Agenda
Manufacturers Update

• Current Market Markets and Products
• SBB Safety Services Tests Bench Roll Out
• Flying SBB Safety – breaking the chronology
• Market Perspective – The E-enabled airline
• Aviator S Development
The HGA-7001 is certified on the following air-transport aircraft:

- A320 family
- B737
- A330
- A350**
- B777
- A380**
- B767
- B747-8**
- B787**

*** standard fit

Over 1550 HGA-7001 Antennas have been sold to more than 80 airlines to date
Business Jets Subset

• Bombardier
  - Lear 40/45/60
  - CL300, 605, 850 (A300, A700, IGA-5006, HGA-6000)
  - GX/XRS

• Dassault
  - F2000, F900, F7X
  - HGA-6000

• Hawker Beechcraft
  - 7/8/9, King Air 200

• Embraer
  - Legacy 450/500

• Cessna
  - Sovereign, XLS, Ten

• Gulfstream
Government / Military Subset

- LMCO C130 Hercules
- UAV Predator
- UAV Global Hawk
- BD-700 BACN
- Airbus Military
- SAAB 340 MSA
- Lockheed Martin P3
- Hawker Beechcraft C12
- Alenia C27J
- Raytheon trainer
- Various helicopters
Products for Cockpit and Cabin
Aviator 200, 300, 350 and 700 E/D
Aviator SP
SB200, 300, 400, 600, 800 and 1600
SBB Flight Trials
Bench Test Roll Out - Update

**SBU TT-5040A-THD** (Swift Broadband Unit = Satellite Data Unit)
- Incremental Implementation of test bench set-up with:
  - Inmarsat DP/ Service Providers
  - Service Providers

**SBU TT-5040A-THD** (Swift Broadband Unit = Satellite Data Unit)
- AAGW included, ACARS over SBB
- Level D software
- 1 x CMU interface
- No Aircraft Network Domain Segregation
- ARINC 404 tray interface

- Two possible system configurations

1. **Aviator 700D/S**
   - Includes Classic/S64 SDU + DLNA + HGA
   - Allows Classic Voice + ACARS over SBB (with Classic ACARS fall-back)

2. **Aviator 300D**
   - Includes single channel HLD + IGA (IGA-5001)
SBB Safety Services
First Flight Trial Achieved!

• The parallel Approach

• Boeing 767 Hawaii Airlines
  - Cobham Aviator 300D

• Airbus 319
  - An Airbus A319 aircraft has been installed with an **SB-Safety capable Cobham Aviator 300D** equipment for the purposes of proving the performance of the **ACARS over SBB service**
  - Services tested: ACARS over SBB, SB-Safety position reporting
  - The parties involved in the trial
    - Inmarsat
    - Satcom Direct
    - SITA
    - Cobham

• Data transmission

• The important dates
  - Installation of the SB-Safety equipment: 20th May 2014
  - First messages being transmitted: 23rd May 2014
  - Ocean regions flown in: AMER and EMEA
1. Aircraft Control / Air Traffic Control
   - high reliability and security
   - compliance with standards & mandates
2. Operational efficiency via applications with real-time communication
3. Cabin Connectivity - Crew and Passengers

How can we satisfy the different domain requirements?
• AVIATOR S Series

• IP Data (1 SBB Channel)
• ACARS Data
• Segregation between ATC Data and AOC Data
• Safe Voice

• Typical ARINC 781 ship set

• New AVIATOR 200S ship set

• 6MCU Box
• Flat Pack DLNA
• High Gain Antenna

• 2MCU Box
• Antenna
• MCHPA To support (class 6, 7 and multi channel options)

Same functionality in a much smaller package
Project Status
Aviator S development Schedule

- **Aviator S** System Product family is developed under common system architecture in CT and Lyngby
- Antenna and HPA elements being developed by the CT engineering team
- Satellite Data Modem being developed in Lyngby
- Diligent industry requirement undertaken
- Program is well under way
- Further details can be released under NDA
Questions?
Manufacturer updates

Honeywell
Possibilities of Connectivity. *Made Easy.*
Honeywell Aerospace . . . A $12B Business

Our technologies . . .

- Air traffic modernization
- Flight and runway safety
- Engines
- Integrated Mechanical and Electronic solutions
- Airborne connectivity
- Logistics and more

Serving commercial air transport, business & general aviation, military and airports
Aircraft Connectivity Is Becoming Pervasive

Flight Crew
- Cockpit avionics and connectivity

Maintenance & Operations
- Maintenance and operations data

Passengers
- Cabin connectivity

More than SATCOM . . .
Connectivity is wired & wireless, enabling applications and multiple recipients of information
Industry Trends

More sensors . . .  
More data collected . . .  
Easier data flow

More bandwidth . . .  
Much lower cost

Cheaper data storage and processing

Faster, more Comprehensive analytics

500 GB of data from 787 (average per flight)

Internet bandwidth up 32%  
Cost/bit down 18%

Storage doubles every 14 months for the same cost

More powerful CPUs & data mining software

Critical Mass Approaching for Innovative Solutions
Satellite Connectivity Solutions . . . Across the Spectrum

Tracking Assets

Connecting Cockpit
Terminals, Radomes, Antennas

Connecting Cabin
Terminals, Radomes, Antennas

Connecting Passengers
Servers, Routers, NWAPs

Inmarsat L Band
Aspire 200
HSD-400 HSD440\HD-710
MCS-7200
AMT Antennas
1800 (IGA)
3800 (HGA)
700 (HGA)
MCS8000/ MCS8200

Inmarsat Ka Band

CNX/CG Routers
Wireless Access Point
Server
MCS-7200; MCS-7120; HSD-440

• Cockpit Safety:
  – Supports existing interfaces
    • Cockpit audio
    • MCDU interfaces
  – WSCI Primus Epic interface
  – Level “D” certified SDU, HPA

• Typical Configurations
  – 1 -6 Aero-H+ Voice, 1 Aero Packet Data
  – 2 -4 Swift64`
  – 1 -3 SwiftBroadband

• May be configured to automatically switch between I-3 and I-4 satellites

• HSD-Xi adds additional SBB channels

• HDR – Software Service Bulletin
The Aspire Product Family

**Cockpit Services**
Cockpit Voice and Datalink services

**Cabin Services**
Voice and Data with Integrated PBX and Wi-Fi
New Satcom Technology Developments

• Enhancing Inmarsat Services
    • Software only Service bulletin for all Honeywell SBB products
  – Up to 700 kbps/channel
  – Increasing Cockpit Performance – Q1 - 2016
    • SB-Safety - Support ACARS and Cockpit Voice on SB
    • New smaller Antenna (Class 4 → 7)

• Supporting Alphasat, SGSN, Beijing SAS
  – Updates to Hon products to support modified network

• Inmarsat GX Aviation
  – More capacity and higher data rates available for Aircraft
  – World wide coverage

More capability → smaller equipage
Aspire-400 – The complete cockpit solution

- Cockpit Avionics Interface & Support for Inmarsat SwiftBroadband Safety
- HGA, IGA or ELGA support
- Cooperative interface to support Dual Satcom
AMT-1800 – Smallest IGA

- **Inmarsat Multichannel IGA**
  - 18.1” x 7.6” x 2.0”
  - ARINC 781 air transport functionality, in optimized form factor

- **Performance**
  - Inmarsat Class 4/7
  - Extended L-band frequency range for Alphasat (XLB)
  - Provides coverage over full Inmarsat volume (5° look angle)

- **Status**
  - Type Approved with Aspire 200
  - STC’d and flying

Available Now
Alphasat

- Inmarsat announced turn on of Alphasat moving from June, 2014 to March, 2015
- Honeywell SIL D201310000093 covers all products:

<table>
<thead>
<tr>
<th>Models</th>
<th>Solution</th>
<th>Technical Publication</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCS-3000/6000</td>
<td>ORT Update only</td>
<td>D201310000017</td>
</tr>
<tr>
<td>MCS-4000/7000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MCS-4200/7200</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MCS-7147/7163</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HD-710</td>
<td>Operating Software Update</td>
<td>Service Bulletin available June, 14</td>
</tr>
<tr>
<td>HSD-440</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HSD-400, Aspire</td>
<td>No change required</td>
<td>N/A</td>
</tr>
</tbody>
</table>

- HSD-440/HD-710 Service Bulletins available in June, 2014
Beijing SAS – China Handover

- Beijing SAS to be deployed Mid-July, 2014
- New Ground Station for China. SBB traffic to be force routed to Beijing SAS when in China region
- BGAN SDM CN 11/14 provides enhanced operation for SAS handover
- Honeywell terminals have CN 10 implemented
  - Analysis shows that terminal will log off and log back on to network when entering or leaving China region.
  - Applications will re-establish context
  - Test performed last week to confirm operation on air with ‘London SAS’
  - No issues reported.
- No action planned for Beijing SAS
Next Generation Aircraft Connectivity

Passenger Connectivity
- GX Aviation
  - Up to 50 Mb/s
  - Only Global High Speed Network

Cockpit Connectivity
- Aspire 400 A781
  - SB Safety Services
  - +SBB for Maintenance / EFB

GX Aviation
- Ka Inmarsat
- The Fastest Network Available
  - Globally, Seamlessly

Aspire 400
- Supports Cockpit and
  - Maintenance / EFB Applications
Thank You

Mark Goodman
Sr. Manager Marketing & Product Management
SATCOM Terminals

Honeywell Aerospace
400 Maple Grove Road
Ottawa, ON Canada
K2V 1B8
(613) 591.6040 x1103 Phone
(613) 286.2001 Mobile

www.honeywell.com
mark.goodman@honeywell.com
Manufacturer updates
Rockwell Collins
SATCOM Status and Roadmap

June 11th, 2014
Connectivity Use Case Domains

Flight Operations
- Dispatch
- Aviate
- Navigate
- Communicate

Business Operations
- Passenger Services
- Performance
- Documentation
- Maintenance
- Coordination
- Electronic Flight Bag

Passenger Connectivity
- Voice Communication
- Data Communication
- Entertainment
- Information

A.C.D.
- Aircraft Control Domain

A.I.S.D.
- Aircraft Information System Domain

P.I.E.S.D.
- Passenger Information and Entertainment System Domain

Ground– Connectivity
In Flight– Connectivity
Use Case Domains and Product Coverage today

**Enablement:**
- High safety standard
- Low to medium bandwidth
- Packet based protocols

Ground connectivity (If usage does not require real time exchanges)

**In-flight Safety product-line**
- Inmarsat / SBB (low/med)
- Iridium / Next (low/med)
- => L-Band based protocols

**Enablement:**
- Low safety standard
- Medium to Very High bandwidth
- IP based protocols

In-flight Cabin product-line

**Ground– Connectivity**

**In Flight– Connectivity**

ACD  
AISD  
PIESD

**Ground connectivity**

- Ka (highest speed)
- Ku (high)
- Air-To-Ground (med - high)
Rockwell Collins Inmarsat Solutions’ evolution

**ARINC 741 SAT-906/906B**
- 3-5 LRU’s / 18-22 MCU
- Cockpit voice and ACARS
- 1-2 Channels of SBB

**ARINC 761 SAT-2100B**
- 2-3 LRU’s / 8 -12 MCU
- Cockpit Voice and ACARS
- 1-2 Channels of SBB

**ARINC 781 Antenna**

**ARINC 781 SAT-2200**
- 1 LRU / 6 MCU
- Cockpit Voice and ACARS
- 1-2 Channels of SBB

1994  | 2004  | 2011
Rockwell Collins Inmarsat Solutions’ evolution

ARINC 741 SAT-906/906B
• 3-5 LRU’s / 18-22 MCU
• Cockpit voice and ACARS
• 1-2 Channels of SBB

ARINC 761 SAT-2100B
• 2-3 LRU’s / 8 -12 MCU
• Cockpit Voice and ACARS
• 1-2 Channels of SBB

ARINC 781 Antenna

ARINC 781 SAT-2200
• 1 LRU / 6 MCU
• Cockpit Voice and ACARS
• 1-2 Channels of SBB

SB200-Evol.
• 1 LRU / 2 MCU
• Single Channel:
  Cockpit Voice/ACARS
  200Kbps IP

1994  2004  2011  Future

Proprietary Information
Line-fit Airbus SA/LR status:
- SAT2100 is previous generation Inmarsat Satcom
- Rockwell Collins and Airbus are working on a replacement to be announced before 2015
## SAT2200 Line fit offerability

<table>
<thead>
<tr>
<th>Platform</th>
<th>Performance</th>
<th>Position</th>
<th>Available</th>
</tr>
</thead>
<tbody>
<tr>
<td>B737</td>
<td>One Channel of SBB</td>
<td>BFE</td>
<td>Now</td>
</tr>
<tr>
<td>B777</td>
<td></td>
<td>SFE</td>
<td></td>
</tr>
<tr>
<td>B747-8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bombardier Business Jets</td>
<td></td>
<td></td>
<td>Future</td>
</tr>
<tr>
<td>A350</td>
<td>One or two channels of SBB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B787</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Bandwidth ‘to Aircraft’ expectation with different trends

- **e-mail access**, **SMS**, **Social Networking**, **Internet browsing**, **Shopping on-line**, **EFB**
- **Safety Services**, **Secondary Com**, **HF replacement**
- **Skype**, **Live-TV / IPTV**, **Business VPN**, **Download**, **Non safety EFB**
- **Limited real time EFB safety applications**
- **Streamed content**, **Cloud computing**, **Operations**
- **Safety of flight remote content**
Bandwidth ‘to Aircraft’ expectation with different trends

Anticipate that very large broadband services (Ka, Ku, ATG) will:
- Be needed to satisfy the demand on board passenger connected A/C
- But will be optional
- And will not satisfy the requirements for Safety Services

Anticipate that L-Band services will:
- Be needed to satisfy Safety critical applications
- And will not be optional on intercontinental A/C
Footprint reduction example

Existing A781 6 MCU Solution → New A781 2 MCU Solution for future cockpits (SB200-Evol.)

With bigger HPA OR
Dual equipage without Next Gen L-Band

High Gain Antenna

Ka/Ku Antenna

Optional

Ka/Ku Satcom

Current A781 L-Band Satcom
Dual equipage Next Gen L-Band only

Blade Antenna

Next Gen L-Band Satcom

High Gain Antenna

Optional

Next Gen L-Band Satcom
Summary

• L-Band will not be replaced by Ku/Ka technologies
• L-Band Satcom is reinforcing its position in the cockpit step by step
• Expected significant reduction in all Life cycle costs with Next Generation of L-Band Satcom Systems
• L-Band will remain an acceptable cabin connectivity solution for the smaller platforms and the short trips when ATG is not available
Manufacturer updates
Thales Satcom and Connectivity

Julia Jiggins - General Manager Civil Avionics Sector
Flight Avionics
Thales UK
Markets served by Thales

Dual markets civil / military

Defence
Aerospace
Space
Security
Ground Transportation

Trusted partner for a safer world
- Cockpit-only, Cabin-only and Cockpit/Cabin configurations – with appropriate segregation and security
- Classic Voice and ACARS/FANS Data / Up to two channels of SBB including CS Voice over SBB
- ARINC 781 Compliant
  - Breakthrough in size and performance
  - Housed in a single 6 MCU enclosure
- Compatible with all onboard communication networks
  - Thales TopConnect, Airbus KID-Systeme, Aeromobile, eXConnect
TFS Cockpit Integration

- Engine indication and crew alerting system
- Centralised fault display system
- Three multifunction control and display units
- Two audio control panels
- Aircraft / Portable Data Loaders
- Inertial Reference System / GPS
- Straps / Discretes
- Power
- Maintenance Terminal

TFS tightly integrates with cockpit systems
TopFlight Satcom integration with TopConnect

TFS integrates with fully connected IFE systems
TopConnect Onboard Network

- Thales WiFi
  - Secondary cabin network
  - Crew and passenger
  - Communications management
  - Bandwidth optimisation

- Thales mobile network
  - GSM/GPRS/SMS Services

- Mobility and entertainment
  - Connected IFE experience

- Media delivery
  - Streamed wireless to PEDs
  - Distribution of live media – TV (Planned)

Proven with SwiftBroadband

A rich suite of bearer-agnostic connectivity solutions
TopFlight Product Roadmap

**TFS**
- Current multiservice L-band Satcom

**TopConnect**
- Connectivity Server optimising bandwidth

**TopFlight Satcom**
- In-service Satcom
- Inmarsat Classic
- Inmarsat SBB

**SDCC**
- SW Defined Terminal Channel Card

**SDCC Building Block**
- Multi-waveform capable
- Classic
- SBB / SB-SS
- Precursor
- Antares
- Iridium

**TFS NG**
- Multi-waveform Satcom Terminal

**TFS NG Product**
- Next gen Satcom
- Classic
- SBB / SB-SS
- Precursor
- Antares
- Iridium

**IMC**
- Integrated Modular Comms for All ATM & Connectivity

**Future IMC Product**
- Multi-band
- Multi-waveform
- Security
- Routing
- All comms stds

THALES
**Product Roadmap and Supporting R & T Programmes**

**FUTURE ATM**

- **Anastasia**
  - Future ATM Waveforms
  - Basis of Class 4/15 SBB

- **Antares**
  - Future ATM Terminal Technologies: antennas, HPA, avionics

- **TFS**
  - Current multiservice L-band Satcom

- **TopConnect**
  - Connectivity Server
  - Optimising bandwidth

- **SDCC**
  - SW Defined Terminal Channel Card

- **TFS NG**
  - Multi-waveform Satcom Terminal

- **Precusor**
  - Precursor System for SESAR Evaluation of SATCOM

- **Thaumas**
  - Use of Commercial Infrastructure for future ATM

- **IRIS**
  - SESAR 2020 - 2030

- **IMC**
  - Integrated Modular Comms for All ATM & Connectivity

**SECURITY ACTIVITIES**

- **SANDRA**
  - Seamless Networking on SW Defined Radio / IMR Concepts

- **GAMMA**
  - Network security supervisor

- **INCBAC**
  - Secure, optimised routing: ATM and general connectivity

- **SHARON**
  - Future Secure Seamless Networking / IMR

- **HARNet**
  - Aeronautical Growth Partnership IMR

---

**THALES**

**Secure Multi-Bearer Connectivity**
L Band market

◆ Thales sees a strong and growing long-term market for L Band Satcom
  ○ Cockpit: ‘Safety Services’ status is a key OEM requirement for the long term
  ○ Cabin: mobility applications, GSM & Wi-Fi can all be delivered with SBB

Inmarsat roadmap

◆ Thales is following the Inmarsat roadmap
◆ Thales continues to maintain its 6MCU ARINC 781 Product Range
  ○ Alphasat; SGSN: Change Note 11
◆ Thales will expand its L Band Product Range in line with published evolutions of ARINC 781 – 2 MCU LRUs
  ○ SwiftBroadband Safety services and extended L Band will be incorporated
◆ Thales has a vision for multi-band Satcom product range
### Cockpit Connectivity

**Boeing 777F**
- TopFlight™ Satcom
  - Classic Voice and Data
  - SwiftBroadband (AMBE+2™ Voice / EFB)

### Cockpit and Cabin Connectivity

**Boeing 737 and 777PAX**
- TopFlight™ Satcom
  - Classic Voice and Data
  - SwiftBroadband (AMBE+2™ Voice / EFB)
  - Integrated with Thales GSM / GPRS / SMS

### Cabin Connectivity

**Airbus Single Aisle A320 family**
- TopFlight™ Satcom
  - Integrated with Airbus KID-Systeme GSM / GPRS / SMS

**Embraer 170 / 190 / Lineage**
- TopFlight™ Satcom & TopConnect™
  - Thales WiFi / Airline Portal / VoIP (Through PEDs)
  - Billing Application
  - Caching and Bandwidth Optimisation

**Boeing B787 / B777**
- TopFlight™ SATCOM & TopConnect™
  - Thales WiFi / Airline Portal / VoIP (Through PEDs)
  - Thales GSM / GPRS / SMS
  - Connected IFE (Through the Seat Back Screen)
- Boeing Linefit on 777 and 777F
- Multi-Service TopFlight SATCOM

**Can be configured as:**
- One Classic Aero SATVOICE and one Classic Aero data, plus one SwiftBroadband Channel (providing a non-safety cockpit voice channel plus IP data)
- Or two Classic Aero SATVOICE and one Classic Aero data channel
- Or two channels of SwiftBroadband

**In service**
- 777 – Aeroflot
- 777F – Multiple operators

**Flange Mount HPA used to overcome installation constraints on 777F**
Boeing Linefit

Multi-Service TopFlight SATCOM

Can be configured as:

- One Classic Aero SATVOICE and one Classic Aero data, plus one SwiftBroadband Channel (providing a non-safety cockpit voice channel plus IP data)
- Or two Classic Aero SATVOICE and one Classic Aero data channel
- Or two channels of SwiftBroadband

In service

- US Navy Clipper (C40A)
- Malaysia Airlines

Single-Channel version STC’d

Cockpit voice and data services and/or Cabin connectivity
- **Dual Multi-Service TopFlight SATCOM**

- **Dedicated cockpit Satcom**
  - One Classic Aero SATVOICE and one Classic Aero data, plus one SwiftBroadband Channel (providing a non-safety cockpit voice channel plus EFB connectivity)
  - High Gain Antenna (HGA)

- **Dedicated cabin Satcom**
  - Two channels of SwiftBroadband
  - High Gain Antenna (HGA)

- **Saudi Arabian installation pending**

- **Entertainment**
  - Augmented IFE experience
  - Media delivery

- **WiFi Connectivity**
  - Personal Electronic Devices

- **GSM/GPRS/SMS**
  - Thales designed solution
  - Configured to support 16 concurrent voice calls

*Live news, Web browsing, E-mail, SMS, Cellular phone calls and data services*
Embraer Lineage 1000 & ERJ 170/190

- **Embraer Linefit**
  - Lineage 1000 and ERJ 170/190
- **Dedicated cabin Satcom**
  - 2 channels of SwiftBroadband
  - High Gain Antenna (HGA)
- **In service with multiple private operators**

- **Cabin Server and WiFi Access Point**
  - WiFi Connectivity
  - Two Ethernet ports (RJ45) for wired laptops
- **Airbus linefit**
  - A318/319/320/321
- **Dedicated cabin Satcom**
  - 1 channel of SwiftBroadband
  - Intermediate Gain Antenna (IGA)
- **In Service with multiple airlines**
- **GSM/GPRS/SMS**
  - OnAir / KID-Systeme solution
First Connectivity system available on the Boeing 787

Dedicated cabin Satcom
- 2 channels of SwiftBroadband
- High Gain Antenna (HGA)

In Service with Qatar Airways

Entertainment
- Augmented IFE experience
- Media delivery

WiFi Connectivity
- Personal Electronic Devices

GSM/GPRS/SMS
- Thales designed solution
- Configured to support 16 concurrent voice calls

Live news, Web browsing, E-mail, SMS, Cellular phone calls and data services
Thales TopFlight Satcom Installations

Airbus A320 Family

Boeing 737NG

Embraer Lineage / 190PR

Boeing 777 PAX

Boeing 777F

Boeing 787
End of Presentation
Aviation Partner Conference
10-12 June 2014