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ICAO Big Data Project

ADS-B Data as a source for
analytical solutions for
traffic behaviour in airspace

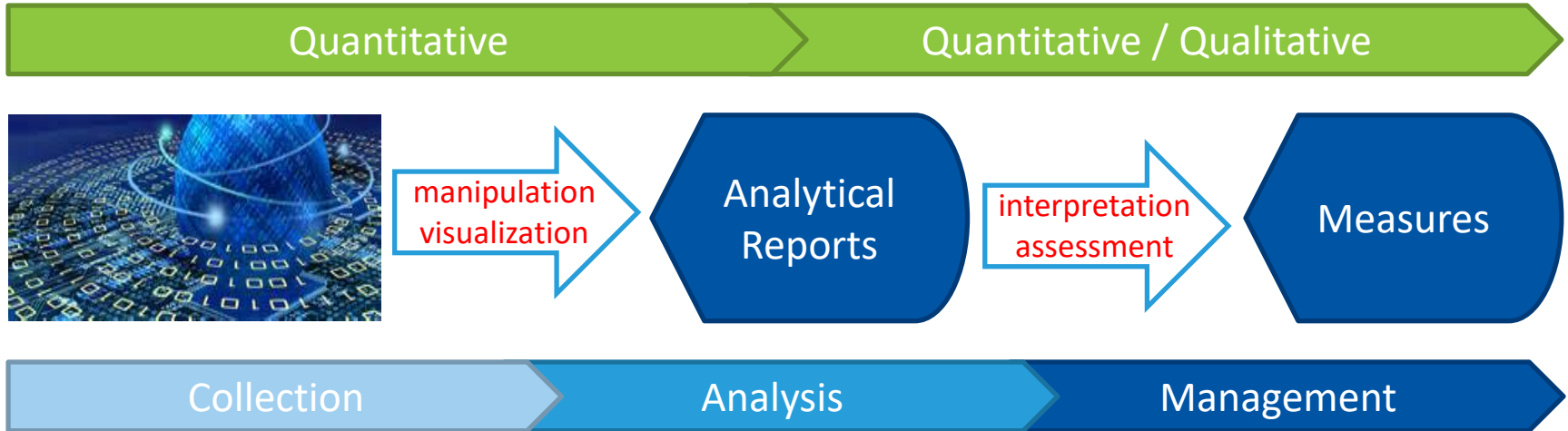
ICAO/IATA/CANSO PBN/2

San Jose – December 8, 2016





Big Data process





Code of Conduct (A-Res 37-1)

- **GASP - Appendix 3: Code of Conduct on the Sharing and Use of Safety Information**
 - 5.1. b) ensure that shared safety information is used in an appropriate, fair and consistent manner, solely to improve aviation safety and not for inappropriate purposes, including for the purpose of gaining economic advantage;



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ADS-B Data Summary

The availability of automatic dependent surveillance broadcast (ADS-B) data presents a useful source for analytical efforts on effective and efficient airspace and navigation procedure usage.

The sufficient availability of such data depends in-part, on a network of ground based receivers. Presently most States in the SAM do not have adequate coverage of these receivers for meaningful analysis. This presentation provides an overview on technical requirements for this type of analysis and illustrates possible solutions for States, once appropriate coverage is established.



ADS-B Data

ADS-B is a system intended to broadcast the precise location of the aircraft via a digital link to other aircraft and air traffic control without the need for secondary radar. The system involves a GPS equipped aircraft whose position can be determined through cross-validation of multiple on-board sources, and is capable of transmitting that position through a suitable ADS-B transmitter to a ground station (in the future, satellite-based receivers are perceived).



ADS-B Data

The broadcast consists of information continually transmitted for monitoring by appropriately equipped aircraft or ground stations and is: automatic (requires no pilot inputs or external interrogation); dependent (influenced by the accurate position and velocity data from the aircraft's navigation system – e.g. GPS); and offers surveillance capability. ADS-B data is broadcasted every half-second on a 1090 MHz datalink and may include:

- flight identification (flight number call sign or call sign);
- ICAO 24-bit aircraft address (globally unique airframe code);
- position (latitude/longitude);
- position integrity/accuracy (GPS horizontal protection limit);
- barometric and geometric altitudes;
- vertical rate (rate of climb/descent);
- track angle and ground speed (velocity);
- emergency indication (when emergency code selected); and
- special position identification (when IDENT selected).



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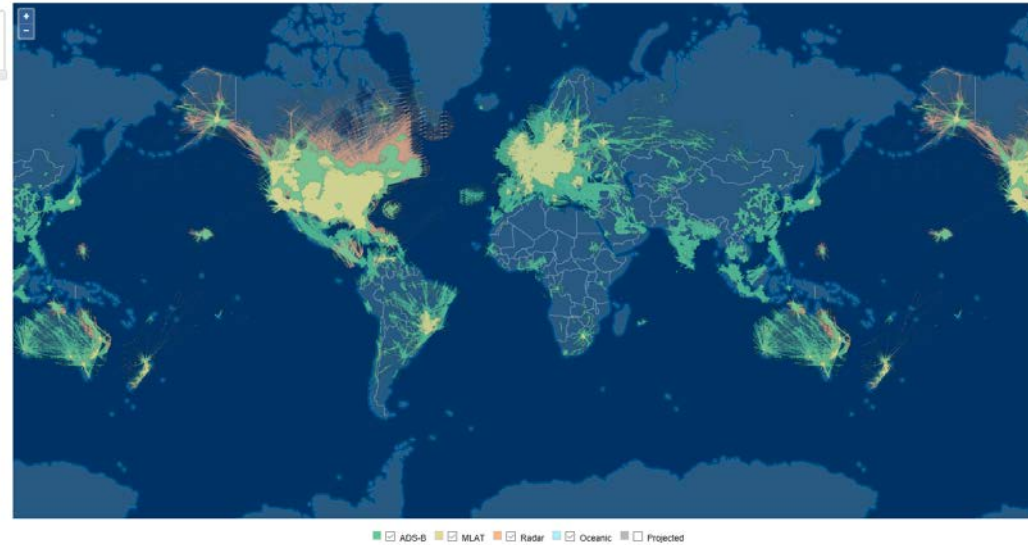
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Feeder Coverage

Altitude: 0ft - 60,000ft and above

last updated 2 days ago



With permission of FlightAware



Feeder location characteristics

- Average site covers approx.
 - 50nm up to 5,000ft AGL
 - 100nm above 10,000ft AGL
 - 300nm for 20,000 to 40,000ft AGL
- Low altitude full coverage requires a grid of 50nm
- High altitude full coverage requires a grid of 150nm
- Surface coverage requires on site antenna(s)



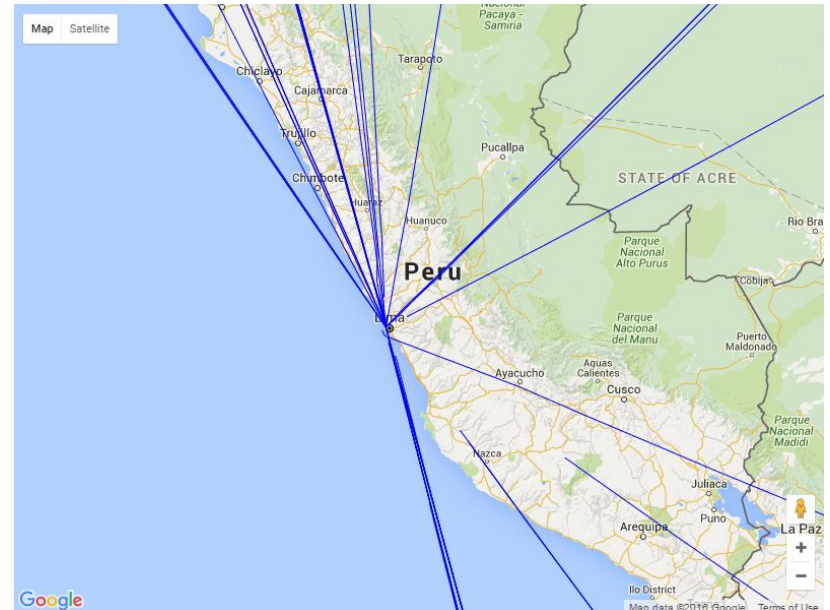
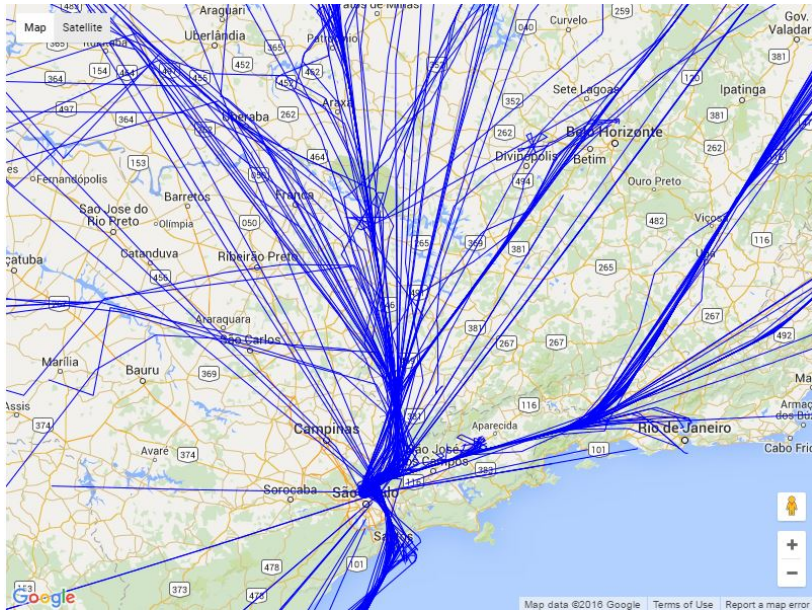
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Coverage vs. Non-Coverage





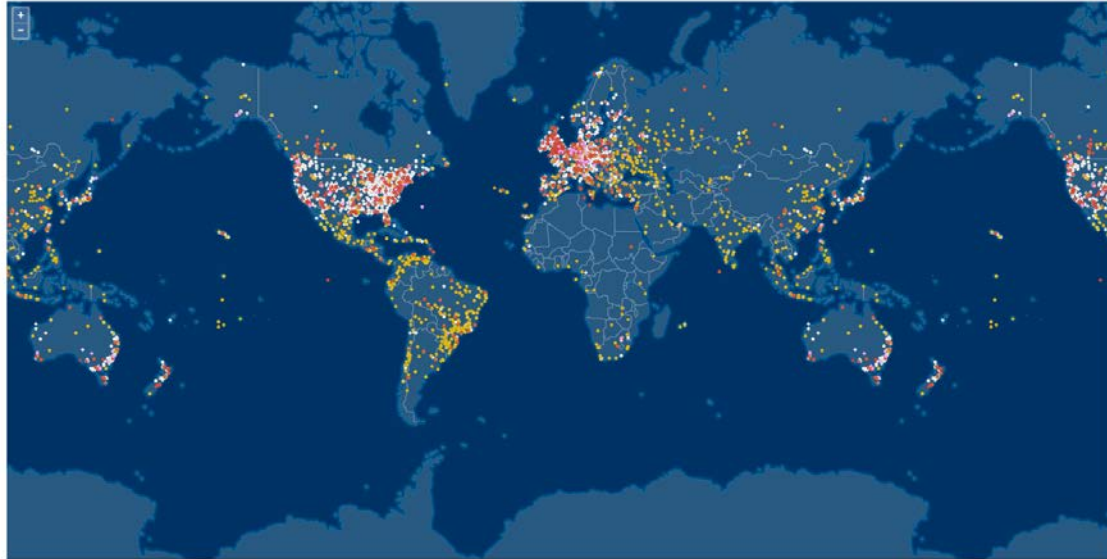
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Feeder Location



■ PlaneFlotter ■ FlightFeeder ■ FlightFeeder for Android ■ PIAware ■ Radarcape

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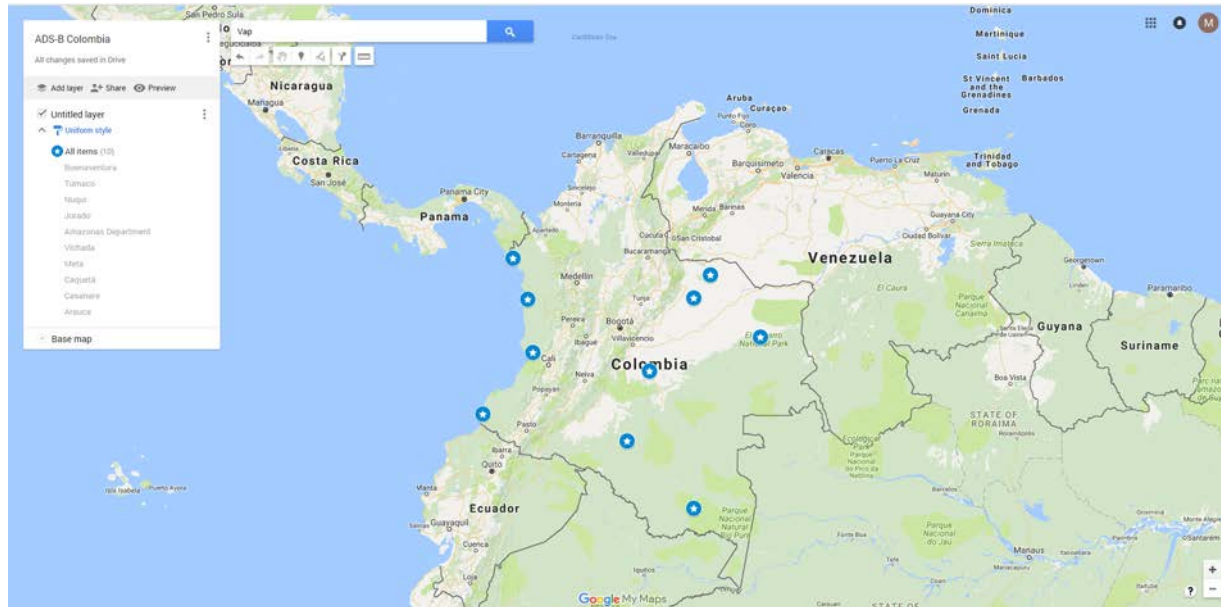
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Proposed Feeder Location





Analytical Solutions

General Information

- Number of international airports
- Size of Airspace
- Number of annual departures
- Number of national carriers
- Number and details to air traffic connections

Airspace

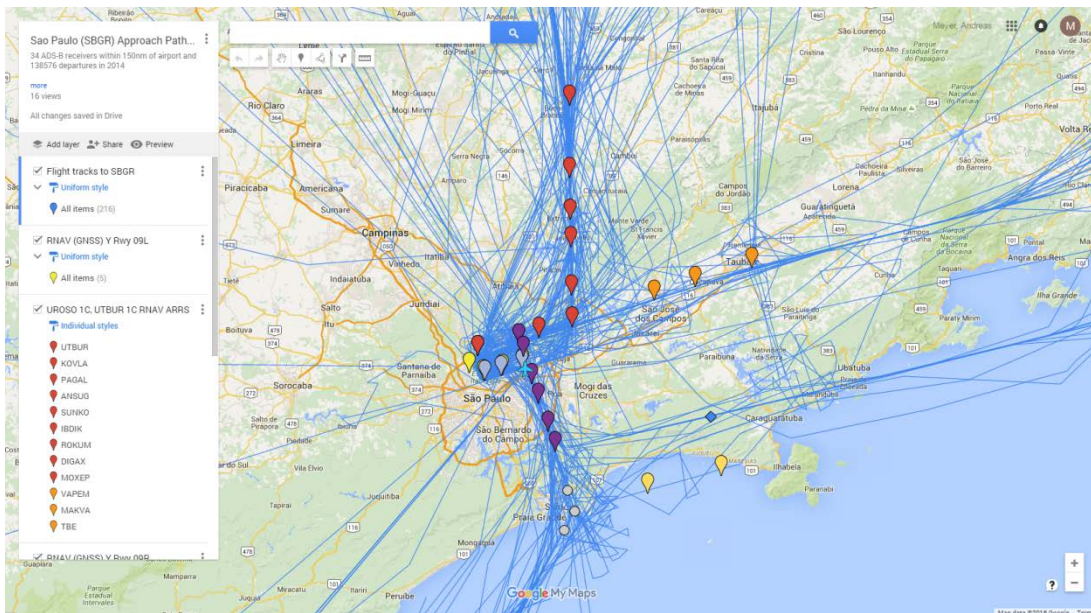
- Number of daily overflights
- Number of daily inbound flights
- Number of daily outbound flights
- Number of daily domestic flights
- Average airspace density (below 28,000ft and above 28,000ft)
- Number of daily active NOTAMS
- Daily total of track miles flown within FIR

Airport

- Number of flights crossing procedural waypoints for each airport
- Percentage of daily tailwind landings
- Percentage of daily bad visibility
- Percentage of daily precipitation
- Percentage of daily wind conditions
- Percentage of daily freezing conditions
- Percentage of daily adverse weather phenomena
- Number of daily departures
- Number of daily active NOTAMS
- Average touch down point of landing traffic for every runway
- [\(Ground Surface Movements\)](#)



Procedures Overlay Solution



- Qualified visualization
- Exact paths
- Any available procedure
- Terminal and Enroute airspace
- Quantified analysis of rate and numbers for each available procedure



Dynamic vector analysis

UTC Dats of arrival of the flight (yyyy-mm-dd)

2016-11-01

Destination Airport

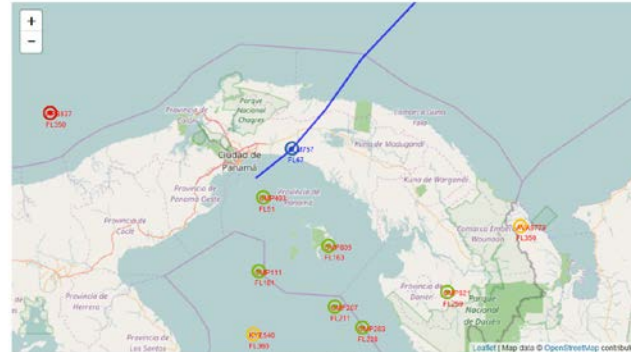
MPTO

Go

Flights to Panama City (MPTO) on 2016-11-01

From	Flight	UTC	Duration	ToD	HFE	CDO	IN	OUT	ASMA
Amsterdam (EHAM)	KLM757	21:18	10:27	37000 ft	98.47%	45.36%	258		
Asuncion (SGAS)	CMP206	10:56	06:03	38000 ft	97.27%	60.27%	030		
Asuncion (SGAS)	CMP290	15:43	06:03	40000 ft	99.18%	72.18%	028		
Atlanta (KATL)	DAL393	02:11	03:29	35000 ft	98.68%		151	035	7.5 min
Belize City (MZBZ)	CMP281	22:15	01:38	39000 ft	96.89%		115	135	10.2 min
Brasilia (SBER)	CMP204	11:13	05:48	30000 ft	99.08%	46.54%	029		
Buenos Aires (SAEZ)	CMP453	11:16	07:13	36000 ft	98.1%	72.62%	016	021	12.2 min
Cancun (MMUN)	CMP271	00:47	02:32	37000 ft	95.92%	60.11%	174	141	22.7 min
Cancun (MMUN)	CMP326	21:34	02:32	39000 ft	95.71%	26.95%	174	029	16.9 min
Cancun (MMUN)	CMP354	15:00	01:56	37000 ft	96.85%	56.02%	157	029	16 min

Previous Next



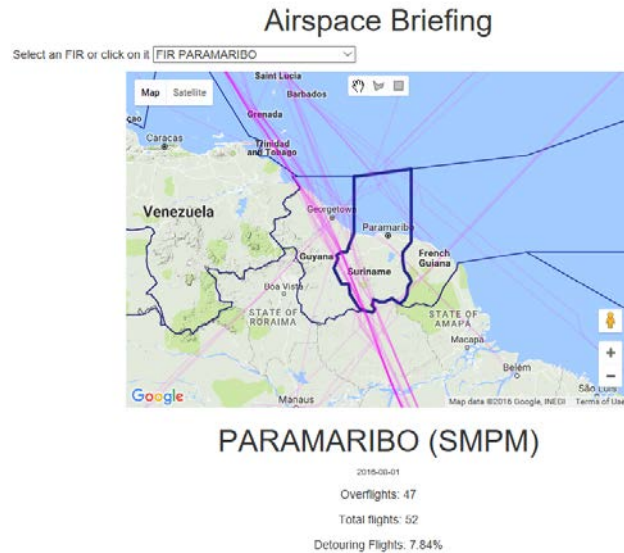
Vertical Profile

KLM757 2016-11-01 UTC (arrival)





Airspace Briefing



- Number of affected flights
- Number of rerouted flights
- Average route length increase
- Additional fuel cost
- Number of affected States of Operators



Requirements

- Promote the installation of ADS-B receivers (at no cost)
- Promote the cooperation of ANSP to provide radar data in exchange for ADS-B infrastructure
- Provide secure locations for the ADS-B receiver installation
- Readiness to share collected data
- Have a specific goal



ADS-B Project Plan

1. Expression of interest to the RO
2. Country coverage analysis and proposed feeder sites
3. Agreement on scope of project
4. MoU (Working agreement)
5. Installation of additional feeder site (at no cost)
6. **Let's GO**



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Asia and Pacific
(APAC) Office
Bangkok



Captain Andreas Meyer
Phone +1 514 954 8219 x 8121
Email ameyer@icao.int

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