SITAONAIR

AIRCOM Datalink Infrastructure

Patrick Geurts

August 8-11, 2016
Operational Datalink Seminar
Accra, Ghana

Agenda

1. High Level SITAONAIR Overview

2. SITAONAIR Aircraft Communications (AIRCOM) Evolving Datalink and Voice Architecture

    - AIRCOM Datalink and Voice Evolution
    - ATS AIRCOM FANS-1/A Service

3. SITAONAIR Validation, Assessment, and Qualification (VAQ)

4. Proactive Performance Monitoring

5. FANS and ATN Problem Report Support

6. Soon to be Published Related ICAO References

7. SITAONAIR Participation in Industry Activities

SITAONAIR

Pioneering e-Aircraft™ solutions

Passenger	Cabin Crew	Cockpit Crew	Aircraft	Flight Operations	Air Traffic Control

SITAONAIR Applications products

Passenger
- **Internet ONAIR** — Inflight Wi-Fi
- **ONAIR Play** — On-demand Entertainment
- **Mobile ONAIR** — Mobile data, SMS and voice

Cabin Crew
- **CrewTab** — Digital crew operations
- **CrewRetail** — Live onboard sales
- **CrewServices** — Concierge
- **Device Management** — Mobility

Cockpit Crew
- **EFB** — Digital flight operation
- **EFB Weather Services** — Weather situational awareness

Aircraft
- **Aircraft Health Management** — Air framer data
- **Aircraft Data Management** — OEM driven operations IT & connectivity
- **VQAR*** — QAR management
- **Aircraft Maintenance** — Digital Aircraft operations

Flight Operations
- **AIRCOM FlightMessenger** — AIRCOM Server
- **AIRCOM FlightTracker** — Real-time flight tracking
- **AIRCOM Info Services** — Surface weather, d-ATIS gateway, Wind up link
- **AIRCOM FlightPlanner** — Flight navigation & briefing

Air Traffic Control
- **ATS AIRCOM Solutions** — Airport Tower Systems, En route Systems
- **ATS AIRCOM Services** — Pre-FANS, FANS, ATN

SITAONAIR Enabling products

- **Link ONAIR** — IP Satellite inflight connectivity
- **Gate Connect** — Gate Link Wi-Fi 3/4G at the gate
- **AIRCOM Network Services (ACARS)** — VHF, VDL2, Satellite aero
- **ATS AIRCOM** — Network Systems

- **ONAIR Plug** — Wireless network to connect airlines' devices
- **AIRCOM Connect**
- **Combined operating system**
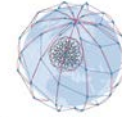
- **Installation Services and Equipment Resell** — Design to installation
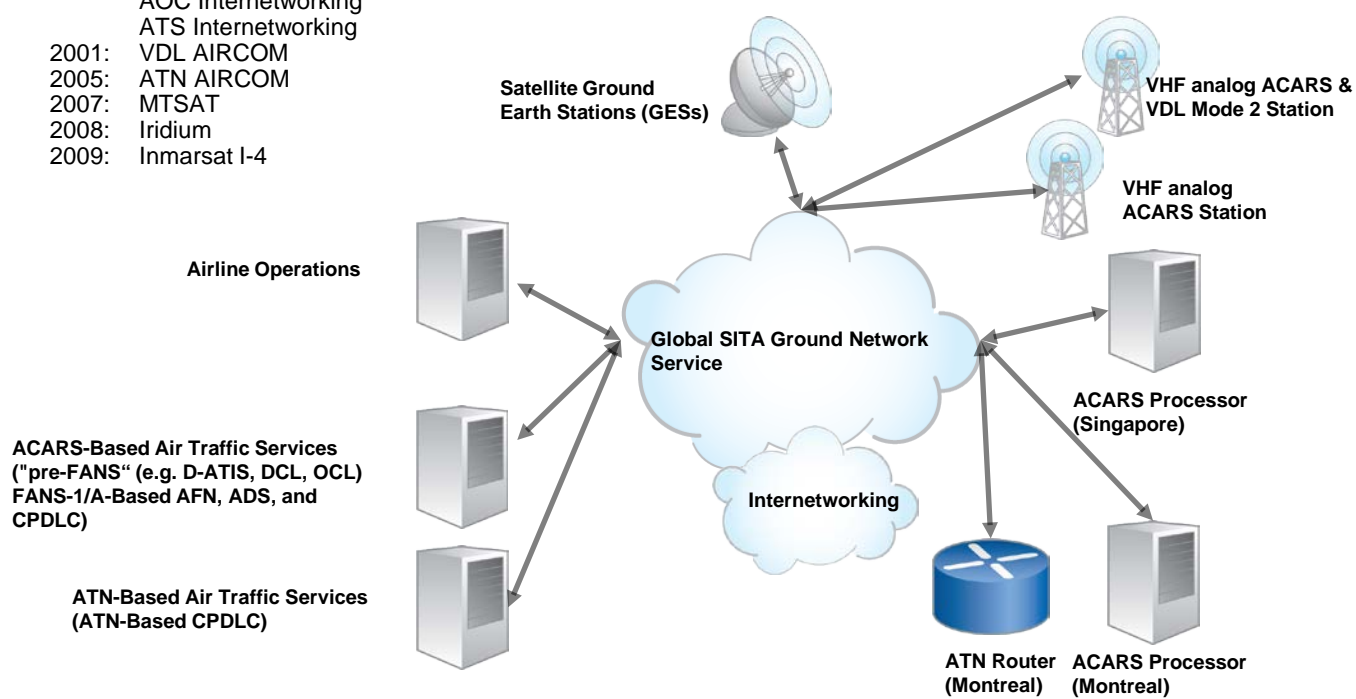
AIRCOM Datalink and Voice Evolution

1984: VHF AIRCOM ACARS Service
1990s: Satellite AIRCOM
      ATS AIRCOM
      AOC Internetworking
      ATS Internetworking
2001: VDL AIRCOM
2005: ATN AIRCOM
2007: MTSAT
2008: Iridium
2009: Inmarsat I-4

Inmarsat I-3 /I-4 JCAB MTSAT Geostationary Satellites

Iridium Satellites Low Earth Orbit

Satellite Ground Earth Stations (GESs)

VHF analog ACARS & VDL Mode 2 Station

VHF analog ACARS Station

Airline Operations

Global SITA Ground Network Service

ACARS Processor (Singapore)

ACARS-Based Air Traffic Services ("pre-FANS" (e.g. D-ATIS, DCL, OCL) FANS-1/A-Based AFN, ADS, and CPDLC)

Internetworking

ATN-Based Air Traffic Services (ATN-Based CPDLC)

ATN Router (Montreal)

ACARS Processor (Montreal)

4

VHF Coverage*

World's largest air/ground VHF datalink network with over 1690 radios worldwide in 161 countries as of Aug 8, 2016 and growing.

* Maps as of Sep 2015.
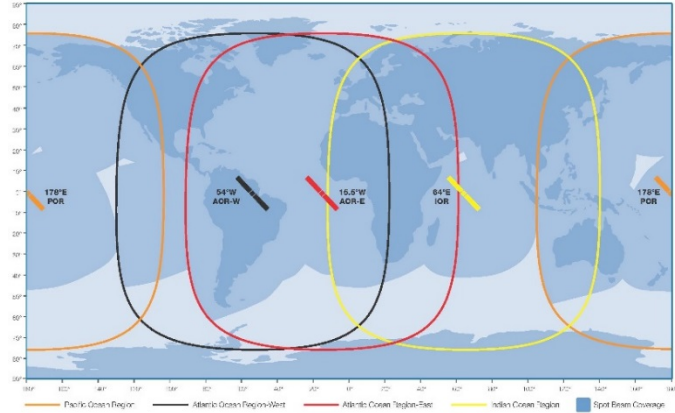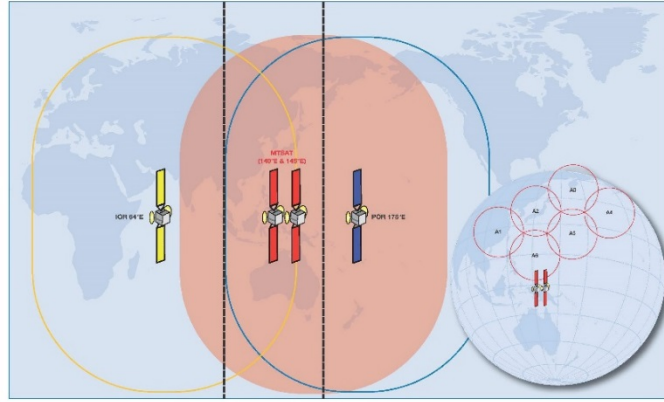On-line in red, planned in blue.
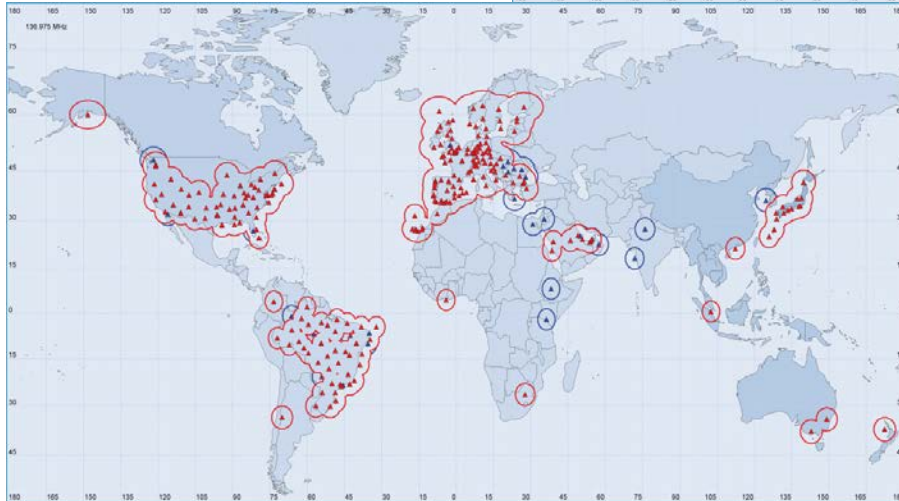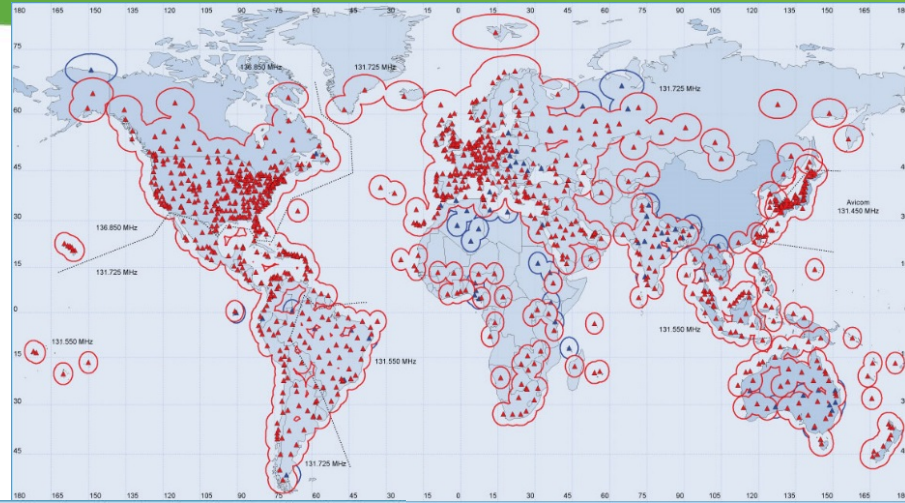
VDL Mode 2 Coverage*

295 VDL Mode 2 radios on-line as of Aug 8, 2016 and growing.
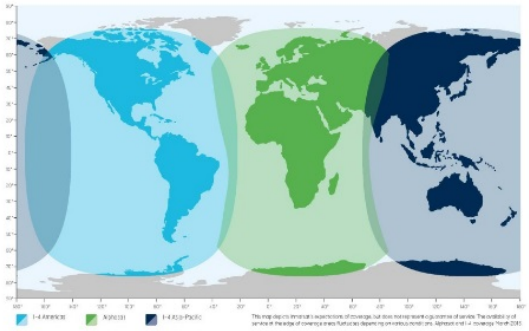
SITAONAIR

Satellite AIRCOM-Datalink and Voice

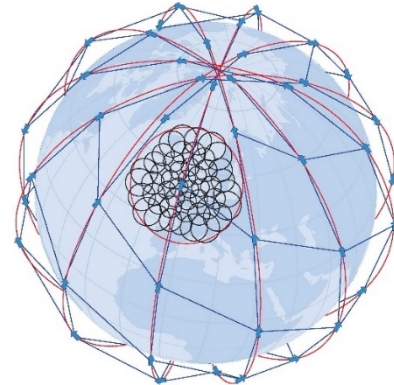**AIRCOM SATELLITE CLASSIC AERO INMARSAT I–3 COVERAGE**
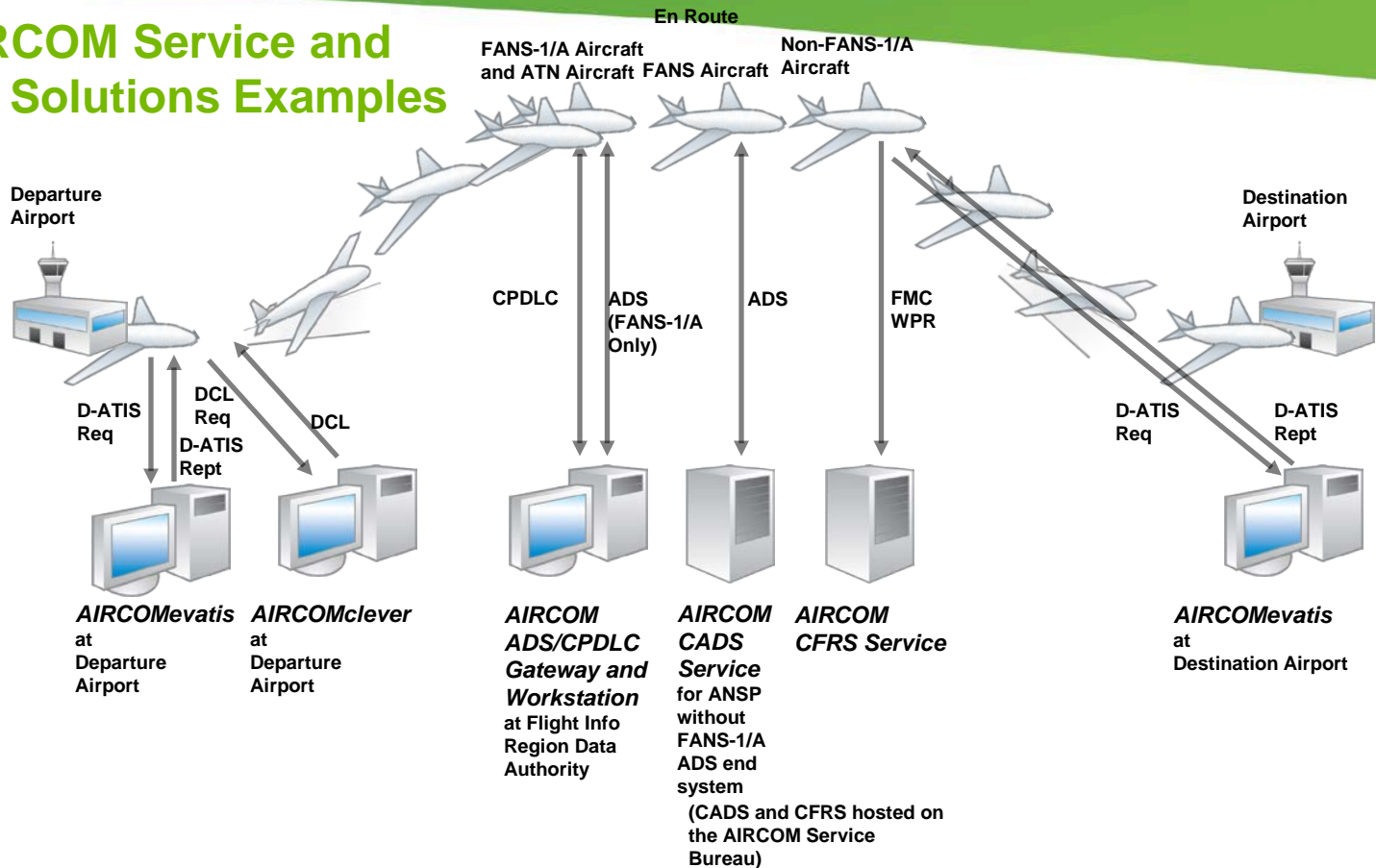

AIRCOM SATELLITE MTSAT COVERAGE

AIRCOM SATELLITE IRIDIUM COVERAGE

ATS AIRCOM Service and System Solutions Examples

En Route

FANS-1/A Aircraft and ATN Aircraft

FANS Aircraft

Non-FANS-1/A Aircraft

Departure Airport

Destination Airport

CPDLC

ADS (FANS-1/A Only)

ADS

FMC WPR

D-ATIS Req

DCL Req
D-ATIS Rept

DCL

D-ATIS Req

D-ATIS Rept

AIRCOMevatis
at Departure Airport

AIRCOMclever
at Departure Airport

AIRCOM ADS/CPDLC Gateway and Workstation
at Flight Info Region Data Authority

AIRCOM CADS Service
for ANSP without FANS-1/A ADS end system
(CADS and CFRS hosted on the AIRCOM Service Bureau)

AIRCOM CFRS Service

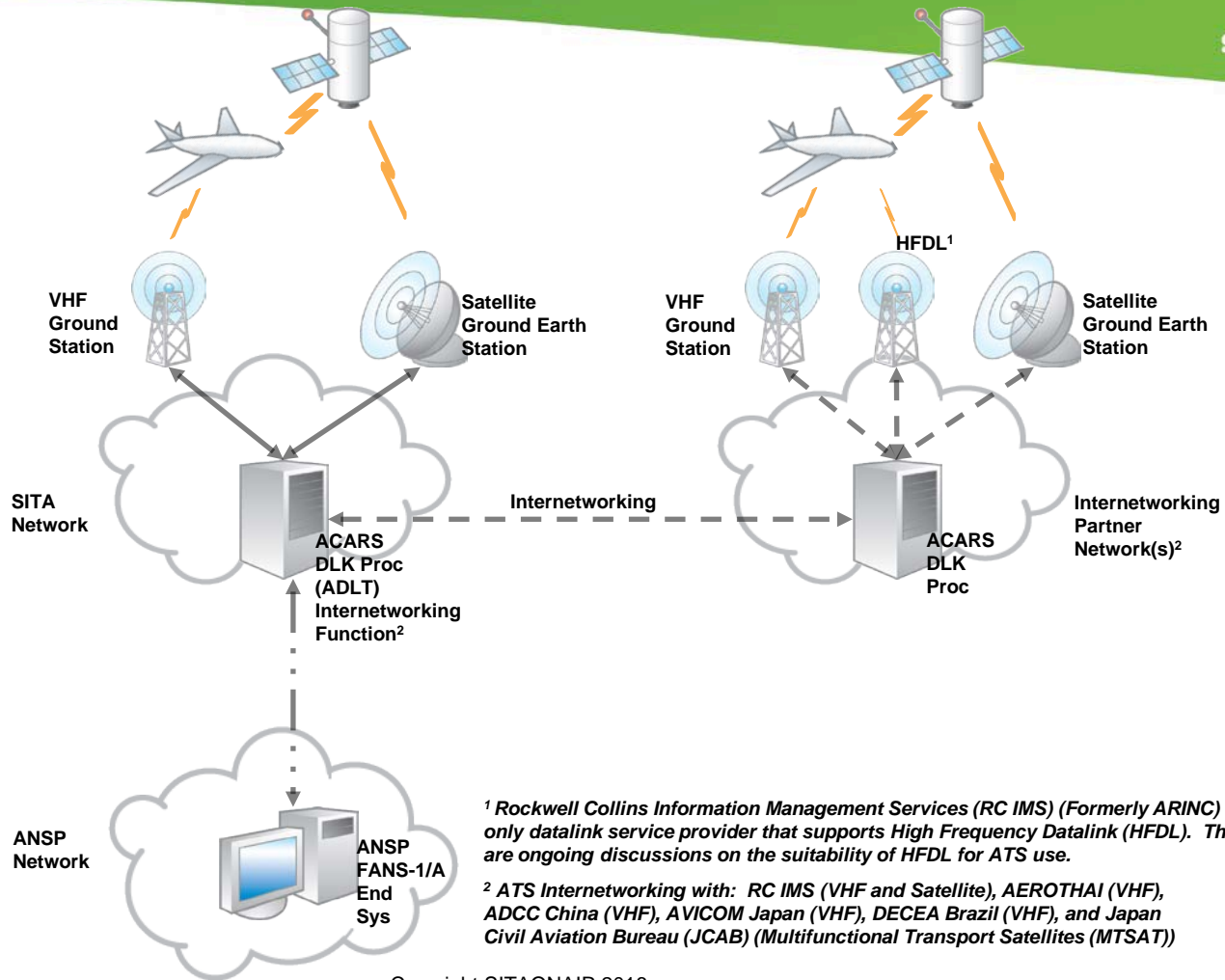*AIRCOMevatis*
at Destination Airport

NOTE 1: There may also be intermediate transactions for these services. This is for high level illustrative purposes only. There may also be other ATS Datalink exchanges during all phases of flight.
NOTE 2: The SITA AIRCOM datalink and pre-FANS and FANS-1/A and ATN services may be used to provide required network and datalink connectivity as appropriate.

SITAONAIR ATS AIRCOM FANS-1/A Service

HFDL[1]

VHF Ground Station

Satellite Ground Earth Station

VHF Ground Station

Satellite Ground Earth Station

SITA Network

Internetworking

ACARS DLK Proc (ADLT) Internetworking Function[2]

ACARS DLK Proc

Internetworking Partner Network(s)[2]

ANSP Network

ANSP FANS-1/A End Sys

[1] *Rockwell Collins Information Management Services (RC IMS) (Formerly ARINC) is only datalink service provider that supports High Frequency Datalink (HFDL). There are ongoing discussions on the suitability of HFDL for ATS use.*

[2] *ATS Internetworking with: RC IMS (VHF and Satellite), AEROTHAI (VHF), ADCC China (VHF), AVICOM Japan (VHF), DECEA Brazil (VHF), and Japan Civil Aviation Bureau (JCAB) (Multifunctional Transport Satellites (MTSAT))*
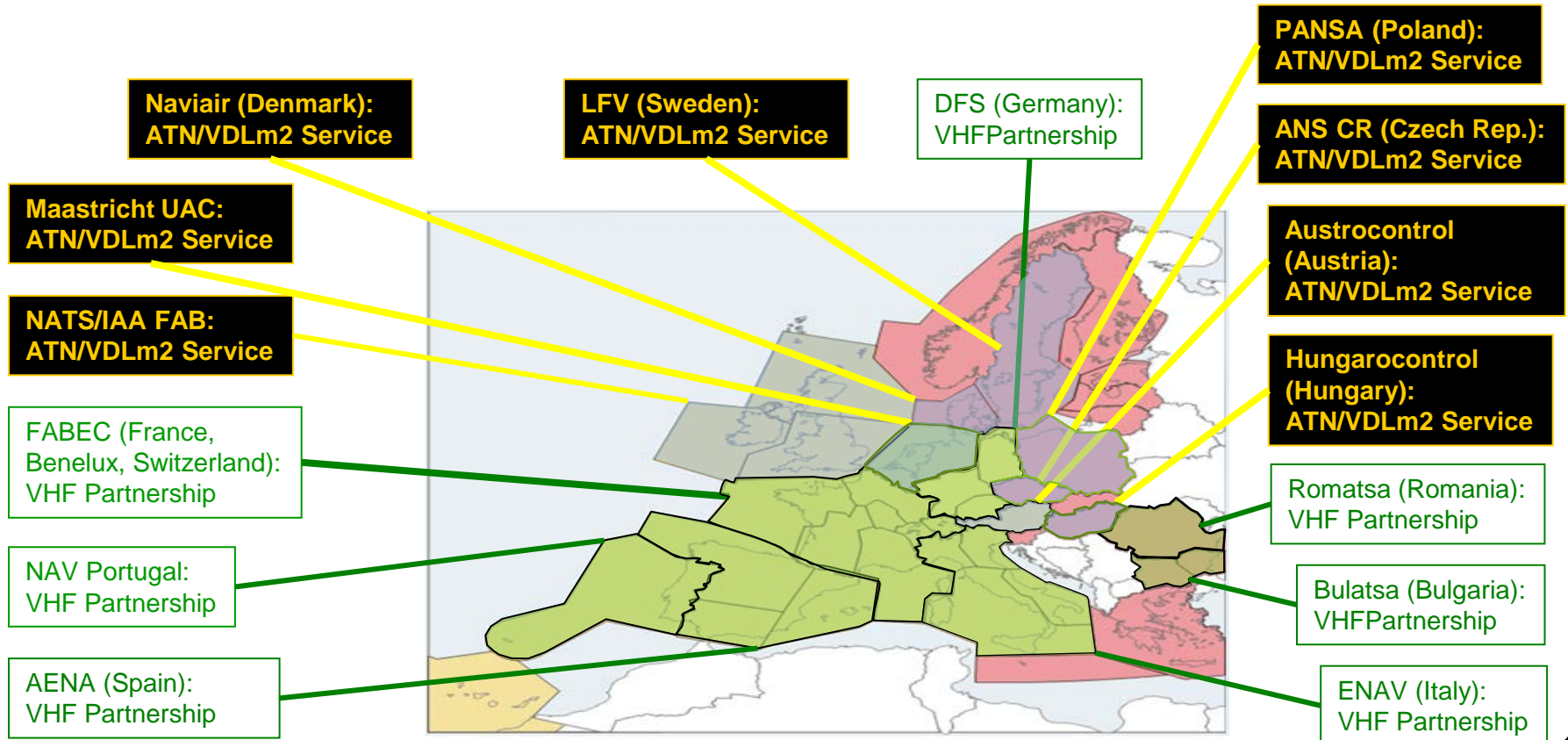
SITAONAIR FANS Customers*
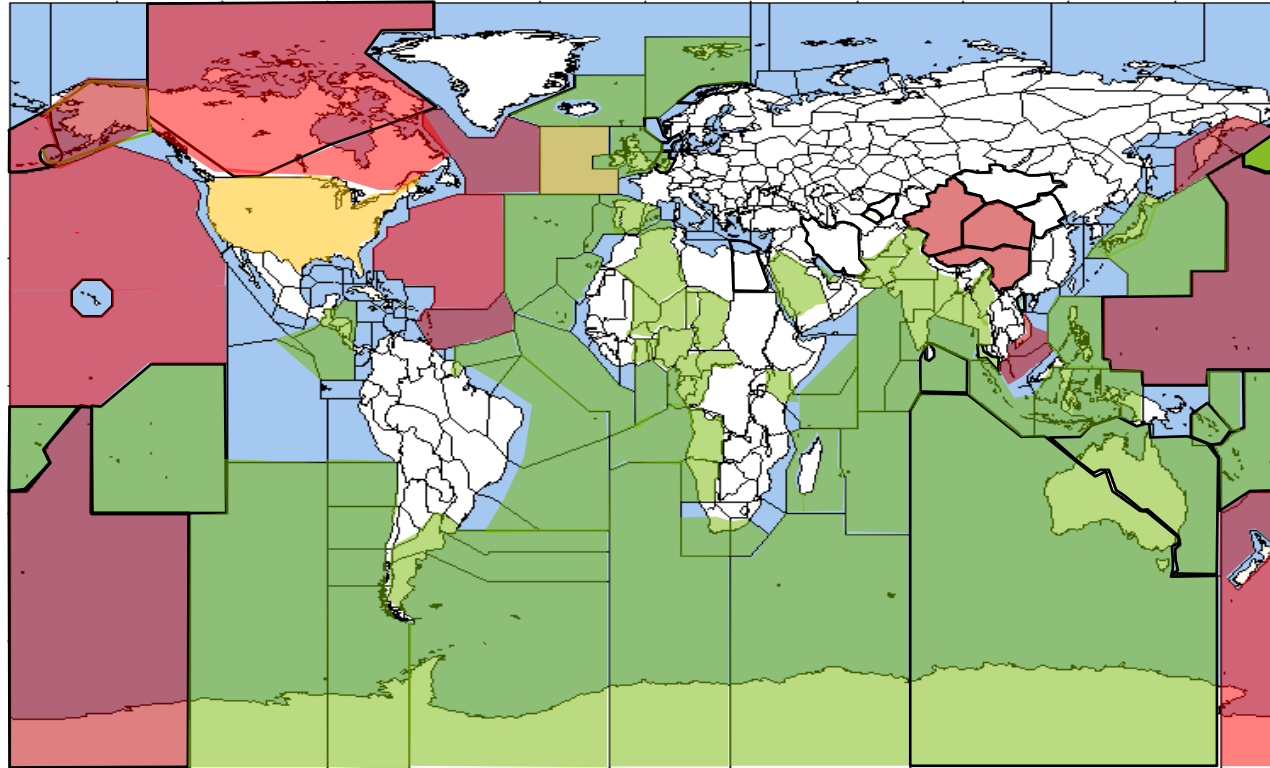
Legend:
- **SITA Customer FIRs** (green)
- **Rockwell Collins-ARINC Customer FIRs** (red)
- **Both SITA and Rockwell Collins-ARINC Customer FIRs** (yellow)

* NOTE: Flight Information Region (FIR) boundaries are approximate. Shaded FIRs are FIRs for which we are contracted or aware that Rockwell Collins-ARINC is contracted, but, not all are operational and it is possible not all will implement in the end. However, most shown are operational.

SITA's Current ATN/VDLm2 Provision in Europe

PANSA (Poland): ATN/VDLm2 Service

Naviair (Denmark): ATN/VDLm2 Service

LFV (Sweden): ATN/VDLm2 Service

DFS (Germany): VHFPartnership

ANS CR (Czech Rep.): ATN/VDLm2 Service

Maastricht UAC: ATN/VDLm2 Service

Austrocontrol (Austria): ATN/VDLm2 Service

NATS/IAA FAB: ATN/VDLm2 Service

Hungarocontrol (Hungary): ATN/VDLm2 Service

FABEC (France, Benelux, Switzerland): VHF Partnership

Romatsa (Romania): VHF Partnership

NAV Portugal: VHF Partnership

Bulatsa (Bulgaria): VHFPartnership

AENA (Spain): VHF Partnership

ENAV (Italy): VHF Partnership

10

SITAONAIR Validation, Assessment, and Qualification (VAQ)

- Verify compliance with industry standards.
- Conformity tests performed to
  - Ensure that all systems directly accessing SITA AIRCOM behave in such a way as not to interfere with the delivery of the AIRCOM data link service to all user aircraft.
  - Identify issues with the ACARS avionics that affect network performance not only on the aircraft on which they are installed but also other aircraft within contracted coverage of that aircraft.
- Cooperative effort between operators, avionics manufacturers, airframe manufacturers, and SITA.
- May be used in the certification process of avionics vendors, and ANSPs

Avionics Qualification-
SITAONAIR VAQ Test Facility

- Located in Montreal Canada
- Supports VHF, SATCOM, and HF avionics testing
- ACARS Test Avionics
- SATCOM Avionics Pallet
- Computer simulation is used to emulate HF service
- Test network including VHF ground stations that support VHF ACARS and VDL Mode 2
- SITA Data Link Processor (AIRCOM Datalink Link Traffic System (ADLT)) testbed
- SITA ATN staging platform
- Can be used to support testing without having to use the operational systems.
- Boeing and Airbus as well as the major avionics vendors have access to a SITA VHF ground station.
- SITAONAIR also has ATN End Systems and a FANS workstation that enable us to provide assistance to airframe manufacturers and third parties in their need to certify ATN and FANS installations onboard aircraft.

SITAONAIR Proactive Performance Monitoring

- Datalink Key Performance Indicators (KPIs) include:
  - Availability
  - Uplink Success Rate
  - Uplink Delivery Time
  - Downlink Delivery Time
- SATCOM Voice KPIs include:
  - Availability
  - Call Blockage Rate (for service via the Inmarsat and JCAB MTSAT constellations)

NOTE: The PBCS Manual Appendix D requires, among other things, that ANSPs to do end-to-end monitoring that includes measurements and calculations for ACP, ACTP, PORT, ADS-C reporting time, ACP Port, and availability from the end-to-end perspective and specifies how these calculations should be done. The above would not be used for inputs to these calculations. The PBCS Manual Appendix D calculations are relative to the data available at the ANSP FANS-1/A ground end system level. The minimum set of data points that the ANSP should use based on the information they have available on their FANS-1/A ground end system are also specified.

.

SITAONAIR AIRCOM Advisory Process

- Upon visual and/or audible alarm(s) issuance, AIRCOM Ops first look to resolve as quickly as possible.
    - If issue persists for more than 10 minutes, SITAONAIR determines, what, if any, services are impacted and issues advisories accordingly.
    - Updates are then provided when available and then upon service restoration.
- Advisories also provided in advance of scheduled maintenance activities.
- Advisories can be provided via e-mail and fax.

Soon to be Published Related ICAO References

- ICAO, *Global Operational Data Link Document (GOLD)*, Second Edition, April 26, 2013. (NOTE: ICAO Doc 10037-AN/509, *Global Operational Data Link (GOLD) Manual*, First Edition, anticipated to soon be published, will supersede the above-referenced ICAO GOLD April 26, 2013 document.)

- ICAO Doc 9869, *Performance-Based Communication and Surveillance (PBCS) Manual*, Second Edition, anticipated to soon be published, will supersede ICAO Doc 9869, *Manual on Required Communication Performance (RCP)*, First Edition, 2008. GOLD Second Edition Appendixes B, C, D are included in the PBCS Manual.

- ICAO Doc 10038, *Satellite Voice Operations Manual (SVOM)*.

SITAONAIR Participation in Industry Activities

- Standards Bodies Including:
  - ICAO
  - RTCA
  - Eurocae
  - Airlines Electronic Engineering Committee (AEEC) (organized by SAE Industry Technologies Consortia (SAE ITC) Aviation Industry Activities)

- ICAO Regional Groups Including:
  - ISPACG, IPACG, SAT and their associated FIT groups, FIT-Asia, and the NAT Technology and Interoperability Group (TIG)

- ANSP Groups Including:
  - FAA Data Communications Implementation Team (DCIT)
  - FAA Performance-based Aviation Rulemaking Committee Communications Working Group (PARC CWG)
  - Eurocontrol Datalink Services Central Reporting Office (DLS-CRO)

SITAONAIR FANS-1/A Steps Taken to Enhance FANS-1/A Operations - Examples

- SITAONAIR Enhanced UL Routing to help cope with fact that Aircraft do not always send Media Advisories

  - SITAONAIR currently ACKs and delivers non-contracted airlines' aircraft downlinks.

  - SITAONAIR updated its FANS DL routing logic to take into account messages without a media advisory

  - SITAONAIR works closely with RC IMS/ARINC to help internetworking work seamlessly.

  - SITAONAIR ATN and FANS-1/A Workstation Test Resources

FANS-1/A and ATN
Problem Report Support

- SITAONAIR Supports all of the Regional Agencies Tasked with Investigating FANS-1/A and ATN Problem Reports Including:
  - Informal South Pacific ATS Coordinating Group FANS Interoperability Team (ISPACG FIT) Central Reporting Agency (CRA)
  - Informal Pacific ATC Coordinating Group FIT (IPACG FIT) CRA
  - FIT-Asia CRA
  - South Atlantic FIT (SAT FIT) Central FANS Reporting Agency (CFRA)
  - Eurocontrol Datalink Services Central Reporting Office (DLS-CRO)
  - North Atlantic (NAT) Datalink Monitoring Agency (DLMA)
- SITAONAIR Support Includes
  - Flight Log Provision
  - Technical Support, when requested, in cases in which one of the above groups suspect that the problem may be within the SITAONAIR domain.
  - Advisories
  - SITAONAIR has special group e-mail address that should be used by the above groups for contacting SITAONAIR.

Lessons Learned

- The following are essential for continuous FANS-1/A Operational Improvements:

  - Standardization

  - FANS-1/A Problem Reporting/Monitoring

  - Regional Groups

  - Continuous Evolution

  - Collaboration

  - Training

CONCLUSION

- SITAONAIR continues to evolve the SITAONAIR AIRCOM datalink and voice services to meet the evolving aircraft operator and ANSP needs.

- SITAONAIR supports the FANS and ATN Problem Reporting process and actively participates in the associated aviation industry standards bodies, coordinating groups, and ANSP groups.

Thank you

Patrick Geurts
Senior Manager, ATM Business Development

SITAONAIR
71, av. Louis Casaï, PO Box 42
1216 Cointrin, Geneva, Switzerland

Brussels Address
2 ,Avenue des Olympiades
B-1140 Brussels, Belgium

Simply connect to www.sitaonair.aero