

Airspace & Airport^{by} NAVBLUE

Luca Zuccarini – Senior Project Manager Airspace
Luis Gáfaró – Business Development Director



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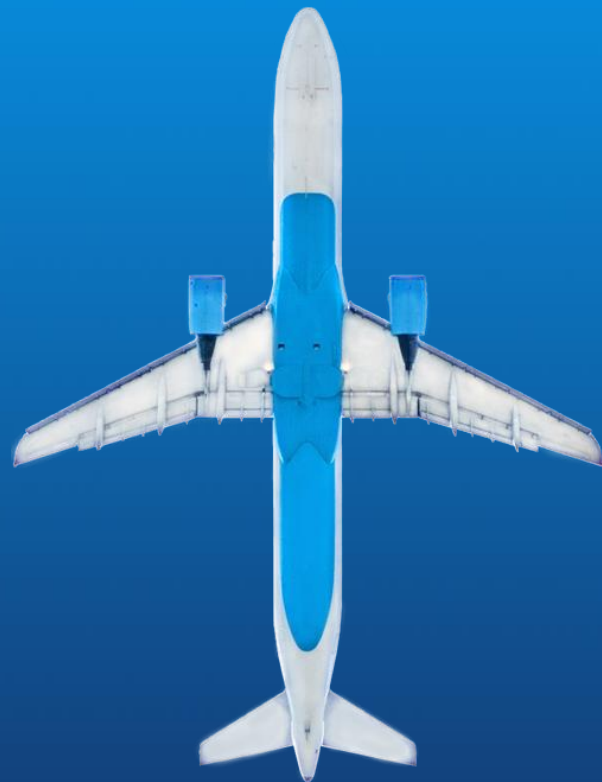
WHO ARE WE?

LEADING AVIATION INTO THE DIGITAL AGE

NAVBLUE is a services company, **wholly owned by Airbus**, dedicated to Flight Operations & **Air Traffic Management Solutions**.

Fuelled by the agility of Airbus ProSky and Navtech (acquired in 2016), and the pioneering spirit of Airbus, NAVBLUE was created in July 2016 with one mission: lead aviation into the digital age.

Based on a more than 10 year experience, NAVBLUE is ready to provide state of the art ATM solutions worldwide



OUR UNIQUE EXPERTISE

NAVBLUE offers the highest level of expertise in digital cockpit operations, Operations Control Centre (OCC) systems, Performance Based Navigation (PBN) and **Air Traffic Management (ATM)**.

Its staff is composed of highly experienced **pilots, dispatchers, flight operations analysts, performance engineers, air traffic controllers, project managers, UI/UX designers and IT/software specialists.**

NAVBLUE has a close and permanent relationship with the worldwide benchmark aircraft manufacturer ensuring a full mastery of aircraft know-how.



CHOOSE THE RIGHT COMBINATION OF OUR SERVICES



What does Airspace do for you?



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Enhance
Safety

Improve
Accessibility

Reduce Fuel Burn

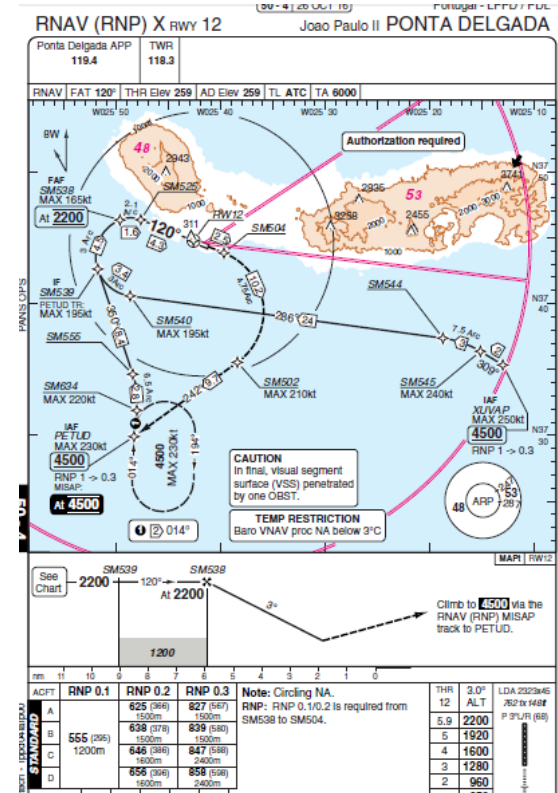
Increase Capacity

Avoid Sensitive
Areas

Increase Payload

Airspace by NAVBLUE – Airspace Re-design & PBN implementation

- Current situation assessment / gap analysis
- CONOPS development and validation through Fast Time Simulation
- Procedure design & validation (flight simulator)
- Safety & environmental assessments
- Training of Air Traffic Controllers
- Support to change management (regulation update, manuals update)



NAVBLUE Airspace experience



NAVBLUE is the #1 for PBN deployment

Since 2009, NAVBLUE has delivered successful PBN projects:

- 853 procedures
- 64 airports
- 50 airline
- 29 CAAs
- 12 aircraft types (incl. Boeing, Bombardier, Embraer...)

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NAVBLUE Key Differentials

- > Key NAVBLUE team members have authored ICAO manuals such as the ICAO CCO Manual, ICAO CDO Manual and PBN Airspace Design Manual
- > Technical test pilots (e.g. Airbus, Boeing, Embraer), dispatchers and engineers
- > Worldwide experienced Air Traffic Controllers (Europe, USA, etc.)

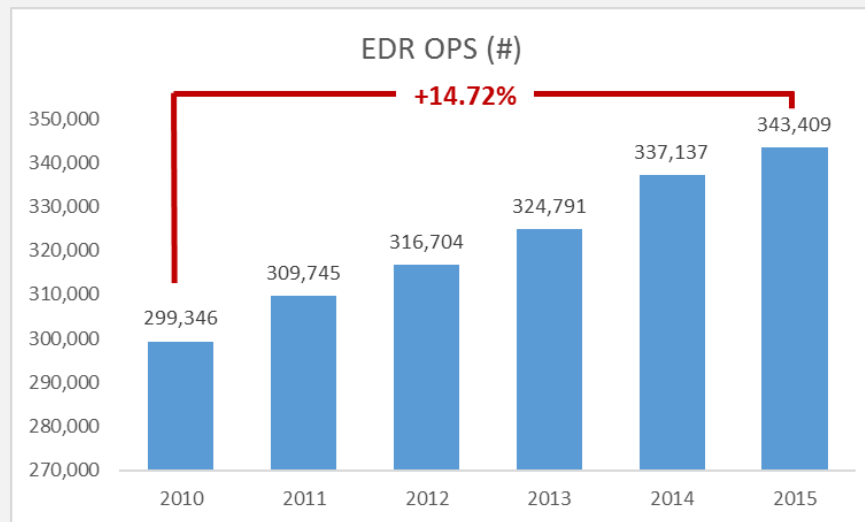
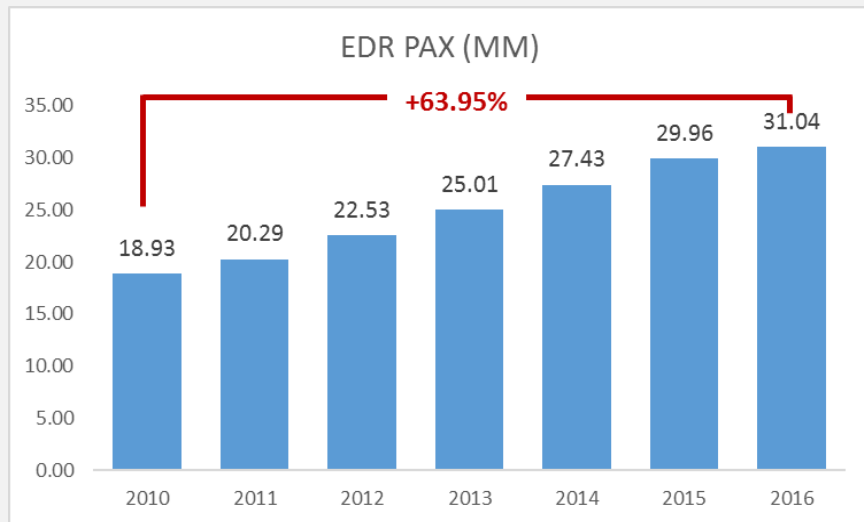


Bogota TMA Airspace Re-design project

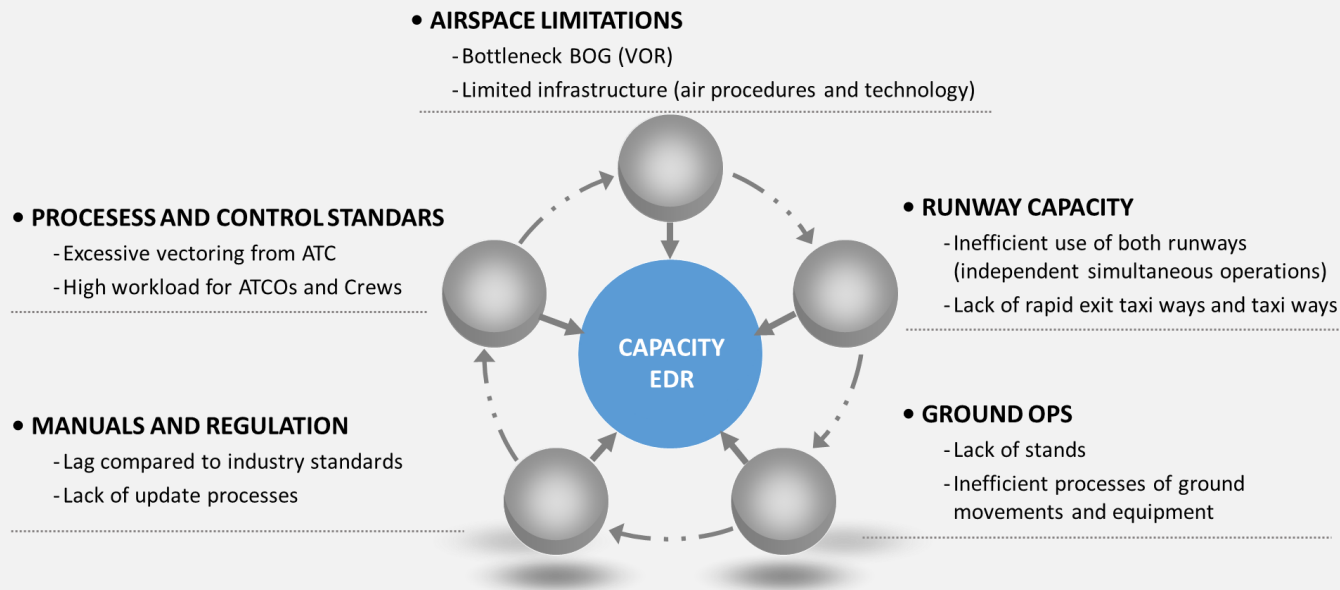


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In only 6 years PAX increased in Bogota more than 60%

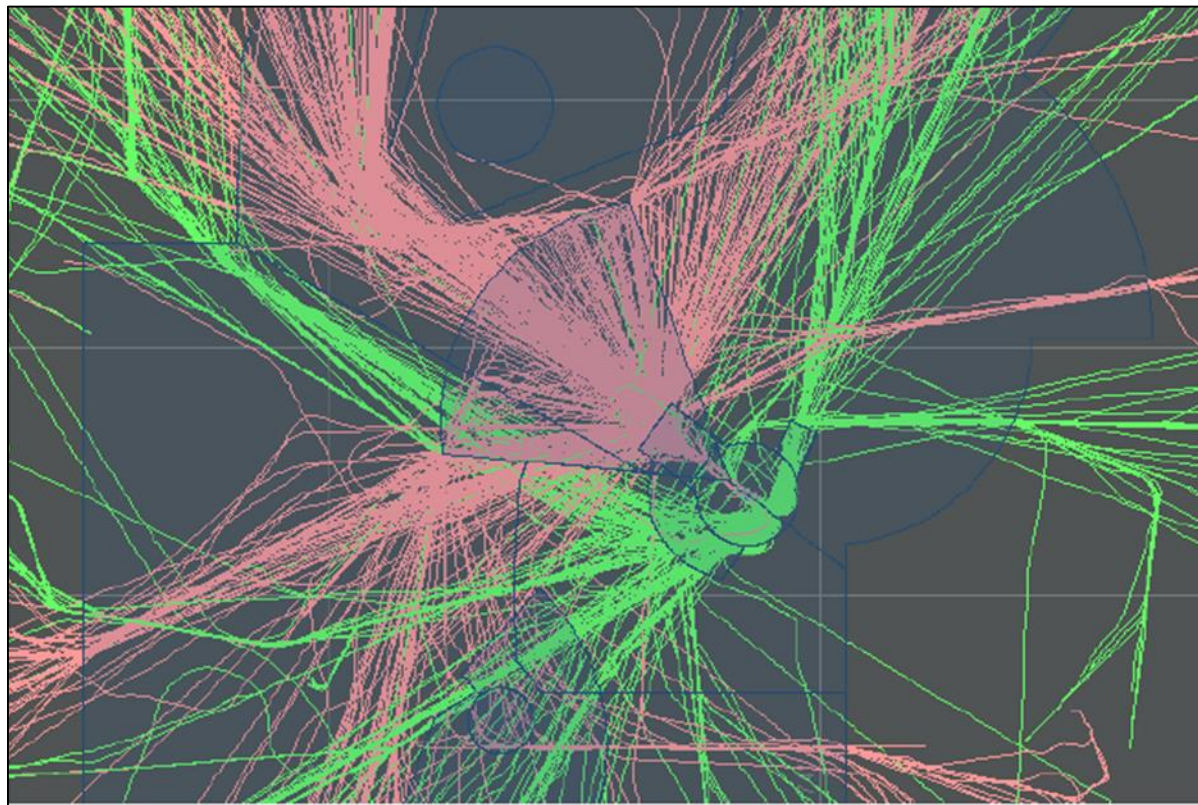


Capacity at EDR airport is constrained by different systemic elements



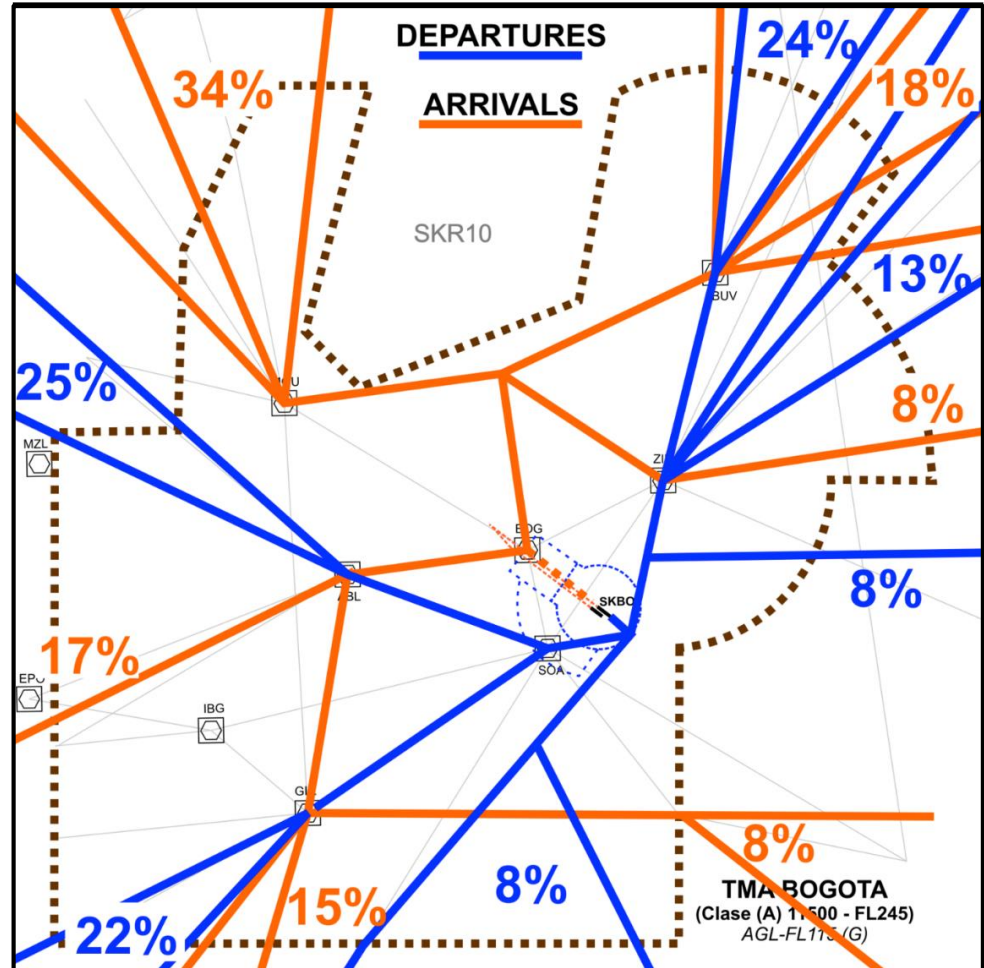
El Dorado urgently needed an airspace turnaround

- ATCOs vector ~100% of arriving aircrafts
- Encounter/dispersed flows
- Holding patterns
- Bottleneck at VOR



TMA workload needed to be balanced

- Different sectors work balance
- Excessive radio communications
- Job dissatisfaction



Project Overview

CHAPTER 02



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Project Objectives

International Cooperation Agreement to Redesign the Airspace & Optimize Airside Capacity at Bogota El Dorado Airport

To position Bogotá El Dorado international airport as one of the most efficient international terminals in Latin America by increasing its capacity and airspace efficiency through:

- ✓ Introduction of PBN
- ✓ Reduction of aircraft separation within the TMA
- ✓ Implementation of independent and simultaneous parallel runways operations
- ✓ Improvement of ground operations
- ✓ Update of regulations & operations manuals
- ✓ Enhancement of ATC capability with theoretical & practical On-the-Job training

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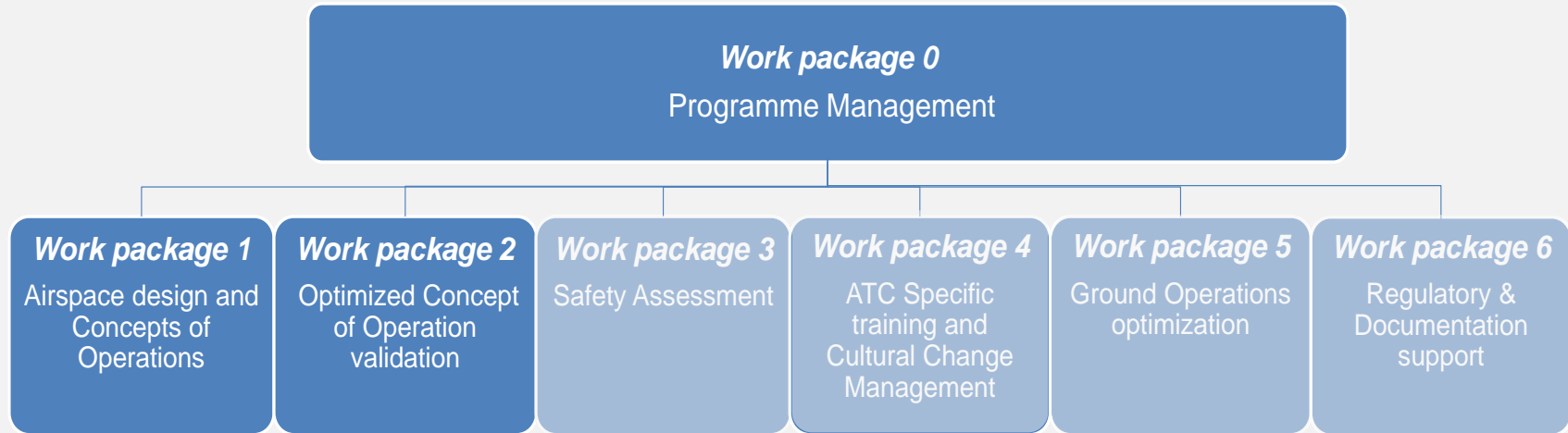


A Successful Partnership Story

- International Cooperation Agreement signed between IATA and UAEAC
- Project as the result of a assessment made by IATA Consulting
- NAVBLUE as the airspace design provider
- Project contemplated 6 major work packages



An holistic approach for a systemic challenge was necessary



Bogota New CONOPS

CHAPTER 03



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Project Constrains and Considerations

- Location of airport
- Orientation of runways
- Mountains - terrain
- Restricted airspace
- Location of city pairs
- Performance of aircrafts

Information Gathering

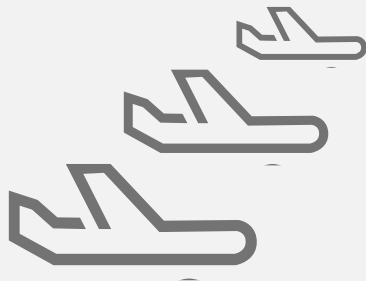
- Previous designs
- Local experience and suggestions
- ACC limits
- Scope
- Aircraft flows and operations

Design for improvements at each step

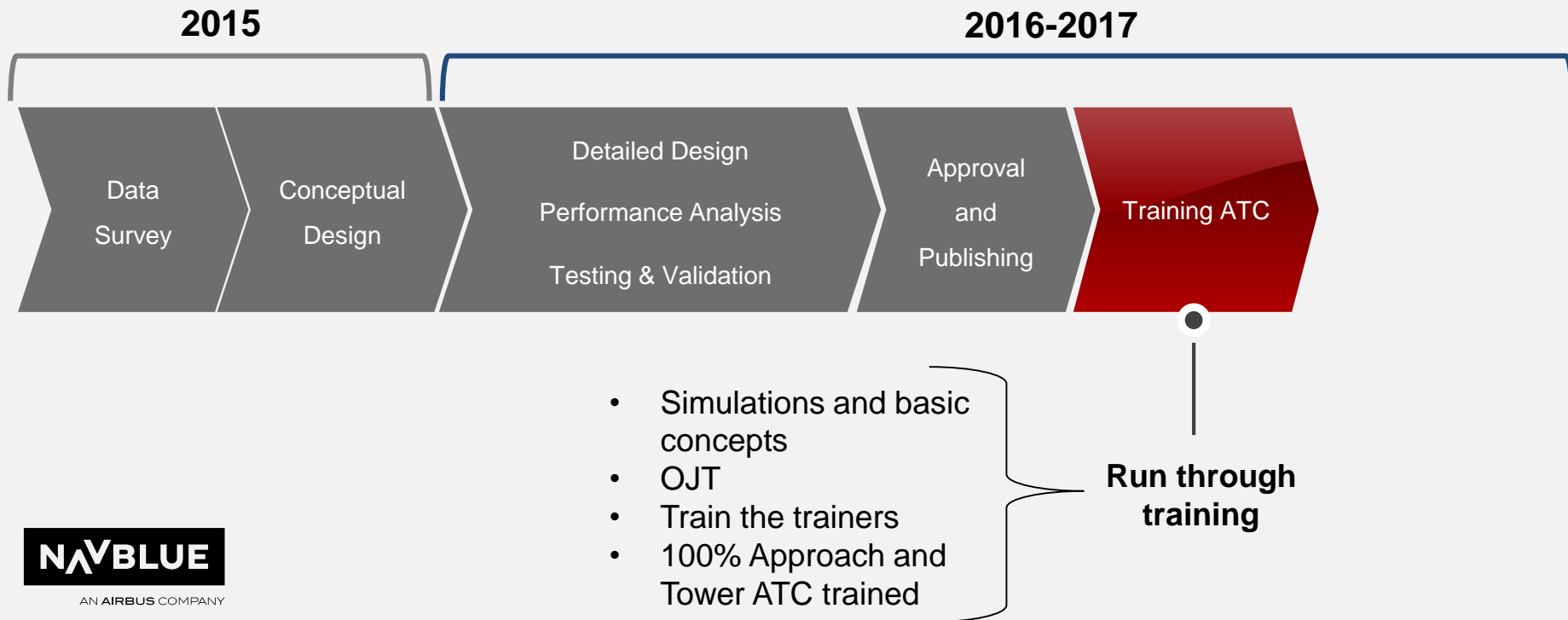
- Trajectory and aircraft separations
- Reduction of crew workload with repeatable and easy to operate trajectories.



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CONOPS Design Process

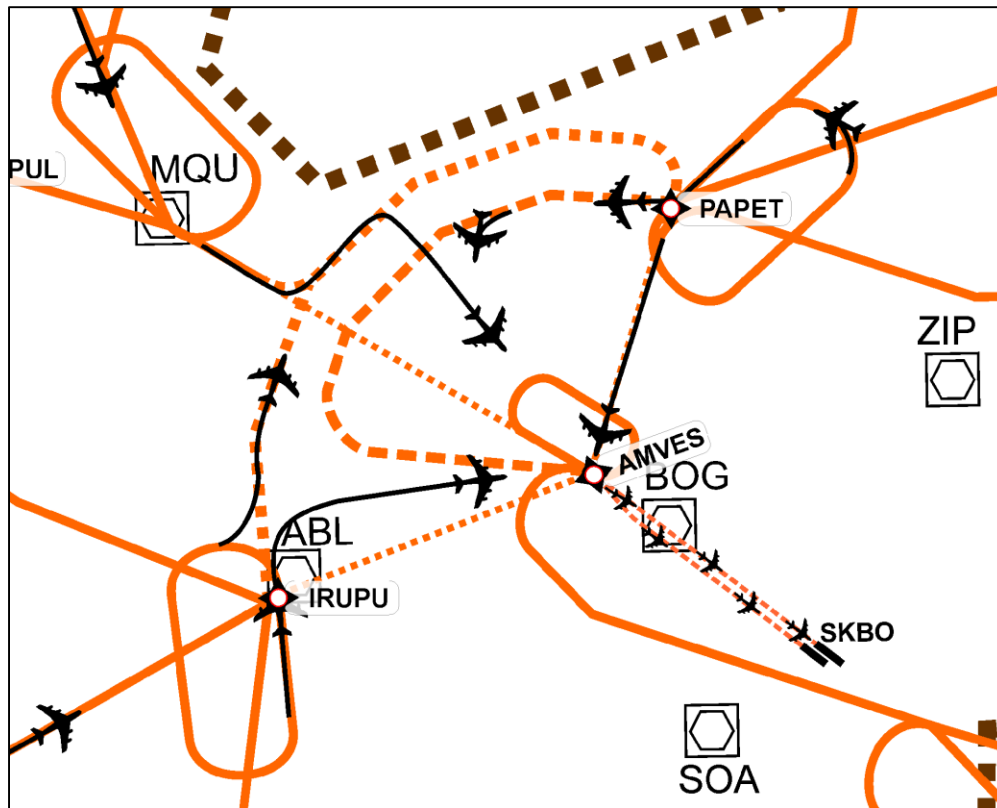


CONOPS Design Process



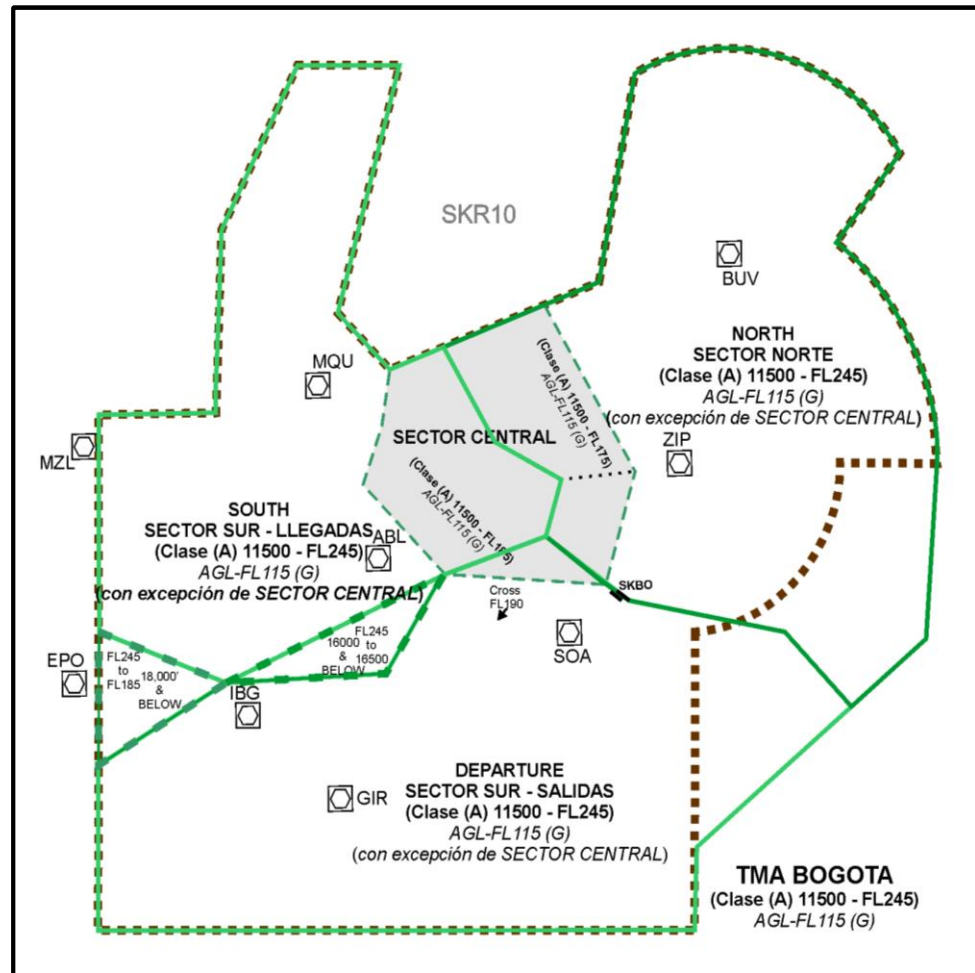
Point of Merge System

- All aircraft sent direct AMVES



New TMA sectors

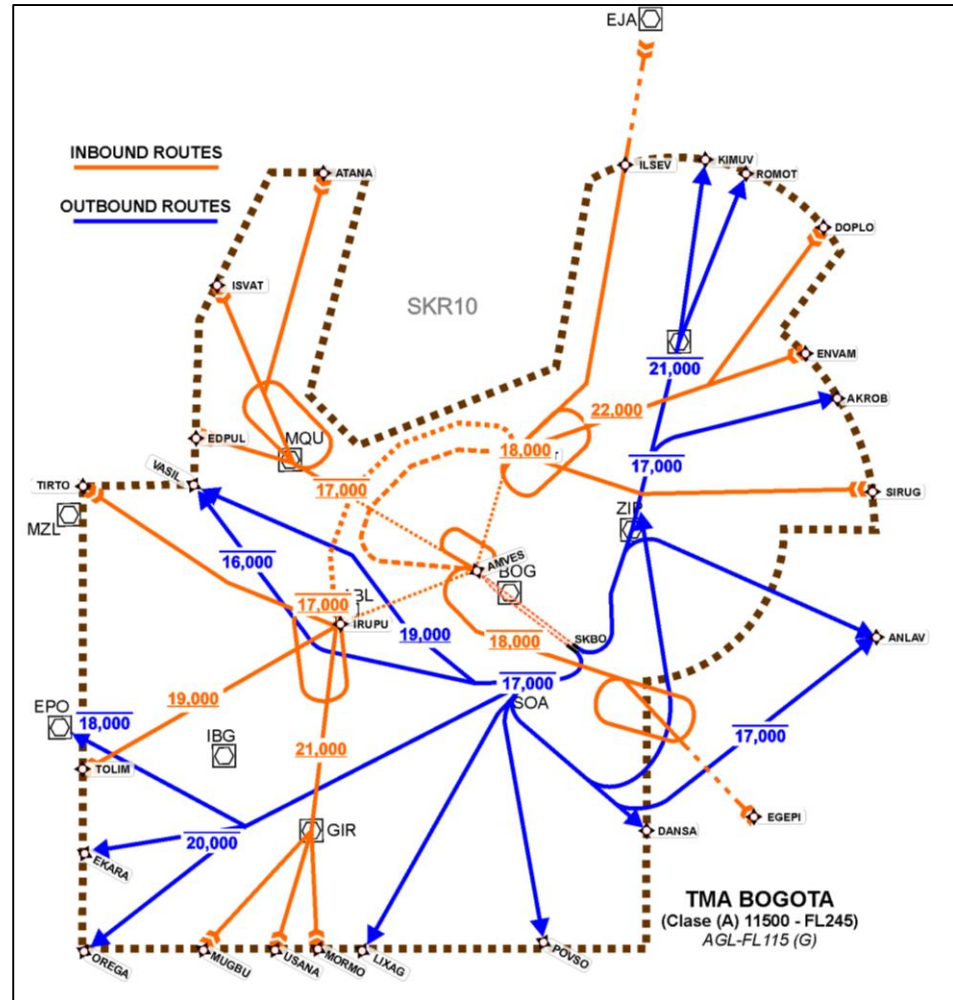
- Reduced span of control
- Fewer conflicts to manage
- Reduced ATCO workload
- Reduced ATCO intervention



EDR CONOPS

Runway 13

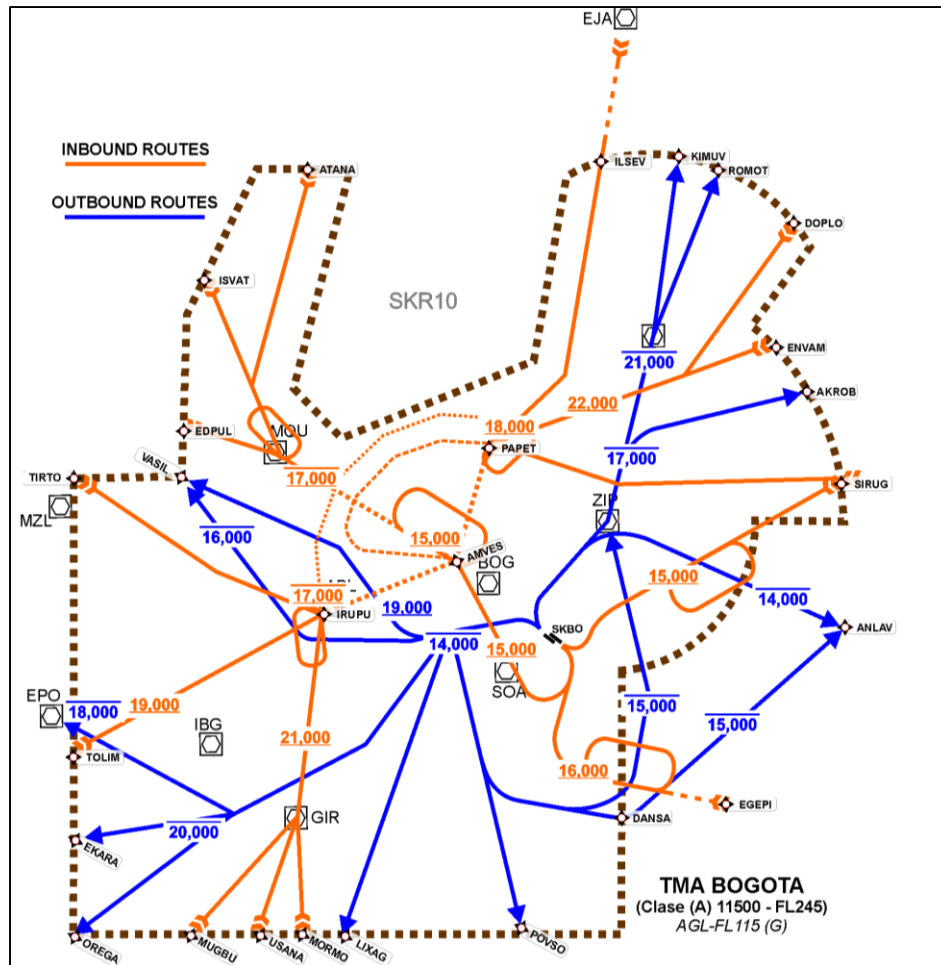
- Altitude separation
- Reduced ATCO/ crew workload
- Reduced ATCO intervention
- Improved safety



EDR CONOPS

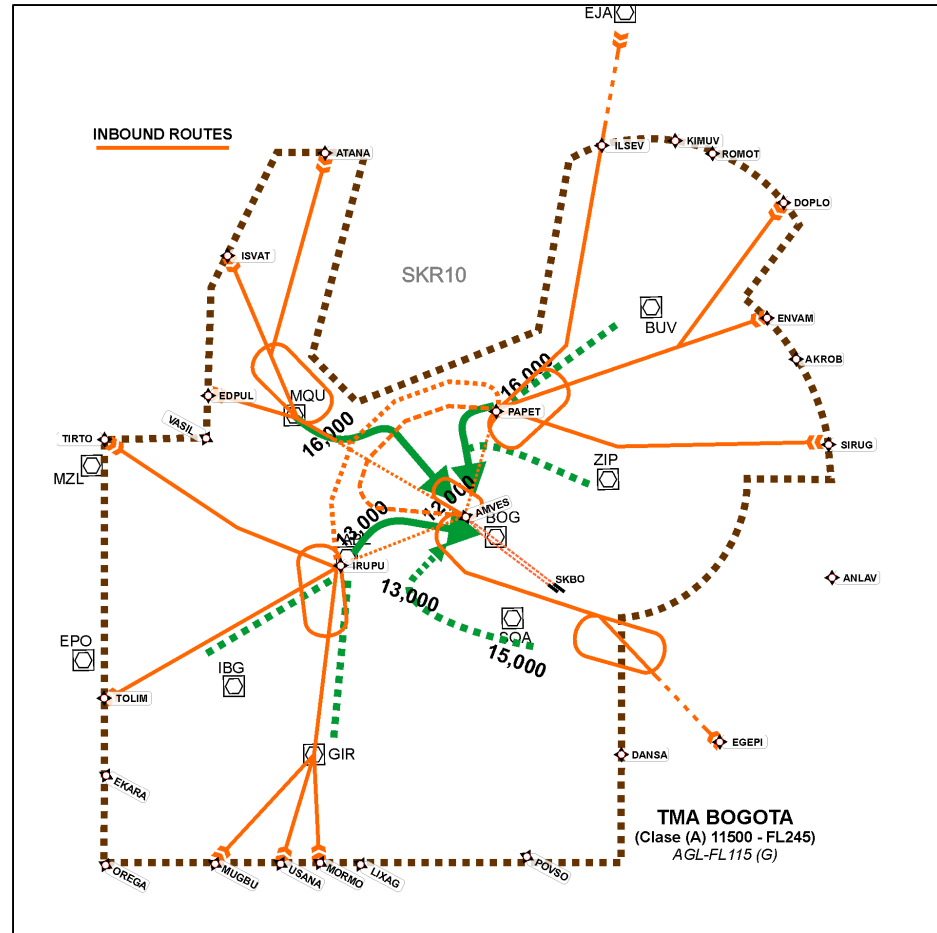
Runway 31

- Altitude separation
- Reduced ATCO/ crew workload
- Reduced ATCO intervention
- Improved safety



Non/RNAV1 Slow Traffic

- Conventional procedures
- Vectoring techniques



Airspace ^{by NAVBLUE} — Airspace Re-design & PBN implementation



Bogotá Key Results

- Increase in airspace potential capacity:
 - ✓ *RNW13: 92 ops per hour (29.2% increase)*
 - ✓ *RNW31: 68 ops per hour (126% increase)*
- Reduction in ATCOs workload (60% less communications per aircraft)
- Flexibilization of restricted military airspace
- Expected financial efficiencies for up to US100M/year
- Project created a lot of momentum on the region:
 - ✓ *RFP Panama Airspace re-design project*
 - ✓ *Upcoming Buenos Aires TMA re-design project*

Contact

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LUCA ZUCCARINI
luca.zuccarini@navblue.aero
Mob: +1 3052157976

LUIS GÁFARO
luis.gafaro@navblue.aero
Mob: +57 3165260474



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