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Telecom, Media & Finance Associates, Inc.

Perspectives on MSS and ATC/CGC

Evolutions in Satellite Telecommunication Ground Segments
ESA Workshop

Tim Farrar
June 6, 2008

Contents

- Mobile Satellite Services (MSS) market outlook
- The role of Complementary Ground Components (CGCs)
- Prospects for CGC/ATC

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The most promising MSS opportunities are in maritime and aeronautical broadband plus low speed data…

Market Segment	2007 Wholesale MSS Service Revs	Annual Growth (2007-2017)
Land voice	$365M	2%-6%
Land low speed data	$50M	**15%-30%**
Land broadband	$111M	5%-8%
Maritime voice	$101M	2%-3%
Maritime low speed data	$39M	7%-10%
Maritime broadband	**$244M**	**7%-9%**
Aero voice/low speed data	$26M	4%-7%
Aero broadband	$48M	**15%-20%**
Total	**$985M**	**7%-11%**

Source: TMF Associates estimates, May 2008
Note: broadband includes all revenues from terminals capable of 64kbps+

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…as the need for "user cooperation" makes satellite mobile broadband unlikely to achieve critical mass…

- BGAN will fall short of original expectations for 150K-200K terminal sales and $200M in wholesale revenues by 2010
- Power limitations and the inefficiencies of omni-directional antennas make handheld satellite broadband infeasible
- Most potential users are unlikely to accept outdoor-only coverage and a need to point the antenna at the satellite, unless they are truly "desperate"
  - take-up will be largely within vertical segments such as military, broadcasters, aid agencies, etc.
  - this will still be true even if terrestrial solutions (e.g. GPRS) are more expensive and less capable

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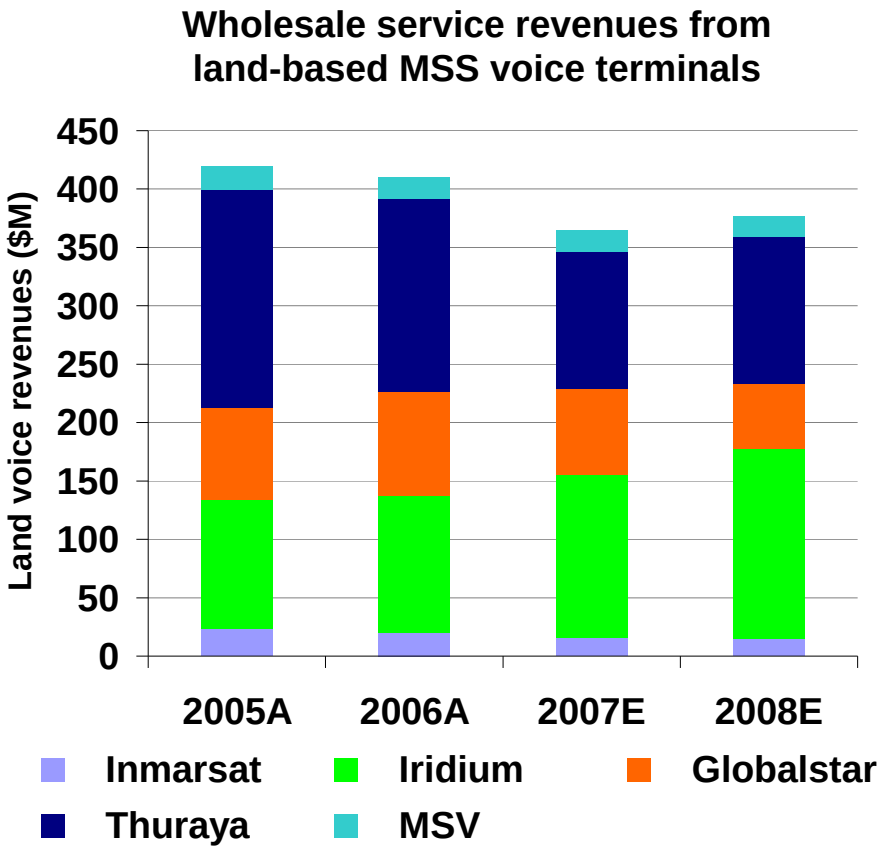
…and handheld MSS may already have peaked in some parts of the world

- Thuraya's revenues have declined dramatically since 2005 and initiatives such as new handsets and price reductions in lower usage countries have failed to stem the tide
  - notably, its single mode handsets are outselling dual mode handsets by at least 3 or 4 to 1
- Dual mode handsets are unable to match terrestrial offerings, so users opt to carry a (single mode) satellite phone only when needed
- There are limited opportunities in previously closed markets (China, India) and high income markets for emergency users, but the future of some systems (e.g. Globalstar) remains uncertain



Source: TMF Associates estimates, May 2008

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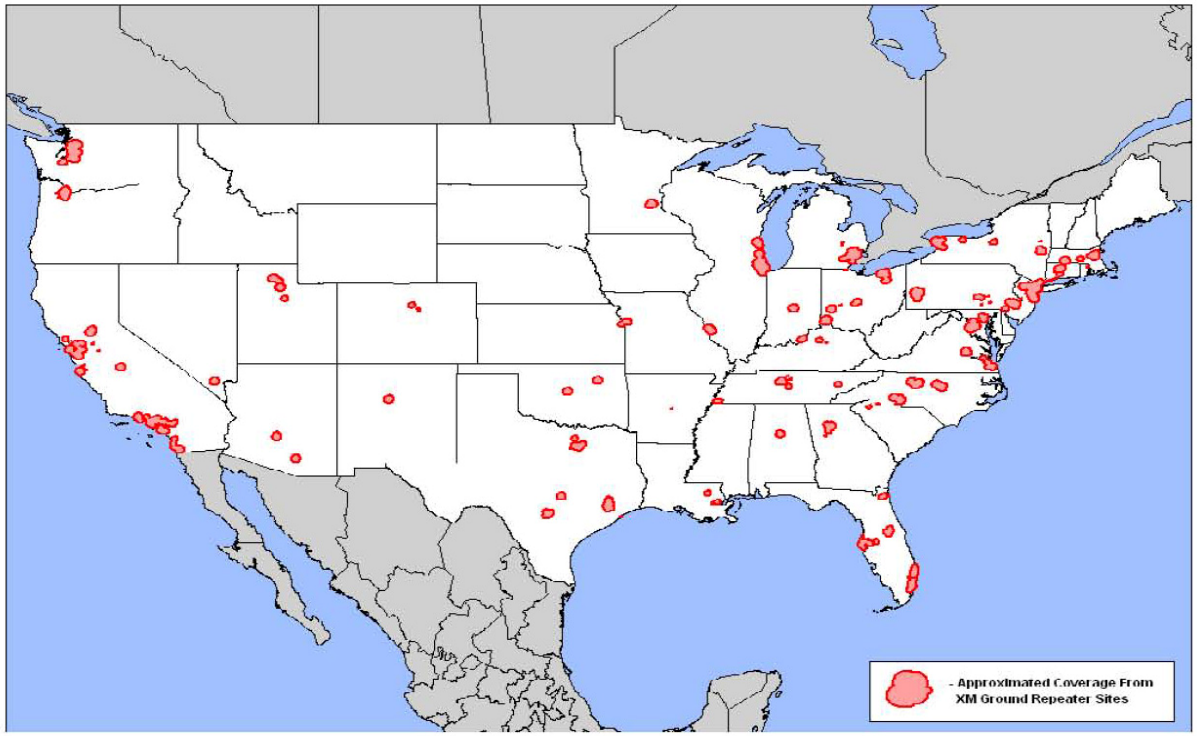
When is the ground component “complementary” to satellite? [1]



XM has only 800 repeaters in the US but these still serve ~70% of satellite radio users. By comparison there are more than 10,000 S-DMB repeaters in Korea

Source: ICO investor day presentation, May 2007

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When is the ground component "complementary" to satellite? [2]

Open Range

- 3 x 3.5MHz S-band WiMAX channels with "no unsightly antenna on your house", offering "capabilities that surpass those now provided in urban areas by the largest cable, telephone, and wireless companies" with "minimum speeds of 1.5 Mbps down and 512 kbps up for less than $40 per month"
- Availability "to begin in selected markets in 2008"

Globalstar

- Voice and data services at up to 9.6kbps from a handheld phone (with large external antenna that must be raised above the head to make a call)
- Next generation ground network will support 1Mbps down and 256kbps up
- Limited two-way service at present due to failing first generation satellites (intermittent service not expected to be resolved before 2010)

Will the FCC consider Globalstar's simplex satellite data service to be "substantial" and/or grant a waiver in advance of its second generation satellite launch?

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When is the ground component “complementary” to satellite? [3]

MSV and TerreStar

Inmarsat and Thuraya

If Inmarsat or Thuraya wanted to support terrestrial devices with no external antenna via their existing satellites, then any (reliable) satellite service could well be limited to SMS

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Will “spectrum efficiency” and “emergency backup” trump “spectrum arbitrage”?

- The willingness of regulators such as the FCC to permit various contemplated ATC services remains unclear
  - ICO’s vehicle-focused mobile TV network is analogous to satellite radio and should be relatively simple to approve (subject to ICO securing a ground spare)
  - Globalstar and Open Range’s WiMAX network is primarily a terrestrial service and will require changes to the ATC rules, plus various waivers to permit operation ahead of the second generation satellite deployment
- US mobile operators appear to have held off from opposing ATC in recent years because they do not believe it will ever be realized in practice
  - if a major partner were secured for an ATC network deployment then renewed opposition would be expected
- A focus on (lower value) mobile broadcast services in Europe has avoided many of the possible concerns about spectrum arbitrage and could benefit mobile operators by allowing them to retain “digital dividend” TV spectrum for two-way services

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Substantial near-term funding is still required by MSV, TerreStar and ICO…

MSV Mobile Satellite Ventures

Current funding to end 2008, need $350M-$400M for first launch

$250M required for Inmarsat L-band spectrum transition

Est. $20M-$60M/market for ATC deployment, total $500M to $2.6B

TerreStar NETWORKS

Current funding into early 2009 (through first launch) after recent layoffs, not funded for subsequent operations

Est. $40M-$60M/market for ATC deployment

ICO

Current funding into 2009 (alpha trial only)

Est. $300M-$800M for ATC deployment

$767M convertible bond must be refinanced by Aug 2009

The three companies will need to raise a total of nearly $1.5B in 2009 even without any ATC deployment

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…and a major terrestrial partner is needed for them to initiate ATC deployment

- After the 700MHz auction and the Sprint-Clearwire partnership, only few options remain for a major terrestrial partner in the US
  - cellular operators: AT&T and Verizon are unlikely to validate ATC, thus only second tier players such as Leap and Alltel remain possibilities
  - cable TV operators: most are now committed to Clearwire or alternatives (e.g. Cablevision WiFi)
  - satellite TV operators: to date have not suffered from their lack of wireless, DISH has been focused on mobile TV
  - internet portals: Google now involved with Clearwire
  - other retail or media brands: unlikely to lead any network deployment
- Funding may therefore be reliant on financial investors (e.g. Harbinger), and no terrestrial rollout is likely to take place until a partner is secured
  - consolidation (e.g. Inmarsat-MSV, TerreStar-ICO) may result

With the focus now on deployment of LTE from 2012 onwards, it is unlikely that any prospective partner will move forward with a large scale two-way ATC network in the near term

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Can two-way CGC succeed anywhere else in the world without a successful US ATC deployment?

- The upcoming S-band (2GHz) competition will enable CGC deployment in Europe, but it is far from clear that a two-way network will be deployed
  - the TerreStar Global system is being de-emphasized after recent cutbacks at its US parent
- The omens for satellite mobile broadcast networks are becoming less favorable (e.g. TU Media layoffs, CMBSat suspension) as doubts spread about the potential demand for broadcast mobile TV (and thus the value of the associated spectrum)
  - while satellite radio has been successful in the US, it has failed to provide an adequate return to investors, and the European landscape is considerably more challenging (due to multiple languages, less commuting by car, etc.)
- As noted previously, the growth prospects for handheld and broadband land-based MSS are relatively limited and do not justify deployment of advanced two-way systems on a standalone basis

Will there even be two viable entrants in the S-band competition?

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Background on TMF Associates

- Telecom, Media and Finance Associates, Inc. (“TMF Associates”) was founded by Tim Farrar in 2002 to provide technical and financial analysis of satellite and telecom ventures and is based in Menlo Park, California
- Tim has over 15 years consulting experience across the telecom and satellite industries, having worked for leading technical and strategy consultancies in both the UK and US. He has an M.A. and a Ph.D. from the University of Cambridge, UK. Between 1999 and 2002, Tim conceived, founded and led the operations of Analysys Consulting in the US, developing a multi-million dollar stream of consulting business and establishing one of the pre-eminent global strategy consulting practices in the satellite sector
- Tim has worked on both ‘traditional’ satellite applications and a wide range of new developments, such as broadband and mobile satellite systems. Over the past decade he has worked with many leading players, including Iridium, Inmarsat, Intelsat, Teledesic, MSV and Globalstar

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Unique experience in Mobile Satellite Systems

- TMF Associates offers a unique breadth of expertise across the mobile satellite sector. Tim has worked with almost all of the major players, including operators (Iridium, Inmarsat, Globalstar, MSV and others), distributors, equipment manufacturers and investors for more than a decade

- We publish detailed research on the MSS sector, including the only in-depth research service on MSS market developments and reports on Ancillary Terrestrial Component (ATC) technology and the Market for In-flight Passenger Communications

- Tim is also President of the Mobile Satellite Users Association (MSUA)

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