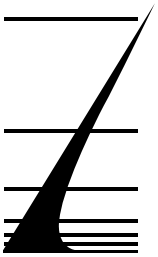
The Market for Civil & Commercial Remote Sensing Satellites

Product Code #F677

A Special Focused Market Segment Analysis by:



FORECAST INTERNATIONAL

Analysis 4
The Market for Civil & Commercial Remote Sensing Satellites 2011 – 2020

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Analysis 4

* * *

PROGRAMS

The following reports are included in this section: (**Note:** a single report may cover several programs.)

ADEOS/GCOM
CBERS
COSMO-SkyMed/Pleiades
DigitalGlobe Inc
Disaster Monitoring Constellation
Earth Observing System (EOS)
Earth System Science Pathfinder
EROS
ESA Polar Platform
GeoEye
GOES-Next
Indian Remote Sensing Satellites (IRS)
Jason Series
Landsat
Living Planet Program
Meteosat
NigeriaSat
NOAA Series/NPOESS
Radarsat
RapidEye
SAC

Introduction

Governments are still the main users of satellite imagery. At the same time, commercial uses for satellite remote sensing imagery are growing. With the expanding uses for satellite imagery, along with long-term commitments from government buyers, satellite operators will continue to purchase satellites over the next 10 years.

Many government agencies operate remote sensing satellite networks. Agencies such as NASA and ESA use the satellite data to advance scientific study. Others, such as ISRO, use networks of remote sensing satellites to improve urban planning and for agricultural and resource utilization. Still others, such as the U.S. NOAA and Eumetsat, use remote sensing satellites for weather forecasting.

Commercial satellite operators, such as DigitalGlobe and GeoEye, depend on government contracts for a large percentage of their revenues. The U.S. National Geospatial-Intelligence Agency (NGA) awarded the two companies contracts that could be worth over $3.5 billion each over the next 10 years to provide remote sensing data to the agency. The NGA will then distribute the data to military and intelligence agencies.

In addition to government interest in the remote sensing satellite industry is private industry's growing need for satellite data. Improved technology, increased global coverage, and reduced government restrictions on data that can be sold are increasing the appeal of satellite imagery in the private sector. Some of these applications include urban planning, natural resource exploitation, agriculture, mapping, navigation, and transportation.

The steady support of government funding, as well as increased private sector uses for satellite data, will drive satellite production over the next 10 years. Satellite operators will continue to purchase new satellites to replace older birds as well as to expand global coverage and revisit rates.

This analysis is an examination of the trends and factors that currently affect and are expected to affect the growth of this market. It is designed to provide the reader with an understanding of the current state of major remote sensing systems and the market factors that influence the development, production, and implementation of these systems.

Please note that only commercial and civil programs will be defined in this analysis. Military surveillance systems whose imagery is not available to the public are not covered in this report.

Major systems for which a production forecast is provided within this report include the following and formed the study population for this analysis:

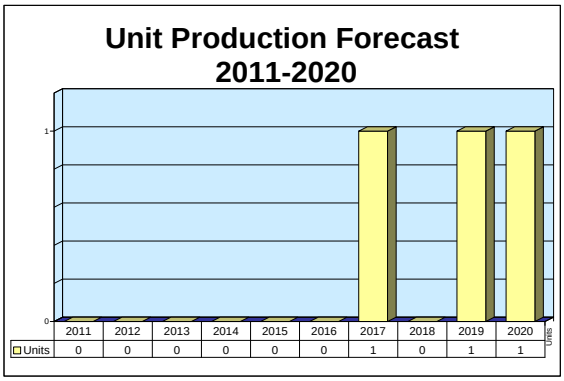
Prime Contractor	**Designation/Program**
Astronautic Technology (M) Sendirian Berhad (ATSB)	Razaksat
Ball Corporation	NPP
Ball Corporation	WorldView-3
China Aerospace Science & Technology Corp	Fengyun-3 (FY-3)
EADS Astrium	ADM-Aeolus
EADS Astrium	AlSat-2
EADS Astrium	EarthCARE
EADS Astrium	Pleiades
EADS Astrium	VNREDSat-1
EADS Astrium	SPOT 6
EADS Astrium	SPOT 7
EADS Astrium	Sentinel-2
EADS Astrium	Additional DMC
INVAP	SAC Follow-Ons
INVAP	SAC-D/Aquarius

Continued…

Meteosat

Outlook

- ESA gave go-ahead to Thales Alenia/OHB to start development work on MTG spacecraft in November 2010
- Compromise reached to end dispute over MTG contract; under the agreement, Thales Alenia and OHB will head construction efforts of six MTG spacecraft
- New full members in Eutelsat group include the Slovak Republic, Croatia, Slovenia, Hungary, Latvia, and Poland



Orientation

Description. Meteosat is a series of geosynchronous meteorological satellites.

Sponsor. European Meteorological Satellite Organization (Eumetsat), Darmstadt-Eberstadt, Germany, is responsible for Meteosat satellite funding, procurement of launch services, development of the ground segment, and operation of the system.

The European Space Agency (ESA) developed the MSG-1 (Meteosat Second Generation) prototype satellite, and, on behalf of Eumetsat, it is the procurement agent for MSG-2/3 satellites.

Status. In production and operation. MSG-3 and MSG-4 are in storage. MSG-2 (Meteosat-9) was launched in December 2005 on an Ariane 5G; MSG-1 (Meteosat-8) was launched in August 2002 on an Ariane 5 rocket.

Meteosat-7, launched on an Ariane 44LP expendable launch vehicle in 1997, operates at 57° E. Meteosat-6 operates as a backup. Meteosats -5, -4, -3, -2, and -1 are in graveyard orbits.

Total Produced. Ten (Meteosat-1/2/3/4/5/6/7/8/9 and MSG-3).

Application. Meteosats provide weather observation of Europe, Africa, and the northeastern part of South America.

Price Range. MSG spacecraft cost approximately $180 million each.

MTG spacecraft will likely cost about $200 million each.

Contractors

Prime

Thales Alenia Space	http://www.thaleson-line.com/space, 26 ave JF Champollion, BP 1187, Toulouse, 31037 France, Tel: + 33 05 34 35 36 37, Fax: + 33 05 61 44 49 90, Prime

Subcontractor

Astrium GmbH	http://www.astrium.eads.net, Robert-Koch-Str. 1, Ottobrunn, Taufkirchen, 82024 Germany, Tel: + 49 89 607 0 (Solar Array; Thermal Control)
Astrium Satellites	http://www.space.eads.net, Anchorage Rd, Portsmouth, PO3 5PU Hampshire, United Kingdom, Tel: + 44 2392 705705, Fax: + 44 2392 705706 (Altitude Measurement & AOCS; Radiometer Detector & Electrics; S-Band Pre-Amplifier; UHF Receiver & Amplifier)

Meteosat

EADS Sodern	http://www.sodern.com, 20, ave Descartes, Limeil-Brevannes, 94451 France, Tel: + 33 01 45 95 70 00, Fax: + 33 01 45 95 71 77 (STR03 Infrared Horizon Crossing Earth Sensor)
ITT Communications Systems	http://www.cs.itt.com, 1919 W Cook Rd, PO Box 3700, Fort Wayne, IN 46801 United States, Tel: + 1 (260) 451-6414, Fax: + 1 (260) 451-6126 (High-Resolution Infrared Radiation Sounder)
Intertechnique	http://www.intertechnique.fr, 61 rue Pierre-Curie, BP 1, Plaisir Cedex, 78373 France, Tel: + 33 1 30 54 82 00, Fax: + 33 1 30 55 71 61 (Data Acquisition & Processing Station Equipment)
MT Aerospace AG	http://www.mt-aerospace.de, Franz-Josef-Strauss-Strasse 5, Augsburg, 86153 Germany, Tel: + 49 821 505 01, Fax: + 49 821 505 1000, Email: PublicRelations@mt.man.de (Mage 1 Apogee Motor)
Radiall SA	101 Rue P Hoffmann, Rosny-Sous-Bois, 93116 France, Tel: + 33 148 54 8040 (Electronic Connector)
Rohde & Schwarz Co Group	http://www2.rohde-schwarz.com, PO Box 801469, Munich, D-81614 Germany, Tel: + 49 89 4129 0, Fax: + 49 89 4129 2164 (RW075 Image Receiving Equipment)
SNIA SpA	http://www.snia.it/en/index.php, 14 Via Borgonuovo, Milan, 20121 Italy, Tel: + 39 02 6332 1, Email: giuseppe.raciti@snia.it (Mage 1 Apogee Motor with MAN & SEP)
Sagem	http://www.sagem-ds.com, Le Ponant de Paris, 27, Rue Leblanc, Paris, 75015 France, Tel: + 33 1 58 11 78 00, Fax: + 33 1 58 11 78 50 (Solar Cell; Telemetry Equipment)
Siemens AG	Wittelsbacherplatz 2, PO Box 103, Munich, W-8000 Germany, Tel: + 49 89 2342812, Fax: + 49 89 2342825 (S/UHF Transponder)
Thales	http://www.thalesgroup.com, 45, Rue de Villiers, Neuilly-sur-Seine, 92526 France, Tel: + 33 1 57 77 80 00, Fax: + 33 1 57 77 86 59 (Data Collection Platform)
Thales Avionics SA	http://www.thalesgroup.com/aerospace/, 25 Rue Jules Védrines, Valence, 26027 France, Tel: + 33 4 75 79 85 11, Fax: + 33 4 75 49 36 20 (Transducer Equipment)
Thales Nederland BV	http://www.thalesgroup.com/netherlands, Haaksbergerstraat 49, Hengelo, 7554 PA Netherlands, Tel: + 31 74 2488111, Fax: + 31 74 2425936, Email: info@nl.thalesgroup.com (AOCS Momentum Wheel Unit)

Comprehensive information on Contractors can be found in Forecast International's "International Contractors" series. For a detailed description, go to www.forecastinternational.com (see Products & Samples/Governments & Industries) or call + 1 (203) 426-0800.

Contractors are invited to submit updated information to Editor, International Contractors, Forecast International, 22 Commerce Road, Newtown, CT 06470, USA; rich.pettibone@forecast1.com

Technical Data

Design Details. For data collection, Meteosat carries a 400-millimeter-aperture telescope, scanning mechanisms, focusing and calibration devices, and electronic detection systems. It operates in the 0.4 to 1.1 mu wavelength in the visible spectrum, 5.7 to 7.1 mu in the water vapor absorption band, and 10.5 to 12.5 mu in the infrared band. Pictures are taken every 30 minutes with a resolution of 2.5 kilometers in the visible light band, and 5 kilometers in the infrared and water vapor absorption bands.

The images are transmitted via an S-band link to ground stations for processing. Command signals and telemeasurement are relayed through a VHF link, and data from buoys, balloons, aircraft, and ships are received through a UHF link. Information extracted from Meteosat images includes cloud evolution and atmospheric patterns, weather prediction, climatology/radiation studies, thermal behavior of the Earth's surface, ocean currents, and hydrology.

Meteosat images – generated every 30 minutes – are transmitted in real time to Eumetsat's satellite and mission control center at its headquarters in Darmstadt. A primary ground station is based in Fucino, Italy, with a backup in Weilheim, in southern Germany. After preprocessing, the images are retransmitted through the satellite to the meteorological user community. They are now familiar images seen in the daily weather forecasts broadcast from many European TV stations. In late 1995, Eumetsat took over operations of all Meteosat satellites from the European Space Agency (ESA).

MSG. At 3.2 meters (10.5 ft) across, the cylindrical MSG satellites are triple the size of the original Meteosats. They also have a seven-year design life, weigh 2,000 kilograms (4,400 lb), and produce 600 watts of power.

The MSG satellite's primary instrument is the Spinning Enhanced Visible and Infrared Imager. The SEVIRI's overall mass including contingency is 270 kilograms, and its power consumption is about 130 watts. Its 12 spectral channels (eight of which are in color, compared with the three on earlier Meteosat series) will provide 20 times more information than the Meteosat-7. A new weather image will be provided every 15 minutes instead of every 30 minutes. The data circulation system will also be improved by allowing much higher data rates for both transmission (3.2 Mbps) and dissemination (1 Mbps).

MSG-1 (Meteosat-8) also features the Geostationary Earth Radiation Budget (GERB) instrument, intended to make accurate measurements of the earth radiation budget from geostationary orbit. The GERB was produced by a European consortium led by the U.K. together with Belgium and Italy, with funding from national agencies. Additional GERB instruments are being provided for MSG-2 (Meteosat-9) and MSG-3, with funding by Eumetsat.

	Metric	U.S.
(Meteosat)		
Dimensions		
Length	3.2 m	10.4 ft
Diameter	2.1 m	6.8 ft
Weight		
Mass in Orbit	320 kg	704 lb
Performance		
Stabilization	Spin (100 rpm)	
Frequency		
S-Band	1,670-2,110 MHz	
UHF	402-402.2 MHz	
Data Rate (MOP)	333 kb/s	
Image Generation Rate	Every 30 min	
Design Life	5 yr	

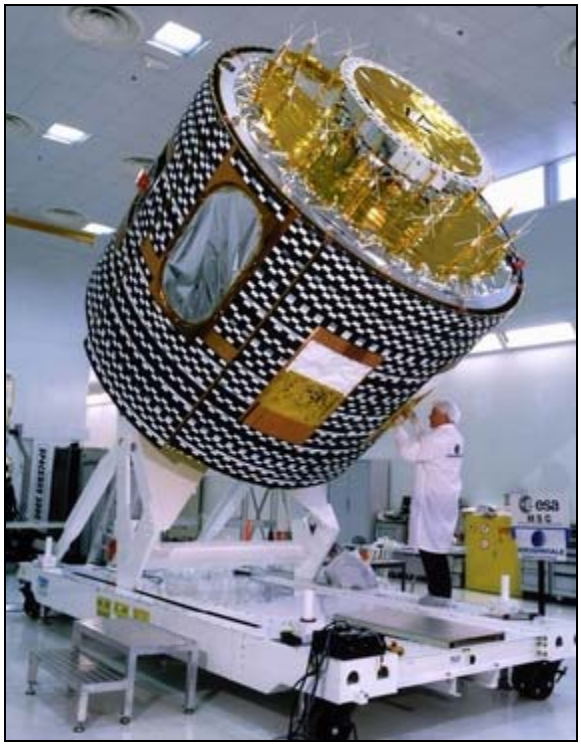
Variants/Upgrades

Meteosat Transition. To bridge the gap in coverage between the current MOP and future second-generation Meteosats, Aerospatiale built one MTP Meteosat satellite (Meteosat-7) along with components for a second. These spacecraft are identical to MOP satellites.

Meteosat Second Generation (MSG). This is Eumetsat's series of newer, larger weather satellites. The first MSG satellite (MSG-1) was launched in August 2002. MSGs monitor weather and ozone conditions, and measure solar radiation reflected from the atmosphere and heat emitted from Earth, as well as visible light, heat, and water vapor. MSG-1 also functions as part of the World Weather Watch network.

Meteosat Third Generation (MTG). Meteosat Third Generation (MTG) satellites will replace MSG satellites. The current plans call for six satellites to be produced in total. This will include four imager satellites (MTG-I) that will carry a Flexible Combined Imager and a Lightning Imager. Two sounding satellites (MTG-S) will be built that will carry an Infrared Sounder and an Ultraviolet Visible Near-Infrared Sounder). The two types of satellites will share a common platform.

Meteosat



The MSG-1 Satellite

Source: European Space Agency

Program Review

Background. Meteosat satellites form a part of the global geosynchronous weather satellite network called World Weather Watch, which also includes two U.S. Geostationary Operational Environmental Satellite (GOES) and one Japanese GMS-3 (Himawari-3) spacecraft. The Meteosats have been moved from their normal operating slot of 0° to as far as 50° to provide images of the Caribbean whenever the U.S. National Oceanic and Atmospheric Administration, which operates the GOES units, finds itself shorthanded. The spacecraft comprising the network provide imagery and relay processed weather data to ground stations, and they act as orbiting relays for data collected by remote weather stations (buoys, weather balloons, etc.) as well as by other observation satellites.

The European Space Agency operated the early Meteosat spacecraft, which were later transferred to Eumetsat's control. Eumetsat was formed in 1986 as a weather satellite operating group. Control of the Meteosat satellites was transferred December 1, 1995, from ESA's European Space Operations Center, located at Darmstadt, to Eumetsat's control center in the same city.

The first Meteosat (Meteosat-1), a pre-operational spacecraft, was launched aboard a Delta expendable launch vehicle in 1977. This satellite was followed in 1981 by Meteosat-2. Both spacecraft were designed to test the system's technical feasibility before deployment of the operational satellites scheduled to follow in the late 1980s and early 1990s. The first two spacecraft exceeded their design specifications and design lives. Meteosat-3 (formerly called P2) was launched in 1988, followed in 1989 by Meteosat-4 (formerly called MOP-1). Meteosat-5, formerly called MOP-2, was launched in 1991.

Meteosat-1 was deactivated in 1985, followed by the deactivation and deorbiting of Meteosat-2 in 1989. Meteosat-3 (the last of the ESA-owned Meteosat satellites) was operated from 1991 until 1995, first at 50° W and then at 75° W, in support of NOAA. Meteosat-4 was also removed from operational use in 1995. Meteosat-7 is fully operational, while Meteosat-5 has been moved to graveyard orbit.

The ESA selected Aerospatiale (whose satellite division became part of Alcatel Space in 1998) in 1996 to head an industrial team to develop three Meteosat

Second-Generation (MSG) satellites. The contract, worth about $765 million, called for the first satellite's launch in 2002.

Ground Installation Troubles Delay MSG-1

Eumetsat announced that the planned MSG-1 launch date would be delayed by several months, until mid-2002. The delay was a direct result of technical problems encountered during the production of ground installations.

In the past, Eumetsat would award several contracts for the ground-segment portion of a program. In this case, the organization was operating under the assumption that the ground installations would be able to use commercial off-the-shelf hardware. Unfortunately, none of the contractors involved let Eumetsat know that it had grossly underestimated the complexity of the software and hardware needed to process the data received from the spacecraft.

As a result, the launch date was delayed while the situation was resolved. In the meantime, Eumetsat changed its contracting policy. From then on, the organization would issue one contract to a prime contractor to handle all aspects of development and implementation.

MSG-1 Launched. MSG-1 was successfully launched from Kourou in French Guiana on an Ariane 5 rocket in late August 2002.

Africa to Benefit from MSG Satellites

In November 2002, Alcatel Space was awarded a contract from the Meteorological Department of Kenya to supply and install 47 receiving stations for MSG weather satellites in 45 African countries. The work is being carried out under the Preparation of the Use of MSG in Africa (PUMA) project, launched in 1996 by Eumetsat and the European Commission. The new stations will mark a significant leap in weather forecasting capabilities for Africa and the Indian Ocean. The European Commission is providing funding for the stations via the European Development Fund.

MSG-4 Contract Signed. In April 2003, Eumetsat continued its cooperation with Alcatel Space and signed a contract worth EUR135 million for on-ground delivery of the fourth MSG satellite in 2007. A 2012 launch on an Ariane 5 is planned.

The Ghanaian Meteorological Service Department (MSD) announced in 2003 that it would construct an MSG ground receiving station in the Accra region. Work on this was completed in 2004. The MSD is a Ghanaian government department tasked with providing meteorological information to all sectors of the country's economy. The region is frequently ravaged by flooding, and it is hoped that flood forecasting will be greatly improved with the station's installation.

Eumetsat secured a 23 percent budget increase for 2009. The budget for the year was EUR229 million ($291 million) and covers MSG-3 launches. The Eumetsat organization is growing; six Cooperating States have joined as full members. These include the Slovak Republic, Croatia, Slovenia, Hungary, Latvia, and Poland. The Czech Republic is also set to become a full member in 2010. These members participate fully in Eumetsat decision-making, and their industry can bid for Eumetsat contracts.

Oman has signed a contract with Eumetsat to receive meteorological data from Meteosat-7, which is in orbit over the Indian Ocean. Oman will pay Eumetsat EUR300,000 ($417,000) per year to receive the information. Payments began in 2009. Oman will also receive data from the Indian Ocean Tsunami Warning System.

MTG. In February 2010, ESA, which is handling the contractor selection process for the Meteosat Third Generation (MTG) constellation, picked a Thales Alenia Space/OHB consortium to build six MTG satellites. Under the agreement between ESA and Eumetsat, the consortium had exclusive negotiating rights with Eumetsat.

The pick quickly proved to be controversial, especially in Germany, where some members of the government hoped for a higher workshare for German manufacturers. The German Space Agency (DLR), which oversees Germany's membership in ESA, allowed ESA to select Thales Alenia and OHB. However, the German Transport Ministry, which oversees Germany's membership in Eumetsat, not only wanted a higher level of German participation, but also that the prime contractor come from Germany. Even after a six-member independent procurement review board endorsed the procedures that ESA had used to select a contractor-team, the German government opposed the plan.

A compromise was finally reached in June 2010. Under the compromise, the Thales Alenia and OHB consortium will remain the prime contractor. However, Astrium, which has large subsidiaries in Germany, will receive a larger share of the work on the payload. In response to this compromise, Germany and other Eumetsat members have approved MTG. As of November 2010, 17 Eumetsat members have confirmed support for MTG, representing 75 percent of the MTG program budget. In accordance with this, ESA has ordered Thales Alenia Space and other contractors to begin work on developing the MTG constellation.

Meteosat

Funding

Eumetsat contributed one-third of the cost of the MSG-1 satellite and is paying for MSG-2 and MSG-3 in full. ESA contributed the remaining two-thirds of the cost of MSG-1 through an optional program in which 13 of the agency's member states participate.

Eumetsat is covering 75 percent of the cost of Meteosat Third Generation satellites, while ESA is covering the remaining 25 percent. MTG is expected to cost a total of EUR4.4 billion ($6 billion). This includes the cost of the satellites, ground stations, launch operations, and satellite operations. ESA conducted the contractor selection, while Eumetsat will award the contract.

Eumetsat derives most of its funding from the contributions of its member states. These contributions are calculated as pro-rata to the GDP of the respective state. In descending order, member state contributions are as follows:

Country	Percentage
Germany	19.20
U.K.	15.62
France	14.70
Italy	12.04
Spain	7.56
Netherlands	4.38
Switzerland	2.75
Belgium	2.57
Sweden	2.53
Turkey	2.27
Austria	2.05
Norway	2.03
Poland	1.95
Denmark	1.78
Greece	1.65
Finland	1.35
Portugal	1.23
Ireland	1.17
Czech Republic	0.80
Hungary	0.69
Romania	0.57
Slovak Republic	0.32
Croatia	0.25
Slovenia	0.23
Luxembourg	0.21
Bulgaria*	0.18
Lithuania*	0.16
Latvia	0.10
Iceland*	0.10
Estonia*	0.08
Serbia*	0.18

* Indicates a cooperating state.

Timetable

Month	Year	Major Development
Nov	1977	Meteosat-1 launched on a Delta vehicle
Jun	1981	Meteosat-2 launched on an Ariane 3
Jun	1988	Meteosat-3 launched on an Ariane 4
Mar	1989	Meteosat-4 launched on an Ariane 4
Mar	1991	Meteosat-5 launched on an Ariane 4
Nov	1993	Meteosat-6 launched on an Ariane 4
Sep	1997	Meteosat-7 launched on an Ariane 4

Meteosat

Month	Year	Major Development
Aug	2002	MSG-1 launched on an Ariane 5
Dec	2005	MSG-2 launched on an Ariane 5
Feb	2010	Thales Alenia Space/OHB consortium selected by ESA to negotiate a contract to build Meteosat Third Generation
Nov	2010	Development begins on MTG constellation
	2011	Scheduled launch of MSG-3 on Ariane 5
	2013	Scheduled launch of MSG-4 on Ariane 5
	2016	Planned launch of MTG-Imager 1
	2017	Planned launch of MTG-Sounder 1
	2018	Planned launch of MTG-Imager 2
	2023	Planned launch of MTG-Imager 3
	2024	Planned launch of MTG-Sounder 2
	2025	Planned launch of MTG-Imager 4

Forecast Rationale

Meteosat Third Generation (MTG) satellites will continue to provide meteorological coverage over Europe for Eumetsat, ensuring that coverage proceeds after the second generation Meteosat satellites begin to reach the end of their service lives by the end of this decade.

The four Meteosat Second Generation (MSG) satellites have already been produced. Two have been launched, and two are awaiting launch. Now with MSG completed, Eumetsat has turned its attention toward the third generation satellites in order to continue weather coverage over Europe.

However, the MTG satellite program hit a snag in 2010 when Germany said it was opposed to the Thales Alenia Space/OHB consortium being selected to build the six MTG satellites. The country not only wanted a higher level of participation in the program, but especially desired that the prime contractor come from Germany. The program got back on track when a compromise was struck in June 2010. Under the agreement, the Thales Alenia Space-OHB consortium will proceed with the development, while Astrium, a company with a large German presence, will have an increased role in payload development and manufacture. The compromise has allowed MTG development to proceed, but did delay the program.

Delivery of these spacecraft is expected to begin by the end of the forecast period. No MTG satellites are expected to be delivered until late in the forecast period. The four MSG satellites have already been manufactured. The two spacecraft that have yet to launch are in storage. In addition to the projected MTG spacecraft, additional spacecraft will be delivered beyond the forecast period. In total, six spacecraft will be produced.

Ten-Year Outlook

ESTIMATED CALENDAR YEAR UNIT PRODUCTION

Designation or Program	High Confidence				Good Confidence			Speculative			
	Thru 2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Total
MFR Not Selected												
Meteosat Third Generation - Imager (MTG-I) <> Meteosat												
	0	0	0	0	0	0	0	1	0	0	1	2
Meteosat Third Generation - Sounder (MTG-S) <> Meteosat												
	0	0	0	0	0	0	0	0	0	1	0	1
Subtotal	0	0	0	0	0	0	0	1	0	1	1	3
Total	0	0	0	0	0	0	0	1	0	1	1	3

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DVD	$50	$95

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DVD	$50	$95
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DVD	$50	$95
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Binder	$90	$170
DVD	$50	$95
Weapons		
Binder	$180	$340
DVD	$50	$95

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