



## IP Applications On The Move

- **News gathering has much in common with War fighters, crime fighters, and fire fighters:**
  - ◆ All need communications on the move
  - ◆ The mission demands mobility
  - ◆ Voice is important, but not enough
  - ◆ Video is essential in today's world
- **Applications may be summarized:**
  - ◆ Common Operational Picture
  - ◆ Situational Awareness
- **The biggest issue:**
  - ◆ More Bandwidth!

## Satellite Solutions

- **L-Band**
  - ◆ Inmarsat, BGAN, Iridium, etc.
    - Limited spectrum (36 MHz shared)
    - Good for low usage low bandwidth applications
- **C-Band**
  - ◆ Usually used in fixed or maritime terminals
    - Large antennas and RF components
    - Large spectrum
    - Impractical for most SOTM applications
- **Ku-Band**
  - ◆ Originally slated for Fixed Satellite Services
    - 500 MHz shared spectrum
    - Good physical component sizes
- **Ka-Band**
  - ◆ Great spectrum (1 GHz), high power
    - Minimal coverage
    - Requires highly accurate antenna pointing

## SOTM Antenna Issues

- **On-The-Move applications demand small antennas, typically < 2'**
  - ◆ Aerodynamics
  - ◆ Mission exploitation
  - ◆ Available real estate
- **Motion Dynamics**
  - ◆ Varying pitch, yaw, and heading dictate pointing ranges and tracking speed
  - ◆ Blockage mitigation
- **Regulatory Compliance**
  - ◆ Mis-pointing causing interference with other satellites
  - ◆ Wide beam widths overlapping adjacent satellites

## SOTM is a system solution

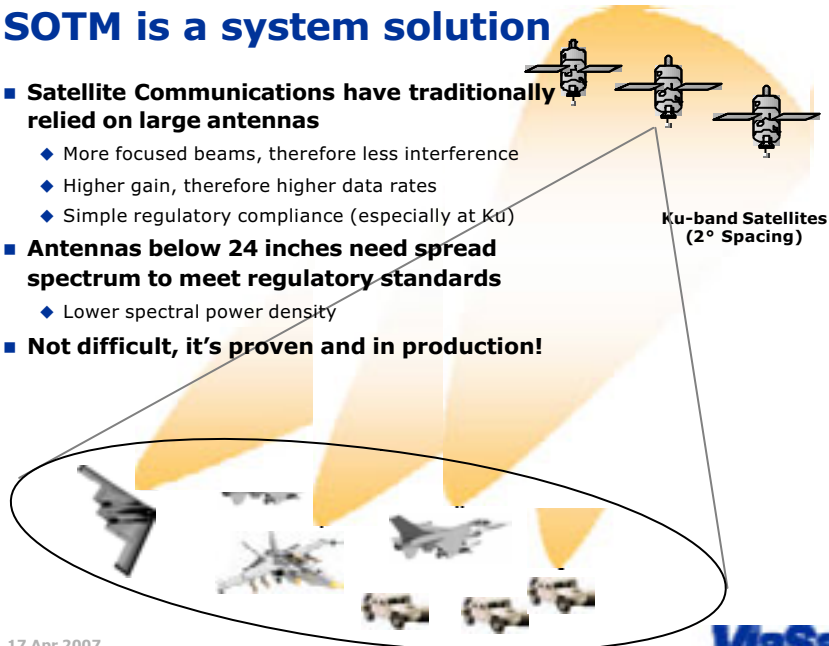
- **Satellite Communications have traditionally relied on large antennas**

- ◆ More focused beams, therefore less interference
- ◆ Higher gain, therefore higher data rates
- ◆ Simple regulatory compliance (especially at Ku)

- **Antennas below 24 inches need spread spectrum to meet regulatory standards**

- ◆ Lower spectral power density

- **Not difficult, it's proven and in production!**



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## Antennas for SOTM

- **ANTENNAS ARE A COMPROMISE (Waveform versus Platform performance)**

- **Parabolic Antennas**

- ◆ Greatest efficiency
- ◆ Smallest beam widths, higher directivity
- ◆ Greatest pointing range (typically -10° to 90° El)
- ◆ Highest profile – best target!

- **Low Profile Antennas**

- ◆ Wider beam widths – more interference
- ◆ Limited bandwidth (often separate Tx Rx ant)
- ◆ Limited elevation angles (typically 20° to 70°)
- ◆ Limited equatorial operation
- ◆ Lower profile, less of a target, less wind load

- **Different antennas will always be required for different applications**

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## Regulatory, How To Conform

- **ViaSat's ArcLight spreads the signal over a very wide bandwidth**
  - ◆ Very low spectral power density
  - ◆ Lots of margin against interference
  - ◆ In fact, the antenna can be pointed to the wrong satellite without interfering
- **The system is deployed on over 300 platforms today**
  - ◆ Fully licensed in 24 countries and growing

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## What is ArcLight?

- **ArcLight is a complete network architecture optimized for small mobile terminals on FSS satellites**
  - ◆ State-of-the-art spread spectrum waveform
  - ◆ Highly efficient network access protocol
  - ◆ Automated network management system
  - ◆ IP-based network
- **ArcLight is a set of proven products**
  - ◆ Compact full-featured hub suite
  - ◆ Integrated remote mobile terminals



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## What Does ArcLight Provide Today?

- **A complete two-way broadband system/service over Ku-band satellites for:**

- ◆ Aviation
- ◆ Maritime
- ◆ Rail
- ◆ Ground vehicles – RV's, SUV's, Buses, military, etc.

- **True broadband experience to *small* apertures**

- ◆ Forward channel data rates up to 30Mbits/s
- ◆ Return channel data rates up to 1.024 Mbits/s
- ◆ IP "pipe" to platform

- **Large and growing coverage area**



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## Unique Regulatory Position

- **ArcLight is the *only* mobile broadband system approved for operation on FSS satellites with antennas as small as 30 cm**

- ◆ Licensed in the U.S. and over 25 other countries

- **The architecture & waveform are specifically designed to meet the strict regulatory requirements imposed by the FCC & ITU**

- ◆ Spread waveform enables very small antennas
- ◆ Automated network management features assure that regulatory limits are met
  - Uplink power control
  - Congestion control
  - Automated log-in and network management
  - Adjacent satellite interference management
  - Auto-shutdown in restricted areas

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## Hub & Network Ops Center

### ■ ViaSat Owns and/or Operates:

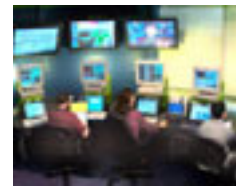
- ◆ Network Operations Center (NOC)
- ◆ Carlsbad Ground Earth Station
- ◆ Hubs for:
  - *North America*
  - *North Atlantic*
  - *Europe*
  - *Caribbean*



Typical Hub Equipment



Ground Earth Station Antenna Farm



Network Operations Center

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## Current ArcLight Coverage



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## Coverage by Late '08 / Early '09



*Plus coverage over North Pacific (not shown)!*

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## One System for Joint Network Centric Broadband On-the-Move



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## The Basics

### ■ ArcLight is...

#### ◆ **Efficient** hub-spoke system designed for:

- Very small aperture antennas (<12" to 24")
- OTM operation
- Regulatory compliance (FCC/ITU), in particular for adjacent satellite interference concerns
- Efficient use of transponder bandwidth and power
- Helicopter and High Blockage Operation
- Operation with low-cost antennas

#### ◆ **Here today**

- FCC licensed in several applications
- In operation on over 300 platforms