SwiftBroadband Oceanic Safety Implementation and Trials

Workshop on the implementation of datalink

ICAO SAM, Lima Peru, 10-12th Sept 2012

Gary Colledge, Aero Product and Safety Service Management

Inmarsat

11 September 2012

Agenda

- Inmarsat Aviation Services
- FANS datalink & Required Communications Performance
- SwiftBroadband Oceanic Safety
  - Overview
  - Products
  - Architecture
  - Benefits
  - Hardware
  - Standardisation
  - Trials
  - Where are we now?

Inmarsat Aviation Services

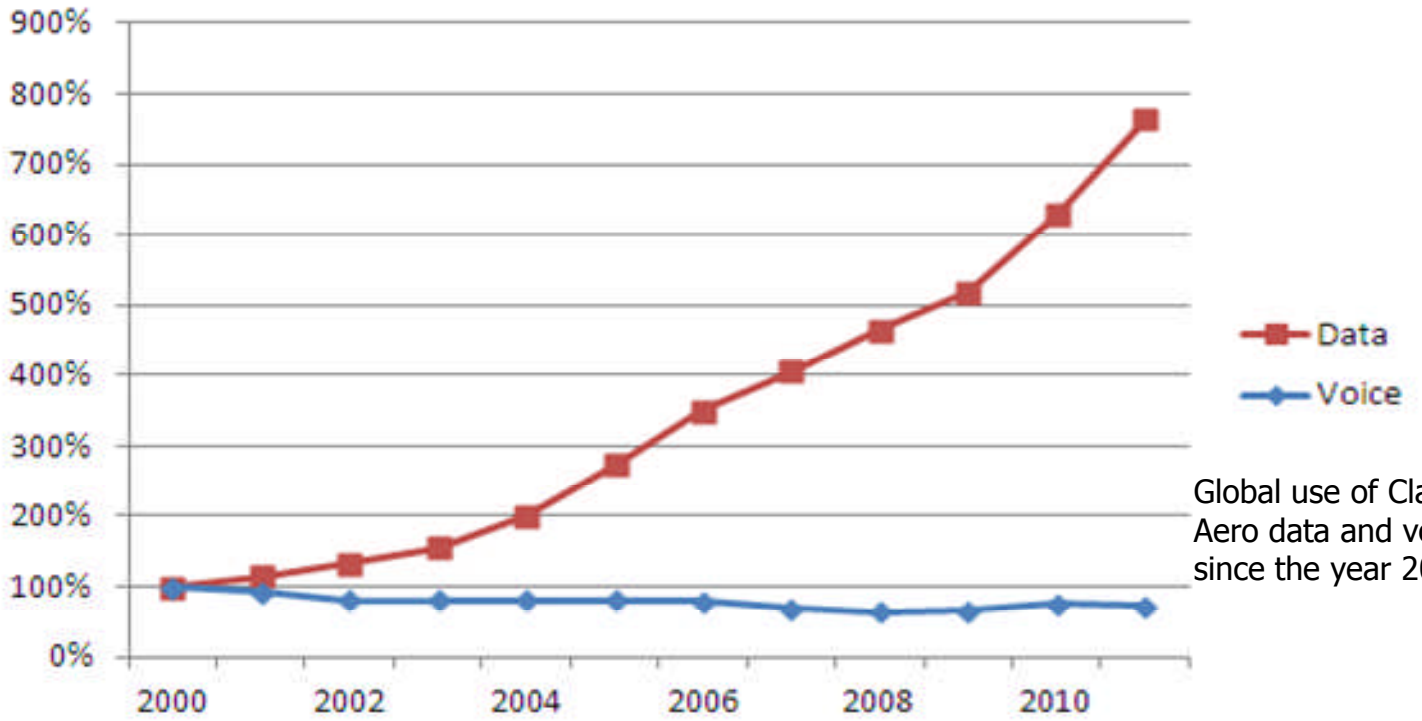
Legacy Services	**Inmarsat-3 based services** • Aero-C, mini-M • Low data rate and voice services
'Classic Aero' Existing and Evolved	**Inmarsat-3 based services** • Aero-H+, Aero-H, Aero-I, Aero-L • Current platform for Safety services • Swift 64 – Circuit switched and packet mode variants • Swift 64 - Demand Assigned and Lease Closed User Groups
SwiftBroadband Classic Aero-H+ supported	**Inmarsat-4 satellite constellation** • Higher data rate Standard and Streaming IP • Up to 432kbps IP data per channel; multi channel systems per airplane • Single antenna: Optional simultaneous 'Classic' voice and data services • Future platform for safety services (from 2013)
Global Xpress	**Inmarsat-5 satellite constellation** • Ka-band • Global coverage • Additional bandwidth service to high demand users • Aviation systems available for service launch in 2014

Increased Use of FANS Data Link

Forecasts show that air traffic levels are set to increase over the medium and long term

FANS air-ground data link is increasing, as it can reduce controller workload and reduce ATS communication errors

- Inmarsat has seen aviation data link usage rising consistently since 2000



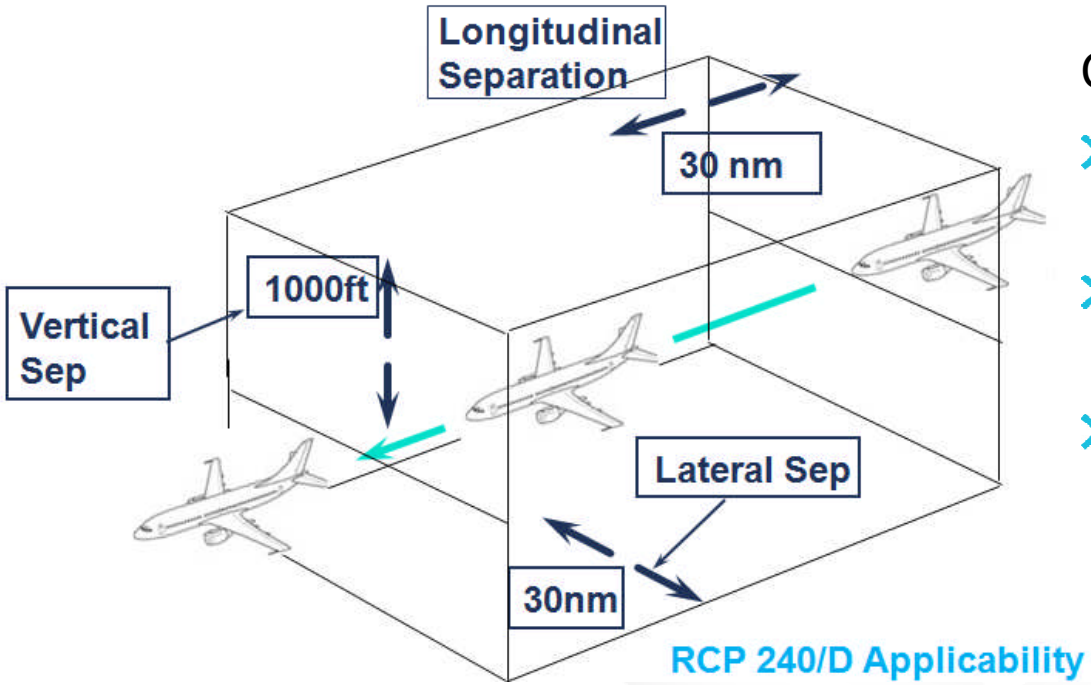
Global use of Classic Aero data and voice since the year 2000

Required Communications Performance (RCP)

There are now moves internationally to move to reduced aircraft separations (30NM/30NM) in certain oceanic airspace

To achieve reduced oceanic separations, there is a need for a greater frequency of aircraft position reporting, and to ensure a higher datalink service availability:

- ICAO has specified the FANS data Required Communications Performance (RCP) values in the **Global Operational Data Link Document (GOLD)** document



RCP 240/D Applicability

GOLD RCP 240 Requirements:

- 0.999 is the minimum for operational safety
- 0.9999 is the minimum for operational efficiency
- Data messages to be delivered in 100s (95%) and 120s (99%) over CSP networks

SwiftBroadband Oceanic Safety

Overview

SwiftBroadband has been in service since October 2007, and now has widespread use for non-safety applications

Operates on the same platform as Inmarsat's Broadband Global Area Network (BGAN) which also supports land and maritime services

Uses Inmarsat's I4 L-Band satellites and Ground Earth Stations

The **SwiftBroadband Oceanic Safety program** enhances Inmarsat's existing SwiftBroadband service to provide a safety service

- Meeting ICAO GOLD RCP240
- Meeting the requirements for support of 30/30 NM operations
- Meeting the required high service availability and lower message latency
- Achieving spectrum and cost efficiencies over Classic Aero

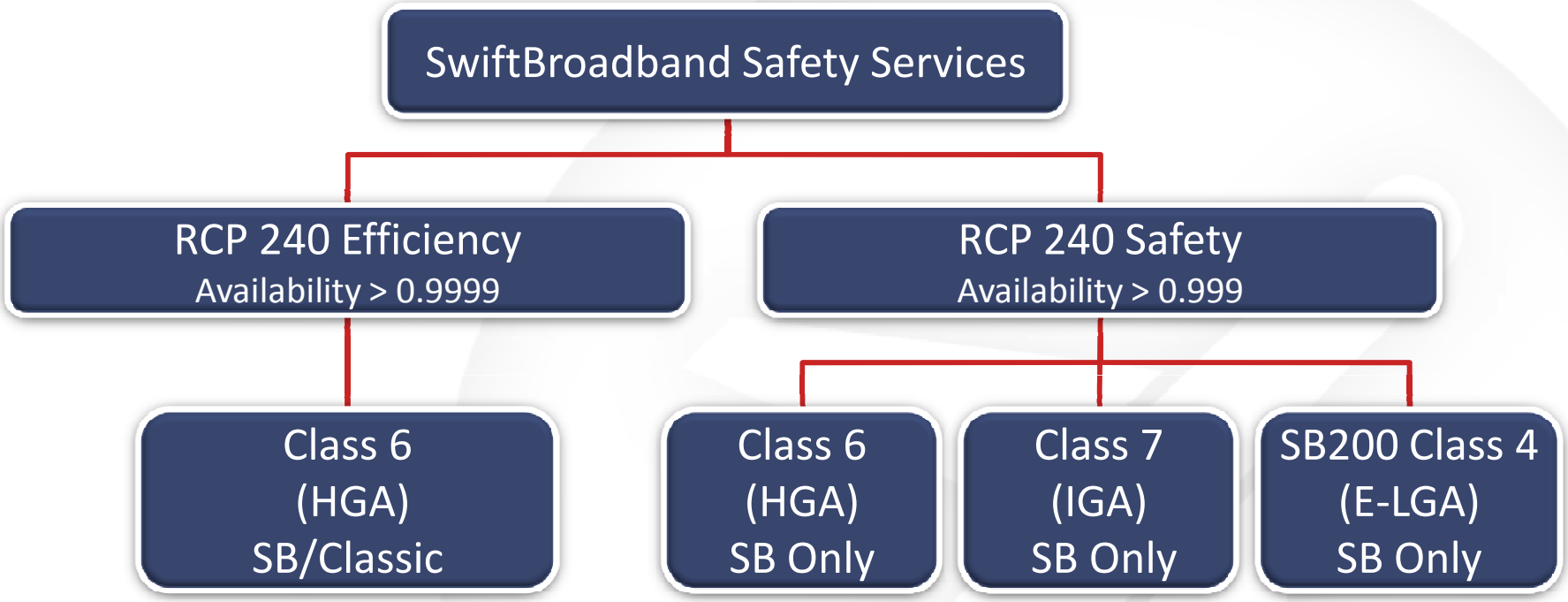
SwiftBroadband Safety Project Overview

The Inmarsat SwiftBroadband Oceanic Safety implementation programme comprises the following activities:

- Definition of System Design (avionics and ground system modifications)
- Development and implementation of an ACARS Ground Gateway (AGGW) at the Inmarsat Satellite Access Stations (SASs) to carry FANS/ACARS safety messages
- Standardisation of airborne terminal equipment for airlines with the AEEC Air-to-Ground Communications Subcommittee (AGCS)
  - Three equipment configurations have been proposed to satisfy the requirements of different airframes
- Development of Minimum Aviation System Performance Standards (MASPS) and Minimum Operational Performance Standards (MOPS) for airborne terminals by the RTCA SC-222
- Development of an ICAO Technical Manual and a Validation Manual
- Trials and evaluation

SwiftBroadband Safety Product Overview

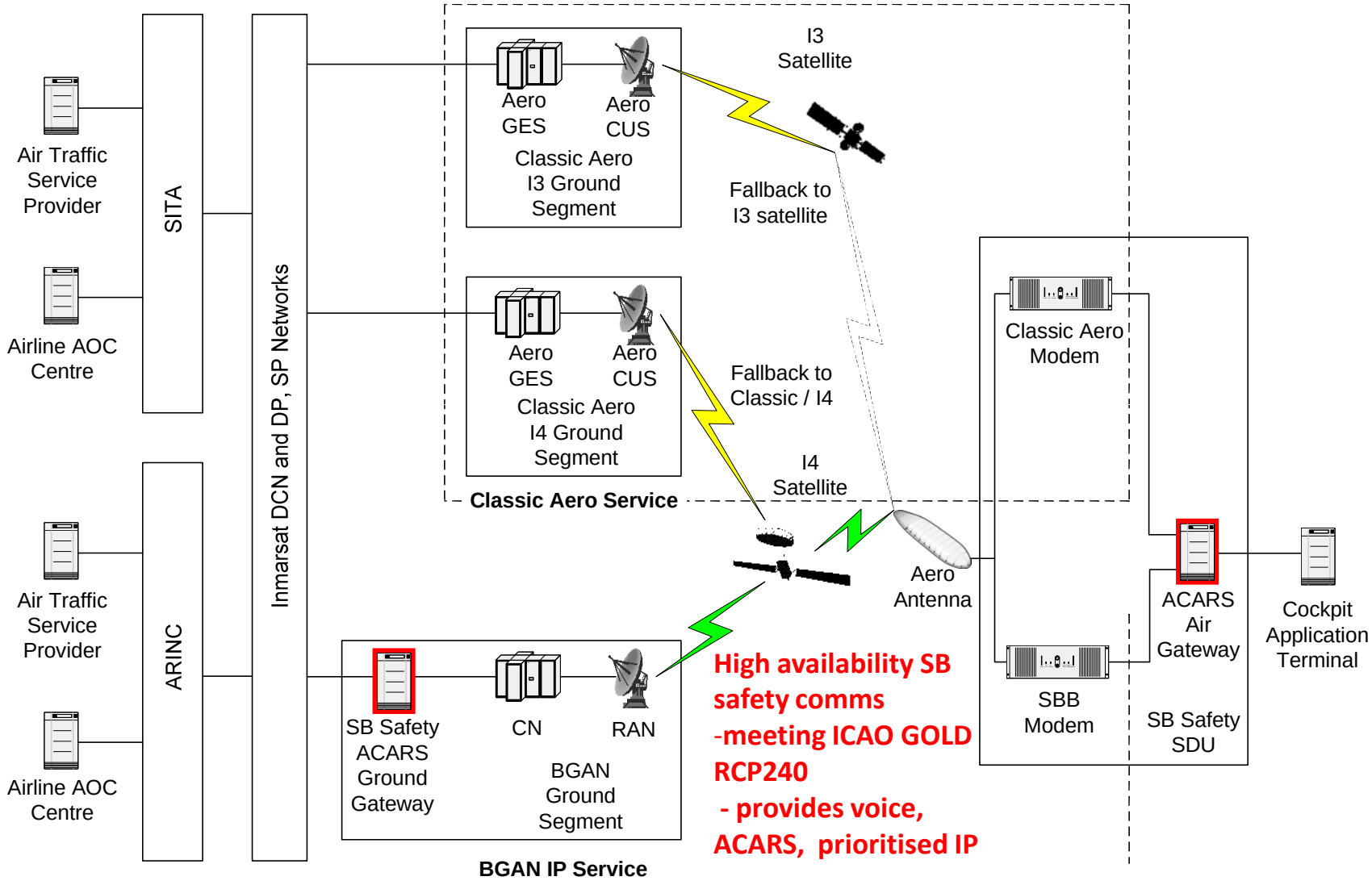
- The customer will have a range of product options to choose from:



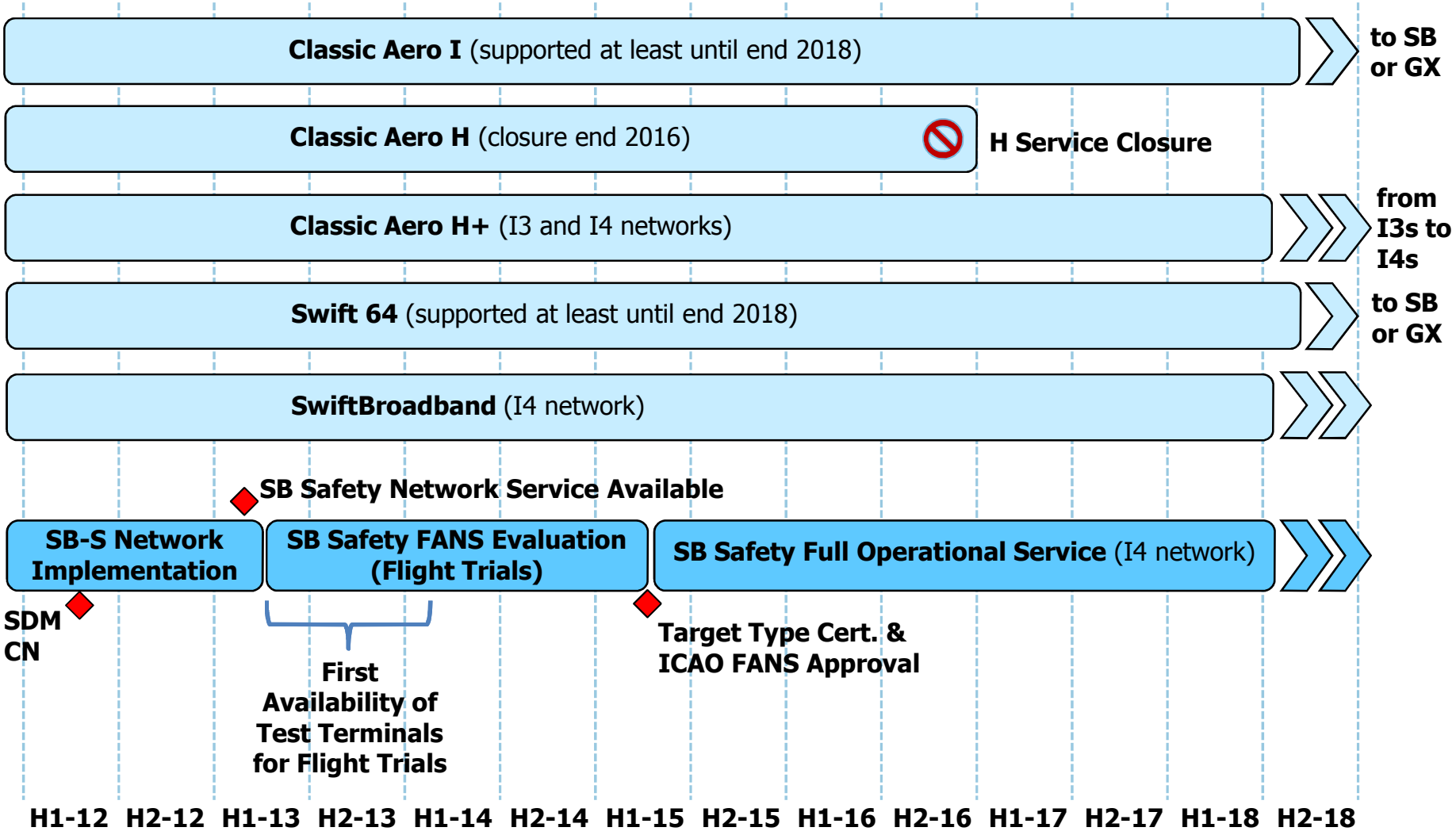
- All classes support the following safety services
  - Prioritised FANS/ACARS Data
  - Prioritised IP Data
  - 2 channels of voice

inmarsat

SwiftBroadband Oceanic Safety Architecture



Inmarsat Aviation Services Roadmap

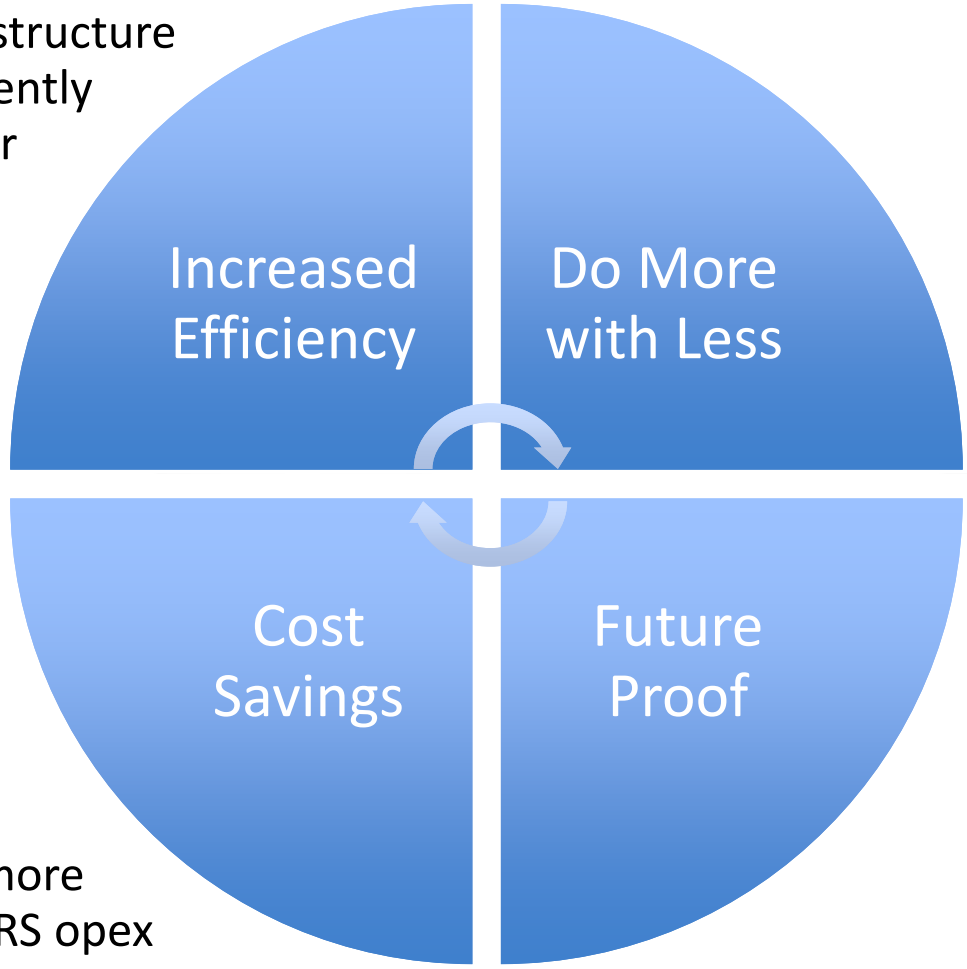


Benefits of the New Service

- Improved performance over Classic Aero – target to meet GOLD RCP240
- Provides Priority, Pre-emption and Precedence
- Support for new cockpit applications via the Prioritised IP link
- Priority given to: ATS, AOC, AAC data & voice
- Ensures comms availability for ATS safety
  - Priority over cabin users of SwiftBroadband and other BGAN users
  - Users with lower priority can be pre-empted
- Spectrum efficiencies compared to Classic Aero
- Cost effective
  - At least 30% reduction in ACARS opex costs expected compared to Classic Aero
  - Enabled by ability of the system to share the network with other commercial services, while providing full protection to the safety voice and data services
  - Equipment cost savings enabled by smaller, lighter, cheaper Class 4 solution

Benefits Summary

- Better use of spectrum – simpler channel structure & channels efficiently shared with other services
- High throughput available for data link apps
- Maintains RCP performance



- 2xVoice & ACARS & Prioritised IP in one channel
- Lower Channel Powers = Smaller Equipment

- Savings on usage expect ~30% or more reduction in ACARS opex
- Significant savings on avionics for smaller, lighter Class 4 safety terminal

- Extends Safety to I-4 for cockpit services
- Allows end-users to adopt new features, not available on Classic Aero

SwiftBroadband and Safety Services

Today and tomorrow

	HGA High Gain Antenna	IGA Intermediate Gain Antenna	E-LGA Enhanced Low Gain Antenna
	Available since 2007		**Available from 2014**
Background IP	Up to 432 kbps	Up to 332 kbps	Up to 200 kbps
Streaming IP	Approx 250 kbps (X-Stream)	Up to 128 kbps	Up to 32 kbps
AMBE+2 Voice	Yes	Yes	Yes

Available from 2014			
SBB Safety	**Yes**	**Yes**	**Yes**
HDR (High Data Rate)	Up to 640 kbps	Up to 380 kbps	Up to 150 kbps

ARINC Characteristic 781 SwiftBroadband System

6MCU and 2MCU SDU

Typical ARINC 781 Shipset

Compact SwiftBroadband Shipset

Applicable Standards & Activities

ICAO

SARPs
GOLD (published)
IRSVTF GM

AEEC

ARINC 781
DLK SubCom
Media Independent ACARS Messaging (MIAM)
[Data Link Users Forum (DLUF)]

RTCA

SC-222
DO-3XX MASPS
DO-262 MOPS
DO-210D

ETSI

BGAN system standard

SB Safety FANS Evaluation Trials Objective

- Inmarsat and its programme partners now need to;
- Ensure development and safety of flight qualification and certification of airborne terminals by the equipment manufacturers
- Gain the qualification and approval of the end-to-end service
- To achieve this final step, involvement of aircraft operator(s) is required in an operational trials phase

Trials Objective

- The main objective of the trials phase is to accrue sufficient operational usage to enable approval for the usage of SwiftBroadband (SBB) as a transmission medium for FANS/ACARS safety services
- The means to achieve this is to have airline/operator involvement in flight trials whereby trials data will be presented in the FAA PARC group and/or an ICAO regional group (e.g. NAT CNSG)

Airline Operator Participation

- Inmarsat and its partner mobile terminal manufacturers are developing flight certified equipment
- In order to carry out trials we will need an aircraft operator to:
  - Select aircraft from their fleet to install the SB Safety capable equipment
  - Certify the installation
  - (with ANSP/regulator approval) Use the SATCOM for FANS communications during normal operations
- Traffic performance will be monitored by Inmarsat and authorities for evaluation

SwiftBroadband Safety - Where Are we now?

- ACARS Ground Gateways (AGGW) have been delivered to sites
  - Successful initial testing between prototype UT and AGGW
  - On schedule for fully functional AGGW FAT test in Oct 2012 and SAT in Nov 2012
  - Final acceptance of AGGW in Feb 2013 leading to full network availability
- Ground segment changes for network integration under development
- Cobham/Thrane & Thrane are developing SB Safety terminals now
- Process is underway to appoint SwiftBroadband Safety Distribution Partners
- Inmarsat is looking for early adopters for flight trial tests and ICAO FANS evaluations

Thank you

Questions?