Who's Who in Commercial Satellite Remote Sensing: A Status Check

by
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Introduction

Remote sensing technology will improve by increasing spatial, spectral and temporal resolutions starting during 1997. Commercial remote sensing is moving rapidly. This paper will present information that the authors believe to be accurate to January, 1999. Since the Russians are no longer our enemies, the aerospace companies have sought new markets for their sensors and their expertise especially since the Department of Defense is no longer their prime customer. Agriculture and many other disciplines are receiving the benefits of these events.

The current satellites in orbit are: Landsat 5, IRS-1C, IRS-1D, JERS 1, SPOT 2, 3 and 4, ERS 1 and 2, Radarsat, and a host of NOAA satellites. All are owned and launched with government assistance or ownership and all have commercial value. Related to these satellites are companies who are marketing images, services and products.

Future satellites will be owned and launched by commercial companies in addition to governments. It is interesting to note that a strong commercial interest is mostly in the United States. Table 1 shows the satellites that are scheduled for launch during 1997-99. Many of the 1997 expected launches were delayed because of problems with launch vehicles.

Table 1. SATELLITE Launches Scheduled for 1997-01

Satellite	Launch	Resolution	Channels
Earth Watch:			
EarlyBird (USA)**	12/24/97	3 m (P), 15 m (M)	3
QuickBird 1 (USA)	Mid/99	0.8 m (P), 4.5 m (M)	4
QuickBird 2 (USA)	2000?	0.8 m (P), 4.5 m (M)	4
TRW Lewis (USA)*	8/23/97	5 m (P), 30 m (M)	256,128 (384)
~~CTA Clark (USA)~~	~~6/98~~	~~3 m (P), 15 m (M)~~	(cancelled contract)
Orbview-2/Seastar (USA)	8/1/97	1.1 km/4.5 km	8
Orbview-3 (USA, Saudi Arabia)	late/99	1 and 2 m (P) 4 m (M), 8 m (H)	4
Orbview-4	2000	1 - 2 m (P), 4 m (M), 8 m (H)	4
TRMM (USA-Japan)	11/27/97		
NOAA-K (USA)	9/97	0.5 km/1.0 km	5
IRS-1D (India)	9/97	5 m (P), 23 m (M)	4 (launched)

Table 1 (con't). SATELLITE Launches Scheduled for 1997-01

Satellite	Launch	Resolution	Channels
KitSat-3 (Korea)	97		
EROS, CST/IAI (Israel, USA)	10/97	1.5 m (P)	1
CBERS (China, Brasilia)	10/97	20 m (P), 20 m (M)	7
Space Imaging:			
IKONOS 1	10/98	1 m (P), 4 m (M)	4
IKONOS 2	2/99	1 m (P), 4 m (M)	4
IKONOS 3	2002	1 m (P), 4 m (M)	4
Resurs-O1-4 (Russian)	7/1098	160 m (M)	
IRS-P4/OceanSat-1 (India)	1-3/98	10 m, 125 m (M)	4,8
SPOT 4 (France)	3/98	10 m (P), 20 m (M)	4
SPOT 5 (France)	late/01	2.5-5 m (P), 10 m (M)	?
RockSat (Taiwan)	4/98		
Landsat-7 (USA)	7/98	15 m (P), 30 m (M)	7
David (Israel-Germany)	TBD	5 m (P)	
EOS-AM 1 (USA, Japan)	7/98	15 m (P), 15 m (M)	14
GDE Systems (USA)	2000	1 m (P)	1
Resource21 (USA, Canada)	2000	5 m (P), 10 m (M)	3
GERS (USA)	98	5 m (P)	1
Almaz-1B (Russian)	98	2.5 m (P), 4 (M), 5.4 m,®	3

P=Panchromatic, M=Multispectral, R=Radar

*Lewis was launched but lost when thruster rockets failed to place the satellite in its proper orbit. Loss of attitude control.

**EarlBird was launched 12/24/97. Communications were lost shortly after orbit.

Sources: Homepages of most of the companies. Also thanks to the National Land Survey, Finland (http://www.nls.fi/sat/) from which we filled in the gaps.

Aerospace Companies Relating to Ag Applications

Since the InfoAg Conference emphasizes agriculture, we derived Table 2 from Table 1 showing the expected commercial launches for 1997-01 that would impact agriculture.

Table 2. Commercial Satellite Launches Providing Data for Agriculture

Satellite	Launch	Resolution	Channels
Earth Watch:			
EarlyBird** (USA)	12/24/97	3 m (P), 15 m (M)	3
QuickBird 1 (USA)	Mid/99	0.8 m (P), 4.5 m (M)	4
QuickBird 2 (USA)	2000?	0.8 m (P), 4.5 m (M)	4
TRW Lewis* (USA)	8/23/97	5 m (P), 30 m (M)	256, 128 (384)
Orbview-3 (USA, Saudi Arabia	late/99	1 - 2 m (P), 4 m (M), 8 m (H)	4
Orbview-4	2000	1 - 2 m (P), 4 m (M), 8 m (H)	4
Space Imaging:			
IKONOS 1	10/98	1 m (P), 4 m (M)	4
IKONOS 2	2/99	1 m (P), 4 m (M)	4
IKONOS 3	2002	1 m (P), 4 m (M)	4
SPOT 4 (France)	3/98	10 m (P), 20 m (M)	4
SPOT 5 (France)	late/01	2.5-5 m (P), 10 m (M)	?
GDE Systems (USA)	2000	1 m (P), ?m (M)	1+?
Resource21 (USA, Canada)	2000	5 m (P), 10 m (M)	3
GERS (USA)	98	5 m (P), 10m (M)	4

P=Panchromatic, M=Multispectral, R=Radar

* Lewis was launched but lost when thruster rockets failed to place the satellite in its proper orbit. It was funded by government but has strong commercial interests.

** EarlBird was launched 12/24/97. Communications were lost shortly after orbit.

Some specific information about each company is provided in alphabetical order so that readers can contact them or follow their progress on their homepages. This information was provided directly by representatives of the companies or through their homepages.

EarthWatch Incorporated - 1900 Pike Road, Longmont, CO 80501.

Telephone: (800) 496-1225, or (303) 702-5561, Fax: (303) 702-5562, E-mail: info@digitalglobe.com, and homepage: http://www.digitalglobe.com

EarthWatch is in the position to become a preeminent worldwide supplier of digital geographic information and image data, through a unique satellite system, product design, and product delivery method. They plan to be the first commercial company to build and launch high resolution commercial imaging satellites. EarthWatch has partnered themselves with many other companies to provide Digital Globe databases and distribution networks. They are looking at a broad base of customers including agriculture.

The first of the satellites in their system are the EarlyBird and the QuickBird 1 & 2. EarlyBird features two sensors, 3 meter resolution panchromatic and 15 meter multispectral. It is planned for launch in late 1997. QuickBird 1 & 2 features 0.82 meter resolution panchromatic and 3.28 meter resolution multispectral sensors and is planned for launch in late 1998.

GER - Geographic and Environmental Research Corporation - One Bennett Common, Millbrook, New York, 12545. Telephone: (914) 677-6100, Fax: (914) 677-6106. There is currently no web page.

This is the most recent company to enter the commercial satellite remote sensing arena. Their system will center around the agriculture market, making it slightly different than others in the business. Their intent is to offer agribusiness an affordable product on a rapid revisit cycle, to develop a ground system to get data and crop information to producers rapidly enough to "save" stressed crops, and promise to find new ways to deliver data and information to farmers in a more timely manner. The company plans to offer raw data and information extraction products and services.

GER plans 6-8 satellites with <10 meter panchromatic and 10 meter multispectral resolution sensor capability. This system has been dubbed GEROS (GER Earth resource Observation System) by the company, and they plan the first launch in 1998. They are currently flying agricultural fields in the Midwest with prototype sensors to gain experience with agricultural needs.

Orbimage (Orbital Sciences Corporation) - 21700 Atlantic Boulevard, Dulles, VA. 20166 Telephone: (703) 406-5436, Fax: (703) 406-5552 or e-mail info@orbimage.com, and homepage: http://www.orbimage.com.

Orbital Sciences Corporation designs, manufactures, operates, and markets a variety of space related services and products and is the parent company. Orbimage is dedicated to providing low cost, state-of-the-art, satellite-based imaging products and services to customers around the world. They plan a unique global system to collect, process, and distribute their products. Three satellites are planned over the next several years with each performing a separate task.

Orbview-1 has a resolution of 10 km and Orbview-2 of 1.1 km. Each of these are currently collecting data with a global coverage orientation. Orbview-3 & 4 are their latest satellites planned in the system. They are to have 1 meter and 2 meter resolution panchromatic, and 4 meter resolution multispectral sensors with a revisit cycle of 3 days. They are stressing economic development and agriculture for a major part of their market.

Resource21 - 7257 South Tucson Way Suite 200, Englewood, CO 80112 Telephone: 303-749-2000, Fax: (303) 749-3295 There is currently no web page.

Resource21 is a partnership of aerospace companies, Boeing Commercial Space Company and GDE Systems, and agribusiness companies, Agrium LTD, Farmland Industries, and ITD. They plan to specifically to emphasize production agriculture applications with a 4 satellite system and commercial aerial flights. The plan is to restart aerial flights in 1998 and to start satellite launches by the year 2000. Each satellite is to be equipped with 5 meter resolution panchromatic and 10 meter resolution multispectral sensors in 5+ bands including 3 bands visible and NIR and SWIR with a 7 day revisit cycle.

Space Imaging - 9351 Grant Street, Suite 500, Thornton, Colorado 80229 Telephone: (303) 254-2000 or 800-425-2997, Fax: (303) 254-2215, E-mail: info@spaceimaging.com, and homepage: http://www.spaceimage.com

Space Imaging EOSAT is an experienced company with access to the marketing of products from current satellites such as Landsat, IRS-C and JERS. They are partnered with Lockheed Martin, Raytheon E-Systems, Van Der Horst Ltd, Mitsibishi, and Kodak.

The latest planned satellites, IKONOS 1, 2 and 3 (formerly CARTERRIA 1 and 2), will have sensors for 1 meter panchromatic and 4 meter multispectral resolution and will provide 1 meter fused data from similar observations with a 3 day revisit cycle. SIE is stressing agriculture, transportation, utilities and environmental applications as their market area. Launch dates are for October 1998 and February 1999.

SPOT Image Corporation - 1897 Preston White Drive, Reston, VA 20191-4368 Telephone: (703) 715-3100, Fax: (703) 648-1813, and homepage: http://www.spot.com. SPOT, Owned by Centre National d'Etudes Spatial (CNES), the French Space Agency.

SPOT was designed by Centre National d'Etudes Spatiales, France and developed with the help from Sweden and Belgium. The system incorporates spacecraft, ground facilities for control and programming, and image production and distribution. SPOT is operating SPOT 2 and SPOT 3 at the present time and plan the launch of SPOT 4 early in 1998. SPOT 2 and 3 offer 10 meter resolution panchromatic and 20 meter resolution multispectral sensors with a flexible revisit schedule. SPOT Image Corp. markets to the US market.

SPOT has an extensive archive of images from the 10 years of collections of data. Areas that have been of particular marketing interest are land use, land cover, and special interest (deforestation, erosion, desertification, urban zones), and the impact of changes on the environment.

Summary

The status of commercial satellites for remote sensing is changing daily. One can see that there are over 20 satellites scheduled for launch during the next 16 months with 9 of them being of special interest to agriculture. There are over 50 satellites scheduled for launch during the next 10 years and that number is likely to increase as many of the commercial companies start into Phase 2 and 3 of their strategic plans. The message to agriculture and other potential users is very clear. The more satellites that are successfully launched the more data will be available and if the government doesn't interfere with the marketplace, the cheaper the cost of the data. The view from a satellite changes each time that the satellite passes over a specific area on the Earth and the type of views provided are also changing. The status is of commercial satellites is not stagnate.

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2/ Presented on August 7, 1997 at InfoAg Conference, Champaign, IL. Current copy published at URL: http://dynamo.ecn.purdue.edu/~biehl/SiteFarming/
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