whether it can or wants to operate within those defined parameters, and if it does, how it will achieve them. For example, a small grass strip airfield is built outside a small rural town, with two private general aviation operators using it for their own private use. Other than ensuring that the aircraft are serviceable and therefore not a danger to the public, the State has little regulatory interest in this airfield. However, as the airfield grows, and the numbers of users grow, the State's interest may also grow. At some point, there may be a sufficient number of users that a control tower is needed to provide for the continued safe operation of the airfield. And upon completion of the construction of the control tower, radio communication with the tower may become a prerequisite for operation into and out of that airfield and for operating in the surrounding airspace. This does not generate a mandate for radios in all aircraft within the State, but it does generate a mandate for radios to operate at this airfield. As the number of operations at the airfield continues to grow, there may be a requirement for surveillance of the airspace surrounding the airfield and a secondary surveillance radar might be installed at the request of the user community. As a result, a transponder may be required to operate within the airspace surrounding the airport in addition to the radio. Again, this does not mandate that every operator have a transponder, but rather only those who desire to operate to/from this particular airport (or others with similar requirements). The choice remains solely with the user/operator.

A similar example is the implementation of RVSM. If a certain route is declared to be an RVSM route, then ALL aircraft that fly the route using RVSM separation standards must be RVSM

certified. This does not mandate that all aircraft be RVSM certified, but it does mandate that all aircraft that desire to fly this particular route be certified. Again, the user/operator must decide whether the use of that route rather than some other route is economically lucrative enough to justify the investment in RVSM capability.

The point being made here is that unless there is an across the board safety reason (TCAS for example), affecting all of a particular operation in all controlled airspace, the decision about whether or not to equip rests solely with the user/operator. The Authority can mandate that operators have a certain capability to operate in a specific airspace, but it is the user that decides whether operating in that airspace under such a mandate is economically feasible, and how to comply (choice of technology, manufacturer, etc.) with the requirement. In the end, the Authority must base its decisions on the safety and welfare of the flying and non-flying public. And the user/operator will continue to make its decisions based on the economic impact to its business. If both do their jobs with utmost integrity, both will be successful.

The application of these regulations does not easily divide along commercial, non-commercial, special aerial work, and general aviation lines. The basis for answering that question is who is at risk and what target level of safety is to be applied. For example, a small private general aviation aircraft may arrive and depart visually to a given airport, even under adverse weather conditions, while a 200 passenger commercial jet requires dual ILSs to even begin an approach to the same airfield. The reason for the difference is the level of safety required to protect those 200 passengers. On the other hand, if the problem that needs to be addressed is highly congested airspace and a resultant concern for mid-sir-collisions, the requirement for some minimum level of communications capability and a transponder to address the management of the traffic in that airspace may be equal for all operators, regardless of whether they are commercial or general aviation, because the risk is the same.

In the end, the State's obligation is to provide for the safe and efficient use of its airspace through an effective regulatory, certification, and inspection program while at the same time not trying to tell the users how to run their personal or commercial businesses. When the users decide that there is an economic reason to put something (anything) on their aircraft there will be manufacturers standing by to compete for their business.

B. Airline Perspective

ISI Team representatives conducted surveys of airlines located in Colombia. This effort was to support the Colombian TDA sponsored ATM/CNS Feasibility Study. The following airlines were visited: Aeromenegus, Aerosucre, Aerupia, AIRES, AeroRepublica, Arall, AVIANCA/SUMMA, SATENA, SELVA, TAMPA, Transorient, and West Caribbean Airways

The purpose of this section of the Options Report document is to provide information regarding the data collected during the Airline visits.

The main reasons for this work include:

- Validate the information previously provided by Aerocivil as reflected in the responses to the questionnaire and supplemental questions.

- Obtain on-site information regarding the real-world performance and operation of key airlines in the area of ATM/CNS.
- Discuss with airline executives their top modernization priorities for improving ATM/CNS at Colombian airports and in Colombian airspace.
- Establish a foundation for continued analysis to determine whether or not there is a business/technical/operational basis for modernizing specific ATM/CNS systems or altering the current ATM/CNS infrastructure.

The topics discussed with each airline included:

- Aircraft operated and installed ATM/CNS equipment
- Future aircraft and equipment plans
- Number of Pilots
- Airports they operate from including frequencies and operating hours
- Navigation aids used
- Weather services used
- Communication use and quality
- Opinion of service provided by Aerocivil

C. Methodology

We visited 12 airlines in Bogotá, Medellin, and Villavicencio. We talked in all cases with chief pilots, owners, and technical operations supervisors. In the process of visiting these airline operators we also talked with some general aviation pilots at these airports.

At Villavicencio, many pilots wanted to talk with us and discuss the future of aviation in Colombia. We were in discussions until late in the evening with a number of operators.

It was soon evident that the structured questionnaire that we had hoped to fill in was almost useless for the operators that we were dealing with. We therefore used the format that you will find in the remainder of this report to provide a picture of aviation from the operators' standpoint in Colombia.

We did not visit any airlines located in the Northern part of the country if there are any. Some of the airlines we talked with gave us a good description of aviation in the north of Colombia but we did not go to any airport in the north.

Because we were very surprised to learn that from the airlines that there seemed to be no aviation weather service in the country we investigated this further. We visited www.ideam.gov.co and talked with Dr. Oscar Bermudez from the Aeronautical Civil office in Bogotá.

D. General Impressions

We found professional pilots and people with good business skills at every airline we visited.

Because of the terrain and lack of weather forecasting pilots were very skilled at calculating how much fuel they needed to go to a destination and return to their starting point with enough fuel.

Every company that we talked with did not scrimp with engine maintenance. They knew how many hours each engine had remaining and exactly where every engine was that were in overhaul. All of the operators either had a factory trained professional engine mechanic on the payroll or got new engines from the manufacturer. The quality of the engines in Colombia is superb.

We could not find one person in any of the airlines we visited that complained about cutting corners to save money when it came to work on aircraft. We saw several aircraft in check and all were using organized tracking practices and good material. The Occupational Safety and Health Administration (A US established Safety Standard) compliance was minimal but the material such as paint was top quality polyurethane.

The Air Traffic Controllers in Colombia get very high marks for flexibility. Every airline had good things to say about ATC. In particular they all mentioned the ease with witch they got direct routes whenever they asked for them. In essence Colombia has RNAV routing "on demand". This equates to what most ATM/CNS people call "free flight". The ability to do this is based on GPS in each aircraft.

There are only 6 airports in Colombia that have ILS with Bogotá having two. All of these are Cat I except for Bogotá which has one Cat I and one Cat II. The roads are poor between cities because of the mountainous terrain. This has resulted in Colombia having 112 airports that are officially recognized. With less than 6% of the airports having precision approaches and only one Cat II one can assume that most of the time the weather at Colombia's airports is above 300ft with a visibility of at least 1.5 nm.

The airline operators are using GPS every day and are very confident that this system provides the best information available. We did not receive one complaint about navigation aids. This is due to the widespread use of GPS in every aircraft we looked at. It appears that Aero Civil technical people are behind in the understanding of the quality of service available to the operators in Colombia. All of the operators are aware that Aero Civil does not allow the use of GPS officially. However, it is legal to have this equipment installed in aircraft. As one senior pilot stated "Why shouldn't I use the best information available (GPS) when it is right in front of me and always the most accurate navigation tool I have? I have never had a problem with GPS like happens with other conventional navaids."

E. Safety of flight issues

1. Weather Forecasting

When talking with the airlines it soon became obvious that Colombia does not have any weather forecasting agency or system anywhere in the country that they use. There is no TV weather person or any place a pilot can get forecast weather for any airport in Colombia. Several people told us they get it from the internet but when they showed us how they obtained this information is was always CNN and useless for use in aviation except to show where some clouds were.

Because every pilot must have enough fuel on every flight to return to his base a great deal of money is wasted in carrying extra fuel on every flight.

We witnessed this first hand flying from Bogotá to Medellin. We took off and 23 minutes later we were told that we would be returning to Bogotá. After the flight we talked with the pilots. We asked them why they did not have accurate weather information 20 minutes earlier. They did not have any information telling them that their destination airport was closed because of weather and they said they never have any information. They just take off and when they start on the approach are told if the field is below minimums. If it is below minimums they return to the airport they took off from. The weather at most airports seems to be worse in the morning.

Colombia aviation will save millions a year if they can get reliable weather forecasting for use by the airlines at airport destinations.

After expressing our dismay with the lack of weather forecasting in Colombia we were introduced to Dr. Oscar Bermudez from the Jefe Grupo Meterologia Aeronautica and he provided the following:

- Colombia has a significant national weather service.
- There is a web site www.ideam.gov.co that the national weather service maintains.
- There are met offices at 7 of the international airports. These are Bogotá, Barranquilla, San Andres, Leticia, Cali, Cartagena, and Rionegro.
- All information on forecasts is in folders at each of these airports for viewing by pilots or dispatchers.
- They do not have any log of people who use the information
- They have 12-hour forecasts for each of these airports with 6-hour updates.
- The weather forecasters use Satellite (GOES) information, five radio sound stations that launch weather balloons each morning. These are located at Leticia, San Andres, Bogotá, Riohacha, and Gaviotas. They would like to have two more stations one near Cali to cover the south west of Colombia and one at Puerto Carreno to cover the eastern part of Colombia. However, these cost $500,000.00/ year to operate and there is not funding for these two additional stations
- He thinks his forecasts are between 75% and 80% accurate.
- He does not have any weather radars. In the 2005 budget is funding for two weather radars one at Bogotá and one at Rionegro.
- A plan to form a weather organization within Aero Civil was provided. There will be employees who receive training in weather observing and eventually weather forecasting who are dedicated to providing aviation users with weather forecasts.
- They never receive PIREPS and do not seem to know what these are and how they are used.

After looking at the web site for over 45 minutes we were never able to obtain forecasting information for any airport in Colombia. This web site is not user friendly for aviation users.

There is no weather feed information planned from the weather radars to the air traffic control centers in Colombia.

The current primary radars in Colombia at Bogotá, Cerro Maco, Tubara, Cerro Verde, Villavicencio, and Santana could be upgraded to have weather capability for up to 60 nm. The Thompson long-range radar at Carimagua providing 200nm coverage does not have weather capable equipment installed.

There are 4 new Lockheed Martin MSSR radars planned for Leticia, El Tablazo, El Picacho, and Santander. These will provide six level weather information but it has not been determined who or how this weather information will be utilized.

2. Runway Remaining Markers

The only runway that we saw with runway remaining markers was the "new" runway at Bogotá. We asked the Air Force pilots that flew the SATENA aircraft if the military airfields had these markers. They said all of the military fields had these. There is ICAO guidance that suggests these would be useful. As Colombia moves from slow flying turboprops to RJ aircraft knowing how much runway remains on take off and landing will be much more important.

3. Runway markings

Villavicencio which is the third or fourth largest airport in terms of passengers moved and many other day only airports do not have paint on the runways. There are no centerline or runway edge lines and no threshold or hold short markings. It cannot be too expensive to paint these lines on the runways. This would aid pilots in marginal weather and ensure a more professional operation at the airport. Markings on the aprons showing taxiways would also ensure critical areas were clear of vehicles.

In Villavicencio we notice a fairly high tempo of operations involving DC-3, ATRs and Cessna's all moving about at the same time without any structure. This would be like removing all the street markings in Bogotá on all busy streets.

4. GPS related issues

The terrain around many airports in Colombia is mountainous. The current EGPWS systems available would enhance pilot's ability to know where the terrain is and avoid running into it. Colombia should strongly encourage use of EGPWS in as many transport aircraft as possible.

Almost every pilot we talked with and many of the aircraft we climbed into had GPS equipment. Some had installed TSO-129 equipment and many others had "portable" (hand held) systems. Every pilot we talked with said that GPS provided the most reliable source of navigation they had in the aircraft. No pilot we talked with said they had ever seen less than 8 satellites in view and usually there were 8-10 in view. If there were published GPS approaches to most of the airports used the companies owners that we talked with told us they would equip with TSO equipment at the least. The larger operators said they would consider RNP 0.3 equipment.

It is not good when customers are using equipment for every flight that the regulators do not seem to understand or embrace. After several meetings in Bogotá with Aero Civil supervisors during which we heard all manner of criticism of GPS and how it would not work in Colombia is was very surprising to find that in fact is it working very well and is the most trusted navigation aid in the country.

Airports that do not have lights or night operations probably do not have lights because the cost of an ILS is so expensive that they feel like why buy lights when we cannot afford and ILS. You can see from our tables the airlines would like to have the ability to fly into many airports in Colombia at night if precision type approaches were available. We found a very remarkable endorsement of airline owners willing to spend their money on GPS systems if they could fly precision approaches to the airports they operate in and out of.

Because the sun comes up and sets at the same time all year there is regularly 12 hours of the day that are lost because of the inability to fly at night. Much of the country does not have any roads connecting major cities especially in the Eastern plains part. If someone needs medical evacuation at 6:01 PM they will not be able to fly to receive help for 12 hours.

5. Communication, VHF

Several large operators complained of very poor service in the northern part of the country. Other airlines had poor service at the lower altitudes they utilized. In the terminal areas communication was good. En route there seemed to be serious problems. We began asking all of the airlines to discuss this issue and found that over half did not experience any problems.

The disturbing part of this issue is the problems were reported by the biggest airlines that flew the larger aircraft. They were adamant about the poor service from Barranquilla.

F. Economic issues

- Almost no one used NDB's or HF radios. Everyone we talked with said they would like to stop maintaining this equipment. Colombia should consider terminating support of this equipment.
- It would save every operator a lot of money if they could get accurate weather information so they could use alternate airports vice always carrying enough fuel to fly back to where they departed from. This was emphasized repeatedly in Villavicencio for airlines flying to destinations east of Villavicencio.
- Having airports that would operate at night would greatly expand business opportunities for companies operating in the eastern plains part of Colombia.
- Only one cargo operator and one passenger airline expressed any interest in RVSM. All of the other carriers do not fly high enough to worry about this. The operators that could use RVSM flight levels may not choose to get their aircraft certified unless it is mandated or is inexpensive. Both companies did not think the volume of traffic warranted RVSM. As operators receive new aircraft that come certified as RVSM aircraft they will certainly use these aircraft above Flight Level 290 if this will save them fuel.

G. Airport Improvements

Information on airport improvements desired for addition of night capability and precision approaches. In some cases lower minimums are desired or additional runway end approaches are desired. In most cases surface marking are also needed for night/IFR operations.

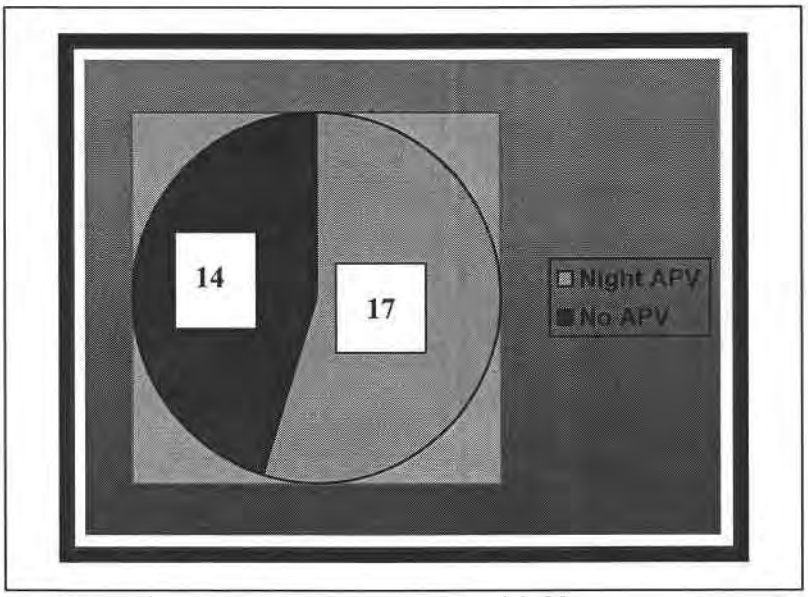
Airport	Ranking of Airports Importance by each Airline	Night Capability	PA/APV Approach
Araracuara	5	Yes	Yes
Armania	4	Y	Y
Aruba	1	Y	Y
Barranquilla	1,2,6	Y	Y
Bucaramanga	2	Y	Y
Calamar	2,2	Y	Y
Cartagena	2,2	Y	Y
Caucasia	2	Y	Y
Chigorodo	1	Yes	Yes
Corozal	2	Y	Y
El Bagre	2	Y	Y
El Yopal	1,3,4	Have Lights	Y
Gaupi	4	Y	Y
Inirida	8	Y	Y
La Macarena	6	Y	Y
La Pedrera	5	Y	Y
La Plata	5	Y	Y

La Victoria	4,4	Y	Y
Leticia	**1,1,**3	Have Lights	1 ILS
Manizales	9	Y	Y
Mapiripan	**2,**5	Y	Y
Mariquita	3	Y	Y
Medellin (Down Town**)**	3,3,5	Y	Y
Miraflores	3	Y	Y
Mitu	3,3,5	Y	Y
Monteria	4	Y	Y
Neiva	4	Y	Y
Otu	4	Y	Y
Port Alvira	3	Y	Y
Porto Asis	**1,** 3	Y	Y
Porto Carreno	**1,**4,5,7	Y	Y
Porto Inirida	**2,**7	Y	Y
Providencia	5	Y	Y
Puerto Berrio	6	Y	Y
Puerto Rico	3	Y	Y
Quibdo	**1**	Y	Need lower minimums
San Andres	3,5,6,7	Y	Y
San Fielpe	10	Y	Y

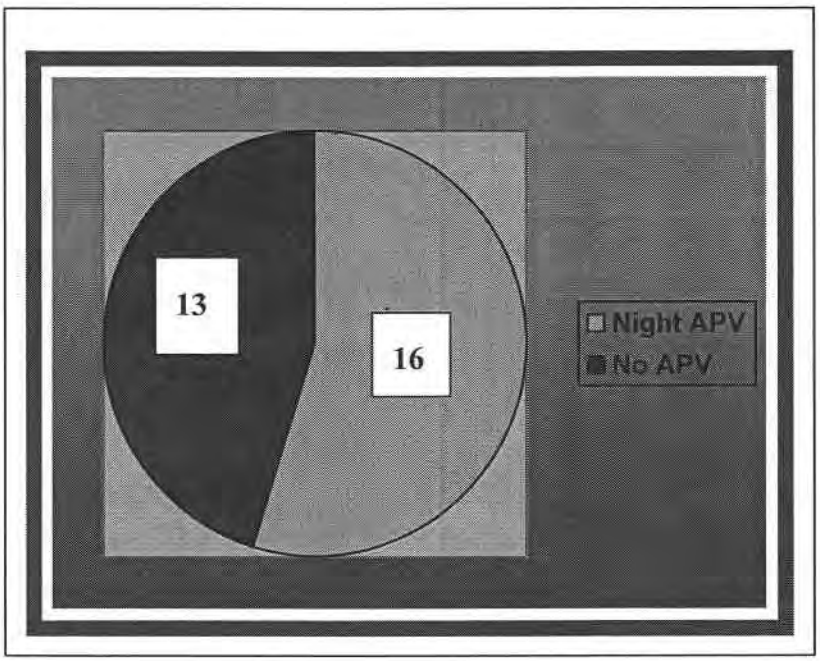
San Jorge Gonzalez	2	Y	Y
San Jose	1,1,2	Y	Y
San Jose Del Guaviare	5	Y	Y
Sarevena	2	Y	Y
Turbo	8	Y	Y
Villavicencio	1,1,6	Y	Y

Blue fill ▭ are top 10 airports which include all Airlines #1 priorities.

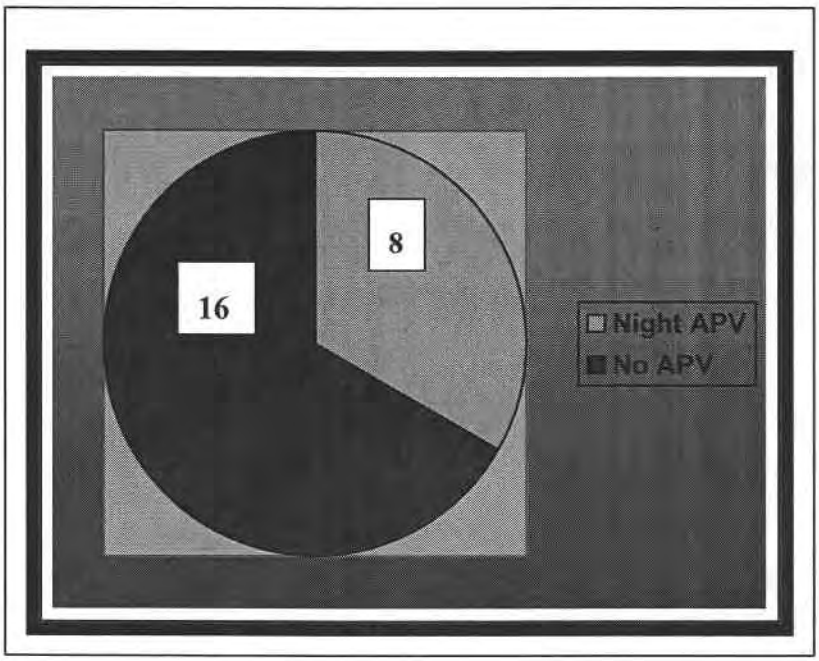
Dividing up the country into three general aviation areas of the Eastern Plains, North-Northwest from Bogotá and South-Southwest from Bogotá we get the following information.



Eastern Plains including 31 Airports



North-Northwest from Bogotá 29 Airports



South-Southwest from Bogotá 24 Airports

Most of the demand for night APV (IFR precision class approaches) operations is for airports in the Eastern Plains and Northern airports. Two of the 8 airports in the south-southwest are number one priority for two different carriers.

H. Conclusion

1. Communications

The airlines in Colombia have a problem communicating with ATC in the northern part of the country. This does seem to be a geography problem which could be eliminated with more VHF stations or better utilization of HF. They have not expressed any problems with congested circuits. They would not support any requirements that would mandate new airborne equipment such as 8.33 unless they can realize tangible benefits from this additional expense. If the transition was over a long period of time the new aircraft that they purchase for the most part will come equipped with additional capability without an increase in cost. The airlines would support this type of a transition.

2. Navigation

Currently the need for GBAS is not supported by any airline. Not one has purchased a WAAS capable system and they presently do not envision doing so. Collins has manufactured over 8,000 Multimode Receivers (MMR's GPS capable) and none of them has been sold with WAAS capability even though this was available. Today most of the airlines with MMR's have RNP 0.3 capability which could be used for all phases of flight. The only limiting issue is the ATC

provider's reluctance to grant permission to something that is new and that they do not really understand completely. Several countries now allow GPS sole means in all phase of flight down to approaches that are very close to CAT I (200 Ft). The airlines recommend therefore, that Colombia quickly take advantage of the proven performance of GPS as it exists today and allow all of their airspace users to legally use what many of them already consider to be the best navigation system available in Colombia. The FAA has several TSOs that if adopted would allow this capability. When talking with 11 different owners of regional air services companies they all said they would immediately equip their aircraft with MMR's or other TSO certified equipment if AeroCivil would allow this equipment for flight. The cost for an MMR (which will provide non-obstructed minimums of 250 Ft) in a wide body transport category without any previous equipment is about $330,000. The cost for a TSO 129/145 without WAAS is less than $4,000.00 and would provide approaches down to approximately 275 feet (non- obstructed).

There is no operational reason to install an SBAS augmentation system for use in Colombia. They do not need the extra 50 ft that may be possible with a SBAS system. The weather at most airports is either above 300 ft or down to almost 0 when a thunderstorm is passing overhead.

Galileo is a R&D system and does not have funding for any operational satellites in space. It is very possible that if it is funded it will be operational after GPS III is in operation. When GPS III becomes operational CAT III C will be possible and no other system will be required for aviation.

Not another VOR should be purchased in Colombia. As a back up to GPS, DME excels. Currently many European countries have instituted this policy and it is backed by Eurocontrol. The future navigation system should be GPS-based with DME as a backup.

3. Surveillance

- Background: In the United States there is a methodology utilized by a joint Industry-FAA group to define the requirements and operating specifications for equipment that is designed and installed in aircraft. This equipment is designed to work in conjunction with the appropriate ground stations. This methodology is being implemented by Working Groups and Special Committees. (WG and SC)

RTCA is the organization chartered to provide this working environment and public forum.

Through the Committee and Working Group process, Special Committees such as SC -186, are developing standards for ADS-B and act as the forum for technical discussions between FAA engineers, Industry Organizations and Equipment Manufacturers. SC-186 is comprised of three key officials - two co-chairs, one from Industry and one from the FAA, and one Designated Federal Official, DFO.

SC-186 was formed for the specific purpose of designing documents that describe ADS-B equipment. Currently there are two documents issued by RTCA.

- DO-260
- DO-260A

DO-260B is currently under development.

Each document contains a number of definitions and performance characteristics that a manufacturer should follow in their application for a Technical Standard Order (TSO) that supports ADS-B operations.

As previously mentioned, manufacturers of avionics are actively working on building new DO-260 equipment, including:

- Rockwell Collins
- ACSS
- Honeywell
- Garmin

Other documents are being developed today describing separation standards and surveillance transmission performance.

Australia has equipped with mostly DO-260 based ADS-B equipment. Under the authority afforded each individual member State, their regulators can specify either specification for manufactures to use as a design target. The manufacturer would then apply for the appropriate TSO.

The US has also chosen to use the TSO for the Universal Access Transceiver (UAT) avionics in Alaska for ADS-B equipment designed for General Aviation. This is NOT recommended for Colombia.

It is anticipated that specifications will evolve to address the "bugs" that are being discovered, similar to what has happened during the development of other avionics such as TCAS versions and software upgrades.

4. Air Traffic Management

In almost all cases the airlines do not feel there is any need for any more capacity. They do not feel like this is something they need to worry about in the future since when they need to change routing now they are permitted to do so whenever they want to. If it could be shown that airports or routes were going to become congested so as to require slot assignment or other restrictions they would support ATC acquiring equipment or programs to reduce these problems.

XI. AVIONICS REQUIREMENTS FOR EACH OPTION

The following tables describe the user avionics requirements for Communications, Navigation, Surveillance and Air Traffic Management, for each of the Phases of Implementation, by Phase of Flight. The Legacy column indicates the equipment that is assumed to already be on board during that time period. Modern describes the new equipment to be acquired during the period. And Avionics/AC describes the new equipment requirements and applicable TSO if currently available. A Table of applicable DO's has been inserted after the equipment tables for reference. Several of the applicable TSO's/DO's have also been described in the preceding narrative. [18]

18 There are portions of this section of the document where the Users perspective does not match with the recommendations of ISI. For example, the Users have recommended DME/DME as the navigation back-up system to GNSS. We cannot change what they say they would prefer. We have taken into consideration their preference, but we continue to recommend VOR/DME as the better choice for Colombia.

A. Air Traffic Management

Phase I (present-2010)	Option 1: Evolutionary Implementation			Option 2: Accelerated Implementation		
Phases of Flight	**Legacy**	**Modern**	**Avionics**	**Legacy**	**Modern**	**Avionics**
Oceanic En route H/D		CDM, TMU, ETMS	Nothing New		CDM, TMU, ETMS, G-GNM	Nothing New
Oceanic En route L/D		CDM, TMU, ETMS	Nothing New		CDM, TMU, ETMS, G-GNM	Nothing New
Continental High Density		CDM, TMU, ETMS, Eliminate Chokepoints	Nothing New		CDM, TMU, ETMS, G-GNM, Eliminate Chokepoints	Nothing New
Continental Low Density		CDM, TMU, ETMS, Eliminate Chokepoints	Nothing New		CDM, TMU, ETMS, Eliminate Chokepoints	Nothing New
Terminal High Density		CDM, TMU, ETMS, Eliminate Chokepoints	Nothing New		CDM, TMU, ETMS, G-GNM, Eliminate Chokepoints	Nothing New

Phase I (present-2010)	Option 1: Evolutionary Implementation			Option 2: Accelerated Implementation		
Phases of Flight	**Legacy**	**Modern**	**Avionics**	**Legacy**	**Modern**	**Avionics**
Terminal Low Density		CDM, TMU, ETMS, Eliminate Chokepoints	Nothing New		CDM, TMU, ETMS, Eliminate Chokepoints	Nothing New
Approach H/D-Procedures		CDM, TMU, ETMS, Benchmark Airports	Nothing New		CDM, TMU, ETMS, G-GNM, Benchmark Airports	Nothing New
App H/D-NPA		CDM, TMU, ETMS, Benchmark Airports	Nothing New		CDM, TMU, ETMS, Benchmark Airports	Nothing New
App H/D-PA		CDM, TMU, ETMS, Benchmark Airports	Nothing New		CDM, TMU, ETMS, G-GNM, Benchmark Airports	Nothing New
App L/D-Procedures		CDM, TMU, ETMS, Benchmark Airports	Nothing New		CDM, TMU, ETMS, Benchmark Airports	Nothing New
App L/D-NPA		CDM, TMU, ETMS, Benchmark Airports	Nothing New		CDM, TMU, ETMS, Benchmark Airports	Nothing New

Phase I (present-2010)	Option 1: Evolutionary Implementation			Option 2: Accelerated Implementation		
Phases of Flight	**Legacy**	**Modern**	**Avionics**	**Legacy**	**Modern**	**Avionics**
App L/D-PA		CDM, TMU, ETMS, Benchmark Airports	Nothing New		CDM, TMU, ETMS, Benchmark Airports	Nothing New
Surface and Taxi		CDM, TMU, ETMS	Nothing New		CDM, TMU, ETMS	Nothing New

Phase II (2011-2015)	Option 1: Evolutionary Implementation			Option 2: Accelerated Implementation		
Phases of Flight	**Legacy**	**Modern**	**Avionics**	**Legacy**	**Modern**	**Avionics**
Oceanic En route H/D	CDM, TMU, ETMS	G-GNM Global ATM	MMR or TSO 129/145	CDM, TMU, ETMS, G-GNM	Global ATM	MMR or TSO 129/145
Oceanic En route L/D	CDM, TMU, ETMS	G-GNM Global ATM	MMR or TSO 129/145	CDM, TMU, ETMS, G-GNM	Global ATM	MMR or TSO 129/145
Continental High Density	CDM, TMU, ETMS	G-GNM Global ATM	MMR or TSO 129/145	CDM, TMU, ETMS, G-GNM	Global ATM	MMR or TSO 129/145
Continental Low Density	CDM, TMU, ETMS	G-GNM Global ATM	MMR or TSO 129/145	CDM, TMU, ETMS, G-GNM	G-GNM Global ATM	MMR or TSO 129/145
Terminal High Density	CDM, TMU, ETMS	G-GNM Global ATM	MMR or TSO 129/145	CDM, TMU, ETMS, G-GNM	Global ATM	MMR or TSO 129/145
Terminal Low Density	CDM, TMU, ETMS	G-GNM Global ATM	MMR or TSO 129/145	CDM, TMU, ETMS, G-GNM	G-GNM Global ATM	MMR or TSO 129/145
Approach H/D-Procedures	CDM, TMU, ETMS	G-GNM Global ATM	MMR or TSO 129/145	CDM, TMU, ETMS, G-GNM	Global ATM	MMR or TSO 129/145
App H/D-NPA	CDM, TMU, ETMS	G-GNM Global ATM	MMR or TSO 129/145	CDM, TMU, ETMS, G-GNM	G-GNM Global ATM	MMR or TSO 129/145
App H/D-PA	CDM, TMU, ETMS	G-GNM Global ATM	MMR or TSO 129/145	CDM, TMU, ETMS, G-GNM	Global ATM	MMR or TSO 129/145

Phase II (2011-2015)	Option 1: Evolutionary Implementation			Option 2: Accelerated Implementation		
Phases of Flight	**Legacy**	**Modern**	**Avionics**	**Legacy**	**Modern**	**Avionics**
App L/D-Procedures	CDM, TMU, ETMS	G-GNM Global ATM	MMR or TSO 129/145	CDM, TMU, ETMS, G-GNM	G-GNM Global ATM	MMR or TSO 129/145
App L/D-NPA	CDM, TMU, ETMS	G-GNM Global ATM	MMR or TSO 129/145	CDM, TMU, ETMS, G-GNM	G-GNM Global ATM	MMR or TSO 129/145
App L/D-PA	CDM, TMU, ETMS	G-GNM Global ATM	MMR or TSO 129/145	CDM, TMU, ETMS, G-GNM	G-GNM Global ATM	MMR or TSO 129/145
Surface and Taxi	CDM, TMU, ETMS	G-GNM Global ATM	MMR or TSO 129/145	CDM, TMU, ETMS	G-GNM Global ATM	MMR or TSO 129/145

Phase III (2016-2019)	Option 1: Evolutionary Implementation			Option 2: Accelerated Implementation		
Phases of Flight	**Legacy**	**Modern**	**Avionics**	**Legacy**	**Modern**	**Avionics**
Oceanic En route H/D	Global ATM		MMR or TSO 129/145	Global ATM		MMR or TSO 129/145
Oceanic En route L/D	Global ATM		MMR or TSO 129/145	Global ATM		MMR or TSO 129/145
Continental High Density	Global ATM		MMR or TSO 129/145	Global ATM		MMR or TSO 129/145
Continental Low Density	Global ATM		MMR or TSO 129/145	Global ATM		MMR or TSO 129/145
Terminal High Density	Global ATM		MMR or TSO 129/145	Global ATM		MMR or TSO 129/145
Terminal Low Density	Global ATM		MMR or TSO 129/145	Global ATM		MMR or TSO 129/145
Approach H/D-Procedures	Global ATM		MMR or TSO 129/145	Global ATM		MMR or TSO 129/145
App H/D-NPA	Global ATM		MMR or TSO 129/145	Global ATM		MMR or TSO 129/145
App H/D-PA	Global ATM		MMR or TSO 129/145	Global ATM		MMR or TSO 129/145
App L/D-Procedures	Global ATM		MMR or TSO 129/145	Global ATM		MMR or TSO 129/145

Phase III (2016-2019)	Option 1: Evolutionary Implementation			Option 2: Accelerated Implementation		
Phases of Flight	**Legacy**	**Modern**	**Avionics**	**Legacy**	**Modern**	**Avionics**
App L/D-NPA	Global ATM		MMR or TSO 129/145	Global ATM		MMR or TSO 129/145
App L/D-PA	Global ATM		MMR or TSO 129/145	Global ATM		MMR or TSO 129/145
Surface and Taxi	Global ATM		MMR or TSO 129/145	Global ATM		MMR or TSO 129/145

B. Communications

Phase I (present-2010)	Option 1: Evolutionary Implementation			Option 2: Accelerated Implementation		
Phases of Flight	**Legacy**	**Modern**	**Avionics A/C**	**Legacy**	**Modern**	**Avionics A/C**
Oceanic En route H/D	HF Voice	No new technology	Nothing new	HF Voice	HF Data Link	New HF Radios
Oceanic En route L/D	HF Voice	No new technology	Nothing new	HF Voice	HF Data Link	New HF Radios
Continental High Density	VHF Voice	VDL-2, Non-Critical	New Radios w/digital info capability	VHF Voice	VDL-2, Non-Critical and Critical, Mode-S	New Transponders with Mode-S; new radios w/digital info capability
Continental Low Density	HF Voice	No new technology	Nothing new	HF Voice	HF Data Link	New HF Radios
Terminal	VHF Voice	VDL-2, Non-Critical	New Radios w/digital info capability	VHF Voice	VDL-2, Non-Critical and Critical, Mode-S	New Transponders with Mode-S; new radios w/digital info capability

Phase II (2011-2015)	Option 1: Evolutionary Implementation			Option 2: Accelerated Implementation		
Phases of Flight	**Legacy**	**Modern**	**Avionics A/C**	**Legacy**	**Modern**	**Avionics A/C**
Oceanic En route H/D	HF Voice	HFDL, VHF/AMSS (voice and data)	New Radios and Transponders	HF Voice HF Data Link	HFDL, VHF/AMSS (voice/data), Full ATN Data	New HF & VHF Radios w/ATN router capability & new Transponders
Oceanic En route L/D	HF Voice	HFDL	New HF Radios	HF Voice HF Data Link	VHF/AMSS (voice/data) HFDL, Full ATN data	New HF & VHF Radios w/ATN router capability & new Transponders
Continental High Density	VHF Voice VDL-2, Non-critical	VDL-2/3 Critical and Non-Critical; Mode-S	New Transponders & New VHF Radios w/digital info capability	VHF Voice VDL-2, critical and Non-critical Mode-S	VHF/AMSS (voice/data); VDL 2/3; Full ATN data; Mode-S	New HF & VHF Radios w/ATN router capability & new Transponders
Continental Low Density	HF Voice	HFDL	New HF Radios	HF Voice HF Data Link	VHF/AMSS (voice/data) HFDL, Full ATN data	New HF & VHF Radios w/ATN router capability & new Transponders
Terminal	VHF Voice VDL-2, Non-critical	VDL 2/3 Critical and Non-Critical; Mode-S	New VHF Radios w/digital info & new Transponders	VHF Voice VDL-2, critical and Non-critical Mode-S	VHF/AMSS (voice/data) Mode-S, Full ATN data	New HF & VHF Radios w/ATN router capability & new Transponders

Phase III (2016-2019)	Option 1: Evolutionary Implementation			Option 2: Accelerated Implementation		
Phases of Flight	**Legacy**	**Modern**	**Avionics A/C**	**Legacy**	**Modern**	**Avionics A/C**
Oceanic En route H/D	HF Voice HF Data Link VHF/ AMSS	VHF/AMSS (voice/data) HFDL, Full ATN data	New communication suite of equipment	HF Voice HF Data Link VHF/ AMSS Full ATN Data		New communication suite of equipment
Oceanic En route L/D	HF Voice HF Data Link	VHF/AMSS (voice/data) HFDL, Full ATN data	New communication suite of equipment	HF Voice VHF/AMSS (voice/data) HFDL, Full ATN data		New communication suite of equipment
Continental High Density	VHF Voice VDL2/3 Critical and Non-critical Mode-S	VHF/AMSS (voice/data) VDL-2/3, Mode-S, Full ATN data	New communication suite of equipment	VHF Voice VHF/AMSS (voice/data); VDL 2/3; Full ATN data; Mode-S		New communication suite of equipment
Continental Low Density	HF Voice HF Data Link	VHF/AMSS (voice/data) HFDL, Full ATN data	New communication suite of equipment	HF Voice VHF/AMSS (voice/data) HFDL, Full ATN data		New communication suite of equipment
Terminal	VHF Voice VDL2/3 Critical and Non-critical Mode-S	VHF/AMSS (voice/data) Mode-S Full ATN data	New communication suite of equipment	VHF Voice VHF/AMSS (voice/data) Mode-S Full ATN data		New communication suite of equipment

C. Navigation

Phase I (present-2010)	Option 1: Evolutionary Implementation (Lowest Risks Implementation)			Option 2: Accelerated Implementation (Highest probability of Becoming Service Provider)		
Phases of Flight	**Legacy**	**Modern**	**Avionics A/C**	**Legacy**	**Modern**	**Avionics A/C**
Oceanic En route H/D	None	GPMS	Nothing New GNSS Use Authorized	NONE	GNSS Use Authorized SBAS & GPMS	MMR with WAAS or TSO 129/145 equiv.
Oceanic En route L/D	None	GPMS	Nothing New GNSS Use Authorized	NONE	GNSS Use Authorized SBAS & GPMS	MMR with WAAS or TSO 129/145 equiv.
Continental High Density	VOR/DME	GPMS	Nothing New GNSS Use Authorized	VOR/DME	GNSS Use Authorized SBAS & GPMS	MMR with WAAS or TSO 129/145 equiv
Continental Low Density	VOR	GPMS	Nothing New GNSS Use Authorized	VOR	GNSS Use Authorized SBAS & GPMS	MMR with WAAS or TSO 129/145 equiv.
Terminal High Density	VOR/DME	GPMS	Nothing New GNSS Use Authorized	VOR/DME	GNSS Use Authorized SBAS & GPMS	MMR with WAAS or TSO 129/145 equiv.
Terminal Low Density	VOR	GPMS	Nothing New GNSS Use Authorized	VOR	GNSS Use Authorized SBAS & GPMS	MMR with WAAS or TSO 129/145 equiv.
Approach H/D-Procedures	VOR/DME	GPMS	Nothing New GNSS Use Authorized	VOR/DME	GNSS Use Authorized SBAS & GPMS Lower Minimums	MMR with WAAS or TSO 129/145 equiv.

Phase I (present-2010)	Option 1: Evolutionary Implementation (Lowest Risks Implementation)			Option 2: Accelerated Implementation (Highest probability of Becoming Service Provider)		
Phases of Flight	**Legacy**	**Modern**	**Avionics A/C**	**Legacy**	**Modern**	**Avionics A/C**
App H/D-NPA	VOR/DME	APV-1 GPMS	BaroVNAV plus FMS GNSS Use Authorized	VOR/DME	GNSS Use Authorized and APV-1 SBAS & GPMS Lower Minimums	MMR with LAAS or TSO 129/145 equiv. BaroVNAV plus FMS
App H/D-PA	ILS CAT 1	None GPMS	Nothing New with Cat I Avionics and GNSS Use Authorized	ILS Cat I	GNSS Use Authorized GBAS & GPMS GNSS CAT II	MMR with LAAS or TSO 129/145 equiv.
App L/D-Procedures	VOR	None GPMS	Nothing New GNSS Use Authorized	VOR	GNSS Use Authorized SBAS & GPMS Lower Minimums	MMR with WAAS or TSO 129/145 equiv.
App L/D-NPA	VOR	RNP-0.3 GPMS	Nothing New GNSS Use Authorized RNP-0.3 Aircraft	VOR	GNSS Use Authorized SBAS & GPMS Lower Minimums with APV-1	MMR with WAAS or TSO 129/145 equiv. BaroVNAV plus FMS
App L/D-PA	ILS CAT 1	APV-II GPMS	Nothing New with ILS Cat I Avionics GNSS Use Authorized	NONE ILS CAT	GNSS Use Authorized SBAS & GPMS GNSS CAT I	MMR with WAAS or TSO 129/145 equiv.
Surface and Taxi	None	MDS GPMS	Nothing New	None	GNSS Use Authorized SBAS/GBAS & GPMS	MMR with LAAS or TSO 129/145 equiv.
App H/D-NPA	GPMS	Nothing New	Nothing New with RNP	SBAS	SBAS & GPMS	MMR with WAAS or

Phase I (present-2010)	Option 1: Evolutionary Implementation (Lowest Risks Implementation)			Option 2: Accelerated Implementation (Highest probability of Becoming Service Provider)		
Phases of Flight	**Legacy**	**Modern**	**Avionics A/C**	**Legacy**	**Modern**	**Avionics A/C**
	VOR/DME as backup	GPMS	GNSS Compliant GNSS Use Authorized and BaroVNAV with FMS	GPMS	And APV-II	TSO 129/145 equiv.
App H/D-PA	GPMS ILS Cat I/II	Nothing New GPMS	Nothing New GNSS Compliant GNSS Use Authorized with Cat I Avionics	GBAS GPMS	GBAS & GPMS	MMR with LAAS or TSO 129/145 equiv.
App L/D-Procedures	GPMS	Nothing New GPMS	Nothing New GNSS Compliant GNSS Use Authorized	SBAS GPMS	SBAS & GPMS	MMR with WAAS or TSO 129/145 equiv.

Phase II (2011-2015)	Option 1: Evolutionary Implementation (Lowest Risks Implementation)			Option 2: Accelerated Implementation (Highest probability of Becoming Service Provider)		
Phases of Flight	**Legacy**	**Modern**	**Avionics A/C**	**Legacy**	**Modern**	**Avionics A/C**
Oceanic En route H/D	GPMS	Nothing New	Nothing New GNSS Compliant Receiver GNSS Use Authorized	SBAS GPMS	SBAS & GPMS GNSS Compliant GNSS Use Authorized	MMR with WAAS or TSO 129/145 equiv.
Oceanic En route L/D	GPMS	Nothing New	Nothing New GNSS Compliant Receiver GNSS Use Authorized	SBAS GPMS	SBAS & GPMS GNSS Compliant GNSS Use Authorized	MMR with WAAS or TSO 129/145 equiv.
Continental High Density	GPMS Minimal set of VOR/DME as Backup	Nothing New	Nothing New GNSS Compliant Receiver GNSS Use Authorized	SBAS GPMS	SBAS & GPMS GNSS Compliant GNSS Use Authorized	MMR with WAAS or TSO 129/145 equiv.
Continental Low Density	GPMS	Nothing New	Nothing New GNSS Compliant Receiver GNSS Use Authorized	SBAS GPMS	SBAS & GPMS GNSS Compliant GNSS Use Authorized	MMR with WAAS or TSO 129/145 equiv.
Terminal High Density	GPMS Minimal set of VOR/DME as backbone	Nothing New	Nothing New GNSS Compliant Receiver GNSS Use Authorized	SBAS GPMS	SBAS & GPMS GNSS Compliant GNSS Use Authorized and RNP-0.3 Aircraft	MMR with WAAS or TSO 129/145 equiv.
Terminal Low Density	GPMS	Nothing New	Nothing New GNSS Compliant Receiver GNSS Use	SBAS GPMS	SBAS & GPMS GNSS Compliant GNSS Use Authorized	MMR with WAAS or TSO 129/145 equiv.

Phase II (2011-2015)	Option 1: Evolutionary Implementation (Lowest Risks Implementation)			Option 2: Accelerated Implementation (Highest probability of Becoming Service Provider)		
Phases of Flight	**Legacy**	**Modern**	**Avionics A/C**	**Legacy**	**Modern**	**Avionics A/C**
			Authorized			
Approach H/D-Procedures	GPMS VOR/DME as backup	Nothing New	Nothing New GNSS Compliant Receiver GNSS Use Authorized	SBAS GPMS	SBAS & GPMS GNSS Compliant GNSS Use Authorized and RNP-0.3 Aircraft	MMR with WAAS or TSO 129/145 equiv.
App L/D-NPA	GPMS	APV-1	Nothing New GNSS Compliant Receiver GNSS Use Authorized and BaroVNAV with FMS	SBAS GPMS	SBAS & GPMS With APV-II	MMR with WAAS or TSO 129/145 equiv.
App L/D-PA	GPMS ILS Cat I	Nothing New	No GPS Use Authorized Nothing New with Cat I Avionics	SBAS GPMS	SBAS & GPMS	MMR with WAAS or TSO 129/145 equiv.
Surface and Taxi	MDS	Nothing New	Nothing New GNSS Compliant Receiver GNSS Use Authorized	SBAS GPMS	SBAS & GPMS	MMR with LAAS or TSO 129/145 equiv.

Phase III (2016)	Option 1: Evolutionary Implementation (Lowest Risks Implementation)			Option 2: Accelerated Implementation (Highest probability of Becoming Service Provider)		
Phases of Flight	**Legacy**	**Modern**	**Avionics A/C**	**Legacy**	**Modern**	**Avionics A/C**
Oceanic En route H/D	GPMS	Nothing New	Nothing New	SBAS GPMS	Nothing New	MMR with WAAS or TSO 129/145 equiv.
Oceanic En route L/D	GPMS	Nothing New	Nothing New	SBAS GPMS	Nothing New	MMR with WAAS or TSO 129/145 equiv.
Continental High Density	GPMS	Nothing New	Nothing New	SBAS GPMS	Nothing New	MMR with WAAS or TSO 129/145 equiv.
Continental Low Density	GPMS	Nothing New	Nothing New	SBAS GPMS	Nothing New	MMR with WAAS or TSO 129/145 equiv.
Terminal High Density	GPMS	Nothing New	Nothing New	SBAS GPMS	Nothing New	MMR with WAAS or TSO 129/145 equiv.
Terminal Low Density	GPMS	Nothing New	Nothing New	SBAS GPMS	Nothing New	MMR with WAAS or TSO 129/145 equiv.
Approach H/D-Procedures	GPMS	Nothing New	Nothing New	SBAS GPMS	Nothing New	MMR with WAAS or TSO 129/145 equiv.
App H/D-NPA	GPMS	Nothing New	Nothing New	SBAS GPMS	Nothing New	MMR with WAAS or TSO 129/145 equiv.
App H/D-PA	ILS Cat II/III	Nothing New	Nothing New	GBAS GPMS	Nothing New	MMR with LAAS or TSO 129/145 equiv.

Phase III (2016)	Option 1: Evolutionary Implementation (Lowest Risks Implementation)			Option 2: Accelerated Implementation (Highest probability of Becoming Service Provider)		
Phases of Flight	**Legacy**	**Modern**	**Avionics A/C**	**Legacy**	**Modern**	**Avionics A/C**
App L/D-Procedures	GPMS	Nothing New	Nothing New	SBAS GPMS	Nothing New	MMR with WAAS or TSO 129/145 equiv.
App L/D-NPA	GPMS	Nothing New	Nothing New	SBAS GPMS	Nothing New	MMR with WAAS or TSO 129/145 equiv.
App L/D-PA	None	Nothing New	Nothing New	SBAS GPMS	Nothing New	MMR with WAAS or TSO 129/145 equiv.
Surface and Taxi	None	Nothing New	Nothing New	SBAS/ GBAS GPMS	Nothing New	MMR with LAAS or TSO 129/145 equiv.

D. Surveillance

Phase I (present-2010)	Option 1: Evolutionary Implementation			Option 2: Accelerated Implementation		
Phases of Flight	**Legacy**	**Modern**	**Avionics A/C**	**Legacy**	**Modern**	**Avionics A/C**
Oceanic En route H/D		ADS-B	Mode S Transponder with TSO C166 capability		ADS-B	Mode S Transponder with TSO C166 capability, new radios w/digital info capability
Oceanic En route L/D		ADS-B	Mode S Transponder with TSO C166 capability		ADS-B	Mode S Transponder with TSO C166 capability, new radios w/digital info capability
Continental High Density	Maintain existing secondary, let primary go away after recovery of existing dollars spent. PSR/ SSR where available	ADS-B	Mode S Transponder with TSO C166 capability	PSR/ SSR where available	ADS-B	Mode S Transponder with TSO C166 capability, new radios w/digital info capability
Continental Low Density	Maintain existing secondary, let primary go away after recovery of existing dollars spent. PSR/ SSR where available	ADS-B	Mode S Transponder with TSO C166 capability	PSR/ SSR where available	ADS-B	Mode S Transponder with TSO C166 capability, new radios w/digital info capability
Terminal High Density	Maintain existing secondary, let primary go away after recovery of existing dollars spent. PSR/ SSR where available	ADS-B	Mode S Transponder with TSO C166 capability	PSR/ SSR where available	ADS-B	Mode S Transponder with TSO C166 capability, new radios w/digital info capability

Phase I (present-2010)	Option 1: Evolutionary Implementation			Option 2: Accelerated Implementation		
Phases of Flight	**Legacy**	**Modern**	**Avionics A/C**	**Legacy**	**Modern**	**Avionics A/C**
Terminal Low Density	PSR/ SSR where available	ADS-B	Mode S Transponder with TSO C166 capability	PSR/ SSR where available	ADS-B	Mode S Transponder with TSO C166 capability, new radios w/digital info capability
Approach H/D-Procedures	PSR/ SSR where available	ADS-B	Mode S Transponder with TSO C166 capability	PSR/ SSR where available	ADS-B	Mode S Transponder with TSO C166 capability, new radios w/digital info capability
App H/D-NPA	PSR/ SSR where available	ADS-B	Mode S Transponder with TSO C166 capability	PSR/ SSR where available	ADS-B	Mode S Transponder with TSO C166 capability, new radios w/digital info capability
App H/D-PA	PSR/ SSR where available	ADS-B	Mode S Transponder with TSO C166 capability	PSR/ SSR where available	ADS-B	Mode S Transponder with TSO C166 capability, new radios w/digital info capability
App L/D-Procedures	PSR/ SSR where available	ADS-B	Mode S Transponder with TSO C166 capability	PSR/ SSR where available	ADS-B	Mode S Transponder with TSO C166 capability, new radios w/digital info capability
App L/D-NPA	PSR/ SSR where available	ADS-B	Mode S Transponder with TSO C166 capability	PSR/ SSR where available	ADS-B	Mode S Transponder with TSO C166 capability, new radios w/digital info capability

Phase I (present-2010)	Option 1: Evolutionary Implementation			Option 2: Accelerated Implementation		
Phases of Flight	**Legacy**	**Modern**	**Avionics A/C**	**Legacy**	**Modern**	**Avionics A/C**
App L/D-PA	PSR/ SSR where available	ADS-B	Mode S Transponder with TSO C166 capability	PSR/ SSR where available	ADS-B	Mode S Transponder with TSO C166 capability, new radios w/digital info capability
Surface and Taxi	ADS-B, multilateration, secondary radar	Install surface primary and secondary with vehicle ADS-B	Mode S Transponder with TSO C166 capability	Begin installing surface equipment such as Surface movement radar (ASDE)	ADS-B	Mode S Transponder with TSO C166 capability, new radios w/digital info capability

Phase II (2011-2015)	Option 1: Evolutionary Implementation			Option 2: Accelerated Implementation		
Phases of Flight	**Legacy**	**Modern**	**Avionics A/C**	**Legacy**	**Modern**	**Avionics A/C**
Oceanic En route H/D	ADS-B		Mode S Transponder with TSO C166 capability, new radios w/digital info capability	ADS-B		Mode S Transponder with TSO C166 capability, new radios w/digital info capability
Oceanic En route L/D	ADS-B		Mode S Transponder with TSO C166 capability, new radios w/digital info capability	ADS-B		Mode S Transponder with TSO C166 capability, new radios w/digital info capability
Continental High Density	ADS-B, Multilateration Secondary Radar		Mode S Transponder with TSO C166 capability, new radios w/digital info capability	ADS-B, multilateration, secondary radar		Mode S Transponder with TSO C166 capability, new radios w/digital info capability
Continental Low Density	PSR/ SSR where available	ADS-B	Mode S Transponder with TSO C166 capability, new radios w/digital info capability	ADS-B, multilateration, secondary radar		Mode S Transponder with TSO C166 capability, new radios w/digital info capability
Terminal High Density	ADS-B, Multilateration Secondary Radar		Mode S Transponder with TSO C166 capability, new radios w/digital info capability	ADS-B, multilateration, secondary radar		Mode S Transponder with TSO C166 capability, new radios w/digital info capability

Phase II (2011-2015)	Option 1: Evolutionary Implementation			Option 2: Accelerated Implementation		
Phases of Flight	**Legacy**	**Modern**	**Avionics A/C**	**Legacy**	**Modern**	**Avionics A/C**
Terminal Low Density	PSR/ SSR where available	Replace secondary at end of life with ADS-B compatible MSSR ADS-B	Mode S Transponder with TSO C166 capability, new radios w/digital info capability	ADS-B, multilateration, secondary radar		Mode S Transponder with TSO C166 capability, new radios w/digital info capability
Approach H/D-Procedures	ADS-B Multilateration Secondary Radar		Mode S Transponder with TSO C166 capability, new radios w/digital info capability	ADS-B, multilateration, secondary radar		Mode S Transponder with TSO C166 capability, new radios w/digital info capability
App H/D-NPA	ADS-B Multilateration Secondary Radar		Mode S Transponder with TSO C166 capability, new radios w/digital info capability	ADS-B, multilateration, secondary radar		Mode S Transponder with TSO C166 capability, new radios w/digital info capability
App H/D-PA	ADS-B Multilateration Secondary Radar		Mode S Transponder with TSO C166 capability, new radios w/digital info capability	ADS-B, multilateration, secondary radar		Mode S Transponder with TSO C166 capability, new radios w/digital info capability
App L/D-Procedures	PSR/ SSR where available	ADS-B	Mode S Transponder with TSO C166 capability, new radios w/digital info capability	ADS-B, multilateration, secondary radar		Mode S Transponder with TSO C166 capability, new radios w/digital info capability

Phase II (2011-2015)	Option 1: Evolutionary Implementation			Option 2: Accelerated Implementation		
Phases of Flight	**Legacy**	**Modern**	**Avionics A/C**	**Legacy**	**Modern**	**Avionics A/C**
App L/D-NPA	PSR/ SSR where available	ADS-B	Mode S Transponder with TSO C166 capability, new radios w/digital info capability	ADS-B, multilateration, secondary radar		Mode S Transponder with TSO C166 capability, new radios w/digital info capability
App L/D-PA	PSR/ SSR where available.	ADS-B	Mode S Transponder with TSO C166 capability, new radios w/digital info capability	ADS-B, multilateration, secondary radar		Mode S Transponder with TSO C166 capability, new radios w/digital info capability
Surface and Taxi	Surface Surveillance Radar	Mandate vehicle equipage on movement area once ADS-B infrastructure is in place	Mode S Transponder with TSO C166 capability, new radios w/digital info capability	Surface Surveillance Radar		Mode S Transponder with TSO C166 capability, new radios w/digital info capability

Phase III (2016-2019)	Option 1: Evolutionary Implementation			Option 2: Accelerated Implementation		
Phases of Flight	**Legacy**	**Modern**	**Avionics A/C**	**Legacy**	**Modern**	**Avionics A/C**
Oceanic En route H/D	ADS-B	Do nothing	New communication suite of equipment	ADS-B		New communication suite of equipment
Oceanic En route L/D	ADS-B	Do nothing	New communication suite of equipment	ADS-B		New communication suite of equipment
Continental High Density	ADS-B, Multilateration Secondary Radar		New communication suite of equipment	ADS-B, multilateration, secondary radar		New communication suite of equipment
Continental Low Density	ADS-B, Multilateration Secondary Radar.		New communication suite of equipment	ADS-B, multilateration, secondary radar		New communication suite of equipment
Terminal High Density	ADS-B, Multilateration Secondary Radar.		New communication suite of equipment	ADS-B, multilateration, secondary radar		New communication suite of equipment
Terminal Low Density	ADS-B, Multilateration Secondary Radar		New communication suite of equipment	ADS-B, multilateration, secondary radar		New communication suite of equipment
Approach H/D-Procedures	ADS-B, Multilateration Secondary Radar		New communication suite of equipment	ADS-B, multilateration, secondary radar		New communication suite of equipment
App H/D-NPA	ADS-B, Multilateration Secondary Radar		Mode S Transponder with TSO C166 capability	ADS-B, multilateration, secondary radar		Mode S Transponder with TSO C166 capability
App H/D-PA	ADS-B, Multilateration Secondary Radar.		Mode S Transponder with TSO C166	ADS-B, multilateration, secondary radar		Mode S Transponder with TSO C166

Phase III (2016-2019)	Option 1: Evolutionary Implementation			Option 2: Accelerated Implementation		
Phases of Flight	**Legacy**	**Modern**	**Avionics A/C**	**Legacy**	**Modern**	**Avionics A/C**
			capability			capability
App L/D-Procedures	ADS-B, Multilateration Secondary Radar		Mode S Transponder with TSO C166 capability	ADS-B, multilateration, secondary radar		Mode S Transponder with TSO C166 capability
App L/D-NPA	ADS-B, Multilateration Secondary Radar		Mode S Transponder with TSO C166 capability	ADS-B, multilateration, secondary radar		Mode S Transponder with TSO C166 capability
App L/D-PA	ADS-B, Multilateration Secondary Radar		Mode S Transponder with TSO C166 capability	ADS-B, multilateration, secondary radar		Mode S Transponder with TSO C166 capability
Surface and Taxi	Secondary for surface, (A multilateration based solution with ADS-B compatibility) Mode-S ES (extended squitter requires avionics mandate	Mandate vehicle equipage on movement area once ADS-B infrastructure is in place	Mode S Transponder with TSO C166 capability	ADS-B, multilateration, secondary radar		Mode S Transponder with TSO C166 capability

System specifications corresponding to these systems are indicated below:

ATM Systems	Corresponding Airborne Equipment (if applicable)	Availability (Now/When)	Technical Specifications, Certifying/governing directive(s)
CDM	MMR*	Now	TSO 129/145 Equivalent;
TMU	MMR*	Now	TSO 129/145 Equivalent
ETMS	MMR*	Now	TSO 129/145 Equivalent
G-GNM	MMR*	Now	TSO 129/145 Equivalent
Global ATM	MMR*	Now	TSO 129/145 Equivalent

** There is not a separate airborne component required for ATM. ATM utilizes the surveillance information and data link provided by the C, N & S components to derive and provide its capabilities to the controller and pilot. For example SSR provides position/altitude. ADS-B provides 4D. The surveillance information is processed by ATM which is provided through an operational LAN with Interface Device. Data link exchanges ATM information between the air traffic controller and the cockpit – e.g. a message for an aircraft to cross a specific point at a specific time; and acknowledgement of the instruction by the flight deck.*

Communications System	Corresponding Airborne Equipment (if applicable)	Availability (Now/When)	Technical Specifications, Certifying/governing directive(s)
VHF Voice	VHF Radio	Now	DO 186B
VHF Voice & Data	VHF/Digital Radio	Now	DO 219; DO 224B; DO 225
VHF 8.33	VHF 8.33 enabled Radio	Now	DO 225
HF Voice	HF Radio	Now	DO 163
HF Data Link	HF Digital Radio	Now	DO 165; DO 219; DO 265; DO 277
HF Voice & Data Link	HF Digital Radio	Now	DO 163; DO 165; DO 219; DO 265; DO 277
AMSS	Satcom Radio	Now	DO 210D; DO 215A; DO 231; DO 262; DO 270

Communications System	Corresponding Airborne Equipment (if applicable)	Availability (Now/When)	Technical Specifications, Certifying/governing directive(s)
VDL 2	VHF Digital Radio	Now	DO 219; DO 258A; DO 264; DO 269; DO 281A; DO 290
VDL 3	VHF Digital Radio	Commercial--Future	DO 271C; DO 273; DO 274; DO 279; DO 285; DO 288
Full ATN	N/A	Commercial--Future	DO 240; DO 250; DO 280A; DO 284; DO 287

Navigation Systems	Corresponding Airborne Equipment (if applicable)	Availability (Now/When)	Technical Specifications, Certifying/governing directive(s)
VOR/DME	VOR/DME receiver	Now	DO 189; DO 196
ILS	ILS Receiver	Now	DO 117; DO 192; DO 195
GPS	GPS Receiver	Now	DO 202; DO 208; DO 217; DO 228; DO 257A TSO 129C
GPS/Baro	GPS Receiver/Barometric Altimeter	Now	DO 88; DO 202; DO 208; DO 217; DO 228; DO 257A
GPS/IRS	GPS Receiver/Inertial Reference System	Now	DO 217; DO 228; DO 257A
GPS/WAAS SBAS	GPS Receiver with WAAS	Now	DO 217; DO 228; DO 229C; DO 257A TSO 145a, TSO 146
GPS/LAAS GBAS	GPS Receiver with LAAS MMR	Now	DO 245A; DO 253A; DO257A TSO !61, TSO 162 VDB
GPMS	tbd	tbd	tbd

Navigation Systems	Corresponding Airborne Equipment (if applicable)	Availability (Now/When)	Technical Specifications, Certifying/governing directive(s)
GRAS	GPS receiver with GRAS	tbd	MOPS in progress
Galileo	tbd	tbd	DO 262
GPS III	tbd	tbd	DO 262

Surveillance Systems	Corresponding Airborne Equipment (if applicable)	Availability (Now/When)	Technical Specifications, Certifying/governing directive(s)
Multilateration	Transponder	Now	DO-144
Multilateration with ADS-B	Transponder + accurate position information (e.g. GNSS) + suitable datalink	Now	DO 144; DO 212; DO 242A; DO-260/260a; DO 263; DO 286A; DO 289
ADS-B (UAT or Mode S	Accurate position information (e.g. GNSS) + UAT or Mode S Transponder	Now	DO 144; DO 181C; DO 212; DO 218B; DO 242A; DO 249; DO-260/260a; DO 263; DO 280; DO 282A; DO 286A; DO 289
ADS-C	Accurate position information (e.g. GNSS) + datalink to contract service provider	Now	DO 212
Mode S	Mode S Transponder		DO 144; DO-181C; DO 218B
MSSR	Transponder	Now	DO 144
SMR	Transponder; Accurate position information (e.g. GNSS) + UAT or Mode S Transponder depending on type	Now	DO 144; DO 221

XII. REFERENCE DOCUMENTS

Org	Title	Ref Number
ICAO	Manual on Radio Telephony	DOC 9342
ICAO	Annex 10 Volume II	
ICAO	Annex 10 Volume III	
ICAO	Annex 10 Volume V	
ICAO	Annex 11 Air Traffic Services	
ICAO	Air Traffic Management	DOC 4444
ICAO	Regional Supplementary Procedure	DOC 7030
ICAO	Global Air Navigation Plan for CNS-ATM systems	DOC 9750
ICAO	Manual of Air Traffic Services data link applications	DOC 9694
ICAO	Air Traffic Service Planning Manual	DOC 9426
ICAO	National plan for ATM/CNS systems	Circ. 278
ICAO	Comprehensive ATN(Manual)	DOC 9739
ICAO	Manual on ATS (Gnd-Gnd) Voice Switching and signaling	DOC 9804
ICAO	Manual on HF DL	DOC 9741
ICAO	Manual on the planning and engineering of the AFTN	DOC 8259
ICAO	Manual on VHF-DL Mode 2	DOC 9776
ICAO	Air Traffic Management Operational Concept Panel (ATMCP) The Global ATM Operational Concept: Version 4	
ICAO	Report on the world wide ATM/CNS system implementation Conference	DOC 9719
CAR/SAM	Report of the 3rd Caribbean/South American Regional Air	DOC 8733

	Navigation meeting	
CAR/SAM	CAR/SAM Regional Plan for the Implementation of ATM/CNS Systems, 9/99	
CAR/SAM	Regional Plan for the Implementation of RVSM	
CAR/SAM	CAR/SAM RVSM CONOPS Oct 2003	
Grepecas	Meeting Minutes – Mtgs 8, 9 (ATM/CNS), 10 & 11 (RVSM)	
Colombia	DOCUMENTO INFRAESTRUCTURA VISION 2019	
Colombia	Proposals for the Future Development of GNSS Navigation Systems (presented by Colombia [AN-Conf/11-WP/174])	
IATA	Publications regarding CAR/SAM regional implementation of ATM/CNS. Implementation of GNSS/RNAV at BOG	
IFATCA	Vision Document Towards the 21st Century (controllers perspective)	
Colombia	Air Navigation Plan for Colombia	
ICAO	ICAO policies on Charger for airport and Air Navigation Services	DOC 9082
ICAO	Privatization on the provision of airport and Air Navigation Services	Circ 284
ICAO	Economics of Satellite Based Air Navigation Services	Circ 257
ICAO	Outlook for Air Transport to the year 2010	Circ 281
ICAO	Manual on Air Traffic forecasting	DOC 8991
RTCA		DO 210
RTCA		DO 211
RTCA		DO 215A
RTCA		DO 219
RTCA		DO 222

RTCA		DO 224
RTCA		DO 225
RTCA		DO 231
RTCA		DO 232
RTCA		DO 239
RTCA		DO 240
RTCA		DO 250
RTCA		DO 258
RTCA		DO 260
RTCA		DO 260A
RTCA		DO 264
RTCA		DO 265
RTCA		DO 267
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RTCA		DO 271
RTCA		DO 278
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RTCA		DO 284
RTCA		DO 286
RTCA		DO 287
RTCA		DO 288
RTCA		DO 290

XIII. OPTIONS REPORT ACRONYMS LIST

ACARS	Aircraft Communications and Reporting System
ACAS	Airborne Collision Avoidance System
ACC	Area Control Center
ADL	Aeronautical Data Link
ADS	Automatic Dependent Surveillance
ADS-C	Automatic Dependent Surveillance-Contract
ADS-B	Automatic Dependent Surveillance-Broadcast
AFTN	Aeronautical Fixed Telecommunications Network
AIP	Aeronautical Information Publication
AMSS	Aeronautical Mobile Satellite Service
APV	Non-precision Approach with Vertical Guidance
ARTCC	Air Route Traffic Control Center
ASR	Airport Surveillance Radar
ATC	Air Traffic Control
ATM	Air Traffic Management
ATN	Aeronautical Telecommunications Network
ATS	Air Traffic Services
BARO	Barometric Pressure Derived Altitude
CAA	Civil Aeronautics Administration
CAR/SAM	Caribbean/South American Region
CAT-I	Category I precision approach
CAT-II	Category II precision approach
CAT III	Category III precision approach
CDM	Collaborative Decision Making
CSTB	CAR/SAM Satellite Test Bed
CTAS/FAST	Center/TRACON Automation System/Final Approach Spacing Tool
ATM/CNS	Communications, Navigation, Surveillance/Air Traffic Management

COCESNA	Central American Air Navigation Consortium
COFDM	Coded Orthogonal Frequency Division Multiplex
CPDLC	Controller-Pilot Data Link Communications
DME	Distance Measuring Equipment
DP	Departure Procedures
EGNOS	European Geostationary Navigation Overlay Service
ETMS	Enhanced Traffic Management System
EU	European Union
FAA	U.S. Federal Aviation Administration
FANS–1	Future Air Navigation System - 1
FIR	Flight Information Region
FMS	Flight Management System
GA	General Aviation
GAGAN	Indian system – WAAS compatible SBAS
Galileo	GNSS system proposed by European Union members States and other sponsors
GBAS	Ground Based Augmentation System
G-GNM	Gate-to-Gate Network Management
Global ATM	Global Air Traffic Management
GLONASS	Global Orbiting Navigational Satellite System
GNSS	Global Navigation Satellite System
GPMS	GPS Monitoring System
GPS	Global Positioning System
GRAS	Ground-based Regional Augmentation System
GREPECAS	Caribbean-South America Planning and Implementation Regional Group
HF	High Frequency
HFDL	High Frequency Data Link
IAP	Instrument Approach Procedure
ICAO	International Civil Aviation Organization
IFR	Instrument Flight Rules
ILS	Instrument Landing System

IMC	Instrument Meteorological Conditions
IRS	Inertial Reference System
LAAS	Local Area Augmentation System
LADGPS	Local Area Differential Global Positioning System
LNAV	Lateral Navigation
MCS	Master Control Station
MEA	Minimum En route Altitude
MFD	Multi-functional display
MMR	Multi-modal Receiver
Modes A, C, S	Secondary Surveillance reporting – (A) Acft ID, bearing, distance (C) adds altitude (S) supports data-link transactions
MOPS	Minimum Operational Performance Standards
MSAS	Multi-function Transport Satellite (MTSAT) Augmentation System (Japanese version of WAAS
MSSR	Monopulse Secondary Surveillance Radar
MTSAT	Multi-functional Transport Satellite
NADIN II	National Aerospace Data Interchange Network
NAS	National Aerospace System
NAVAID	Navigational Aid
NDB	Non-Directional Beacon
NOTAM	Notice to Airmen
NPA	Non-precision Approach
NSTB	National Satellite Test Bed
O&M	Operations and Maintenance
OJT	On the job training
PANS-OPS	Procedures for Air Navigation Services – Operations
PRM	Precision Runway Monitor
QPSK	Quad Phase Shift Keying
8PSK	8-phase shifting key (D means digital)
RAIM	Receiver Autonomous Integrity Monitoring
RFI	Radio Frequency Interference

RFP	Request for Proposals
RMMS	Remote Maintenance Monitoring System
RNAV	Area Navigation
RNP	Required Navigation Performance
RVR	Runway Visibility Range
RVSM	Reduced Vertical Separation Minima
SARPS	Standards and Recommended Practices
SATNAV	Satellite Navigation
SBAS	Space Based Augmentation System
SID	Standard Instrument Departure
SITA	Societe Internationale de Telecommunications
SMA	Surface Management Advisor
SMGCS	Surface Management and Guidance Control system
SOW	Statement of Work
SSR	Secondary Surveillance Radar
STAR	Standard Terminal Arrival Route
SUA	Special Use Airspace
TCAS	Terminal Collision and Avoidance System
TDMA	Time Division Multiple Access
TFM	Traffic Flow Management
TMA	Terminal Control Area
TMU	Traffic Management Unit
TSO	Technical Standard Order
UAT	Universal Access Transceiver
VDL	VHF Data Link
VFR	Visual Flight Rules
VHF	Very High Frequency
VHF-ER	VHF Extended Range
VOR	VHF Omni-Directional Radio Range
VSAT	Very Small Aperture Terminal
VSCS	Voice Switching and Control Systems

WAAS	Wide Area Augmentation System
WGS-84	World Geodetic Survey –84

APPENDIX A – ATM WORKSHEETS

ATM by Phase of Flight and Airport

Present to 2010

AIRSPACE	Volumen esperado (expected volume) - number-	Convergencia de rutas (route convergence)	Categoria de aeronaves (category of aircraft: A, B, C,...) %	Categoria de espacio aereo (Airspace category: A, B, C, D...)	Convergencia y ptos conflicto entre SIDS, STARS (Convergence of, points of conflict between SIDS, STARS and other procedures)	Condiciones MET (Weather conditions)	Capacidad espac. Aer. Adyacentes (adjacent airspace capacities)	RNP	COM. NEEDS (Coverage, availability, capacity, delays)	SUR. NEEDS (Coverage, availability, capacity, delays, accuracy, latency, updating rate, resolution)	ATM NEEDS	Other consideratio ns e.g. Unusual Weather, Terrain, etc.	Diseño del espacio aéreo recomendado (recommended airspace design)
TMAs													
BOGOTA	238,809	High difficulty Ascending and descending traffic Demands a lot of coordination cause the control is shared by 3 operators	Cat A: 5%; Cat B: 15%; Cat C: 35%; Cat D: 40%; Cat E: 5%	A: If it is A, now, it should not be changed	Yes. SIDS and, STARS, parallel RWYs ,RNP and, conflict managment implementation requiered. Conflict points: Zipaquira VOR, Buvis VOR Ambalema NDB	IMC: IFR - Cat I, Cat II	Yes Reason: It has locations of traffic congestion that affect the traffic in Bog: Med, Mqu, Clo, Mtr, Buvis, Otu, Bga, Pei.	2 Because: High density terminal	Coverage Vol - .100% over fixes & airways Availability .9995 capacity - unlimited delays - 0 Back up systems for contingence plan	Coverage Vol - .100% over fixes & airways Availability - .9995 capacity - 200 delays - 0 Accuracy - 30'/95% Back up system for contingence plan	Airspace organization . coordination procedures •Regulations (yes): Class A airspace Airspace management. •Sharing of Airspace (yes) . Increase flexibility Aerodrome operations Demand and capacity balancing Efficiency: Minimize Delays; throughput; benchmarking Information management . Aeronautical information . Meteorological information Safety management •Human Factors: training; certification; workload • •Operational Safety: Operational errors; Operational Deviations; Pilot deviations; Collision avoidance; Terrain/obstacle avoidance Strategic conflict management	TMA should not be changed due to restrictions of Palanquero's airspace + topography	No
BARRANQUILLA	57505	Low difficulty Segregated traffic The control is under one Air Traffic controller	Cat A: 10%; Cat B: 25%; Cat C: 30%; Cat D: 30%; Cat E: 5%	D	No	IMC: IFR - Cat 1	No	4. Low Density	Coverage Vol - .100% over fixes & airways Availability - 9995 capacity - unlimited delays - 0 Back up systems for contingence plan	Coverage Vol - .100% over fixes & airways Availability - .9995% capacity - 200 delays - 0 Accuracy - 30'/95%	Airspace organization Regulations (yes): Class D airspace Airspace management. •Sharing of Airspace (Yes): Aerodrome operations Demand and capacity balancing •Efficiency: Minimize Delays; throughput; benchmarking Information management Safety management •Human Factors: training; certification; workload coordination procedures • •Operational Safety: Operational errors; Operational Deviations; Pilot deviations; Collision avoidance; Terrain/obstacle avoidance Strategic conflict management		No

	Present to 2010												
AIRSPACE	Volumen esperado (expected volume) - number-	Convergencia de rutas (route convergence)	Categoria de aeronaves (category of aircraft: A, B, C,...) %	Categoria de espacio aereo (Airspace category: A, B, C, D...)	Convergencia y ptos conflicto entre SIDS, STARS (Convergence of, points of conflict between SIDS, STARS and other procedures)	Condiciones MET (Weather conditions)	Capacidad espac. Aer. Adyacentes (adjacent airspace capacities)	RNP	COM. NEEDS (Coverage, availability, capacity, delays)	SUR. NEEDS (Coverage, availability, capacity, delays, accuracy, latency, updating rate, resolution)	ATM NEEDS	Other consideratio ns e.g. Unusual Weather, Terrain, etc.	Diseño del espacio aéreo recomendado (recommended airspace design)
CALI	62739	Low difficulty The control is under one Air Traffic controller	Cat A: 10%; Cat B: 19%; Cat C: 30%; Cat D: 40%; Cat E: 1 %	D	Conflict Points: Tulua VOR	IMC: IFR - Cat I	Yes. Reason: We have id locations of traffic congestion that affect the traffic in Cali: ABL	2. Because: High density terminal	Coverage Vol - 100% over fixes & airways Availability - .9995 capacity - unlimited delays - 0	Coverage Vol - 100% over fixes & airways Availability - .9995% capacity - 200 delays - 0 Accuracy - 30/95%	Airspace organization •Regulations (yes): Class D Airspace management): •Efficiency: Minimize Delays; throughput; benchmarking Aerodrome operations Demand and capacity balancing Information management Safety management Strategic conflict management •Human Factors: training; certification; workload •Sharing of Airspace (No •Operational Safety: Operational errors; Operational Deviations; Pilot deviations; Collision avoidance; Terrain/obstacle avoidance	Difficult terrain coupled with significant amounts of adverse weather	No
PEREIRA	25037	Medium difficulty Small airspace	Cat A: 10%; Cat B: 15%; Cat C: 35%; Cat D: 40%;	D	Conflict Points: El paso NDB Tolim interseccion	IMC: APV II	Yes. Reason: We have id locations of traffic congestion that affect the traffic in Pereira: Med, Clo, Bog	4. Low Density	Coverage Vol - 100% over fixes & airways Availability - .9995 capacity - unlimited delays - 0	Coverage Vol - 100% over fixes & airways Availability - .9995% capacity - 100 delays - 0 Accuracy - 30/95%	Airspace organization •Regulations (yes): Class D airspace Airspace management • Sharing of Airspace (No) Aerodrome operations Demand and capacity balancing •Efficiency: Minimize Delays; throughput; benchmarking Information management Safety management •Human Factors: training; certification; workload : •Operational Safety: Operational errors; Operational Deviations; Pilot deviations; Collision avoidance; Terrain/obstacle avoidance Strategic conflict management	Difficult terrain coupled with significant amounts of adverse weather	No

	Present to 2010												
AIRSPACE	Voluman esperado (expected volume) - number-	Convergencia de rutas (route convergence)	Categoria de aeronaves (category of aircraft: A, B, C,...) %	Categoria de espacio aereo (Airspace category: A, B, C, D...)	Convergencia y ptos conflicto entre SIDS, STARS (Convergence of, points of conflict between SIDS, STARS and other procedures)	Condiciones MET (Weather conditions)	Capacidad espac. Aer. Adyacentes (adjacent airspace capacities)	RNP	COM. NEEDS (Coverage, availability, capacity, delays)	SUR. NEEDS (Coverage, availability, capacity, delays, accuracy, latency, updating rate, resolution)	ATM NEEDS	Other consideratio ns e.g. Unusual Weather, Terrain, etc.	Diseño del espacio aéreo recomendado (recommended airspace design)
SAN ANDRES	12291	No	Cat B: 15%; Cat C: 40 %; Cat D: 45%;	D	No	IMC: APV II	No	4. Low Density	Coverage Vol - 100% over fixes & airways Availability - 9995 capacity - unlimited delays - 0	Coverage Vol - 100% over fixes & airways Availability - 9995% capacity - 100 delays - 0 Accuracy - 30/95%	Airspace organization •Regulations (yes): Class D airspace Airspace management workload •Sharing of Airspace (No): Aerodrome operations Demand and capacity balancing Efficiency: Minimize Delays Information management Safety management •Human Factors: training; certification; • throughput; benchmarking •Operational Safety: Operational errors; Operational Deviations; Pilot deviations; Collision avoidance; Terrain/obstacle avoidance Strategic conflict management		No
BUCARAMANGA	30443	Low difficulty	Cat A: 10 %; Cat B: 25 %; Cat C: 45%; Cat D: 20%;	D	No	IMC: APV II	Yes Reason: We have id locations of traffic congestion that affect the traffic in Bucaramanga: Cuc, Eyp, Bog	4. Low Density	Coverage Vol - 100% over fixes & airways Availability - 9995 capacity - unlimited delays - 0	Coverage Vol - 100% over fixes & airways Availability - 9995% capacity - 100 delays - 0 Accuracy - 30/95%	Airspace organization •Regulations (yes): Class D airspace Airspace management •Sharing of Airspace (No): Aerodrome operations Demand and capacity balancing •Efficiency: Minimize Delays; throughput; benchmarking Information management Safety management Human Factors: training; certification; workload •Operational Safety: Operational errors; Operational Deviations; Pilot deviations; Collision avoidance; Terrain/obstacle avoidance Strategic conflict management •	Difficult terrain coupled with significant amounts of adverse weather	No

	Present to 2010												
AIRSPACE	Volumen esperado (expected volume) - number-	Convergencia de rutas (route convergence)	Categoria de aeronaves (category of aircraft: A, B, C,...) %	Categoria de espacio aereo (Airspace category: A, B, C, D...)	Convergencia y ptos conflicto entre SIDS, STARS (Convergence of, points of conflict between SIDS, STARS and other procedures)	Condiciones MET (Weather conditions)	Capacidad espac. Aer. Adyacentes (adjacent airspace capacities)	RNP	COM. NEEDS (Coverage, availability, capacity, delays)	SUR. NEEDS (Coverage, availability, capacity, delays, accuracy, latency, updating rate, resolution)	ATM NEEDS	Other consideratio ns e.g. Unusual Weather, Terrain, etc.	Diseño del espacio aéreo recomendado (recommended airspace design)
CUCUTA	17533	Low difficulty The control is under one Air Traffic controller	Cat A: 10 %; Cat B: 25 %; Cat C: 45%; Cat D: 20%;	D	No	IMC: APV II	Yes. Reason: We have id locations of traffic congestion that affect the traffic in Cucuta: Bga	4. Low Density	Coverage Vol - 100% over fixes & airways Availability - 9995 capacity - unlimited delays - 0	Coverage Vol - 100% over fixes & airways Availability - 9995% capacity - 100 delays - 0 Accuracy - 30/95%	Airspace organization •Regulations (yes): Class D airspace Airspace management •Sharing of Airspace (No): Aerodrome operations Demand and capacity balancing •Efficiency: Minimize Delays; throughput; benchmarking Information management Safety management •Human Factors: training; certification; workload •Operational Safety: Operational errors; Operational Deviations; Pilot deviations; Collision avoidance; Terrain/obstacle avoidance Strategic conflict management	Difficult terrain coupled with significant amounts of adverse weather	No
ANDES	1716	No	Cat A: 10 %; Cat B: 25 %; Cat C: 45%; Cat D: 20%;	D	No	IMC: APV II	No	4. Low Density	Coverage Vol - 100% over fixes & airways Availability - 9995 capacity - unlimited delays - 0	Coverage Vol - 100% over fixes & airways Availability - 9995% capacity - 100 delays - 0 Accuracy - 30/95%	Airspace organization •Regulations (yes): Class D airspace Airspace management •Sharing of Airspace (No): Aerodrome operations Demand and capacity balancing •Efficiency: Minimize Delays; throughput; benchmarking Information management Safety management •Human Factors: training; certification; workload •Operational Safety: Operational errors; Operational Deviations; Pilot deviations; Collision avoidance; Terrain/obstacle avoidance Strategic conflict management	Difficult terrain coupled with significant amounts of adverse weather	No

	Present to 2010												
AIRSPACE	**Volumen esperado (expected volume) - number-**	**Convergencia de rutas (route convergence)**	**Categoria de aeronaves (category of aircraft: A, B, C,...) %**	**Categoria de espacio aereo (Airspace category: A, B, C, D...)**	**Convergencia y ptos conflicto entre SIDS, STARS (Convergence of, points of conflict between SIDS, STARS and other procedures)**	**Condiciones MET (Weather conditions)**	**Capacidad espac. Aer. Adyacentes (adjacent airspace capacities)**	**RNP**	**COM. NEEDS (Coverage, availability, capacity, delays)**	**SUR. NEEDS (Coverage, availability, capacity, delays, accuracy, latency, updating rate, resolution)**	**ATM NEEDS**	**Other consideratio ns e.g. Unusual Weather, Terrain, etc.**	**Diseño del espacio aéreo recomendado (recommended airspace design)**
LETICIA	3721	No	Cat A: 10%; Cat B: 15%; Cat C: 50%; Cat D: 25%;	D	No	IMC: APV II	No	4. Low Density	Coverage Vol - 100% over fixes & airways Availability - 9995 capacity - unlimited delays - 0	Coverage Vol - 100% over fixes & airways Availability - 9995% capacity - 100 delays - 0 Accuracy - 30'/95%	Airspace organization •Regulations (yes): Class D airspace Airspace management •Sharing of Airspace (No): Aerodrome operations Demand and capacity balancing •Efficiency: Minimize Delays; throughput; benchmarking Information management Safety management •Human Factors: training; certification; workload •Operational Safety: Operational errors; Operational Deviations; Pilot deviations; Collision avoidance; Terrain/obstacle avoidance Strategic conflict management		No
VILLAVICENCIO	42475	Low difficulty	Cat A: 45%; Cat B: 45%; Cat C: 10 %;	D	No	IMC: APV II	Yes Reason: We have id locations of traffic congestion that affect the traffic in Villavicencio: Eyp, Bog	4. Low Density	Coverage Vol - 100% over fixes & airways Availability - 9995 capacity - unlimited delays - 0	Coverage Vol - 100% over fixes & airways Availability - 9995% capacity - 100 delays - 0 Accuracy - 30'/95%	•Human Factors: training; certification; workload •Sharing of Airspace (No): •Regulations (yes): Class D airspace •Efficiency: Minimize Delays; throughput; benchmarking •Operational Safety: Operational errors; Operational Deviations; Pilot deviations; Collision avoidance; Terrain/obstacle avoidance		No
MEDELLIN	95226	Medium difficulty Require a lot of coordination	Cat A: 15%; Cat B: 15%; Cat C: 40 %; Cat D: 30%;	D	No	IMC: APV II	Yes Reason: We have id locations of traffic congestion that affect the traffic in Medellin: PEI	4. Low Density	Coverage Vol - 100% over fixes & airways Availability - 9995 capacity - unlimited delays - 0	Coverage Vol - 100% over fixes & airways Availability - 9995% capacity - 100 delays - 0 Accuracy - 30/95%	Airspace organization• Regulations (yes): Class D airspace Airspace management •Sharing of Airspace (No): Aerodrome operations Demand and capacity balancing •Efficiency: Minimize Delays; throughput; benchmarking Information management Safety management •Human Factors: training; certification; workload •Operational Safety: Operational errors; Operational Deviations; Pilot deviations; Collision avoidance; Terrain/obstacle avoidance Strategic conflict management	Difficult terrain coupled with significant amounts of adverse weather;	No

	Present to 2010												
AIRSPACE	Volumen esperado (expected volume) - number-	Convergencia de rutas (route convergence)	Categoria de aeronaves (category of aircraft: A, B, C,...) %	Categoria de espacio aereo (Airspace category: A, B, C, D...)	Convergencia y ptos conflicto entre SIDS, STARS (Convergence of, points of conflict between SIDS, STARS and other procedures)	Condiciones MET (Weather conditions)	Capacidad espac. Aer. Adyacentes (adjacent airspace capacities)	RNP	COM. NEEDS (Coverage, availability, capacity, delays)	SUR. NEEDS (Coverage, availability, capacity, delays, accuracy, latency, updating rate, resolution)	ATM NEEDS	Other consideratio ns e.g. Unusual Weather, Terrain, etc.	Diseño del espacio aéreo recomendado (recommended airspace design)
BOGOTA NE		No	Cat B: 40 % Cat C: 45%; Cat D: 15%;	E	No		No	4 Low Density	Coverage Vol - 100% over fixes & airways Availability - .9995 capacity - unlimited delays - 0	Coverage Vol - 100% over fixes & airways Availability - .9995% capacity - 100 delays - 0 Accuracy - 30'/95%	Airspace organization •Regulations (yes): Class D airspace Airspace management •Sharing of Airspace (No): Aerodrome operations Demand and capacity balancing •Efficiency: Minimize Delays; throughput; benchmarking Information management Safety management •Human Factors: training; certification; workload •Operational Safety: Operational errors; Operational Deviations; Pilot deviations; Collision avoidance; Terrain/obstacle avoidance Strategic conflict management		No
BOGOTA SE		No	Cat B: 40 % Cat C: 45%; Cat D: 15%;	E	No		No	4 Low Density	Coverage Vol - .100% over fixes & airways Availability - .9995 capacity - unlimited delays - 0	Coverage Vol - .100% over fixes & airways Availability - .9995% capacity - 100 delays - 0 Accuracy - 30'/95%	Airspace organization •Regulations (yes): Class D airspace Airspace management •Sharing of Airspace (No) Aerodrome operations Demand and capacity balancing •Efficiency: Minimize Delays; throughput; benchmarking Information management Safety management •Human Factors: training; certification; workload •Operational Safety: Operational errors; Operational Deviations; Pilot deviations; Collision avoidance; Terrain/obstacle avoidance Strategic conflict management		No

	Present to 2010												
AIRSPACE	Volumen esperado (expected volume) - number-	Convergencia de rutas (route convergence)	Categoria de aeronaves (category of aircraft: A, B, C,...) %	Categoria de espacio aereo (Airspace category: A, B, C, D...)	Convergencia y ptos conflicto entre SIDS, STARS (Convergence of, points of conflict between SIDS, STARS and other procedures)	Condiciones MET (Weather conditions)	Capacidad espac. Aer. Adyacentes (adjacent airspace capacities)	RNP	COM. NEEDS (Coverage, availability, capacity, delays)	SUR. NEEDS (Coverage, availability, capacity, delays, accuracy, latency, updating rate, resolution)	ATM NEEDS	Other consideratio ns e.g. Unusual Weather, Terrain, etc.	Diseño del espacio aéreo recomendado (recommended airspace design)
BARRANQUILLA N		Medium difficulty Require a lot of coordination	Cat B: 40 % Cat C: 45%; Cat D: 15%;	E	No		No	4 Low Density	Coverage Vol - 100% over fixes & airways Availability - .9995 capacity - unlimited delays - 0	Coverage Vol - 100% over fixes & airways Availability - .9995% capacity - 100 delays - 0 Accuracy - 30'/95%	Airspace organization •Regulations (yes): Class D airspace Airspace management •Sharing of Airspace (No): Aerodrome operations Demand and capacity balancing •Efficiency: Minimize Delays; throughput; benchmarking Information management Safety management •Human Factors: training; certification; workload •Operational Safety: Operational errors; Operational Deviations; Pilot deviations; Collision avoidance; Terrain/obstacle avoidance Strategic conflict management		No
BARRANQUILLA S		Medium difficulty Require a lot of coordination	Cat B: 40 % Cat C: 45%; Cat D: 15%;	E	No		No	4 Low Density	OLD1	Coverage Vol - 100% over fixes & airways Availability - .9995% capacity - 100 delays - 0 Accuracy - 30'/95%	Airspace organization •Regulations (yes): Class D airspace Airspace management •Sharing of Airspace (No): Aerodrome operations Demand and capacity balancing •Efficiency: Minimize Delays; throughput; benchmarking Information management Safety management •Human Factors: training; certification; workload •Operational Safety: Operational errors; Operational Deviations; Pilot deviations; Collision avoidance; Terrain/obstacle avoidance Strategic conflict management		No

	Present to 2010												
AIRSPACE	Volumen esperado (expected volume) - number-	Convergencia de rutas (route convergence)	Categoria de aeronaves (category of aircraft: A, B, C,...) %	Categoria de espacio aereo (Airspace category: A, B, C, D...)	Convergencia y ptos conflicto entre SIDS, STARS (Convergence of, points of conflict between SIDS, STARS and other procedures)	Condiciones MET (Weather conditions)	Capacidad espac. Aer. Adyacentes (adjacent airspace capacities)	RNP	COM. NEEDS (Coverage, availability, capacity, delays)	SUR. NEEDS (Coverage, availability, capacity, delays, accuracy, latency, updating rate, resolution)	ATM NEEDS	Other consideratio ns e.g. Unusual Weather, Terrain, etc.	Diseño del espacio aéreo recomendado (recommended airspace design)
CALI		Medium difficulty	Cat B: 55 % Cat C: 45%;	E	No		No	4 Low Density	OLDi	Coverage Vol - 100% over fixes & airways Availability - .9995% capacity - 100 delays - 0 Accuracy - 30'/95%	Airspace organization •Regulations (yes): Class D airspace Airspace management •Sharing of Airspace (No): Aerodrome operations Demand and capacity balancing •Efficiency: Minimize Delays; throughput; benchmarking Information management Safety management •Human Factors: training; certification; workload •Operational Safety: Operational errors; Operational Deviations; Pilot deviations; Collision avoidance; Terrain/obstacle avoidance Strategic conflict management		No
MEDELLIN		Medium difficulty Require a lot off coordination	Cat B: 55 % Cat C: 45%;	E	No		No	4 Low Density	OLD1 fine tune	Coverage Vol - 100% over fixes & airways Availability - .9995% capacity - 100 delays - 0 Accuracy - 30'/95%	Airspace organization •Regulations (yes): Class D airspace Airspace management •Sharing of Airspace (No): Aerodrome operations Demand and capacity balancing •Efficiency: Minimize Delays; throughput; benchmarking Information management Safety management •Human Factors: training; certification; workload •Operational Safety: Operational errors; Operational Deviations; Pilot deviations; Collision avoidance; Terrain/obstacle avoidance Strategic conflict management	Difficult terrain coupled with significant amounts of adverse weather; However, current operation is VFR only	No

	Present to 2010												
AIRSPACE	Volumen esperado (expected volume) - number-	Convergencia de rutas (route convergence)	Categoria de aeronaves (category of aircraft: A, B, C,...) %	Categoria de espacio aereo (Airspace category: A, B, C, D...)	Convergencia y ptos conflicto entre SIDS, STARS (Convergence of, points of conflict between SIDS, STARS and other procedures)	Condiciones MET (Weather conditions)	Capacidad espac. Aer. Adyacentes (adjacent airspace capacities)	RNP	COM. NEEDS (Coverage, availability, capacity, delays)	SUR. NEEDS (Coverage, availability, capacity, delays, accuracy, latency, updating rate, resolution)	ATM NEEDS	Other consideratio ns e.g. Unusual Weather, Terrain, etc.	Diseño del espacio aéreo recomendado (recommended airspace design)
NEIVA		No	Cat B: 55 % Cat C: 45%;	E	No		No	4. Low Density		Coverage Vol - 100% over fixes & airways Availability - 9995% capacity - 100 delays - 0 Accuracy - 30'/95%	Airspace organization •Regulations (yes): Class D airspace Airspace management •Sharing of Airspace (No): Aerodrome operations Demand and capacity balancing •Efficiency: Minimize Delays; throughput; benchmarking Information management Safety management •Human Factors: training; certification; workload •Operational Safety: Operational errors; Operational Deviations; Pilot deviations; Collision avoidance; Terrain/obstacle avoidance Strategic conflict management		No
Upper Area													
BOGOTA NW;NE;SW;SE		High difficulty Climbing and descending traffic Require a lot of coordination	Cat C: 40 %; Cat D: 45%; Cat E: 15%	A	Conflict points at: Bogota VOR Mariquita VOR Rionegro VOR East of Villavicencio VOR		Yes, Bogotá TMA, Barranquilla UTA, Brasil UTA	Regional dependent implementation	Coverage Vol - 100% over fixes & airways Availability - .9995 capacity - unlimited delays - 0 OLDI	Coverage Vol - 100% over fixes & airways Availability - .9995% capacity - 100 delays - 0 Accuracy - 30/95%	Airspace organization •Regulations (yes): Class D airspace Airspace management •Sharing of Airspace (No): Aerodrome operations Demand and capacity balancing •Efficiency: Minimize Delays; throughput; benchmarking Information management Safety management •Human Factors: training; certification; workload •Operational Safety: Operational errors; Operational Deviations; Pilot deviations; Collision avoidance; Terrain/obstacle avoidance Strategic conflict management	Close to reach Hight level congestion	Yes reason : to level the workload

	Present to 2010												
AIRSPACE	Volumen esperado (expected volume) - number-	Convergencia de rutas (route convergence)	Categoria de aeronaves (category of aircraft: A, B, C,...) %	Categoria de espacio aereo (Airspace category: A, B, C, D...)	Convergencia y ptos conflicto entre SIDS, STARS (Convergence of, points of conflict between SIDS, STARS and other procedures)	Condiciones MET (Weather conditions)	Capacidad espac. Aer. Adyacentes (adjacent airspace capacities)	RNP	COM. NEEDS (Coverage, availability, capacity, delays)	SUR. NEEDS (Coverage, availability, capacity, delays, accuracy, latency, updating rate, resolution)	ATM NEEDS	Other consideratio ns e.g. Unusual Weather, Terrain, etc.	Diseño del espacio aéreo recomendado (recommended airspace design)
BARRANQUILLA N; S		High difficulty Require a lot of coordination	Cat C: 40 %; Cat D: 45%; Cat E: 15%	A	Conflict points at : Ugota intersection Magangue VOR Bivos intersection		Yes, Bogotá UTA, Kingston UTA	Regional dependent implementation	Coverage Vol - 100% over fixes & airways Availability - .9995 capacity - unlimited delays - 0 OLDI	Coverage Vol - 100% over fixes & airways Availability - .9995% capacity - 100 delays - 0 Accuracy - 30/95%	Airspace organization •Regulations (yes): Class D airspace Airspace management •Sharing of Airspace (No): Aerodrome operations Demand and capacity balancing workload •Efficiency: Minimize Delays; throughput; benchmarking Information management Safety management •Human Factors: training; certification; •Operational Safety: Operational errors; Operational Deviations; Pilot deviations; Collision avoidance; Terrain/obstacle avoidance Strategic conflict management	Close to reach Hight level congestion	No

	2011 – 2015												
AIRSPACE	Volumen esperado (expected volume) - number-	Convergencia de rutas (route convergence)	Categoria de aeronaves (category of aircraft: A, B, C,...) %	Categoria de espacio aereo (Airspace category: A, B, C, D...)	Convergencia y ptos conflicto entre SIDS, STARS (Convergence of, points of conflict between SIDS, STARS and other procedures)	Condiciones MET (Weather conditions)	Capacidad espac. Aer. Adyacentes (adjacent airspace capacities)	RNP	COM. NEEDS (Coverage, availability, capacity, delays)	SUR. NEEDS (Coverage, availability, capacity, delays, accuracy, latency, updating rate, resolution)	ATM NEEDS	Other considerations e.g. Unusual Weather, Terrain, etc.	Diseño del espacio aéreo recomendado (recommended airspace design)
BOGOTA	279540	Medium	Cat B: 25%; Cat C: 30%; Cat D: 35%; Cat E: 10%	A	YES. Because SIDS, ST	IMC: IFR - Cat II	Yes. Reason: We have id locations of traffic congestion that affect the traffic in Bog: Med, Mqu, Clo, Mtr, Buvis, Otu, Bga, Pei	1. Because: High density terminal	Coverage - 100% Availability - 100% capacity - unlimited delays - 0	Back up radar heads to Establish full radar control	Airspace organization Airspace management Aerodrome operations Demand and capacity balancing Information management Safety management Conflict management Separation provision Collision avoidance ATM service delivery management	It could be necessary to reduce de runway time occupation and eliminate taxi restrictions to increase the capability. It could be necessary to implement free flight and an information management system	Re-evaluate
BARRANQUILLA	673,314	Low	Cat A: 10%; Cat B: 25%; Cat C: 30%; Cat D: 25%; Cat E: 10 %	D	Yes	IMC: IFR - Cat II	No	1. Because: High density terminal	Coverage - 100% Availability - 100% capacity - unlimited delays - 0	Increase the Coverage in Oceanic airspace	Airspace organization Airspace management Aerodrome operations Demand and capacity balancing Information management Safety management Conflict management Separation provision Collision avoidance ATM service delivery management		Re-evaluate
CALI	73,441	Low	Cat A: 10%; Cat B: 25%; Cat C: 30%; Cat D: 30%; Cat E: 5%	D	Yes	IMC: IFR - Cat II	Yes. Reason: We have id locations of traffic congestion that affect the traffic in Cali	1. Because: High density terminal	Coverage - 100% Availability - 100% capacity - unlimited delays - 0		Airspace organization Airspace management. Aerodrome operations Demand and capacity balancing Information management Safety management Conflict management Separation provision Collision avoidance ATM service delivery management	Difficult terrain coupled with significant amounts of adverse weather	Re-evaluate

	2011 – 2015												
AIRSPACE	**Volumen esperado (expected volume) - number-**	**Convergencia de rutas (route convergence)**	**Categoria de aeronaves (category of aircraft: A, B, C,...) %**	**Categoria de espacio aereo (Airspace category: A, B, C, D...)**	**Convergencia y ptos conflicto entre SIDS, STARS (Convergence of, points of conflict between SIDS, STARS and other procedures)**	**Condiciones MET (Weather conditions)**	**Capacidad espac. Aer. Adyacentes (adjacent airspace capacities)**	**RNP**	**COM. NEEDS (Coverage, availability, capacity, delays)**	**SUR. NEEDS (Coverage, availability, capacity, delays, accuracy, latency, updating rate, resolution)**	**ATM NEEDS**	**Other consideratio ns e.g. Unusual Weather, Terrain, etc.**	**Diseño del espacio aéreo recomendado (recommended airspace design)**
PEREIRA	29,308	Medium	Cat A: 10%; Cat B: 15%; Cat C: 35%; Cat D: 40%;	D		IMC: IFR - Cat I	Yes Reason: We have id locations of traffic congestion that affect the traffic in Pereira: Med, Clo, Bog	2. Low Density	Coverage - 100% Availability - 100% capacity - unlimited delays - 0		Airspace organization Airspace management Aerodrome operations Demand and capacity balancing Information management Safety management Conflict management Separation provision Collision avoidance ATM service delivery management	Difficult terrain coupled with significant amounts of adverse weather	Re-evaluate
SAN ANDRES	14,388	No	Cat B: 15 %; Cat C: 35%; Cat D: 50%;	D		IMC: IFR - Cat I	No	2. Low Density	Coverage - 100% Availability - 100% capacity - unlimited delays - 0		Airspace organization Airspace management Aerodrome operations Demand and capacity balancing Information management Safety management Conflict management Separation provision Collision avoidance ATM service delivery management		Re-evaluate
BUCARAMANGA	35,636	Low	Cat A: 10 %; Cat B: 25 %; Cat C: 40%; Cat D: 25%;	D		IMC: IFR - Cat I	Yes Reason: We have id locations of traffic congestion that affect the traffic in Bucaramanga: Cuc, Eyp, Bog	2. Low Density	Coverage - 100% Availability - 100% capacity - unlimited delays - 0		Airspace organization Airspace management Aerodrome operations Demand and capacity balancing Information management Safety management Conflict management Separation provision Collision avoidance ATM service delivery management	It could be necessary to match safety requirements to establish precision approaches and increase the Bucaramanga airport operation availability	Re-evaluate

	2011 – 2015												
AIRSPACE	Volumen esperado (expected volume) - number-	Convergencia de rutas (route convergence)	Categoria de aeronaves (category of aircraft: A, B, C,...) %	Categoria de espacio aereo (Airspace category: A, B, C, D...)	Convergencia y ptos conflicto entre SIDS, STARS (Convergence of, points of conflict between SIDS, STARS and other procedures)	Condiciones MET (Weather conditions)	Capacidad espac. Aer. Adyacentes (adjacent airspace capacities)	RNP	COM. NEEDS (Coverage, availability, capacity, delays)	SUR. NEEDS (Coverage, availability, capacity, delays, accuracy, latency, updating rate, resolution)	ATM NEEDS	Other considerations e.g. Unusual Weather, Terrain, etc.	Diseño del espacio aéreo recomendado (recommended airspace design)
CUCUTA	20,524	Low	Cat A: 10 %; Cat B: 25 %; Cat C: 40% Cat D: 25%;	D		IMC: IFR - Cat I	Yes. Reason: We have id locations of traffic congestion that affect the traffic in Cucuta: Bga	2. Low Density	Coverage - 100% Availability - 100% capacity - unlimited delays - 0		Airspace organization Airspace management Aerodrome operations Demand and capacity balancing Information management Safety management Conflict management Separation provision Collision avoidance ATM service delivery management	Difficult terrain coupled with significant amounts of adverse weather	Re-evaluate
ANDES	2,009	No	Cat A: 10 %; Cat B: 25 %; Cat C: 45%; Cat D: 20%;	D		IMC: IFR - Cat I	No	2. Low Density	Coverage - 100% Availability - 100% capacity - unlimited delays - 0		Airspace organization Airspace management Aerodrome operations Demand and capacity balancing Information management Safety management Conflict management Separation provision Collision avoidance ATM service delivery management	Difficult terrain coupled with significant amounts of adverse weather	Re-evaluate
LETICIA	4,356	No	Cat A: 10%; Cat B: 15%; Cat C: 40%; Cat D: 35%;	D		IMC: IFR - Cat I	No	2. Low Density	Coverage - 100% Availability - 100% capacity - unlimited delays - 0		Airspace organization Airspace management Aerodrome operations Demand and capacity balancing Information management Safety management Conflict management Separation provision Collision avoidance ATM service delivery management		Re-evaluate

	2011 – 2015												
AIRSPACE	Volumen esperado (expected volume) - number-	Convergencia de rutas (route convergence)	Categoria de aeronaves (category of aircraft: A, B, C,...) %	Categoria de espacio aereo (Airspace category: A, B, C, D...)	Convergencia y ptos conflicto entre SIDS, STARS (Convergence of, points of conflict between SIDS, STARS and other procedures)	Condiciones MET (Weather conditions)	Capacidad espac. Aer. Adyacentes (adjacent airspace capacities)	RNP	COM. NEEDS (Coverage, availability, capacity, delays)	SUR. NEEDS (Coverage, availability, capacity, delays, accuracy, latency, updating rate, resolution)	ATM NEEDS	Other consideratio ns e.g. Unusual Weather, Terrain, etc.	Diseño del espacio aéreo recomendado (recommended airspace design)
VILLAVICENCIO	49,720	Medium	Cat A: 45%; Cat B: 40%; Cat C: 15 %;	D		IMC: IFR - Cat I	Yes Reason: We have id locations of traffic congestion that affect the traffic in Villavicencio: Eyp, Bog	2. Low Density	Coverage - 100% Availability - 100% capacity - unlimited delays - 0		Airspace organization Airspace management Aerodrome operations Demand and capacity balancing Information management Safety management Conflict management Separation provision Collision avoidance ATM service delivery management	It could be necessary to relocate the Villavicencio Airport to increase the operation time	Re-evaluate
MEDELLIN	111,400	Medium	Cat A: 15%; Cat B: 15%; Cat C: 35 %; Cat D: 35%;	D	No	IMC: IFR - Cat I	Yes Reason: We have id locations of traffic congestion that affect the traffic in Medellin: PEI	2. Low Density	Coverage - 100% Availability - 100% capacity - unlimited delays - 0		Airspace organization Airspace management Aerodrome operations Demand and capacity balancing Information management Safety management Conflict management Separation provision Collision avoidance ATM service delivery management	Difficult terrain coupled with significant amounts of adverse weather;	Re-evaluate
BOGOTA NE			Cat B: 40 % Cat C: 40%; Cat D: 20%;	E	No		No	4. Low Density	Coverage Vol - .100% over fixes & airways Availability - .9995 capacity - unlimited delays - 0	Coverage Vol - .100% over fixes & airways Availability - .9995% capacity - 100 delays - 0 Accuracy - 30'/95%	Airspace organization Airspace management Aerodrome operations Demand and capacity balancing Information management Safety management Conflict management Separation provision Collision avoidance ATM service delivery management		No

	2011 – 2015												
AIRSPACE	Volumen esperado (expected volume) - number-	Convergencia de rutas (route convergence)	Categoria de aeronaves (category of aircraft: A, B, C,...) %	Categoria de espacio aereo (Airspace category: A, B, C, D...)	Convergencia y ptos conflicto entre SIDS, STARS (Convergence of, points of conflict between SIDS, STARS and other procedures)	Condiciones MET (Weather conditions)	Capacidad espac. Aer. Adyacentes (adjacent airspace capacities)	RNP	COM. NEEDS (Coverage, availability, capacity, delays)	SUR. NEEDS (Coverage, availability, capacity, delays, accuracy, latency, updating rate, resolution)	ATM NEEDS	Other consideratio ns e.g. Unusual Weather, Terrain, etc.	Diseño del espacio aéreo recomendado (recommended airspace design)
BOGOTA SE			Cat B: 40 % Cat C: 40%; Cat D: 20%;	E	No		No	4. Low Density	Coverage Vol - .100% over fixes & airways Availability - .9995 capacity - unlimited delays - 0	Coverage Vol - .100% over fixes & airways Availability - .9995% capacity - 100 delays - 0 Accuracy - 30'/95%	Airspace organization Airspace management Aerodrome operations Demand and capacity balancing Information management Safety management Conflict management Separation provision Collision avoidance ATM service delivery management		No
BARRANQUILLA N			Cat B: 40 % Cat C: 40%; Cat D: 20%;	E	No		No	4. Low Density	Coverage Vol - .100% over fixes & airways Availability - .9995 capacity - unlimited delays - 0	Coverage Vol - .100% over fixes & airways Availability - .9995% capacity - 100 delays - 0 Accuracy - 30'/95%	Airspace organization Airspace management Aerodrome operations Demand and capacity balancing Information management Safety management Conflict management Separation provision Collision avoidance ATM service delivery management		No
BARRANQUILLA S			Cat B: 40 % Cat C: 40%; Cat D: 20%;	E	No		No	4. Low Density	OLDI	Coverage Vol - .100% over fixes & airways Availability - .9995% capacity - 100 delays - 0 Accuracy - 30'/95%	Airspace organization Airspace management Aerodrome operations Demand and capacity balancing Information management Safety management Conflict management Separation provision Collision avoidance ATM service delivery management		No

	2011 – 2015												
AIRSPACE	Volumen esperado (expected volume) - number-	Convergencia de rutas (route convergence)	Categoria de aeronaves (category of aircraft: A, B, C,...) %	Categoria de espacio aereo (Airspace category: A, B, C, D...)	Convergencia y ptos conflicto entre SIDS, STARS (Convergence of, points of conflict between SIDS, STARS and other procedures)	Condiciones MET (Weather conditions)	Capacidad espac. Aer. Adyacentes (adjacent airspace capacities)	RNP	COM. NEEDS (Coverage, availability, capacity, delays)	SUR. NEEDS (Coverage, availability, capacity, delays, accuracy, latency, updating rate, resolution)	ATM NEEDS	Other consideratio ns e.g. Unusual Weather, Terrain, etc.	Diseño del espacio aéreo recomendado (recommended airspace design)
CALI			Cat B: 55 % Cat C: 45%;	E	No		No	4. Low Density	OLDi	Coverage Vol - .100% over fixes & airways Availability - .9995% capacity - 100 delays - 0 Accuracy - 30'/95%	Airspace organization Airspace management Aerodrome operations Demand and capacity balancing Information management Safety management Conflict management Separation provision Collision avoidance ATM service delivery management		No
MEDELLIN			Cat B: 55 % Cat C: 45%;	E	No		No	4. Low Density	OLDI fine tune	Coverage Vol - 100% over fixes & airways Availability - .9995% capacity - 100 delays - 0 Accuracy - 30'/95%	Airspace organization Airspace management Aerodrome operations Demand and capacity balancing Information management Safety management Conflict management Separation provision Collision avoidance ATM service delivery management	Difficult terrain coupled with significant amounts of adverse weather; However, current operation is VFR only	No
NEIVA			Cat B: 50 % Cat C: 50 %;	E	No		No	4. Low Density		Coverage Vol - .100% over fixes & airways Availability - .9995% capacity - 100 delays - 0 Accuracy - 30'/95%	Airspace organization Airspace management Aerodrome operations Demand and capacity balancing Information management Safety management Conflict management Separation provision Collision avoidance ATM service delivery management		No

	2011 – 2015												
AIRSPACE	**Volumen esperado (expected volume) - number-**	**Convergencia de rutas (route convergence)**	**Categoria de aeronaves (category of aircraft: A, B, C,...) %**	**Categoria de espacio aereo (Airspace category: A, B, C, D...)**	**Convergencia y ptos conflicto entre SIDS, STARS (Convergence of, points of conflict between SIDS, STARS and other procedures)**	**Condiciones MET (Weather conditions)**	**Capacidad espac. Aer. Adyacentes (adjacent airspace capacities)**	**RNP**	**COM. NEEDS (Coverage, availability, capacity, delays)**	**SUR. NEEDS (Coverage, availability, capacity, delays, accuracy, latency, updating rate, resolution)**	**ATM NEEDS**	**Other consideratio ns e.g. Unusual Weather, Terrain, etc.**	**Diseño del espacio aéreo recomendado (recommended airspace design)**
BOGOTA NW;NE;SW;SE		high,	Cat C: 35 %; Cat D: 45%; Cat E: 20%	A	Conflict points at: Bogota VOR Mariquita VOR Rionegro VOR East of Villavicencio VOR		Yes, Bogotá TMA, Barranquilla UTA, Brasil UTA	Regional dependent implementation	Coverage Vol - 100% over fixes & airways Availability - .9995 capacity - unlimited delays - 0 OLDI CPDLC	Coverage Vol - 100% over fixes & airways Availability - .9995% capacity - 100 delays - 0 Accuracy - 30/95% ADS Implementation	Airspace organization Airspace management. Aerodrome operations Demand and capacity balancing Information management Safety management Conflict management Separation provision Collision avoidance ATM service delivery management	Hight level congestion	Yes reason : to level the workload
BARRANQUILLA N; S		High,	Cat C: 35 %; Cat D: 45%, Cat E: 20%	A	Conflict points at : Ugota intersection Magangue VOR Bivos intersection		Yes, Bogotá UTA, Kingston UTA	Regional dependent implementation	Coverage Vol - 100% over fixes & airways Availability - .9995 capacity - unlimited delays - 0 OLDI CPDLC	Coverage Vol - 100% over fixes & airways Availability - .9995% capacity - 100 delays - 0 Accuracy - 30/95% ADS Implementation	Airspace organization Airspace management. Aerodrome operations Demand and capacity balancing Information management Safety management Conflict management Separation provision Collision avoidance ATM service delivery management	Hight level congestion	No

2016 - 2019													
AIRSPACE	Volumen esperado (expected volume) - number-	Convergencia de rutas (route convergence)	Categoria de aeronaves (category of aircraft: A, B, C,...) %	Categoria de espacio aereo (Airspace category: A, B, C, D...)	Convergencia y ptos conflicto entre SIDS, STARS (Convergence of, points of conflict between SIDS, STARS and other procedures)	Condiciones MET (Weather conditions)	Capacidad espac. Aer. Adyacentes (adjacent airspace capacities)	RNP	COM. NEEDS (Coverage, availability, capacity, delays)	SUR. NEEDS (Coverage, availability, capacity, delays, accuracy, latency, updating rate, resolution)	ATM NEEDS	Other consideratio ns e.g. Unusual Weather, Terrain, etc.	Diseño del espacio aéreo recomendado (recommended airspace design)
BOGOTA	317079	Medium	Cat B: 20%; Cat C: 30%; Cat D: 35%; Cat E: 15%	B	Conflict points elimination by means of segregation or synchronism	IMC: IFR - Cat III	Yes. Reason: It has locations of traffic congestion that affect the traffic in Bog: Med, Mqu, Clo, Mir, Buvis, Otu, Bga, Pei.	0.3. Because: High density terminal	Coverage - 100% Availability - 100% capacity - unlimited delays - 0	ADS B and multilateration compability Under second refreshment period	Airspace organization Airspace management Aerodrome operations Demand and capacity balancing Information management Safety management Conflict management Separation provision Collision avoidance Traffic synchronization Airspace user operations ATM service delivery management		Re-evaluate
BARRANQUILLA	76352	Low	Cat A: 10%; Cat B: 20%; Cat C: 30%; Cat D: 25%; Cat E: 15 %	C	Yes	IMC: IFR - Cat III	No	0.3. Because: High density terminal	Coverage - 100% Availability - 100% capacity - unlimited delays - 0	Coverage Vol - 100% over fixes & airways Availability - 9995 capacity - 200 delays - 0 Accuracy - 30'/95% Back up system for contingence plan	Airspace organization Airspace management Aerodrome operations Demand and capacity balancing Information management Safety management Conflict management Separation provision Collision avoidance Traffic synchronization Airspace user operations ATM service delivery management		Re-evaluate

2016 - 2019

AIRSPACE	Volumen esperado (expected volume) - number-	Convergencia de rutas (route convergence)	Categoria de aeronaves (category of aircraft: A, B, C,...) %	Categoria de espacio aereo (Airspace category: A, B, C, D...)	Convergencia y ptos conflicto entre SIDS, STARS (Convergence of, points of conflict between SIDS, STARS and other procedures)	Condiciones MET (Weather conditions)	Capacidad espac. Aer. Adyacentes (adjacent airspace capacities)	RNP	COM. NEEDS (Coverage, availability, capacity, delays)	SUR. NEEDS (Coverage, availability, capacity, delays, accuracy, latency, updating rate, resolution)	ATM NEEDS	Other consideratio ns e.g. Unusual Weather, Terrain, etc.	Diseño del espacio aéreo recomendado (recommended airspace design)
CALI	83302	Low	Cat A: 10%; Cat B: 20%; Cat C: 30%; Cat D: 30%; Cat E: 10%	D	Yes	IMC: IFR - Cat III	Yes Reason: We have id locations of traffic congestion that affect the traffic in Cali	0.3 Because: High density terminal	Coverage - 100% Availability - 100% capacity - unlimited delays - 0	ADS B and multilateration compability Under second refreshment period	Airspace organization Airspace management Aerodrome operations Demand and capacity balancing Information management Safety management Conflict management Separation provision Collision avoidance Traffic synchronization Airspace user operations ATM service delivery management	Difficult terrain coupled with significant amounts of adverse weather	Re-evaluate
PEREIRA	33243	Medium	Cat A: 10%; Cat B: 15%; Cat C: 35%; Cat D: 40%;	C		IMC: IFR - Cat I	Yes Reason: We have id locations of traffic congestion that affect the traffic in Pereira: Med, Clo, Bog	1 Low Density	Coverage - 100% Availability - 100% capacity - unlimited delays - 0	Coverage Vol - 100% over fixes & airways Availability - 9995 capacity - 200 delays - 0 Accuracy - 30'/95% Back up system for contingence plan	Airspace organization Airspace management Aerodrome operations Demand and capacity balancing Information management Safety management Conflict management Separation provision Collision avoidance Traffic synchronization Airspace user operations ATM service delivery management	Difficult terrain coupled with significant amounts of adverse weather	Re-evaluate

2016 - 2019

AIRSPACE	Volumen esperado (expected volume) - number-	Convergencia de rutas (route convergence)	Categoria de aeronaves (category of aircraft: A, B, C,...) %	Categoria de espacio aereo (Airspace category: A, B, C, D...)	Convergencia y ptos conflicto entre SIDS, STARS (Convergence of, points of conflict between SIDS, STARS and other procedures)	Condiciones MET (Weather conditions)	Capacidad espac. Aer. Adyacentes (adjacent airspace capacities)	RNP	COM. NEEDS (Coverage, availability, capacity, delays)	SUR. NEEDS (Coverage, availability, capacity, delays, accuracy, latency, updating rate, resolution)	ATM NEEDS	Other consideratio ns e.g. Unusual Weather, Terrain, etc.	Diseño del espacio aéreo recomendado (recommended airspace design)
SAN ANDRES	16320	No	Cat B: 1 0 %; Cat C: 40 %; Cat D: 50%;	D		IMC: IFR - Cat I	No	I. Low Density	Coverage - 100% Availability - 100% capacity - unlimited delays - 0		Airspace organization Airspace management Aerodrome operations Demand and capacity balancing Information management Safety management Conflict management Separation provision Collision avoidance Traffic synchronization Airspace user operations ATM service delivery management		Re-evaluate
BUCARAMANGA	40421	Low	Cat A: 10 %; Cat B: 20 %; Cat C: 40%; Cat D: 30%;	C		IMC: IFR - Cat I	Yes. Reason: We have id locations of traffic congestion that affect the traffic in Bucaramanga: Cuc, Eyp, Bog	I. Low Density	Coverage - 100% Availability - 100% capacity - unlimited delays - 0	Coverage Vol - 100% over fixes & airways Availability - 9995 capacity - 200 delays - 0 Accuracy - 30'/95% Back up system for contingence plan	Airspace organization Airspace management. Aerodrome operations Demand and capacity balancing Information management Safety management Conflict management Separation provision Collision avoidance Traffic synchronization Airspace user operations ATM service delivery management	It culd be necesaary to match safety requieremementes to stablesh precision aproaches and increase the Bucaramanga airport operation availability	Re-evaluate

2016 - 2019

AIRSPACE	Volumen esperado (expected volume) - number-	Convergencia de rutas (route convergence)	Categoria de aeronaves (category of aircraft: A, B, C,...) %	Categoria de espacio aereo (Airspace category: A, B, C, D...)	Convergencia y ptos conflicto entre SIDS, STARS (Convergence of, points of conflict between SIDS, STARS and other procedures)	Condiciones MET (Weather conditions)	Capacidad espac. Aer. Adyacentes (adjacent airspace capacities)	RNP	COM. NEEDS (Coverage, availability, capacity, delays)	SUR. NEEDS (Coverage, availability, capacity, delays, accuracy, latency, updating rate, resolution)	ATM NEEDS	Other consideratio ns e.g. Unusual Weather, Terrain, etc.	Diseño del espacio aéreo recomendado (recommended airspace design)
CUCUTA	23280	Low	Cat A: 10 %; Cat B: 20 %; Cat C: 40% Cat D: 30%;	C		IMC: IFR - Cat I	Yes Reason: We have id locations of traffic congestion that affect the traffic in Cucuta: Bga	I. Low Density	Coverage - 100% Availability - 100% capacity - unlimited delays - 0	Coverage Vol - 100% over fixes & airways Availability - 9995 capacity - 200 delays - 0 Accuracy - 30/95% Back up system for contingence plan	Airspace organization Airspace management Aerodrome operations Demand and capacity balancing Information management Safety management Conflict management Separation provision Collision avoidance Traffic synchronization Airspace user operations ATM service delivery management	Difficult terrain coupled with significant amounts of adverse weather	Re-evaluate
ANDES	2279	No	Cat A: 10 %; Cat B: 25 %; Cat C: 45%; Cat D: 20%;	D		IMC: IFR - Cat I	No	I. Low Density	Coverage - 100% Availability - 100% capacity - unlimited delays - 0		Airspace organization Airspace management Aerodrome operations Demand and capacity balancing Information management Safety management Conflict management Separation provision Collision avoidance Traffic synchronization Airspace user operations ATM service delivery management	Difficult terrain coupled with significant amounts of adverse weather	Re-evaluate

2016 - 2019

AIRSPACE	Volumen esperado (expected volume) - number-	Convergencia de rutas (route convergence)	Categoria de aeronaves (category of aircraft: A, B, C,...) %	Categoria de espacio aereo (Airspace category: A, B, C, D...)	Convergencia y ptos conflicto entre SIDS, STARS (Convergence of, points of conflict between SIDS, STARS and other procedures)	Condiciones MET (Weather conditions)	Capacidad espac. Aer. Adyacentes (adjacent airspace capacities)	RNP	COM. NEEDS (Coverage, availability, capacity, delays)	SUR. NEEDS (Coverage, availability, capacity, delays, accuracy, latency, updating rate, resolution)	ATM NEEDS	Other considerations e.g. Unusual Weather, Terrain, etc.	Diseño del espacio aéreo recomendado (recommended airspace design)
LETICIA	4941	No	Cat A: 10%; Cat B: 15%; Cat C: 35%; Cat D: 40%;	D		IMC: IFR - Cat I	No	1. Low Density	Coverage - 100% Availability - 100% capacity - unlimited delays - 0		Airspace organization Airspace management Aerodrome operations Demand and capacity balancing Information management Safety management Conflict management Separation provision Collision avoidance Traffic synchronization Airspace user operations ATM service delivery management		Re-evaluate
VILLAVICENCIO	56396	Medium	Cat A: 45%; Cat B: 35%; Cat C: 20 %;	D		IMC: IFR - Cat I	Yes Reason: We have id locations of traffic congestion that affect the traffic in Villavicencio: Eyp, Bog	1. Low Density	Coverage - 100% Availability - 100% capacity - unlimited delays - 0		Airspace organization Airspace management Aerodrome operations Demand and capacity balancing Information management Safety management Conflict management Separation provision Collision avoidance Traffic synchronization Airspace user operations ATM service delivery management	It could be necesary to relocate the Villavicencio Airport to increase the operation time	Re-evaluate

2016 - 2019

AIRSPACE	Volumen esperado (expected volume) - number-	Convergencia de rutas (route convergence)	Categoria de aeronaves (category of aircraft: A, B, C,...) %	Categoria de espacio aereo (Airspace category: A, B, C, D...)	Convergencia y ptos conflicto entre SIDS, STARS (Convergence of, points of conflict between SIDS, STARS and other procedures)	Condiciones MET (Weather conditions)	Capacidad espac. Aer. Adyacentes (adjacent airspace capacities)	RNP	COM. NEEDS (Coverage, availability, capacity, delays)	SUR. NEEDS (Coverage, availability, capacity, delays, accuracy, latency, updating rate, resolution)	ATM NEEDS	Other consideratio ns e.g. Unusual Weather, Terrain, etc.	Diseño del espacio aéreo recomendado (recommended airspace design)
MEDELLIN	126357	Medium	Cat A: 15%; Cat B: 15%; Cat C: 35 %; Cat D: 35%;	C	No	IMC: IFR - Cat I	Yes Reason: We have id locations of traffic congestion that affect the traffic in Medellin: PEI	1 Low Density	Coverage - 100% Availability - 100% capacity - unlimited delays - 0	ADS B and multilateration compability Under second refreshment period	Airspace organization Airspace management Aerodrome operations Demand and capacity balancing Information management Safety management Conflict management Separation provision Collision avoidance Traffic synchronization Airspace user operations ATM service delivery management	Difficult terrain coupled with significant amounts of adverse weather;	Re-evaluate
BOGOTA NE			Cat B: 35 % Cat C: 40%; Cat D: 25%;	D	No		No	4 Low Density	Coverage Vol - .100% over fixes & airways Availability - .9995 capacity - unlimited delays - 0	Coverage Vol - .100% over fixes & airways Availability - .9995% capacity - 100 delays - 0 Accuracy - 30/95%	Airspace organization Airspace management Aerodrome operations Demand and capacity balancing Information management Safety management Conflict management Separation provision Collision avoidance Traffic synchronization Airspace user operations ATM service delivery management		No

2016 - 2019

AIRSPACE	Volumen esperado (expected volume) - number-	Convergencia de rutas (route convergence)	Categoria de aeronaves (category of aircraft: A, B, C,...) %	Categoria de espacio aereo (Airspace category: A, B, C, D...)	Convergencia y ptos conflicto entre SIDS, STARS (Convergence of, points of conflict between SIDS, STARS and other procedures)	Condiciones MET (Weather conditions)	Capacidad espac. Aer. Adyacentes (adjacent airspace capacities)	RNP	COM. NEEDS (Coverage, availability, capacity, delays)	SUR. NEEDS (Coverage, availability, capacity, delays, accuracy, latency, updating rate, resolution)	ATM NEEDS	Other considerations e.g. Unusual Weather, Terrain, etc.	Diseño del espacio aéreo recomendado (recommended airspace design)
BOGOTA SE			Cat B: 35 % Cat C: 40%; Cat D: 25%;	D	No		No	4. Low Density	Coverage Vol - 100% over fixes & airways Availability - 9995 capacity - unlimited delays - 0	Coverage Vol - 100% over fixes & airways Availability - 9995% capacity - 100 delays - 0 Accuracy - 30/95%	Airspace organization Airspace management Aerodrome operations Demand and capacity balancing Information management Safety management Conflict management Separation provision Collision avoidance Traffic synchronization Airspace user operations ATM service delivery management		No
BARRANQUILLA N			Cat B: 35 % Cat C: 40%; Cat D: 25%;	D	No		No	4. Low Density	Coverage Vol - 100% over fixes & airways Availability - 9995 capacity - unlimited delays - 0	Coverage Vol - 100% over fixes & airways Availability - 9995% capacity - 100 delays - 0 Accuracy - 30/95%	Airspace organization Airspace management Aerodrome operations Demand and capacity balancing Information management Safety management Conflict management Separation provision Collision avoidance Traffic synchronization Airspace user operations ATM service delivery management		No

2016 - 2019

AIRSPACE	Volumen esperado (expected volume) - number-	Convergencia de rutas (route convergence)	Categoria de aeronaves (category of aircraft: A, B, C,...) %	Categoria de espacio aereo (Airspace category: A, B, C, D...)	Convergencia y ptos conflicto entre SIDS, STARS (Convergence of, points of conflict between SIDS, STARS and other procedures)	Condiciones MET (Weather conditions)	Capacidad espac. Aer. Adyacentes (adjacent airspace capacities)	RNP	COM. NEEDS (Coverage, availability, capacity, delays)	SUR. NEEDS (Coverage, availability, capacity, delays, accuracy, latency, updating rate, resolution)	ATM NEEDS	Other consideratio ns e.g. Unusual Weather, Terrain, etc.	Diseño del espacio aéreo recomendado (recommended airspace design)
BARRANQUILLAS			Cat B: 35 % Cat C: 40%; Cat D: 25%;	D	No		No	4. Low Density	OLDI	Coverage Vol - 100% over fixes & airways Availability - 9995% capacity - 100 delays - 0 Accuracy - 30'/95%	Airspace organization Airspace management Aerodrome operations Demand and capacity balancing Information management Safety management Conflict management Separation provision Collision avoidance Traffic synchronization Airspace user operations ATM service delivery management		No
CALI			Cat B: 50 % Cat C: 50%;	D	No		No	4. Low Density	OLDi	Coverage Vol - 100% over fixes & airways Availability - 9995% capacity - 100 delays - 0 Accuracy - 30'/95%	Airspace organization Airspace management Aerodrome operations Demand and capacity balancing Information management Safety management Conflict management Separation provision Collision avoidance Traffic synchronization Airspace user operations ATM service delivery management		No

2016 - 2019

AIRSPACE	Volumen esperado (expected volume) - number-	Convergencia de rutas (route convergence)	Categoria de aeronaves (category of aircraft: A, B, C,...) %	Categoria de espacio aereo (Airspace category: A, B, C, D...)	Convergencia y ptos conflicto entre SIDS, STARS (Convergence of, points of conflict between SIDS, STARS and other procedures)	Condiciones MET (Weather conditions)	Capacidad espac. Aer. Adyacentes (adjacent airspace capacities)	RNP	COM. NEEDS (Coverage, availability, capacity, delays)	SUR. NEEDS (Coverage, availability, capacity, delays, accuracy, latency, updating rate, resolution)	ATM NEEDS	Other consideratio ns e.g. Unusual Weather, Terrain, etc.	Diseño del espacio aéreo recomendado (recommended airspace design)
MEDELLIN			Cat B: 50 % Cat C: 50%;	D	No		No	4 Low Density	OLDI fine tune	Coverage Vol - 100% over fixes & airways Availability - 9995% capacity - 100 delays - 0 Accuracy - 30'/95%	Airspace organization Airspace management Aerodrome operations Demand and capacity balancing Information management Safety management Conflict management Separation provision Collision avoidance Traffic synchronization Airspace user operations ATM service delivery management	Difficult terrain coupled with significant amounts of adverse weather, However, current operation is VFR only	No
NEIVA			Cat B: 45 % Cat C: 55 %;	D	No		No	4 Low Density		Coverage Vol - 100% over fixes & airways Availability - 9995% capacity - 100 delays - 0 Accuracy - 30'/95%	Airspace organization Airspace management Aerodrome operations Demand and capacity balancing Information management Safety management Conflict management Separation provision Collision avoidance Traffic synchronization Airspace user operations ATM service delivery management		No

2016 - 2019

AIRSPACE	Volumen esperado (expected volume) - number-	Convergencia de rutas (route convergence)	Categoria de aeronaves (category of aircraft: A, B, C,...) %	Categoria de espacio aereo (Airspace category: A, B, C, D...)	Convergencia y ptos conflicto entre SIDS, STARS (Convergence of, points of conflict between SIDS, STARS and other procedures)	Condiciones MET (Weather conditions)	Capacidad espac. Aer. Adyacentes (adjacent airspace capacities)	RNP	COM. NEEDS (Coverage, availability, capacity, delays)	SUR. NEEDS (Coverage, availability, capacity, delays, accuracy, latency, updating rate, resolution)	ATM NEEDS	Other consideratio ns e.g. Unusual Weather, Terrain, etc.	Diseño del espacio aéreo recomendado (recommended airspace design)
BOGOTA NW;NE;SW;SE		High,	Cat C: 30 %; Cat D: 45%; Cat E: 25%	A	New conflict points resulting of RNAV implementation		Yes, Bogotá TMA, Barranquilla UTA, Brasil UTA	Regional dependent implementation	Coverage Vol - 100% over fixes & airways Availability - 9995 capacity - unlimited delays - 0 OLDI CPDLC ADS B Compability	Coverage Vol - 100% over fixes & airways Availability - 9995% capacity - 100 delays - 0 Accuracy - 30/95% ADS Implementation	Airspace organization Airspace management Aerodrome operations Demand and capacity balancing Information management Safety management Conflict management Separation provision Collision avoidance Traffic synchronization Airspace user operations ATM service delivery management		Re-evaluate
BARRANQUILLA N; S		High,	Cat C: 30 %; Cat D: 45%; Cat E: 25%	A	New conflict points resulting of RNAV implementation		Yes, Bogotá UTA, Kingston UTA	Regional dependent implementation	Coverage Vol - 100% over fixes & airways Availability - 9995 capacity - unlimited delays - 0 OLDI CPDLC ADS B Compability	Coverage Vol - 100% over fixes & airways Availability - 9995% capacity - 100 delays - 0 Accuracy - 30/95% ADS Implementation	Airspace organization Airspace management Aerodrome operations Demand and capacity balancing Information management Safety management Conflict management Separation provision Collision avoidance Traffic synchronization Airspace user operations ATM service delivery management		Re-evaluate

APPENDIX B – COMMUNICATIONS WORKSHEETS

Current Communication Systems Inventory

Location Information				System by Age																									
				VSAT				VHF-ER				VHF-ER VDL 2 Capable				VDL-3				HF				REDDIG				AFTN/ AMHS			
Location/Site	ICAO Code	Airport	Site Visit	Quantity	Install Year	Age	Useful life	Quantity	Install Year	Age	Useful life	Quantity	Install Year	Age	Useful life	Quantity	Install Year	Age	Useful life	Quantity	Install Year	Age	Useful life	Quantity	Install Year	Age	Useful life	Quantity	Install Year	Age	Useful life
ANTIOQUIA			No																												
APARTADO			No	1	2000	5	10	12	1996	9	15									1	1999	6	10								
ARAUACUARA			No	1	2007		10	12	2006	0	15	12	2006	0	10																
ARAUCA	SKAU	SANTIAGO PEREZ	No	1	2000	5	10	12	1997	8	15																				
ARMENIA	SKAR	EL EDEN	No	1	2000	5	10																								
ATLANTICO			No																	1	1999	6	10								
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS	No																												
BARRANCABERMEJA	SKEJ	YARIGUIES	No	1	2000	5	10																								
BARRANQUILLA	SKBQ	CORTISSOZ	Yes	1	2000	5	10													1	1999	6	10					1	1997	8	10
BOGOTA	SKBO	EL DORADO	Yes	1	2000	5	10													2	1999	6	10	1	2003	2	10	2	1997	8	10
																				1	1997	8	10								
																				1	1999	6	10								
BUCARAMANGA	SKBG	PALONEGRO	No																												
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ	No																												
CALI	SKCL	BONILLA	Yes	1	2000	5	10													1	1998	7	10					1	1997	8	10
CAREPA	SKLC	ANTONIO ROLDAN	No																												
CARIMAGUA			No	1	2000	5	10	12	1997	8	15																				
CARTAGENA	SKCG	RAFAEL NUÑEZ	Yes	1	2000	5	10													1	1998	7	10								
																				1	1999	6	10								
CARTAGO	SKGO	SANTA ANA	No																												
CERRO EL TIGRE			No					24	1993	12	15																				
								4	2006	0	10	4	2006	0	10																
CERRO KENEDY			No					16	1993	12	15																				
CERRO LOS DOMINGUEZ			No					16	1993	12	15																				
CERRO MACO			No	1	2000	5	10	12	1993	12	15																				
CERRO MANJUT			No					28	1993	12	15																				
CERRO NEIVA								4	2003			4	2003	2	10	4	2005	0	15												
CERRO SANTA ANA			No	1	2000	5	10	12	1993	12	15																				
CERRO VERDE			No					16	1993	12	15																				
CHIA/GUAYMARAL	SKGY	GUAYMARAL	No																												
COROZAL	SKCZ	LAS BRUJAS	No																												
CUCUTA	SKCC	CAMILO DAZA	No	1	2000	5	10													1	1998	7	10					1	1997	8	10
EL YOPAL	SKYP	EL YOPAL	No	1	2000	5	10	4	1999	6	15																				
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA	No	1	2000	5	10	4	2003	2	10	4	2003	2	10	4	2005	0	15												
GIRARDOT	SKGI	SANTIAGO VILA	No																												
GUAPI	SKGP	GUAPI	No																												
IBAGUE	SKIB	PERALES	No	1	2000	5	10																								
IPIALES	SKIP	SAN LUIS	No	1	2000	5	10																								
JURISDICCIONES			No	1	2000	5	10	20	1993	12	15																				
LA PEDRERA	SKLP	LA PEDRERA						4	2006	0	10	4	2006	0	10	8	2005	1	15												
LETICIA	SKLT	VASQUEZ COBO	No	1	2000	5	10	4	1993	12	15																				
MANIZALES	SKMZ	LA NUBIA	No	1	2000	5	10																								
MARIQUITA	SKQU	MARIQUITA	No																												
MEDELLIN	SKMD	OLAYA HERRERA	No																												
META			No																	1	1999	6	10								
MITU	SKMU	FABIO LEON B.	No	1	2000	5	10	8	1993	12	15	4	2006	0	10																
								4	2006	0	10																				
MONTERIA	SKMR	LOS GARZONES	No	1	2000	5	10	8	1998	7	15																				
NEIVA	SKNV	BENITO SALAS	No	1	2000	5	10									4	2005	0	15												
OCANA	SKOC	AGUAS CLARAS	No																												
OTU	SKOT	REMEDIOS	No																												
PASTO	SKPS	ANTONIO NARIÑO	No	1	2000	5	10																								
PEREIRA	SKPE	MATECAÑA	No	1	2000	5	10																								
POPAYAN	SKPP	GUILLERMO LEON VALENCIA	No																												
PROVIDENCIA	SKPV	PROVIDENCIA	No																												
PUERTO ASIS	SKAS	PUERTO ASIS	No	1	2000	5	10	4	2003	2	10	4	2003	2	10	4	2005	0	15												
PUERTO CARRENO	SKPC	PUERTO CARREÑO	No																												
PUERTO INIRIDA			No	1	2000	5	10	12	1993	12	15	4	2006	0	10																
								4	2006	0	10																				
PUERTO LEGUIZAMO			No					4	2003	2	10	4	2003	2	10																
				1	2000	5	10	12	1993	12	15	4	2006	0	10																
								4	2006	0	10																				
QUIBDO	SKUT	EL CARAÑO	No	1	2000	5	10																								
RIOHACHA	SKRH	ALMIRANTE PADILLA	No	1	2000	5	10	12	1998	7	15																				
RIONEGRO	SKRG	JOSE MARIA CORDOBA	No	1	2000	5	10													1	1997	8	15					1	1997	8	10
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO	No																												
SAN ANDRES	SKSP	SESQUICENTENARIO	No					4	1993	12	15									1	1998	7	10								
SAN JOSE DEL GUAV.	SKSJ	JORGE E.GONZALEZ	No	1	2000	5	10					4	2006	1	10																
								4	2006	0	10																				
SANTA MARTA	SKSM	SIMON BOLIVAR	No																												
SANTANDER			No																	1	1999	6	10								
SARAVENA	SKSA	LOS COLONIZADORES	No																												
TABLAZO			Yes					36	1993	12	15																				
TAME	SKTM	TAME	No																												
TUMACO	SKCO	LA FLORIDA	No	1	2000	5	10																								
VALLE			No																	1	1999	6	10								
VALLEDUPAR	SKVP	ALFONSO LOPEZ	No	1	2000	5	10	8	1998	7	15																				
VILLAVICENCIO	SKVV	VANGUARDIA	No	1	2000	5	10													1	1999	6	10								
Subtotal				**38**				**340**				**62**				**24**				**17**				**1**				**6**			

ed, so they will be assumed to be at the end of their operational lives (15 years?)

System Implementation Plan
Communications **note: All HF radios should be digital HF even if only voice**

HF Voice/Datalink

Option 1 (Evolutionary)
Component:

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)															Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
ANTIOQUIA							1										1	digital HF upgradeable for DL
APARTADO																		
ARARACUARA																		
ARAUCA	SKAU	SANTIAGO PEREZ																
ARMENIA	SKAR	EL EDEN																
ATLANTICO							1										1	digital HF upgradeable for DL
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS																
BARRANCABERMEJA	SKEJ	YARIGUIES																
BARRANQUILLA	SKBQ	CORTISSOZ					1										1	digital HF upgradeable for DL
BOGOTA	SKBO	EL DORADO					2										2	digital HF upgradeable for DL
					1										1			digital HF upgradeable for DL
							1										1	digital HF upgradeable for DL
BUCARAMANGA	SKBG	PALONEGRO																
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ																
CALI	SKCL	BONILLA				1										1		digital HF upgradeable for DL
CAREPA	SKLC	ANTONIO ROLDAN																
CARIMAGUA																		
CARTAGENA	SKCG	RAFAEL NUÑEZ				1										1		digital HF upgradeable for DL
							1										1	digital HF upgradeable for DL
CARTAGO	SKGO	SANTA ANA																
CERRO EL TIGRE																		
CERRO KENEDY																		
CERRO LOS DOMINGUEZ																		
CERRO MACO																		
CERRO MANJUI																		
CERRO NEIVA																		
CERRO SANTA ANA																		
CERRO VERDE																		
CHIA/GUAYMARAL	SKGY	GUAYMARAL																
COROZAL	SKCZ	LAS BRUJAS																
CUCUTA	SKCC	CAMILO DAZA				1										1		digital HF upgradeable for DL
EL YOPAL	SKYP	EL YOPAL																
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA																
GIRARDOT	SKGI	SANTIAGO VILA																
GUAPI	SKGP	GUAPI																
IBAGUE	SKIB	PERALES																
IPIALES	SKIP	SAN LUIS																
JURISDICCIONES																		
LA PEDRERA	SKLP	LA PEDRERA																
LETICIA	SKLT	VASQUEZ COBO																
MANIZALES	SKMZ	LA NUBIA																
MARIQUITA	SKQU	MARIQUITA																
MEDELLIN	SKMD	OLAYA HERRERA																
META							1										1	digital HF upgradeable for DL
MITU	SKMU	FABIO LEON B.																
MONTERIA	SKMR	LOS GARZONES																
NEIVA	SKNV	BENITO SALAS																
OCANA	SKOC	AGUAS CLARAS																
OTU	SKOT	REMEDIOS																
PASTO	SKPS	ANTONIO NARIÑO																
PEREIRA	SKPE	MATECAÑA																
POPAYAN	SKPP	GUILLERMO LEON VALENCIA																
PROVIDENCIA	SKPV	PROVIDENCIA																
PUERTO ASIS	SKAS	PUERTO ASIS																
PUERTO CARRENO	SKPC	PUERTO CARREÑO																
PUERTO INIRIDA																		
PUERTO LEGUIZAMO																		
0																		
QUIBDO	SKUI	EL CARAÑO																
RIOHACHA	SKRH	ALMIRANTE PADILLA																
RIONEGRO	SKRG	JOSE MARIA CORDOBA			1										1			digital HF upgradeable for DL
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO																
SAN ANDRES	SKSP	SESQUICENTENARIC				1										1		digital HF upgradeable for DL
SAN JOSE DEL GUAV	SKSJ	JORGE E.GONZALEZ																
SANTA MARTA	SKSM	SIMON BOLIVAR																
SANTANDER							1										1	digital HF upgradeable for DL
SARAVENA	SKSA	LOS COLONIZADORES																
TABLAZO																		
TAME	SKTM	TAME																
TUMACO	SKCO	LA FLORIDA																
VALLE							1										1	digital HF upgradeable for DL
VALLEDUPAR	SKVP	ALFONSO LOPEZ																
VILLAVICENCIO	SKVV	VANGUARDIA					1										1	digital HF upgradeable for DL

System Implementation Plan

Communications

HF Datalink

Option 1 (Evolutionary)

Component:

note: All HF radios should be digital voice and DL

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)														Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
ANTIOQUIA									1									
APARTADO																		
ARARACUARA																		
ARAUCA	SKAU	SANTIAGO PEREZ																
ARMENIA	SKAR	EL EDEN																
ATLANTICO									1									
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS																
BARRANCABERMEJA	SKEJ	YARIGUIES																
BARRANQUILLA	SKBQ	CORTISSOZ							1									
BOGOTA	SKBO	EL DORADO							2									
									1									
									1									
BUCARAMANGA	SKBG	PALONEGRO																
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ																
CALI	SKCL	BONILLA							1									
CAREPA	SKLC	ANTONIO ROLDAN																
CARIMAGUA																		
CARTAGENA	SKCG	RAFAEL NUÑEZ							1									
									1									
CARTAGO	SKGO	SANTA ANA																
CERRO EL TIGRE																		
CERRO KENEDY																		
CERRO LOS DOMINGUEZ																		
CERRO MACO																		
CERRO MANJUI																		
CERRO NEIVA																		
CERRO SANTA ANA																		
CERRO VERDE																		
CHIA/GUAYMARAL	SKGY	GUAYMARAL																
COROZAL	SKCZ	LAS BRUJAS																
CUCUTA	SKCC	CAMILO DAZA							1									
EL YOPAL	SKYP	EL YOPAL																
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA																
GIRARDOT	SKGI	SANTIAGO VILA																
GUAPI	SKGP	GUAPI																
IBAGUE	SKIB	PERALES																
IPIALES	SKIP	SAN LUIS																
JURISDICCIONES																		
LA PEDRERA	SKLP	LA PEDRERA																
LETICIA	SKLT	VASQUEZ COBO																
MANIZALES	SKMZ	LA NUBIA																
MARIQUITA	SKQU	MARIQUITA																
MEDELLIN	SKMD	OLAYA HERRERA																
META									1									
MITU	SKMU	FABIO LEON B.																
MONTERIA	SKMR	LOS GARZONES																
NEIVA	SKNV	BENITO SALAS																
OCANA	SKOC	AGUAS CLARAS																
OTU	SKOT	REMEDIOS																
PASTO	SKPS	ANTONIO NARIÑO																
PEREIRA	SKPE	MATECAÑA																
POPAYAN	SKPP	GUILLERMO LEON VALENCIA																
PROVIDENCIA	SKPV	PROVIDENCIA																
PUERTO ASIS	SKAS	PUERTO ASIS																
PUERTO CARRENO	SKPC	PUERTO CARREÑO																
PUERTO INIRIDA																		
PUERTO LEGUIZAMO																		
0																		
QUIBDO	SKUI	EL CARAÑO																
RIOHACHA	SKRH	ALMIRANTE PADILLA																
RIONEGRO	SKRG	JOSE MARIA CORDOBA							1									
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO																
SAN ANDRES	SKSP	SESQUICENTENARIC							1									
SAN JOSE DEL GUAV.	SKSJ	JORGE E.GONZALEZ																
SANTA MARTA	SKSM	SIMON BOLIVAR																
SANTANDER									1									
SARAVENA	SKSA	LOS COLONIZADORES																
TABLAZO																		
TAME	SKTM	TAME																
TUMACO	SKCO	LA FLORIDA																
VALLE									1									
VALLEDUPAR	SKVP	ALFONSO LOPEZ																
VILLAVICENCIO	SKVV	VANGUARDIA							1									

System Implementation Plan
Communications
VHF/AMSS
Option 1 (Evolutionary)
Component:

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)															Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
ANTIOQUIA																		
APARTADO								1										
ARARACUARA															1			
ARAUCA	SKAU	SANTIAGO PEREZ						1										
ARMENIA	SKAR	EL EDEN						1										
ATLANTICO																		
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS																
BARRANCABERMEJA	SKEJ	YARIGUIES						1										
BARRANQUILLA	SKBQ	CORTISSOZ						1										
BOGOTA	SKBO	EL DORADO						1										
BUCARAMANGA	SKBG	PALONEGRO																
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ																
CALI	SKCL	BONILLA						1										
CAREPA	SKLC	ANTONIO ROLDAN																
CARIMAGUA								1										
CARTAGENA	SKCG	RAFAEL NUÑEZ						1										
CARTAGO	SKGO	SANTA ANA																
CERRO EL TIGRE																		
CERRO KENEDY																		
CERRO LOS DOMINGUEZ																		
CERRO MACO								1										
CERRO MANJUI																		
CERRO NEIVA																		
CERRO SANTA ANA								1										
CERRO VERDE																		
CHIA/GUAYMARAL	SKGY	GUAYMARAL																
COROZAL	SKCZ	LAS BRUJAS																
CUCUTA	SKCC	CAMILO DAZA						1										
EL YOPAL	SKYP	EL YOPAL						1										
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA						1										
GIRARDOT	SKGI	SANTIAGO VILA																
GUAPI	SKGP	GUAPI																
IBAGUE	SKIB	PERALES						1										
IPIALES	SKIP	SAN LUIS						1										
JURISDICCIONES								1										
LA PEDRERA	SKLP	LA PEDRERA																
LETICIA	SKLT	VASQUEZ COBO						1										
MANIZALES	SKMZ	LA NUBIA						1										
MARIQUITA	SKQU	MARIQUTA																
MEDELLIN	SKMD	OLAYA HERRERA																
META																		
MITU	SKMU	FABIO LEON B						1										
MONTERIA	SKMR	LOS GARZONES						1										
NEIVA	SKNV	BENITO SALAS						1										
OCANA	SKOC	AGUAS CLARAS																
OTU	SKOT	REMEDIOS																
PASTO	SKPS	ANTONIO NARIÑO						1										
PEREIRA	SKPE	MATECAÑA						1										
POPAYAN	SKPP	GUILLERMO LEON VALENCIA																
PROVIDENCIA	SKPV	PROVIDENCIA																
PUERTO ASIS	SKAS	PUERTO ASIS						1										
PUERTO CARRENO	SKPC	PUERTO CARREÑO																
PUERTO INIRIDA								1										
PUERTO LEGUIZAMO																		
0								1										
QUIBDO	SKUI	EL CARAÑO						1										
RIOHACHA	SKRH	ALMIRANTE PADILLA						1										
RIONEGRO	SKRG	JOSE MARIA CORDOBA						1										
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO																
SAN ANDRES	SKSP	SESQUICENTENARIC																
SAN JOSE DEL GUAV	SKSJ	JORGE E.GONZALEZ						1										
SANTA MARTA	SKSM	SIMON BOLIVAR																
SANTANDER																		
SARAVENA	SKSA	LOS COLONIZADORES																
TABLAZO																		
TAME	SKTM	TAME																
TUMACO	SKCO	LA FLORIDA						1										
VALLE																		
VALLEDUPAR	SKVP	ALFONSO LOPEZ						1										
VILLAVICENCIO	SKVV	VANGUARDIA						1										

System Implementation Plan
Communications

VHF Voice 25 Khz note: a 25 kHz option was not recommended since the standard will be 8.33 and the cost delta should be marginal

Option 1 (Evolutionary)
Component:

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)														Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
ANTIOQUIA																		
APARTADO																		
ARARACUARA																		
ARAUCA	SKAU	SANTIAGO PEREZ																
ARMENIA	SKAR	EL EDEN																
ATLANTICO																		
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS																
BARRANCABERMEJA	SKEJ	YARIGUIES																
BARRANQUILLA	SKBQ	CORTISSOZ																
BOGOTA	SKBO	EL DORADO																
BUCARAMANGA	SKBG	PALONEGRO																
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ																
CALI	SKCL	BONILLA																
CAREPA	SKLC	ANTONIO ROLDAN																
CARIMAGUA																		
CARTAGENA	SKCG	RAFAEL NUÑEZ																
CARTAGO	SKGO	SANTA ANA																
CERRO EL TIGRE																		
CERRO KENEDY																		
CERRO LOS DOMINGUEZ																		
CERRO MACO																		
CERRO MANJUI																		
CERRO NEIVA																		
CERRO SANTA ANA																		
CERRO VERDE																		
CHIA/GUAYMARAL	SKGY	GUAYMARAL																
COROZAL	SKCZ	LAS BRUJAS																
CUCUTA	SKCC	CAMILO DAZA																
EL YOPAL	SKYP	EL YOPAL																
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA																
GIRARDOT	SKGI	SANTIAGO VILA																
GUAPI	SKGP	GUAPI																
IBAGUE	SKIB	PERALES																
IPIALES	SKIP	SAN LUIS																
JURISDICCIONES																		
LA PEDRERA	SKLP	LA PEDRERA																
LETICIA	SKLT	VASQUEZ COBO																
MANIZALES	SKMZ	LA NUBIA																
MARIQUITA	SKQU	MARIQUITA																
MEDELLIN	SKMD	OLAYA HERRERA																
META																		
MITU	SKMU	FABIO LEON B.																
MONTERIA	SKMR	LOS GARZONES																
NEIVA	SKNV	BENITO SALAS																
OCANA	SKOC	AGUAS CLARAS																
OTU	SKOT	REMEDIOS																
PASTO	SKPS	ANTONIO NARIÑO																
PEREIRA	SKPE	MATECAÑA																
POPAYAN	SKPP	GUILLERMO LEON VALENCIA																
PROVIDENCIA	SKPV	PROVIDENCIA																
PUERTO ASIS	SKAS	PUERTO ASIS																
PUERTO CARRENO	SKPC	PUERTO CARREÑO																
PUERTO INIRIDA																		
PUERTO LEGUIZAMO																		
0																		
QUIBDO	SKUI	EL CARAÑO																
RIOHACHA	SKRH	ALMIRANTE PADILLA																
RIONEGRO	SKRG	JOSE MARIA CORDOBA																
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO																
SAN ANDRES	SKSP	SESQUICENTENARIC																
SAN JOSE DEL GUAV	SKSJ	JORGE E.GONZALEZ																
SANTA MARTA	SKSM	SIMON BOLIVAR																
SANTANDER																		
SARAVENA	SKSA	LOS COLONIZADORES																
TABLAZO																		
TAME	SKTM	TAME																
TUMACO	SKCO	LA FLORIDA																
VALLE																		
VALLEDUPAR	SKVP	ALFONSO LOPEZ																
VILLAVICENCIO	SKVV	VANGUARDIA																

System Implementation Plan
Communications

VHF Voice 8.33 Khz

Option 1 (Evolutionary)
Component:

The transition to 8.33 KHz radios should be considered when the cost of these radios (giving proper consideration to new/improved features) are comparable to the cost of 25 KHz radios.

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)														Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
ANTIOQUIA																		
APARTADO									12									
ARARACUARA														12				
ARAUCA	SKAU	SANTIAGO PEREZ								12								
ARMENIA	SKAR	EL EDEN																
ATLANTICO																		
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS																
BARRANCABERMEJA	SKEJ	YARIGUIES																
BARRANQUILLA	SKBQ	CORTISSOZ																
BOGOTA	SKBO	EL DORADO																
BUCARAMANGA	SKBG	PALONEGRO																
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ																
CALI	SKCL	BONILLA																
CAREPA	SKLC	ANTONIO ROLDAN																
CARIMAGUA										12								
CARTAGENA	SKCG	RAFAEL NUÑEZ																
CARTAGO	SKGO	SANTA ANA																
CERRO EL TIGRE						24								4		24		
CERRO KENEDY						16										16		
CERRO LOS DOMINGUEZ						16										16		
CERRO MACO						12										12		
CERRO MANJUI						28										28		
CERRO NEIVA											4							
CERRO SANTA ANA						12										12		
CERRO VERDE						16										16		
CHIA/GUAYMARAL	SKGY	GUAYMARAL																
COROZAL	SKCZ	LAS BRUJAS																
CUCUTA	SKCC	CAMILO DAZA																
EL YOPAL	SKYP	EL YOPAL										4						
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA									4							
GIRARDOT	SKGI	SANTIAGO VILA																
GUAPI	SKGP	GUAPI																
IBAGUE	SKIB	PERALES																
IPIALES	SKIP	SAN LUIS																
JURISDICCIONES						20										20		
LA PEDRERA	SKLP	LA PEDRERA												4				
LETICIA	SKLT	VASQUEZ COBO				4										4		
MANIZALES	SKMZ	LA NUBIA																
MARIQUITA	SKQU	MARIQUTA																
MEDELLIN	SKMD	OLAYA HERRERA																
META																		
MITU	SKMU	FABIO LEON B.				8								4		8		
MONTERIA	SKMR	LOS GARZONES									8							
NEIVA	SKNV	BENITO SALAS																
OCANA	SKOC	AGUAS CLARAS																
OTU	SKOT	REMEDIOS																
PASTO	SKPS	ANTONIO NARIÑO																
PEREIRA	SKPE	MATECAÑA																
POPAYAN	SKPP	GUILLERMO LEON VALENCIA																
PROVIDENCIA	SKPV	PROVIDENCIA																
PUERTO ASIS	SKAS	PUERTO ASIS									4							
PUERTO CARRENO	SKPC	PUERTO CARREÑO																
PUERTO INIRIDA						12								4		12		
PUERTO LEGUIZAMO											4			4				
0						12										12		
QUIBDO	SKUI	EL CARAÑO																
RIOHACHA	SKRH	ALMIRANTE PADILLA									12							
RIONEGRO	SKRG	JOSE MARIA CORDOBA																
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO																
SAN ANDRES	SKSP	SESQUICENTENARIC				4										4		
SAN JOSE DEL GUAV.	SKSJ	JORGE E.GONZALEZ												4				
SANTA MARTA	SKSM	SIMON BOLIVAR																
SANTANDER																		
SARAVENA	SKSA	LOS COLONIZADORES																
TABLAZO						36										36		
TAME	SKTM	TAME																
TUMACO	SKCO	LA FLORIDA																
VALLE																		
VALLEDUPAR	SKVP	ALFONSO LOPEZ									8							
VILLAVICENCIO	SKVV	VANGUARDIA																

System Implementation Plan
Communications

CPDLC Phase I

Option 1 (Evolutionary)
Component:

note: VDL-2 radios exist at these locations, upgrade to provide CPDLC Phase I Functionality (non-time-critical messages)

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)															Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
ANTIOQUIA																		
APARTADO																		
ARARACUARA					12													Upgrade only, if required
ARAUCA	SKAU	SANTIAGO PEREZ																
ARMENIA	SKAR	EL EDEN																
ATLANTICO																		
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS																
BARRANCABERMEJA	SKEJ	YARIGUIES																
BARRANQUILLA	SKBQ	CORTISSOZ																
BOGOTA	SKBO	EL DORADO																
BUCARAMANGA	SKBG	PALONEGRO																
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ																
CALI	SKCL	BONILLA																
CAREPA	SKLC	ANTONIO ROLDAN																
CARIMAGUA																		
CARTAGENA	SKCG	RAFAEL NUÑEZ																
CARTAGO	SKGO	SANTA ANA																
CERRO EL TIGRE					4													Upgrade only, if required
CERRO KENEDY																		
CERRO LOS DOMINGUEZ																		
CERRO MACO																		
CERRO MANJUI																		
CERRO NEIVA					4													Upgrade only, if required
CERRO SANTA ANA																		
CERRO VERDE																		
CHIA/GUAYMARAL	SKGY	GUAYMARAL																
COROZAL	SKCZ	LAS BRUJAS																
CUCUTA	SKCC	CAMILO DAZA																
EL YOPAL	SKYP	EL YOPAL																
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA			4													Upgrade only, if required
GIRARDOT	SKGI	SANTIAGO VILA																
GUAPI	SKGP	GUAPI																
IBAGUE	SKIB	PERALES																
IPIALES	SKIP	SAN LUIS																
JURISDICCIONES																		
LA PEDRERA	SKLP	LA PEDRERA			4													Upgrade only, if required
LETICIA	SKLT	VASQUEZ COBO																
MANIZALES	SKMZ	LA NUBIA																
MARIQUITA	SKQU	MARIQUTA																
MEDELLIN	SKMD	OLAYA HERRERA																
META																		
MITU	SKMU	FABIO LEON B.			4													Upgrade only, if required
MONTERIA	SKMR	LOS GARZONES																
NEIVA	SKNV	BENITO SALAS																
OCANA	SKOC	AGUAS CLARAS																
OTU	SKOT	REMEDIOS																
PASTO	SKPS	ANTONIO NARIÑO																
PEREIRA	SKPE	MATECAÑA																
POPAYAN	SKPP	GUILLERMO LEON VALENCIA																
PROVIDENCIA	SKPV	PROVIDENCIA																
PUERTO ASIS	SKAS	PUERTO ASIS			4													Upgrade only, if required
PUERTO CARRENO	SKPC	PUERTO CARREÑO																
PUERTO INIRIDA					4													Upgrade only, if required
PUERTO LEGUIZAMO					8													Upgrade only, if required
QUIBDO	SKUI	EL CARAÑO																
RIOHACHA	SKRH	ALMIRANTE PADILLA																
RIONEGRO	SKRG	JOSE MARIA CORDOBA																
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO																
SAN ANDRES	SKSP	SESQUICENTENARIC																
SAN JOSE DEL GUAV.	SKSJ	JORGE E.GONZALEZ			4													Upgrade only, if required
SANTA MARTA	SKSM	SIMON BOLIVAR																
SANTANDER																		
SARAVENA	SKSA	LOS COLONIZADORES																
TABLAZO																		
TAME	SKTM	TAME																
TUMACO	SKCO	LA FLORIDA																
VALLE																		
VALLEDUPAR	SKVP	ALFONSO LOPEZ																
VILLAVICENCIO	SKVV	VANGUARDIA																

System Implementation Plan
Communications

VDL-3

Option 1 (Evolutionary)
Component:

note: VDL-3 radios exist at these locations--may have to upgrade--if not, then no purchase required

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)															Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
ANTIOQUIA																		
APARTADO																		
ARARACUARA																		
ARAUCA	SKAU	SANTIAGO PEREZ																
ARMENIA	SKAR	EL EDEN																
ATLANTICO																		
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS																
BARRANCABERMEJA	SKEJ	YARIGUIES																
BARRANQUILLA	SKBQ	CORTISSOZ																
BOGOTA	SKBO	EL DORADO																
BUCARAMANGA	SKBG	PALONEGRO																
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ																
CALI	SKCL	BONILLA																
CAREPA	SKLC	ANTONIO ROLDAN																
CARIMAGUA																		
CARTAGENA	SKCG	RAFAEL NUÑEZ																
CARTAGO	SKGO	SANTA ANA																
CERRO EL TIGRE																		
CERRO KENEDY																		
CERRO LOS DOMINGUEZ																		
CERRO MACO																		
CERRO MANJUI																		
CERRO NEIVA									4									Upgrade only, if required
CERRO SANTA ANA																		
CERRO VERDE																		
CHIAVGUAYMARAL	SKGY	GUAYMARAL																
COROZAL	SKCZ	LAS BRUJAS																
CUCUTA	SKCC	CAMILO DAZA																
EL YOPAL	SKYP	EL YOPAL																
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA							4									Upgrade only, if required
GIRARDOT	SKGI	SANTIAGO VILA																
GUAPI	SKGP	GUAPI																
IBAGUE	SKIB	PERALES																
IPIALES	SKIP	SAN LUIS																
JURISDICCIONES																		
LA PEDRERA	SKLP	LA PEDRERA							8									Upgrade only, if required
LETICIA	SKLT	VASQUEZ COBO																
MANIZALES	SKMZ	LA NUBIA																
MARIQUITA	SKQU	MARIQUITA																
MEDELLIN	SKMD	OLAYA HERRERA																
META																		
MITU	SKMU	FABIO LEON B.																
MONTERIA	SKMR	LOS GARZONES																
NEIVA	SKNV	BENITO SALAS							4									Upgrade only, if required
OCANA	SKOC	AGUAS CLARAS																
OTU	SKOT	REMEDIOS																
PASTO	SKPS	ANTONIO NARIÑO																
PEREIRA	SKPE	MATECAÑA																
POPAYAN	SKPP	GUILLERMO LEON VALENCIA																
PROVIDENCIA	SKPV	PROVIDENCIA																
PUERTO ASIS	SKAS	PUERTO ASIS							4									Upgrade only, if required
PUERTO CARRENO	SKPC	PUERTO CARREÑO																
PUERTO INIRIDA																		
PUERTO LEGUIZAMO																		
0																		
QUIBDO	SKUI	EL CARAÑO																
RIOHACHA	SKRH	ALMIRANTE PADILLA																
RIONEGRO	SKRG	JOSE MARIA CORDOBA																
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO																
SAN ANDRES	SKSP	SESQUICENTENARIC																
SAN JOSE DEL GUAV.	SKSJ	JORGE E.GONZALEZ																
SANTA MARTA	SKSM	SIMON BOLIVAR																
SANTANDER																		
SARAVENA	SKSA	LOS COLONIZADORES																
TABLAZO																		
TAME	SKTM	TAME																
TUMACO	SKCO	LA FLORIDA																
VALLE																		
VALLEDUPAR	SKVP	ALFONSO LOPEZ																
VILLAVICENCIO	SKVV	VANGUARDIA																

System Implementation Plan
Communications
CPDLC Phase II
Option 1 (Evolutionary)
Component:

Note: VDL-2 capability required with upgrade to include CPDLC Phase II time-critical functionality

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)															Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
ANTIOQUIA																		
APARTADO																		
ARARACUARA																		
ARAUCA	SKAU	SANTIAGO PEREZ																
ARMENIA	SKAR	EL EDEN																
ATLANTICO																		
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS																
BARRANCABERMEJA	SKEJ	YARIGUIES																
BARRANQUILLA	SKBQ	CORTISSOZ							2									
BOGOTA	SKBO	EL DORADO							2									
BUCARAMANGA	SKBG	PALONEGRO																
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ																
CALI	SKCL	BONILLA																
CAREPA	SKLC	ANTONIO ROLDAN																
CARIMAGUA																		
CARTAGENA	SKCG	RAFAEL NUÑEZ																
CARTAGO	SKGO	SANTA ANA																
CERRO EL TIGRE																		
CERRO KENEDY																		
CERRO LOS DOMINGUEZ																		
CERRO MACO																		
CERRO MANJUI																		
CERRO NEIVA																		
CERRO SANTA ANA																		
CERRO VERDE																		
CHIA/GUAYMARAL	SKGY	GUAYMARAL																
COROZAL	SKCZ	LAS BRUJAS																
CUCUTA	SKCC	CAMILO DAZA																
EL YOPAL	SKYP	EL YOPAL																
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA																
GIRARDOT	SKGI	SANTIAGO VILA																
GUAPI	SKGP	GUAPI																
IBAGUE	SKIB	PERALES																
IPIALES	SKIP	SAN LUIS																
JURISDICCIONES																		
LA PEDRERA	SKLP	LA PEDRERA																
LETICIA	SKLT	VASQUEZ COBO																
MANIZALES	SKMZ	LA NUBIA																
MARIQUITA	SKQU	MARIQUTA																
MEDELLIN	SKMD	OLAYA HERRERA																
META																		
MITU	SKMU	FABIO LEON B.																
MONTERIA	SKMR	LOS GARZONES																
NEIVA	SKNV	BENITO SALAS																
OCANA	SKOC	AGUAS CLARAS																
OTU	SKOT	REMEDIOS																
PASTO	SKPS	ANTONIO NARIÑO																
PEREIRA	SKPE	MATECAÑA																
POPAYAN	SKPP	GUILLERMO LEON VALENCIA																
PROVIDENCIA	SKPV	PROVIDENCIA																
PUERTO ASIS	SKAS	PUERTO ASIS																
PUERTO CARRENO	SKPC	PUERTO CARREÑO																
PUERTO INIRIDA																		
PUERTO LEGUIZAMO																		
0																		
QUIBDO	SKUI	EL CARAÑO																
RIOHACHA	SKRH	ALMIRANTE PADILLA																
RIONEGRO	SKRG	JOSE MARIA CORDOBA																
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO																
SAN ANDRES	SKSP	SESQUICENTENARIC																
SAN JOSE DEL GUAV.	SKSJ	JORGE E.GONZALEZ																
SANTA MARTA	SKSM	SIMON BOLIVAR																
SANTANDER																		
SARAVENA	SKSA	LOS COLONIZADORES																
TABLAZO																		
TAME	SKTM	TAME																
TUMACO	SKCO	LA FLORIDA																
VALLE																		
VALLEDUPAR	SKVP	ALFONSO LOPEZ																
VILLAVICENCIO	SKVV	VANGUARDIA																

System Implementation Plan
Communications

Full ATN Data

Option 1 (Evolutionary)

Component:

The aeronautical telecommunications network (ATN) is a global networking infrastructure that will enable the exchange of information betweem all those connected, such as air traffic service provider facilities, airline operations centers, etc. ATN will be comprised of subnetworks, such as VDL-2,/ACARS, VDL-3, SATCOM, and HF. Full ATN refers to having in place all of the appropriate subnetworks.

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)															Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
ANTIOQUIA																		
APARTADO																		
ARARACUARA																		
ARAUCA	SKAU	SANTIAGO PEREZ																
ARMENIA	SKAR	EL EDEN																
ATLANTICO																		
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS																
BARRANCABERMEJA	SKEJ	YARIGUIES																
BARRANQUILLA	SKBQ	CORTISSOZ											2					
BOGOTA	SKBO	EL DORADO											2					
BUCARAMANGA	SKBG	PALONEGRO																
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ																
CALI	SKCL	BONILLA																
CAREPA	SKLC	ANTONIO ROLDAN																
CARIMAGUA																		
CARTAGENA	SKCG	RAFAEL NUÑEZ																
CARTAGO	SKGO	SANTA ANA																
CERRO EL TIGRE																		
CERRO KENEDY																		
CERRO LOS DOMINGUEZ																		
CERRO MACO																		
CERRO MANJUI																		
CERRO NEIVA																		
CERRO SANTA ANA																		
CERRO VERDE																		
CHIA/GUAYMARAL	SKGY	GUAYMARAL																
COROZAL	SKCZ	LAS BRUJAS																
CUCUTA	SKCC	CAMILO DAZA																
EL YOPAL	SKYP	EL YOPAL																
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA																
GIRARDOT	SKGI	SANTIAGO VILA																
GUAPI	SKGP	GUAPI																
IBAGUE	SKIB	PERALES																
IPIALES	SKIP	SAN LUIS																
JURISDICCIONES																		
LA PEDRERA	SKLP	LA PEDRERA																
LETICIA	SKLT	VASQUEZ COBO																
MANIZALES	SKMZ	LA NUBIA																
MARIQUITA	SKQU	MARIQUITA																
MEDELLIN	SKMD	OLAYA HERRERA																
META																		
MITU	SKMU	FABIO LEON B.																
MONTERIA	SKMR	LOS GARZONES																
NEIVA	SKNV	BENITO SALAS																
OCANA	SKOC	AGUAS CLARAS																
OTU	SKOT	REMEDIOS																
PASTO	SKPS	ANTONIO NARIÑO																
PEREIRA	SKPE	MATECAÑA																
POPAYAN	SKPP	GUILLERMO LEON VALENCIA																
PROVIDENCIA	SKPV	PROVIDENCIA																
PUERTO ASIS	SKAS	PUERTO ASIS																
PUERTO CARRENO	SKPC	PUERTO CARREÑO																
PUERTO INIRIDA																		
PUERTO LEGUIZAMO																		
0																		
QUIBDO	SKUI	EL CARAÑO																
RIOHACHA	SKRH	ALMIRANTE PADILLA																
RIONEGRO	SKRG	JOSE MARIA CORDOBA																
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO																
SAN ANDRES	SKSP	SESQUICENTENARIC																
SAN JOSE DEL GUAV.	SKSJ	JORGE E.GONZALEZ																
SANTA MARTA	SKSM	SIMON BOLIVAR																
SANTANDER																		
SARAVENA	SKSA	LOS COLONIZADORES																
TABLAZO																		
TAME	SKTM	TAME																
TUMACO	SKCO	LA FLORIDA																
VALLE																		
VALLEDUPAR	SKVP	ALFONSO LOPEZ																
VILLAVICENCIO	SKVV	VANGUARDIA																

System Replacement/Discontinuance Plan

Option 1 (Evolutionary)

HF

note: Replace all radios with digital HF radios

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)															Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
ANTIOQUIA			0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	to be replaced with digital HF
APARTADO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ARARACUARA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ARAUCA	SKAU	SANTIAGO PEREZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ARMENIA	SKAR	EL EDEN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ATLANTICO			0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	to be replaced with digital HF
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BARRANCABERMEJA	SKEJ	YARIGUIES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BARRANQUILLA	SKBQ	CORTISSOZ	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	to be replaced with digital HF
BOGOTA	SKBO	EL DORADO	0	0	0	0	2	0	0	0	0	0	0	0	0	0	2	to be replaced with digital HF
			0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	to be replaced with digital HF
			0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	to be replaced with digital HF
BUCARAMANGA	SKBG	PALONEGRO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CALI	SKCL	BONILLA	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	to be replaced with digital HF
CAREPA	SKLC	ANTONIO ROLDAN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARIMAGUA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARTAGENA	SKCG	RAFAEL NUÑEZ	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	to be replaced with digital HF
			0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	to be replaced with digital HF
CARTAGO	SKGO	SANTA ANA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO EL TIGRE			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO KENEDY			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO LOS DOMINGUEZ			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO MACO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO MANJUI			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO NEIVA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO SANTA ANA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO VERDE			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CHIA/GUAYMARAL	SKGY	GUAYMARAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
COROZAL	SKCZ	LAS BRUJAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CUCUTA	SKCC	CAMILO DAZA	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	to be replaced with digital HF
EL YOPAL	SKYP	EL YOPAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
GIRARDOT	SKGI	SANTIAGO VILA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
GUAPI	SKGP	GUAPI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
IBAGUE	SKIB	PERALES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
IPIALES	SKIP	SAN LUIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
JURISDICCIONES			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
LA PEDRERA	SKLP	LA PEDRERA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
LETICIA	SKLT	VASQUEZ COBO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MANIZALES	SKMZ	LA NUBIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MARIQUITA	SKQU	MARIQUITA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MEDELLIN	SKMD	OLAYA HERRERA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
META			0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	to be replaced with digital HF
MITU	SKMU	FABIO LEON B.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MONTERIA	SKMR	LOS GARZONES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
NEIVA	SKNV	BENITO SALAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
OCANA	SKOC	AGUAS CLARAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
OTU	SKOT	REMEDIOS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PASTO	SKPS	ANTONIO NARIÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PEREIRA	SKPE	MATECAÑA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
POPAYAN	SKPP	GUILLERMO LEON VALENCIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PROVIDENCIA	SKPV	PROVIDENCIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO ASIS	SKAS	PUERTO ASIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO CARRENO	SKPC	PUERTO CARREÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO INIRIDA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO LEGUIZAMO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
QUIBDO	SKUI	EL CARAÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
RIOHACHA	SKRH	ALMIRANTE PADILLA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
RIONEGRO	SKRG	JOSE MARIA CORDOBA	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	to be replaced with digital HF
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SAN ANDRES	SKSP	SESQUICENTENARIO	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	to be replaced with digital HF
SAN JOSE DEL GUAV.	SKSJ	JORGE E.GONZALEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SANTA MARTA	SKSM	SIMON BOLIVAR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SANTANDER			0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	to be replaced with digital HF
SARAVENA	SKSA	LOS COLONIZADORES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TABLAZO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TAME	SKTM	TAME	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TUMACO	SKCO	LA FLORIDA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
VALLE			0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	to be replaced with digital HF
VALLEDUPAR	SKVP	ALFONSO LOPEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
VILLAVICENCIO	SKVV	VANGUARDIA	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	to be replaced with digital HF

System Replacement/Discontinuance Plan
Option 1 (Evolutionary)

VSAT

Note: VSAT supports ground to ground communications.

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)														Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
ANTIOQUIA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
APARTADO			0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Current System Replacement
ARARACUARA			0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	Current System Replacement
ARAUCA	SKAU	SANTIAGO PEREZ	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Current System Replacement
ARMENIA	SKAR	EL EDEN	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Current System Replacement
ATLANTICO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BARRANCABERMEJA	SKEJ	YARIGUIES	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Current System Replacement
BARRANQUILLA	SKBQ	CORTISSOZ	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Current System Replacement
BOGOTA	SKBO	EL DORADO	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Current System Replacement
			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BUCARAMANGA	SKBG	PALONEGRO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CALI	SKCL	BONILLA	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Current System Replacement
CAREPA	SKLC	ANTONIO ROLDAN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARIMAGUA			0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Current System Replacement
CARTAGENA	SKCG	RAFAEL NUÑEZ	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Current System Replacement
			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARTAGO	SKGO	SANTA ANA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO EL TIGRE			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO KENEDY			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO LOS DOMINGUEZ			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO MACO			0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Current System Replacement
CERRO MANJUI			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO NEIVA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO SANTA ANA			0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Current System Replacement
CERRO VERDE			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CHIA/GUAYMARAL	SKGY	GUAYMARAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
COROZAL	SKCZ	LAS BRUJAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CUCUTA	SKCC	CAMILO DAZA	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Current System Replacement
EL YOPAL	SKYP	EL YOPAL	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Current System Replacement
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Current System Replacement
GIRARDOT	SKGI	SANTIAGO VILA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
GUAPI	SKGP	GUAPI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
IBAGUE	SKIB	PERALES	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Current System Replacement
IPIALES	SKIP	SAN LUIS	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Current System Replacement
JURISDICCIONES			0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Current System Replacement
LA PEDRERA	SKLP	LA PEDRERA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
LETICIA	SKLT	VASQUEZ COBO	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Current System Replacement
MANIZALES	SKMZ	LA NUBIA	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Current System Replacement
MARIQUITA	SKQU	MARIQUITA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MEDELLIN	SKMD	OLAYA HERRERA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
META			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MITU	SKMU	FABIO LEON B.	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Current System Replacement
MONTERIA	SKMR	LOS GARZONES	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Current System Replacement
NEIVA	SKNV	BENITO SALAS	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Current System Replacement
OCANA	SKOC	AGUAS CLARAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
OTU	SKOT	REMEDIOS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PASTO	SKPS	ANTONIO NARIÑO	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Current System Replacement
PEREIRA	SKPE	MATECAÑA	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Current System Replacement
POPAYAN	SKPP	GUILLERMO LEON VALENCIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PROVIDENCIA	SKPV	PROVIDENCIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO ASIS	SKAS	PUERTO ASIS	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Current System Replacement
PUERTO CARRENO	SKPC	PUERTO CARREÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO INIRIDA			0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Current System Replacement
PUERTO LEGUIZAMO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0			0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Current System Replacement
QUIBDO	SKUI	EL CARAÑO	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Current System Replacement
RIOHACHA	SKRH	ALMIRANTE PADILLA	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Current System Replacement
RIONEGRO	SKRG	JOSE MARIA CORDOBA	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Current System Replacement
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SAN ANDRES	SKSP	SESQUICENTENARIO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SAN JOSE DEL GUAV	SKSJ	JORGE E.GONZALEZ	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Current System Replacement
SANTA MARTA	SKSM	SIMON BOLIVAR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SANTANDER			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SARAVENA	SKSA	LOS COLONIZADORES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TABLAZO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TAME	SKTM	TAME	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TUMACO	SKCO	LA FLORIDA	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Current System Replacement
VALLE			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
VALLEDUPAR	SKVP	ALFONSO LOPEZ	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Current System Replacement
VILLAVICENCIO	SKVV	VANGUARDIA	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Current System Replacement

System Replacement/Discontinuance Plan
Option 1 (Evolutionary)
VHF-ER

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)														Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
ANTIOQUIA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
APARTADO			0	0	0	0	0	0	12	0	0	0	0	0	0	0	0	To be Replaced with 8.33kHz radios
ARARACUARA			0	0	0	0	0	0	0	0	0	0	0	12	0	0	0	To be Replaced with 8.33kHz radios
ARAUCA	SKAU	SANTIAGO PEREZ	0	0	0	0	0	0	0	12	0	0	0	0	0	0	0	To be Replaced with 8.33kHz radios
ARMENIA	SKAR	EL EDEN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ATLANTICO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BARRANCABERMEJA	SKEJ	YARIGUIES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BARRANQUILLA	SKBQ	CORTISSOZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BOGOTA	SKBO	EL DORADO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BUCARAMANGA	SKBG	PALONEGRO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CALI	SKCL	BONILLA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CAREPA	SKLC	ANTONIO ROLDAN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARIMAGUA			0	0	0	0	0	0	0	12	0	0	0	0	0	0	0	To be Replaced with 8.33kHz radios
CARTAGENA	SKCG	RAFAEL NUÑEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARTAGO	SKGO	SANTA ANA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO EL TIGRE			0	0	0	24	0	0	0	0	0	0	0	4	0	0	0	To be Replaced with 8.33kHz radios
CERRO KENEDY			0	0	0	16	0	0	0	0	0	0	0	0	0	0	0	To be Replaced with 8.33kHz radios
CERRO LOS DOMINGUEZ			0	0	0	16	0	0	0	0	0	0	0	0	0	0	0	To be Replaced with 8.33kHz radios
CERRO MACO			0	0	0	12	0	0	0	0	0	0	0	0	0	0	0	To be Replaced with 8.33kHz radios
CERRO MANJUI			0	0	0	28	0	0	0	0	0	0	0	0	0	0	0	To be Replaced with 8.33kHz radios
CERRO NEIVA			0	0	0	0	0	0	0	0	4	0	0		0	0	0	To be Replaced with 8.33kHz radios
CERRO SANTA ANA			0	0	0	12	0	0	0	0	0	0	0	0	0	0	0	To be Replaced with 8.33kHz radios
CERRO VERDE			0	0	0	16	0	0	0	0	0	0	0	0	0	0	0	To be Replaced with 8.33kHz radios
CHIAGUAYMARAL	SKGY	GUAYMARAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
COROZAL	SKCZ	LAS BRUJAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CUCUTA	SKCC	CAMILO DAZA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
EL YOPAL	SKYP	EL YOPAL	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	To be Replaced with 8.33kHz radios
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA	0	0	0	0	0	0	0	0	4	0	0	0	0		0	To be Replaced with 8.33kHz radios
GIRARDOT	SKGI	SANTIAGO VILA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
GUAPI	SKGP	GUAPI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
IBAGUE	SKIB	PERALES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
IPIALES	SKIP	SAN LUIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
JURISDICCIONES			0	0	0	20	0	0	0	0	0	0	0	0	0	0	0	To be Replaced with 8.33kHz radios
LA PEDRERA	SKLP	LA PEDRERA	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	To be Replaced with 8.33kHz radios
LETICIA	SKLT	VASQUEZ COBO	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	To be Replaced with 8.33kHz radios
MANIZALES	SKMZ	LA NUBIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MARIQUITA	SKQU	MARIQUTA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MEDELLIN	SKMD	OLAYA HERRERA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
META			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MITU	SKMU	FABIO LEON B.	0	0	0	8	0	0	0	0	0	0	0	4	0	0	0	To be Replaced with 8.33kHz radios
MONTERIA	SKMR	LOS GARZONES	0	0	0	0	0	0	0	0	8	0	0	0	0	0	0	To be Replaced with 8.33kHz radios
NEIVA	SKNV	BENITO SALAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
OCANA	SKOC	AGUAS CLARAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
OTU	SKOT	REMEDIOS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PASTO	SKPS	ANTONIO NARIÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PEREIRA	SKPE	MATECAÑA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
POPAYAN	SKPP	GUILLERMO LEON VALENCIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PROVIDENCIA	SKPV	PROVIDENCIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO ASIS	SKAS	PUERTO ASIS	0	0	0	0	0	0	0	0	4	0	0	0	0		0	To be Replaced with 8.33kHz radios
PUERTO CARRENO	SKPC	PUERTO CARREÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO INIRIDA			0	0	0	12	0	0	0	0	0	0	0	4	0	0	0	To be Replaced with 8.33kHz radios
PUERTO LEGUIZAMO			0	0	0	0	0	0	0	0	4	0	0	4	0		0	To be Replaced with 8.33kHz radios
0			0	0	0	12	0	0	0	0	0	0	0	0	0	0	0	To be Replaced with 8.33kHz radios
QUIBDO	SKUI	EL CARAÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
RIOHACHA	SKRH	ALMIRANTE PADILLA	0	0	0	0	0	0	0	0	12	0	0	0	0	0	0	To be Replaced with 8.33kHz radios
RIONEGRO	SKRG	JOSE MARIA CORDOBA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SAN ANDRES	SKSP	SESQUICENTENARIO	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	To be Replaced with 8.33kHz radios
SAN JOSE DEL GUAV.	SKSJ	JORGE E.GONZALEZ	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	To be Replaced with 8.33kHz radios
SANTA MARTA	SKSM	SIMON BOLIVAR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SANTANDER			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SARAVENA	SKSA	LOS COLONIZADORES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TABLAZO			0	0	0	36	0	0	0	0	0	0	0	0	0	0	0	To be Replaced with 8.33kHz radios
TAME	SKTM	TAME	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TUMACO	SKCO	LA FLORIDA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
VALLE			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
VALLEDUPAR	SKVP	ALFONSO LOPEZ	0	0	0	0	0	0	0	0	8	0	0	0	0	0	0	To be Replaced with 8.33kHz radios
VILLAVICENCIO	SKVV	VANGUARDIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

System Replacement/Discontinuance Plan
Option 1 (Evolutionary)

VHF-ER VDL-2 Expansion Capable

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)														Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
ANTIOQUIA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
APARTADO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ARARACUARA			0	0	0	0	0	0	0	0	0	0	0	12	0	0	0	Replace if original radios were modified rather than replaced
ARAUCA	SKAU	SANTIAGO PEREZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ARMENIA	SKAR	EL EDEN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ATLANTICO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BARRANCABERMEJA	SKEJ	YARIGUIES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BARRANQUILLA	SKBQ	CORTISSOZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BOGOTA	SKBO	EL DORADO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BUCARAMANGA	SKBG	PALONEGRO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CALI	SKCL	BONILLA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CAREPA	SKLC	ANTONIO ROLDAN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARIMAGUA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARTAGENA	SKCG	RAFAEL NUÑEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARTAGO	SKGO	SANTA ANA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO EL TIGRE			0	0	0	0	0	0	0	0	0	0	0	4	0		0	
CERRO KENEDY			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO LOS DOMINGUEZ			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO MACO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO MANJUI			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO NEIVA			0	0	0	0	0	0	0	0	4	0	0	0	0		0	Replace if original radios were modified rather than replaced
CERRO SANTA ANA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO VERDE			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CHIA/GUAYMARAL	SKGY	GUAYMARAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
COROZAL	SKCZ	LAS BRUJAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CUCUTA	SKCC	CAMILO DAZA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
EL YOPAL	SKYP	EL YOPAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA	0	0	0	0	0	0	0	0	4	0	0	0	0		0	Replace if original radios were modified rather than replaced
GIRARDOT	SKGI	SANTIAGO VILA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
GUAPI	SKGP	GUAPI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
IBAGUE	SKIB	PERALES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
IPIALES	SKIP	SAN LUIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
JURISDICCIONES			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
LA PEDRERA	SKLP	LA PEDRERA	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	Replace if original radios were modified rather than replaced
LETICIA	SKLT	VASQUEZ COBO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MANIZALES	SKMZ	LA NUBIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MARIQUITA	SKQU	MARIQUTA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MEDELLIN	SKMD	OLAYA HERRERA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
META			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MITU	SKMU	FABIO LEON B.	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	Replace if original radios were modified rather than replaced
MONTERIA	SKMR	LOS GARZONES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
NEIVA	SKNV	BENITO SALAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
OCANA	SKOC	AGUAS CLARAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
OTU	SKOT	REMEDIOS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PASTO	SKPS	ANTONIO NARIÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PEREIRA	SKPE	MATECAÑA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
POPAYAN	SKPP	GUILLERMO LEON VALENCIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PROVIDENCIA	SKPV	PROVIDENCIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO ASIS	SKAS	PUERTO ASIS	0	0	0	0	0	0	0	0	4	0	0	0	0		0	Replace if original radios were modified rather than replaced
PUERTO CARRENO	SKPC	PUERTO CARREÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO INIRIDA			0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	Replace if original radios were modified rather than replaced
PUERTO LEGUIZAMO			0	0	0	0	0	0	0	0	4	0	0	4	0		0	Replace if original radios were modified rather than replaced
0			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
QUIBDO	SKUI	EL CARAÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
RIOHACHA	SKRH	ALMIRANTE PADILLA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
RIONEGRO	SKRG	JOSE MARIA CORDOBA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SAN ANDRES	SKSP	SESQUICENTENARIO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SAN JOSE DEL GUAV.	SKSJ	JORGE E.GONZALEZ	0	0	0	0	0	0	0	0	4	0	0	4	0	0		Replace if original radios were modified rather than replaced
SANTA MARTA	SKSM	SIMON BOLIVAR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SANTANDER			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SARAVENA	SKSA	LOS COLONIZADORES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TABLAZO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TAME	SKTM	TAME	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TUMACO	SKCO	LA FLORIDA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
VALLE			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
VALLEDUPAR	SKVP	ALFONSO LOPEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
VILLAVICENCIO	SKVV	VANGUARDIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

System Replacement/Discontinuance Plan
Option 1 (Evolutionary)
REDDIG

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)														Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
ANTIOQUIA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
APARTADO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ARARACUARA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ARAUCA	SKAU	SANTIAGO PEREZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ARMENIA	SKAR	EL EDEN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ATLANTICO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BARRANCABERMEJA	SKEJ	YARIGUIES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BARRANQUILLA	SKBQ	CORTISSOZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BOGOTA	SKBO	EL DORADO	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	Assumes continued regional requirement
			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BUCARAMANGA	SKBG	PALONEGRO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CALI	SKCL	BONILLA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CAREPA	SKLC	ANTONIO ROLDAN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARIMAGUA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARTAGENA	SKCG	RAFAEL NUÑEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARTAGO	SKGO	SANTA ANA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO EL TIGRE			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO KENEDY			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO LOS DOMINGUEZ			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO MACO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO MANJUI			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO NEIVA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO SANTA ANA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO VERDE			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CHIA/GUAYMARAL	SKGY	GUAYMARAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
COROZAL	SKCZ	LAS BRUJAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CUCUTA	SKCC	CAMILO DAZA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
EL YOPAL	SKYP	EL YOPAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
GIRARDOT	SKGI	SANTIAGO VILA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
GUAPI	SKGP	GUAPI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
IBAGUE	SKIB	PERALES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
IPIALES	SKIP	SAN LUIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
JURISDICCIONES			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
LA PEDRERA	SKLP	LA PEDRERA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
LETICIA	SKLT	VASQUEZ COBO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MANIZALES	SKMZ	LA NUBIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MARIQUITA	SKQU	MARIQUITA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MEDELLIN	SKMD	OLAYA HERRERA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
META			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MITU	SKMU	FABIO LEON B.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MONTERIA	SKMR	LOS GARZONES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
NEIVA	SKNV	BENITO SALAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
OCANA	SKOC	AGUAS CLARAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
OTU	SKOT	REMEDIOS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PASTO	SKPS	ANTONIO NARIÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PEREIRA	SKPE	MATECAÑA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
POPAYAN	SKPP	GUILLERMO LEON VALENCIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PROVIDENCIA	SKPV	PROVIDENCIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO ASIS	SKAS	PUERTO ASIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO CARRENO	SKPC	PUERTO CARREÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO INIRIDA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO LEGUIZAMO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
QUIBDO	SKUI	EL CARAÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
RIOHACHA	SKRH	ALMIRANTE PADILLA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
RIONEGRO	SKRG	JOSE MARIA CORDOBA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SAN ANDRES	SKSP	SESQUICENTENARIC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SAN JOSE DEL GUAV.	SKSJ	JORGE E GONZALEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SANTA MARTA	SKSM	SIMON BOLIVAR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SANTANDER			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SARAVENA	SKSA	LOS COLONIZADORES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TABLAZO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TAME	SKTM	TAME	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TUMACO	SKCO	LA FLORIDA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
VALLE			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
VALLEDUPAR	SKVP	ALFONSO LOPEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
VILLAVICENCIO	SKVV	VANGUARDIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

System Replacement/Discontinuance Plan
Option 1 (Evolutionary)
AFTN/AMHS

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)														Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
ANTIOQUIA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
APARTADO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ARARACUARA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ARAUCA	SKAU	SANTIAGO PEREZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ARMENIA	SKAR	EL EDEN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ATLANTICO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BARRANCABERMEJA	SKEJ	YARIGUIES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BARRANQUILLA	SKBQ	CORTISSOZ	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	Current System Replacement
BOGOTA	SKBO	EL DORADO	0	0	2	0	0	0	0	0	0	0	0	0	2	0	0	Current System Replacement
			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BUCARAMANGA	SKBG	PALONEGRO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CALI	SKCL	BONILLA	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	Current System Replacement
CAREPA	SKLC	ANTONIO ROLDAN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARIMAGUA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARTAGENA	SKCG	RAFAEL NUÑEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARTAGO	SKGO	SANTA ANA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO EL TIGRE			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO KENEDY			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO LOS DOMINGUEZ			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO MACO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO MANJUI			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO NEIVA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO SANTA ANA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO VERDE			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CHIA/GUAYMARAL	SKGY	GUAYMARAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
COROZAL	SKCZ	LAS BRUJAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CUCUTA	SKCC	CAMILO DAZA	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	Current System Replacement
EL YOPAL	SKYP	EL YOPAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
GIRARDOT	SKGI	SANTIAGO VILA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
GUAPI	SKGP	GUAPI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
IBAGUE	SKIB	PERALES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
IPIALES	SKIP	SAN LUIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
JURISDICCIONES			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
LA PEDRERA	SKLP	LA PEDRERA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
LETICIA	SKLT	VASQUEZ COBO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MANIZALES	SKMZ	LA NUBIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MARIQUITA	SKQU	MARIQUITA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MEDELLIN	SKMD	OLAYA HERRERA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
META			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MITU	SKMU	FABIO LEON B.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MONTERIA	SKMR	LOS GARZONES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
NEIVA	SKNV	BENITO SALAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
OCANA	SKOC	AGUAS CLARAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
OTU	SKOT	REMEDIOS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PASTO	SKPS	ANTONIO NARIÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PEREIRA	SKPE	MATECAÑA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
POPAYAN	SKPP	GUILLERMO LEON VALENCIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PROVIDENCIA	SKPV	PROVIDENCIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO ASIS	SKAS	PUERTO ASIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO CARRENO	SKPC	PUERTO CARREÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO INIRIDA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO LEGUIZAMO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
QUIBDO	SKUI	EL CARAÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
RIOHACHA	SKRH	ALMIRANTE PADILLA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
RIONEGRO	SKRG	JOSE MARIA CORDOBA	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	Current System Replacement
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SAN ANDRES	SKSP	SESQUICENTENARIO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SAN JOSE DEL GUAV.	SKSJ	JORGE E.GONZALEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SANTA MARTA	SKSM	SIMON BOLIVAR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SANTANDER			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SARAVENA	SKSA	LOS COLONIZADORES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TABLAZO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TAME	SKTM	TAME	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TUMACO	SKCO	LA FLORIDA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
VALLE			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
VALLEDUPAR	SKVP	ALFONSO LOPEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
VILLAVICENCIO	SKVV	VANGUARDIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

System Implementation Plan
Communications

HF Voice

Option 2 (Accelerated)

Component:

note: see HFDL option 2 for plan since all radios will be digital voice and DL

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)															Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
ANTIOQUIA																		
APARTADO																		
ARARACUARA																		
ARAUCA	SKAU	SANTIAGO PEREZ																
ARMENIA	SKAR	EL EDEN																
ATLANTICO																		
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS																
BARRANCABERMEJA	SKEJ	YARIGUIES																
BARRANQUILLA	SKBQ	CORTISSOZ																
BOGOTA	SKBO	EL DORADO																
BUCARAMANGA	SKBG	PALONEGRO																
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ																
CALI	SKCL	BONILLA																
CAREPA	SKLC	ANTONIO ROLDAN																
CARIMAGUA																		
CARTAGENA	SKCG	RAFAEL NUÑEZ																
CARTAGO	SKGO	SANTA ANA																
CERRO EL TIGRE																		
CERRO KENEDY																		
CERRO LOS DOMINGUEZ																		
CERRO MACO																		
CERRO MANJUI																		
CERRO NEIVA																		
CERRO SANTA ANA																		
CERRO VERDE																		
CHIA/GUAYMARAL	SKGY	GUAYMARAL																
COROZAL	SKCZ	LAS BRUJAS																
CUCUTA	SKCC	CAMILO DAZA																
EL YOPAL	SKYP	EL YOPAL																
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA																
GIRARDOT	SKGI	SANTIAGO VILA																
GUAPI	SKGP	GUAPI																
IBAGUE	SKIB	PERALES																
IPIALES	SKIP	SAN LUIS																
JURISDICCIONES																		
LA PEDRERA	SKLP	LA PEDRERA																
LETICIA	SKLT	VASQUEZ COBO																
MANIZALES	SKMZ	LA NUBIA																
MARIQUITA	SKQU	MARIQUTA																
MEDELLIN	SKMD	OLAYA HERRERA																
META																		
MITU	SKMU	FABIO LEON B.																
MONTERIA	SKMR	LOS GARZONES																
NEIVA	SKNV	BENITO SALAS																
OCANA	SKOC	AGUAS CLARAS																
OTU	SKOT	REMEDIOS																
PASTO	SKPS	ANTONIO NARIÑO																
PEREIRA	SKPE	MATECAÑA																
POPAYAN	SKPP	GUILLERMO LEON VALENCIA																
PROVIDENCIA	SKPV	PROVIDENCIA																
PUERTO ASIS	SKAS	PUERTO ASIS																
PUERTO CARRENO	SKPC	PUERTO CARREÑO																
PUERTO INIRIDA																		
PUERTO LEGUIZAMO																		
0																		
QUIBDO	SKUI	EL CARAÑO																
RIOHACHA	SKRH	ALMIRANTE PADILLA																
RIONEGRO	SKRG	JOSE MARIA CORDOBA																
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO																
SAN ANDRES	SKSP	SESQUICENTENARIC																
SAN JOSE DEL GUAV.	SKSJ	JORGE E.GONZALEZ																
SANTA MARTA	SKSM	SIMON BOLIVAR																
SANTANDER																		
SARAVENA	SKSA	LOS COLONIZADORES																
TABLAZO																		
TAME	SKTM	TAME																
TUMACO	SKCO	LA FLORIDA																
VALLE																		
VALLEDUPAR	SKVP	ALFONSO LOPEZ																
VILLAVICENCIO	SKVV	VANGUARDIA																

System Implementation Plan
Communications
HF Voice and Datalink note: All HF radios will be digital voice and DL
Option 2 (Accelerated)
Component:

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)															Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
ANTIOQUIA							1										1	All HF radios will be digital voice and DL
APARTADO																		
ARARACUARA																		
ARAUCA	SKAU	SANTIAGO PEREZ																
ARMENIA	SKAR	EL EDEN																
ATLANTICO							1										1	All HF radios will be digital voice and DL
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS																
BARRANCABERMEJA	SKEJ	YARIGUIES																
BARRANQUILLA	SKBQ	CORTISSOZ					1										1	All HF radios will be digital voice and DL
BOGOTA	SKBO	EL DORADO					2										2	All HF radios will be digital voice and DL
					1										1			All HF radios will be digital voice and DL
							1										1	All HF radios will be digital voice and DL
BUCARAMANGA	SKBG	PALONEGRO																
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ																
CALI	SKCL	BONILLA				1										1		All HF radios will be digital voice and DL
CAREPA	SKLC	ANTONIO ROLDAN																
CARIMAGUA																		
CARTAGENA	SKCG	RAFAEL NUÑEZ				1										1		All HF radios will be digital voice and DL
							1										1	All HF radios will be digital voice and DL
CARTAGO	SKGO	SANTA ANA																
CERRO EL TIGRE																		
CERRO KENEDY																		
CERRO LOS DOMINGUEZ																		
CERRO MACO																		
CERRO MANJUI																		
CERRO NEIVA																		
CERRO SANTA ANA																		
CERRO VERDE																		
CHIA/GUAYMARAL	SKGY	GUAYMARAL																
COROZAL	SKCZ	LAS BRUJAS																
CUCUTA	SKCC	CAMILO DAZA				1										1		All HF radios will be digital voice and DL
EL YOPAL	SKYP	EL YOPAL																
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA																
GIRARDOT	SKGI	SANTIAGO VILA																
GUAPI	SKGP	GUAPI																
IBAGUE	SKIB	PERALES																
IPIALES	SKIP	SAN LUIS																
JURISDICCIONES																		
LA PEDRERA	SKLP	LA PEDRERA																
LETICIA	SKLT	VASQUEZ COBO																
MANIZALES	SKMZ	LA NUBIA																
MARIQUITA	SKQU	MARIQUTA																
MEDELLIN	SKMD	OLAYA HERRERA																
META							1										1	All HF radios will be digital voice and DL
MITU	SKMU	FABIO LEON B.																
MONTERIA	SKMR	LOS GARZONES																
NEIVA	SKNV	BENITO SALAS																
OCANA	SKOC	AGUAS CLARAS																
OTU	SKOT	REMEDIOS																
PASTO	SKPS	ANTONIO NARIÑO																
PEREIRA	SKPE	MATECAÑA																
POPAYAN	SKPP	GUILLERMO LEON VALENCIA																
PROVIDENCIA	SKPV	PROVIDENCIA																
PUERTO ASIS	SKAS	PUERTO ASIS																
PUERTO CARRENO	SKPC	PUERTO CARREÑO																
PUERTO INIRIDA																		
PUERTO LEGUIZAMO																		
0																		
QUIBDO	SKUI	EL CARAÑO																
RIOHACHA	SKRH	ALMIRANTE PADILLA																
RIONEGRO	SKRG	JOSE MARIA CORDOBA			1										1			All HF radios will be digital voice and DL
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO																
SAN ANDRES	SKSP	SESQUICENTENARIC				1										1		All HF radios will be digital voice and DL
SAN JOSE DEL GUAV.	SKSJ	JORGE E.GONZALEZ																
SANTA MARTA	SKSM	SIMON BOLIVAR																
SANTANDER							1										1	All HF radios will be digital voice and DL
SARAVENA	SKSA	LOS COLONIZADORES																
TABLAZO																		
TAME	SKTM	TAME																
TUMACO	SKCO	LA FLORIDA																
VALLE							1										1	All HF radios will be digital voice and DL
VALLEDUPAR	SKVP	ALFONSO LOPEZ																
VILLAVICENCIO	SKVV	VANGUARDIA					1										1	All HF radios will be digital voice and DL

System Implementation Plan
Communications
VHF/AMSS
Option 2 (Accelerated)
Component:

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)															Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
ANTIOQUIA																		
APARTADO								1										
ARARACUARA								1										
ARAUCA	SKAU	SANTIAGO PEREZ						1										
ARMENIA	SKAR	EL EDEN						1										
ATLANTICO																		
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS																
BARRANCABERMEJA	SKEJ	YARIGUIES						1										
BARRANQUILLA	SKBQ	CORTISSOZ						1										
BOGOTA	SKBO	EL DORADO						1										
BUCARAMANGA	SKBG	PALONEGRO																
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ																
CALI	SKCL	BONILLA						1										
CAREPA	SKLC	ANTONIO ROLDAN																
CARIMAGUA								1										
CARTAGENA	SKCG	RAFAEL NUÑEZ						1										
CARTAGO	SKGO	SANTA ANA																
CERRO EL TIGRE																		
CERRO KENEDY																		
CERRO LOS DOMINGUEZ																		
CERRO MACO								1										
CERRO MANJUI																		
CERRO NEIVA																		
CERRO SANTA ANA								1										
CERRO VERDE																		
CHIA/GUAYMARAL	SKGY	GUAYMARAL																
COROZAL	SKCZ	LAS BRUJAS																
CUCUTA	SKCC	CAMILO DAZA						1										
EL YOPAL	SKYP	EL YOPAL						1										
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA						1										
GIRARDOT	SKGI	SANTIAGO VILA																
GUAPI	SKGP	GUAPI																
IBAGUE	SKIB	PERALES						1										
IPIALES	SKIP	SAN LUIS						1										
JURISDICCIONES								1										
LA PEDRERA	SKLP	LA PEDRERA																
LETICIA	SKLT	VASQUEZ COBO						1										
MANIZALES	SKMZ	LA NUBIA						1										
MARIQUITA	SKQU	MARIQUTA																
MEDELLIN	SKMD	OLAYA HERRERA																
META																		
MITU	SKMU	FABIO LEON B.						1										
MONTERIA	SKMR	LOS GARZONES						1										
NEIVA	SKNV	BENITO SALAS						1										
OCANA	SKOC	AGUAS CLARAS																
OTU	SKOT	REMEDIOS																
PASTO	SKPS	ANTONIO NARIÑO						1										
PEREIRA	SKPE	MATECAÑA						1										
POPAYAN	SKPP	GUILLERMO LEON VALENCIA																
PROVIDENCIA	SKPV	PROVIDENCIA																
PUERTO ASIS	SKAS	PUERTO ASIS						1										
PUERTO CARRENO	SKPC	PUERTO CARREÑO																
PUERTO INIRIDA								1										
PUERTO LEGUIZAMO																		
0								1										
QUIBDO	SKUI	EL CARAÑO						1										
RIOHACHA	SKRH	ALMIRANTE PADILLA						1										
RIONEGRO	SKRG	JOSE MARIA CORDOBA						1										
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO																
SAN ANDRES	SKSP	SESQUICENTENARIC																
SAN JOSE DEL GUAV.	SKSJ	JORGE E.GONZALEZ						1										
SANTA MARTA	SKSM	SIMON BOLIVAR																
SANTANDER																		
SARAVENA	SKSA	LOS COLONIZADORES																
TABLAZO																		
TAME	SKTM	TAME																
TUMACO	SKCO	LA FLORIDA						1										
VALLE																		
VALLEDUPAR	SKVP	ALFONSO LOPEZ						1										
VILLAVICENCIO	SKVV	VANGUARDIA						1										

System Implementation Plan
Communications
VHF Voice 25 Khz
Option 2 (Accelerated)
Component:

note: a 25 kHz option was not recommended since the standard will be 8.33 and the cost delta should be marginal

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)															Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
ANTIOQUIA																		
APARTADO																		
ARARACUARA																		
ARAUCA	SKAU	SANTIAGO PEREZ																
ARMENIA	SKAR	EL EDEN																
ATLANTICO																		
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS																
BARRANCABERMEJA	SKEJ	YARIGUIES																
BARRANQUILLA	SKBQ	CORTISSOZ																
BOGOTA	SKBO	EL DORADO																
BUCARAMANGA	SKBG	PALONEGRO																
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ																
CALI	SKCL	BONILLA																
CAREPA	SKLC	ANTONIO ROLDAN																
CARIMAGUA																		
CARTAGENA	SKCG	RAFAEL NUÑEZ																
CARTAGO	SKGO	SANTA ANA																
CERRO EL TIGRE																		
CERRO KENEDY																		
CERRO LOS DOMINGUEZ																		
CERRO MACO																		
CERRO MANJUI																		
CERRO NEIVA																		
CERRO SANTA ANA																		
CERRO VERDE																		
CHIAGUAYMARAL	SKGY	GUAYMARAL																
COROZAL	SKCZ	LAS BRUJAS																
CUCUTA	SKCC	CAMILO DAZA																
EL YOPAL	SKYP	EL YOPAL																
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA																
GIRARDOT	SKGI	SANTIAGO VILA																
GUAPI	SKGP	GUAPI																
IBAGUE	SKIB	PERALES																
IPIALES	SKIP	SAN LUIS																
JURISDICCIONES																		
LA PEDRERA	SKLP	LA PEDRERA																
LETICIA	SKLT	VASQUEZ COBO																
MANIZALES	SKMZ	LA NUBIA																
MARIQUITA	SKQU	MARIQUITA																
MEDELLIN	SKMD	OLAYA HERRERA																
META																		
MITU	SKMU	FABIO LEON B.																
MONTERIA	SKMR	LOS GARZONES																
NEIVA	SKNV	BENITO SALAS																
OCANA	SKOC	AGUAS CLARAS																
OTU	SKOT	REMEDIOS																
PASTO	SKPS	ANTONIO NARIÑO																
PEREIRA	SKPE	MATECAÑA																
POPAYAN	SKPP	GUILLERMO LEON VALENCIA																
PROVIDENCIA	SKPV	PROVIDENCIA																
PUERTO ASIS	SKAS	PUERTO ASIS																
PUERTO CARRENO	SKPC	PUERTO CARREÑO																
PUERTO INIRIDA																		
PUERTO LEGUIZAMO																		
0																		
QUIBDO	SKUI	EL CARAÑO																
RIOHACHA	SKRH	ALMIRANTE PADILLA																
RIONEGRO	SKRG	JOSE MARIA CORDOBA																
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO																
SAN ANDRES	SKSP	SESQUICENTENARIO																
SAN JOSE DEL GUAV.	SKSJ	JORGE E GONZALEZ																
SANTA MARTA	SKSM	SIMON BOLIVAR																
SANTANDER																		
SARAVENA	SKSA	LOS COLONIZADORES																
TABLAZO																		
TAME	SKTM	TAME																
TUMACO	SKCO	LA FLORIDA																
VALLE																		
VALLEDUPAR	SKVP	ALFONSO LOPEZ																
VILLAVICENCIO	SKVV	VANGUARDIA																

System Implementation Plan
Communications

VHF Voice 8.33 Khz

Option 2 (Accelerated)
Component:

The transition to 8.33 KHz radios should be considered when the cost of these radios (giving proper consideration to new/improved features) are comparable to the cost of 25 KHz radios.

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)															Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
ANTIOQUIA																		
APARTADO					12													
ARARACUARA					12													
ARAUCA	SKAU	SANTIAGO PEREZ			12													
ARMENIA	SKAR	EL EDEN																
ATLANTICO																		
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS																
BARRANCABERMEJA	SKEJ	YARIGUIES																
BARRANQUILLA	SKBQ	CORTISSOZ																
BOGOTA	SKBO	EL DORADO																
BUCARAMANGA	SKBG	PALONEGRO																
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ																
CALI	SKCL	BONILLA																
CAREPA	SKLC	ANTONIO ROLDAN																
CARIMAGUA					12													
CARTAGENA	SKCG	RAFAEL NUÑEZ																
CARTAGO	SKGO	SANTA ANA																
CERRO EL TIGRE					28													
CERRO KENEDY					16													
CERRO LOS DOMINGUEZ					16													
CERRO MACO					12													
CERRO MANJUI					28													
CERRO NEIVA					4													
CERRO SANTA ANA					12													
CERRO VERDE					16													
CHIA/GUAYMARAL	SKGY	GUAYMARAL																
COROZAL	SKCZ	LAS BRUJAS																
CUCUTA	SKCC	CAMILO DAZA																
EL YOPAL	SKYP	EL YOPAL			4													
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA			4													
GIRARDOT	SKGI	SANTIAGO VILA																
GUAPI	SKGP	GUAPI																
IBAGUE	SKIB	PERALES																
IPIALES	SKIP	SAN LUIS																
JURISDICCIONES					20													
LA PEDRERA	SKLP	LA PEDRERA			4													
LETICIA	SKLT	VASQUEZ COBO			4													
MANIZALES	SKMZ	LA NUBIA																
MARIQUITA	SKQU	MARIQUITA																
MEDELLIN	SKMD	OLAYA HERRERA																
META																		
MITU	SKMU	FABIO LEON B.			12													
MONTERIA	SKMR	LOS GARZONES			8													
NEIVA	SKNV	BENITO SALAS																
OCANA	SKOC	AGUAS CLARAS																
OTU	SKOT	REMEDIOS																
PASTO	SKPS	ANTONIO NARIÑO																
PEREIRA	SKPE	MATECAÑA																
POPAYAN	SKPP	GUILLERMO LEON VALENCIA																
PROVIDENCIA	SKPV	PROVIDENCIA																
PUERTO ASIS	SKAS	PUERTO ASIS			4													
PUERTO CARRENO	SKPC	PUERTO CARREÑO																
PUERTO INIRIDA					16													
PUERTO LEGUIZAMO					8													
0					12													
QUIBDO	SKUI	EL CARAÑO																
RIOHACHA	SKRH	ALMIRANTE PADILLA			12													
RIONEGRO	SKRG	JOSE MARIA CORDOBA																
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO																
SAN ANDRES	SKSP	SESQUICENTENARIC			4													
SAN JOSE DEL GUAV.	SKSJ	JORGE E.GONZALEZ			4													
SANTA MARTA	SKSM	SIMON BOLIVAR																
SANTANDER																		
SARAVENA	SKSA	LOS COLONIZADORES																
TABLAZO					36													
TAME	SKTM	TAME																
TUMACO	SKCO	LA FLORIDA																
VALLE																		
VALLEDUPAR	SKVP	ALFONSO LOPEZ			8													
VILLAVICENCIO	SKVV	VANGUARDIA																

System Implementation Plan
Communications
CPDLC Phase I
Option 2 (Accelerated)
Component:

note: This capability should be included in the VHF 8.33 radio purchase

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)															Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
ANTIOQUIA																		
APARTADO					12													included in the VHF 8.33 radio purchase
ARARACUARA					12													included in the VHF 8.33 radio purchase
ARAUCA	SKAU	SANTIAGO PEREZ			12													included in the VHF 8.33 radio purchase
ARMENIA	SKAR	EL EDEN																
ATLANTICO																		
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS																
BARRANCABERMEJA	SKEJ	YARIGUIES																
BARRANQUILLA	SKBQ	CORTISSOZ																
BOGOTA	SKBO	EL DORADO																
BUCARAMANGA	SKBG	PALONEGRO																
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ																
CALI	SKCL	BONILLA																
CAREPA	SKLC	ANTONIO ROLDAN																
CARIMAGUA					12													included in the VHF 8.33 radio purchase
CARTAGENA	SKCG	RAFAEL NUÑEZ																
CARTAGO	SKGO	SANTA ANA																
CERRO EL TIGRE					28													included in the VHF 8.33 radio purchase
CERRO KENEDY					16													included in the VHF 8.33 radio purchase
CERRO LOS DOMINGUEZ					16													included in the VHF 8.33 radio purchase
CERRO MACO					12													included in the VHF 8.33 radio purchase
CERRO MANJUI					28													included in the VHF 8.33 radio purchase
CERRO NEIVA					4													included in the VHF 8.33 radio purchase
CERRO SANTA ANA					12													included in the VHF 8.33 radio purchase
CERRO VERDE					16													included in the VHF 8.33 radio purchase
CHIA/GUAYMARAL	SKGY	GUAYMARAL																
COROZAL	SKCZ	LAS BRUJAS																
CUCUTA	SKCC	CAMILO DAZA																
EL YOPAL	SKYP	EL YOPAL			4													included in the VHF 8.33 radio purchase
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA			4													
GIRARDOT	SKGI	SANTIAGO VILA																
GUAPI	SKGP	GUAPI																
IBAGUE	SKIB	PERALES																
IPIALES	SKIP	SAN LUIS																
JURISDICCIONES					20													included in the VHF 8.33 radio purchase
LA PEDRERA	SKLP	LA PEDRERA			4													
LETICIA	SKLT	VASQUEZ COBO			4													included in the VHF 8.33 radio purchase
MANIZALES	SKMZ	LA NUBIA																
MARIQUITA	SKQU	MARIQUITA																
MEDELLIN	SKMD	OLAYA HERRERA																
META																		
MITU	SKMU	FABIO LEON B.			12													included in the VHF 8.33 radio purchase
MONTERIA	SKMR	LOS GARZONES			8													included in the VHF 8.33 radio purchase
NEIVA	SKNV	BENITO SALAS																
OCANA	SKOC	AGUAS CLARAS																
OTU	SKOT	REMEDIOS																
PASTO	SKPS	ANTONIO NARIÑO																
PEREIRA	SKPE	MATECAÑA																
POPAYAN	SKPP	GUILLERMO LEON VALENCIA																
PROVIDENCIA	SKPV	PROVIDENCIA																
PUERTO ASIS	SKAS	PUERTO ASIS			4													
PUERTO CARRENO	SKPC	PUERTO CARREÑO																
PUERTO INIRIDA					16													included in the VHF 8.33 radio purchase
PUERTO LEGUIZAMO					8													included in the VHF 8.33 radio purchase
0					12													included in the VHF 8.33 radio purchase
QUIBDO	SKUI	EL CARAÑO																
RIOHACHA	SKRH	ALMIRANTE PADILLA			12													included in the VHF 8.33 radio purchase
RIONEGRO	SKRG	JOSE MARIA CORDOBA																
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO																
SAN ANDRES	SKSP	SESQUICENTENARIC			4													included in the VHF 8.33 radio purchase
SAN JOSE DEL GUAV.	SKSJ	JORGE E GONZALEZ			4													included in the VHF 8.33 radio purchase
SANTA MARTA	SKSM	SIMON BOLIVAR																
SANTANDER																		
SARAVENA	SKSA	LOS COLONIZADORES																
TABLAZO					36													included in the VHF 8.33 radio purchase
TAME	SKTM	TAME																
TUMACO	SKCO	LA FLORIDA																
VALLE																		
VALLEDUPAR	SKVP	ALFONSO LOPEZ			8													included in the VHF 8.33 radio purchase
VILLAVICENCIO	SKVV	VANGUARDIA																

System Implementation Plan
Communications

VDL-3

Option 2 (Accelerated)
Component:

note: this should be included in the VHF 8.33 radio purchase if it has been implemented by ICAO and is available at the time of purchase

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)															Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
ANTIOQUIA																		
APARTADO					12													included in the VHF 8.33 radio purchase
ARARACUARA					12													included in the VHF 8.33 radio purchase
ARAUCA	SKAU	SANTIAGO PEREZ			12													included in the VHF 8.33 radio purchase
ARMENIA	SKAR	EL EDEN																
ATLANTICO																		
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS																
BARRANCABERMEJA	SKEJ	YARIGUIES																
BARRANQUILLA	SKBQ	CORTISSOZ																
BOGOTA	SKBO	EL DORADO																
BUCARAMANGA	SKBG	PALONEGRO																
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ																
CALI	SKCL	BONILLA																
CAREPA	SKLC	ANTONIO ROLDAN																
CARIMAGUA					12													included in the VHF 8.33 radio purchase
CARTAGENA	SKCG	RAFAEL NUÑEZ																
CARTAGO	SKGO	SANTA ANA																
CERRO EL TIGRE					28													included in the VHF 8.33 radio purchase
CERRO KENEDY					16													included in the VHF 8.33 radio purchase
CERRO LOS DOMINGUEZ					16													included in the VHF 8.33 radio purchase
CERRO MACO					12													included in the VHF 8.33 radio purchase
CERRO MANJUI					28													included in the VHF 8.33 radio purchase
CERRO NEIVA					4													
CERRO SANTA ANA					12													included in the VHF 8.33 radio purchase
CERRO VERDE					16													included in the VHF 8.33 radio purchase
CHIA/GUAYMARAL	SKGY	GUAYMARAL																
COROZAL	SKCZ	LAS BRUJAS																
CUCUTA	SKCC	CAMILO DAZA																
EL YOPAL	SKYP	EL YOPAL			4													included in the VHF 8.33 radio purchase
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA			4													included in the VHF 8.33 radio purchase
GIRARDOT	SKGI	SANTIAGO VILA																
GUAPI	SKGP	GUAPI																
IBAGUE	SKIB	PERALES																
IPIALES	SKIP	SAN LUIS																
JURISDICCIONES					20													included in the VHF 8.33 radio purchase
LA PEDRERA	SKLP	LA PEDRERA			4													included in the VHF 8.33 radio purchase
LETICIA	SKLT	VASQUEZ COBO			4													included in the VHF 8.33 radio purchase
MANIZALES	SKMZ	LA NUBIA																
MARIQUITA	SKQU	MARIQUITA																
MEDELLIN	SKMD	OLAYA HERRERA																
META																		
MITU	SKMU	FABIO LEON B.			12													included in the VHF 8.33 radio purchase
MONTERIA	SKMR	LOS GARZONES			8													included in the VHF 8.33 radio purchase
NEIVA	SKNV	BENITO SALAS																
OCANA	SKOC	AGUAS CLARAS																
OTU	SKOT	REMEDIOS																
PASTO	SKPS	ANTONIO NARIÑO																
PEREIRA	SKPE	MATECAÑA																
POPAYAN	SKPP	GUILLERMO LEON VALENCIA																
PROVIDENCIA	SKPV	PROVIDENCIA																
PUERTO ASIS	SKAS	PUERTO ASIS			4													
PUERTO CARRENO	SKPC	PUERTO CARREÑO																
PUERTO INIRIDA					16													included in the VHF 8.33 radio purchase
PUERTO LEGUIZAMO					8													included in the VHF 8.33 radio purchase
0					12													included in the VHF 8.33 radio purchase
QUIBDO	SKUI	EL CARAÑO																
RIOHACHA	SKRH	ALMIRANTE PADILLA			12													included in the VHF 8.33 radio purchase
RIONEGRO	SKRG	JOSE MARIA CORDOBA																
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO																
SAN ANDRES	SKSP	SESQUICENTENARIC			4													included in the VHF 8.33 radio purchase
SAN JOSE DEL GUAV.	SKSJ	JORGE E GONZALEZ			4													included in the VHF 8.33 radio purchase
SANTA MARTA	SKSM	SIMON BOLIVAR																
SANTANDER																		
SARAVENA	SKSA	LOS COLONIZADORES																
TABLAZO					36													included in the VHF 8.33 radio purchase
TAME	SKTM	TAME																
TUMACO	SKCO	LA FLORIDA																
VALLE																		
VALLEDUPAR	SKVP	ALFONSO LOPEZ			8													included in the VHF 8.33 radio purchase
VILLAVICENCIO	SKVV	VANGUARDIA																

System Implementation Plan
Communications

CPDLC Phase II

Option 2 (Accelerated)
Component:

note: this should be included in the VHF 8.33 radio purchase if it is available at the time of purchase

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)															Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
ANTIOQUIA																		
APARTADO					12													included in the VHF 8.33 radio purchase
ARARACUARA					12													included in the VHF 8.33 radio purchase
ARAUCA	SKAU	SANTIAGO PEREZ			12													included in the VHF 8.33 radio purchase
ARMENIA	SKAR	EL EDEN																
ATLANTICO																		
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS																
BARRANCABERMEJA	SKEJ	YARIGUIES																
BARRANQUILLA	SKBQ	CORTISSOZ																
BOGOTA	SKBO	EL DORADO																
BUCARAMANGA	SKBG	PALONEGRO																
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ																
CALI	SKCL	BONILLA																
CAREPA	SKLC	ANTONIO ROLDAN																
CARIMAGUA					12													included in the VHF 8.33 radio purchase
CARTAGENA	SKCG	RAFAEL NUÑEZ																
CARTAGO	SKGO	SANTA ANA																
CERRO EL TIGRE					28													included in the VHF 8.33 radio purchase
CERRO KENEDY					16													included in the VHF 8.33 radio purchase
CERRO LOS DOMINGUEZ					16													included in the VHF 8.33 radio purchase
CERRO MACO					12													included in the VHF 8.33 radio purchase
CERRO MANJUI					28													included in the VHF 8.33 radio purchase
CERRO NEIVA					4													included in the VHF 8.33 radio purchase
CERRO SANTA ANA					12													included in the VHF 8.33 radio purchase
CERRO VERDE					16													included in the VHF 8.33 radio purchase
CHIA/GUAYMARAL	SKGY	GUAYMARAL																
COROZAL	SKCZ	LAS BRUJAS																
CUCUTA	SKCC	CAMILO DAZA																
EL YOPAL	SKYP	EL YOPAL			4													included in the VHF 8.33 radio purchase
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA			4													included in the VHF 8.33 radio purchase
GIRARDOT	SKGI	SANTIAGO VILA																
GUAPI	SKGP	GUAPI																
IBAGUE	SKIB	PERALES																
IPIALES	SKIP	SAN LUIS																
JURISDICCIONES					20													included in the VHF 8.33 radio purchase
LA PEDRERA	SKLP	LA PEDRERA			4													included in the VHF 8.33 radio purchase
LETICIA	SKLT	VASQUEZ COBO			4													included in the VHF 8.33 radio purchase
MANIZALES	SKMZ	LA NUBIA																
MARIQUITA	SKQU	MARIQUITA																
MEDELLIN	SKMD	OLAYA HERRERA																
META																		
MITU	SKMU	FABIO LEON B.			12													included in the VHF 8.33 radio purchase
MONTERIA	SKMR	LOS GARZONES			8													included in the VHF 8.33 radio purchase
NEIVA	SKNV	BENITO SALAS																
OCANA	SKOC	AGUAS CLARAS																
OTU	SKOT	REMEDIOS																
PASTO	SKPS	ANTONIO NARIÑO																
PEREIRA	SKPE	MATECAÑA																
POPAYAN	SKPP	GUILLERMO LEON VALENCIA																
PROVIDENCIA	SKPV	PROVIDENCIA																
PUERTO ASIS	SKAS	PUERTO ASIS			4													
PUERTO CARRENO	SKPC	PUERTO CARREÑO																
PUERTO INIRIDA					16													included in the VHF 8.33 radio purchase
PUERTO LEGUIZAMO					8													included in the VHF 8.33 radio purchase
0					12													included in the VHF 8.33 radio purchase
QUIBDO	SKUI	EL CARAÑO																
RIOHACHA	SKRH	ALMIRANTE PADILLA			12													included in the VHF 8.33 radio purchase
RIONEGRO	SKRG	JOSE MARIA CORDOBA																
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO																
SAN ANDRES	SKSP	SESQUICENTENARIC			4													included in the VHF 8.33 radio purchase
SAN JOSE DEL GUAV	SKSJ	JORGE E.GONZALEZ			4													included in the VHF 8.33 radio purchase
SANTA MARTA	SKSM	SIMON BOLIVAR																
SANTANDER																		
SARAVENA	SKSA	LOS COLONIZADORES																
TABLAZO					36													included in the VHF 8.33 radio purchase
TAME	SKTM	TAME																
TUMACO	SKCO	LA FLORIDA																
VALLE																		
VALLEDUPAR	SKVP	ALFONSO LOPEZ			8													included in the VHF 8.33 radio purchase
VILLAVICENCIO	SKVV	VANGUARDIA																

System Implementation Plan
Communications
Full ATN Data
Option 2 (Accelerated)

Component:

The aeronautical telecommunications network (ATN) is a global networking infrastructure that will enable the exchange of information betweem all those connected, such as air traffic service provider facilities, airline operations centers, etc. ATN will be comprised of subnetworks, such as VDL-2,/ACARS, VDL-3, SATCOM, and HF. Full ATN refers to having in place all of the appropriate subnetworks.

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)														Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
ANTIOQUIA																		
APARTADO																		
ARARACUARA																		
ARAUCA	SKAU	SANTIAGO PEREZ																
ARMENIA	SKAR	EL EDEN																
ATLANTICO																		
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS																
BARRANCABERMEJA	SKEJ	YARIGUIES																
BARRANQUILLA	SKBQ	CORTISSOZ								2								
BOGOTA	SKBO	EL DORADO								2								
BUCARAMANGA	SKBG	PALONEGRO																
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ																
CALI	SKCL	BONILLA																
CAREPA	SKLC	ANTONIO ROLDAN																
CARIMAGUA																		
CARTAGENA	SKCG	RAFAEL NUÑEZ																
CARTAGO	SKGO	SANTA ANA																
CERRO EL TIGRE																		
CERRO KENEDY																		
CERRO LOS DOMINGUEZ																		
CERRO MACO																		
CERRO MANJUI																		
CERRO NEIVA																		
CERRO SANTA ANA																		
CERRO VERDE																		
CHIA/GUAYMARAL	SKGY	GUAYMARAL																
COROZAL	SKCZ	LAS BRUJAS																
CUCUTA	SKCC	CAMILO DAZA																
EL YOPAL	SKYP	EL YOPAL																
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA																
GIRARDOT	SKGI	SANTIAGO VILA																
GUAPI	SKGP	GUAPI																
IBAGUE	SKIB	PERALES																
IPIALES	SKIP	SAN LUIS																
JURISDICCIONES																		
LA PEDRERA	SKLP	LA PEDRERA																
LETICIA	SKLT	VASQUEZ COBO																
MANIZALES	SKMZ	LA NUBIA																
MARIQUITA	SKQU	MARIQUTA																
MEDELLIN	SKMD	OLAYA HERRERA																
META																		
MITU	SKMU	FABIO LEON B.																
MONTERIA	SKMR	LOS GARZONES																
NEIVA	SKNV	BENITO SALAS																
OCANA	SKOC	AGUAS CLARAS																
OTU	SKOT	REMEDIOS																
PASTO	SKPS	ANTONIO NARIÑO																
PEREIRA	SKPE	MATECAÑA																
POPAYAN	SKPP	GUILLERMO LEON VALENCIA																
PROVIDENCIA	SKPV	PROVIDENCIA																
PUERTO ASIS	SKAS	PUERTO ASIS																
PUERTO CARRENO	SKPC	PUERTO CARREÑO																
PUERTO INIRIDA																		
PUERTO LEGUIZAMO																		
0																		
QUIBDO	SKUI	EL CARAÑO																
RIOHACHA	SKRH	ALMIRANTE PADILLA																
RIONEGRO	SKRG	JOSE MARIA CORDOBA																
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO																
SAN ANDRES	SKSP	SESQUICENTENARIC																
SAN JOSE DEL GUAV.	SKSJ	JORGE E.GONZALEZ																
SANTA MARTA	SKSM	SIMON BOLIVAR																
SANTANDER																		
SARAVENA	SKSA	LOS COLONIZADORES																
TABLAZO																		
TAME	SKTM	TAME																
TUMACO	SKCO	LA FLORIDA																
VALLE																		
VALLEDUPAR	SKVP	ALFONSO LOPEZ																
VILLAVICENCIO	SKVV	VANGUARDIA																

System Replacement/Discontinuance Plan
Option 2 (Accelerated) **note: Replace all radios with digital radios**

HF

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)														Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
ANTIOQUIA			0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	Replace all radios with digital radios
APARTADO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ARARACUARA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ARAUCA	SKAU	SANTIAGO PEREZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ARMENIA	SKAR	EL EDEN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ATLANTICO			0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	Replace all radios with digital radios
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BARRANCABERMEJA	SKEJ	YARIGUIES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BARRANQUILLA	SKBQ	CORTISSOZ	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	Replace all radios with digital radios
BOGOTA	SKBO	EL DORADO	0	0	0	0	2	0	0	0	0	0	0	0	0	0	2	Replace all radios with digital radios
			0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	Replace all radios with digital radios
			0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	Replace all radios with digital radios
BUCARAMANGA	SKBG	PALONEGRO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CALI	SKCL	BONILLA	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	Replace all radios with digital radios
CAREPA	SKLC	ANTONIO ROLDAN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARIMAGUA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARTAGENA	SKCG	RAFAEL NUÑEZ	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	Replace all radios with digital radios
			0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	Replace all radios with digital radios
CARTAGO	SKGO	SANTA ANA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO EL TIGRE			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO KENEDY			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO LOS DOMINGUEZ			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO MACO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO MANJUI			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO NEIVA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO SANTA ANA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO VERDE			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CHIAGUAYMARAL	SKGY	GUAYMARAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
COROZAL	SKCZ	LAS BRUJAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CUCUTA	SKCC	CAMILO DAZA	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	Replace all radios with digital radios
EL YOPAL	SKYP	EL YOPAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
GIRARDOT	SKGI	SANTIAGO VILA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
GUAPI	SKGP	GUAPI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
IBAGUE	SKIB	PERALES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
IPIALES	SKIP	SAN LUIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
JURISDICCIONES			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
LA PEDRERA	SKLP	LA PEDRERA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
LETICIA	SKLT	VASQUEZ COBO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MANIZALES	SKMZ	LA NUBIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MARIQUITA	SKQU	MARIQUITA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MEDELLIN	SKMD	OLAYA HERRERA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
META			0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	Replace all radios with digital radios
MITU	SKMU	FABIO LEON B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MONTERIA	SKMR	LOS GARZONES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
NEIVA	SKNV	BENITO SALAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
OCANA	SKOC	AGUAS CLARAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
OTU	SKOT	REMEDIOS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PASTO	SKPS	ANTONIO NARIÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PEREIRA	SKPE	MATECAÑA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
POPAYAN	SKPP	GUILLERMO LEON VALENCIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PROVIDENCIA	SKPV	PROVIDENCIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO ASIS	SKAS	PUERTO ASIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO CARRENO	SKPC	PUERTO CARREÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO INIRIDA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO LEGUIZAMO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
QUIBDO	SKUI	EL CARAÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
RIOHACHA	SKRH	ALMIRANTE PADILLA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
RIONEGRO	SKRG	JOSE MARIA CORDOBA	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	Replace all radios with digital radios
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SAN ANDRES	SKSP	SESQUICENTENARIC	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	Replace all radios with digital radios
SAN JOSE DEL GUAV	SKSJ	JORGE E GONZALEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SANTA MARTA	SKSM	SIMON BOLIVAR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SANTANDER			0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	Replace all radios with digital radios
SARAVENA	SKSA	LOS COLONIZADORES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TABLAZO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TAME	SKTM	TAME	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TUMACO	SKCO	LA FLORIDA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
VALLE			0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	Replace all radios with digital radios
VALLEDUPAR	SKVP	ALFONSO LOPEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
VILLAVICENCIO	SKVV	VANGUARDIA	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	Replace all radios with digital radios

System Replacement/Discontinuance Plan
Option 2 (Accelerated)

VSAT

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)														Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
ANTIOQUIA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
APARTADO			0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Current System Replacement
ARARACUARA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Current System Replacement
ARAUCA	SKAU	SANTIAGO PEREZ	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Current System Replacement
ARMENIA	SKAR	EL EDEN	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Current System Replacement
ATLANTICO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BARRANCABERMEJA	SKEJ	YARIGUIES	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Current System Replacement
BARRANQUILLA	SKBQ	CORTISSOZ	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Current System Replacement
BOGOTA	SKBO	EL DORADO	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Current System Replacement
			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BUCARAMANGA	SKBG	PALONEGRO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CALI	SKCL	BONILLA	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Current System Replacement
CAREPA	SKLC	ANTONIO ROLDAN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARIMAGUA			0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Current System Replacement
CARTAGENA	SKCG	RAFAEL NUÑEZ	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Current System Replacement
			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARTAGO	SKGO	SANTA ANA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO EL TIGRE			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO KENEDY			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO LOS DOMINGUEZ			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO MACO			0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Current System Replacement
CERRO MANJUI			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO NEIVA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO SANTA ANA			0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Current System Replacement
CERRO VERDE			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CHIA/GUAYMARAL	SKGY	GUAYMARAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
COROZAL	SKCZ	LAS BRUJAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CUCUTA	SKCC	CAMILO DAZA	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Current System Replacement
EL YOPAL	SKYP	EL YOPAL	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Current System Replacement
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Current System Replacement
GIRARDOT	SKGI	SANTIAGO VILA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
GUAPI	SKGP	GUAPI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
IBAGUE	SKIB	PERALES	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Current System Replacement
IPIALES	SKIP	SAN LUIS	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Current System Replacement
JURISDICCIONES			0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Current System Replacement
LA PEDRERA	SKLP	LA PEDRERA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
LETICIA	SKLT	VASQUEZ COBO	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Current System Replacement
MANIZALES	SKMZ	LA NUBIA	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	
MARIQUITA	SKQU	MARIQUITA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MEDELLIN	SKMD	OLAYA HERRERA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
META			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MITU	SKMU	FABIO LEON B.	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Current System Replacement
MONTERIA	SKMR	LOS GARZONES	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Current System Replacement
NEIVA	SKNV	BENITO SALAS	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Current System Replacement
OCANA	SKOC	AGUAS CLARAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
OTU	SKOT	REMEDIOS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PASTO	SKPS	ANTONIO NARIÑO	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Current System Replacement
PEREIRA	SKPE	MATECAÑA	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Current System Replacement
POPAYAN	SKPP	GUILLERMO LEON VALENCIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PROVIDENCIA	SKPV	PROVIDENCIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO ASIS	SKAS	PUERTO ASIS	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Current System Replacement
PUERTO CARRENO	SKPC	PUERTO CARREÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO INIRIDA			0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Current System Replacement
PUERTO LEGUIZAMO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0			0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Current System Replacement
QUIBDO	SKUI	EL CARAÑO	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Current System Replacement
RIOHACHA	SKRH	ALMIRANTE PADILLA	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Current System Replacement
RIONEGRO	SKRG	JOSE MARIA CORDOBA	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Current System Replacement
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SAN ANDRES	SKSP	SESQUICENTENARIO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SAN JOSE DEL GUAV.	SKSJ	JORGE E GONZALEZ	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Current System Replacement
SANTA MARTA	SKSM	SIMON BOLIVAR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SANTANDER			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SARAVENA	SKSA	LOS COLONIZADORES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TABLAZO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TAME	SKTM	TAME	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TUMACO	SKCO	LA FLORIDA	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Current System Replacement
VALLE			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
VALLEDUPAR	SKVP	ALFONSO LOPEZ	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Current System Replacement
VILLAVICENCIO	SKVV	VANGUARDIA	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Current System Replacement

System Replacement/Discontinuance Plan
Option 2 (Accelerated)
VHF-ER

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)															Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
ANTIOQUIA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
APARTADO			0	0	0	0	0	0	12	0	0	0	0	0	0	0	0	To be Replaced with 8.33kHz radios
ARARACUARA			0	0	0	0	0	0	0	0	0	0	0	12	0	0	0	To be Replaced with 8.33kHz radios
ARAUCA	SKAU	SANTIAGO PEREZ	0	0	0	0	0	0	0	12	0	0	0	0	0	0	0	To be Replaced with 8.33kHz radios
ARMENIA	SKAR	EL EDEN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ATLANTICO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BARRANCABERMEJA	SKEJ	YARIGUIES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BARRANQUILLA	SKBQ	CORTISSOZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BOGOTA	SKBO	EL DORADO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BUCARAMANGA	SKBG	PALONEGRO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CALI	SKCL	BONILLA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CAREPA	SKLC	ANTONIO ROLDAN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARIMAGUA			0	0	0	0	0	0	0	12	0	0	0	0	0	0	0	To be Replaced with 8.33kHz radios
CARTAGENA	SKCG	RAFAEL NUÑEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARTAGO	SKGO	SANTA ANA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO EL TIGRE			0	0	0	24	0	0	0	0	0	0	0	4	0	0	0	To be Replaced with 8.33kHz radios
CERRO KENEDY			0	0	0	16	0	0	0	0	0	0	0	0	0	0	0	To be Replaced with 8.33kHz radios
CERRO LOS DOMINGUEZ			0	0	0	16	0	0	0	0	0	0	0	0	0	0	0	To be Replaced with 8.33kHz radios
CERRO MACO			0	0	0	12	0	0	0	0	0	0	0	0	0	0	0	To be Replaced with 8.33kHz radios
CERRO MANJUI			0	0	0	28	0	0	0	0	0	0	0	0	0	0	0	To be Replaced with 8.33kHz radios
CERRO NEIVA			0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	
CERRO SANTA ANA			0	0	0	12	0	0	0	0	0	0	0	0	0	0	0	To be Replaced with 8.33kHz radios
CERRO VERDE			0	0	0	16	0	0	0	0	0	0	0	0	0	0	0	To be Replaced with 8.33kHz radios
CHIA/GUAYMARAL	SKGY	GUAYMARAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
COROZAL	SKCZ	LAS BRUJAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CUCUTA	SKCC	CAMILO DAZA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
EL YOPAL	SKYP	EL YOPAL	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	To be Replaced with 8.33kHz radios
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA	0	0	0	0	0	0	0	0	4	0	0	0	0		0	
GIRARDOT	SKGI	SANTIAGO VILA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
GUAPI	SKGP	GUAPI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
IBAGUE	SKIB	PERALES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
IPIALES	SKIP	SAN LUIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
JURISDICCIONES			0	0	0	20	0	0	0	0	0	0	0	0	0	0	0	To be Replaced with 8.33kHz radios
LA PEDRERA	SKLP	LA PEDRERA	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	
LETICIA	SKLT	VASQUEZ COBO	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	To be Replaced with 8.33kHz radios
MANIZALES	SKMZ	LA NUBIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MARIQUITA	SKQU	MARIQUITA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MEDELLIN	SKMD	OLAYA HERRERA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
META			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MITU	SKMU	FABIO LEON B.	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0	To be Replaced with 8.33kHz radios
MONTERIA	SKMR	LOS GARZONES	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	To be Replaced with 8.33kHz radios
NEIVA	SKNV	BENITO SALAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
OCANA	SKOC	AGUAS CLARAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
OTU	SKOT	REMEDIOS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PASTO	SKPS	ANTONIO NARIÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PEREIRA	SKPE	MATECAÑA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
POPAYAN	SKPP	GUILLERMO LEON VALENCIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PROVIDENCIA	SKPV	PROVIDENCIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO ASIS	SKAS	PUERTO ASIS	0	0	0	0	0	0	0	0	4	0	0	0	0		0	
PUERTO CARRENO	SKPC	PUERTO CARREÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO INIRIDA			0	0	0	12	0	0	0	0	0	0	0	4	0	0	0	To be Replaced with 8.33kHz radios
PUERTO LEGUIZAMO			0	0	0	0	0	0	0	0	4	0	0	4	0		0	
0			0	0	0	12	0	0	0	0	0	0	0	0	0	0	0	To be Replaced with 8.33kHz radios
QUIBDO	SKUI	EL CARAÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
RIOHACHA	SKRH	ALMIRANTE PADILLA	0	0	0	0	0	0	0	0	12	0	0	0	0	0	0	To be Replaced with 8.33kHz radios
RIONEGRO	SKRG	JOSE MARIA CORDOBA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SAN ANDRES	SKSP	SESQUICENTENARIO	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	To be Replaced with 8.33kHz radios
SAN JOSE DEL GUAV.	SKSJ	JORGE E.GONZALEZ	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	
SANTA MARTA	SKSM	SIMON BOLIVAR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SANTANDER			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SARAVENA	SKSA	LOS COLONIZADORES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TABLAZO			0	0	0	36	0	0	0	0	0	0	0	0	0	0	0	To be Replaced with 8.33kHz radios
TAME	SKTM	TAME	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TUMACO	SKCO	LA FLORIDA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
VALLE			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
VALLEDUPAR	SKVP	ALFONSO LOPEZ	0	0	0	0	0	0	0	0	8	0	0	0	0	0	0	To be Replaced with 8.33kHz radios
VILLAVICENCIO	SKVV	VANGUARDIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

System Replacement/Discontinuance Plan

Option 2 (Accelerated)

VHF-ER VDL-2 Expansion Capable

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)															Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
ANTIOQUIA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
APARTADO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ARARACUARA			0	0	0	0	0	0	0	0	0	0	0	12	0	0	0	Replace if original radios were modified rather than replaced
ARAUCA	SKAU	SANTIAGO PEREZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ARMENIA	SKAR	EL EDEN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ATLANTICO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BARRANCABERMEJA	SKEJ	YARIGUIES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BARRANQUILLA	SKBQ	CORTISSOZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BOGOTA	SKBO	EL DORADO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BUCARAMANGA	SKBG	PALONEGRO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CALI	SKCL	BONILLA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CAREPA	SKLC	ANTONIO ROLDAN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARIMAGUA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARTAGENA	SKCG	RAFAEL NUÑEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARTAGO	SKGO	SANTA ANA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO EL TIGRE			0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	Replace if original radios were modified rather than replaced
CERRO KENEDY			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO LOS DOMINGUEZ			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO MACO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO MANJUI			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO NEIVA			0	0	0	0	0	0	0	0	4	0	0	0	0		0	Replace if original radios were modified rather than replaced
CERRO SANTA ANA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO VERDE			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CHIA/GUAYMARAL	SKGY	GUAYMARAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
COROZAL	SKCZ	LAS BRUJAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CUCUTA	SKCC	CAMILO DAZA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
EL YOPAL	SKYP	EL YOPAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA	0	0	0	0	0	0	0	0	4	0	0	0	0		0	Replace if original radios were modified rather than replaced
GIRARDOT	SKGI	SANTIAGO VILA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
GUAPI	SKGP	GUAPI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
IBAGUE	SKIB	PERALES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
IPIALES	SKIP	SAN LUIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
JURISDICCIONES			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
LA PEDRERA	SKLP	LA PEDRERA	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	Replace if original radios were modified rather than replaced
LETICIA	SKLT	VASQUEZ COBO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MANIZALES	SKMZ	LA NUBIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MARIQUITA	SKQU	MARIQUITA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MEDELLIN	SKMD	OLAYA HERRERA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
META			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MITU	SKMU	FABIO LEON B	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	Replace if original radios were modified rather than replaced
MONTERIA	SKMR	LOS GARZONES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
NEIVA	SKNV	BENITO SALAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
OCANA	SKOC	AGUAS CLARAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
OTU	SKOT	REMEDIOS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PASTO	SKPS	ANTONIO NARIÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PEREIRA	SKPE	MATECAÑA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
POPAYAN	SKPP	GUILLERMO LEON VALENCIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PROVIDENCIA	SKPV	PROVIDENCIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO ASIS	SKAS	PUERTO ASIS	0	0	0	0	0	0	0	0	4	0	0	0	0		0	Replace if original radios were modified rather than replaced
PUERTO CARRENO	SKPC	PUERTO CARREÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO INIRIDA			0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	Replace if original radios were modified rather than replaced
PUERTO LEGUIZAMO			0	0	0	0	0	0	0	0	4	0	0	4	0		0	Replace if original radios were modified rather than replaced
0			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
QUIBDO	SKUI	EL CARAÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
RIOHACHA	SKRH	ALMIRANTE PADILLA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
RIONEGRO	SKRG	JOSE MARIA CORDOBA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SAN ANDRES	SKSP	SESQUICENTENARIO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SAN JOSE DEL GUAV.	SKSJ	JORGE E.GONZALEZ	0	0	0	0	0	0	0	0	0	0	0	4	0	0		Replace if original radios were modified rather than replaced
SANTA MARTA	SKSM	SIMON BOLIVAR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SANTANDER			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SARAVENA	SKSA	LOS COLONIZADORES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TABLAZO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TAME	SKTM	TAME	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TUMACO	SKCO	LA FLORIDA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
VALLE			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
VALLEDUPAR	SKVP	ALFONSO LOPEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
VILLAVICENCIO	SKVV	VANGUARDIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

System Replacement/Discontinuance Plan
Option 2 (Accelerated)
REDDIG

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)														Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
ANTIOQUIA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
APARTADO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ARARACUARA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ARAUCA	SKAU	SANTIAGO PEREZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ARMENIA	SKAR	EL EDEN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ATLANTICO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BARRANCABERMEJA	SKEJ	YARIGUIES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BARRANQUILLA	SKBQ	CORTISSOZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BOGOTA	SKBO	EL DORADO	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	Assumes continued regional requirement
			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BUCARAMANGA	SKBG	PALONEGRO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CALI	SKCL	BONILLA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CAREPA	SKLC	ANTONIO ROLDAN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARIMAGUA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARTAGENA	SKCG	RAFAEL NUÑEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARTAGO	SKGO	SANTA ANA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO EL TIGRE			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO KENEDY			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO LOS DOMINGUEZ			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO MACO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO MANJUI			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO NEIVA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO SANTA ANA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO VERDE			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CHIA/GUAYMARAL	SKGY	GUAYMARAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
COROZAL	SKCZ	LAS BRUJAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CUCUTA	SKCC	CAMILO DAZA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
EL YOPAL	SKYP	EL YOPAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
GIRARDOT	SKGI	SANTIAGO VILA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
GUAPI	SKGP	GUAPI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
IBAGUE	SKIB	PERALES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
IPIALES	SKIP	SAN LUIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
JURISDICCIONES			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
LA PEDRERA	SKLP	LA PEDRERA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
LETICIA	SKLT	VASQUEZ COBO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MANIZALES	SKMZ	LA NUBIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MARIQUITA	SKQU	MARIQUITA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MEDELLIN	SKMD	OLAYA HERRERA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
META			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MITU	SKMU	FABIO LEON B.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MONTERIA	SKMR	LOS GARZONES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
NEIVA	SKNV	BENITO SALAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
OCANA	SKOC	AGUAS CLARAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
OTU	SKOT	REMEDIOS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PASTO	SKPS	ANTONIO NARIÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PEREIRA	SKPE	MATECAÑA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
POPAYAN	SKPP	GUILLERMO LEON VALENCIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PROVIDENCIA	SKPV	PROVIDENCIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO ASIS	SKAS	PUERTO ASIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO CARRENO	SKPC	PUERTO CARREÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO INIRIDA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO LEGUIZAMO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
QUIBDO	SKUI	EL CARAÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
RIOHACHA	SKRH	ALMIRANTE PADILLA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
RIONEGRO	SKRG	JOSE MARIA CORDOBA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SAN ANDRES	SKSP	SESQUICENTENARIC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SAN JOSE DEL GUAV.	SKSJ	JORGE E GONZALEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SANTA MARTA	SKSM	SIMON BOLIVAR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SANTANDER			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SARAVENA	SKSA	LOS COLONIZADORES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TABLAZO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TAME	SKTM	TAME	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TUMACO	SKCO	LA FLORIDA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
VALLE			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
VALLEDUPAR	SKVP	ALFONSO LOPEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
VILLAVICENCIO	SKVV	VANGUARDIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

System Replacement/Discontinuance Plan
Option 2 (Accelerated)
AFTN/AMHS

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)														Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
ANTIOQUIA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
APARTADO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ARARACUARA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ARAUCA	SKAU	SANTIAGO PEREZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ARMENIA	SKAR	EL EDEN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ATLANTICO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BARRANCABERMEJA	SKEJ	YARIGUIES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BARRANQUILLA	SKBQ	CORTISSOZ	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	Current System Replacement
BOGOTA	SKBO	EL DORADO	0	0	2	0	0	0	0	0	0	0	0	0	2	0	0	Current System Replacement
			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BUCARAMANGA	SKBG	PALONEGRO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CALI	SKCL	BONILLA	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	Current System Replacement
CAREPA	SKLC	ANTONIO ROLDAN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARIMAGUA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARTAGENA	SKCG	RAFAEL NUÑEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARTAGO	SKGO	SANTA ANA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO EL TIGRE			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO KENEDY			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO LOS DOMINGUEZ			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO MACO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO MANJUI			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO NEIVA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO SANTA ANA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO VERDE			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CHIA/GUAYMARAL	SKGY	GUAYMARAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
COROZAL	SKCZ	LAS BRUJAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CUCUTA	SKCC	CAMILO DAZA	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	Current System Replacement
EL YOPAL	SKYP	EL YOPAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
GIRARDOT	SKGI	SANTIAGO VILA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
GUAPI	SKGP	GUAPI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
IBAGUE	SKIB	PERALES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
IPIALES	SKIP	SAN LUIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
JURISDICCIONES			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
LA PEDRERA	SKLP	LA PEDRERA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
LETICIA	SKLT	VASQUEZ COBO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MANIZALES	SKMZ	LA NUBIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MARIQUITA	SKQU	MARIQUITA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MEDELLIN	SKMD	OLAYA HERRERA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
META			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MITU	SKMU	FABIO LEON B.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MONTERIA	SKMR	LOS GARZONES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
NEIVA	SKNV	BENITO SALAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
OCAÑA	SKOC	AGUAS CLARAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
OTU	SKOT	REMEDIOS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PASTO	SKPS	ANTONIO NARIÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PEREIRA	SKPE	MATECAÑA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
POPAYAN	SKPP	GUILLERMO LEON VALENCIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PROVIDENCIA	SKPV	PROVIDENCIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO ASIS	SKAS	PUERTO ASIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO CARRENO	SKPC	PUERTO CARREÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO INIRIDA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO LEGUIZAMO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
QUIBDO	SKUI	EL CARAÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
RIOHACHA	SKRH	ALMIRANTE PADILLA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
RIONEGRO	SKRG	JOSE MARIA CORDOBA	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	Current System Replacement
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SAN ANDRES	SKSP	SESQUICENTENARIO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SAN JOSE DEL GUAV.	SKSJ	JORGE E GONZALEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SANTA MARTA	SKSM	SIMON BOLIVAR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SANTANDER			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SARAVENA	SKSA	LOS COLONIZADORES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TABLAZO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TAME	SKTM	TAME	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TUMACO	SKCO	LA FLORIDA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
VALLE			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
VALLEDUPAR	SKVP	ALFONSO LOPEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
VILLAVICENCIO	SKVV	VANGUARDIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

APPENDIX C – NAVIGATION WORKSHEETS

Navigation Systems Inventory

Location Information				System by Age																							
				ILS CAT I				ILS CAT II/III				DVOR/ DME				CVOR/ DME				PVOR/ DME				DME				NDB			
Location/Site	ICAO Code	Airport	Site Visit?	Quantity	Install year	Age	ILS CAT I Useful Life	Quantity	Install year	Age	ILS CAT II/III Useful Life	Quantity	Install year	Age	DVOR/DME Useful Life	Quantity	Install year	Age	CVOR/DME Useful Life	Quantity	Install year	Age	PVOR/DME Useful Life	Quantity	Install year	Age	DME Useful Life	Quantity	Install year	Age	NDB Useful Life
AMBALEMA			No																								1	1993	12	15
ARARACUARA			No																											
ARAUCA	SKAU	SANTIAGO PEREZ	No													1	1985	20	15											
ARMENIA	SKAR	EL EDEN	No																	1	1997	8	15				1	1970	35	15
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS	No																								1	1975	30	15
BARRANCABERMEJA	SKEJ	YARIGUIES	No									1	1994	11	15															
BARRANCA DE UPIA			No																								1	1999	6	15
BARRANQUILLA	SKBQ	CORTISSOZ	Yes	1	1998	7	15									1	1993	12	15											
BOGOTA	SKBO	ELDORADO	Yes	1	1995	10	15	1	1998	7	15													1	1995	10	15			
																								1	1998	7	15			
BUCARAMANGA	SKBG	PALONEGRO	No													1	2003	2	15											
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ	No													1	1993	12	15								1	1975	30	15
BUVIS			No									1	1996	9	15															
CALI	SKCL	BONILLA	Yes	1	1994	11	15																							
CALIPUERTO			No													1	1994	11	15								1	1994	11	15
CAREPA	SKLC	ANTONIO ROLDAN	No																											
CARIMAGUA			No																								1	1999	6	15
CARTAGENA	SKCG	RAFAEL NUÑEZ	Yes													1	1982	23	15								1	1985	20	15
CARTAGO	SKGO	SANTA ANA	No																											
CHIA/GUAYMARAL	SKGY	GUAYMARAL	No																											
CONDOTO			No																								1	1975	30	15
COROZAL	SKCZ	LAS BRUJAS	No																											
CUCUTA	SKCC	CAMILO DAZA	No	1	1986	19	15					1	2003	2	15															
EL BANCO			No													1	1995	10	15											
EL PASO			No																								1	1999	6	15
EL ROSAL			No									1	1995	10	15												1	1995	10	15
EL YOPAL	SKYP	EL YOPAL	No													1	1993	12	15											
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA	No													1	1994	11	15											
GIRARDOT	SKGI	SANTIAGO VILA	No													1	1991	14	15											
GUAPI	SKGP	GUAPI	No																								1	1989	16	15
IBAGUE	SKIB	PERALES	No													1	1996	9	15								1	1987	18	15
IPIALES	SKIP	SAN LUIS	No													1	1997	8	15								1	1975	30	15
JARDIN			No																								1	1999	6	15
LA MINA			No																											
LA PEDRERA			No																								1	1981	24	15
LETICIA	SKLT	VASQUEZ COBO	No	1	1986	19	15					1	1994	11	15												1	1990	15	15
LOS CEDROS			No													1	1997	8	15											
MAGANGUE			No													1	1995	10	15											
MANIZALES	SKMZ	LA NUBIA	No																								1	1999	6	15
MARINILLA			No									1	2003	2	15															
MARIQUITA	SKQU	MARIQUITA	No									1	1995	10	15															
MECADERES			No													1	1997	8	15											
MEDELLIN	SKMD	OLAYA HERRERA	No																											
MITU	SKMU	FABIO LEON B.	No													1	1995	10	15								1	1975	30	15
MONTERIA	SKMR	LOS GARZONES	No													1	1997	8	15											
NEIVA	SKNV	BENITO SALAS	No													1	1989	16	15											
NUQUI			No																								1	1975	30	15
OCANA	SKOC	AGUAS CLARAS	No																											
OTU	SKOT	REMEDIOS	No													1	1995	10	15											
PALMA			No																								1	1975	30	15
PASTO	SKPS	ANTONIO NARIÑO	No													1	1998	7	15											
PEREIRA	SKPE	MATECAÑA	No													1	1994	11	15								1	1970	35	15
PIEDECUESTA			No																								1	1975	30	15
POPAYAN	SKPP	GUILLERMO LEON VALENCIA	No																								1	1970	35	15
PROVIDENCIA	SKPV	PROVIDENCIA	No																											
PUERTO ASIS	SKAS	PUERTO ASIS	No																											
PUERTO CARRENO	SKPC	PUERTO CARREÑO	No													1	1998	7	15								1	1975	30	15
PUERTO INIRIDA			No													1	1998	7	15								1	1970	35	15
PUERTO LEGUIZAMO			No													1	1998	7	15											
QUIBDO	SKUI	EL CARAÑO	No									1	1997	8	15															
RIOHACHA	SKRH	ALMIRANTE PADILLA	No									1	2003	2	15															
RIONEGRO	SKRG	JOSE MARIA CORDOBA	No	1	2003	2	15					1	1993	12	15															
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO	No																	1	1997	8	15							
SAN ANDRES	SKSP	SESQUICENTENARIO	No									1	1989	16	15												1	1990	15	15
SAN JOSE DEL GUAV.	SKSJ	JORGE E.GONZALEZ	No	1	2002	3	15									1	1997	8	15					1	2002	3	15			
SANTA MARTA	SKSM	SIMON BOLIVAR	No													1	1999	6	15								1	1975	30	15
SARAVENA	SKSA	LOS COLONIZADORES	No																								1	1997	8	15
SOGAMOSO			No																								1	2002	3	15
TAME	SKTM	TAME	No																								1	1975	30	15
TECHO			No																								1	1986	19	15
TRES ESQUINAS			No																											
TRINIDAD			No																								1	1970	35	15
TULUA			No													1	1996	9	15											
TUMACO	SKCO	LA FLORIDA	No													1	1996	9	15								1	1970	35	15
TURBO			No																								1	1984	21	15
VALLEDUPAR	SKVP	ALFONSO LOPEZ	No													1	1997	8	15								1	1975	30	15
VILLAVICENCIO	SKVV	VANGUARDIA	No													1	1994	11	15								1	1970	35	15
ZIPAQUIRA			No									1	2003	2	15															
Sub total				7				1				12				30				2				3				37			

System Implementation Plan
Navigation
GPMS
Option 1 (Evolutionary)
Component: **Master Station**

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)															Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
AMBALEMA																		
ARARACUARA																		
ARAUCA	SKAU	SANTIAGO PEREZ																
ARMENIA	SKAR	EL EDEN																
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS																
BARRANCABERMEJA	SKEJ	YARIGUIES																
BARRANCA DE UPIA																		
BARRANQUILLA	SKBQ	CORTISSOZ				1												
BOGOTA	SKBO	ELDORADO				1												
BUCARAMANGA	SKBG	PALONEGRO																
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ																
BUVIS																		
CALI	SKCL	BONILLA																
CALIPUERTO																		
CAREPA	SKLC	ANTONIO ROLDAN																
CARIMAGUA																		
CARTAGENA	SKCG	RAFAEL NUÑEZ																
CARTAGO	SKGO	SANTA ANA																
CHIA/GUAYMARAL	SKGY	GUAYMARAL																
CONDOTO																		
COROZAL	SKCZ	LAS BRUJAS																
CUCUTA	SKCC	CAMILO DAZA																
EL BANCO																		
EL PASO																		
EL ROSAL																		
EL YOPAL	SKYP	EL YOPAL																
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA																
GIRARDOT	SKGI	SANTIAGO VILA																
GUAPI	SKGP	GUAPI																
IBAGUE	SKIB	PERALES																
IPIALES	SKIP	SAN LUIS																
JARDIN																		
LA MINA																		
LA PEDRERA																		
LETICIA	SKLT	VASQUEZ COBO																
LOS CEDROS																		
MAGANGUE																		
MANIZALES	SKMZ	LA NUBIA																
MARINILLA																		
MARIQUITA	SKQU	MARIQUITA																
MECADERES																		
MEDELLIN	SKMD	OLAYA HERRERA																
MITU	SKMU	FABIO LEON B.																
MONTERIA	SKMR	LOS GARZONES																
NEIVA	SKNV	BENITO SALAS																
NUQUI																		
OCANA	SKOC	AGUAS CLARAS																
OTU	SKOT	REMEDIOS																
PALMA																		
PASTO	SKPS	ANTONIO NARIÑO																
PEREIRA	SKPE	MATECAÑA																
PIEDECUESTA																		
POPAYAN	SKPP	GUILLERMO LEON VALENCIA																
PROVIDENCIA	SKPV	PROVIDENCIA																
PUERTO ASIS	SKAS	PUERTO ASIS																
PUERTO CARRENO	SKPC	PUERTO CARREÑO																
PUERTO INIRIDA																		
PUERTO LEGUIZAMO																		
QUIBDO	SKUI	EL CARAÑO																
RIOHACHA	SKRH	ALMIRANTE PADILLA																
RIONEGRO	SKRG	JOSE MARIA CORDOBA																
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO																
SAN ANDRES	SKSP	SESQUICENTENARIO																
SAN JOSE DEL GUAV.	SKSJ	JORGE E.GONZALEZ																
SANTA MARTA	SKSM	SIMON BOLIVAR																
SARAVENA	SKSA	LOS COLONIZADORES																
SOGAMOSO																		
TAME	SKTM	TAME																
TECHO																		
TRES ESQUINAS																		
TRINIDAD																		
TULUA																		
TUMACO	SKCO	LA FLORIDA																
TURBO																		
VALLEDUPAR	SKVP	ALFONSO LOPEZ																
VILLAVICENCIO	SKVV	VANGUARDIA																
ZIPAQUIRA																		

System Implementation Plan

Navigation

SBAS

Option 1 (Evolutionary) none

Component: **Master Station**

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)															Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
AMBALEMA																		
ARARACUARA																		
ARAUCA	SKAU	SANTIAGO PEREZ																
ARMENIA	SKAR	EL EDEN																
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS																
BARRANCABERMEJA	SKEJ	YARIGUIES																
BARRANCA DE UPIA																		
BARRANQUILLA	SKBQ	CORTISSOZ																
BOGOTA	SKBO	ELDORADO																
BUCARAMANGA	SKBG	PALONEGRO																
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ																
BUVIS																		
CALI	SKCL	BONILLA																
CALIPUERTO																		
CAREPA	SKLC	ANTONIO ROLDAN																
CARIMAGUA																		
CARTAGENA	SKCG	RAFAEL NUÑEZ																
CARTAGO	SKGO	SANTA ANA																
CHIA/GUAYMARAL	SKGY	GUAYMARAL																
CONDOTO																		
COROZAL	SKCZ	LAS BRUJAS																
CUCUTA	SKCC	CAMILO DAZA																
EL BANCO																		
EL PASO																		
EL ROSAL																		
EL YOPAL	SKYP	EL YOPAL																
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA																
GIRARDOT	SKGI	SANTIAGO VILA																
GUAPI	SKGP	GUAPI																
IBAGUE	SKIB	PERALES																
IPIALES	SKIP	SAN LUIS																
JARDIN																		
LA MINA																		
LA PEDRERA																		
LETICIA	SKLT	VASQUEZ COBO																
LOS CEDROS																		
MAGANGUE																		
MANIZALES	SKMZ	LA NUBIA																
MARINILLA																		
MARIQUITA	SKQU	MARIQUITA																
MECADERES																		
MEDELLIN	SKMD	OLAYA HERRERA																
MITU	SKMU	FABIO LEON B.																
MONTERIA	SKMR	LOS GARZONES																
NEIVA	SKNV	BENITO SALAS																
NUQUI																		
OCANA	SKOC	AGUAS CLARAS																
OTU	SKOT	REMEDIOS																
PALMA																		
PASTO	SKPS	ANTONIO NARIÑO																
PEREIRA	SKPE	MATECAÑA																
PIEDECUESTA																		
POPAYAN	SKPP	GUILLERMO LEON VALENCIA																
PROVIDENCIA	SKPV	PROVIDENCIA																
PUERTO ASIS	SKAS	PUERTO ASIS																
PUERTO CARRENO	SKPC	PUERTO CARREÑO																
PUERTO INIRIDA																		
PUERTO LEGUIZAMO																		
QUIBDO	SKUI	EL CARAÑO																
RIOHACHA	SKRH	ALMIRANTE PADILLA																
RIONEGRO	SKRG	JOSE MARIA CORDOBA																
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO																
SAN ANDRES	SKSP	SESQUICENTENARIO																
SAN JOSE DEL GUAV.	SKSJ	JORGE E GONZALEZ																
SANTA MARTA	SKSM	SIMON BOLIVAR																
SARAVENA	SKSA	LOS COLONIZADORES																
SOGAMOSO																		
TAME	SKTM	TAME																
TECHO																		
TRES ESQUINAS																		
TRINIDAD																		
TULUA																		
TUMACO	SKCO	LA FLORIDA																
TURBO																		
VALLEDUPAR	SKVP	ALFONSO LOPEZ																
VILLAVICENCIO	SKVV	VANGUARDIA																
ZIPAQUIRA																		

System Implementation Plan
Navigation
GPMS
Option 1 (Evolutionary)
Component: **Reference Stations**

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)															Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
AMBALEMA																		
ARARACUARA																		
ARAUCA	SKAU	SANTIAGO PEREZ																
ARMENIA	SKAR	EL EDEN																
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS																
BARRANCABERMEJA	SKEJ	YARIGUIES																
BARRANCA DE UPIA																		
BARRANQUILLA	SKBQ	CORTISSOZ																
BOGOTA	SKBO	ELDORADO							1									
BUCARAMANGA	SKBG	PALONEGRO																
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ																
BUVIS																		
CALI	SKCL	BONILLA																
CALIPUERTO																		
CAREPA	SKLC	ANTONIO ROLDAN																
CARIMAGUA																		
CARTAGENA	SKCG	RAFAEL NUÑEZ																
CARTAGO	SKGO	SANTA ANA																
CHIA/GUAYMARAL	SKGY	GUAYMARAL																
CONDOTO																		
COROZAL	SKCZ	LAS BRUJAS																
CUCUTA	SKCC	CAMILO DAZA																
EL BANCO																		
EL PASO																		
EL ROSAL																		
EL YOPAL	SKYP	EL YOPAL																
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA																
GIRARDOT	SKGI	SANTIAGO VILA																
GUAPI	SKGP	GUAPI																
IBAGUE	SKIB	PERALES																
IPIALES	SKIP	SAN LUIS																
JARDIN																		
LA MINA																		
LA PEDRERA																		
LETICIA	SKLT	VASQUEZ COBO							1									
LOS CEDROS																		
MAGANGUE																		
MANIZALES	SKMZ	LA NUBIA																
MARINILLA																		
MARIQUITA	SKQU	MARIQUITA																
MECADERES																		
MEDELLIN	SKMD	OLAYA HERRERA																
MITU	SKMU	FABIO LEON B.																
MONTERIA	SKMR	LOS GARZONES																
NEIVA	SKNV	BENITO SALAS																
NUQUI																		
OCANA	SKOC	AGUAS CLARAS																
OTU	SKOT	REMEDIOS																
PALMA																		
PASTO	SKPS	ANTONIO NARIÑO																
PEREIRA	SKPE	MATECAÑA																
PIEDECUESTA																		
POPAYAN	SKPP	GUILLERMO LEON VALENCIA																
PROVIDENCIA	SKPV	PROVIDENCIA																
PUERTO ASIS	SKAS	PUERTO ASIS																
PUERTO CARRENO	SKPC	PUERTO CARREÑO							1									
PUERTO INIRIDA																		
PUERTO LEGUIZAMO																		
QUIBDO	SKUI	EL CARAÑO																
RIOHACHA	SKRH	ALMIRANTE PADILLA																
RIONEGRO	SKRG	JOSE MARIA CORDOBA																
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO																
SAN ANDRES	SKSP	SESQUICENTENARIO							1									
SAN JOSE DEL GUAV.	SKSJ	JORGE E.GONZALEZ																
SANTA MARTA	SKSM	SIMON BOLIVAR							1									
SARAVENA	SKSA	LOS COLONIZADORES																
SOGAMOSO																		
TAME	SKTM	TAME																
TECHO																		
TRES ESQUINAS																		
TRINIDAD																		
TULUA																		
TUMACO	SKCO	LA FLORIDA							1									
TURBO																		
VALLEDUPAR	SKVP	ALFONSO LOPEZ																
VILLAVICENCIO	SKVV	VANGUARDIA																
ZIPAQUIRA																		

System Implementation Plan

Navigation

SBAS

Option 1 (Evolutionary) none

Component: **Reference Stations**

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)															Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
AMBALEMA																		
ARARACUARA																		
ARAUCA	SKAU	SANTIAGO PEREZ																
ARMENIA	SKAR	EL EDEN																
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS																
BARRANCABERMEJA	SKEJ	YARIGUIES																
BARRANCA DE UPIA																		
BARRANQUILLA	SKBQ	CORTISSOZ																
BOGOTA	SKBO	ELDORADO																
BUCARAMANGA	SKBG	PALONEGRO																
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ																
BUVIS																		
CALI	SKCL	BONILLA																
CALIPUERTO																		
CAREPA	SKLC	ANTONIO ROLDAN																
CARIMAGUA																		
CARTAGENA	SKCG	RAFAEL NUÑEZ																
CARTAGO	SKGO	SANTA ANA																
CHIA/GUAYMARAL	SKGY	GUAYMARAL																
CONDOTO																		
COROZAL	SKCZ	LAS BRUJAS																
CUCUTA	SKCC	CAMILO DAZA																
EL BANCO																		
EL PASO																		
EL ROSAL																		
EL YOPAL	SKYP	EL YOPAL																
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA																
GIRARDOT	SKGI	SANTIAGO VILA																
GUAPI	SKGP	GUAPI																
IBAGUE	SKIB	PERALES																
IPIALES	SKIP	SAN LUIS																
JARDIN																		
LA MINA																		
LA PEDRERA																		
LETICIA	SKLT	VASQUEZ COBO																
LOS CEDROS																		
MAGANGUE																		
MANIZALES	SKMZ	LA NUBIA																
MARINILLA																		
MARIQUITA	SKQU	MARIQUITA																
MECADERES																		
MEDELLIN	SKMD	OLAYA HERRERA																
MITU	SKMU	FABIO LEON B.																
MONTERIA	SKMR	LOS GARZONES																
NEIVA	SKNV	BENITO SALAS																
NUQUI																		
OCANA	SKOC	AGUAS CLARAS																
OTU	SKOT	REMEDIOS																
PALMA																		
PASTO	SKPS	ANTONIO NARIÑO																
PEREIRA	SKPE	MATECAÑA																
PIEDECUESTA																		
POPAYAN	SKPP	GUILLERMO LEON VALENCIA																
PROVIDENCIA	SKPV	PROVIDENCIA																
PUERTO ASIS	SKAS	PUERTO ASIS																
PUERTO CARRENO	SKPC	PUERTO CARREÑO																
PUERTO INIRIDA																		
PUERTO LEGUIZAMO																		
QUIBDO	SKUI	EL CARAÑO																
RIOHACHA	SKRH	ALMIRANTE PADILLA																
RIONEGRO	SKRG	JOSE MARIA CORDOBA																
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO																
SAN ANDRES	SKSP	SESQUICENTENARIO																
SAN JOSE DEL GUAV.	SKSJ	JORGE E.GONZALEZ																
SANTA MARTA	SKSM	SIMON BOLIVAR																
SARAVENA	SKSA	LOS COLONIZADORES																
SOGAMOSO																		
TAME	SKTM	TAME																
TECHO																		
TRES ESQUINAS																		
TRINIDAD																		
TULUA																		
TUMACO	SKCO	LA FLORIDA																
TURBO																		
VALLEDUPAR	SKVP	ALFONSO LOPEZ																
VILLAVICENCIO	SKVV	VANGUARDIA																
ZIPAQUIRA																		

System Implementation Plan

Navigation

GBAS

Option 1 (Evolutionary) none

Component: **CAT I**

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)															Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
AMBALEMA																		
ARARACUARA																		
ARAUCA	SKAU	SANTIAGO PEREZ																
ARMENIA	SKAR	EL EDEN																
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS																
BARRANCABERMEJA	SKEJ	YARIGUIES																
BARRANCA DE UPIA																		
BARRANQUILLA	SKBQ	CORTISSOZ																
BOGOTA	SKBO	ELDORADO																
BUCARAMANGA	SKBG	PALONEGRO																
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ																
BUVIS																		
CALI	SKCL	BONILLA																
CALIPUERTO																		
CAREPA	SKLC	ANTONIO ROLDAN																
CARIMAGUA																		
CARTAGENA	SKCG	RAFAEL NUÑEZ																
CARTAGO	SKGO	SANTA ANA																
CHIA/GUAYMARAL	SKGY	GUAYMARAL																
CONDOTO																		
COROZAL	SKCZ	LAS BRUJAS																
CUCUTA	SKCC	CAMILO DAZA																
EL BANCO																		
EL PASO																		
EL ROSAL																		
EL YOPAL	SKYP	EL YOPAL																
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA																
GIRARDOT	SKGI	SANTIAGO VILA																
GUAPI	SKGP	GUAPI																
IBAGUE	SKIB	PERALES																
IPIALES	SKIP	SAN LUIS																
JARDIN																		
LA MINA																		
LA PEDRERA																		
LETICIA	SKLT	VASQUEZ COBO																
LOS CEDROS																		
MAGANGUE																		
MANIZALES	SKMZ	LA NUBIA																
MARINILLA																		
MARIQUITA	SKQU	MARIQUTA																
MECADERES																		
MEDELLIN	SKMD	OLAYA HERRERA																
MITU	SKMU	FABIO LEON B.																
MONTERIA	SKMR	LOS GARZONES																
NEIVA	SKNV	BENITO SALAS																
NUQUI																		
OCANA	SKOC	AGUAS CLARAS																
OTU	SKOT	REMEDIOS																
PALMA																		
PASTO	SKPS	ANTONIO NARIÑO																
PEREIRA	SKPE	MATECAÑA																
PIEDECUESTA																		
POPAYAN	SKPP	GUILLERMO LEON VALENCIA																
PROVIDENCIA	SKPV	PROVIDENCIA																
PUERTO ASIS	SKAS	PUERTO ASIS																
PUERTO CARRENO	SKPC	PUERTO CARREÑO																
PUERTO INIRIDA																		
PUERTO LEGUIZAMO																		
QUIBDO	SKUI	EL CARAÑO																
RIOHACHA	SKRH	ALMIRANTE PADILLA																
RIONEGRO	SKRG	JOSE MARIA CORDOBA																
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO																
SAN ANDRES	SKSP	SESQUICENTENARIO																
SAN JOSE DEL GUAV.	SKSJ	JORGE E.GONZALEZ																
SANTA MARTA	SKSM	SIMON BOLIVAR																
SARAVENA	SKSA	LOS COLONIZADORES																
SOGAMOSO																		
TAME	SKTM	TAME																
TECHO																		
TRES ESQUINAS																		
TRINIDAD																		
TULUA																		
TUMACO	SKCO	LA FLORIDA																
TURBO																		
VALLEDUPAR	SKVP	ALFONSO LOPEZ																
VILLAVICENCIO	SKVV	VANGUARDIA																
ZIPAQUIRA																		

System Implementation Plan
Navigation
GBAS

Option 1 (Evolutionary) none

Component: **CAT II/III**

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)															Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
AMBALEMA																		
ARARACUARA																		
ARAUCA	SKAU	SANTIAGO PEREZ																
ARMENIA	SKAR	EL EDEN																
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS																
BARRANCABERMEJA	SKEJ	YARIGUIES																
BARRANCA DE UPIA																		
BARRANQUILLA	SKBQ	CORTISSOZ																
BOGOTA	SKBO	ELDORADO																
BUCARAMANGA	SKBG	PALONEGRO																
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ																
BUVIS																		
CALI	SKCL	BONILLA																
CALIPUERTO																		
CAREPA	SKLC	ANTONIO ROLDAN																
CARIMAGUA																		
CARTAGENA	SKCG	RAFAEL NUÑEZ																
CARTAGO	SKGO	SANTA ANA																
CHIA/GUAYMARAL	SKGY	GUAYMARAL																
CONDOTO																		
COROZAL	SKCZ	LAS BRUJAS																
CUCUTA	SKCC	CAMILO DAZA																
EL BANCO																		
EL PASO																		
EL ROSAL																		
EL YOPAL	SKYP	EL YOPAL																
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA																
GIRARDOT	SKGI	SANTIAGO VILA																
GUAPI	SKGP	GUAPI																
IBAGUE	SKIB	PERALES																
IPIALES	SKIP	SAN LUIS																
JARDIN																		
LA MINA																		
LA PEDRERA																		
LETICIA	SKLT	VASQUEZ COBO																
LOS CEDROS																		
MAGANGUE																		
MANIZALES	SKMZ	LA NUBIA																
MARINILLA																		
MARIQUITA	SKQU	MARIQUITA																
MECADERES																		
MEDELLIN	SKMD	OLAYA HERRERA																
MITU	SKMU	FABIO LEON B.																
MONTERIA	SKMR	LOS GARZONES																
NEIVA	SKNV	BENITO SALAS																
NUQUI																		
OCANA	SKOC	AGUAS CLARAS																
OTU	SKOT	REMEDIOS																
PALMA																		
PASTO	SKPS	ANTONIO NARIÑO																
PEREIRA	SKPE	MATECAÑA																
PIEDECUESTA																		
POPAYAN	SKPP	GUILLERMO LEON VALENCIA																
PROVIDENCIA	SKPV	PROVIDENCIA																
PUERTO ASIS	SKAS	PUERTO ASIS																
PUERTO CARRENO	SKPC	PUERTO CARREÑO																
PUERTO INIRIDA																		
PUERTO LEGUIZAMO																		
QUIBDO	SKUI	EL CARAÑO																
RIOHACHA	SKRH	ALMIRANTE PADILLA																
RIONEGRO	SKRG	JOSE MARIA CORDOBA																
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO																
SAN ANDRES	SKSP	SESQUICENTENARIO																
SAN JOSE DEL GUAV.	SKSJ	JORGE E.GONZALEZ																
SANTA MARTA	SKSM	SIMON BOLIVAR																
SARAVENA	SKSA	LOS COLONIZADORES																
SOGAMOSO																		
TAME	SKTM	TAME																
TECHO																		
TRES ESQUINAS																		
TRINIDAD																		
TULUA																		
TUMACO	SKCO	LA FLORIDA																
TURBO																		
VALLEDUPAR	SKVP	ALFONSO LOPEZ																
VILLAVICENCIO	SKVV	VANGUARDIA																
ZIPAQUIRA																		

System Replacement/Discontinuance Plan
Option 1 (Evolutionary)

ILS CAT I

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)														Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
AMBALEMA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ARARACUARA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ARAUCA	SKAU	SANTIAGO PEREZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ARMENIA	SKAR	EL EDEN	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	New ILS based on Aerocivil Plans
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BARRANCABERMEJA	SKEJ	YARIGUIES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BARRANCA DE UPIA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BARRANQUILLA	SKBQ	CORTISSOZ	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	
BOGOTA	SKBO	ELDORADO	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	
			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BUCARAMANGA	SKBG	PALONEGRO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BUVIS			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CALI	SKCL	BONILLA	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	
CALIPUERTO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CAREPA	SKLC	ANTONIO ROLDAN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARIMAGUA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARTAGENA	SKCG	RAFAEL NUÑEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARTAGO	SKGO	SANTA ANA	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	New ILS based on Aerocivil Plans
CHIA/GUAYMARAL	SKGY	GUAYMARAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CONDOTO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
COROZAL	SKCZ	LAS BRUJAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CUCUTA	SKCC	CAMILO DAZA	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
EL BANCO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
EL PASO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
EL ROSAL			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
EL YOPAL	SKYP	EL YOPAL	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	New ILS based on Aerocivil Plans
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	New ILS based on Aerocivil Plans
GIRARDOT	SKGI	SANTIAGO VILA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
GUAPI	SKGP	GUAPI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
IBAGUE	SKIB	PERALES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
IPIALES	SKIP	SAN LUIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
JARDIN			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
LA MINA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
LA PEDRERA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
LETICIA	SKLT	VASQUEZ COBO	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
LOS CEDROS			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MAGANGUE			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MANIZALES	SKMZ	LA NUBIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MARINILLA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MARIQUITA	SKQU	MARIQUITA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MECADERES			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MEDELLIN	SKMD	OLAYA HERRERA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MITU	SKMU	FABIO LEON B.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MONTERIA	SKMR	LOS GARZONES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
NEIVA	SKNV	BENITO SALAS	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	New ILS based on Aerocivil Plans
NUQUI			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
OCANA	SKOC	AGUAS CLARAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
OTU	SKOT	REMEDIOS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PALMA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PASTO	SKPS	ANTONIO NARIÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PEREIRA	SKPE	MATECAÑA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PIEDECUESTA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
POPAYAN	SKPP	GUILLERMO LEON VALENCIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PROVIDENCIA	SKPV	PROVIDENCIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO ASIS	SKAS	PUERTO ASIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO CARRENO	SKPC	PUERTO CARREÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO INIRIDA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO LEGUIZAMO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
QUIBDO	SKUI	EL CARAÑO	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	New ILS based on Aerocivil Plans
RIOHACHA	SKRH	ALMIRANTE PADILLA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
RIONEGRO	SKRG	JOSE MARIA CORDOBA	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SAN ANDRES	SKSP	SESQUICENTENARIC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SAN JOSE DEL GUAV.	SKSJ	JORGE E GONZALEZ	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	
SANTA MARTA	SKSM	SIMON BOLIVAR	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	New ILS based on Aerocivil Plans
SARAVENA	SKSA	LOS COLONIZADORES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SOGAMOSO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TAME	SKTM	TAME	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TECHO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TRES ESQUINAS			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TRINIDAD			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TULUA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TUMACO	SKCO	LA FLORIDA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TURBO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
VALLEDUPAR	SKVP	ALFONSO LOPEZ	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	New ILS based on Aerocivil Plans
VILLAVICENCIO	SKVV	VANGUARDIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ZIPAQUIRA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

System Replacement/Discontinuance Plan
Option 1 (Evolutionary)

ILS CAT II

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components installed)														Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
AMBALEMA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ARARACUARA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ARAUCA	SKAU	SANTIAGO PEREZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ARMENIA	SKAR	EL EDEN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BARRANCABERMEJA	SKEJ	YARIGUIES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BARRANCA DE UPIA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BARRANQUILLA	SKBQ	CORTISSOZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BOGOTA	SKBO	ELDORADO	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	
			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BUCARAMANGA	SKBG	PALONEGRO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BUVIS			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CALI	SKCL	BONILLA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CALIPUERTO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CAREPA	SKLC	ANTONIO ROLDAN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARIMAGUA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARTAGENA	SKCG	RAFAEL NUÑEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARTAGO	SKGO	SANTA ANA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CHIA/GUAYMARAL	SKGY	GUAYMARAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CONDOTO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
COROZAL	SKCZ	LAS BRUJAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CUCUTA	SKCC	CAMILO DAZA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
EL BANCO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
EL PASO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
EL ROSAL			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
EL YOPAL	SKYP	EL YOPAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
GIRARDOT	SKGI	SANTIAGO VILA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
GUAPI	SKGP	GUAPI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
IBAGUE	SKIB	PERALES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
IPIALES	SKIP	SAN LUIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
JARDIN			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
LA MINA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
LA PEDRERA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
LETICIA	SKLT	VASQUEZ COBO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
LOS CEDROS			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MAGANGUE			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MANIZALES	SKMZ	LA NUBIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MARINILLA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MARIQUITA	SKQU	MARIQUTA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MECADERES			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MEDELLIN	SKMD	OLAYA HERRERA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MITU	SKMU	FABIO LEON B.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MONTERIA	SKMR	LOS GARZONES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
NEIVA	SKNV	BENITO SALAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
NUQUI			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
OCANA	SKOC	AGUAS CLARAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
OTU	SKOT	REMEDIOS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PALMA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PASTO	SKPS	ANTONIO NARIÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PEREIRA	SKPE	MATECAÑA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PIEDECUESTA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
POPAYAN	SKPP	GUILLERMO LEON VALENCIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PROVIDENCIA	SKPV	PROVIDENCIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO ASIS	SKAS	PUERTO ASIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO CARRENO	SKPC	PUERTO CARREÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO INIRIDA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO LEGUIZAMO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
QUIBDO	SKUI	EL CARAÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
RIOHACHA	SKRH	ALMIRANTE PADILLA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
RIONEGRO	SKRG	JOSE MARIA CORDOBA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SAN ANDRES	SKSP	SESQUICENTENARIC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SAN JOSE DEL GUAV.	SKSJ	JORGE E.GONZALEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SANTA MARTA	SKSM	SIMON BOLIVAR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SARAVENA	SKSA	LOS COLONIZADORES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SOGAMOSO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TAME	SKTM	TAME	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TECHO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TRES ESQUINAS			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TRINIDAD			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TULUA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TUMACO	SKCO	LA FLORIDA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TURBO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
VALLEDUPAR	SKVP	ALFONSO LOPEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
VILLAVICENCIO	SKVV	VANGUARDIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ZIPAQUIRA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

System Replacement/Discontinuance Plan
Option 1 (Evolutionary)

DVOR/DME

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)														Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
AMBALEMA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ARARACUARA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ARAUCA	SKAU	SANTIAGO PEREZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ARMENIA	SKAR	EL EDEN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BARRANCABERMEJA	SKEJ	YARIGUIES	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	
BARRANCA DE UPIA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BARRANQUILLA	SKBQ	CORTISSOZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BOGOTA	SKBO	ELDORADO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BUCARAMANGA	SKBG	PALONEGRO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BUVIS			0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	
CALI	SKCL	BONILLA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CALIPUERTO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CAREPA	SKLC	ANTONIO ROLDAN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARIMAGUA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARTAGENA	SKCG	RAFAEL NUÑEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARTAGO	SKGO	SANTA ANA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CHIA/GUAYMARAL	SKGY	GUAYMARAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CONDOTO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
COROZAL	SKCZ	LAS BRUJAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CUCUTA	SKCC	CAMILO DAZA	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	
EL BANCO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
EL PASO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
EL ROSAL			0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	
EL YOPAL	SKYP	EL YOPAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
GIRARDOT	SKGI	SANTIAGO VILA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
GUAPI	SKGP	GUAPI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
IBAGUE	SKIB	PERALES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
IPIALES	SKIP	SAN LUIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
JARDIN			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
LA MINA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
LA PEDRERA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
LETICIA	SKLT	VASQUEZ COBO	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	
LOS CEDROS			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MAGANGUE			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MANIZALES	SKMZ	LA NUBIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MARINILLA			0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	
MARIQUITA	SKQU	MARIQUTA	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	
MECADERES			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MEDELLIN	SKMD	OLAYA HERRERA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MITU	SKMU	FABIO LEON B.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MONTERIA	SKMR	LOS GARZONES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
NEIVA	SKNV	BENITO SALAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
NUQUI			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
OCANA	SKOC	AGUAS CLARAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
OTU	SKOT	REMEDIOS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PALMA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PASTO	SKPS	ANTONIO NARIÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PEREIRA	SKPE	MATECAÑA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PIEDECUESTA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
POPAYAN	SKPP	GUILLERMO LEON VALENCIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PROVIDENCIA	SKPV	PROVIDENCIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO ASIS	SKAS	PUERTO ASIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO CARRENO	SKPC	PUERTO CARREÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO INIRIDA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO LEGUIZAMO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
QUIBDO	SKUI	EL CARAÑO	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	
RIOHACHA	SKRH	ALMIRANTE PADILLA	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	
RIONEGRO	SKRG	JOSE MARIA CORDOBA	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SAN ANDRES	SKSP	SESQUICENTENARIC	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SAN JOSE DEL GUAV.	SKSJ	JORGE E.GONZALEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SANTA MARTA	SKSM	SIMON BOLIVAR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SARAVENA	SKSA	LOS COLONIZADORES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SOGAMOSO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TAME	SKTM	TAME	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TECHO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TRES ESQUINAS			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TRINIDAD			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TULUA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TUMACO	SKCO	LA FLORIDA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TURBO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
VALLEDUPAR	SKVP	ALFONSO LOPEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
VILLAVICENCIO	SKVV	VANGUARDIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ZIPAQUIRA			0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	

System Replacement/Discontinuance Plan
Option 1 (Evolutionary)

CVOR/DME

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)														Implementation Notes
			2005	2005	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
AMBALEMA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ARARACUARA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ARAUCA	SKAU	SANTIAGO PEREZ	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ARMENIA	SKAR	EL EDEN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BARRANCABERMEJA	SKEJ	YARIGUIES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BARRANCA DE UPIA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BARRANQUILLA	SKBQ	CORTISSOZ	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	
BOGOTA	SKBO	ELDORADO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BUCARAMANGA	SKBG	PALONEGRO	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	
BUVIS			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CALI	SKCL	BONILLA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CALIPUERTO			0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	
CAREPA	SKLC	ANTONIO ROLDAN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARIMAGUA			0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	
CARTAGENA	SKCG	RAFAEL NUÑEZ	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARTAGO	SKGO	SANTA ANA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CHIA/GUAYMARAL	SKGY	GUAYMARAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CONDOTO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
COROZAL	SKCZ	LAS BRUJAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CUCUTA	SKCC	CAMILO DAZA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
EL BANCO			0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	
EL PASO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
EL ROSAL			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
EL YOPAL	SKYP	EL YOPAL	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	
GIRARDOT	SKGI	SANTIAGO VILA	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	
GUAPI	SKGP	GUAPI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
IBAGUE	SKIB	PERALES	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	
IPIALES	SKIP	SAN LUIS	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	
JARDIN			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
LA MINA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
LA PEDRERA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
LETICIA	SKLT	VASQUEZ COBO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
LOS CEDROS			0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	
MAGANGUE			0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	
MANIZALES	SKMZ	LA NUBIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MARINILLA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MARIQUITA	SKQU	MARIQUTA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MECADERES			0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	
MEDELLIN	SKMD	OLAYA HERRERA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MITU	SKMU	FABIO LEON B.	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	
MONTERIA	SKMR	LOS GARZONES	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	
NEIVA	SKNV	BENITO SALAS	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	
NUQUI			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
OCANA	SKOC	AGUAS CLARAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
OTU	SKOT	REMEDIOS	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	
PALMA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PASTO	SKPS	ANTONIO NARIÑO	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	
PEREIRA	SKPE	MATECAÑA	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	
PIEDECUESTA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
POPAYAN	SKPP	GUILLERMO LEON VALENCIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PROVIDENCIA	SKPV	PROVIDENCIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO ASIS	SKAS	PUERTO ASIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO CARRENO	SKPC	PUERTO CARREÑO	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	
PUERTO INIRIDA			0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	
PUERTO LEGUIZAMO			0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	
QUIBDO	SKUI	EL CARAÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
RIOHACHA	SKRH	ALMIRANTE PADILLA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
RIONEGRO	SKRG	JOSE MARIA CORDOBA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SAN ANDRES	SKSP	SESQUICENTENARIC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SAN JOSE DEL GUAV.	SKSJ	JORGE E.GONZALEZ	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	
SANTA MARTA	SKSM	SIMON BOLIVAR	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	
SARAVENA	SKSA	LOS COLONIZADORES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SOGAMOSO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TAME	SKTM	TAME	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TECHO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TRES ESQUINAS			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TRINIDAD			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TULUA			0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	
TUMACO	SKCO	LA FLORIDA	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	
TURBO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
VALLEDUPAR	SKVP	ALFONSO LOPEZ	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	
VILLAVICENCIO	SKVV	VANGUARDIA	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	
ZIPAQUIRA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

System Replacement/Discontinuance Plan
Option 1 (Evolutionary)

PVOR/DME

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)														Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
AMBALEMA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ARARACUARA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ARAUCA	SKAU	SANTIAGO PEREZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ARMENIA	SKAR	EL EDEN	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BARRANCABERMEJA	SKEJ	YARIGUIES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BARRANCA DE UPIA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BARRANQUILLA	SKBQ	CORTISSOZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BOGOTA	SKBO	ELDORADO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BUCARAMANGA	SKBG	PALONEGRO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BUVIS			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CALI	SKCL	BONILLA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CALIPUERTO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CAREPA	SKLC	ANTONIO ROLDAN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARIMAGUA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARTAGENA	SKCG	RAFAEL NUÑEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARTAGO	SKGO	SANTA ANA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CHIA/GUAYMARAL	SKGY	GUAYMARAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CONDOTO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
COROZAL	SKCZ	LAS BRUJAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CUCUTA	SKCC	CAMILO DAZA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
EL BANCO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
EL PASO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
EL ROSAL			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
EL YOPAL	SKYP	EL YOPAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
GIRARDOT	SKGI	SANTIAGO VILA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
GUAPI	SKGP	GUAPI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
IBAGUE	SKIB	PERALES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
IPIALES	SKIP	SAN LUIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
JARDIN			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
LA MINA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
LA PEDRERA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
LETICIA	SKLT	VASQUEZ COBO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
LOS CEDROS			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MAGANGUE			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MANIZALES	SKMZ	LA NUBIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MARINILLA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MARIQUITA	SKQU	MARIQUITA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MECADERES			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MEDELLIN	SKMD	OLAYA HERRERA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MITU	SKMU	FABIO LEON B.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MONTERIA	SKMR	LOS GARZONES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
NEIVA	SKNV	BENITO SALAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
NUQUI			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
OCANA	SKOC	AGUAS CLARAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
OTU	SKOT	REMEDIOS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PALMA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PASTO	SKPS	ANTONIO NARIÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PEREIRA	SKPE	MATECAÑA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PIEDECUESTA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
POPAYAN	SKPP	GUILLERMO LEON VALENCIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PROVIDENCIA	SKPV	PROVIDENCIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO ASIS	SKAS	PUERTO ASIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO CARRENO	SKPC	PUERTO CARREÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO INIRIDA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO LEGUIZAMO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
QUIBDO	SKUI	EL CARAÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
RIOHACHA	SKRH	ALMIRANTE PADILLA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
RIONEGRO	SKRG	JOSE MARIA CORDOBA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	
SAN ANDRES	SKSP	SESQUICENTENARIC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SAN JOSE DEL GUAV.	SKSJ	JORGE E.GONZALEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SANTA MARTA	SKSM	SIMON BOLIVAR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SARAVENA	SKSA	LOS COLONIZADORES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SOGAMOSO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TAME	SKTM	TAME	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TECHO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TRES ESQUINAS			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TRINIDAD			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TULUA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TUMACO	SKCO	LA FLORIDA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TURBO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
VALLEDUPAR	SKVP	ALFONSO LOPEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
VILLAVICENCIO	SKVV	VANGUARDIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ZIPAQUIRA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

System Replacement/Discontinuance Plan
Option 1 (Evolutionary)

DME

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)														Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
AMBALEMA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ARARACUARA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ARAUCA	SKAU	SANTIAGO PEREZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ARMENIA	SKAR	EL EDEN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BARRANCABERMEJA	SKEJ	YARIGUIES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BARRANCA DE UPIA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BARRANQUILLA	SKBQ	CORTISSOZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BOGOTA	SKBO	ELDORADO	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	
			0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	
BUCARAMANGA	SKBG	PALONEGRO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BUVIS			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CALI	SKCL	BONILLA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CALIPUERTO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CAREPA	SKLC	ANTONIO ROLDAN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARIMAGUA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARTAGENA	SKCG	RAFAEL NUÑEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARTAGO	SKGO	SANTA ANA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CHIA/GUAYMARAL	SKGY	GUAYMARAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CONDOTO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
COROZAL	SKCZ	LAS BRUJAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CUCUTA	SKCC	CAMILO DAZA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
EL BANCO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
EL PASO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
EL ROSAL			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
EL YOPAL	SKYP	EL YOPAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
GIRARDOT	SKGI	SANTIAGO VILA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
GUAPI	SKGP	GUAPI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
IBAGUE	SKIB	PERALES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
IPIALES	SKIP	SAN LUIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
JARDIN			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
LA MINA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
LA PEDRERA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
LETICIA	SKLT	VASQUEZ COBO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
LOS CEDROS			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MAGANGUE			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MANIZALES	SKMZ	LA NUBIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MARINILLA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MARIQUITA	SKQU	MARIQUTA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MECADERES			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MEDELLIN	SKMD	OLAYA HERRERA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MITU	SKMU	FABIO LEON B.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MONTERIA	SKMR	LOS GARZONES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
NEIVA	SKNV	BENITO SALAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
NUQUI			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
OCANA	SKOC	AGUAS CLARAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
OTU	SKOT	REMEDIOS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PALMA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PASTO	SKPS	ANTONIO NARIÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PEREIRA	SKPE	MATECAÑA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PIEDECUESTA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
POPAYAN	SKPP	GUILLERMO LEON VALENCIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PROVIDENCIA	SKPV	PROVIDENCIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO ASIS	SKAS	PUERTO ASIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO CARRENO	SKPC	PUERTO CARREÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO INIRIDA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO LEGUIZAMO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
QUIBDO	SKUI	EL CARAÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
RIOHACHA	SKRH	ALMIRANTE PADILLA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
RIONEGRO	SKRG	JOSE MARIA CORDOBA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SAN ANDRES	SKSP	SESQUICENTENARIC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SAN JOSE DEL GUAV.	SKSJ	JORGE E.GONZALEZ	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	
SANTA MARTA	SKSM	SIMON BOLIVAR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SARAVENA	SKSA	LOS COLONIZADORES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SOGAMOSO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TAME	SKTM	TAME	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TECHO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TRES ESQUINAS			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TRINIDAD			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TULUA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TUMACO	SKCO	LA FLORIDA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TURBO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
VALLEDUPAR	SKVP	ALFONSO LOPEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
VILLAVICENCIO	SKVV	VANGUARDIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ZIPAQUIRA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

System Replacement/Discontinuance Plan
Option 1 (Evolutionary)

NDB

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)														Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
AMBALEMA			0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	
ARARACUARA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ARAUCA	SKAU	SANTIAGO PEREZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ARMENIA	SKAR	EL EDEN	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BARRANCABERMEJA	SKEJ	YARIGUIES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BARRANCA DE UPIA			0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	
BARRANQUILLA	SKBQ	CORTISSOZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BOGOTA	SKBO	ELDORADO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BUCARAMANGA	SKBG	PALONEGRO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BUVIS			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CALI	SKCL	BONILLA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CALIPUERTO			0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	
CAREPA	SKLC	ANTONIO ROLDAN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARIMAGUA			0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	
CARTAGENA	SKCG	RAFAEL NUÑEZ	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARTAGO	SKGO	SANTA ANA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CHIA/GUAYMARAL	SKGY	GUAYMARAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CONDOTO			1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
COROZAL	SKCZ	LAS BRUJAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CUCUTA	SKCC	CAMILO DAZA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
EL BANCO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
EL PASO			0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	
EL ROSAL			0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	
EL YOPAL	SKYP	EL YOPAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
GIRARDOT	SKGI	SANTIAGO VILA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
GUAPI	SKGP	GUAPI	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
IBAGUE	SKIB	PERALES	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
IPIALES	SKIP	SAN LUIS	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
JARDIN			0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	
LA MINA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
LA PEDRERA			1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
LETICIA	SKLT	VASQUEZ COBO	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
LOS CEDROS			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MAGANGUE			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MANIZALES	SKMZ	LA NUBIA	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	
MARINILLA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MARIQUITA	SKQU	MARIQUITA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MECADERES			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MEDELLIN	SKMD	OLAYA HERRERA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MITU	SKMU	FABIO LEON B.	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MONTERIA	SKMR	LOS GARZONES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
NEIVA	SKNV	BENITO SALAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
NUQUI			1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
OCANA	SKOC	AGUAS CLARAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
OTU	SKOT	REMEDIOS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PALMA			1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PASTO	SKPS	ANTONIO NARIÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PEREIRA	SKPE	MATECAÑA	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PIEDECUESTA			1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
POPAYAN	SKPP	GUILLERMO LEON VALENCIA	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PROVIDENCIA	SKPV	PROVIDENCIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO ASIS	SKAS	PUERTO ASIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO CARRENO	SKPC	PUERTO CARREÑO	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO INIRIDA			1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO LEGUIZAMO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
QUIBDO	SKUI	EL CARAÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
RIOHACHA	SKRH	ALMIRANTE PADILLA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
RIONEGRO	SKRG	JOSE MARIA CORDOBA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SAN ANDRES	SKSP	SESQUICENTENARIC	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SAN JOSE DEL GUAV.	SKSJ	JORGE E GONZALEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SANTA MARTA	SKSM	SIMON BOLIVAR	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SARAVENA	SKSA	LOS COLONIZADORES	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	
SOGAMOSO			0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	
TAME	SKTM	TAME	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TECHO			1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TRES ESQUINAS			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TRINIDAD			1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TULUA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TUMACO	SKCO	LA FLORIDA	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TURBO			1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
VALLEDUPAR	SKVP	ALFONSO LOPEZ	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
VILLAVICENCIO	SKVV	VANGUARDIA	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ZIPAQUIRA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

System Implementation Plan
Navigation
GPMS
Option 2 (Accelerated)
Component: **Master Station**

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)															Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
AMBALEMA																		
ARARACUARA																		
ARAUCA	SKAU	SANTIAGO PEREZ																
ARMENIA	SKAR	EL EDEN																
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS																
BARRANCABERMEJA	SKEJ	YARIGUIES																
BARRANCA DE UPIA																		
BARRANQUILLA	SKBQ	CORTISSOZ			1													
BOGOTA	SKBO	ELDORADO			1													
BUCARAMANGA	SKBG	PALONEGRO																
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ																
BUVIS																		
CALI	SKCL	BONILLA																
CALIPUERTO																		
CAREPA	SKLC	ANTONIO ROLDAN																
CARIMAGUA																		
CARTAGENA	SKCG	RAFAEL NUÑEZ																
CARTAGO	SKGO	SANTA ANA																
CHIA/GUAYMARAL	SKGY	GUAYMARAL																
CONDOTO																		
COROZAL	SKCZ	LAS BRUJAS																
CUCUTA	SKCC	CAMILO DAZA																
EL BANCO																		
EL PASO																		
EL ROSAL																		
EL YOPAL	SKYP	EL YOPAL																
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA																
GIRARDOT	SKGI	SANTIAGO VILA																
GUAPI	SKGP	GUAPI																
IBAGUE	SKIB	PERALES																
IPIALES	SKIP	SAN LUIS																
JARDIN																		
LA MINA																		
LA PEDRERA																		
LETICIA	SKLT	VASQUEZ COBO																
LOS CEDROS																		
MAGANGUE																		
MANIZALES	SKMZ	LA NUBIA																
MARINILLA																		
MARIQUITA	SKQU	MARIQUITA																
MECADERES																		
MEDELLIN	SKMD	OLAYA HERRERA																
MITU	SKMU	FABIO LEON B.																
MONTERIA	SKMR	LOS GARZONES																
NEIVA	SKNV	BENITO SALAS																
NUQUI																		
OCANA	SKOC	AGUAS CLARAS																
OTU	SKOT	REMEDIOS																
PALMA																		
PASTO	SKPS	ANTONIO NARIÑO																
PEREIRA	SKPE	MATECAÑA																
PIEDECUESTA																		
POPAYAN	SKPP	GUILLERMO LEON VALENCIA																
PROVIDENCIA	SKPV	PROVIDENCIA																
PUERTO ASIS	SKAS	PUERTO ASIS																
PUERTO CARRENO	SKPC	PUERTO CARREÑO																
PUERTO INIRIDA																		
PUERTO LEGUIZAMO																		
QUIBDO	SKUI	EL CARAÑO																
RIOHACHA	SKRH	ALMIRANTE PADILLA																
RIONEGRO	SKRG	JOSE MARIA CORDOBA																
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO																
SAN ANDRES	SKSP	SESQUICENTENARIO																
SAN JOSE DEL GUAV.	SKSJ	JORGE E.GONZALEZ																
SANTA MARTA	SKSM	SIMON BOLIVAR																
SARAVENA	SKSA	LOS COLONIZADORES																
SOGAMOSO																		
TAME	SKTM	TAME																
TECHO																		
TRES ESQUINAS																		
TRINIDAD																		
TULUA																		
TUMACO	SKCO	LA FLORIDA																
TURBO																		
VALLEDUPAR	SKVP	ALFONSO LOPEZ																
VILLAVICENCIO	SKVV	VANGUARDIA																
ZIPAQUIRA																		

System Implementation Plan

Navigation

SBAS

Option 2 (Accelerated)

Component: **Master Station**

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)															Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
AMBALEMA																		
ARARACUARA																		
ARAUCA	SKAU	SANTIAGO PEREZ																
ARMENIA	SKAR	EL EDEN																
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS																
BARRANCABERMEJA	SKEJ	YARIGUIES																
BARRANCA DE UPIA																		
BARRANQUILLA	SKBQ	CORTISSOZ						1										
BOGOTA	SKBO	ELDORADO						1										
BUCARAMANGA	SKBG	PALONEGRO																
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ																
BUVIS																		
CALI	SKCL	BONILLA																
CALIPUERTO																		
CAREPA	SKLC	ANTONIO ROLDAN																
CARIMAGUA																		
CARTAGENA	SKCG	RAFAEL NUÑEZ																
CARTAGO	SKGO	SANTA ANA																
CHIA/GUAYMARAL	SKGY	GUAYMARAL																
CONDOTO																		
COROZAL	SKCZ	LAS BRUJAS																
CUCUTA	SKCC	CAMILO DAZA																
EL BANCO																		
EL PASO																		
EL ROSAL																		
EL YOPAL	SKYP	EL YOPAL																
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA																
GIRARDOT	SKGI	SANTIAGO VILA																
GUAPI	SKGP	GUAPI																
IBAGUE	SKIB	PERALES																
IPIALES	SKIP	SAN LUIS																
JARDIN																		
LA MINA																		
LA PEDRERA																		
LETICIA	SKLT	VASQUEZ COBO																
LOS CEDROS																		
MAGANGUE																		
MANIZALES	SKMZ	LA NUBIA																
MARINILLA																		
MARIQUITA	SKQU	MARIQUITA																
MECADERES																		
MEDELLIN	SKMD	OLAYA HERRERA																
MITU	SKMU	FABIO LEON B.																
MONTERIA	SKMR	LOS GARZONES																
NEIVA	SKNV	BENITO SALAS																
NUQUI																		
OCANA	SKOC	AGUAS CLARAS																
OTU	SKOT	REMEDIOS																
PALMA																		
PASTO	SKPS	ANTONIO NARIÑO																
PEREIRA	SKPE	MATECAÑA																
PIEDECUESTA																		
POPAYAN	SKPP	GUILLERMO LEON VALENCIA																
PROVIDENCIA	SKPV	PROVIDENCIA																
PUERTO ASIS	SKAS	PUERTO ASIS																
PUERTO CARRENO	SKPC	PUERTO CARREÑO																
PUERTO INIRIDA																		
PUERTO LEGUIZAMO																		
QUIBDO	SKUI	EL CARAÑO																
RIOHACHA	SKRH	ALMIRANTE PADILLA																
RIONEGRO	SKRG	JOSE MARIA CORDOBA																
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO																
SAN ANDRES	SKSP	SESQUICENTENARIO																
SAN JOSE DEL GUAV.	SKSJ	JORGE E.GONZALEZ																
SANTA MARTA	SKSM	SIMON BOLIVAR																
SARAVENA	SKSA	LOS COLONIZADORES																
SOGAMOSO																		
TAME	SKTM	TAME																
TECHO																		
TRES ESQUINAS																		
TRINIDAD																		
TULUA																		
TUMACO	SKCO	LA FLORIDA																
TURBO																		
VALLEDUPAR	SKVP	ALFONSO LOPEZ																
VILLAVICENCIO	SKVV	VANGUARDIA																
ZIPAQUIRA																		

System Implementation Plan
Navigation
GPMS
Option 2 (Accelerated)
Component: **Reference Station**

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)															Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
AMBALEMA																		
ARARACUARA																		
ARAUCA	SKAU	SANTIAGO PEREZ																
ARMENIA	SKAR	EL EDEN																
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS																
BARRANCABERMEJA	SKEJ	YARIGUIES																
BARRANCA DE UPIA																		
BARRANQUILLA	SKBQ	CORTISSOZ																
BOGOTA	SKBO	ELDORADO			1													
BUCARAMANGA	SKBG	PALONEGRO																
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ																
BUVIS																		
CALI	SKCL	BONILLA																
CALIPUERTO																		
CAREPA	SKLC	ANTONIO ROLDAN																
CARIMAGUA																		
CARTAGENA	SKCG	RAFAEL NUÑEZ																
CARTAGO	SKGO	SANTA ANA																
CHIA/GUAYMARAL	SKGY	GUAYMARAL																
CONDOTO																		
COROZAL	SKCZ	LAS BRUJAS																
CUCUTA	SKCC	CAMILO DAZA																
EL BANCO																		
EL PASO																		
EL ROSAL																		
EL YOPAL	SKYP	EL YOPAL																
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA																
GIRARDOT	SKGI	SANTIAGO VILA																
GUAPI	SKGP	GUAPI																
IBAGUE	SKIB	PERALES																
IPIALES	SKIP	SAN LUIS																
JARDIN																		
LA MINA																		
LA PEDRERA																		
LETICIA	SKLT	VASQUEZ COBO			1													
LOS CEDROS																		
MAGANGUE																		
MANIZALES	SKMZ	LA NUBIA																
MARINILLA																		
MARIQUITA	SKQU	MARIQUITA																
MECADERES																		
MEDELLIN	SKMD	OLAYA HERRERA																
MITU	SKMU	FABIO LEON B.																
MONTERIA	SKMR	LOS GARZONES																
NEIVA	SKNV	BENITO SALAS																
NUQUI																		
OCANA	SKOC	AGUAS CLARAS																
OTU	SKOT	REMEDIOS																
PALMA																		
PASTO	SKPS	ANTONIO NARIÑO																
PEREIRA	SKPE	MATECAÑA																
PIEDECUESTA																		
POPAYAN	SKPP	GUILLERMO LEON VALENCIA																
PROVIDENCIA	SKPV	PROVIDENCIA																
PUERTO ASIS	SKAS	PUERTO ASIS																
PUERTO CARRENO	SKPC	PUERTO CARREÑO			1													
PUERTO INIRIDA																		
PUERTO LEGUIZAMO																		
QUIBDO	SKUI	EL CARAÑO																
RIOHACHA	SKRH	ALMIRANTE PADILLA																
RIONEGRO	SKRG	JOSE MARIA CORDOBA																
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO																
SAN ANDRES	SKSP	SESQUICENTENARIO			1													
SAN JOSE DEL GUAV.	SKSJ	JORGE E.GONZALEZ																
SANTA MARTA	SKSM	SIMON BOLIVAR			1													
SARAVENA	SKSA	LOS COLONIZADORES																
SOGAMOSO																		
TAME	SKTM	TAME																
TECHO																		
TRES ESQUINAS																		
TRINIDAD																		
TULUA																		
TUMACO	SKCO	LA FLORIDA			1													
TURBO																		
VALLEDUPAR	SKVP	ALFONSO LOPEZ																
VILLAVICENCIO	SKVV	VANGUARDIA																
ZIPAQUIRA																		

System Implementation Plan
Navigation
SBAS
Option 2 (Accelerated)
Component: **Reference Station**

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)															Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
AMBALEMA																		
ARARACUARA																		
ARAUCA	SKAU	SANTIAGO PEREZ																
ARMENIA	SKAR	EL EDEN																
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS																
BARRANCABERMEJA	SKEJ	YARIGUIES																
BARRANCA DE UPIA																		
BARRANQUILLA	SKBQ	CORTISSOZ						1										
BOGOTA	SKBO	ELDORADO						1										
BUCARAMANGA	SKBG	PALONEGRO																
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ																
BUVIS																		
CALI	SKCL	BONILLA																
CALIPUERTO																		
CAREPA	SKLC	ANTONIO ROLDAN																
CARIMAGUA																		
CARTAGENA	SKCG	RAFAEL NUÑEZ																
CARTAGO	SKGO	SANTA ANA																
CHIA/GUAYMARAL	SKGY	GUAYMARAL																
CONDOTO																		
COROZAL	SKCZ	LAS BRUJAS																
CUCUTA	SKCC	CAMILO DAZA						1										
EL BANCO																		
EL PASO																		
EL ROSAL																		
EL YOPAL	SKYP	EL YOPAL																
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA						1										
GIRARDOT	SKGI	SANTIAGO VILA																
GUAPI	SKGP	GUAPI																
IBAGUE	SKIB	PERALES																
IPIALES	SKIP	SAN LUIS																
JARDIN																		
LA MINA																		
LA PEDRERA																		
LETICIA	SKLT	VASQUEZ COBO						1										
LOS CEDROS																		
MAGANGUE																		
MANIZALES	SKMZ	LA NUBIA																
MARINILLA																		
MARIQUITA	SKQU	MARIQUITA																
MECADERES																		
MEDELLIN	SKMD	OLAYA HERRERA																
MITU	SKMU	FABIO LEON B.						1										
MONTERIA	SKMR	LOS GARZONES																
NEIVA	SKNV	BENITO SALAS																
NUQUI																		
OCANA	SKOC	AGUAS CLARAS																
OTU	SKOT	REMEDIOS																
PALMA																		
PASTO	SKPS	ANTONIO NARIÑO																
PEREIRA	SKPE	MATECAÑA																
PIEDECUESTA																		
POPAYAN	SKPP	GUILLERMO LEON VALENCIA																
PROVIDENCIA	SKPV	PROVIDENCIA																
PUERTO ASIS	SKAS	PUERTO ASIS																
PUERTO CARRENO	SKPC	PUERTO CARREÑO						1										
PUERTO INIRIDA																		
PUERTO LEGUIZAMO																		
QUIBDO	SKUI	EL CARAÑO						1										
RIOHACHA	SKRH	ALMIRANTE PADILLA																
RIONEGRO	SKRG	JOSE MARIA CORDOBA																
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO																
SAN ANDRES	SKSP	SESQUICENTENARIO						1										
SAN JOSE DEL GUAV.	SKSJ	JORGE E.GONZALEZ																
SANTA MARTA	SKSM	SIMON BOLIVAR						1										
SARAVENA	SKSA	LOS COLONIZADORES																
SOGAMOSO																		
TAME	SKTM	TAME																
TECHO																		
TRES ESQUINAS																		
TRINIDAD																		
TULUA																		
TUMACO	SKCO	LA FLORIDA																
TURBO																		
VALLEDUPAR	SKVP	ALFONSO LOPEZ																
VILLAVICENCIO	SKVV	VANGUARDIA																
ZIPAQUIRA																		

System Implementation Plan
Navigation
GBAS
Option 2 (Accelerated)
Component: **CAT I**

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)															Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
AMBALEMA																		
ARARACUARA																		
ARAUCA	SKAU	SANTIAGO PEREZ																
ARMENIA	SKAR	EL EDEN																
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS																
BARRANCABERMEJA	SKEJ	YARIGUIES																
BARRANCA DE UPIA																		
BARRANQUILLA	SKBQ	CORTISSOZ																
BOGOTA	SKBO	ELDORADO				1												
BUCARAMANGA	SKBG	PALONEGRO				1												
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ																
BUVIS																		
CALI	SKCL	BONILLA				1												
CALIPUERTO																		
CAREPA	SKLC	ANTONIO ROLDAN																
CARIMAGUA																		
CARTAGENA	SKCG	RAFAEL NUÑEZ																
CARTAGO	SKGO	SANTA ANA																
CHIA/GUAYMARAL	SKGY	GUAYMARAL																
CONDOTO																		
COROZAL	SKCZ	LAS BRUJAS																
CUCUTA	SKCC	CAMILO DAZA				1												
EL BANCO																		
EL PASO																		
EL ROSAL																		
EL YOPAL	SKYP	EL YOPAL																
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA																
GIRARDOT	SKGI	SANTIAGO VILA																
GUAPI	SKGP	GUAPI																
IBAGUE	SKIB	PERALES																
IPIALES	SKIP	SAN LUIS																
JARDIN																		
LA MINA																		
LA PEDRERA																		
LETICIA	SKLT	VASQUEZ COBO				1												
LOS CEDROS																		
MAGANGUE																		
MANIZALES	SKMZ	LA NUBIA																
MARINILLA																		
MARIQUITA	SKQU	MARIQUITA																
MECADERES																		
MEDELLIN	SKMD	OLAYA HERRERA												1				
MITU	SKMU	FABIO LEON B.																
MONTERIA	SKMR	LOS GARZONES																
NEIVA	SKNV	BENITO SALAS																
NUQUI																		
OCANA	SKOC	AGUAS CLARAS																
OTU	SKOT	REMEDIOS																
PALMA																		
PASTO	SKPS	ANTONIO NARIÑO												1				
PEREIRA	SKPE	MATECAÑA												1				
PIEDECUESTA																		
POPAYAN	SKPP	GUILLERMO LEON VALENCIA																
PROVIDENCIA	SKPV	PROVIDENCIA																
PUERTO ASIS	SKAS	PUERTO ASIS																
PUERTO CARRENO	SKPC	PUERTO CARREÑO																
PUERTO INIRIDA																		
PUERTO LEGUIZAMO																		
QUIBDO	SKUI	EL CARAÑO																
RIOHACHA	SKRH	ALMIRANTE PADILLA																
RIONEGRO	SKRG	JOSE MARIA CORDOBA												1				
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO																
SAN ANDRES	SKSP	SESQUICENTENARIO												1				
SAN JOSE DEL GUAV.	SKSJ	JORGE E.GONZALEZ												1				
SANTA MARTA	SKSM	SIMON BOLIVAR																
SARAVENA	SKSA	LOS COLONIZADORES																
SOGAMOSO																		
TAME	SKTM	TAME																
TECHO																		
TRES ESQUINAS																		
TRINIDAD																		
TULUA																		
TUMACO	SKCO	LA FLORIDA																
TURBO																		
VALLEDUPAR	SKVP	ALFONSO LOPEZ																
VILLAVICENCIO	SKVV	VANGUARDIA												1				
ZIPAQUIRA																		

System Implementation Plan
Navigation
GBAS
Option 2 (Accelerated)
Component: **CAT II/III**

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)															Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
AMBALEMA																		
ARARACUARA																		
ARAUCA	SKAU	SANTIAGO PEREZ																
ARMENIA	SKAR	EL EDEN																
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS																
BARRANCABERMEJA	SKEJ	YARIGUIES																
BARRANCA DE UPIA																		
BARRANQUILLA	SKBQ	CORTISSOZ							1									
BOGOTA	SKBO	ELDORADO							1									
BUCARAMANGA	SKBG	PALONEGRO																
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ																
BUVIS																		
CALI	SKCL	BONILLA							1									
CALIPUERTO																		
CAREPA	SKLC	ANTONIO ROLDAN																
CARIMAGUA																		
CARTAGENA	SKCG	RAFAEL NUÑEZ																
CARTAGO	SKGO	SANTA ANA																
CHIA/GUAYMARAL	SKGY	GUAYMARAL																
CONDOTO																		
COROZAL	SKCZ	LAS BRUJAS																
CUCUTA	SKCC	CAMILO DAZA																
EL BANCO																		
EL PASO																		
EL ROSAL																		
EL YOPAL	SKYP	EL YOPAL																
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA																
GIRARDOT	SKGI	SANTIAGO VILA																
GUAPI	SKGP	GUAPI																
IBAGUE	SKIB	PERALES																
IPIALES	SKIP	SAN LUIS																
JARDIN																		
LA MINA																		
LA PEDRERA																		
LETICIA	SKLT	VASQUEZ COBO																
LOS CEDROS																		
MAGANGUE																		
MANIZALES	SKMZ	LA NUBIA																
MARINILLA																		
MARIQUITA	SKQU	MARIQUITA																
MECADERES																		
MEDELLIN	SKMD	OLAYA HERRERA																
MITU	SKMU	FABIO LEON B.																
MONTERIA	SKMR	LOS GARZONES																
NEIVA	SKNV	BENITO SALAS																
NUQUI																		
OCANA	SKOC	AGUAS CLARAS																
OTU	SKOT	REMEDIOS																
PALMA																		
PASTO	SKPS	ANTONIO NARIÑO																
PEREIRA	SKPE	MATECAÑA																
PIEDECUESTA																		
POPAYAN	SKPP	GUILLERMO LEON VALENCIA																
PROVIDENCIA	SKPV	PROVIDENCIA																
PUERTO ASIS	SKAS	PUERTO ASIS																
PUERTO CARRENO	SKPC	PUERTO CARREÑO																
PUERTO INIRIDA																		
PUERTO LEGUIZAMO																		
QUIBDO	SKUI	EL CARAÑO																
RIOHACHA	SKRH	ALMIRANTE PADILLA																
RIONEGRO	SKRG	JOSE MARIA CORDOBA																
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO																
SAN ANDRES	SKSP	SESQUICENTENARIO																
SAN JOSE DEL GUAV.	SKSJ	JORGE E.GONZALEZ																
SANTA MARTA	SKSM	SIMON BOLIVAR																
SARAVENA	SKSA	LOS COLONIZADORES																
SOGAMOSO																		
TAME	SKTM	TAME																
TECHO																		
TRES ESQUINAS																		
TRINIDAD																		
TULUA																		
TUMACO	SKCO	LA FLORIDA																
TURBO																		
VALLEDUPAR	SKVP	ALFONSO LOPEZ																
VILLAVICENCIO	SKVV	VANGUARDIA																
ZIPAQUIRA																		

System Replacement/Discontinuance Plan
Option 2 (Accelerated)

ILS CAT I

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)															Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
AMBALEMA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ARARACUARA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ARAUCA	SKAU	SANTIAGO PEREZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ARMENIA	SKAR	EL EDEN	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	New ILS based on Aerocivil Plans - retain until end of useful life - do not replace
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BARRANCABERMEJA	SKEJ	YARIGUIES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BARRANCA DE UPIA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BARRANQUILLA	SKBQ	CORTISSOZ	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	Retained as Back-up
BOGOTA	SKBO	ELDORADO	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Retained as Back-up
BUCARAMANGA	SKBG	PALONEGRO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BUVIS			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CALI	SKCL	BONILLA	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	Retained as Back-up
CALIPUERTO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CAREPA	SKLC	ANTONIO ROLDAN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARIMAGUA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARTAGENA	SKCG	RAFAEL NUÑEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARTAGO	SKGO	SANTA ANA	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	New ILS based on Aerocivil Plans - retain until end of useful life - do not replace
CHIA/GUAYMARAL	SKGY	GUAYMARAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CONDOTO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
COROZAL	SKCZ	LAS BRUJAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CUCUTA	SKCC	CAMILO DAZA	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	Required through 2008
EL BANCO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
EL PASO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
EL ROSAL			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
EL YOPAL	SKYP	EL YOPAL	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	New ILS based on Aerocivil Plans - retain until end of useful life - do not replace
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	New ILS based on Aerocivil Plans - retain until end of useful life - do not replace
GIRARDOT	SKGI	SANTIAGO VILA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
GUAPI	SKGP	GUAPI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
IBAGUE	SKIB	PERALES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
IPIALES	SKIP	SAN LUIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
JARDIN			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
LA MINA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
LA PEDRERA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
LETICIA	SKLT	VASQUEZ COBO	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	Required through 2008
LOS CEDROS			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MAGANGUE			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MANIZALES	SKMZ	LA NUBIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MARINILLA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MARIQUITA	SKQU	MARIQUITA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MECADERES			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MEDELLIN	SKMD	OLAYA HERRERA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MITU	SKMU	FABIO LEON B.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MONTERIA	SKMR	LOS GARZONES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
NEIVA	SKNV	BENITO SALAS	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	New ILS based on Aerocivil Plans - retain until end of useful life - do not replace
NUQUI			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
OCANA	SKOC	AGUAS CLARAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
OTU	SKOT	REMEDIOS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PALMA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PASTO	SKPS	ANTONIO NARIÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PEREIRA	SKPE	MATECAÑA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PIEDECUESTA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
POPAYAN	SKPP	GUILLERMO LEON VALENCIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PROVIDENCIA	SKPV	PROVIDENCIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO ASIS	SKAS	PUERTO ASIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO CARRENO	SKPC	PUERTO CARREÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO INIRIDA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO LEGUIZAMO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
QUIBDO	SKUI	EL CARAÑO	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	New ILS based on Aerocivil Plans - retain until end of useful life - do not replace
RIOHACHA	SKRH	ALMIRANTE PADILLA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
RIONEGRO	SKRG	JOSE MARIA CORDOBA	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	Function replaced by GNSS
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SAN ANDRES	SKSP	SESQUICENTENARIO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SAN JOSE DEL GUAV.	SKSJ	JORGE E.GONZALEZ	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	Function replaced by GNSS
SANTA MARTA	SKSM	SIMON BOLIVAR	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	New ILS based on Aerocivil Plans - retain until end of useful life - do not replace
SARAVENA	SKSA	LOS COLONIZADORES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SOGAMOSO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TAME	SKTM	TAME	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TECHO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TRES ESQUINAS			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TRINIDAD			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TULUA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TUMACO	SKCO	LA FLORIDA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TURBO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
VALLEDUPAR	SKVP	ALFONSO LOPEZ	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	New ILS based on Aerocivil Plans - retain until end of useful life - do not replace
VILLAVICENCIO	SKVV	VANGUARDIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ZIPAQUIRA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

System Replacement/Discontinuance Plan
Option 2 (Accelerated)

ILS CAT II

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)													Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
AMBALEMA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ARARACUARA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ARAUCA	SKAU	SANTIAGO PEREZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ARMENIA	SKAR	EL EDEN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BARRANCABERMEJA	SKEJ	YARIGUIES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BARRANCA DE UPIA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BARRANQUILLA	SKBQ	CORTISSOZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BOGOTA	SKBO	ELDORADO	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	Retained as Back-up
			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BUCARAMANGA	SKBG	PALONEGRO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BUVIS			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CALI	SKCL	BONILLA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CALIPUERTO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CAREPA	SKLC	ANTONIO ROLDAN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARIMAGUA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARTAGENA	SKCG	RAFAEL NUÑEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARTAGO	SKGO	SANTA ANA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CHIA/GUAYMARAL	SKGY	GUAYMARAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CONDOTO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
COROZAL	SKCZ	LAS BRUJAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CUCUTA	SKCC	CAMILO DAZA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
EL BANCO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
EL PASO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
EL ROSAL			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
EL YOPAL	SKYP	EL YOPAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
GIRARDOT	SKGI	SANTIAGO VILA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
GUAPI	SKGP	GUAPI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
IBAGUE	SKIB	PERALES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
IPIALES	SKIP	SAN LUIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
JARDIN			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
LA MINA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
LA PEDRERA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
LETICIA	SKLT	VASQUEZ COBO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
LOS CEDROS			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MAGANGUE			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MANIZALES	SKMZ	LA NUBIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MARINILLA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MARIQUITA	SKQU	MARIQUITA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MECADERES			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MEDELLIN	SKMD	OLAYA HERRERA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MITU	SKMU	FABIO LEON B.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MONTERIA	SKMR	LOS GARZONES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
NEIVA	SKNV	BENITO SALAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
NUQUI			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
OCANA	SKOC	AGUAS CLARAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
OTU	SKOT	REMEDIOS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PALMA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PASTO	SKPS	ANTONIO NARIÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PEREIRA	SKPE	MATECAÑA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PIEDECUESTA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
POPAYAN	SKPP	GUILLERMO LEON VALENCIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PROVIDENCIA	SKPV	PROVIDENCIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO ASIS	SKAS	PUERTO ASIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO CARRENO	SKPC	PUERTO CARREÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO INIRIDA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO LEGUIZAMO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
QUIBDO	SKUI	EL CARAÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
RIOHACHA	SKRH	ALMIRANTE PADILLA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
RIONEGRO	SKRG	JOSE MARIA CORDOBA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SAN ANDRES	SKSP	SESQUICENTENARIC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SAN JOSE DEL GUAV.	SKSJ	JORGE E.GONZALEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SANTA MARTA	SKSM	SIMON BOLIVAR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SARAVENA	SKSA	LOS COLONIZADORES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SOGAMOSO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TAME	SKTM	TAME	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TECHO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TRES ESQUINAS			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TRINIDAD			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TULUA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TUMACO	SKCO	LA FLORIDA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TURBO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
VALLEDUPAR	SKVP	ALFONSO LOPEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
VILLAVICENCIO	SKVV	VANGUARDIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ZIPAQUIRA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

System Replacement/Discontinuance Plan
Option 2 (Accelerated)

DVOR/DME

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)														Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
AMBALEMA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ARARACUARA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ARAUCA	SKAU	SANTIAGO PEREZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ARMENIA	SKAR	EL EDEN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BARRANCABERMEJA	SKEJ	YARIGUIES	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	Retained as Back-up
BARRANCA DE UPIA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BARRANQUILLA	SKBQ	CORTISSOZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BOGOTA	SKBO	ELDORADO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BUCARAMANGA	SKBG	PALONEGRO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BUVIS			0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	Function replaced by GNSS
CALI	SKCL	BONILLA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CALIPUERTO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CAREPA	SKLC	ANTONIO ROLDAN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARIMAGUA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARTAGENA	SKCG	RAFAEL NUÑEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARTAGO	SKGO	SANTA ANA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CHIA/GUAYMARAL	SKGY	GUAYMARAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CONDOTO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
COROZAL	SKCZ	LAS BRUJAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CUCUTA	SKCC	CAMILO DAZA	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	Retained as Back-up
EL BANCO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
EL PASO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
EL ROSAL			0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Function replaced by GNSS
EL YOPAL	SKYP	EL YOPAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
GIRARDOT	SKGI	SANTIAGO VILA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
GUAPI	SKGP	GUAPI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
IBAGUE	SKIB	PERALES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
IPIALES	SKIP	SAN LUIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
JARDIN			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
LA MINA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
LA PEDRERA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
LETICIA	SKLT	VASQUEZ COBO	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	Retained as Back-up
LOS CEDROS			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MAGANGUE			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MANIZALES	SKMZ	LA NUBIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MARINILLA			0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	Function replaced by GNSS
MARIQUITA	SKQU	MARIQUITA	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Function replaced by GNSS
MECADERES			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MEDELLIN	SKMD	OLAYA HERRERA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MITU	SKMU	FABIO LEON B.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MONTERIA	SKMR	LOS GARZONES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
NEIVA	SKNV	BENITO SALAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
NUQUI			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
OCANA	SKOC	AGUAS CLARAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
OTU	SKOT	REMEDIOS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PALMA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PASTO	SKPS	ANTONIO NARIÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PEREIRA	SKPE	MATECAÑA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PIEDECUESTA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
POPAYAN	SKPP	GUILLERMO LEON VALENCIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PROVIDENCIA	SKPV	PROVIDENCIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO ASIS	SKAS	PUERTO ASIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO CARRENO	SKPC	PUERTO CARREÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO INIRIDA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO LEGUIZAMO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
QUIBDO	SKUI	EL CARAÑO	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	Function replaced by GNSS
RIOHACHA	SKRH	ALMIRANTE PADILLA	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	Function replaced by GNSS
RIONEGRO	SKRG	JOSE MARIA CORDOBA	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	Retained as Back-up
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SAN ANDRES	SKSP	SESQUICENTENARIC	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Retained as Back-up
SAN JOSE DEL GUAV	SKSJ	JORGE E.GONZALEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SANTA MARTA	SKSM	SIMON BOLIVAR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SARAVENA	SKSA	LOS COLONIZADORES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SOGAMOSO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TAME	SKTM	TAME	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TECHO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TRES ESQUINAS			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TRINIDAD			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TULUA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TUMACO	SKCO	LA FLORIDA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TURBO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
VALLEDUPAR	SKVP	ALFONSO LOPEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
VILLAVICENCIO	SKVV	VANGUARDIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ZIPAQUIRA			0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	Function replaced by GNSS

System Replacement/Discontinuance Plan
Option 2 (Accelerated)

CVOR/DME

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)														Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
AMBALEMA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ARARACUARA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ARAUCA	SKAU	SANTIAGO PEREZ	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Retained as part of Back-up System
ARMENIA	SKAR	EL EDEN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BARRANCABERMEJA	SKEJ	YARIGUIES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BARRANCA DE UPIA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BARRANQUILLA	SKBQ	CORTISSOZ	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	Retained as part of Back-up System
BOGOTA	SKBO	ELDORADO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BUCARAMANGA	SKBG	PALONEGRO	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	Retained as part of Back-up System
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	Retained as part of Back-up System
BUVIS			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CALI	SKCL	BONILLA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CALIPUERTO			0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	Retained as part of Back-up System
CAREPA	SKLC	ANTONIO ROLDAN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARIMAGUA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARTAGENA	SKCG	RAFAEL NUÑEZ	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Retained as part of Back-up System
CARTAGO	SKGO	SANTA ANA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CHIA/GUAYMARAL	SKGY	GUAYMARAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CONDOTO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
COROZAL	SKCZ	LAS BRUJAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CUCUTA	SKCC	CAMILO DAZA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
EL BANCO			0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Function replaced by GNSS
EL PASO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
EL ROSAL			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
EL YOPAL	SKYP	EL YOPAL	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	Retained as part of Back-up System
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	Retained as part of Back-up System
GIRARDOT	SKGI	SANTIAGO VILA	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	Retained as part of Back-up System
GUAPI	SKGP	GUAPI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
IBAGUE	SKIB	PERALES	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	Function replaced by GNSS
IPIALES	SKIP	SAN LUIS	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	Function replaced by GNSS
JARDIN			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
LA MINA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
LA PEDRERA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
LETICIA	SKLT	VASQUEZ COBO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
LOS CEDROS			0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	Function replaced by GNSS
MAGANGUE			0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Function replaced by GNSS
MANIZALES	SKMZ	LA NUBIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MARINILLA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MARIQUITA	SKQU	MARIQUITA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MECADERES			0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	Function replaced by GNSS
MEDELLIN	SKMD	OLAYA HERRERA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MITU	SKMU	FABIO LEON B.	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Function replaced by GNSS
MONTERIA	SKMR	LOS GARZONES	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	Function replaced by GNSS
NEIVA	SKNV	BENITO SALAS	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Retained as part of Back-up System
NUQUI			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
OCANA	SKOC	AGUAS CLARAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
OTU	SKOT	REMEDIOS	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Function replaced by GNSS
PALMA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PASTO	SKPS	ANTONIO NARIÑO	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	Retained as part of Back-up System
PEREIRA	SKPE	MATECAÑA	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	Retained as part of Back-up System
PIEDECUESTA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
POPAYAN	SKPP	GUILLERMO LEON VALENCIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PROVIDENCIA	SKPV	PROVIDENCIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO ASIS	SKAS	PUERTO ASIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO CARRENO	SKPC	PUERTO CARREÑO	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	Function replaced by GNSS
PUERTO INIRIDA			0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	Function replaced by GNSS
PUERTO LEGUIZAMO			0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	Function replaced by GNSS
QUIBDO	SKUI	EL CARAÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
RIOHACHA	SKRH	ALMIRANTE PADILLA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
RIONEGRO	SKRG	JOSE MARIA CORDOBA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SAN ANDRES	SKSP	SESQUICENTENARIC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SAN JOSE DEL GUAV.	SKSJ	JORGE E.GONZALEZ	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	Function replaced by GNSS
SANTA MARTA	SKSM	SIMON BOLIVAR	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	Function replaced by GNSS
SARAVENA	SKSA	LOS COLONIZADORES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SOGAMOSO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TAME	SKTM	TAME	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TECHO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TRES ESQUINAS			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TRINIDAD			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TULUA			0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	Function replaced by GNSS
TUMACO	SKCO	LA FLORIDA	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	Function replaced by GNSS
TURBO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
VALLEDUPAR	SKVP	ALFONSO LOPEZ	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	Function replaced by GNSS
VILLAVICENCIO	SKVV	VANGUARDIA	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	Retained as part of Back-up System
ZIPAQUIRA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

System Replacement/Discontinuance Plan
Option 2 (Accelerated)

PVOR/DME

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)														Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
AMBALEMA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ARARACUARA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ARAUCA	SKAU	SANTIAGO PEREZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ARMENIA	SKAR	EL EDEN	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	Function replaced by GNSS
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BARRANCABERMEJA	SKEJ	YARIGUIES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BARRANCA DE UPIA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BARRANQUILLA	SKBQ	CORTISSOZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BOGOTA	SKBO	ELDORADO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BUCARAMANGA	SKBG	PALONEGRO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BUVIS			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CALI	SKCL	BONILLA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CALIPUERTO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CAREPA	SKLC	ANTONIO ROLDAN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARIMAGUA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARTAGENA	SKCG	RAFAEL NUÑEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARTAGO	SKGO	SANTA ANA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CHIA/GUAYMARAL	SKGY	GUAYMARAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CONDOTO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
COROZAL	SKCZ	LAS BRUJAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CUCUTA	SKCC	CAMILO DAZA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
EL BANCO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
EL PASO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
EL ROSAL			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
EL YOPAL	SKYP	EL YOPAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
GIRARDOT	SKGI	SANTIAGO VILA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
GUAPI	SKGP	GUAPI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
IBAGUE	SKIB	PERALES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
IPIALES	SKIP	SAN LUIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
JARDIN			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
LA MINA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
LA PEDRERA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
LETICIA	SKLT	VASQUEZ COBO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
LOS CEDROS			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MAGANGUE			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MANIZALES	SKMZ	LA NUBIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MARINILLA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MARIQUITA	SKQU	MARIQUTA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MECADERES			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MEDELLIN	SKMD	OLAYA HERRERA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MITU	SKMU	FABIO LEON B.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MONTERIA	SKMR	LOS GARZONES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
NEIVA	SKNV	BENITO SALAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
NUQUI			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
OCANA	SKOC	AGUAS CLARAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
OTU	SKOT	REMEDIOS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PALMA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PASTO	SKPS	ANTONIO NARIÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PEREIRA	SKPE	MATECAÑA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PIEDECUESTA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
POPAYAN	SKPP	GUILLERMO LEON VALENCIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PROVIDENCIA	SKPV	PROVIDENCIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO ASIS	SKAS	PUERTO ASIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO CARRENO	SKPC	PUERTO CARREÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO INIRIDA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO LEGUIZAMO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
QUIBDO	SKUI	EL CARAÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
RIOHACHA	SKRH	ALMIRANTE PADILLA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
RIONEGRO	SKRG	JOSE MARIA CORDOBA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	Function replaced by GNSS
SAN ANDRES	SKSP	SESQUICENTENARIO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SAN JOSE DEL GUAV.	SKSJ	JORGE E.GONZALEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SANTA MARTA	SKSM	SIMON BOLIVAR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SARAVENA	SKSA	LOS COLONIZADORES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SOGAMOSO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TAME	SKTM	TAME	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TECHO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TRES ESQUINAS			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TRINIDAD			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TULUA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TUMACO	SKCO	LA FLORIDA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TURBO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
VALLEDUPAR	SKVP	ALFONSO LOPEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
VILLAVICENCIO	SKVV	VANGUARDIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ZIPAQUIRA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

System Replacement/Discontinuance Plan
Option 2 (Accelerated)

DME

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)														Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
AMBALEMA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ARARACUARA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ARAUCA	SKAU	SANTIAGO PEREZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ARMENIA	SKAR	EL EDEN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BARRANCABERMEJA	SKEJ	YARIGUIES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BARRANCA DE UPIA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BARRANQUILLA	SKBQ	CORTISSOZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BOGOTA	SKBO	ELDORADO	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Retained for back-up
			0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	Function replaced by GNSS
BUCARAMANGA	SKBG	PALONEGRO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BUVIS			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CALI	SKCL	BONILLA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CALIPUERTO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CAREPA	SKLC	ANTONIO ROLDAN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARIMAGUA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARTAGENA	SKCG	RAFAEL NUÑEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARTAGO	SKGO	SANTA ANA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CHIA/GUAYMARAL	SKGY	GUAYMARAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CONDOTO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
COROZAL	SKCZ	LAS BRUJAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CUCUTA	SKCC	CAMILO DAZA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
EL BANCO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
EL PASO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
EL ROSAL			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
EL YOPAL	SKYP	EL YOPAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
GIRARDOT	SKGI	SANTIAGO VILA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
GUAPI	SKGP	GUAPI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
IBAGUE	SKIB	PERALES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
IPIALES	SKIP	SAN LUIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
JARDIN			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
LA MINA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
LA PEDRERA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
LETICIA	SKLT	VASQUEZ COBO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
LOS CEDROS			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MAGANGUE			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MANIZALES	SKMZ	LA NUBIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MARINILLA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MARIQUITA	SKQU	MARIQUITA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MECADERES			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MEDELLIN	SKMD	OLAYA HERRERA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MITU	SKMU	FABIO LEON B.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MONTERIA	SKMR	LOS GARZONES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
NEIVA	SKNV	BENITO SALAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
NUQUI			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
OCANA	SKOC	AGUAS CLARAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
OTU	SKOT	REMEDIOS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PALMA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PASTO	SKPS	ANTONIO NARIÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PEREIRA	SKPE	MATECAÑA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PIEDECUESTA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
POPAYAN	SKPP	GUILLERMO LEON VALENCIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PROVIDENCIA	SKPV	PROVIDENCIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO ASIS	SKAS	PUERTO ASIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO CARRENO	SKPC	PUERTO CARREÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO INIRIDA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO LEGUIZAMO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
QUIBDO	SKUI	EL CARAÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
RIOHACHA	SKRH	ALMIRANTE PADILLA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
RIONEGRO	SKRG	JOSE MARIA CORDOBA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SAN ANDRES	SKSP	SESQUICENTENARIC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SAN JOSE DEL GUAV.	SKSJ	JORGE E.GONZALEZ	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	Function replaced by GNSS
SANTA MARTA	SKSM	SIMON BOLIVAR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SARAVENA	SKSA	LOS COLONIZADORES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SOGAMOSO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TAME	SKTM	TAME	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TECHO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TRES ESQUINAS			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TRINIDAD			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TULUA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TUMACO	SKCO	LA FLORIDA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TURBO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
VALLEDUPAR	SKVP	ALFONSO LOPEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
VILLAVICENCIO	SKVV	VANGUARDIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ZIPAQUIRA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

System Replacement/Discontinuance Plan
Option 2 (Accelerated)

NDB

NDB's no longer required. Retained through 2007 to coincide with GPMS installation. If NDB fails - Do not replace.

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components installed)															Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
AMBALEMA			0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	Function replaced by GNSS
ARARACUARA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ARAUCA	SKAU	SANTIAGO PEREZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ARMENIA	SKAR	EL EDEN	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	Function replaced by GNSS
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	Function replaced by GNSS
BARRANCABERMEJA	SKEJ	YARIGUIES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BARRANCA DE UPIA			0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	Function replaced by GNSS
BARRANQUILLA	SKBQ	CORTISSOZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BOGOTA	SKBO	ELDORADO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BUCARAMANGA	SKBG	PALONEGRO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	Function replaced by GNSS
BUVIS			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CALI	SKCL	BONILLA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CALIPUERTO			0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	Function replaced by GNSS
CAREPA	SKLC	ANTONIO ROLDAN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARIMAGUA			0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	Function replaced by GNSS
CARTAGENA	SKCG	RAFAEL NUÑEZ	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	Function replaced by GNSS
CARTAGO	SKGO	SANTA ANA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CHIA/GUAYMARAL	SKGY	GUAYMARAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CONDOTO			0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	Function replaced by GNSS
COROZAL	SKCZ	LAS BRUJAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CUCUTA	SKCC	CAMILO DAZA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
EL BANCO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
EL PASO			0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	Function replaced by GNSS
EL ROSAL			0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Function replaced by GNSS
EL YOPAL	SKYP	EL YOPAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
GIRARDOT	SKGI	SANTIAGO VILA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
GUAPI	SKGP	GUAPI	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	Function replaced by GNSS
IBAGUE	SKIB	PERALES	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	Function replaced by GNSS
IPIALES	SKIP	SAN LUIS	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	Function replaced by GNSS
JARDIN			0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	Function replaced by GNSS
LA MINA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
LA PEDRERA			0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	Function replaced by GNSS
LETICIA	SKLT	VASQUEZ COBO	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	Function replaced by GNSS
LOS CEDROS			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MAGANGUE			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MANIZALES	SKMZ	LA NUBIA	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	Function replaced by GNSS
MARINILLA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MARIQUITA	SKQU	MARIQUITA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MECADERES			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MEDELLIN	SKMD	OLAYA HERRERA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MITU	SKMU	FABIO LEON B.	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	Function replaced by GNSS
MONTERIA	SKMR	LOS GARZONES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
NEIVA	SKNV	BENITO SALAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
NUQUI			0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	Function replaced by GNSS
OCANA	SKOC	AGUAS CLARAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
OTU	SKOT	REMEDIOS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PALMA			0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	Function replaced by GNSS
PASTO	SKPS	ANTONIO NARIÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PEREIRA	SKPE	MATECAÑA	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	Function replaced by GNSS
PIEDECUESTA			0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	Function replaced by GNSS
POPAYAN	SKPP	GUILLERMO LEON VALENCIA	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	Function replaced by GNSS
PROVIDENCIA	SKPV	PROVIDENCIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO ASIS	SKAS	PUERTO ASIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO CARRENO	SKPC	PUERTO CARREÑO	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	Function replaced by GNSS
PUERTO INIRIDA			0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	Function replaced by GNSS
PUERTO LEGUIZAMO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
QUIBDO	SKUI	EL CARAÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
RIOHACHA	SKRH	ALMIRANTE PADILLA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
RIONEGRO	SKRG	JOSE MARIA CORDOBA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SAN ANDRES	SKSP	SESQUICENTENARIC	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	Function replaced by GNSS
SAN JOSE DEL GUAV.	SKSJ	JORGE E.GONZALEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SANTA MARTA	SKSM	SIMON BOLIVAR	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	Function replaced by GNSS
SARAVENA	SKSA	LOS COLONIZADORES	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	Function replaced by GNSS
SOGAMOSO			0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	Function replaced by GNSS
TAME	SKTM	TAME	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	Function replaced by GNSS
TECHO			0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	Function replaced by GNSS
TRES ESQUINAS			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TRINIDAD			0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	Function replaced by GNSS
TULUA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TUMACO	SKCO	LA FLORIDA	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	Function replaced by GNSS
TURBO			0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	Function replaced by GNSS
VALLEDUPAR	SKVP	ALFONSO LOPEZ	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	Function replaced by GNSS
VILLAVICENCIO	SKVV	VANGUARDIA	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	Function replaced by GNSS
ZIPAQUIRA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

APPENDIX D – SURVEILLANCE WORKSHEETS

Current Surveillance Systems Inventory

Location Information				System by Age													
				PSR				SSR				MSSR A/C				MSSR A/C and PSR			
Location/Site	ICAO Code	Airport	Site Visit?	Quantity	Install year	Age	Useful life (yrs)	Quantity	Install year	Age	Useful life (yrs)	Quantity	Install year	Age	Useful life (yrs)	Quantity	Install year	Age	Useful life (yrs)
ARARACUARA			No																
ARAUCA	SKAU	SANTIAGO PEREZ	No																
ARMENIA	SKAR	EL EDEN	No																
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS	No																
BARRANCABERMEJA	SKEJ	YARIGUIES	No																
BARRANQUILLA	SKBQ	CORTISSOZ	Yes																
BOGOTA	SKBO	ELDORADO	Yes																
BUCARAMANGA	SKBG	PALONEGRO	No													1	1991	14	15
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ	No																
CALI	SKCL	BONILLA	Yes													1	1998	7	15
CAREPA	SKLC	ANTONIO ROLDAN	No													1	202	3	15
CARIMAGUA			No	1	1993	12	20					1	2002	3	15				
CARTAGENA	SKCG	RAFAEL NUÑEZ	Yes																
CARTAGO	SKGO	SANTA ANA	No																
CERRO MACO			No													1	1995	10	15
CERRO VERDE			No													1	1991	14	15
CHIAGUAYMARAL	SKGY	GUAYMARAL	No																
COROZAL	SKCZ	LAS BRUJAS	No																
CUCUTA	SKCC	CAMILO DAZA	No																
EL YOPAL	SKYP	EL YOPAL	No																
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA	No																
GIRARDOT	SKGI	SANTIAGO VILA	No																
GUAPI	SKGP	GUAPI	No																
IBAGUE	SKIB	PERALES	No																
IPIALES	SKIP	SAN LUIS	No																
LETICIA	SKLT	VASQUEZ COBO	No													1	2002	3	15
MANIZALES	SKMZ	LA NUBIA	No																
MARANDUA			No													1	1991	14	20
MARIQUITA	SKQU	MARIQUITA	No																
MEDELLIN	SKMD	OLAYA HERRERA	No																
MITU	SKMU	FABIO LEON B.	No																
MONTERIA	SKMR	LOS GARZONES	No																
NEIVA	SKNV	BENITO SALAS	No																
OCANA	SKOC	AGUAS CLARAS	No																
OTU	SKOT	REMEDIOS	No																
PASTO	SKPS	ANTONIO NARIÑO	No																
PEREIRA	SKPE	MATECAÑA	No																
PICACHO			No													1	2005	0.5	15
POPAYAN	SKPP	GUILLERMO LEON VALENCIA	No																
PROVIDENCIA	SKPV	PROVIDENCIA	No																
PUERTO ASIS	SKAS	PUERTO ASIS	No																
PUERTO CARRENO	SKPC	PUERTO CARREÑO	No																
QUIBDO	SKUI	EL CARAÑO	No																
RIOACHA			No													1	1991	14	20
RIOHACHA	SKRH	ALMIRANTE PADILLA	No																
RIONEGRO	SKRG	JOSE MARIA CORDOBA	No																
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO	No																
SAN ANDRES	SKSP	SESQUICENTENARIO	No	1	1996	9	20	1	1991	14	20								
SAN JOSE DEL GUAV	SKSJ	JORGE E GONZALEZ	No													1	2000	5	20
SANTA MARTA	SKSM	SIMON BOLIVAR	No																
SANTANA			No													1	1996	9	18
SARAVENA	SKSA	LOS COLONIZADORES	No																
TABLAZO			YES													1	2005	0.5	15
TAME	SKTM	TAME	No																
TRES ESQUINAS			No													1	2001	4	20
TUBARA			No													1	1998	7	15
TUMACO	SKCO	LA FLORIDA	No																
VALLEDUPAR	SKVP	ALFONSO LOPEZ	No																
VIEJO CALDAS			No																
VILLAVICENCIO	SKVV	VANGUARDIA	No	1	1991	14	20	1	1975	30	20	1	2005	0.5	15				
Subtotal				3				2				2				14			

*installations under 1 year are rounded up to a year for planning purposes, planned future installations are in another sheet.

System Implementation Plan
Surveillance

Multilateration with Mode S ADS-B Surveillance Fusion

Option 1 (Evolutionary)
Component:

Option 1 A
Technical Solution

Preferred

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)															Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
ARARACUARA																		
ARAUCA	SKAU	SANTIAGO PEREZ																
ARMENIA	SKAR	EL EDEN																
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS																
BARRANCABERMEJA	SKEJ	YARIGUIES																
BARRANQUILLA	SKBQ	CORTISSOZ																
BOGOTA	SKBO	ELDORADO						1										
BUCARAMANGA	SKBG	PALONEGRO																
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ																
CALI	SKCL	BONILLA					1											
CAREPA	SKLC	ANTONIO ROLDAN																
CARIMAGUA								1										Primary radar age is driver
CARTAGENA	SKCG	RAFAEL NUÑEZ																
CARTAGO	SKGO	SANTA ANA																
CERRO MACO																		
CERRO VERDE																		
CHIA/GUAYMARAL	SKGY	GUAYMARAL																
COROZAL	SKCZ	LAS BRUJAS																
CUCUTA	SKCC	CAMILO DAZA																
EL YOPAL	SKYP	EL YOPAL																
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA																
GIRARDOT	SKGI	SANTIAGO VILA																
GUAPI	SKGP	GUAPI																
IBAGUE	SKIB	PERALES																
IPIALES	SKIP	SAN LUIS																
LETICIA	SKLT	VASQUEZ COBO						1										Transition time is longer
MANIZALES	SKMZ	LA NUBIA																
MARANDUA																		
MARIQUITA	SKQU	MARIQUITA																
MEDELLIN	SKMD	OLAYA HERRERA																
MITU	SKMU	FABIO LEON B																
MONTERIA	SKMR	LOS GARZONES																
NEIVA	SKNV	BENITO SALAS																
OCANA	SKOC	AGUAS CLARAS																
OTU	SKOT	REMEDIOS																
PASTO	SKPS	ANTONIO NARIÑO																
PEREIRA	SKPE	MATECAÑA																
PICACHO								1										For ADS-B
POPAYAN	SKPP	GUILLERMO LEON VALENCIA																
PROVIDENCIA	SKPV	PROVIDENCIA																
PUERTO ASIS	SKAS	PUERTO ASIS																
PUERTO CARRENO	SKPC	PUERTO CARREÑO																
QUIBDO	SKUI	EL CARAÑO																
RIOACHA								1										
RIOHACHA	SKRH	ALMIRANTE PADILLA																
RIONEGRO	SKRG	JOSE MARIA CORDOBA																
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO																
SAN ANDRES	SKSP	SESQUICENTENARIO						1										Both Simultaneously
SAN JOSE DEL GUAV.	SKSJ	JORGE E GONZALEZ																
SANTA MARTA	SKSM	SIMON BOLIVAR																
SANTANA										1								
SARAVENA	SKSA	LOS COLONIZADORES																
TABLAZO										1								Transition time is extended
TAME	SKTM	TAME																
TRES ESQUINAS																		
TUBARA																		
TUMACO	SKCO	LA FLORIDA																
VALLEDUPAR	SKVP	ALFONSO LOPEZ																
VIEJO CALDAS																		
VILLAVICENCIO	SKVV	VANGUARDIA								1								Transition time is extended

For new radars without ADS-B, transition time is noted as being longer. Will require additional equipment to support ADS-B.

System Implementation Plan
Surveillance

Primary Radar Fused with Secondary and ADS-B

Option 1 (Evolutionary)
Component:

Option 1 B
Technical Solution

Alternate

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)															Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
ARARACUARA																		
ARAUCA	SKAU	SANTIAGO PEREZ																
ARMENIA	SKAR	EL EDEN																
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS																
BARRANCABERMEJA	SKEJ	YARIGUIES																
BARRANQUILLA	SKBQ	CORTISSOZ																
BOGOTA	SKBO	ELDORADO						1										
BUCARAMANGA	SKBG	PALONEGRO																
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ																
CALI	SKCL	BONILLA						1										
CAREPA	SKLC	ANTONIO ROLDAN																
CARIMAGUA								1										
CARTAGENA	SKCG	RAFAEL NUÑEZ																
CARTAGO	SKGO	SANTA ANA																
CERRO MACO																		
CERRO VERDE																		
CHIA/GUAYMARAL	SKGY	GUAYMARAL																
COROZAL	SKCZ	LAS BRUJAS																
CUCUTA	SKCC	CAMILO DAZA																
EL YOPAL	SKYP	EL YOPAL																
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA																
GIRARDOT	SKGI	SANTIAGO VILA																
GUAPI	SKGP	GUAPI																
IBAGUE	SKIB	PERALES																
IPIALES	SKIP	SAN LUIS																
LETICIA	SKLT	VASQUEZ COBO						1										
MANIZALES	SKMZ	LA NUBIA																
MARANDUA																		
MARIQUITA	SKQU	MARIQUTA																
MEDELLIN	SKMD	OLAYA HERRERA																
MITU	SKMU	FABIO LEON B.																
MONTERIA	SKMR	LOS GARZONES																
NEIVA	SKNV	BENITO SALAS																
OCANA	SKOC	AGUAS CLARAS																
OTU	SKOT	REMEDIOS																
PASTO	SKPS	ANTONIO NARIÑO																
PEREIRA	SKPE	MATECAÑA																
PICACHO								1										
POPAYAN	SKPP	GUILLERMO LEON VALENCIA																
PROVIDENCIA	SKPV	PROVIDENCIA																
PUERTO ASIS	SKAS	PUERTO ASIS																
PUERTO CARRENO	SKPC	PUERTO CARREÑO																
QUIBDO	SKUI	EL CARAÑO																
RIOACHA								1										
RIOHACHA	SKRH	ALMIRANTE PADILLA																
RIONEGRO	SKRG	JOSE MARIA CORDOBA																
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO																
SAN ANDRES	SKSP	SESQUICENTENARIO						1										
SAN JOSE DEL GUAV.	SKSJ	JORGE E GONZALEZ																
SANTA MARTA	SKSM	SIMON BOLIVAR																
SANTANA								1										
SARAVENA	SKSA	LOS COLONIZADORES																
TABLAZO								1										
TAME	SKTM	TAME																
TRES ESQUINAS																		
TUBARA																		
TUMACO	SKCO	LA FLORIDA																
VALLEDUPAR	SKVP	ALFONSO LOPEZ																
VIEJO CALDAS																		
VILLAVICENCIO	SKVV	VANGUARDIA						1										

ADS-B can be deployed at the same time at all sites

System Implementation Plan
Surveillance

Primary and Secondary with ADS-B Multilateraion

Option 1 (Evolutionary)
Component:

Option 1 C
Technical Solution

Alternate

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)															Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
ARARACUARA																		
ARAUCA	SKAU	SANTIAGO PEREZ																
ARMENIA	SKAR	EL EDEN																
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS																
BARRANCABERMEJA	SKEJ	YARIGUIES																
BARRANQUILLA	SKBQ	CORTISSOZ																
BOGOTA	SKBO	ELDORADO						1										
BUCARAMANGA	SKBG	PALONEGRO																
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ																
CALI	SKCL	BONILLA						1										
CAREPA	SKLC	ANTONIO ROLDAN																
CARIMAGUA								1										
CARTAGENA	SKCG	RAFAEL NUÑEZ																
CARTAGO	SKGO	SANTA ANA																
CERRO MACO																		
CERRO VERDE																		
CHIA/GUAYMARAL	SKGY	GUAYMARAL																
COROZAL	SKCZ	LAS BRUJAS																
CUCUTA	SKCC	CAMILO DAZA																
EL YOPAL	SKYP	EL YOPAL																
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA																
GIRARDOT	SKGI	SANTIAGO VILA																
GUAPI	SKGP	GUAPI																
IBAGUE	SKIB	PERALES																
IPIALES	SKIP	SAN LUIS																
LETICIA	SKLT	VASQUEZ COBO						1										
MANIZALES	SKMZ	LA NUBIA																
MARANDUA																		
MARIQUITA	SKQU	MARIQUTA																
MEDELLIN	SKMD	OLAYA HERRERA																
MITU	SKMU	FABIO LEON B.																
MONTERIA	SKMR	LOS GARZONES																
NEIVA	SKNV	BENITO SALAS																
OCANA	SKOC	AGUAS CLARAS																
OTU	SKOT	REMEDIOS																
PASTO	SKPS	ANTONIO NARIÑO																
PEREIRA	SKPE	MATECAÑA																
PICACHO								1										
POPAYAN	SKPP	GUILLERMO LEON VALENCIA																
PROVIDENCIA	SKPV	PROVIDENCIA																
PUERTO ASIS	SKAS	PUERTO ASIS																
PUERTO CARRENO	SKPC	PUERTO CARREÑO																
QUIBDO	SKUI	EL CARAÑO																
RIOACHA								1										
RIOHACHA	SKRH	ALMIRANTE PADILLA																
RIONEGRO	SKRG	JOSE MARIA CORDOBA																
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO																
SAN ANDRES	SKSP	SESQUICENTENARIO						1										
SAN JOSE DEL GUAV.	SKSJ	JORGE E.GONZALEZ																
SANTA MARTA	SKSM	SIMON BOLIVAR																
SANTANA								1										
SARAVENA	SKSA	LOS COLONIZADORES																
TABLAZO								1										
TAME	SKTM	TAME																
TRES ESQUINAS																		
TUBARA																		
TUMACO	SKCO	LA FLORIDA																
VALLEDUPAR	SKVP	ALFONSO LOPEZ																
VIEJO CALDAS																		
VILLAVICENCIO	SKVV	VANGUARDIA						1										

Adeding ADS-B & Multilateration is recommended in 2010. However, economics will need to be considered.

System Implementation Plan
Surveillance
ADS-B
Option 1 (Evolutionary)
Component:

Option 1 D
Technical Solution

Alternate

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)															Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
ARARACUARA																		
ARAUCA	SKAU	SANTIAGO PEREZ																
ARMENIA	SKAR	EL EDEN																
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS																
BARRANCABERMEJA	SKEJ	YARIGUIES																
BARRANQUILLA	SKBQ	CORTISSOZ																
BOGOTA	SKBO	ELDORADO						1										
BUCARAMANGA	SKBG	PALONEGRO																
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ																
CALI	SKCL	BONILLA						1										
CAREPA	SKLC	ANTONIO ROLDAN																
CARIMAGUA								1										
CARTAGENA	SKCG	RAFAEL NUÑEZ																
CARTAGO	SKGO	SANTA ANA																
CERRO MACO																		
CERRO VERDE																		
CHIA/GUAYMARAL	SKGY	GUAYMARAL																
COROZAL	SKCZ	LAS BRUJAS																
CUCUTA	SKCC	CAMILO DAZA																
EL YOPAL	SKYP	EL YOPAL																
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA																
GIRARDOT	SKGI	SANTIAGO VILA																
GUAPI	SKGP	GUAPI																
IBAGUE	SKIB	PERALES																
IPIALES	SKIP	SAN LUIS																
LETICIA	SKLT	VASQUEZ COBO						1										
MANIZALES	SKMZ	LA NUBIA																
MARANDUA																		
MARIQUITA	SKQU	MARIQUITA																
MEDELLIN	SKMD	OLAYA HERRERA																
MITU	SKMU	FABIO LEON B.																
MONTERIA	SKMR	LOS GARZONES																
NEIVA	SKNV	BENITO SALAS																
OCANA	SKOC	AGUAS CLARAS																
OTU	SKOT	REMEDIOS																
PASTO	SKPS	ANTONIO NARIÑO																
PEREIRA	SKPE	MATECAÑA																
PICACHO								1										
POPAYAN	SKPP	GUILLERMO LEON VALENCIA																
PROVIDENCIA	SKPV	PROVIDENCIA																
PUERTO ASIS	SKAS	PUERTO ASIS																
PUERTO CARRENO	SKPC	PUERTO CARREÑO																
QUIBDO	SKUI	EL CARAÑO																
RIOACHA								1										
RIOHACHA	SKRH	ALMIRANTE PADILLA																
RIONEGRO	SKRG	JOSE MARIA CORDOBA																
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO																
SAN ANDRES	SKSP	SESQUICENTENARIO						1										
SAN JOSE DEL GUAV.	SKSJ	JORGE E.GONZALEZ																
SANTA MARTA	SKSM	SIMON BOLIVAR																
SANTANA																		
SARAVENA	SKSA	LOS COLONIZADORES																
TABLAZO								1										
TAME	SKTM	TAME																
TRES ESQUINAS																		
TUBARA																		
TUMACO	SKCO	LA FLORIDA																
VALLEDUPAR	SKVP	ALFONSO LOPEZ																
VIEJO CALDAS																		
VILLAVICENCIO	SKVV	VANGUARDIA						1										

System Implementation Plan
Surveillance

Surface Movement Radar

Option 1 (Evolutionary)
Component:

Options 1 A, B, C & D
Preferred Technical Solution

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)															Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
ARARACUARA																		
ARAUCA	SKAU	SANTIAGO PEREZ																
ARMENIA	SKAR	EL EDEN																
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS																
BARRANCABERMEJA	SKEJ	YARIGUIES																
BARRANQUILLA	SKBQ	CORTISSOZ																
BOGOTA	SKBO	ELDORADO						1										
BUCARAMANGA	SKBG	PALONEGRO																
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ																
CALI	SKCL	BONILLA																
CAREPA	SKLC	ANTONIO ROLDAN																
CARIMAGUA																		
CARTAGENA	SKCG	RAFAEL NUÑEZ																
CARTAGO	SKGO	SANTA ANA																
CERRO MACO																		
CERRO VERDE																		
CHIA/GUAYMARAL	SKGY	GUAYMARAL																
COROZAL	SKCZ	LAS BRUJAS																
CUCUTA	SKCC	CAMILO DAZA																
EL YOPAL	SKYP	EL YOPAL																
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA																
GIRARDOT	SKGI	SANTIAGO VILA																
GUAPI	SKGP	GUAPI																
IBAGUE	SKIB	PERALES																
IPIALES	SKIP	SAN LUIS																
LETICIA	SKLT	VASQUEZ COBO																
MANIZALES	SKMZ	LA NUBIA																
MARANDUA																		
MARIQUITA	SKQU	MARIQUITA																
MEDELLIN	SKMD	OLAYA HERRERA																
MITU	SKMU	FABIO LEON B.																
MONTERIA	SKMR	LOS GARZONES																
NEIVA	SKNV	BENITO SALAS																
OCANA	SKOC	AGUAS CLARAS																
OTU	SKOT	REMEDIOS																
PASTO	SKPS	ANTONIO NARIÑO																
PEREIRA	SKPE	MATECAÑA																
PICACHO																		
POPAYAN	SKPP	GUILLERMO LEON VALENCIA																
PROVIDENCIA	SKPV	PROVIDENCIA																
PUERTO ASIS	SKAS	PUERTO ASIS																
PUERTO CARRENO	SKPC	PUERTO CARREÑO																
QUIBDO	SKUI	EL CARAÑO																
RIOACHA																		
RIOHACHA	SKRH	ALMIRANTE PADILLA																
RIONEGRO	SKRG	JOSE MARIA CORDOBA																
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO																
SAN ANDRES	SKSP	SESQUICENTENARIO																
SAN JOSE DEL GUAV.	SKSJ	JORGE E.GONZALEZ																
SANTA MARTA	SKSM	SIMON BOLIVAR																
SANTANA																		
SARAVENA	SKSA	LOS COLONIZADORES																
TABLAZO																		
TAME	SKTM	TAME																
TRES ESQUINAS																		
TUBARA																		
TUMACO	SKCO	LA FLORIDA																
VALLEDUPAR	SKVP	ALFONSO LOPEZ																
VIEJO CALDAS																		
VILLAVICENCIO	SKVV	VANGUARDIA																

Only Bogota has sufficient tgraffic to justify SMR

System Implementation Plan
Option 1 (Evolutionary)
System Replacement/Discontinuance Plan

PSR

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)															Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
ARARACUARA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ARAUCA	SKAU	SANTIAGO PEREZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ARMENIA	SKAR	EL EDEN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BARRANCABERMEJA	SKEJ	YARIGUIES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BARRANQUILLA	SKBQ	CORTISSOZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BOGOTA	SKBO	ELDORADO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BUCARAMANGA	SKBG	PALONEGRO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CALI	SKCL	BONILLA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CAREPA	SKLC	ANTONIO ROLDAN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARIMAGUA			0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	Not Required for Civil ATC
CARTAGENA	SKCG	RAFAEL NUÑEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARTAGO	SKGO	SANTA ANA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO MACO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO VERDE			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CHIA/GUAYMARAL	SKGY	GUAYMARAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
COROZAL	SKCZ	LAS BRUJAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CUCUTA	SKCC	CAMILO DAZA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
EL YOPAL	SKYP	EL YOPAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
GIRARDOT	SKGI	SANTIAGO VILA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
GUAPI	SKGP	GUAPI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
IBAGUE	SKIB	PERALES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
IPIALES	SKIP	SAN LUIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
LETICIA	SKLT	VASQUEZ COBO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MANIZALES	SKMZ	LA NUBIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MARANDUA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MARIQUITA	SKQU	MARIQUITA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MEDELLIN	SKMD	OLAYA HERRERA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MITU	SKMU	FABIO LEON B.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MONTERIA	SKMR	LOS GARZONES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
NEIVA	SKNV	BENITO SALAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
OCANA	SKOC	AGUAS CLARAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
OTU	SKOT	REMEDIOS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PASTO	SKPS	ANTONIO NARIÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PEREIRA	SKPE	MATECAÑA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PICACHO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
POPAYAN	SKPP	GUILLERMO LEON VALENCIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PROVIDENCIA	SKPV	PROVIDENCIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO ASIS	SKAS	PUERTO ASIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO CARRENO	SKPC	PUERTO CARRENO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
QUIBDO	SKUI	EL CARAÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
RIOACHA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
RIOHACHA	SKRH	ALMIRANTE PADILLA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
RIONEGRO	SKRG	JOSE MARIA CORDOBA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
S. VIC. DEL CAGUAN	SKSV	EDUARDO ALLA [illegible]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SAN ANDRES	SKSP	SESQUICENTENARIO	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	Not Required for Civil ATC
SAN JOSE DEL GUAV.	SKSJ	JORGE E.GONZALEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SANTA MARTA	SKSM	SIMON BOLIVAR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SANTANA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SARAVENA	SKSA	LOS COLONIZADORES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TABLAZO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TAME	SKTM	TAME	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TRES ESQUINAS			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TUBARA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TUMACO	SKCO	LA FLORIDA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
VALLEDUPAR	SKVP	ALFONSO LOPEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
VIEJO CALDAS			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
VILLAVICENCIO	SKVV	VANGUARDIA	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	Not Required for Civil ATC

System Implementation Plan
Option 1 (Evolutionary)
System Replacement/Discontinuance Plan

SSR

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)															Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
ARARACUARA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ARAUCA	SKAU	SANTIAGO PEREZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ARMENIA	SKAR	EL EDEN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BARRANCABERMEJA	SKEJ	YARIGUIES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BARRANQUILLA	SKBQ	CORTISSOZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BOGOTA	SKBO	ELDORADO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BUCARAMANGA	SKBG	PALONEGRO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CALI	SKCL	BONILLA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CAREPA	SKLC	ANTONIO ROLDAN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARIMAGUA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARTAGENA	SKCG	RAFAEL NUÑEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARTAGO	SKGO	SANTA ANA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO MACO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO VERDE			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CHIA/GUAYMARAL	SKGY	GUAYMARAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
COROZAL	SKCZ	LAS BRUJAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CUCUTA	SKCC	CAMILO DAZA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
EL YOPAL	SKYP	EL YOPAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
GIRARDOT	SKGI	SANTIAGO VILA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
GUAPI	SKGP	GUAPI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
IBAGUE	SKIB	PERALES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
IPIALES	SKIP	SAN LUIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
LETICIA	SKLT	VASQUEZ COBO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MANIZALES	SKMZ	LA NUBIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MARANDUA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MARIQUITA	SKQU	MARIQUITA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MEDELLIN	SKMD	OLAYA HERRERA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MITU	SKMU	FABIO LEON B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MONTERIA	SKMR	LOS GARZONES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
NEIVA	SKNV	BENITO SALAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
OCANA	SKOC	AGUAS CLARAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
OTU	SKOT	REMEDIOS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PASTO	SKPS	ANTONIO NARIÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PEREIRA	SKPE	MATECANA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PICACHO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
POPAYAN	SKPP	GUILLERMO LEON VALENCIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PROVIDENCIA	SKPV	PROVIDENCIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO ASIS	SKAS	PUERTO ASIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO CARRENO	SKPC	PUERTO CARRENO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
QUIBDO	SKUI	EL CARANO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
RIOACHA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
RIOHACHA	SKRH	ALMIRANTE PADILLA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
RIONEGRO	SKRG	JOSE MARIA CORDOBA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
S. VIC. DEL CAGUAN	SKSV	EDUARDO ALEA ROLANO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SAN ANDRES	SKSP	SESQUICENTENARIO	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	Replaced by Multilateration with Mode-S ADS-B (remove if not required for backup)
SAN JOSE DEL GUAV.	SKSJ	JORGE E.GONZALEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SANTA MARTA	SKSM	SIMON BOLIVAR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SANTANA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SARAVENA	SKSA	LOS COLONIZADORES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TABLAZO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TAME	SKTM	TAME	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TRES ESQUINAS			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TUBARA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TUMACO	SKCO	LA FLORIDA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
VALLEDUPAR	SKVP	ALFONSO LOPEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
VIEJO CALDAS			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
VILLAVICENCIO	SKVV	VANGUARDIA	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	Extend MSSR life to 2011 or accelerate Multilateration installation (remove if not required for backup)

System Implementation Plan
Option 1 (Evolutionary)
System Replacement/Discontinuance Plan

MSSR A/C

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)															Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
ARARACUARA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ARAUCA	SKAU	SANTIAGO PEREZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ARMENIA	SKAR	EL EDEN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BARRANCABERMEJA	SKEJ	YARIGUIES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BARRANQUILLA	SKBQ	CORTISSOZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BOGOTA	SKBO	ELDORADO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BUCARAMANGA	SKBG	PALONEGRO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CALI	SKCL	BONILLA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CAREPA	SKLC	ANTONIO ROLDAN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARIMAGUA			0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	Can be removed earlier for cost savings (remove if not required for backup)
CARTAGENA	SKCG	RAFAEL NUÑEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARTAGO	SKGO	SANTA ANA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO MACO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO VERDE			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CHIA/GUAYMARAL	SKGY	GUAYMARAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
COROZAL	SKCZ	LAS BRUJAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CUCUTA	SKCC	CAMILO DAZA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
EL YOPAL	SKYP	EL YOPAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
GIRARDOT	SKGI	SANTIAGO VILA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
GUAPI	SKGP	GUAPI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
IBAGUE	SKIB	PERALES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
IPIALES	SKIP	SAN LUIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
LETICIA	SKLT	VASQUEZ COBO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MANIZALES	SKMZ	LA NUBIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MARANDUA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MARIQUITA	SKQU	MARIQUITA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MEDELLIN	SKMD	OLAYA HERRERA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MITU	SKMU	FABIO LEON B.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MONTERIA	SKMR	LOS GARZONES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
NEIVA	SKNV	BENITO SALAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
OCANA	SKOC	AGUAS CLARAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
OTU	SKOT	REMEDIOS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PASTO	SKPS	ANTONIO NARIÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PEREIRA	SKPE	MATECAÑA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PICACHO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
POPAYAN	SKPP	GUILLERMO LEON VALENCIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PROVIDENCIA	SKPV	PROVIDENCIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO ASIS	SKAS	PUERTO ASIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO CARRENO	SKPC	PUERTO CARRENO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
QUIBDO	SKUI	EL CARANO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
RIOACHA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
RIOHACHA	SKRH	ALMIRANTE PADILLA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
RIONEGRO	SKRG	JOSE MARIA CORDOBA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SAN ANDRES	SKSP	SESQUICENTENARIO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SAN JOSE DEL GUAV.	SKSJ	JORGE E GONZALEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SANTA MARTA	SKSM	SIMON BOLIVAR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SANTANA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SARAVENA	SKSA	LOS COLONIZADORES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TABLAZO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TAME	SKTM	TAME	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TRES ESQUINAS			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TUBARA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TUMACO	SKCO	LA FLORIDA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
VALLEDUPAR	SKVP	ALFONSO LOPEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
VIEJO CALDAS			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
VILLAVICENCIO	SKVV	VANGUARDIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

System Implementation Plan
Option 1 (Evolutionary)
System Replacement/Discontinuance Plan

MSSR A/C and PSR

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)														Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
ARARACUARA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ARAUCA	SKAU	SANTIAGO PEREZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ARMENIA	SKAR	EL EDEN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BARRANCABERMEJA	SKEJ	YARIGUIES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BARRANQUILLA	SKBQ	CORTISSOZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BOGOTA	SKBO	ELDORADO	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Extend Life one year (remove if not required for backup)
BUCARAMANGA	SKBG	PALONEGRO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CALI	SKCL	BONILLA	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	Can discontinue in 2010 (remove if not required for backup)
CAREPA	SKLC	ANTONIO ROLDAN	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	Can discontinue in 2010 (remove if not required for backup)
CARIMAGUA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARTAGENA	SKCG	RAFAEL NUÑEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARTAGO	SKGO	SANTA ANA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO MACO			0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	Can discontinue in 2010 (remove if not required for backup)
CERRO VERDE			0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Extend Life one year (remove if not required for backup)
CHIA/GUAYMARAL	SKGY	GUAYMARAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
COROZAL	SKCZ	LAS BRUJAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CUCUTA	SKCC	CAMILO DAZA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
EL YOPAL	SKYP	EL YOPAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
GIRARDOT	SKGI	SANTIAGO VILA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
GUAPI	SKGP	GUAPI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
IBAGUE	SKIB	PERALES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
IPIALES	SKIP	SAN LUIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
LETICIA	SKLT	VASQUEZ COBO	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	Can discontinue in 2010 (remove if not required for backup)
MANIZALES	SKMZ	LA NUBIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MARANDUA			0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	Can discontinue in 2010 (remove if not required for backup)
MARIQUITA	SKQU	MARIQUITA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MEDELLIN	SKMD	OLAYA HERRERA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MITU	SKMU	FABIO LEON B.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MONTERIA	SKMR	LOS GARZONES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
NEIVA	SKNV	BENITO SALAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
OCANA	SKOC	AGUAS CLARAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
OTU	SKOT	REMEDIOS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PASTO	SKPS	ANTONIO NARIÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PEREIRA	SKPE	MATECAÑA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PICACHO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
POPAYAN	SKPP	GUILLERMO LEON VALENCIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PROVIDENCIA	SKPV	PROVIDENCIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO ASIS	SKAS	PUERTO ASIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO CARRENO	SKPC	PUERTO CARREÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
QUIBDO	SKUI	EL CARAÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
RIOACHA			0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	Can discontinue in 2010 (remove if not required for backup)
RIOHACHA	SKRH	ALMIRANTE PADILLA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
RIONEGRO	SKRG	JOSE MARIA CORDOBA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
S. VIC. DEL CAGUAN	SKSV	EDUARDO ALEA COLANI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SAN ANDRES	SKSP	SESQUICENTENARIC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SAN JOSE DEL GUAV.	SKSJ	JORGE E GONZALEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SANTA MARTA	SKSM	SIMON BOLIVAR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SANTANA			0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	Can discontinue in 2010 (remove if not required for backup)
SARAVENA	SKSA	LOS COLONIZADORES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TABLAZO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TAME	SKTM	TAME	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TRES ESQUINAS			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TUBARA			0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	Can discontinue in 2010 (remove if not required for backup)
TUMACO	SKCO	LA FLORIDA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
VALLEDUPAR	SKVP	ALFONSO LOPEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
VIEJO CALDAS			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
VILLAVICENCIO	SKVV	VANGUARDIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

Discontinuing of systems depends upon their function being replaced and back-up/overlap no longer required

System Implementation Plan
Surveillance

Multilateration with Mode S ADS-B Surveillance Fusion

Option 2 (Accelerated)
Component:

Option 2 A **Preferred**
Technical Solution

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)															Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
ARARACUARA																		
ARAUCA	SKAU	SANTIAGO PEREZ																
ARMENIA	SKAR	EL EDEN																
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS																
BARRANCABERMEJA	SKEJ	YARIGUIES																
BARRANQUILLA	SKBQ	CORTISSOZ																
BOGOTA	SKBO	ELDORADO			1													
BUCARAMANGA	SKBG	PALONEGRO																
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ																
CALI	SKCL	BONILLA			1													
CAREPA	SKLC	ANTONIO ROLDAN			1													
CARIMAGUA					1													
CARTAGENA	SKCG	RAFAEL NUÑEZ																
CARTAGO	SKGO	SANTA ANA																
CERRO MACO					1													
CERRO VERDE					1													
CHIA/GUAYMARAL	SKGY	GUAYMARAL																
COROZAL	SKCZ	LAS BRUJAS																
CUCUTA	SKCC	CAMILO DAZA																
EL YOPAL	SKYP	EL YOPAL																
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA																
GIRARDOT	SKGI	SANTIAGO VILA																
GUAPI	SKGP	GUAPI																
IBAGUE	SKIB	PERALES																
IPIALES	SKIP	SAN LUIS																
LETICIA	SKLT	VASQUEZ COBO			1													
MANIZALES	SKMZ	LA NUBIA																
MARANDUA					1													
MARIQUITA	SKQU	MARIQUITA																
MEDELLIN	SKMD	OLAYA HERRERA																
MITU	SKMU	FABIO LEON B.																
MONTERIA	SKMR	LOS GARZONES																
NEIVA	SKNV	BENITO SALAS																
OCANA	SKOC	AGUAS CLARAS																
OTU	SKOT	REMEDIOS																
PASTO	SKPS	ANTONIO NARIÑO																
PEREIRA	SKPE	MATECAÑA																
PICACHO					1													
POPAYAN	SKPP	GUILLERMO LEON VALENCIA																
PROVIDENCIA	SKPV	PROVIDENCIA																
PUERTO ASIS	SKAS	PUERTO ASIS																
PUERTO CARRENO	SKPC	PUERTO CARREÑO																
QUIBDO	SKUI	EL CARAÑO																
RIOACHA					1													
RIOHACHA	SKRH	ALMIRANTE PADILLA																
RIONEGRO	SKRG	JOSE MARIA CORDOBA																
S. VIC. DEL CAGUAN	SKSV	EDUARDO PALLA GOLANO																
SAN ANDRES	SKSP	SESQUICENTENARIO			1													
SAN JOSE DEL GUAV.	SKSJ	JORGE E.GONZALEZ			1													
SANTA MARTA	SKSM	SIMON BOLIVAR																
SANTANA					1													
SARAVENA	SKSA	LOS COLONIZADORES																
TABLAZO					1													
TAME	SKTM	TAME																
TRES ESQUINAS																		
TUBARA																		
TUMACO	SKCO	LA FLORIDA																
VALLEDUPAR	SKVP	ALFONSO LOPEZ																
VIEJO CALDAS																		
VILLAVICENCIO	SKVV	VANGUARDIA			1													

Accelerated deployment can be done all at once. Existing equipment can be removed early or retained as back-up. Discontinuance rerpresents considerable cost savings

System Implementation Plan
Surveillance

Primary Radar Fused with Secondary and ADS-B

Option 2 (Accelerated)
Component:

Option 2B
Technical Solution

Alternate

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)															Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
ARARACUARA																		
ARAUCA	SKAU	SANTIAGO PEREZ																
ARMENIA	SKAR	EL EDEN																
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS																
BARRANCABERMEJA	SKEJ	YARIGUIES																
BARRANQUILLA	SKBQ	CORTISSOZ																
BOGOTA	SKBO	ELDORADO			1													
BUCARAMANGA	SKBG	PALONEGRO																
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ																
CALI	SKCL	BONILLA			1													
CAREPA	SKLC	ANTONIO ROLDAN			1													
CARIMAGUA					1													
CARTAGENA	SKCG	RAFAEL NUÑEZ																
CARTAGO	SKGO	SANTA ANA																
CERRO MACO					1													
CERRO VERDE					1													
CHIA/GUAYMARAL	SKGY	GUAYMARAL																
COROZAL	SKCZ	LAS BRUJAS																
CUCUTA	SKCC	CAMILO DAZA																
EL YOPAL	SKYP	EL YOPAL																
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA																
GIRARDOT	SKGI	SANTIAGO VILA																
GUAPI	SKGP	GUAPI																
IBAGUE	SKIB	PERALES																
IPIALES	SKIP	SAN LUIS																
LETICIA	SKLT	VASQUEZ COBO			1													
MANIZALES	SKMZ	LA NUBIA																
MARANDUA					1													
MARIQUITA	SKQU	MARIQUITA																
MEDELLIN	SKMD	OLAYA HERRERA																
MITU	SKMU	FABIO LEON B.																
MONTERIA	SKMR	LOS GARZONES																
NEIVA	SKNV	BENITO SALAS																
OCANA	SKOC	AGUAS CLARAS																
OTU	SKOT	REMEDIOS																
PASTO	SKPS	ANTONIO NARIÑO																
PEREIRA	SKPE	MATECAÑA																
PICACHO					1													
POPAYAN	SKPP	GUILLERMO LEON VALENCIA																
PROVIDENCIA	SKPV	PROVIDENCIA																
PUERTO ASIS	SKAS	PUERTO ASIS																
PUERTO CARRENO	SKPC	PUERTO CARREÑO																
QUIBDO	SKUI	EL CARAÑO																
RIOACHA					1													
RIOHACHA	SKRH	ALMIRANTE PADILLA																
RIONEGRO	SKRG	JOSE MARIA CORDOBA																
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO																
SAN ANDRES	SKSP	SESQUICENTENARIO			1													
SAN JOSE DEL GUAV.	SKSJ	JORGE E.GONZALEZ			1													
SANTA MARTA	SKSM	SIMON BOLIVAR																
SANTANA					1													
SARAVENA	SKSA	LOS COLONIZADORES																
TABLAZO					1													
TAME	SKTM	TAME																
TRES ESQUINAS																		
TUBARA																		
TUMACO	SKCO	LA FLORIDA																
VALLEDUPAR	SKVP	ALFONSO LOPEZ																
VIEJO CALDAS																		
VILLAVICENCIO	SKVV	VANGUARDIA			1													

Accelerated deployment can be done all at once Existing equipment can be removed early or retained as back-up Discontinuance rerpresents considerable cost savings

System Implementation Plan
Surveillance

Primary and Secondary with ADS-B Multilateraion

Option 2 (Accelerated)
Component:

Option 2 C
Technical Solution

Alternate

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)															Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
ARARACUARA																		
ARAUCA	SKAU	SANTIAGO PEREZ																
ARMENIA	SKAR	EL EDEN																
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS																
BARRANCABERMEJA	SKEJ	YARIGUIES																
BARRANQUILLA	SKBQ	CORTISSOZ																
BOGOTA	SKBO	ELDORADO			1													
BUCARAMANGA	SKBG	PALONEGRO																
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ																
CALI	SKCL	BONILLA			1													
CAREPA	SKLC	ANTONIO ROLDAN			1													
CARIMAGUA					1													
CARTAGENA	SKCG	RAFAEL NUÑEZ																
CARTAGO	SKGO	SANTA ANA																
CERRO MACO					1													
CERRO VERDE					1													
CHIA/GUAYMARAL	SKGY	GUAYMARAL																
COROZAL	SKCZ	LAS BRUJAS																
CUCUTA	SKCC	CAMILO DAZA																
EL YOPAL	SKYP	EL YOPAL																
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA																
GIRARDOT	SKGI	SANTIAGO VILA																
GUAPI	SKGP	GUAPI																
IBAGUE	SKIB	PERALES																
IPIALES	SKIP	SAN LUIS																
LETICIA	SKLT	VASQUEZ COBO			1													
MANIZALES	SKMZ	LA NUBIA																
MARANDUA																		
MARIQUITA	SKQU	MARIQUITA			1													
MEDELLIN	SKMD	OLAYA HERRERA																
MITU	SKMU	FABIO LEON B.																
MONTERIA	SKMR	LOS GARZONES																
NEIVA	SKNV	BENITO SALAS																
OCANA	SKOC	AGUAS CLARAS																
OTU	SKOT	REMEDIOS																
PASTO	SKPS	ANTONIO NARIÑO																
PEREIRA	SKPE	MATECAÑA																
PICACHO					1													
POPAYAN	SKPP	GUILLERMO LEON VALENCIA																
PROVIDENCIA	SKPV	PROVIDENCIA																
PUERTO ASIS	SKAS	PUERTO ASIS																
PUERTO CARRENO	SKPC	PUERTO CARREÑO																
QUIBDO	SKUI	EL CARAÑO																
RIOACHA					1													
RIOHACHA	SKRH	ALMIRANTE PADILLA																
RIONEGRO	SKRG	JOSE MARIA CORDOBA																
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO																
SAN ANDRES	SKSP	SESQUICENTENARIO			1													
SAN JOSE DEL GUAV.	SKSJ	JORGE E.GONZALEZ			1													
SANTA MARTA	SKSM	SIMON BOLIVAR																
SANTANA					1													
SARAVENA	SKSA	LOS COLONIZADORES																
TABLAZO																		
TAME	SKTM	TAME																
TRES ESQUINAS																		
TUBARA																		
TUMACO	SKCO	LA FLORIDA																
VALLEDUPAR	SKVP	ALFONSO LOPEZ																
VIEJO CALDAS																		
VILLAVICENCIO	SKVV	VANGUARDIA			1													

Accelerated deployment can be done all at once Existing equipment can be removed early or retained as back-up Discontinuance rerpresents considerable cost savings

System Implementation Plan
Surveillance
ADS-B
Option 2 (Accelerated)
Component:

Option 2 D
Technical Solution

Alternate

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)															Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
ARARACUARA																		
ARAUCA	SKAU	SANTIAGO PEREZ																
ARMENIA	SKAR	EL EDEN																
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS																
BARRANCABERMEJA	SKEJ	YARIGUIES																
BARRANQUILLA	SKBQ	CORTISSOZ																
BOGOTA	SKBO	ELDORADO			1													
BUCARAMANGA	SKBG	PALONEGRO																
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ																
CALI	SKCL	BONILLA			1													
CAREPA	SKLC	ANTONIO ROLDAN			1													
CARIMAGUA					1													
CARTAGENA	SKCG	RAFAEL NUÑEZ																
CARTAGO	SKGO	SANTA ANA																
CERRO MACO					1													
CERRO VERDE					1													
CHIA/GUAYMARAL	SKGY	GUAYMARAL																
COROZAL	SKCZ	LAS BRUJAS																
CUCUTA	SKCC	CAMILO DAZA																
EL YOPAL	SKYP	EL YOPAL																
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA																
GIRARDOT	SKGI	SANTIAGO VILA																
GUAPI	SKGP	GUAPI																
IBAGUE	SKIB	PERALES																
IPIALES	SKIP	SAN LUIS																
LETICIA	SKLT	VASQUEZ COBO			1													
MANIZALES	SKMZ	LA NUBIA																
MARANDUA					1													
MARIQUITA	SKQU	MARIQUITA																
MEDELLIN	SKMD	OLAYA HERRERA																
MITU	SKMU	FABIO LEON B.																
MONTERIA	SKMR	LOS GARZONES																
NEIVA	SKNV	BENITO SALAS																
OCANA	SKOC	AGUAS CLARAS																
OTU	SKOT	REMEDIOS																
PASTO	SKPS	ANTONIO NARIÑO																
PEREIRA	SKPE	MATECAÑA																
PICACHO					1													
POPAYAN	SKPP	GUILLERMO LEON VALENCIA																
PROVIDENCIA	SKPV	PROVIDENCIA																
PUERTO ASIS	SKAS	PUERTO ASIS																
PUERTO CARRENO	SKPC	PUERTO CARREÑO																
QUIBDO	SKUI	EL CARAÑO																
RIOACHA					1													
RIOHACHA	SKRH	ALMIRANTE PADILLA																
RIONEGRO	SKRG	JOSE MARIA CORDOBA																
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO																
SAN ANDRES	SKSP	SESQUICENTENARIO			1													
SAN JOSE DEL GUAV	SKSJ	JORGE E.GONZALEZ			1													
SANTA MARTA	SKSM	SIMON BOLIVAR																
SANTANA					1													
SARAVENA	SKSA	LOS COLONIZADORES																
TABLAZO					1													
TAME	SKTM	TAME																
TRES ESQUINAS																		
TUBARA																		
TUMACO	SKCO	LA FLORIDA																
VALLEDUPAR	SKVP	ALFONSO LOPEZ																
VIEJO CALDAS																		
VILLAVICENCIO	SKVV	VANGUARDIA			1													

ADS-B can be deployed immediagtely. However, benefits will require user equippage.

System Implementation Plan
Surveillance

Surface Movement Radar

Option 2 (Accelerated)
Component:

Option 2 A, B, C, D
Technical Solution

Preferred

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)															Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
ARARACUARA																		
ARAUCA	SKAU	SANTIAGO PEREZ																
ARMENIA	SKAR	EL EDEN																
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS																
BARRANCABERMEJA	SKEJ	YARIGUIES																
BARRANQUILLA	SKBQ	CORTISSOZ																
BOGOTA	SKBO	ELDORADO		1														Can be used immediately. No Interdependancies
BUCARAMANGA	SKBG	PALONEGRO																
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ																
CALI	SKCL	BONILLA																
CAREPA	SKLC	ANTONIO ROLDAN																
CARIMAGUA																		
CARTAGENA	SKCG	RAFAEL NUÑEZ																
CARTAGO	SKGO	SANTA ANA																
CERRO MACO																		
CERRO VERDE																		
CHIA/GUAYMARAL	SKGY	GUAYMARAL																
COROZAL	SKCZ	LAS BRUJAS																
CUCUTA	SKCC	CAMILO DAZA																
EL YOPAL	SKYP	EL YOPAL																
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA																
GIRARDOT	SKGI	SANTIAGO VILA																
GUAPI	SKGP	GUAPI																
IBAGUE	SKIB	PERALES																
IPIALES	SKIP	SAN LUIS																
LETICIA	SKLT	VASQUEZ COBO																
MANIZALES	SKMZ	LA NUBIA																
MARANDUA																		
MARIQUITA	SKQU	MARIQUITA																
MEDELLIN	SKMD	OLAYA HERRERA																
MITU	SKMU	FABIO LEON B.																
MONTERIA	SKMR	LOS GARZONES																
NEIVA	SKNV	BENITO SALAS																
OCANA	SKOC	AGUAS CLARAS																
OTU	SKOT	REMEDIOS																
PASTO	SKPS	ANTONIO NARIÑO																
PEREIRA	SKPE	MATECAÑA																
PICACHO																		
POPAYAN	SKPP	GUILLERMO LEON VALENCIA																
PROVIDENCIA	SKPV	PROVIDENCIA																
PUERTO ASIS	SKAS	PUERTO ASIS																
PUERTO CARRENO	SKPC	PUERTO CARREÑO																
QUIBDO	SKUI	EL CARAÑO																
RIOACHA																		
RIOHACHA	SKRH	ALMIRANTE PADILLA																
RIONEGRO	SKRG	JOSE MARIA CORDOBA																
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO																
SAN ANDRES	SKSP	SESQUICENTENARIO																
SAN JOSE DEL GUAV.	SKSJ	JORGE E GONZALEZ																
SANTA MARTA	SKSM	SIMON BOLIVAR																
SANTANA																		
SARAVENA	SKSA	LOS COLONIZADORES																
TABLAZO																		
TAME	SKTM	TAME																
TRES ESQUINAS																		
TUBARA																		
TUMACO	SKCO	LA FLORIDA																
VALLEDUPAR	SKVP	ALFONSO LOPEZ																
VIEJO CALDAS																		
VILLAVICENCIO	SKVV	VANGUARDIA																

System Implementation Plan
Option 2 (Accelerated)
System Replacement/Discontinuance Plan

PSR

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)														Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
ARARACUARA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ARAUCA	SKAU	SANTIAGO PEREZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ARMENIA	SKAR	EL EDEN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BARRANCABERMEJA	SKEJ	YARIGUIES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BARRANQUILLA	SKBQ	CORTISSOZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BOGOTA	SKBO	ELDORADO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BUCARAMANGA	SKBG	PALONEGRO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CALI	SKCL	BONILLA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CAREPA	SKLC	ANTONIO ROLDAN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARIMAGUA			0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	Not required for ATC
CARTAGENA	SKCG	RAFAEL NUÑEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARTAGO	SKGO	SANTA ANA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO MACO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO VERDE			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CHIA/GUAYMARAL	SKGY	GUAYMARAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
COROZAL	SKCZ	LAS BRUJAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CUCUTA	SKCC	CAMILO DAZA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
EL YOPAL	SKYP	EL YOPAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
GIRARDOT	SKGI	SANTIAGO VILA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
GUAPI	SKGP	GUAPI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
IBAGUE	SKIB	PERALES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
IPIALES	SKIP	SAN LUIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
LETICIA	SKLT	VASQUEZ COBO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MANIZALES	SKMZ	LA NUBIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MARANDUA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MARIQUITA	SKQU	MARIQUITA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MEDELLIN	SKMD	OLAYA HERRERA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MITU	SKMU	FABIO LEON B.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MONTERIA	SKMR	LOS GARZONES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
NEIVA	SKNV	BENITO SALAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
OCANA	SKOC	AGUAS CLARAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
OTU	SKOT	REMEDIOS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PASTO	SKPS	ANTONIO NARIÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PEREIRA	SKPE	MATECAÑA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PICACHO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
POPAYAN	SKPP	GUILLERMO LEON VALENCIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PROVIDENCIA	SKPV	PROVIDENCIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO ASIS	SKAS	PUERTO ASIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO CARRENO	SKPC	PUERTO CARRENO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
QUIBDO	SKUI	EL CARAÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
RIOACHA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
RIOHACHA	SKRH	ALMIRANTE PADILLA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
RIONEGRO	SKRG	JOSE MARIA CORDOBA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
S. VIC. DEL CAGUAN	SKSV	EDUARDO ALEA SOLANO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SAN ANDRES	SKSP	SESQUICENTENARIO	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	Not required for ATC
SAN JOSE DEL GUAV	SKSJ	JORGE E.GONZALEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SANTA MARTA	SKSM	SIMON BOLIVAR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SANTANA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SARAVENA	SKSA	LOS COLONIZADORES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TABLAZO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TAME	SKTM	TAME	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TRES ESQUINAS			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TUBARA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TUMACO	SKCO	LA FLORIDA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
VALLEDUPAR	SKVP	ALFONSO LOPEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
VIEJO CALDAS			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
VILLAVICENCIO	SKVV	VANGUARDIA	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	Not required for ATC

System Implementation Plan
Option 2 (Accelerated)
System Replacement/Discontinuance Plan

SSR

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)															Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
ARARACUARA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ARAUCA	SKAU	SANTIAGO PEREZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ARMENIA	SKAR	EL EDEN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BARRANCABERMEJA	SKEJ	YARIGUIES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BARRANQUILLA	SKBQ	CORTISSOZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BOGOTA	SKBO	ELDORADO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BUCARAMANGA	SKBG	PALONEGRO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CALI	SKCL	BONILLA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CAREPA	SKLC	ANTONIO ROLDAN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARIMAGUA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARTAGENA	SKCG	RAFAEL NUNEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARTAGO	SKGO	SANTA ANA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO MACO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO VERDE			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CHIA/GUAYMARAL	SKGY	GUAYMARAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
COROZAL	SKCZ	LAS BRUJAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CUCUTA	SKCC	CAMILO DAZA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
EL YOPAL	SKYP	EL YOPAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
GIRARDOT	SKGI	SANTIAGO VILA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
GUAPI	SKGP	GUAPI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
IBAGUE	SKIB	PERALES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
IPIALES	SKIP	SAN LUIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
LETICIA	SKLT	VASQUEZ COBO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MANIZALES	SKMZ	LA NUBIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MARANDUA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MARIQUITA	SKQU	MARIQUITA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MEDELLIN	SKMD	OLAYA HERRERA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MITU	SKMU	FABIO LEON B.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MONTERIA	SKMR	LOS GARZONES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
NEIVA	SKNV	BENITO SALAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
OCANA	SKOC	AGUAS CLARAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
OTU	SKOT	REMEDIOS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PASTO	SKPS	ANTONIO NARIÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PEREIRA	SKPE	MATECAÑA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PICACHO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
POPAYAN	SKPP	GUILLERMO LEON VALENCIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PROVIDENCIA	SKPV	PROVIDENCIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO ASIS	SKAS	PUERTO ASIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO CARREÑO	SKPC	PUERTO CARREÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
QUIBDO	SKUI	EL CARAÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
RIOACHA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
RIOHACHA	SKRH	ALMIRANTE PADILLA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
RIONEGRO	SKRG	JOSE MARIA CORDOBA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
S. VIC. DEL CAGUAN	SKSV	EDUARDO ALLA COLANO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SAN ANDRES	SKSP	SESQUICENTENARIO	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	Decommission (remove if not required for backup)
SAN JOSE DEL GUAV.	SKSJ	JORGE E GONZALEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SANTA MARTA	SKSM	SIMON BOLIVAR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SANTANA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SARAVENA	SKSA	LOS COLONIZADORES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TABLAZO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TAME	SKTM	TAME	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TRES ESQUINAS			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TUBARA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TUMACO	SKCO	LA FLORIDA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
VALLEDUPAR	SKVP	ALFONSO LOPEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
VIEJO CALDAS			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
VILLAVICENCIO	SKVV	VANGUARDIA	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	Extend life 1+ years (remove if not required for backup)

System Implementation Plan
Option 2 (Accelerated)
System Replacement/Discontinuance Plan

MSSR A/C

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)														Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
ARARACUARA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ARAUCA	SKAU	SANTIAGO PEREZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ARMENIA	SKAR	EL EDEN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BARRANCABERMEJA	SKEJ	YARIGUIES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BARRANQUILLA	SKBQ	CORTISSOZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BOGOTA	SKBO	ELDORADO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BUCARAMANGA	SKBG	PALONEGRO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CALI	SKCL	BONILLA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CAREPA	SKLC	ANTONIO ROLDAN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARIMAGUA			0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	Decommission (remove if not required for backup)
CARTAGENA	SKCG	RAFAEL NUÑEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARTAGO	SKGO	SANTA ANA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO MACO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO VERDE			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CHIA/GUAYMARAL	SKGY	GUAYMARAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
COROZAL	SKCZ	LAS BRUJAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CUCUTA	SKCC	CAMILO DAZA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
EL YOPAL	SKYP	EL YOPAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
GIRARDOT	SKGI	SANTIAGO VILA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
GUAPI	SKGP	GUAPI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
IBAGUE	SKIB	PERALES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
IPIALES	SKIP	SAN LUIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
LETICIA	SKLT	VASQUEZ COBO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MANIZALES	SKMZ	LA NUBIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MARANDUA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MARIQUITA	SKQU	MARIQUITA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MEDELLIN	SKMD	OLAYA HERRERA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MITU	SKMU	FABIO LEON B.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MONTERIA	SKMR	LOS GARZONES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
NEIVA	SKNV	BENITO SALAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
OCANA	SKOC	AGUAS CLARAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
OTU	SKOT	REMEDIOS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PASTO	SKPS	ANTONIO NARIÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PEREIRA	SKPE	MATECAÑA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PICACHO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
POPAYAN	SKPP	GUILLERMO LEON VALENCIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PROVIDENCIA	SKPV	PROVIDENCIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO ASIS	SKAS	PUERTO ASIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO CARRENO	SKPC	PUERTO CARRENO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
QUIBDO	SKUI	EL CARANO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
RIOACHA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
RIOHACHA	SKRH	ALMIRANTE PADILLA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
RIONEGRO	SKRG	JOSE MARIA CORDOBA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
S. VIC. DEL CAGUAN	SKSV	EDUARDO ALEA SOLANO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SAN ANDRES	SKSP	SESQUICENTENARIO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SAN JOSE DEL GUAV.	SKSJ	JORGE E.GONZALEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SANTA MARTA	SKSM	SIMON BOLIVAR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SANTANA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SARAVENA	SKSA	LOS COLONIZADORES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TABLAZO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TAME	SKTM	TAME	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TRES ESQUINAS			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TUBARA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TUMACO	SKCO	LA FLORIDA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
VALLEDUPAR	SKVP	ALFONSO LOPEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
VIEJO CALDAS			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
VILLAVICENCIO	SKVV	VANGUARDIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

System Implementation Plan
Option 2 (Accelerated)
System Replacement/Discontinuance Plan

MSSR A/C and PSR

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)														Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
ARARACUARA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ARAUCA	SKAU	SANTIAGO PEREZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ARMENIA	SKAR	EL EDEN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BARRANCABERMEJA	SKEJ	YARIGUIES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BARRANQUILLA	SKBQ	CORTISSOZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BOGOTA	SKBO	ELDORADO	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	Decommission (remove if not required for backup)
BUCARAMANGA	SKBG	PALONEGRO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CALI	SKCL	BONILLA	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	Decommission (remove if not required for backup)
CAREPA	SKLC	ANTONIO ROLDAN	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	Decommission (remove if not required for backup)
CARIMAGUA			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARTAGENA	SKCG	RAFAEL NUÑEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARTAGO	SKGO	SANTA ANA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CERRO MACO			0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	Decommission (remove if not required for backup)
CERRO VERDE			0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	Decommission (remove if not required for backup)
CHIA/GUAYMARAL	SKGY	GUAYMARAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
COROZAL	SKCZ	LAS BRUJAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CUCUTA	SKCC	CAMILO DAZA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
EL YOPAL	SKYP	EL YOPAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
GIRARDOT	SKGI	SANTIAGO VILA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
GUAPI	SKGP	GUAPI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
IBAGUE	SKIB	PERALES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
IPIALES	SKIP	SAN LUIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
LETICIA	SKLT	VASQUEZ COBO	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	Decommission (remove if not required for backup)
MANIZALES	SKMZ	LA NUBIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MARANDUA			0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	Decommission (remove if not required for backup)
MARIQUITA	SKQU	MARIQUITA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MEDELLIN	SKMD	OLAYA HERRERA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MITU	SKMU	FABIO LEON B.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MONTERIA	SKMR	LOS GARZONES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
NEIVA	SKNV	BENITO SALAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
OCANA	SKOC	AGUAS CLARAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
OTU	SKOT	REMEDIOS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PASTO	SKPS	ANTONIO NARIÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PEREIRA	SKPE	MATECAÑA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PICACHO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
POPAYAN	SKPP	GUILLERMO LEON VALENCIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PROVIDENCIA	SKPV	PROVIDENCIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO ASIS	SKAS	PUERTO ASIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PUERTO CARRENO	SKPC	PUERTO CARREÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
QUIBDO	SKUI	EL CARAÑO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
RIOACHA			0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	Decommission (remove if not required for backup)
RIOHACHA	SKRH	ALMIRANTE PADILLA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
RIONEGRO	SKRG	JOSE MARIA CORDOBA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SAN ANDRES	SKSP	SESQUICENTENARIO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SAN JOSE DEL GUAV.	SKSJ	JORGE E.GONZALEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SANTA MARTA	SKSM	SIMON BOLIVAR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SANTANA			0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	Decommission (remove if not required for backup)
SARAVENA	SKSA	LOS COLONIZADORES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TABLAZO			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TAME	SKTM	TAME	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TRES ESQUINAS			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TUBARA			0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	Decommission (remove if not required for backup)
TUMACO	SKCO	LA FLORIDA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
VALLEDUPAR	SKVP	ALFONSO LOPEZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
VIEJO CALDAS			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
VILLAVICENCIO	SKVV	VANGUARDIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

APPENDIX E – ATM BY PHASE OF FLIGHT AND AIRPORT

System Implementation Plan
Air Traffic Management
Global ATM
Option 1 (Evolutionary)
Component:

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)															Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
AMBALEMA																		
ARARACUARA																		
ARAUCA	SKAU	SANTIAGO PEREZ																
ARMENIA	SKAR	EL EDEN																
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS																
BARRANCABERMEJA	SKEJ	YARIGUIES																
BARRANCA DE UPIA																		
BARRANQUILLA	SKBQ	CORTISSOZ									1							
BOGOTA	SKBO	ELDORADO									1							
BUCARAMANGA	SKBG	PALONEGRO																
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ																
BUVIS																		
CALI	SKCL	BONILLA									1							
CALIPUERTO																		
CAREPA	SKLC	ANTONIO ROLDAN																
CARIMAGUA																		
CARTAGENA	SKCG	RAFAEL NUÑEZ									1							
CARTAGO	SKGO	SANTA ANA																
CHIA/GUAYMARAL	SKGY	GUAYMARAL																
CONDOTO																		
COROZAL	SKCZ	LAS BRUJAS																
CUCUTA	SKCC	CAMILO DAZA																
EL BANCO																		
EL PASO																		
EL ROSAL																		
EL YOPAL	SKYP	EL YOPAL																
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA																
GIRARDOT	SKGI	SANTIAGO VILA																
GUAPI	SKGP	GUAPI																
IBAGUE	SKIB	PERALES																
IPIALES	SKIP	SAN LUIS																
JARDIN																		
LA MINA																		
LA PEDRERA																		
LETICIA	SKLT	VASQUEZ COBO																
LOS CEDROS																		
MAGANGUE																		
MANIZALES	SKMZ	LA NUBIA																
MARINILLA																		
MARIQUITA	SKQU	MARIQUITA																
MECADERES																		
MEDELLIN	SKMD	OLAYA HERRERA																
MITU	SKMU	FABIO LEON B.																
MONTERIA	SKMR	LOS GARZONES																
NEIVA	SKNV	BENITO SALAS																
NUQUI																		
OCANA	SKOC	AGUAS CLARAS																
OTU	SKOT	REMEDIOS																
PALMA																		
PASTO	SKPS	ANTONIO NARIÑO																
PEREIRA	SKPE	MATECAÑA																
PIEDECUESTA																		
POPAYAN	SKPP	GUILLERMO LEON [illegible]																
PROVIDENCIA	SKPV	PROVIDENCIA																
PUERTO ASIS	SKAS	PUERTO ASIS																
PUERTO CARRENO	SKPC	PUERTO CARREÑO																
PUERTO INIRIDA																		
PUERTO LEGUIZAMO																		
QUIBDO	SKUI	EL CARAÑO																
RIOHACHA	SKRH	ALMIRANTE PADILLA																
RIONEGRO	SKRG	JOSE MARIA CORDOBA									1							
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO																
SAN ANDRES	SKSP	SESQUICENTENARIO									1							
SAN JOSE DEL GUAV.	SKSJ	JORGE E GONZALEZ																
SANTA MARTA	SKSM	SIMON BOLIVAR																
SARAVENA	SKSA	LOS COLONIZADORES																
SOGAMOSO																		
TAME	SKTM	TAME																
TECHO																		
TRES ESQUINAS																		
TRINIDAD																		
TULUA																		
TUMACO	SKCO	LA FLORIDA																
TURBO																		
VALLEDUPAR	SKVP	ALFONSO LOPEZ																
VILLAVICENCIO	SKVV	VANGUARDIA																
ZIPAQUIRA																		

System Implementation Plan
Air Traffic Management
CDM
Option 2 (Accelerated)
Component

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)															Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
AMBALEMA																		
ARARACUARA																		
ARAUCA	SKAU	SANTIAGO PEREZ																
ARMENIA	SKAR	EL EDEN																
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS																
BARRANCABERMEJA	SKEJ	YARIGUIES																
BARRANCA DE UPIA																		
BARRANQUILLA	SKBQ	CORTISSOZ		1														
BOGOTA	SKBO	ELDORADO		2														
BUCARAMANGA	SKBG	PALONEGRO																
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ																
BUVIS																		
CALI	SKCL	BONILLA		1														
CALIPUERTO																		
CAREPA	SKLC	ANTONIO ROLDAN																
CARIMAGUA																		
CARTAGENA	SKCG	RAFAEL NUÑEZ		1														
CARTAGO	SKGO	SANTA ANA																
CHIA/GUAYMARAL	SKGY	GUAYMARAL																
CONDOTO																		
COROZAL	SKCZ	LAS BRUJAS																
CUCUTA	SKCC	CAMILO DAZA																
EL BANCO																		
EL PASO																		
EL ROSAL																		
EL YOPAL	SKYP	EL YOPAL																
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA																
GIRARDOT	SKGI	SANTIAGO VILA																
GUAPI	SKGP	GUAPI																
IBAGUE	SKIB	PERALES																
IPIALES	SKIP	SAN LUIS																
JARDIN																		
LA MINA																		
LA PEDRERA																		
LETICIA	SKLT	VASQUEZ COBO																
LOS CEDROS																		
MAGANGUE																		
MANIZALES	SKMZ	LA NUBIA																
MARINILLA																		
MARIQUITA	SKQU	MARIQUITA																
MECADERES																		
MEDELLIN	SKMD	OLAYA HERRERA																
MITU	SKMU	FABIO LEON B.																
MONTERIA	SKMR	LOS GARZONES																
NEIVA	SKNV	BENITO SALAS																
NUQUI																		
OCANA	SKOC	AGUAS CLARAS																
OTU	SKOT	REMEDIOS																
PALMA																		
PASTO	SKPS	ANTONIO NARIÑO																
PEREIRA	SKPE	MATECAÑA																
PIEDECUESTA																		
POPAYAN	SKPP	GUILLERMO LEON VALENCIA																
PROVIDENCIA	SKPV	PROVIDENCIA																
PUERTO ASIS	SKAS	PUERTO ASIS																
PUERTO CARRENO	SKPC	PUERTO CARREÑO																
PUERTO INIRIDA																		
PUERTO LEGUIZAMO																		
QUIBDO	SKUI	EL CARAÑO																
RIOHACHA	SKRH	ALMIRANTE PADILLA																
RIONEGRO	SKRG	JOSE MARIA CORDOBA		1														
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO																
SAN ANDRES	SKSP	SESQUICENTENARIO		1														
SAN JOSE DEL GUAV.	SKSJ	JORGE E GONZALEZ																
SANTA MARTA	SKSM	SIMON BOLIVAR																
SARAVENA	SKSA	LOS COLONIZADORES																
SOGAMOSO																		
TAME	SKTM	TAME																
TECHO																		
TRES ESQUINAS																		
TRINIDAD																		
TULUA																		
TUMACO	SKCO	LA FLORIDA																
TURBO																		
VALLEDUPAR	SKVP	ALFONSO LOPEZ																
VILLAVICENCIO	SKVV	VANGUARDIA																
ZIPAQUIRA																		

System Implementation Plan
Air Traffic Management
TMU
Option 2 (Accelerated)
Component

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)															Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
AMBALEMA																		
ARARACUARA																		
ARAUCA	SKAU	SANTIAGO PEREZ																
ARMENIA	SKAR	EL EDEN																
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS																
BARRANCABERMEJA	SKEJ	YARIGUIES																
BARRANCA DE UPIA																		
BARRANQUILLA	SKBQ	CORTISSOZ		1														
BOGOTA	SKBO	ELDORADO		1														
BUCARAMANGA	SKBG	PALONEGRO																
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ																
BUVIS																		
CALI	SKCL	BONILLA																
CALIPUERTO																		
CAREPA	SKLC	ANTONIO ROLDAN																
CARIMAGUA																		
CARTAGENA	SKCG	RAFAEL NUÑEZ																
CARTAGO	SKGO	SANTA ANA																
CHIA/GUAYMARAL	SKGY	GUAYMARAL																
CONDOTO																		
COROZAL	SKCZ	LAS BRUJAS																
CUCUTA	SKCC	CAMILO DAZA																
EL BANCO																		
EL PASO																		
EL ROSAL																		
EL YOPAL	SKYP	EL YOPAL																
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA																
GIRARDOT	SKGI	SANTIAGO VILA																
GUAPI	SKGP	GUAPI																
IBAGUE	SKIB	PERALES																
IPIALES	SKIP	SAN LUIS																
JARDIN																		
LA MINA																		
LA PEDRERA																		
LETICIA	SKLT	VASQUEZ COBO																
LOS CEDROS																		
MAGANGUE																		
MANIZALES	SKMZ	LA NUBIA																
MARINILLA																		
MARIQUITA	SKQU	MARIQUITA																
MECADERES																		
MEDELLIN	SKMD	OLAYA HERRERA																
MITU	SKMU	FABIO LEON B.																
MONTERIA	SKMR	LOS GARZONES																
NEIVA	SKNV	BENITO SALAS																
NUQUI																		
OCANA	SKOC	AGUAS CLARAS																
OTU	SKOT	REMEDIOS																
PALMA																		
PASTO	SKPS	ANTONIO NARIÑO																
PEREIRA	SKPE	MATECAÑA																
PIEDECUESTA																		
POPAYAN	SKPP	GUILLERMO LEON VALENCIA																
PROVIDENCIA	SKPV	PROVIDENCIA																
PUERTO ASIS	SKAS	PUERTO ASIS																
PUERTO CARRENO	SKPC	PUERTO CARREÑO																
PUERTO INIRIDA																		
PUERTO LEGUIZAMO																		
QUIBDO	SKUI	EL CARAÑO																
RIOHACHA	SKRH	ALMIRANTE PADILLA																
RIONEGRO	SKRG	JOSE MARIA CORDOBA																
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO																
SAN ANDRES	SKSP	SESQUICENTENARIO																
SAN JOSE DEL GUAV	SKSJ	JORGE E GONZALEZ																
SANTA MARTA	SKSM	SIMON BOLIVAR																
SARAVENA	SKSA	LOS COLONIZADORES																
SOGAMOSO																		
TAME	SKTM	TAME																
TECHO																		
TRES ESQUINAS																		
TRINIDAD																		
TULUA																		
TUMACO	SKCO	LA FLORIDA																
TURBO																		
VALLEDUPAR	SKVP	ALFONSO LOPEZ																
VILLAVICENCIO	SKVV	VANGUARDIA																
ZIPAQUIRA																		

System Implementation Plan
Air Traffic Management
ETMS
Option 2 (Accelerated)
Component

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)															Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
AMBALEMA																		
ARARACUARA																		
ARAUCA	SKAU	SANTIAGO PEREZ																
ARMENIA	SKAR	EL EDEN			1													
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS																
BARRANCABERMEJA	SKEJ	YARIGUIES																
BARRANCA DE UPIA																		
BARRANQUILLA	SKBQ	CORTISSOZ		1														
BOGOTA	SKBO	ELDORADO		2														
BUCARAMANGA	SKBG	PALONEGRO			1													
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ			1													
BUVIS																		
CALI	SKCL	BONILLA		1														
CALIPUERTO																		
CAREPA	SKLC	ANTONIO ROLDAN																
CARIMAGUA					1													
CARTAGENA	SKCG	RAFAEL NUÑEZ		1														
CARTAGO	SKGO	SANTA ANA																
CHIA/GUAYMARAL	SKGY	GUAYMARAL			1													
CONDOTO																		
COROZAL	SKCZ	LAS BRUJAS																
CUCUTA	SKCC	CAMILO DAZA			1													
EL BANCO																		
EL PASO																		
EL ROSAL																		
EL YOPAL	SKYP	EL YOPAL																
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA																
GIRARDOT	SKGI	SANTIAGO VILA			1													
GUAPI	SKGP	GUAPI																
IBAGUE	SKIB	PERALES			1													
IPIALES	SKIP	SAN LUIS			1													
JARDIN																		
LA MINA					1													
LA PEDRERA																		
LETICIA	SKLT	VASQUEZ COBO			1													
LOS CEDROS																		
MAGANGUE																		
MANIZALES	SKMZ	LA NUBIA			1													
MARINILLA																		
MARIQUITA	SKQU	MARIQUITA			1													
MECADERES																		
MEDELLIN	SKMD	OLAYA HERRERA			1													
MITU	SKMU	FABIO LEON B.																
MONTERIA	SKMR	LOS GARZONES																
NEIVA	SKNV	BENITO SALAS																
NUQUI																		
OCANA	SKOC	AGUAS CLARAS																
OTU	SKOT	REMEDIOS																
PALMA																		
PASTO	SKPS	ANTONIO NARIÑO																
PEREIRA	SKPE	MATECAÑA			1													
PIEDECUESTA																		
POPAYAN	SKPP	GUILLERMO LEON VALENCIA			1													
PROVIDENCIA	SKPV	PROVIDENCIA			1													
PUERTO ASIS	SKAS	PUERTO ASIS																
PUERTO CARRENO	SKPC	PUERTO CARREÑO																
PUERTO INIRIDA																		
PUERTO LEGUIZAMO																		
QUIBDO	SKUI	EL CARAÑO																
RIOHACHA	SKRH	ALMIRANTE PADILLA			1													
RIONEGRO	SKRG	JOSE MARIA CORDOBA		1														
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO																
SAN ANDRES	SKSP	SESQUICENTENARIO		1														
SAN JOSE DEL GUAV.	SKSJ	JORGE E. GONZALEZ																
SANTA MARTA	SKSM	SIMON BOLIVAR			1													
SARAVENA	SKSA	LOS COLONIZADORES																
SOGAMOSO																		
TAME	SKTM	TAME																
TECHO																		
TRES ESQUINAS																		
TRINIDAD																		
TULUA					1													
TUMACO	SKCO	LA FLORIDA																
TURBO																		
VALLEDUPAR	SKVP	ALFONSO LOPEZ																
VILLAVICENCIO	SKVV	VANGUARDIA			1													
ZIPAQUIRA																		

System Implementation Plan
Air Traffic Management
G-GNM
Option 2 (Accelerated)
Component

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)															Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
AMBALEMA																		
ARARACUARA																		
ARAUCA	SKAU	SANTIAGO PEREZ																
ARMENIA	SKAR	EL EDEN																
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS																
BARRANCABERMEJA	SKEJ	YARIGUIES																
BARRANCA DE UPIA																		
BARRANQUILLA	SKBQ	CORTISSOZ						1										
BOGOTA	SKBO	ELDORADO						1										
BUCARAMANGA	SKBG	PALONEGRO																
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ																
BUVIS																		
CALI	SKCL	BONILLA						1										
CALIPUERTO																		
CAREPA	SKLC	ANTONIO ROLDAN																
CARIMAGUA																		
CARTAGENA	SKCG	RAFAEL NUÑEZ						1										
CARTAGO	SKGO	SANTA ANA																
CHIA/GUAYMARAL	SKGY	GUAYMARAL																
CONDOTO																		
COROZAL	SKCZ	LAS BRUJAS																
CUCUTA	SKCC	CAMILO DAZA																
EL BANCO																		
EL PASO																		
EL ROSAL																		
EL YOPAL	SKYP	EL YOPAL																
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA																
GIRARDOT	SKGI	SANTIAGO VILA																
GUAPI	SKGP	GUAPI																
IBAGUE	SKIB	PERALES																
IPIALES	SKIP	SAN LUIS																
JARDIN																		
LA MINA																		
LA PEDRERA																		
LETICIA	SKLT	VASQUEZ COBO																
LOS CEDROS																		
MAGANGUE																		
MANIZALES	SKMZ	LA NUBIA																
MARINILLA																		
MARIQUITA	SKQU	MARIQUITA																
MECADERES																		
MEDELLIN	SKMD	OLAYA HERRERA																
MITU	SKMU	FABIO LEON B.																
MONTERIA	SKMR	LOS GARZONES																
NEIVA	SKNV	BENITO SALAS																
NUQUI																		
OCANA	SKOC	AGUAS CLARAS																
OTU	SKOT	REMEDIOS																
PALMA																		
PASTO	SKPS	ANTONIO NARIÑO																
PEREIRA	SKPE	MATECAÑA																
PIEDECUESTA																		
POPAYAN	SKPP	GUILLERMO LEON VALENCIA																
PROVIDENCIA	SKPV	PROVIDENCIA																
PUERTO ASIS	SKAS	PUERTO ASIS																
PUERTO CARRENO	SKPC	PUERTO CARREÑO																
PUERTO INIRIDA																		
PUERTO LEGUIZAMO																		
QUIBDO	SKUI	EL CARAÑO																
RIOHACHA	SKRH	ALMIRANTE PADILLA																
RIONEGRO	SKRG	JOSE MARIA CORDOBA						1										
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO																
SAN ANDRES	SKSP	SESQUICENTENARIO						1										
SAN JOSE DEL GUAV.	SKSJ	JORGE E GONZALEZ																
SANTA MARTA	SKSM	SIMON BOLIVAR																
SARAVENA	SKSA	LOS COLONIZADORES																
SOGAMOSO																		
TAME	SKTM	TAME																
TECHO																		
TRES ESQUINAS																		
TRINIDAD																		
TULUA																		
TUMACO	SKCO	LA FLORIDA																
TURBO																		
VALLEDUPAR	SKVP	ALFONSO LOPEZ																
VILLAVICENCIO	SKVV	VANGUARDIA																
ZIPAQUIRA																		

System Implementation Plan
Air Traffic Management
Global ATM
Option 2 (Accelerated)
Component

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)															Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
AMBALEMA																		
ARARACUARA																		
ARAUCA	SKAU	SANTIAGO PEREZ																
ARMENIA	SKAR	EL EDEN																
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS																
BARRANCABERMEJA	SKEJ	YARIGUIES																
BARRANCA DE UPIA																		
BARRANQUILLA	SKBQ	CORTISSOZ							1									
BOGOTA	SKBO	ELDORADO							1									
BUCARAMANGA	SKBG	PALONEGRO																
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ																
BUVIS																		
CALI	SKCL	BONILLA							1									
CALIPUERTO																		
CAREPA	SKLC	ANTONIO ROLDAN																
CARIMAGUA																		
CARTAGENA	SKCG	RAFAEL NUÑEZ							1									
CARTAGO	SKGO	SANTA ANA																
CHIA/GUAYMARAL	SKGY	GUAYMARAL																
CONDOTO																		
COROZAL	SKCZ	LAS BRUJAS																
CUCUTA	SKCC	CAMILO DAZA																
EL BANCO																		
EL PASO																		
EL ROSAL																		
EL YOPAL	SKYP	EL YOPAL																
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA																
GIRARDOT	SKGI	SANTIAGO VILA																
GUAPI	SKGP	GUAPI																
IBAGUE	SKIB	PERALES																
IPIALES	SKIP	SAN LUIS																
JARDIN																		
LA MINA																		
LA PEDRERA																		
LETICIA	SKLT	VASQUEZ COBO																
LOS CEDROS																		
MAGANGUE																		
MANIZALES	SKMZ	LA NUBIA																
MARINILLA																		
MARIQUITA	SKQU	MARIQUITA																
MECADERES																		
MEDELLIN	SKMD	OLAYA HERRERA																
MITU	SKMU	FABIO LEON B.																
MONTERIA	SKMR	LOS GARZONES																
NEIVA	SKNV	BENITO SALAS																
NUQUI																		
OCANA	SKOC	AGUAS CLARAS																
OTU	SKOT	REMEDIOS																
PALMA																		
PASTO	SKPS	ANTONIO NARIÑO																
PEREIRA	SKPE	MATECAÑA																
PIEDECUESTA																		
POPAYAN	SKPP	GUILLERMO LEON VALENCIA																
PROVIDENCIA	SKPV	PROVIDENCIA																
PUERTO ASIS	SKAS	PUERTO ASIS																
PUERTO CARRENO	SKPC	PUERTO CARREÑO																
PUERTO INIRIDA																		
PUERTO LEGUIZAMO																		
QUIBDO	SKUI	EL CARAÑO																
RIOHACHA	SKRH	ALMIRANTE PADILLA																
RIONEGRO	SKRG	JOSE MARIA CORDOBA							1									
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO																
SAN ANDRES	SKSP	SESQUICENTENARIO							1									
SAN JOSE DEL GUAV.	SKSJ	JORGE E GONZALEZ																
SANTA MARTA	SKSM	SIMON BOLIVAR																
SARAVENA	SKSA	LOS COLONIZADORES																
SOGAMOSO																		
TAME	SKTM	TAME																
TECHO																		
TRES ESQUINAS																		
TRINIDAD																		
TULUA																		
TUMACO	SKCO	LA FLORIDA																
TURBO																		
VALLEDUPAR	SKVP	ALFONSO LOPEZ																
VILLAVICENCIO	SKVV	VANGUARDIA																
ZIPAQUIRA																		

System Implementation Plan
Air Traffic Management
CDM
Option 1 (Evolutionary)
Component:

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)														Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
AMBALEMA																		
ARARACUARA																		
ARAUCA	SKAU	SANTIAGO PEREZ																
ARMENIA	SKAR	EL EDEN																
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS																
BARRANCABERMEJA	SKEJ	YARIGUIES																
BARRANCA DE UPIA																		
BARRANQUILLA	SKBQ	CORTISSOZ		1														
BOGOTA	SKBO	ELDORADO		2														
BUCARAMANGA	SKBG	PALONEGRO																
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ																
BUVIS																		
CALI	SKCL	BONILLA		1														
CALIPUERTO																		
CAREPA	SKLC	ANTONIO ROLDAN																
CARIMAGUA																		
CARTAGENA	SKCG	RAFAEL NUÑEZ		1														
CARTAGO	SKGO	SANTA ANA																
CHIA/GUAYMARAL	SKGY	GUAYMARAL																
CONDOTO																		
COROZAL	SKCZ	LAS BRUJAS																
CUCUTA	SKCC	CAMILO DAZA																
EL BANCO																		
EL PASO																		
EL ROSAL																		
EL YOPAL	SKYP	EL YOPAL																
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA																
GIRARDOT	SKGI	SANTIAGO VILA																
GUAPI	SKGP	GUAPI																
IBAGUE	SKIB	PERALES																
IPIALES	SKIP	SAN LUIS																
JARDIN																		
LA MINA																		
LA PEDRERA																		
LETICIA	SKLT	VASQUEZ COBO																
LOS CEDROS																		
MAGANGUE																		
MANIZALES	SKMZ	LA NUBIA																
MARINILLA																		
MARIQUITA	SKQU	MARIQUITA																
MECADERES																		
MEDELLIN	SKMD	OLAYA HERRERA																
MITU	SKMU	FABIO LEON B.																
MONTERIA	SKMR	LOS GARZONES																
NEIVA	SKNV	BENITO SALAS																
NUQUI																		
OCANA	SKOC	AGUAS CLARAS																
OTU	SKOT	REMEDIOS																
PALMA																		
PASTO	SKPS	ANTONIO NARIÑO																
PEREIRA	SKPE	MATECAÑA																
PIEDECUESTA																		
POPAYAN	SKPP	GUILLERMO LEON [illegible]																
PROVIDENCIA	SKPV	PROVIDENCIA																
PUERTO ASIS	SKAS	PUERTO ASIS																
PUERTO CARRENO	SKPC	PUERTO CARREÑO																
PUERTO INIRIDA																		
PUERTO LEGUIZAMO																		
QUIBDO	SKUI	EL CARAÑO																
RIOHACHA	SKRH	ALMIRANTE PADILLA																
RIONEGRO	SKRG	JOSE MARIA CORDOBA		1														
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO																
SAN ANDRES	SKSP	SESQUICENTENARIO		1														
SAN JOSE DEL GUAV.	SKSJ	JORGE E GONZALEZ																
SANTA MARTA	SKSM	SIMON BOLIVAR																
SARAVENA	SKSA	LOS COLONIZADORES																
SOGAMOSO																		
TAME	SKTM	TAME																
TECHO																		
TRES ESQUINAS																		
TRINIDAD																		
TULUA																		
TUMACO	SKCO	LA FLORIDA																
TURBO																		
VALLEDUPAR	SKVP	ALFONSO LOPEZ																
VILLAVICENCIO	SKVV	VANGUARDIA																
ZIPAQUIRA																		

System Implementation Plan
Air Traffic Management

TMU

Option 1 (Evolutionary)
Component:

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)															Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
AMBALEMA																		
ARARACUARA																		
ARAUCA	SKAU	SANTIAGO PEREZ																
ARMENIA	SKAR	EL EDEN																
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS																
BARRANCABERMEJA	SKEJ	YARIGUIES																
BARRANCA DE UPIA																		
BARRANQUILLA	SKBQ	CORTISSOZ		1														
BOGOTA	SKBO	ELDORADO		1														
BUCARAMANGA	SKBG	PALONEGRO																
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ																
BUVIS																		
CALI	SKCL	BONILLA																
CALIPUERTO																		
CAREPA	SKLC	ANTONIO ROLDAN																
CARIMAGUA																		
CARTAGENA	SKCG	RAFAEL NUÑEZ																
CARTAGO	SKGO	SANTA ANA																
CHIA/GUAYMARAL	SKGY	GUAYMARAL																
CONDOTO																		
COROZAL	SKCZ	LAS BRUJAS																
CUCUTA	SKCC	CAMILO DAZA																
EL BANCO																		
EL PASO																		
EL ROSAL																		
EL YOPAL	SKYP	EL YOPAL																
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA																
GIRARDOT	SKGI	SANTIAGO VILA																
GUAPI	SKGP	GUAPI																
IBAGUE	SKIB	PERALES																
IPIALES	SKIP	SAN LUIS																
JARDIN																		
LA MINA																		
LA PEDRERA																		
LETICIA	SKLT	VASQUEZ COBO																
LOS CEDROS																		
MAGANGUE																		
MANIZALES	SKMZ	LA NUBIA																
MARINILLA																		
MARIQUITA	SKQU	MARIQUITA																
MECADERES																		
MEDELLIN	SKMD	OLAYA HERRERA																
MITU	SKMU	FABIO LEON B.																
MONTERIA	SKMR	LOS GARZONES																
NEIVA	SKNV	BENITO SALAS																
NUQUI																		
OCANA	SKOC	AGUAS CLARAS																
OTU	SKOT	REMEDIOS																
PALMA																		
PASTO	SKPS	ANTONIO NARIÑO																
PEREIRA	SKPE	MATECAÑA																
PIEDECUESTA																		
POPAYAN	SKPP	GUILLERMO LEON [illegible]																
PROVIDENCIA	SKPV	PROVIDENCIA																
PUERTO ASIS	SKAS	PUERTO ASIS																
PUERTO CARRENO	SKPC	PUERTO CARREÑO																
PUERTO INIRIDA																		
PUERTO LEGUIZAMO																		
QUIBDO	SKUI	EL CARAÑO																
RIOHACHA	SKRH	ALMIRANTE PADILLA																
RIONEGRO	SKRG	JOSE MARIA CORDOBA																
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO																
SAN ANDRES	SKSP	SESQUICENTENARIO																
SAN JOSE DEL GUAV.	SKSJ	JORGE E GONZALEZ																
SANTA MARTA	SKSM	SIMON BOLIVAR																
SARAVENA	SKSA	LOS COLONIZADORES																
SOGAMOSO																		
TAME	SKTM	TAME																
TECHO																		
TRES ESQUINAS																		
TRINIDAD																		
TULUA																		
TUMACO	SKCO	LA FLORIDA																
TURBO																		
VALLEDUPAR	SKVP	ALFONSO LOPEZ																
VILLAVICENCIO	SKVV	VANGUARDIA																
ZIPAQUIRA																		

System Implementation Plan
Air Traffic Management
ETMS
Option 1 (Evolutionary)
Component:

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)															Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
AMBALEMA																		
ARARACUARA																		
ARAUCA	SKAU	SANTIAGO PEREZ																
ARMENIA	SKAR	EL EDEN				1												
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS																
BARRANCABERMEJA	SKEJ	YARIGUIES																
BARRANCA DE UPIA																		
BARRANQUILLA	SKBQ	CORTISSOZ		1														
BOGOTA	SKBO	ELDORADO		2														
BUCARAMANGA	SKBG	PALONEGRO				1												
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ				1												
BUVIS																		
CALI	SKCL	BONILLA			1													
CALIPUERTO																		
CAREPA	SKLC	ANTONIO ROLDAN																
CARIMAGUA						1												
CARTAGENA	SKCG	RAFAEL NUÑEZ			1													
CARTAGO	SKGO	SANTA ANA																
CHIA/GUAYMARAL	SKGY	GUAYMARAL				1												
CONDOTO																		
COROZAL	SKCZ	LAS BRUJAS																
CUCUTA	SKCC	CAMILO DAZA				1												
EL BANCO																		
EL PASO																		
EL ROSAL																		
EL YOPAL	SKYP	EL YOPAL																
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA																
GIRARDOT	SKGI	SANTIAGO VILA				1												
GUAPI	SKGP	GUAPI																
IBAGUE	SKIB	PERALES				1												
IPIALES	SKIP	SAN LUIS				1												
JARDIN																		
LA MINA						1												
LA PEDRERA																		
LETICIA	SKLT	VASQUEZ COBO				1												
LOS CEDROS																		
MAGANGUE																		
MANIZALES	SKMZ	LA NUBIA				1												
MARINILLA																		
MARIQUITA	SKQU	MARIQUITA				1												
MECADERES																		
MEDELLIN	SKMD	OLAYA HERRERA				1												
MITU	SKMU	FABIO LEON B.																
MONTERIA	SKMR	LOS GARZONES																
NEIVA	SKNV	BENITO SALAS																
NUQUI																		
OCANA	SKOC	AGUAS CLARAS																
OTU	SKOT	REMEDIOS																
PALMA																		
PASTO	SKPS	ANTONIO NARIÑO																
PEREIRA	SKPE	MATECAÑA				1												
PIEDECUESTA																		
POPAYAN	SKPP	GUILLERMO LEON [illegible]				1												
PROVIDENCIA	SKPV	PROVIDENCIA				1												
PUERTO ASIS	SKAS	PUERTO ASIS																
PUERTO CARRENO	SKPC	PUERTO CARREÑO																
PUERTO INIRIDA																		
PUERTO LEGUIZAMO																		
QUIBDO	SKUI	EL CARAÑO																
RIOHACHA	SKRH	ALMIRANTE PADILLA				1												
RIONEGRO	SKRG	JOSE MARIA CORDOBA			1													
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO																
SAN ANDRES	SKSP	SESQUICENTENARIO			1													
SAN JOSE DEL GUAV.	SKSJ	JORGE E GONZALEZ																
SANTA MARTA	SKSM	SIMON BOLIVAR				1												
SARAVENA	SKSA	LOS COLONIZADORES																
SOGAMOSO																		
TAME	SKTM	TAME																
TECHO																		
TRES ESQUINAS																		
TRINIDAD																		
TULUA						1												
TUMACO	SKCO	LA FLORIDA																
TURBO																		
VALLEDUPAR	SKVP	ALFONSO LOPEZ																
VILLAVICENCIO	SKVV	VANGUARDIA				1												
ZIPAQUIRA																		

System Implementation Plan
Air Traffic Management
G-GNM
Option 1 (Evolutionary)
Component:

Location/Site	ICAO Code	Airport	Installation Plan by Year (Quantity of Components Installed)														Implementation Notes
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
AMBALEMA																		
ARARACUARA																		
ARAUCA	SKAU	SANTIAGO PEREZ																
ARMENIA	SKAR	EL EDEN																
BAHIA SOLANO	SKBS	JOSE CELESTINO MUTIS																
BARRANCABERMEJA	SKEJ	YARIGUIES																
BARRANCA DE UPIA																		
BARRANQUILLA	SKBQ	CORTISSOZ								1								
BOGOTA	SKBO	ELDORADO								1								
BUCARAMANGA	SKBG	PALONEGRO																
BUENAVENTURA	SKBU	GERARDO TOVAR LOPEZ																
BUVIS																		
CALI	SKCL	BONILLA								1								
CALIPUERTO																		
CAREPA	SKLC	ANTONIO ROLDAN																
CARIMAGUA																		
CARTAGENA	SKCG	RAFAEL NUÑEZ								1								
CARTAGO	SKGO	SANTA ANA																
CHIA/GUAYMARAL	SKGY	GUAYMARAL																
CONDOTO																		
COROZAL	SKCZ	LAS BRUJAS																
CUCUTA	SKCC	CAMILO DAZA																
EL BANCO																		
EL PASO																		
EL ROSAL																		
EL YOPAL	SKYP	EL YOPAL																
FLORENCIA	SKFL	GUSTAVO ARTUNDUAGA																
GIRARDOT	SKGI	SANTIAGO VILA																
GUAPI	SKGP	GUAPI																
IBAGUE	SKIB	PERALES																
IPIALES	SKIP	SAN LUIS																
JARDIN																		
LA MINA																		
LA PEDRERA																		
LETICIA	SKLT	VASQUEZ COBO																
LOS CEDROS																		
MAGANGUE																		
MANIZALES	SKMZ	LA NUBIA																
MARINILLA																		
MARIQUITA	SKQU	MARIQUITA																
MECADERES																		
MEDELLIN	SKMD	OLAYA HERRERA																
MITU	SKMU	FABIO LEON B.																
MONTERIA	SKMR	LOS GARZONES																
NEIVA	SKNV	BENITO SALAS																
NUQUI																		
OCANA	SKOC	AGUAS CLARAS																
OTU	SKOT	REMEDIOS																
PALMA																		
PASTO	SKPS	ANTONIO NARIÑO																
PEREIRA	SKPE	MATECAÑA																
PIEDECUESTA																		
POPAYAN	SKPP	GUILLERMO LEON [illegible]																
PROVIDENCIA	SKPV	PROVIDENCIA																
PUERTO ASIS	SKAS	PUERTO ASIS																
PUERTO CARRENO	SKPC	PUERTO CARREÑO																
PUERTO INIRIDA																		
PUERTO LEGUIZAMO																		
QUIBDO	SKUI	EL CARAÑO																
RIOHACHA	SKRH	ALMIRANTE PADILLA																
RIONEGRO	SKRG	JOSE MARIA CORDOBA								1								
S. VIC. DEL CAGUAN	SKSV	EDUARDO FALLA SOLANO																
SAN ANDRES	SKSP	SESQUICENTENARIO								1								
SAN JOSE DEL GUAV	SKSJ	JORGE E GONZALEZ																
SANTA MARTA	SKSM	SIMON BOLIVAR																
SARAVENA	SKSA	LOS COLONIZADORES																
SOGAMOSO																		
TAME	SKTM	TAME																
TECHO																		
TRES ESQUINAS																		
TRINIDAD																		
TULUA																		
TUMACO	SKCO	LA FLORIDA																
TURBO																		
VALLEDUPAR	SKVP	ALFONSO LOPEZ																
VILLAVICENCIO	SKVV	VANGUARDIA																
ZIPAQUIRA																		