



BCSS

# Boeing Commercial Satellite Services



## Inmarsat-5: Overview Brief for Arctic

Aug 2014

# Alaska's Broadband Dilemma

- Land area twice the size of Texas with widely dispersed population centers and rough terrain
  - Makes traditional fiber connectivity difficult and expensive
- Very little fiber optic cable to inland locations
  - Current architecture consists of a network of microwave radio towers
- Many communities do not have access to broadband connectivity
- Homeland security concerns with arctic and border regions
  - 4000 Alaska National Guardsmen and nine Active military units
- Insufficient connectivity to national energy assets (natural gas, oil pipeline)
- UAS and rocket launch ranges report 'do not have sufficient SATCOM'
- State and local governments stagnated communications – public safety issue
- Universities in need of broadband for research and development

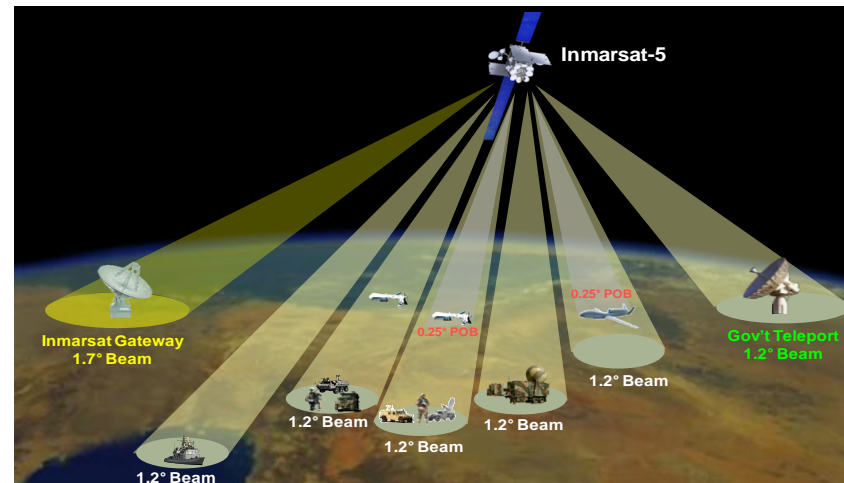
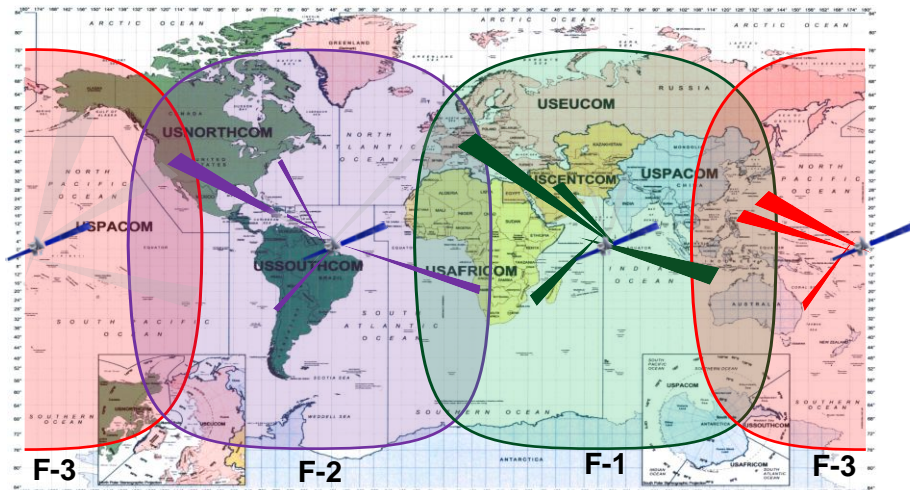
# Inmarsat-5 Overview

- **Three geosynchronous satellites with options for two additional satellites**
  - First launch 3Q 2013 with worldwide coverage by 4Q 2014
  - Military and commercial Ka-band capability
- **Two payloads that together provide 8 Gbps of global Ka coverage**
  - *Global Xpress<sup>(R)</sup>* - provides fixed, global coverage with 216 spot beams operating at commercial Ka-band frequencies
  - **High Capacity Payload** - provides global steerable spot beam coverage at military and commercial Ka-band frequencies and is designed to augment the existing DoD Wideband Global Satellite (WGS)
    - Boeing has exclusive rights to sell HCP bandwidth to the US Government

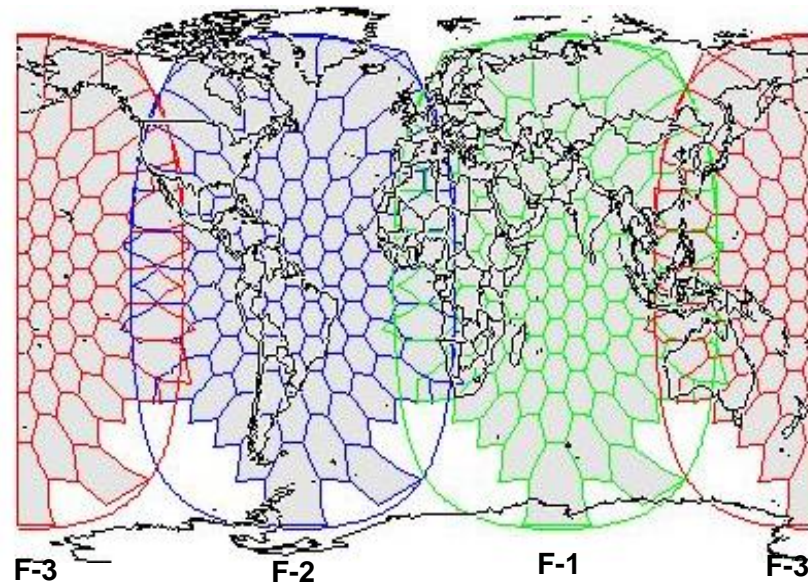




# Coverage and Connectivity



- **High Capacity Payload (HCP) beams** are fully steerable within the satellite's Field of Regard
  - Augments existing WGS capability
  - Expanded connectivity to the warfighter
  - Meets growing AISR demand
- **Global Xpress beams** provide coverage in +/- 70° latitude range
- Users can transition between commercial and military Ka-band service
- **Services available for Alaska (F-3) in early 2015!**



Commercial Ka Coverage

# Frequency Allocations and use in Alaska

Mil-Ka is allocated to “Federal” only and Footnote G117 states that FSS and MSS services in this band are limited to military systems. There is also a provision in the NTIA Manual for possible Non-Federal use of a Federal allocation such as Mil-Ka

The NTIA Manual states that this would be coordinated through the FCC

Chapter 11 of NTIA manual which is titled “Public Access to the Federal Spectrum Management Process”. Section 11.6 therein addresses the process to request access to spectrum allocated for Federal government use. The section states the request is initially received by the FCC which in turn further coordinates with the NTIA

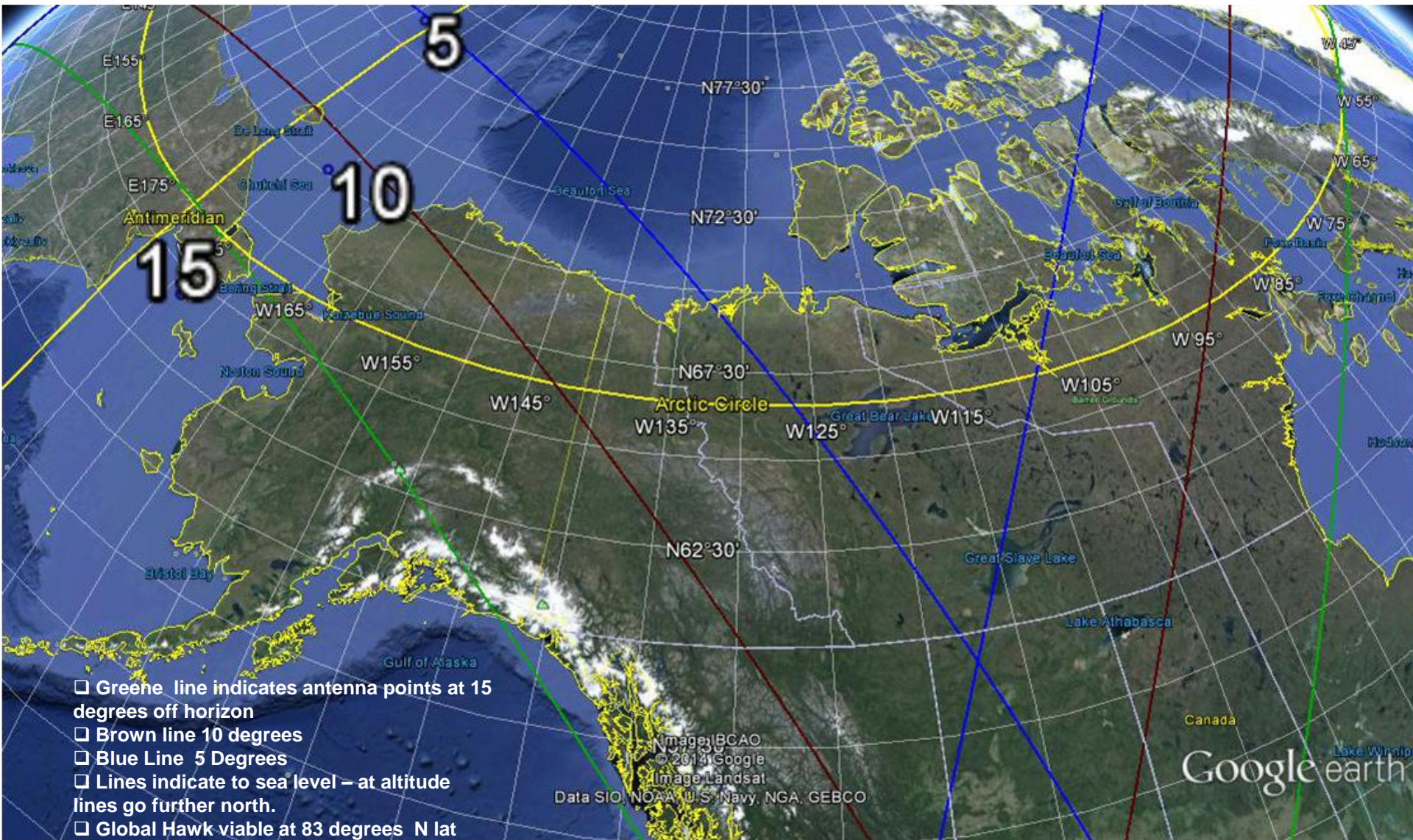
Alaska public fixed stations may be authorized to use Federal frequency assignments for communication with Government stations or for the coordination of Government activities. Several entries related to emergency services and safety-of-life services where the State of Alaska and the USG have special agreements in various frequency bands that are used for these type of services

Precedent exists in AK where civil agencies use UHF SATCOM frequencies per this provision

References to NORTHCOM and The Pacific Alaska Range Complex (PARC) located at Elmendorf AFB. Elmendorf AFB is located in Anchorage. There is a reference to a “Joint Frequency Management office Alaska” at Elmendorf. [http://en.wikipedia.org/wiki/Elmendorf\\_Air\\_Force\\_Base](http://en.wikipedia.org/wiki/Elmendorf_Air_Force_Base)



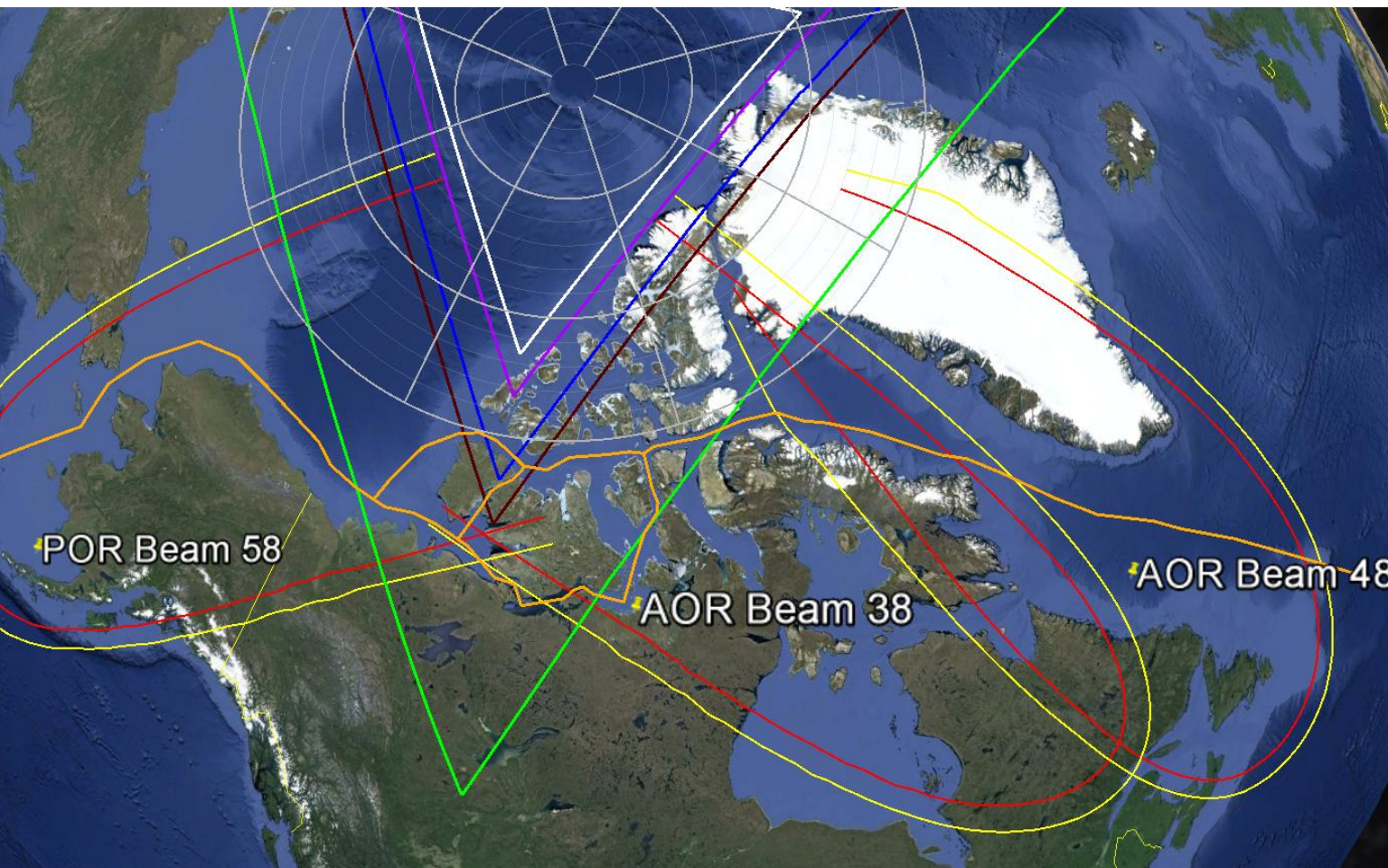
# Look Angle to Inmarsat I5 Pacific Satellite at Sea Level





# 15 Gx Northern Coverage

Global Xpress Commercial Global Beam Ka-band Uplink (29.5 – 30.0 GHz)



- 60K ft
- 40K ft
- 20K ft
- 15K ft
- Ship, 5° EI

Gx supports up to 50Mbps

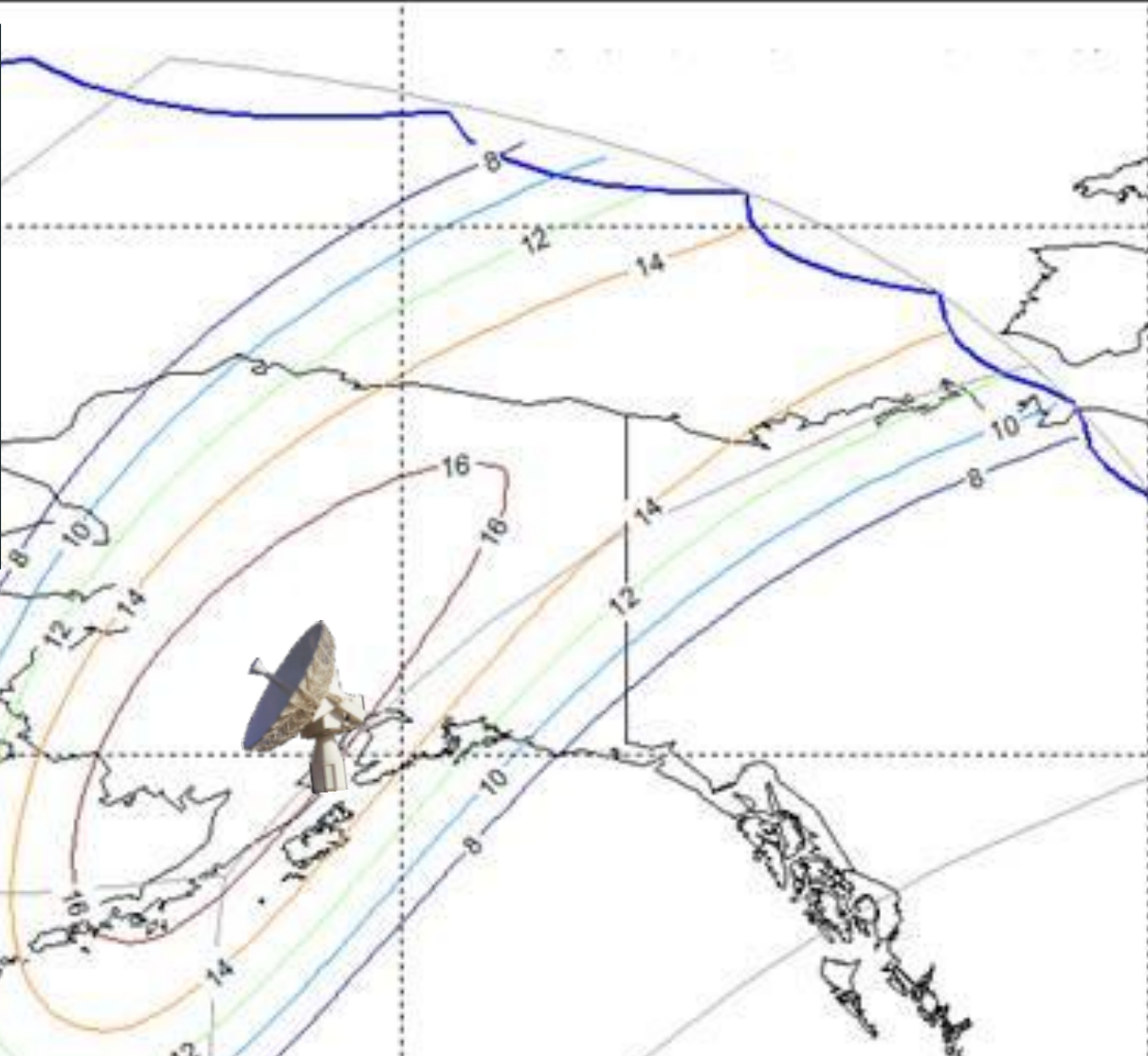
- Global Beam G/T
- 8 dB/K
  - 6 dB/K

NW Passage Route

# 15 HCP Beam Alaska Coverage

Beam position can be adjusted left or right

- G/T Contours**
- 11dB better than Ku band!
  - Provides 10s of Mbps to multiple disadvantaged customers
  - Up to 1 Gbps to earth terminals



**Frequency and bandwidth options**

**HCC = commercial Ka at 100MHz**

**HCC+ HCM (125/275/420/740) MHz in Mil Ka band**

**G/T = 16dB/K**

**Alaska is Well Served by I5 beam with High Power and Bandwidth**

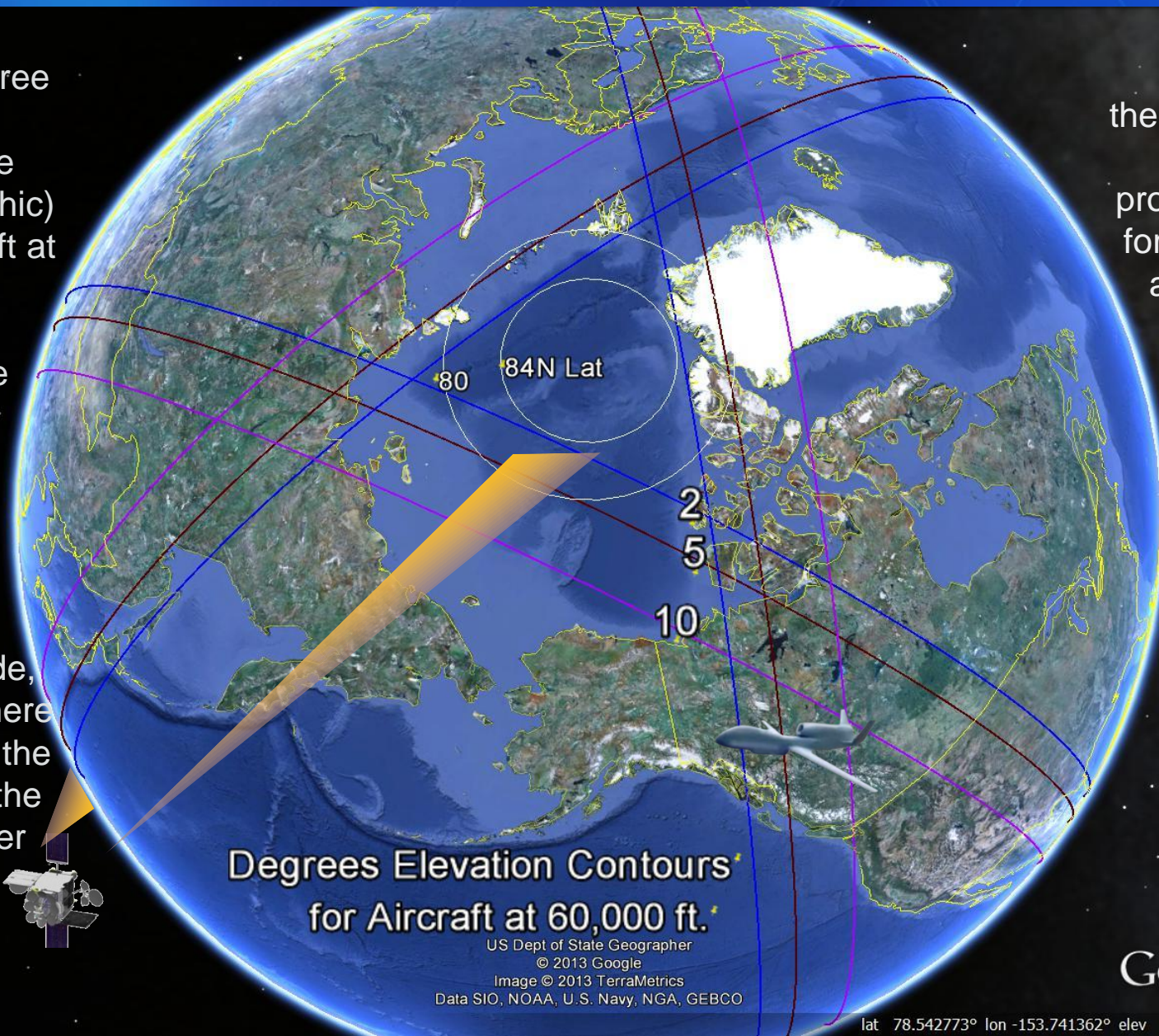


# Inmarsat 5 HCP High-Elevation / Altitude SATCOM Link Elevation Contours

At the 2 degree elevation contour (blue lines in graphic) for an aircraft at 60,000 feet altitude, the peak latitude is 83.66 degrees

On this contour line at this altitude, the atmosphere is thin since the LOS line to the satellite never goes below 40,000 feet

This means there is very little atmospheric propagation loss for aircraft flying at 60K ft when elevation to satellite > 2 degrees.



Degrees Elevation Contours  
for Aircraft at 60,000 ft.

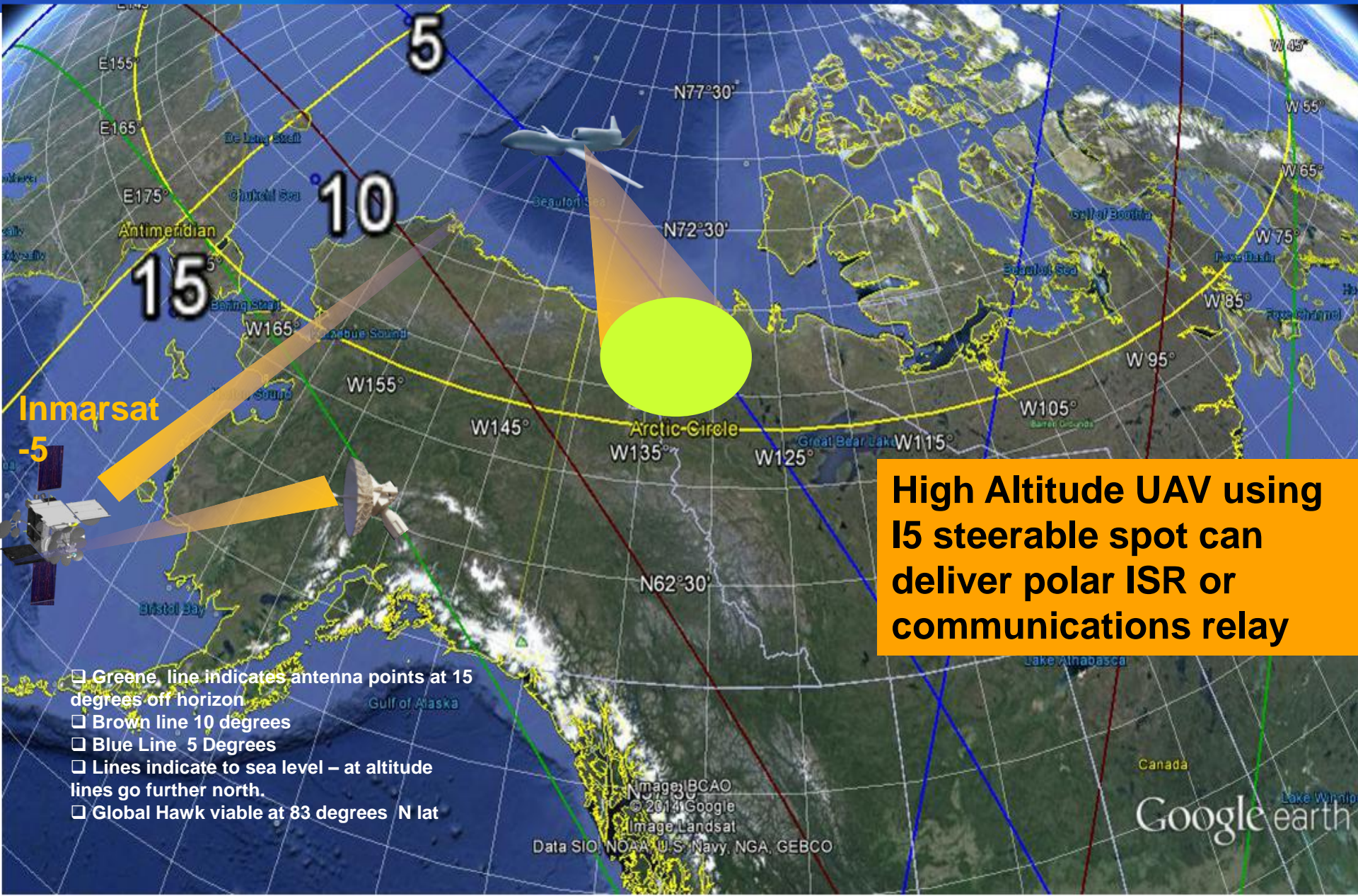
US Dept of State Geographer  
© 2013 Google

Image © 2013 TerraMetrics

Data SIO, NOAA, U.S. Navy, NGA, GEBCO



# Unmanned Aircraft Communications Relay Augmentation





# Summary - The Boeing Commercial SATCOM Advantage

- **BCSS brings a combination of commercial and military frequencies to bear**
- **Unrivalled coverage and power – can cover the entire state of Alaska with a single beam**
- **Flexibility and portability to support changing missions without contract changes**
- **Broadband connect to many remote users without the need for costly fiber infrastructure**
- **Cost effective alternative or adjunct to line of site radio towers**
- **Easily expandable to meet growth**
- **Portable connectivity quickly respond to natural disaster or other events**

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