4F1 Launch 11 March 2005
ILS Atlas V

courtesy ILS

Satellite repositioning, I3 network and Classic Aero over I4

Gary Colledge

4F2 Launch 8 November 2005
SeaLaunch

courtesy Sea Launch

The mobile satellite company™

Background

- Inmarsat I4F3 was successfully launched using a Proton Breeze M launch vehicle on 18th August 2008

- Major milestones passed:
  - Solar Array deployed 26th Aug
  - Reflector deployed 27th Aug
  - In orbit testing (8 degrees East) successfully completed

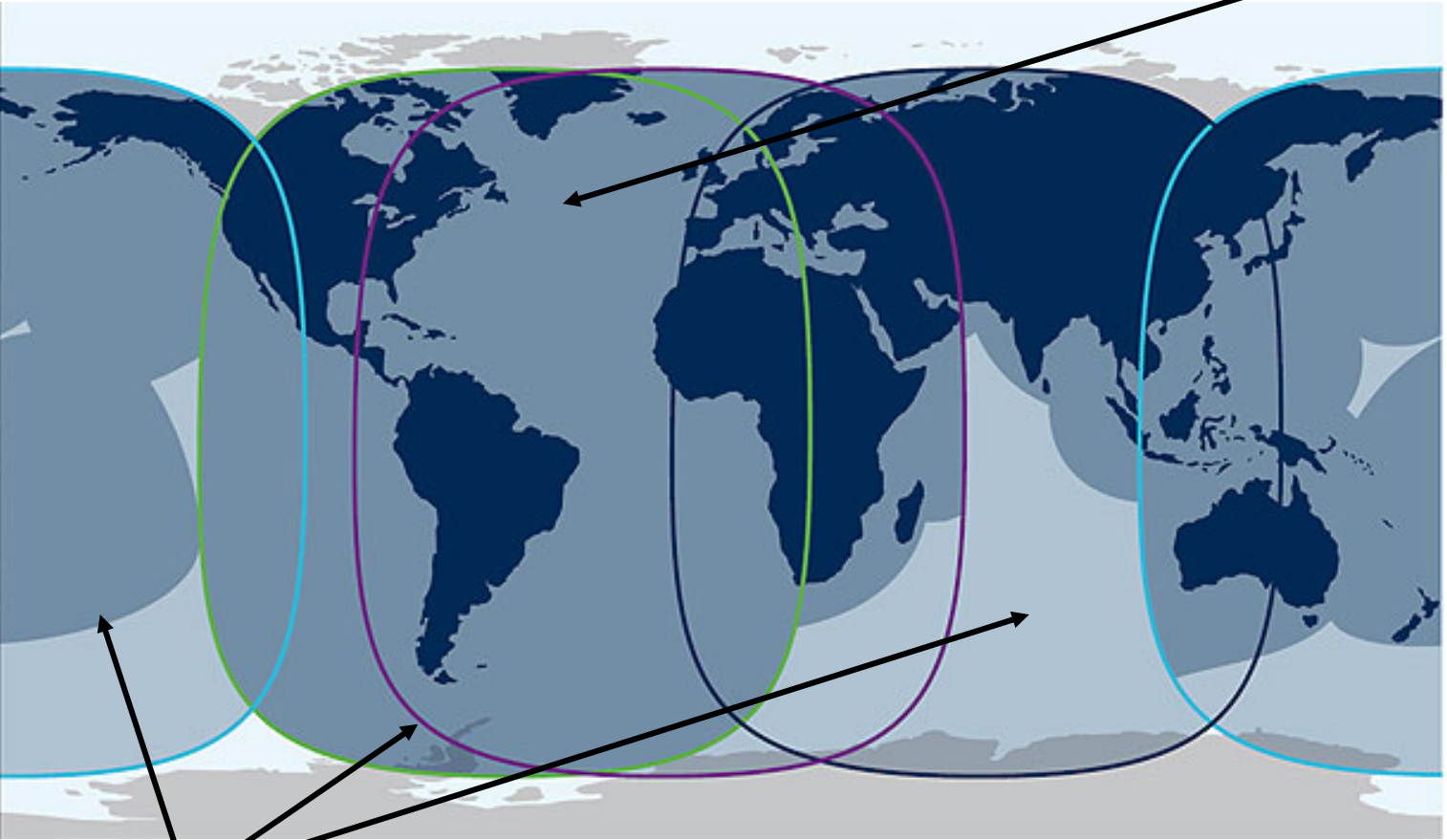- Spacecraft positioned at 98W by 22nd Oct 08

courtesy ILS

AOR(W) Aero Service Transition

- I3F4 was moved to 53W

- Transition of Classic and Swift64 services from I4F2 to I3F4 took place on 7th January 2009

- There was a brief service outage 30mins outage (08:00-08:30 UTC) whilst traffic was transferred from I-4 to I-3 satellite
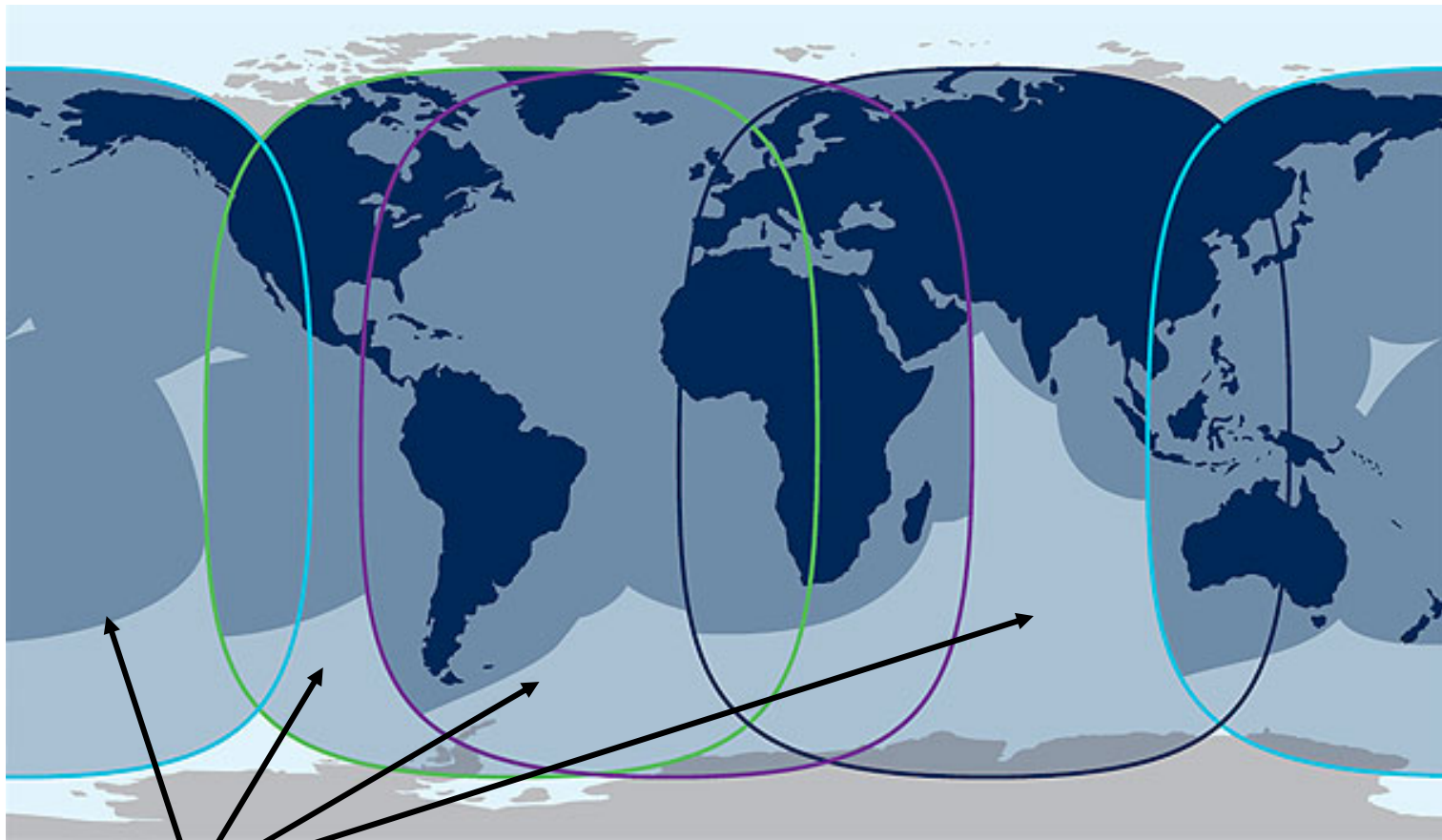
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I3/I4 Coverage – Classic and Swift 64

I4 Satellite

Pre-AOR(W) transition coverage

I3 Satellites

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I3 Coverage – Classic and Swift 64

I3 Satellites

Current Coverage

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Summary - Classic aero

- Short outage during transition

- Global beam datalink services maintained (H & H+ voice operate in global beam, I voice in regional spot beams)

- NAT FANS operations maintained

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Summary of satellite movements
Milestones relevant to classic/I4 programme

Date	Satellite developments
18 Aug 08	I-4 F3 launch
7 Jan 09	Transfer E&E traffic from I-4 F2 to I-3 F4
7 Jan 09	I-4 F2 moves
6 Feb 09	I-4 F2 in position at 25E
7 Feb 09	I-4 F1 begins move to 143.5E
24 Feb 09	I-4 F1 in position at 143.5E

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Classic aero on I-4s
Long term commitment to safety services

- Inmarsat plans to make its Classic services available on the I-4s from mid 2009

- Enables access to simultaneous SwiftBroadband and Classic services via one antenna per aircraft

- Improved redundancy for Classic services

- Appropriate service mix by satellite based on industry consultation

Service	I-3 satellites	I-4 satellites
Classic	✔	✔
Swift 64	✔	
SwiftBroadband		✔

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Classic over I4

- Following successful launch, in-orbit test and deployment of I4F3, Inmarsat has repositioned the I4 fleet.

- To allow a single aircraft antenna to simultaneously access Classic and SwiftBroadband, Inmarsat will operate new GES (from SED) in Hawaii and Fucino to access the I4s.

- Airline service launch target; July 2009 to deliver FANS service over I4s

- The new GES incorporate the recommendations of the FANS SIT.

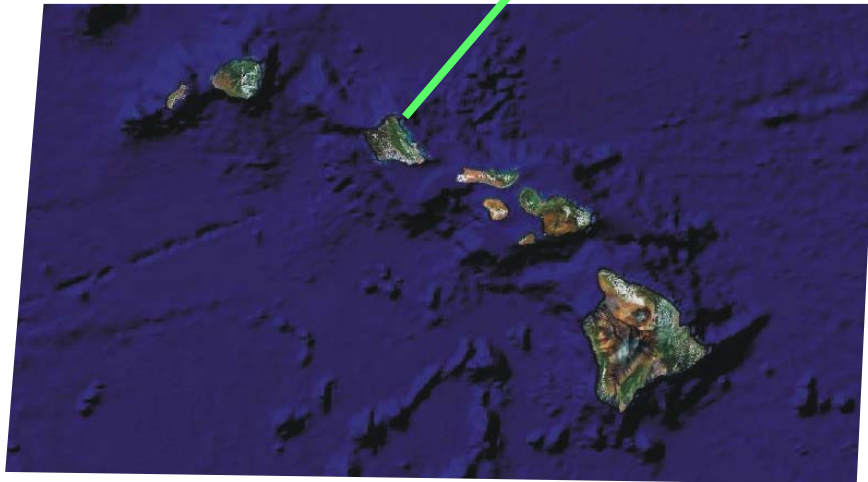**inmarsat**

Datalink service provision (March 27th 2008 onwards)

	LESO	CSP	AOR-E	AOR-W	POR	IOR
Eik	Vizada	Arinc	X	X		X
Santa Paula	Vizada	Arinc			X	
Aussaguel	Vizada	SITA	X	X		
Perth	Stratos	SITA			X	X

- The above table presents service provision following the move of the Southbury AOR(W) service to Eik (27th March 2008) and before implementation of additional new Inmarsat GESs planned for mid 2009 - which will operate over the I4 satellites.

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Hawaii SAS /GES site

Paumalu
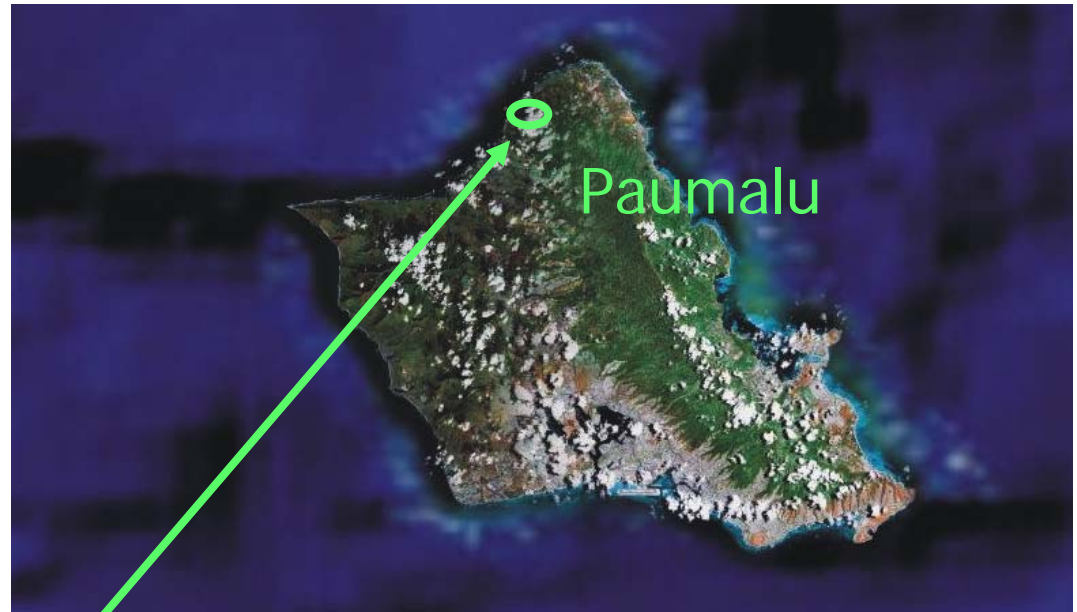
O'ahu

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Paumalu

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Fucino

- The Fucino site will host the SED GES delivering service over the 25E I4 (I4 F2)
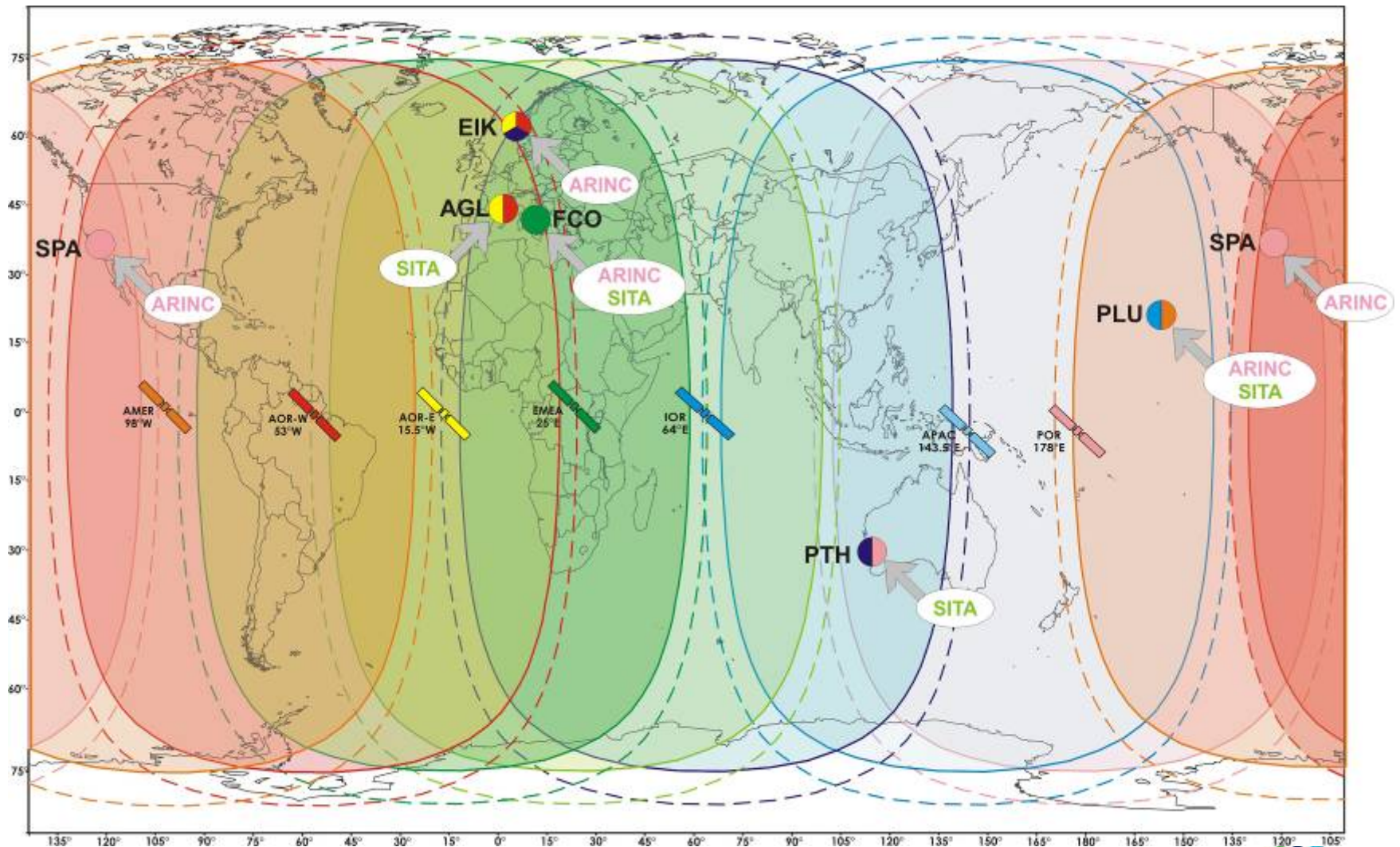

16m dish

13m dish (TTC and backup)

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Inmarsat Classic Aero GES Network – planned aero service mid 2009

Note: Inmarsat reserves the right to make modification to the satellite constellation. Satellite footprints are only an artistic representation.

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Inmarsat Classic Aero proposed GES Network – mid 2009

	LESO	CSP	AOR-E	AOR-W	POR	IOR	ASIA PAC	EMEA	AMERICAS
Eik	Vizada	Arinc	X	X		X			
Santa Paula	Vizada	Arinc			X				
Aussaguel	Vizada	SITA	X	X					
Perth	Stratos	SITA			X	X			
Hawaii	Stratos*/Vizada*	Arinc*/SITA*					X		X
Fucino	Stratos*/Vizada*	Arinc*/SITA*						X	

* - candidate DPs/SPs

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Programme overview

- Inmarsat will own and operate GES from BGAN SAS sites post April 09:
  - Hawaii Dual Ocean Region (98W, 143.5E)
  - Fucino (25E)

- SED is contracted to develop, install and support the Classic Aero GES
  - Squarepeg Communications Inc (SPCI) is SED's principal subcontractor

- GES will include the FANS improvements as recommended by FANS Satcom Improvement Team

- Platform is sustainable for many years providing a flexible architecture for expansion

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FANS Improvements included in SED GES

Improved monitoring of system especially at service level	Y
Improved testing at factory especially for loaded conditions	Y
Improved data gathering to determine problem AES	Y
CP96 - Change to log on process to allow faster 'system recovery time' after a GES failure -Explicit marking of T-Ch superframe (assessed and not required) - (Increase the AES 'loss of P-Channel timer' from 10 to 30(tbc) seconds under evaluation) -ACARS 'no-comm' to trigger log-on to alternate GES (evaluated, not included) - Provision of terminal manufacturer and software build info in Log On Signal Unit	Y
Ability to hand over (and recover) spectrum from one GES to another	Partial

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I4 GES Capability & Service Baseline

	GES Capability	Expected Initial Service Offering
P/R/T 600/1200/10K5	Y	Y
C8400	Y	Y
C21000	Y	N
L	Y	Y data
H	Y	N for voice, Y data
H+	Y	Y data (Y voice but only C8400)
I	Y	N for voice, Y Data
Data 2	Y	Y
Data 3	Y	Y
C8400 Fax	N[1]	N
C8400 PC data	N[1]	N
C21000 Fax	N[1]	N
C21000 PC Data	N[1]	N
C21000 CN11 (secure voice)	N[1]	N
GES Data Broadcast	N[1]	N

[1]GES design could be upgraded to add these services, following business case and provision of funding

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Timescales

1	Kickoff	1 Jan 2008	√
2	Final Design Review	June 2008	√
3a	Factory Acceptance Review	Dec 2008	√
3b	FAT (at SED)	Feb 2009	√
4	SAT Fucino	April 2009	
5	SAT Hawaii	May 2009	
6	Airline Operational Service (ACARS plus voice) 3 Ocean Regions, C8400 voice, D2 & D3	July 2009	
7	CP96 functionality	Nov 2009	

now →

From SAT, I&T with aircraft and ground end systems is required leading to safety service qualification and operational approval

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Classic/I4 High Level Programme targets 2009

Release 1

Release 2 Adds D3, 10K5 ESAS, bug fixes

Release 3 Adds C21K, CN 30/30

Factory Acceptance Test (ACSE)

FAT1 Dry Run — FAT 1

FAT 2

FAT3 Dry Run — FAT 3

Fucino

Site Acceptance Test

SAT

Release 2 upgrade

Release 3 upgrade

Hawaii

SAT

Release 3 upgrade

Opportunities for airframer testing

Airbus Start

Boeing Start

Network availability for Ground and Flight Test

Airbus (25E)

N Atlantic (25E & 98W)

Boeing (98W & 143.5E)

Separate System Table for I3 & I4

Selected AES allowed on I4

Gradual increase in a/c activated for I4

Service Milestones

8 OR System Table Classic/I4 target?

Classic/I4 GES Final Acceptance

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

Issue 2
5 Mar 09
GC

Note: Dates may be subject to change
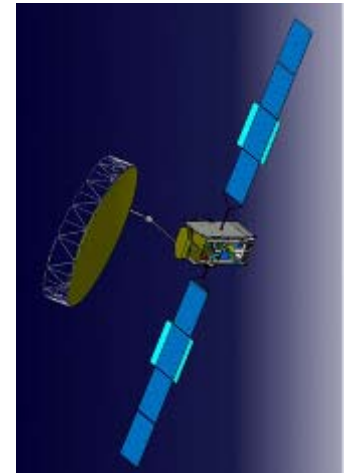
NAT FIG_19 webex, 5th March 2009

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Integration and Test Overview

- Initially the I4 satellites and GESs are separate from the operational I3 satellites and GES (in "Closed System Table") – i.e. service is not accessible to the existing operational aircraft

- For 25E/Fucino testing – proposal; an Airbus bench test via the closed network

- Envisaged that test or pre-delivery aircraft could then be made available in the closed network

- Target for combined 8 ocean region system table – end June 2009

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Alphasat

Alphasat artist's impression

- Inmarsat has signed a major contract with Astrium to build the payload for a satellite to supplement the existing I4s –
        "Alphasat I-XL"
   - one of the largest commercial spacecraft of its kind

- Part of a European Space Agency (ESA) initiative to develop a new spacecraft platform capable of carrying a large communications payload

- Scheduled for completion 2012, launch in 2012/13, design lifetime 15 years

- Will supplement the existing Inmarsat-4 satellites and provide augmented Broadband Global Area Network (BGAN) services over Europe, the Middle East and Africa

- Satellite will have access to a new allocation of L-Band radio spectrum across these regions

- http://www.inmarsat.com/About/Newsroom/00023439.aspx

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Inmarsat Cockpit Services

- Presented preliminary roadmap ideas for Safety Services over SwiftBroadband (SBB) at the July DLUF 07

- SBB safety service roadmap for oceanic and continental airspace safety services discussed as TWG of AEEC 781 (SwiftBroadband equipment specification group) in Nov 08 and RTCA in Jan 09

- Alphasat I-XL programme continues to meet milestones and expected to be available to launch at the end of 2012 - will provide coverage over Europe, Asia, Africa and the Middle East.

- Alphasat is a significant enabler for Safety Services over SwiftBroadband

- CEC ANASTASIA (SBB safety service study) Inmarsat deliverables produced (User Forum 24th / 25th June, Toulouse)

- Inmarsat providing technical assistance to ESA 'Iris' programme studying communications protocol and satellite system for ATM post 2020

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Comments and questions?

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Thank you