

**Worldwide Avionics Mandates /
Technologies Update**
West Palm Beach

March 23, 2016



Agenda

- **Worldwide Avionics Regulatory Mandates**

- Mandate Summary
- Large Cabin Compliance
- Mid Cabin Compliance
- FANS 1/A+ (GIV/GV Update)

- **Technologies Update**

- GIV / GV Flight Deck
- G450 / 550 Flight Deck
- G280 Flight Deck
- G150/200 ADS-B In/Out
- Cabin Connectivity / In Flight Internet
- LED Lights

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WORLDWIDE MANDATE SUMMARY

Mandate	Region	New A/C CofA Date	Fleet Retro-Fit Date
ADS-B OUT v1	Australia Asia-Pacific	December 12, 2013	December 12, 2013
ADS-B OUT v2	Europe U.S.	Europe - June 8, 2016 U.S. – January 1, 2020	Europe – June 7, 2020 U.S. – January 1, 2020
FANS 1/A+	ICAO North Atlantic (NAT) Region	February 7, 2013: FL360-390, Two Tracks in OTS February 5, 2015: FL350-390, All Tracks in OTS December 7, 2017: FL350-390, NAT Region January 30, 2020: FL290 & Above, NAT Region	
LINK 2000+	Europe	February 5, 2020	
DATA LINK RECORDING	FAA-registered a/c with CPDLC	Part 135 – Dec 2010 Part 91 – April 2012	Not required
	EASA-registered	April 8, 2014	Not required
TCAS 7.1	Europe	March 1, 2012	December 1, 2015

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LARGE-CABIN MANDATE SUMMARY

Mandate	GIV	GV	G450	G550	G650
ADS-B Out v1	ASC 481A	ASC 192A	Standard as of Dec 12, 2013	Standard as of Dec 12, 2013	Standard (ASC 045)
ADS-B Out v2	Target 2Q16	Target 2Q16	ASC 059B (prerequisite)	ASC 084B (prerequisite)	ASC 036
			ASC 079 (ADS-B Out v2)	ASC 105 (ADS-B Out v2)	
FANS 1/A+	Target 2Q16	ST04030AT-D	ASC 059B / 071 (Enhanced Nav)	ASC 084B / 096 (Enhanced Nav)	Standard
Link 2000+	Exempt	Exempt	Holding Release (ASC 092)	Holding Release (ASC 115)	Holding Release (ASC 039)
Data Link Recording	Target 2Q16	ST04030AT-D	ASC 072A	ASC 097A	Standard
			Standard 4252+	Standard 5375+	
TCAS 7.1	ASC 480	ASC 188	ASC 077	ASC 103	Standard
			Standard 4256+	Standard 5380+	

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MID-CABIN MANDATE SUMMARY

Mandate	G100	G150	G200	G280
ADS-B Out v1	No Announced Program	v2 solution fulfills v1 requirement	v2 solution fulfills v1 requirement	Standard
ADS-B Out v2	No Announced Program	ST04299AT-D	ST04021AT-D	ST04026AT-D (3.6 MOS)
FANS 1/A+	Under Evaluation	Under Evaluation	Under Evaluation	Standard – Retrofit for In-service a/c
Link 2000+	Permanent Exemption Requested	Permanent Exemption Requested	Exempt	ST04025AT-D (3.6 MOS)
Datalink Recording	Under Evaluation	Under Evaluation	Under Evaluation	Standard – Retrofit for In-service a/c
TCAS 7.1	SB100-34-306	SB-141	SB 200-34-402	Standard

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FANS 1/A+ - Definitions

Future Air Navigation System (FANS 1/A+)

FANS 1/A+ consists of two technologies

- Controller-Pilot Data Link Communication (CPDLC)
 - Uses “text messages” to replace voice communication over HF
 - DO NOT confuse this with PM-CPDLC (Link 2000+)
- Automatic Dependent Surveillance – Contract (ADS-C)
 - Provides automatic aircraft position reporting
 - DO NOT confuse this with ADS-B

FANS requires Datalink Recording – storage of messages on CVR

LOA from country of registry required to operate FANS 1/A+

There is NO SUCH THING as a FANS exemption

The Gulfstream logo is located in the bottom right corner of the slide. It features the word "Gulfstream" in a blue, serif font, with a horizontal line extending to the left from the letter "G".

GIV / GV FANS 1/A+ - Program Update

- **GV - STC ST04030AT-D FAA Certified**
- **GIVSP – STC in work available 2Q2016**
- **GIV – STC certification aircraft identified available 2Q2016**

- GV Program Details
 - Certification
 - Triple IAC aircraft certified
 - Dual IAC aircraft certified
 - Dual IAC, 3rd NZ2000 (additional certification program 2Q2016)
 - Implementation
 - Complete and submit FANS survey - provided by RSM
 - Acceptance of proposal and receipt of 50K deposit for slot request
 - Program management / scheduling to secure slot



GIV / GV FANS 1/A+ - System Architecture



Product	Included/Option	Notes
Flight Management System Version 6.1	Prerequisite	FMS 6.1 prior/concurrent required
FMS 6.1 FANS Upgrade	Included	FANS "mini" load part of FANS
Cockpit Display	Prerequisite	CD-810/820 (830 future) required
Mark III - Communication Management Unit	Included	Replaces AFIS DMU
SATCOM (Level D Certified)	Prerequisite	MCS3000/6000/7000/HD710
VHF Data Radio Mode 2	Included	Collins VHF-4000
Aural and Visual Alerting	Included	External Annunciators-Discretes
Cockpit Voice Recorder with DLR	Included	Datalink Recording CVR
Cockpit Printer	Optional (Extra)	Print out of CPDLC messages

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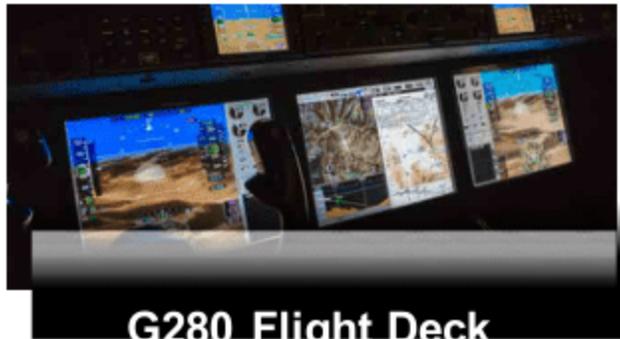
GIV / GV FANS 1/A+ Summary

FANS BENEFITS SUMMARY

- Gulfstream solution is totally integrated into existing SPZ-8XXX cockpit suite
- OEM solution, global AOG support
- Utilizes proven Honeywell MK III solution (thousands flying today)
- Maintains all FMS functionality (i.e., Autothrottle, Autopilot, VNAV)
- Preferred, more direct oceanic routing
- Fully automated position reporting
- Digital data link communication with ATC
- Request / Receive clearances on CDU
- Auto acceptance of clearances into flight plan
- HF radio only used as backup
- RNP 4 compliance
- OEM LOA Guidance

The Gulfstream logo is located in the bottom right corner of the slide. It features the word "Gulfstream" in a blue, serif font. The background of the slide is a faded image of a cockpit instrument panel, showing a map of the North Atlantic Ocean with flight paths and various data fields.

Technologies Update



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GIV / GV FLIGHT DECK

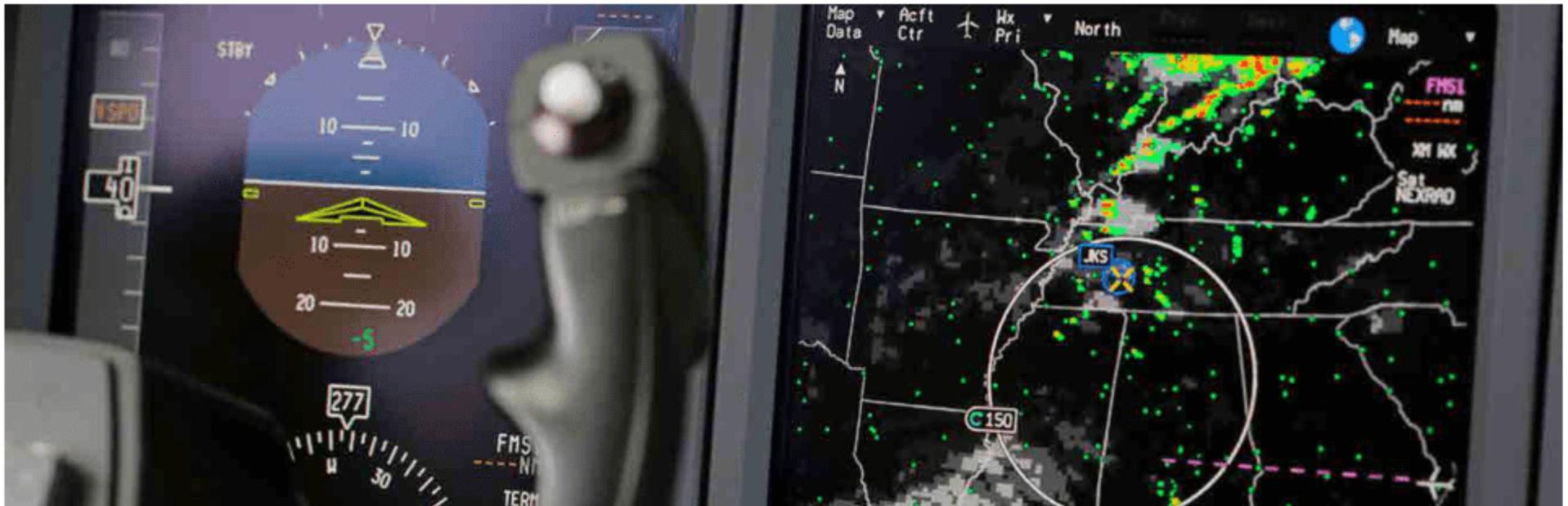
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GULFSTREAM PLANEDECK

AN AVIONICS UPGRADE WITH THE FUTURE IN MIND



*The Gulfstream GIV and Gulfstream GV cockpits leap forward in avionics capability with a PlaneDeck retrofit, which replaces the original Cathode Ray Tube (CRT) primary flight displays with sharper, more vivid Liquid Crystal Display (LCD). **Over 100 systems now in service.***

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GULFSTREAM PLANEDECK

Benefits Summary

SAFETY – INCREASED SITUATIONAL AWARENESS:

- Integrated electronic charts and maps with geo-reference
- Integrated XM graphical weather
- Multiple video display capabilities
- Paperless terminal area charts and approach charts

ADDS VALUE:

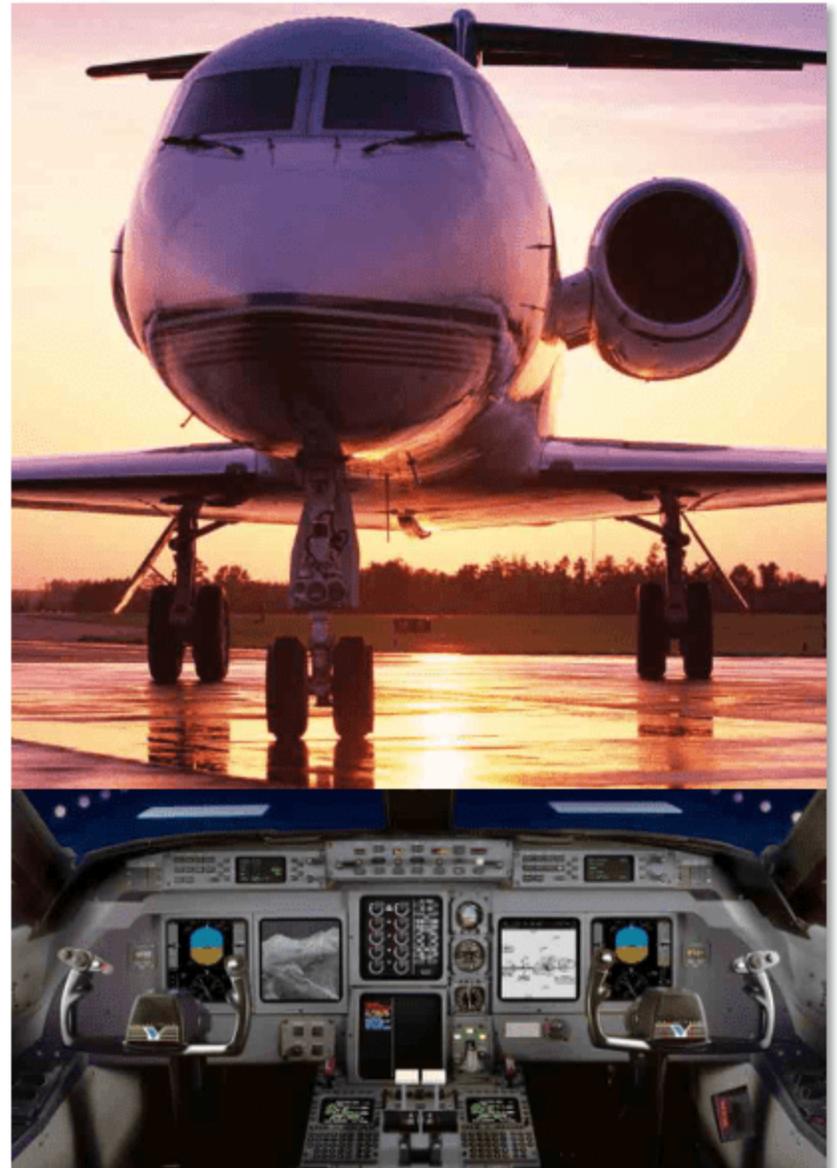
- PlaneDeck installation increases BlueBook value of the aircraft
- 2yr display warranty
- 1yr labor warranty

EFFICIENT OPERATIONS:

- Increases system reliability
- Requires minimal pilot training
- Reduces aircraft weight
- Reduces pilot fatigue
- Maintains current display formats

MAINTENANCE EASE:

- Elimination of the avionics cooling system fans and ducting
- Elimination of cooling system filters and maintenance
- Elimination of required, recurring maintenance of display swapping

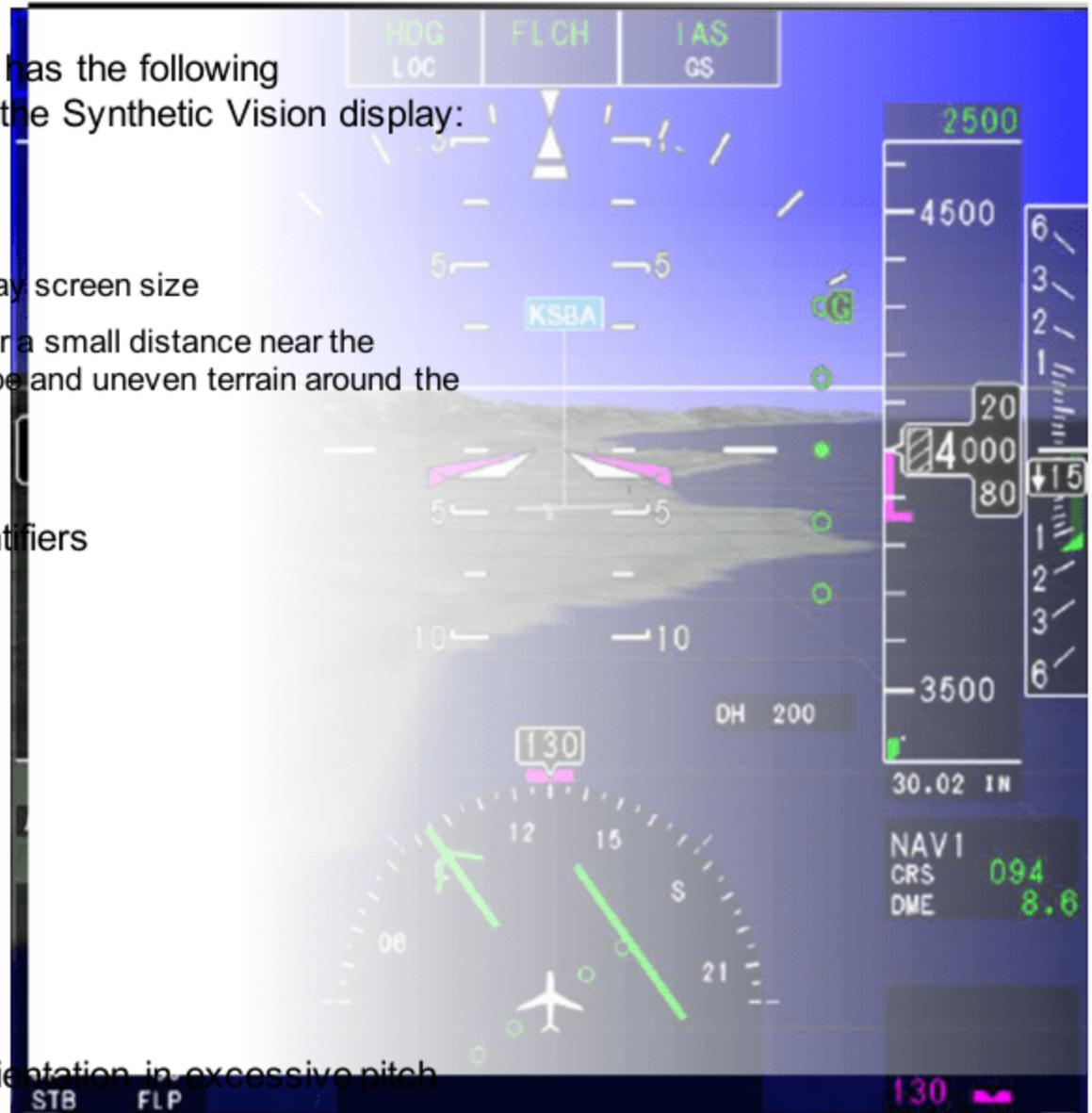


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PlaneDeck Synthetic Vision – (PDSV)

The PFD/SVS function within the DU885 has the following symbology and characteristics related to the Synthetic Vision display:

- Terrain
 - Ground and water features
 - Tailorable field of view based on the display screen size
 - Terrain Leveling: Flattening of terrain over a small distance near the runway area to overcome the runway slope and uneven terrain around the runway area
- Grid lines
- Nearest airports with symbols and identifiers
- Runway depiction
 - Runway symbol and detailing
 - Arrival runway highlighting
- Obstacles >200ft
- Heading centered field of view
- Light source (sun positioned) fixed
- Ground overlay
- Sky overlay
- Symbology to determine the aircraft orientation in excessive pitch attitude



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PDSV - Takeoff (TO) Mode



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PDSV - Enroute Cruise



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PDSV - Blue Over Brown



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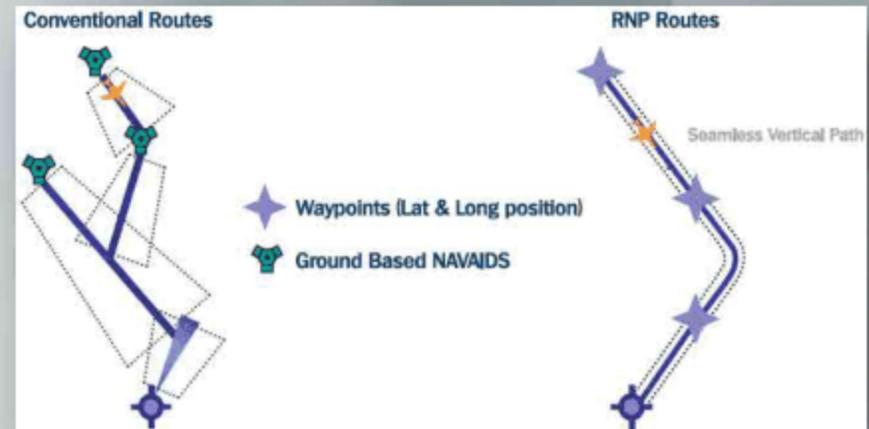
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FMZ-2000 FMS 6.1

Built for the Now, Designed for the Future

- Software upgrade to Honeywell's FMZ-2000 Flight Management System (FMS)
- Wide Area Augmentation System-Localizer Performance with Vertical Guidance (WAAS-LPV)
- Basic improvements, including:
 - circling approaches in the navigation database
 - en-route and approach vector operations
 - Vertical Navigation System (VNAV) temperature compensation
- Required Navigation Performance (RNP) enables aircraft to fly more precise approaches
 - lower minima operations
 - more favorable routing in congested or terrain-challenged airspace
 - noise-abatement compliance
 - improved safety and lower operating costs
- Future Air Navigation System (FANS) and ADS-B Out Version 2 prerequisite



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KOLLSMAN GAVIS

See What Others Can't

- Improved situational awareness at night and in low-visibility conditions
- Enhanced imagery of airports, air traffic, terrain, taxiways and runway conditions
- GAVIS video can be displayed on PlaneDeck and Rosen monitors



BENEFITS SUMMARY:

COMPACT

Self-contained infrared camera

STREAMLINED

Innovative Gulfstream styling

AERODYNAMIC

Low-profile aerodynamic design

LIGHT

Weighs less than four pounds

EASY TO USE

Just turn on and view the image

FLEXIBLE

Operates day, night and under low visibility conditions

COMPATIBLE

Can interface with many existing video-capable head-down displays

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LED COCKPIT LIGHTING

Modernize Your Aircraft

Regardless of an aircraft's age, dispatch ability, reliability and maintainability are important operator concerns.

Gulfstream's new aircraft service changes install new LED lamps, allowing you to enhance cockpit reliability and reducing your maintenance costs quickly and easily.

NEW LEDS VS. OLD INCANDESCENT LAMPS

- Colors are much richer and more vivid
- Whites are brighter and emit a light much whiter over existing incandescent light
- Reds, greens and ambers hues are consistent with the incandescent light
- Provide efficient balanced dimming capabilities
- Reliability is improved 1,000 times over incandescent lights
- Surface temperatures have been measured up to 80 degrees cooler
- Maintenance and power consumption are significantly reduced



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G450 / 550 FLIGHT DECK

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PLANEVIEW MOS UPDATE

- Common Master Operating System (MOS) to adopt an efficient long-term support strategy
- ASC 911A and 090 established as the baseline MOS for G350/G450 aircraft
- ASC 911A/113A established as the baseline MOS for G500 and G550 aircraft
- No charge upgrade prior to July 1, 2016
- Current capacity allows for 15 shipsets per month

Status	Est. Downtime	Est. Cost to Mod
ASC906	7 days	No Charge
ASC907	5 days	No Charge
ASC908/A/B/C	5 days	No Charge
ASC909/A/B	2 days	No Charge
ASC910	2 days	No Charge/\$3,300*

**ASC910 customers only, labor at GAC facility is billable.*



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ENHANCED NAVIGATION

- Future Air Navigation System (FANS) 1/A+ capability
- Prerequisite for ADS-B Out
- WAAS-LPV approach capability
- Electronic terminal charts (certified as paperless)
- Required Navigation Performance (RNP) enables aircraft to fly more precise approaches:
 - Allows lower minima during inclement weather
 - Increases safety due to repeatable and predictable paths
 - Supports the NextGen capabilities and allows better access to busy airports



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Gulfstream SV-PFD – Description

- SV-PFD is a 3D color representation of the terrain, airports and obstacles in the geographical area around the aircraft
- SV-PFD is selectable for display on each pilots Primary Flight Display
- SV-PFD presents a daytime VFR view of the surrounding terrain, regardless of the outside time or visibility
- Gulfstream was the first business jet manufacturer to offer SV-PFD, and was the first to have SV-PFD certified by both the FAA and the European Aviation Safety Agency (EASA)
- As of 2015, China is listed by Jeppesen as WGS-84 compliant permitting SV-PFD use in Chinese airspace

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Gulfstream SV-PFD - Databases

- SV-PFD uses the same terrain database as EGPWS, which is updated as part of the normal terrain database update process (Green Disc)
- Obstacles and airports are provided by Jeppesen, which is maintained as part of the normal navigational database update cycle
- The terrain database is proven on EGPWS with over 600 million flight hours
- The airport database contains over 8,600 airports and 30,000 runways
- The obstacle database includes over 108,000 obstacles

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Gulfstream SV-PFD Basic Features

- Standard HUD based flight information symbology
- Colored textured display of outside terrain
- HSI with integral EGPWS Terrain and TCAS Traffic display



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Gulfstream SV-PFD Depth of Field Features

- Range Rings
 - 3, 5, 10, 20, and 30 NM ranges
 - Conformal with terrain
- Grid Lines
 - Oriented north/south and east/west
 - 0.4 NM spacing



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Gulfstream SV-PFD HSI Features

- HSI

- Top-down view of EGPWS terrain
- SV-PFD display view Frustum
 - Depicts area displayed on SV-PFD display when HSI range < 150 NM
- TAWS pop-up
 - EGPWS terrain warning/caution areas immediately displayed
- TCAS target display pop-up
 - In response to TCAS RA/TA
- CDI needles remain up during EGPWS/TCAS pop ups -
reduced to 50% brightness



Gulfstream SV-PFD Airport/Runway Display

- Airports (runway layout) shown in white
- Selected approach runway highlighted in Cyan



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Gulfstream SV-PFD Extended Runway Centerline

- Selected approach runway lead-in line/extended centerline distance markers
 - 1 NM intervals up to 9 NM
 - Numerical value displayed to right of centerline



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Gulfstream SV-PFD Runway Detailing

- Runway centerline
- Runway numbering
- Texturing
- Runway detailing is displayed when runway is within:
 - 1 NM laterally
 - 500 ft vertically
 - 30 degrees of view-point bearing
- Runway detailing aids pilots in detecting aircraft motion



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G280 FLIGHT DECK

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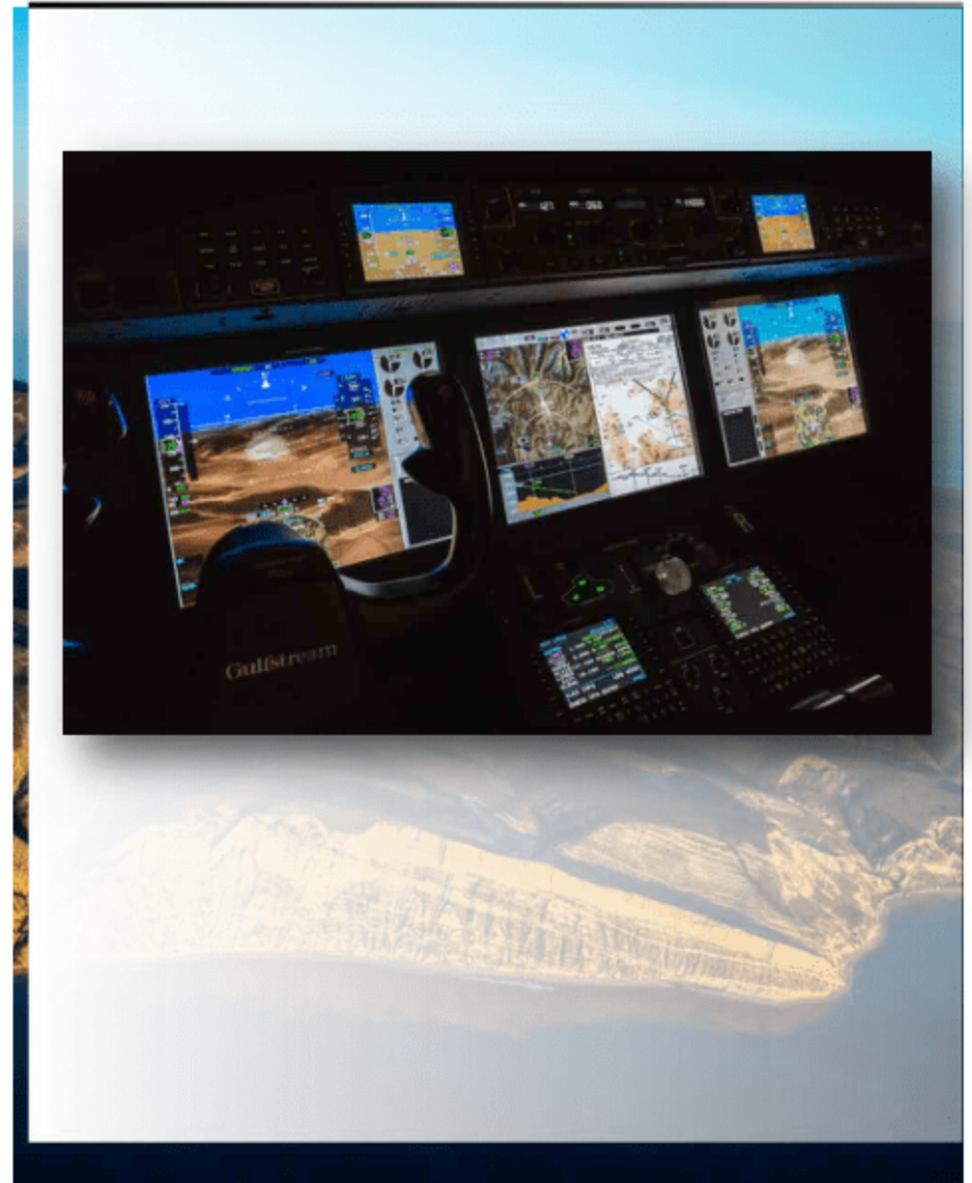
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G280 AVIONICS v3.6 FEATURES

Enhanced display layout:

- Full map and chart on the center AFD
- $\frac{3}{4}$ PFD – new stacked EICAS presentation
- CAS home location moved to the pilots AFD
- Extended ADI height in the $\frac{1}{2}$ PFD
 - AOA and DH moved
 - Relocated HIS
- Revamped memorized display configurations
- Updated SMC menus to reflect new configuration
- $\frac{1}{4}$, $\frac{1}{2}$ and full format menus have a window size selection

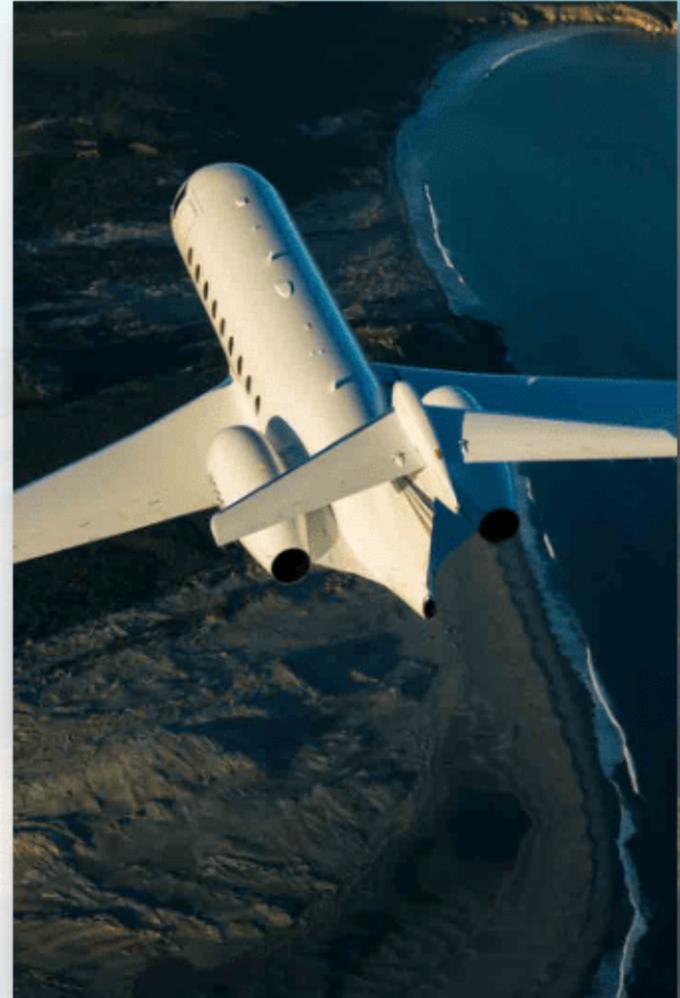


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G280 AVIONICS v3.6 FEATURES (cont'd)

FMS enhancements:

- FMS performance calculation enhancements
 - Equal Time Point (ETP)
 - Max Cruise
 - Long Range Cruise
 - Max Range Cruise
 - Endurance Cruise
 - Continuous Speed Targets
 - BTMS adjustments for Vs speeds
 - Required Time of Arrival
 - Predictive Steps
- Updated forecasted winds algorithm
- Display of VSD on the maps



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G280 AVIONICS v3.6 FEATURES (cont'd)

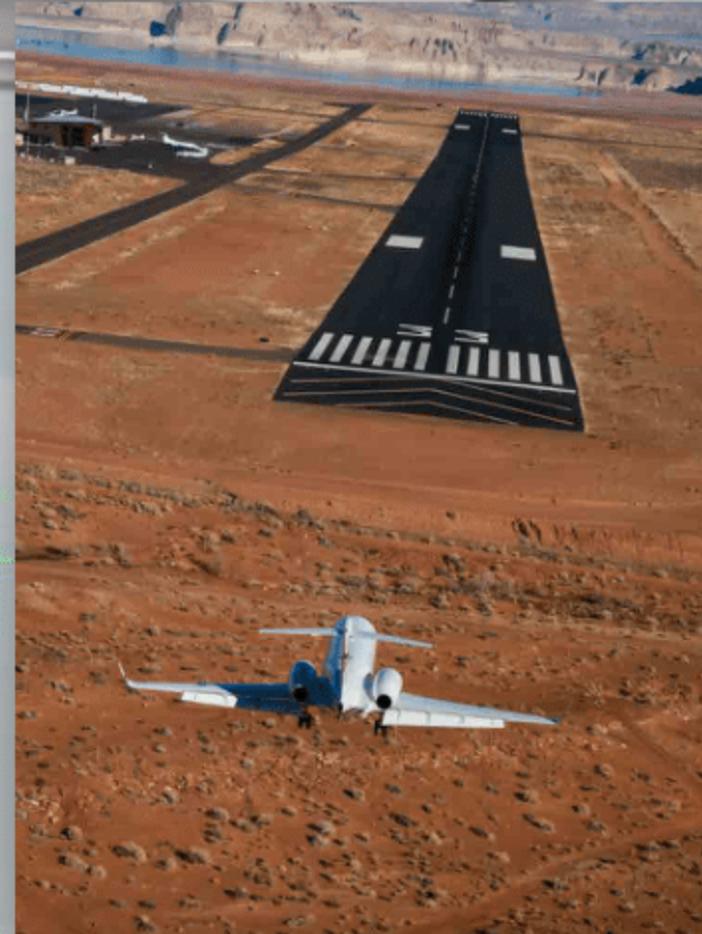
- Vref reduction by ~8-9 knots
- Retuned autopilot gains
- Stick shaker sensitivity reduction
- Activation of Worldview for graphical flight planning
- Maintenance enhancements
 - Updated OMS equations
 - SFIS alignment via the Test and Rigging interface
 - Activation of the Rockwell Collins Ascend system for WiFi transfer of aircraft databases
- v3.6 enables or is a prerequisite for the following options:
 - Synthetic Vision System
 - ADS-B Out Version 2
 - Link 2000+



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HEAD-UP GUIDANCE SYSTEM WITH EVS

- HGS delivers critical flight information and guidance cues that inform and assist pilots in every phase of flight
- EVS II provides live, infrared imagery of the approach and landing environment to the HGS
- Enables use of SA CAT I approval and EVS CAT I lower landing minima
- Overlays aircraft flight path and attitude symbols with the real world
- Assists in maintaining stabilized approaches



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G150/200 ADS-B IN/OUT

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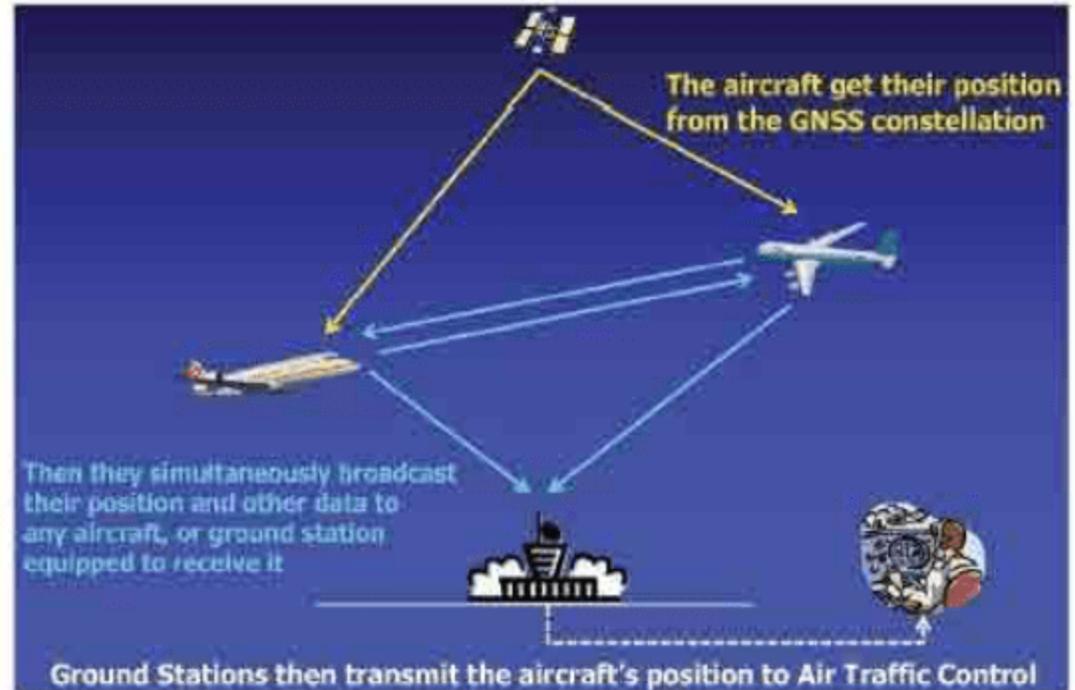
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What is ADS-Broadcast?

Answer:

- **ADS-B Out:** Periodic transmission of accurate aircraft position, speed, identification & direction data to facilitate more accurate radar-like coverage without ground-based radar.
- **ADS-B In:** Appropriately equipped aircraft will be able to receive and process external ADS-B Out transmissions to provide cockpit display of surrounding traffic.



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G150/200 ADS-B Out Mod Summary

- LRU Installations
 - Replacement of (2) Transponders in Fwd Avionics Compartment
 - Installation of UAT/GPS/Flight Stream 210 Bluetooth Xcvr in Fwd Avionics Compartment
 - Cockpit Switch/Indication Panel
- Antenna Installations
 - (1) GPS Antenna Top Mount
 - (1) UAT Antenna Top Mount
 - (1) UAT Antenna Bottom Mount
- Electrical Installations
 - LRU Interconnect Harness
 - FWD Bulkhead Penetrations
 - Antenna Harness

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GTX 3000 Transponder

- Replaces TDR 94 Transponder(s)
- Mode A, C, And S Functions
- European Mode S Mandates For Elementary And Enhanced Surveillance
- 1090 Mhz ADS-B Extended Squitter (ES) Transmission Per Tso-c166b And DO-260B
- Supports Remote IDENT, Automatic Selection And De-selection Of On-the Ground Mode, And Flight ID Capability



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GDL 88 ADS-B Datalink Processor

- Low-cost UAT (978 Mhz) transceiver with integrated 1090 Mhz receiver
- Imbedded GPS WAAS Xcvr
- Provides ADS-B out.
- Provides ADS-B in, TIS-B, FIS-B, conflict alerting, and traffic correlation, *without reliance on ground station*
 - *Requires installation of Flight Stream 210 Bluetooth Transceiver*
 - *Displayed on operator provided Portable Electronic Device (PED)*



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Flight Stream 210 Bluetooth Transceiver

- Displays the following via PED and Garmin “Pilot” app
 - ADS-B In
 - Synthetic Vision
 - TIS-B traffic
 - FIS-B
 - METAR, SPECI, PIREP, winds/temp aloft, TAF, NOTAM, AIRMET, SIGMET, SUA, TFR, NEXRAD



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CABIN CONNECTIVITY AND ENTERTAINMENT

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Current HSD options for GAC Aircraft

Specs	Yonder (BBML)	SwiftBroadband	Gogo
Hardware Provider	ViaSat	Honeywell (Thrane)	Gogo (Aircell)
Network Provider	ViaSat	Inmarsat	Gogo Biz
Method	Satellite	Satellite	Air-to-Ground
Coverage Region	Most populated land masses, except China, Russia, India	Global, except Polar Regions	U.S. & Canadian Border
Up To Speeds / Maximum Speeds	2 Mbps	432 kbps (332 kbps Mid Cabin)	3.1 Mbps
Frequency Band	Ku-band	L-band	3G

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BROADBAND MULTILINK (BBML)

GULFSTREAM'S HIGH-SPEED DATA SOLUTION

- Gulfstream's ultra-high-speed data system
- Delivers internet access via a Ku Band satellite data channel between the aircraft and ground
- Supports connections over optional L Band data connections such as Inmarsat
- Transfer speeds of up to 2.0 mbps
- Available in North America, the North Atlantic, Western Europe, the North Pacific and areas of Africa and South America
- Smartphone compatibility
- Optional voice-over internet protocol (VOIP) capability

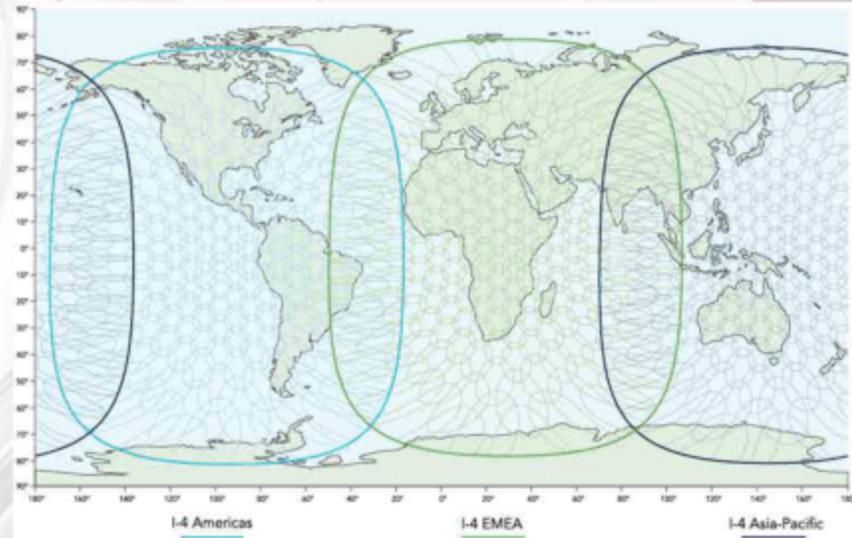


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SWIFT BROADBAND (HD710)

AN OFFICE IN THE SKY

- Bandwidth on demand (experienced data rates of approximately 300 kbps)
- Surf the web and send/receive email
- Low-cost, high-quality voice calls
- Near worldwide coverage using Inmarsat satellite network
- Simple and straightforward upgrade to existing Honeywell Satcom systems
- Supports safety services (Level D certified)



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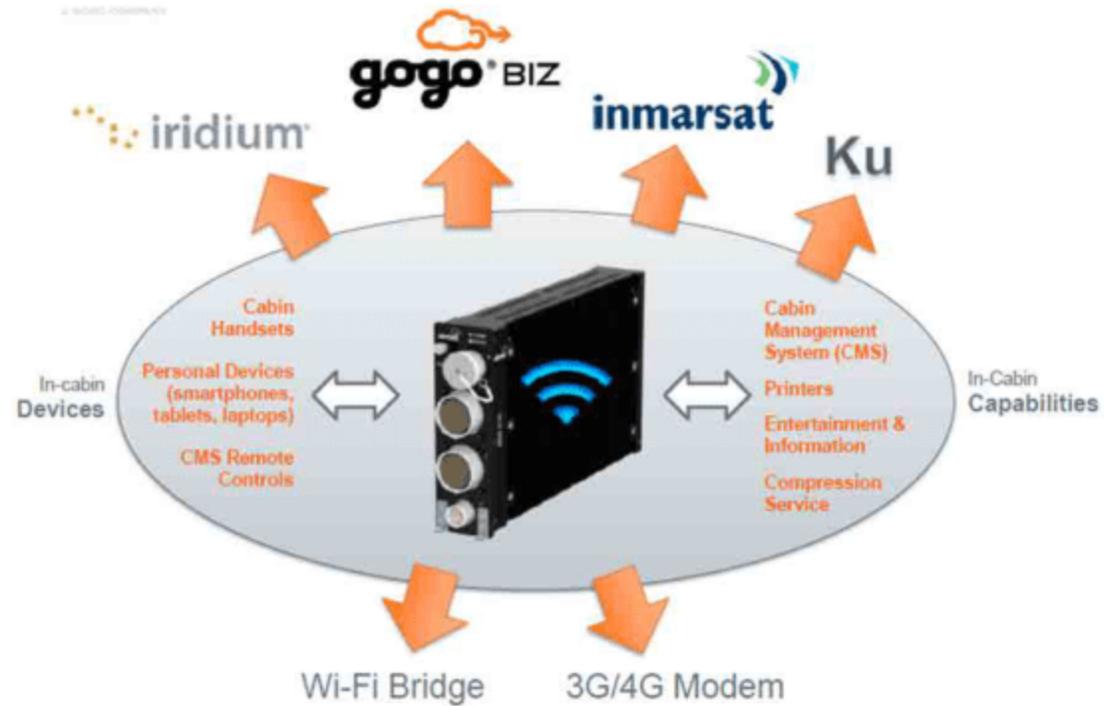
SD-600 Obsolescence

- Installed in over 400 GIV / GV aircraft
- Honeywell announces that the SD600 and RF600 are BER
- MCS-3000 / MCS-6000 systems effected:
 - MCS 3000 architecture includes SD600 / HP600
 - MCS 6000 architecture includes SD600 / HPA600 / RF600
- Gulfstream Solution
 - Remove MCS 3000 / 6000
 - Install MCS-7120
 - Single LRU
 - Current G650 production
 - Inmarsat SBB capable
 - Global AOG support
 - Significant weight savings
 - Trade-in credits

UCS 5000

ALL-IN-ONE SMART ROUTER

- 802.11b/g/n Wi-Fi service
- Wireless access point
- Single SSID for the cabin
- Manages voice & data networks
- Cabin and cockpit interfaces
- 3G/4G modem
- PBX for wired/wireless handsets
- Data compression

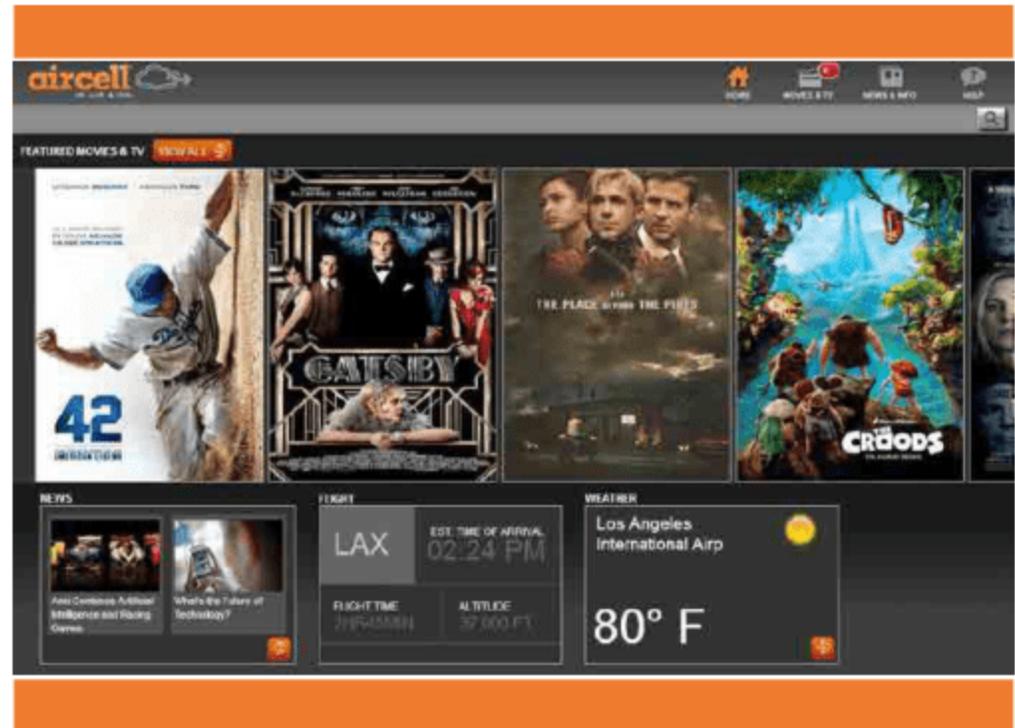


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UCS 5000

COMPLETE, ON-DEMAND SYSTEM

- Streamed from on-board server to personal Wi-Fi devices
 - Laptops – Windows and Mac
 - Tablets – iOS and Android (apps available)
 - Variety of web browsers
- Not a “Bring Your Own” approach
 - Apps and browser plug-ins available from server
 - No need to download anything before departure
- Fully automatic updates available via Gogo Cloud
- Available via software key with UCS system (additional fee required)
- Video Processing Unit (GVPU) will provide interface to CMS (in development)



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SATCOM DIRECT ROUTER

NEXT-GENERATION AIRCRAFT NETWORK ROUTER

- Satellite Ready – L, Ku, Ka ready
- Multiple SSIDs offers more WiFi bandwidth for streaming media
- STC'd for 2.4 or 5.0 Ghz
- Aero XR: acceleration, compression and data caching
- Designate bandwidth to VIP's device for a better experience
- Customer must acknowledge device to be added to WiFi, reducing unwanted data consumption
- WAN Management
- Global One IP Address- seamless handoff (3G/SBB/KU)
- 3G cellular data support while a/c is indicating 75 kts or less
- Multiple configurations to support different mission profiles

- Enables Global VT (with Satcom Direct services)



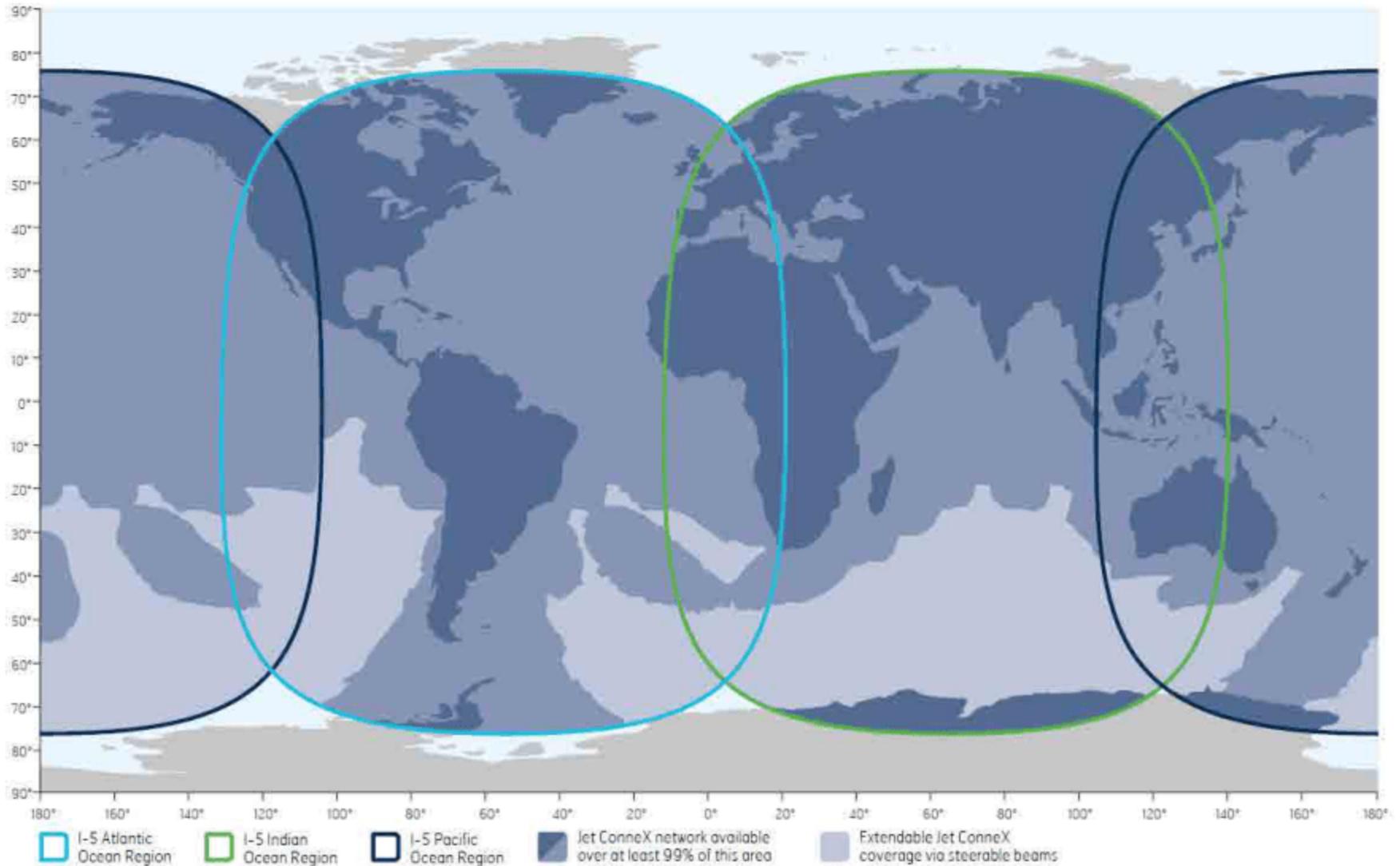
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Key Benefits of Jet ConneX

- Consistency
 - Global coverage, except polar regions
 - Operational at all altitudes and on the ground
 - Consistent speeds across the network
 - Committed Information Rate (CIR) guarantees minimum level of service even in highly congested areas
- Reliability
 - Dual ground stations (satellite access stations “SAS”) add redundancy into the network to provide high level of service
 - Inmarsat industry leader with proven track record in satellite networking
- Speed
 - Speeds significantly faster than existing systems to support more user applications
 - Jet ConneX maximum is 15.0 Mbps
 - Yonder maximum 2.0 Mbps – JX is 7.5x faster
 - SwiftBroadband maximum 432 kbps – JX is 34x faster

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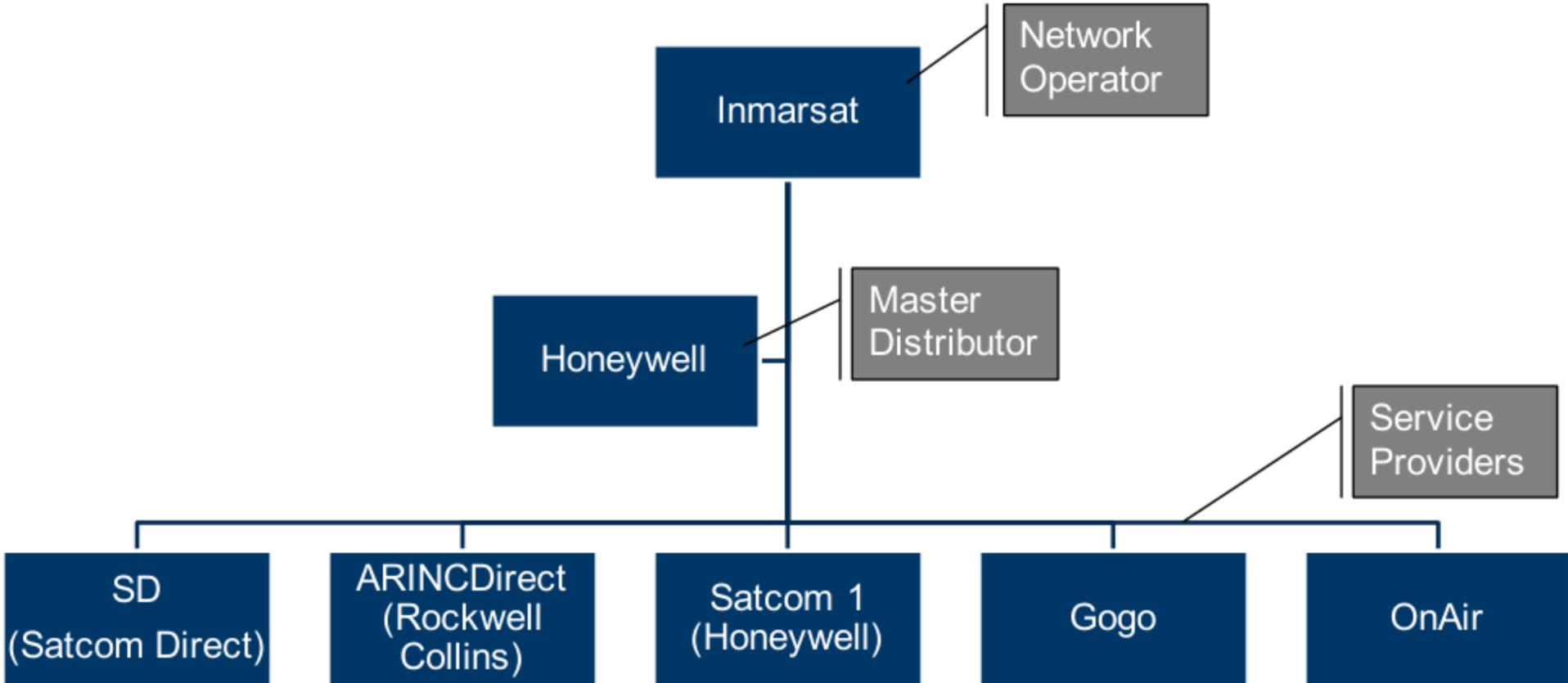
Inmarsat I-5 Jet ConneX (Ka) Coverage Map



This map depicts Inmarsat's expectations of coverage, but does not represent a guarantee of service. The availability of service at the edge of coverage areas fluctuates depending on various conditions. Jet ConneX coverage February 2016.

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Jet ConneX Value Chain for Service Providers



Customers may chose service from multiple providers

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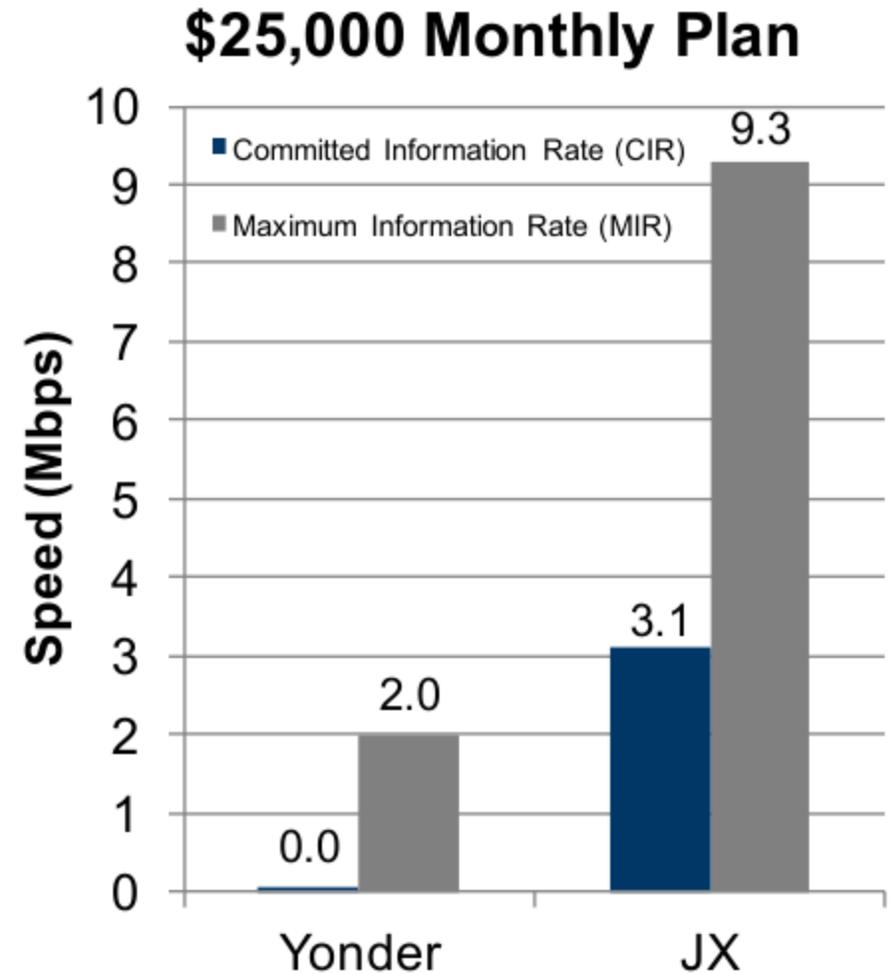
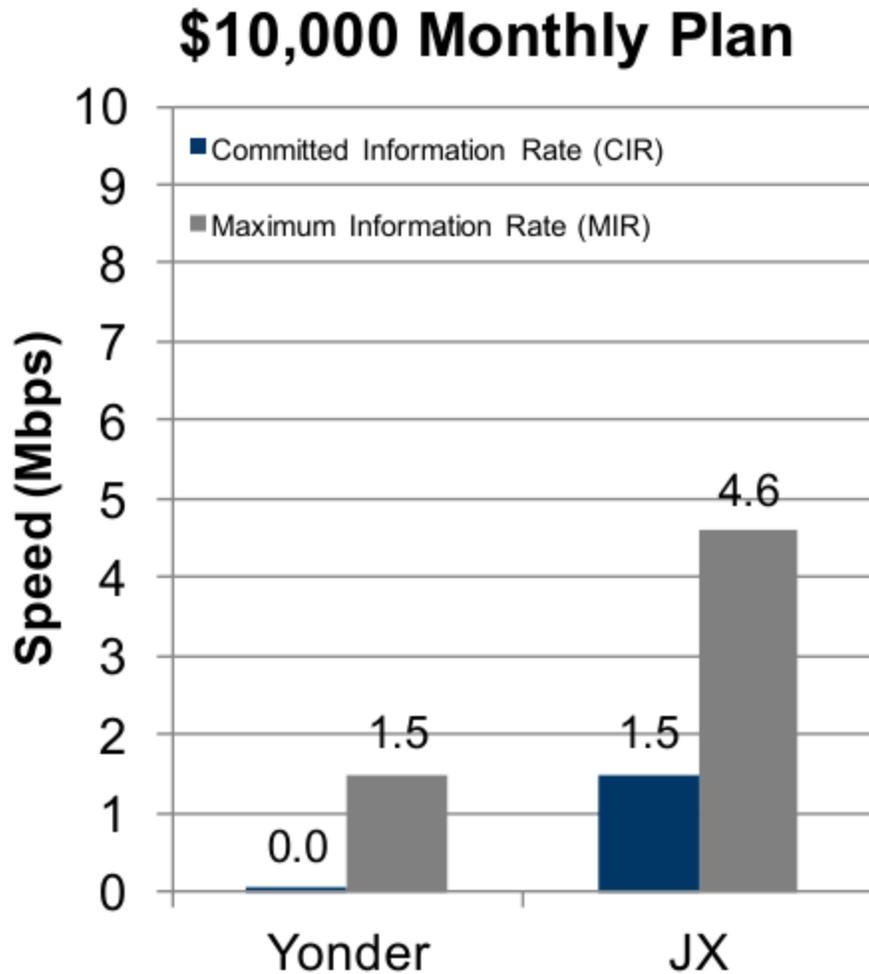
Jet ConneX Subscription Pricing

Monthly Plan	Volume Data Allowance (GB)	Committed Information Rate (Mbps)	Maximum Information Rate (Mbps)	Suggested Monthly Retail Pricing from Inmarsat
Promo	25	1.0	3.0	\$7,000
1	30	1.5	4.6	\$10,000
2	35	2.0	6.1	\$15,000
3	40	2.6	7.7	\$20,000
4	45	3.1	9.3	\$25,000
5	95	6	15	\$45,000

Committed Information Rate (CIR) first in market to guarantee speeds for customers

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Yonder v. JX Speeds and Pricing Comparison



Significant value proposition for JX: higher speeds and greater coverage at comparable prices

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Setting Customer Expectations on Speed



BUSINESS AVIATION

Satcom Direct Validates Ka-band Services for Bizav

by Chad Trautvetter - August 25, 2015, 11:00 AM



Business aviation communication provider Satcom Direct announced today that it validated its services over Inmarsat's new Ka-band Global Xpress network, which is expected to be available by year-end. With speeds of up to 50 Mbps, Jet ConneX—the business aviation version of Global Xpress—will deliver global satcom services that support high-data-rate applications in flight, including streaming videos and real-time video calls.

To verify functionality of its aero network and software services over the Inmarsat-5 satellite network, Satcom Direct provisioned a Global Xpress land terminal. The test was conducted at Satcom Direct's facility at Farnborough, Europe, the Middle East, Africa and Asia.

...g to advance airborne data speeds in a significant way," said "Being the first in business aviation to prove our technologies over it...we're preparing for the future."

tion airtime and hardware for business aviation and it is working services to business aviation end-users. These partners include om Direct.



TRENDING

- AUG 25, 2015 - 9:00 AM XTI Looks to 'Crowdfunding' for Trifan 600
- AUG 24, 2015 - 10:42 AM FAA Details Bizjet Drone Encounters
- AUG 19, 2015 - 9:22 AM Bristow CEO: No Recovery until Late 2017
- AUG 18, 2015 - 2:02 PM Ready for Operations to Cuba



Passengers aboard business aircraft can soon turn the cabin into a serious mobile office.

Announcing Jet ConneX (JX), the business aviation service powered by Inmarsat's Ka-band Global Xpress network, supported by Honeywell Aerospace's JetWave™ hardware. With download speeds up to 33Mbps, passengers and operators can now access fast, global in-flight Wi-Fi across land and sea, while boasting the same speeds they're used to at home and in the office. JX is set to debut in the first half of 2015.

Important to communicate accurate speeds, as publications have printed misleading information

For more information, visit aerospace.honeywell.com
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Applications Supported

- Video streaming
 - TV and movie streaming
 - Video conferencing
- Faster web browsing
- Faster email
- Faster VPN connections
- Clearer phone calls - VoIP

Video Streaming Speeds

Minimum Speed Requirements per Video Stream

Provider	SD (480p)	HD (720p)	HD (1080p)
Netflix	3.0 Mbps	5.0 Mbps	N/A
Amazon Prime	0.9 Mbps	3.5 Mbps	N/A
HBO GO	N/A	3.0 Mbps	N/A
Roku	3.0 Mbps	N/A	6.0 Mbps
Apple TV	2.5 Mbps	6.0 Mbps	8.0 Mbps
slingbox	0.4 Mbps	1.5 Mbps	N/A

Requirements are per stream, minimums must be increased for multiple streaming users

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Video Conferencing Speeds

Minimum Speed Requirements per Video Stream

Provider	SD (480p)	HD (720p)
FaceTime	N/A	(1 Mbps upload)
Skype	N/A	N/A
WebEx	0.5 Mbps upload & download	2.5 Mbps down (3.0 Mbps upload)

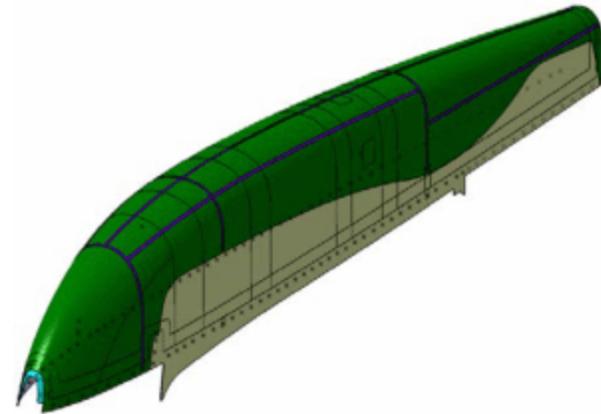
Requirements are per stream, minimums must be increased for multiple streaming users

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JX Installation Components



LRU Hardware
(Honeywell)

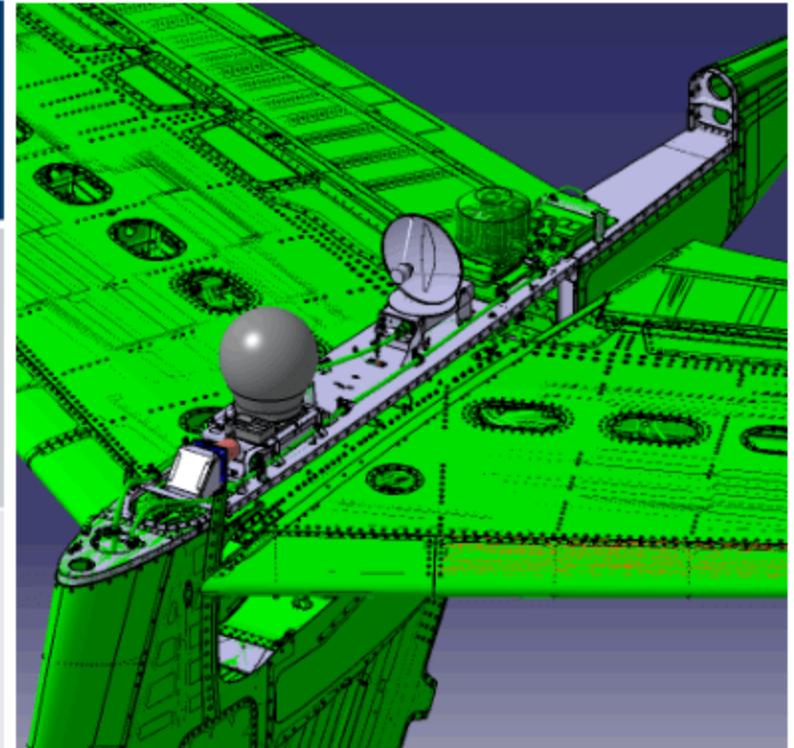


Tail Fin Cap
Radome
(Saint-Gobain)

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Antenna Real Estate in G500/G600/G650 Tail

Antenna Matrix	Forward Position #1	Middle Position #2	Aft Position #3
Current Configuration	ViaSat Yonder (Ku-band)	SatTV (Ku-band)	SBB / Safety Services (L-band)
Configuration 1: Jet ConneX	Jet ConneX (Ka-band)	SatTV (Ku-band)	SBB / Safety Services (L-band)
Configuration 2: Jet ConneX*	Jet ConneX (Ka-band)	ViaSat Yonder (Ku-band)	SBB / Safety Services (L-band)



Real Estate for three (3) antennas in G500/G600/G650 tail

* Future configuration under investigation

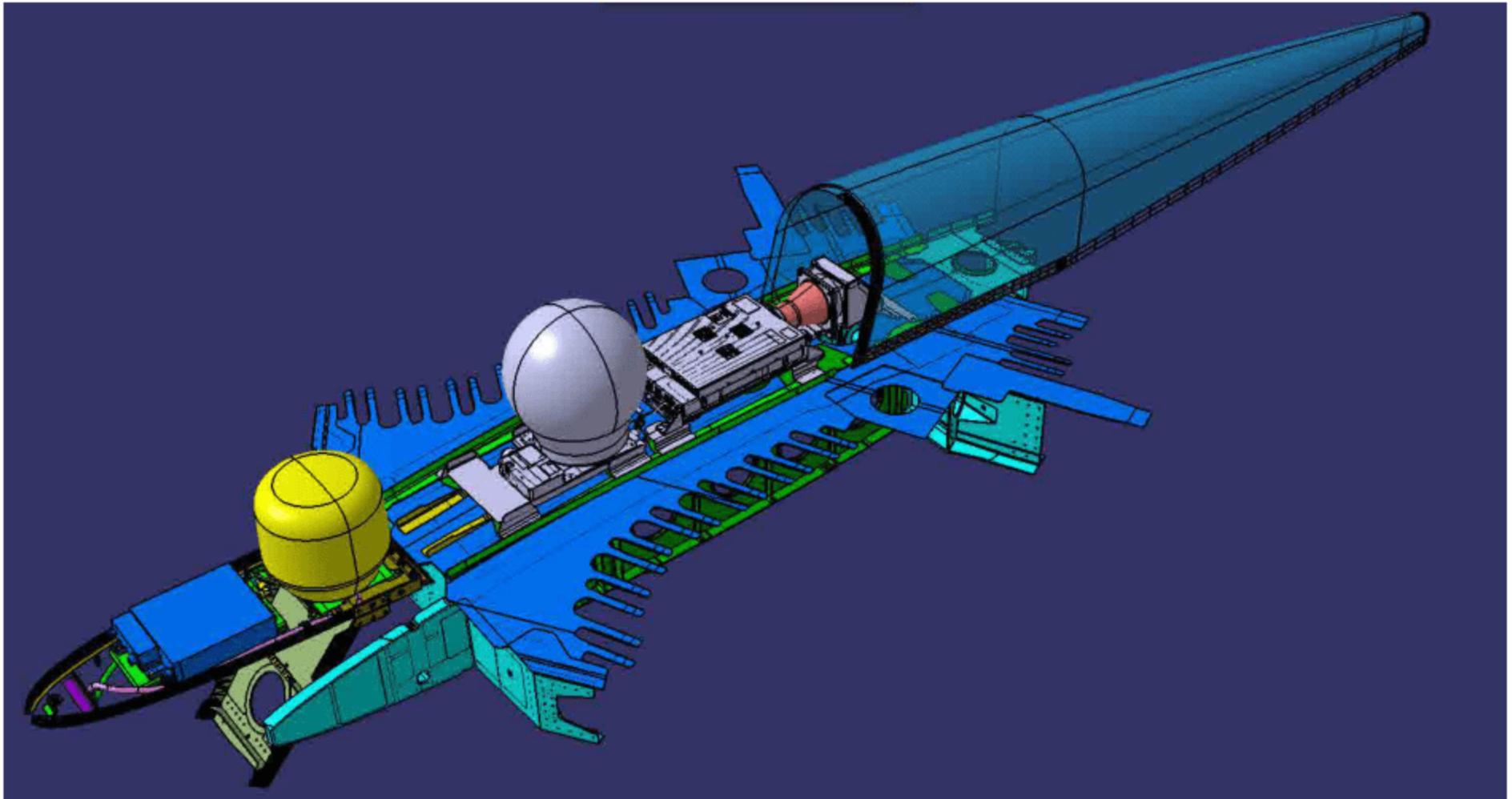
Antenna Real Estate in Tail – G550

Antenna Matrix	Forward Position #1	Middle Position #2	Aft Position #3
Current Configuration	SBB / Safety Services (L-band)	SatTV (Ku-band)	ViaSat Yonder (Ku-band)
Jet ConneX Configuration	SBB / Safety Services (L-band)	Jet ConneX (Ka-band)	

Real Estate for two (2) tail mount antennas with JX

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Antenna Real Estate in Tail – G550



Honeywell KRFU in place of third antenna

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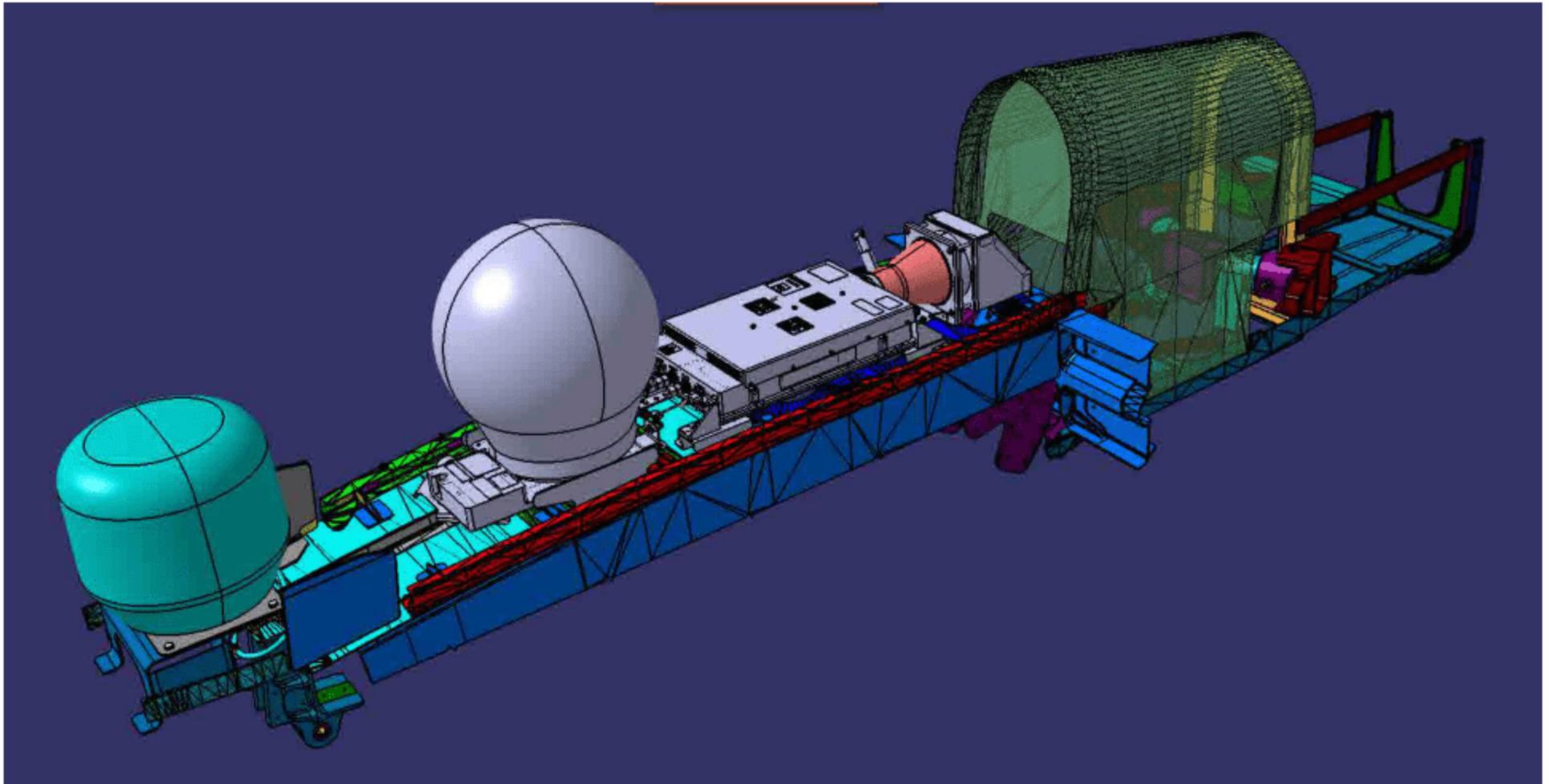
Antenna Real Estate in Tail – G450

Antenna Matrix	Forward Position #1	Middle Position #2	Aft Position #3
Current Configuration	SBB / Safety Services (L-band)	ViaSat Yonder (Ku-band)	SatTV (Ku-band)
Jet ConneX Configuration	SBB / Safety Services (L-band)	Jet ConneX (Ka-band)	

Real Estate for two (2) tail mount antennas with JX

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Antenna Real Estate in Tail – G450



Honeywell KRFU in place of third antenna

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G650 Jet ConneX Program Schedule

Milestone	Date	Complete
Preliminary Design Review Hardware	Oct 2015	✓
G650 ITF Hardware Installation	Feb 2016	✓
Critical Design Review Hardware	Feb 2016	✓
Radome Prototype Testing	Feb 2016	✓
First Install and Test Hardware - 6020	May 2016	
First Install and Test Radome - 6020	Sep 2016	
In-Service Evaluation	Sep 2016	
STC Availability	4Q2016	

Budgetary pricing comparable to current ViaSat Ku

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G550 / G450 Jet ConneX Program Schedule

Milestone	G550	G450	Complete
Preliminary Design Review Hardware	Feb 2016	Feb 2016	✓
ITF Hardware Installation	Feb 2016	Feb 2016	✓
Radome Prototype Testing	Feb 2016	Feb 2016	✓
Critical Design Review Hardware	Apr 2016	Apr 2016	
Critical Design Review Radome	Aug 2016	Aug 2016	
STC Availability	1Q2017	2Q2017	

Budgetary pricing comparable to current ViaSat Ku

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AIR-TO-GROUND (ATG)

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Gogo BIZ



■ Depicts coverage at 21,000 feet MSL.*
Coverage typically increases at higher altitudes.
*Canadian service availability expected first quarter 2014.
Subject to change. All illustrated coverage areas are approximate.

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of Aircell Business Aviation Services LLC and its affiliates. March '13.

Gogo BIZ 3G maximum speed 3.1 Mbps

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4G ATG Market Evolution

4G Comparison Highlights	SmartSky Networks	Gogo Biz 4G
Announced	October 2014	October 2015
Network Ready and Hardware Certified	4Q2016	1Q2017
Coverage	Domestic US	Domestic US
Maximum Theoretical Speed	31.7 Mbps	9.8 Mbps
Technology	4G LTE	3G EVDO Rev B
Network Status	Unlicensed	Licensed
Spectrum Size	60 MHz	3 MHz
Antennas	Two fuselage mount	Two fuselage mount + Two vertical tail mount
Wiring	Likely new wiring required	Potential to use existing wiring
Service Provider	Satcom Direct (exclusive)	Gogo (exclusive)
Router Integration	SDR	TBD
Incentives	Early Bird Special	Trade in value for existing systems

Competitive bid (RFP) with both companies in process

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IN-FLIGHT ENTERTAINMENT (IFE)

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Where Content is Viewed

Aircraft Monitors

- Bulkhead monitors
- Individual seat monitors

Personal Devices

- Smart phones
- Tablets

Assumption: Content must be viewable in both locations

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Where Content is Stored

Aircraft Installed Equipment

Maximum
Obsolescence
Risk,
Minimum
Flexibility

- Gulfstream-installed equipment (Blu-Ray, Gen 4v2 & Gen 5 w/ Thales)
- Customer-installed equipment (AppleTV, Amazon Fire)

Medium
Obsolescence
Risk,
Medium
Flexibility

Personal Devices

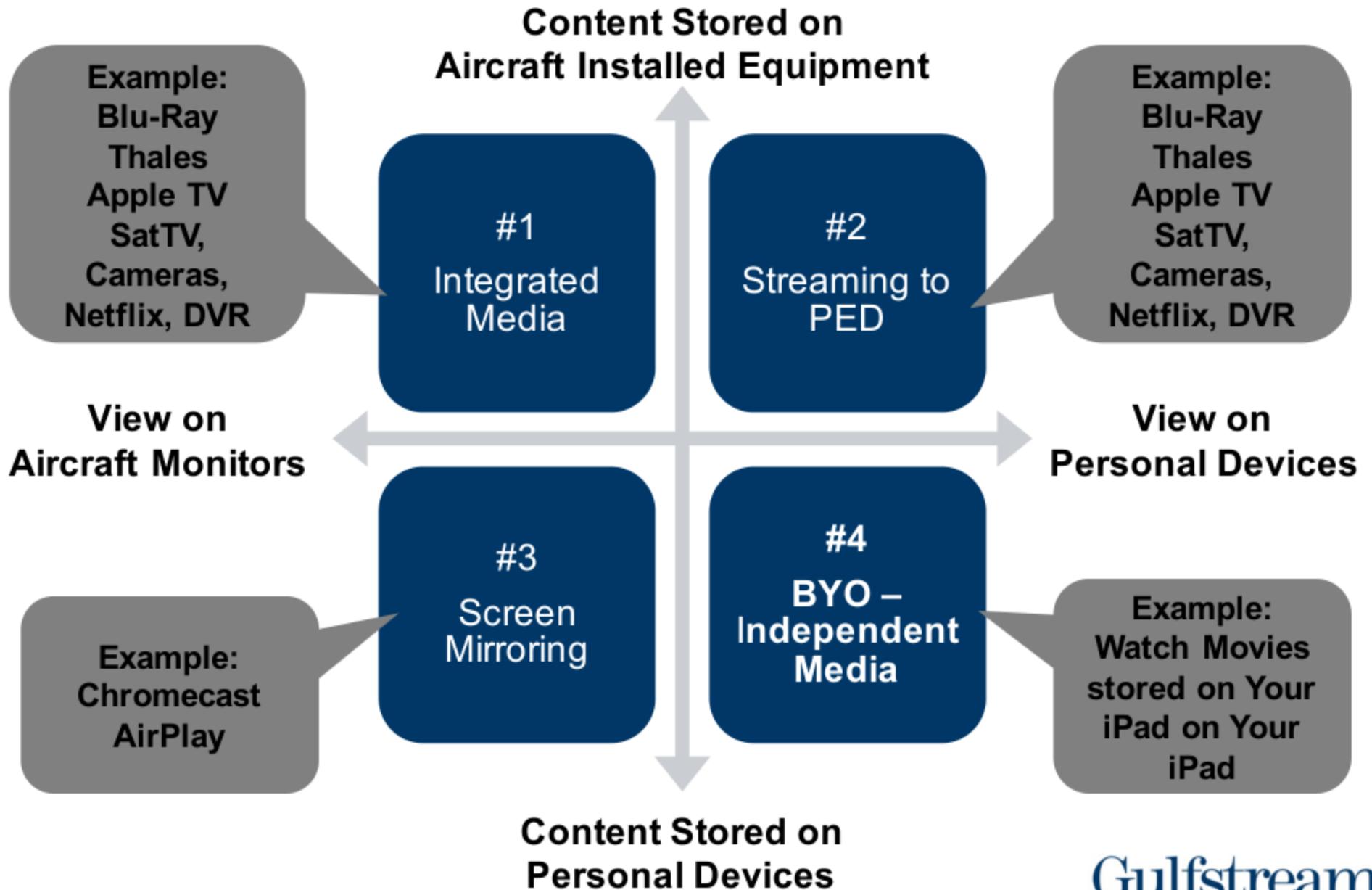
- Smart phones
- Tablets

Minimum
Obsolescence
Risk,
Maximum
Flexibility

Assumption: Content must be stored in both locations

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Entertainment Content/Viewing Matrix

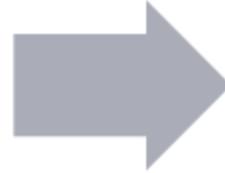


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#1 Integrated Media

Today

- Blu-ray player
- Apple TV
- Amazon Fire
- Kaleidescape



Tomorrow

- Thales IFE
- Rockwell Collins
"Stage"
- Apple TV
- Others

**New entrants to IFE market with various price points,
content offerings and obsolescence risk**

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4K Ultra High-Definition Key Features

- Resolution
 - Successor to 1080p, the current high-definition resolution found on modern TV sets
 - 4 times more data than 1080p HD video (8M v 2M pixels) – more pixels
 - 4K also called Ultra HD (varies by aspect ratio of monitor)
 - 4K take picture much closer to capabilities of the human eye
- High Dynamic Range (HDR)
 - Enhances the contrast and color profile of the picture – better pixels
 - Realism of colors, more lifelike
 - Colors more vibrant, blacks are deeper
- Wide Color Gamut (WCG)
 - Increases from 35% to 75% of color gamut, includes more colors
- Smart TV capability



Comparison of picture with and without High Dynamic Range (HDR)



Comparison of picture with and without Wide Color Gamut (WCG)

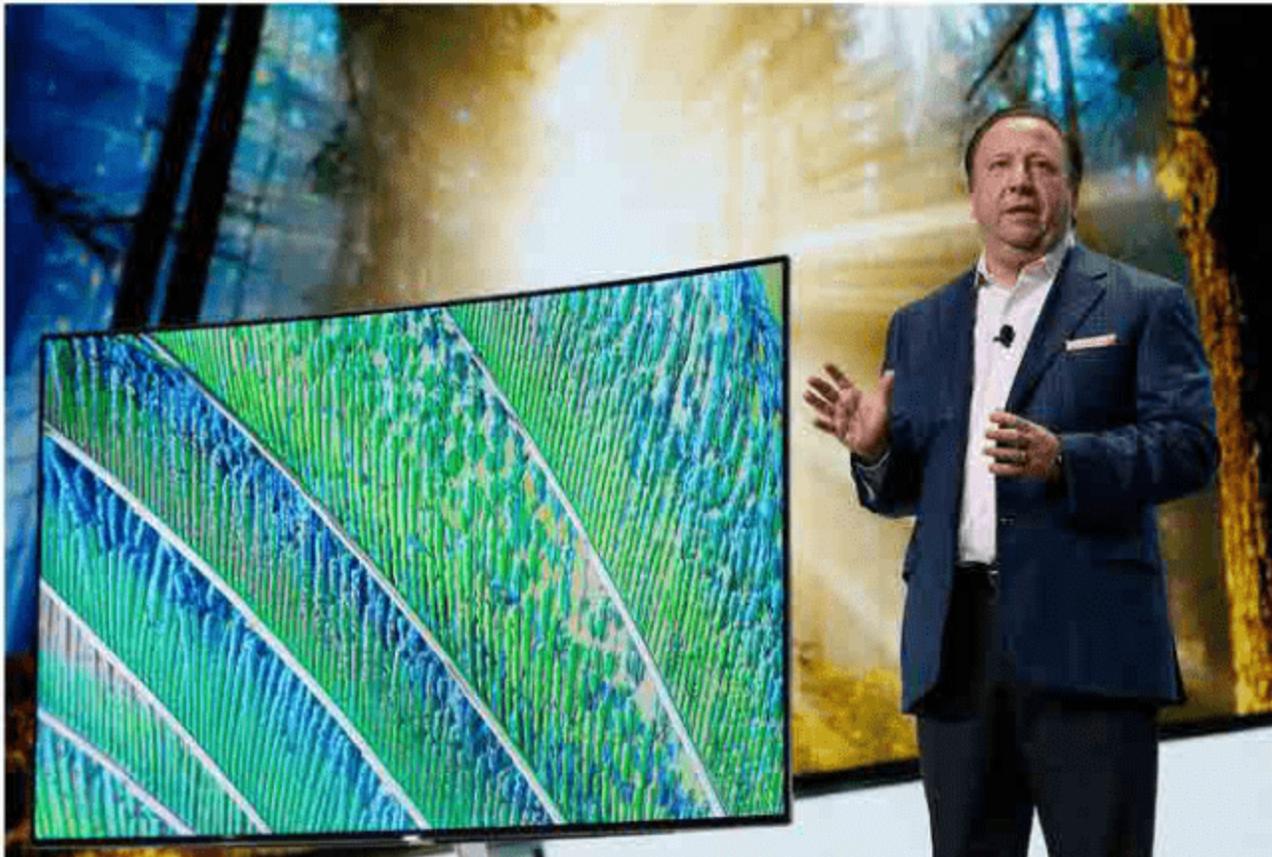
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Major 4K Adoption Anticipated in 2017 and 2018

Despite the CES Hype, It's Better to Wait on That 4K TV

Tech Fix

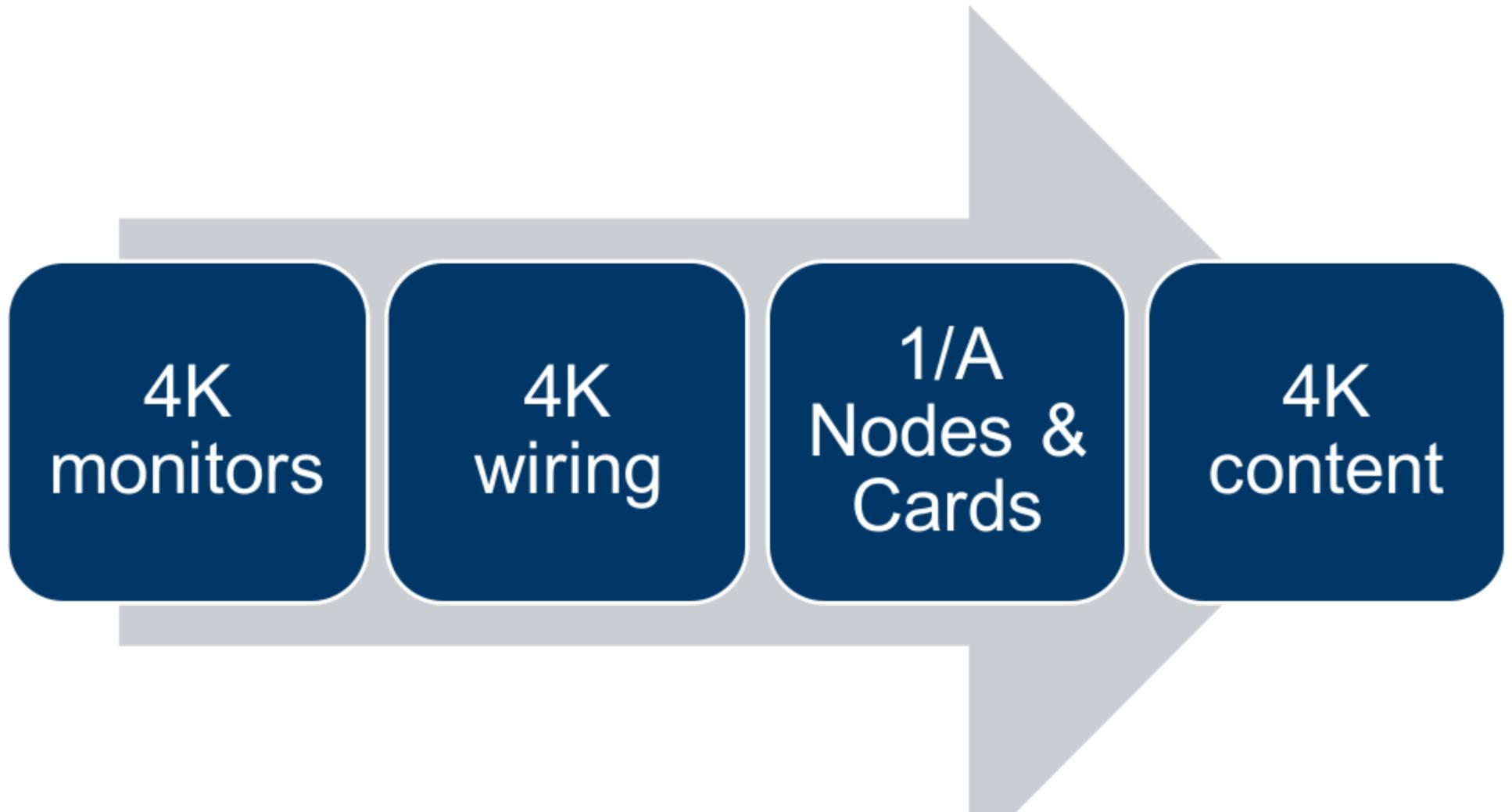
By BRIAN X. CHEN JAN. 5, 2016



Executive vice president at Samsung Electronics America, Joe Stinziano, presents the curved-screen Samsung KS9500 TV at the International CES in Las Vegas. Credit John Locher/Associated Press

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4K Value Chain

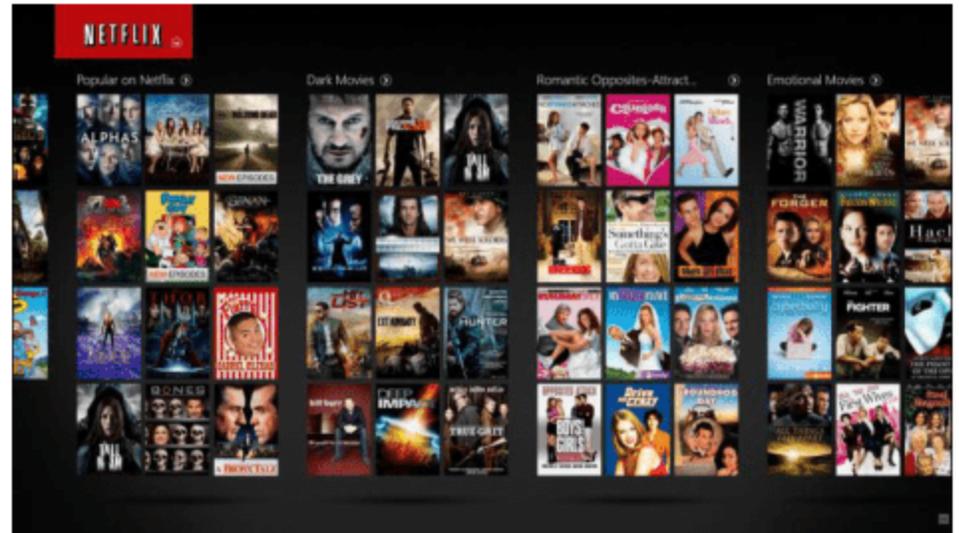


All links must be addressed to support 4K

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4K Content Development and Expansion

- Netflix
 - 25 programs, including its original TV shows like “Jessica Jones” and “Daredevil”
 - All original content produced this year to be available in 4K
 - Launching content with high dynamic range (HDR) this year with show “Marco Polo”
- Amazon Instant Video
 - Hundreds of titles in 4K
 - Original series like “Transparents” and “The Man in the High Castle”
 - All original content produced this year to be available in 4K and launched content with HDR in 2015
- YouTube has supported 4K video streaming since 2010
- Roku working on 4K with TV manufacturers
- Latest Apple TV does not support 4K
- HBO has not announced plans to move to 4K
- Samsung estimates there are 800 titles to watch in Ultra HD (Jan 2016)



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LED Sealed Beam Landing & Taxi Lights

- LED Landing & Taxi Lights Available

- GIV/GIV-SP
- GV
- G450
- G550

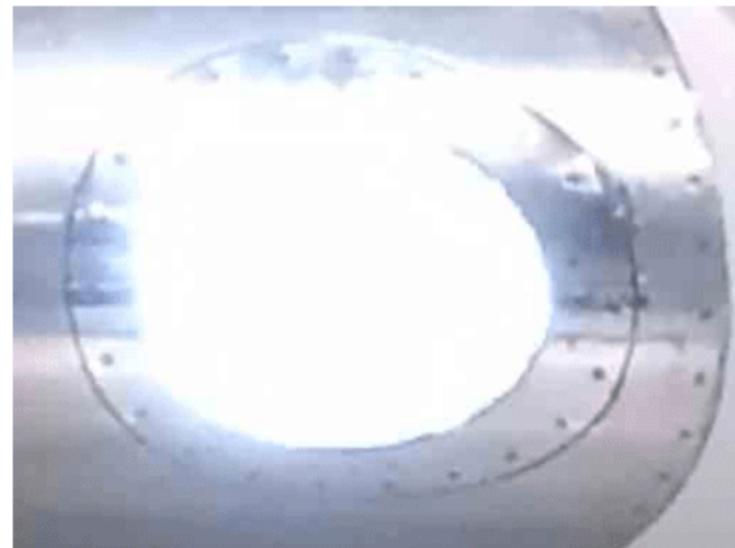


- LED Landing and Taxi Lights in Work

- G100
- G200

- LED Airstair Lights in Work

- Large Cabin (Not G650)



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Questions?

Thank you all for your valuable time!

