www.absatellite.net

May 2012

ABS Global Operations Support the World's Fastest Growing Satellite Operator

*SOC = Satellite Ops Center

ABS' global facilities provide customers with value-added services capabilities and a multitude of service options

ABS Products/Services Overview

Services Offered

Space Capacity

- ~77% of FY10/11 revenue
- Regional and global operators/carriers
- Regional ISPs
- Video broadcasters and content distributors
- Can be used for customers' own video broadcast, VSAT or IP Backbone

IP Backbone

- ~7% of FY10/11 revenue
- Local and regional ISPs
- Provides connectivity to regions that have limited access to a fiber or undersea cable infrastructure, or when backbone link needs to cross unsecured regions

Very Small Aperture Terminal ("VSAT")

- ~9% of FY10/11 revenue
- Regional ISPs, mobile carriers
- Enterprise/outlet with remote sites, i.e. gas stations
- Remote sites relay data to and from hubs that are installed in ABS's teleports in HK, Jakarta and Subic Bay

Broadcast Services

- ~7% of FY10/11 revenue
- Video broadcasters, content distributors, and cable operators
- Cable distribution for TV channels to cable operators
- Video distribution for point to point or multipoint video apps
- Direct to Home (DTH)

Satellite Fleet

Fleet Deployment

- ABS acquired ABS-1 in Sep 06, ABS-1A in Jun 09, ABS-5 in Oct 09 and ABS-7 in May 10.
- ABS-2 is scheduled to launch mid-2013 at 75E which will release ABS-1 and ABS-1A for redeployment to other orbital locations.
  - Existing ABS-1 and ABS-1A traffic at 75E will be migrated to ABS-2
  - ABS-3 was redeployed from 146E to 3W to serve the growing Africa market and started operation there in Jan 2012

	ABS-1 (LMI-1)	ABS-1A (Koreasat-2)	ABS-3 (Agila-2)	ABS-7[1] (Koreasat-3)	ABS-2 (To be launched in mid-2013)	ABS-3A (To be launched in late 2014)	ABS-2A (To be launched in late 2015)
							
Orbital Location	75E	75E	3W	116E	75E	3W	75E
Launch Date	26-Sep-99	14-Jan-96	19-Aug-97	4-Sep-99	Mid 2013	Late 2014	Late 2015
Coverage	Africa, ME, SE Asia and CIS	ME	Africa	ME	Africa, ME, SE Asia and CIS	Africa, ME, Europe, Latin America	Russia, ME, India
Transponders[2]	44	10	54	33	88	51[3]	40[3]
Estimated end of commercial life	2024	2017	2016	2018	2033	2034	2035

(1) Operation started in Feb 2011
(2) Physical transponders
(3) Subject to final configuration

ABS is unmatched in its ability to efficiently acquire and redeploy in-orbit satellites

Overview of Ground Facilities & Teleports

TELEMETRY TRACKING & CONTROL

ABS-1

- **A2100 Satellite Operations Center** (ASOC)
- Operated by Lockheed Martin
- LMCSS, Newtown Pennsylvania, USA
- 24/7 TT&C spacecraft monitoring and maneuvering

- **Primary Uplink Center**
- Dubna Russia Facility (RSCC)
- Antenna: 2 x 13M C band Vertex, 9M Ku-band Vertex
- Connected by leased line and satellite to LMCSS
- 24/7 Carrier Monitoring Services

- **Secondary Uplink Center** in Uralla, Australia
- LMCSS's secondary TT&C Uplink for ABS-1

ABS-1A / ABS-7

- Yong-In City, South Korea
- 24/7 TT&C Operations and Carrier Monitoring Services by KT
- 24/7 Secondary TT&C in Subic is being established

ABS-3 / Teleport Services

- Subic Bay, Philippines
- Antenna: C-Band (2x11m Vertex, 1x4.5m Suman, 2x3.8m, 2x2.4m); Ku-band (9m Vertex, 13m NWIEE of SES, 7.2m Vertex)
- 24/7 TT&C hosting, Carrier Monitoring & Technical Assistance
- Planned TT&C operations for all ABS satellite fleet in 2012/13

Backup | Hong Kong

- Hong Kong provides backup TT&C operations for ABS-1A, ABS-3 and ABS-7

Overview of Ground Facilities & Teleports (cont'd)

VALUE ADDED SERVICES FROM SELECTED TELEPORTS

Chung Hom Kok, Hong Kong

- **Antennas:** C-Band 11M-HW Vertex, C-Band 9M-HW Vertex, 2 x Ku-Band
  9M-HW Vertex
- **Services:** Data (SCPC, MCPC, VSAT, fibre) , Broadcast (encryption, playout, turn-around, video uplink) and Others (co-location, hub-monitoring, Master Control Room (MRC)

Munich, Germany

- **Antennas**: C-Band (9M Andrew)
- **Services**: Data (SCPC, MCPC, fibre) and Broadcast (encryption, playout, turn-around, video uplink)

Jakarta, Indonesia

- **Antennas**: C-Band (1 x 11M, 2 x 9M), Ku-Band (7.2M and 3.8M)
- **Services**: Data (SCPC, VSAT, IP Backbone), Others (co-location, data uplink hosting, hub monitoring)

Islamabad, Pakistan

- **Antennas**: 2 x 3.7m Ku-Band SpaceStar, 1 x 4.6m Ku-Band Andrew
- **Services**: VSAT and IP Backbone

Bahrain

- **Antennas:** 1 x 11M vertex ,1 x 11M RSI
- **Services:** VSAT and IP Backbone

SERVICING IN-ORBIT SATELLITES

Introduction

- Servicing in-orbit satellites:
  - A recurring idea waiting for the right time
  - Two fundamental approaches:
    - Docking, refueling and letting the satellite continue to operate as before
    - Docking and taking over the satellite stationkeeping, momentum dumping and attitude control functions
  - Both ideas are fundamentally sound, but risky because they have no heritage in the commercial world
    - Both approaches are intended to prolong operational life of the satellite
    - Both approaches require some sort of docking arrangement
    - Refueling may require certain adjustment to spacecraft propulsion system prior to its initial launch
      - Drawback: requires functional propulsion / ACS on client satellite
      - Benefit: can serve multiple satellites (minimizes need for multiple vehicles /launches)
    - Docking and remaining with the satellite may require some docking arrangement
      - Drawback: can serve only one satellite at a time
      - Benefit: can move to a different satellites if business dictates
    - When the life extension is nominally obtained, satellites have typically already been in orbit for about 15 years
      - Hopefully all sub-systems are fully or near fully functional, thermal, electrical, power, etc.
      - Extending the life of a 15-18 year old technology and the associated performance
      - More of a temporary measure than a permanent solution (delays but does not replace new procurements)
  - Challenges for both approaches would be:
    - The economics of such ideas
    - Convincing satellite operators to take a risk with a revenue-earning satellite

Background: Capacity Replacement Processes

- Operators typically plan ahead to replace their satellites with some margin before fuel depletion
  - Planning exercise that all operators conduct
    - Technically
    - Operationally
    - Business continuity
    - CAPEX and cash flow
  - Replacing an old satellite allows to utilize new technologies
    - Better performance
    - Remain competitive
    - Allows for growth
    - More reliability
    - Adjust to market changes, if any
    - But at much higher initial cost
  - Satellite procurement and launch costs have been stable and somewhat declining for the achieved performance
    - Adjusting for inflation, more performance can be purchased today than before for the same $$
    - In some instances additional time and fuel margins can be gained by operating the old satellite in an inclined orbit for a short time if needed – offsets financial benefit for purchasing NSSK

Background: Capacity Replacement Cost

- Capacity replacement costs are governed by many factors
  - Vendors and suppliers
  - Spacecraft complexity, flexibility, capability
  - Spacecraft size
    - Typical communications satellites cost per transponder is less for larger transponder count satellites
      - $2M-$4.5M per active transponders (spacecraft cost)
      - $1M-$3.5M per transponder to launch
      - $3M-$8M per transponder delivered in orbit
        - » A very wide range of prices
      - 15 years of revenue generation
  - Combining multiple missions, hosted payload, condosat arrangements, etc.
  - Multiple / block buys
  - Program Terms and Conditions and tests requirements

In orbit servicing

- Applications in the commercial world

  - Will require compelling reason
    - Financial Return on Investment

    - Accommodation for docking and sharing resources
      - Potentially additional cost and complexity, more risks

    - Unforeseen delay in the delivery of the replacement capacity
      - Loss of revenue/business

    - Life extension mainly due to fuel depletion
      - Nimic 6 just replaced Nimic 1, still with many years of fuel remaining- power subsystem failure
        - » Fuel depletion is not the only reason to acquire replacing capacity

    - Near term and quicker solution
      - Short-term solution for occasional situations

    - Gap filler remedy
    - Orbital slot protection
    - Potential green field market testing