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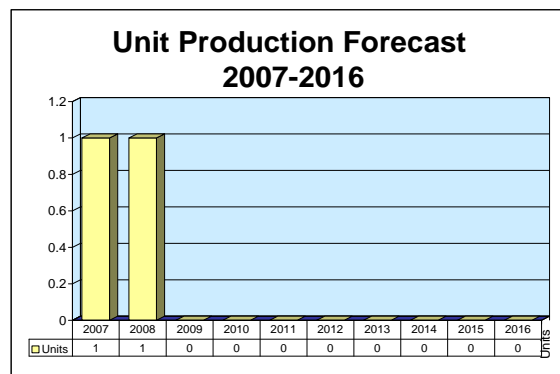
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Skynet 4/5 - Archived 02/2008

Outlook

- This report will be archived from the C⁴I Forecast in 2007 and relocated to Forecast International's new *Satellites & Spacecraft* Forecast
- EADS Astrium is prime contractor for Skynet 5 and responsible for its three spacecraft
- Long-lead items for possible fourth spacecraft are on order



Orientation

Description. Skynet is a military communications satellite system used by the U.K. Ministry of Defence (MoD). The Skynet 4 satellite communications network links U.K. defense forces throughout the world by way of SHF and UHF. An added EHF capability is expected for the Skynet 5 version.

Sponsor. U.K. Ministry of Defence.

Status

Skynet 4. In operational service; no additional production planned.

Skynet 5. Skynet 5 was scheduled to be operational by 2007.

Total Produced

Skynet 4. Ten (eight Skynet 4 and two NATO-version satellites).

Skynet 5. Two Skynet 5 satellites in production.

Application. Military satellite communications.

Price Range

Skynet 4. Skynet 4 satellites were estimated to cost \$122.3 million per unit.

Skynet 5. Skynet 5 satellites are likely to cost \$280 million per unit.

Contractors

Prime

Paradigm Secure Communications	http://www.paradigmsecure.com , Gunnels Wood Rd, EADS Astrium Site, Stevenage, Hertfordshire, SG1 2AS United Kingdom, Tel: + 44 1438 282 121, Fax: + 44 1438 282 130, Prime
EADS Astrium, Division HQ	http://www.space.eads.net , 6 rue Laurent Pichant, Cedex 16, Paris, 75216 France, Tel: + 33 01 42 24 28 28, Fax: + 33 01 42 24 27 27, Second Prime

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Subcontractor

BAE Systems Integrated System Technologies (Insyte)	http://www.baesystems.com , Grange Rd, Christchurch, Dorset, BH23 4JE United Kingdom, Tel: + 44 1202 486 344, Fax: + 44 1202 404 221, Email: media@baesystems.com (Ground Station)
COM DEV Ltd, Headquarters and Manufacturing Plant	http://www.comdev.ca , 155 Sheldon Dr, Cambridge, N1R 7H6 Ontario, Canada, Tel: + 1 (519) 622-2300, Fax: + 1 (519) 622-1961, Email: gary.calhoun@comdev.ca (Core Payload Electronics)
EMS Technologies Inc	http://www.ems-t.com , 660 Engineering Dr, Norcross, GA 30091 United States, Tel: + 1 (770) 263-9200, Ext: 4326, Fax: + 1 (770) 447-4397, Email: pr@ems-t.com (UHF Antennas; Low Noise Amplifiers)
Intersil Corp	115 Palm Bay Rd, Melbourne, FL 32919 United States (Satellite Command & Control Equipment)
RT Logic	1042 Elkton Dr, Colorado Springs, CO 80907 United States, Tel: + 1 (719) 598-2807 (S-Band Modem Systems)

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 Features. Skynet borrows many of the features of the three-axis-stabilized British Aerospace Orbiting Test Satellite (OTS) and European Commercial Satellite (ECS) designs (Matra Marconi Space acquired British Aerospace Space Systems in 1994). The satellite features a four-channel SHF transponder that uses four different antenna coverage patterns to provide

spot beam European coverage, narrow beam European coverage, hemisphere coverage, and wide Earth coverage. The satellite is also equipped with a two-channel UHF transponder and a 45-GHz EHF receiver to support an uplink channel for advanced research and development purposes.

	<u>Metric</u>	<u>U.S.</u>
Dimensions		
Height	2.1 m	6.9 ft
Length	1.9 m	6.2 ft
Width	1.4 m	4.6 ft
Width with solar array span	16 m	52.5 ft
Weight^(a)		
Launch mass	1,175 kg	2,590 lb
In-orbit mass	700 kg	2,297 lb
Performance		
Number of channels	4 SHF, 2 UHF, 1 EHF (45 GHz)	
Stabilization	3-axis	
Power supply	1.2 kW	
Design life	7 years	

^(a) All weights approximate, based on ECS figures.



Rendering of new Skynet 5 satellite

Source: U.K. Defence Procurement Agency

Variants/Upgrades

NATO 4. NATO selected then-British Aerospace (now BAE Systems) in 1987 to build a pair of NATO 4 communications satellites to provide military and diplomatic links among member countries. The value of the satellite contract was approximately \$270 million. Working with BAE as prime subcontractor on the NATO 4 project, then-Marconi Space Systems was responsible for the communications payload.

NATO 4s are nearly identical to the Skynet 4 satellites. The first NATO 4 satellite (NATO 4A) was launched on January 7, 1991 and the second in December 1993.

Skynet Follow-On. The U.K. Ministry of Defence procured additional Skynet 4 Stage 2 satellites to replace the existing models as they retired. These satellites, designated 4D, 4E and 4F, are based on the

current models but include improvements. An enhanced payload, for example, features a steerable SHF spot beam antenna, more power, and anti-jam capability. In addition, each satellite reportedly is interoperable with the French Syracuse military satellite system, allowing users to access either satellite system with one set of ground equipment.

Skynet 5. The U.K. MoD is currently working on replacements for the Skynet 4 Stage 2 satellites. These newer units, called Skynet 5s, will operate in the EHF, SHF and UHF frequencies. Additionally, Skynet 5 will have fully redundant systems, be interoperable with U.S. communications systems, and have the ability to serve fixed, mobile and man-portable terminals. Skynet 5 operational capability is scheduled for sometime in 2007.

Program Review

Background. The Skynet 4 military communications satellites were the first to be procured by the U.K. MoD since the Skynet 2B spacecraft was launched in 1974. Since that time, the U.K. MoD has relied primarily on U.S. and NATO satellites to communicate with its worldwide land and sea forces. During the Falklands campaign, British forces resorted to

transmitting messages by way of the civilian Inmarsat system.

The U.K. MoD picked then-British Aerospace in 1981 to provide two Skynet 4s: Skynet 4A and 4B. A third, Skynet 4C, was later ordered, and the MoD exercised options on an additional three. Marconi Space Systems was chosen as the prime subcontractor in charge of the

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satellites' communications payload, and Canadian Astronautics (Ottawa, Ontario, Canada) supplied the spacecraft's UHF antenna. Pilkington Ltd (St. Asaph, Clwyd, Wales) supplied the surface mirrors and optical solar reflectors used on the two solar panels. Additional Skynet contractors include Matra (altitude and orbit control system), Plessey Defence Systems Ltd (ground station at RAF Oakhangar), Fokker of Holland, Saab-Scania of Sweden, Watkins-Johnson and Wavecom of the United States, and Vega Space Systems Ltd of the U.K.

The Skynets use a command and control system built by Harris Corp's Government Communications Systems Division (Melbourne, FL). The Harris system receives satellite telemetry and transmits operational commands to keep the spacecraft in their orbital slots.

Follow-On to Skynet 4

In 1989, Marconi Space Systems outlined plans for two follow-on Skynet satellites for launch in the latter part of the 1990s as part of a study commissioned by the U.K. MoD. Skynet 4D and 4E satellites followed in the footsteps of the earlier Skynet 4 design but featured a number of improvements, including better anti-jam capabilities. The cost of the two-satellite program, including launch, was approximately \$450 million. Matra Marconi Space confirmed receipt of an order for a third satellite in the February 1996 procurement package.

While the Skynet 4 follow-on systems were being procured, the U.K. MoD began casting about for a replacement for the entire Skynet 4 network. Two contracts were awarded in April 1999 – one to Matra Marconi Space and the other to Lockheed Martin – to perform Skynet 5 design studies focused on the procurement of Skynet 5 through a Private Finance Initiative (PFI). This approach required the industry team selected to finance the satellite construction program and to develop communications service catalogs, charging structures, and billing systems. Under this arrangement, the contractor would be able to offer communications services to other military and commercial users. Astrium created a team around Paradigm Secure Communications to address financing and communications service issues. (Team members included Motorola, Logica, Cogent, TRW, and System Engineering Assessment. Lockheed Martin team members included British Telecommunications plc and British Aerospace.)

Skynet 4 Status. On January 10, 1998, the U.K. MoD's Skynet 4D satellite was launched. Skynet 4E was launched in February 1999. Skynet 4F was launched in February 2001, a bit delayed due to some

technical problems. The launching was part of a dedicated twin defense payload on board an Ariane 4, which also carried the Italian Sicral-1 military satellite.

Skynet 5 Status. In July 2001, the U.K. MoD chose the PFI, thereby making Skynet 5 a commercial endeavor. As part of the agreement, the U.K. would not fund any part of the program, but it guaranteed capacity use to help the manufacturer raise funding for the satellite constellation.

Paradigm, a subsidiary of Astrium, was selected as the preferred bidder for the \$2.8 billion Skynet 5 contract in February 2002. Paradigm took over the Skynet 4 satellites (three U.K. and two NATO) in 2003 and added the Astrium-built Skynet 5A satellite in 2006. The Skynet 5B satellite is expected to be built in 2007.

BAE Systems C⁴ISR was awarded a subcontract of an undisclosed amount from Astrium (the parent company of Paradigm), and provided the first batch of six Talon satellite communications terminals in October 2002 for the Skynet 5 satellites. Nine more Talon terminals were delivered by the end of August 2003, for a total of 15. The Talon terminals incorporate a range of commercial off-the-shelf components to provide military features such as satellite tracking and the use of defense radio frequency bands.

In October 2003, the U.K. MoD officially awarded EADS' Paradigm Secure Communications a GBP2.5 billion (\$4.2 billion) PFI deal to take over operations of U.K. MoD Skynet satellites, associated ground stations, and two future satellites, as well as commercial capacity leases when and where required. The PFI contract is to extend 15 years through 2018.

Later, EADS Astrium was awarded the contract for the design and construction of two Skynet 5 satellites, as well as upgrades to the Skynet ground segments in the U.K.

By April 2004, the Critical Design Review for Skynet operations software, known as I4S, and which will operate the Satellite Control Center for Skynet 4 and Skynet 5 satellites, was completed by L-3 Storm Control Systems. Come December 2004, EADS Astrium awarded the launch contract for both Skynet 5 spacecraft to European Arianespace. The deal for the launch is estimated to be valued at \$75 million per satellite. EADS Astrium is 100 percent owned by EADS Space, the Ariane 5 prime contractor and 29 percent shareholder of Arianespace.

Additional Countries Come Aboard

In September 2004, EADS Astrium subsidiary Paradigm won a contract to provide encrypted satellite

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communications capability to Portugal's defense forces. This capability will be provided through the Skynet system. Financial details of the transaction were not disclosed.

The French Ministry of Defense signed an agreement with EADS Space Services for the provision of satellite communications in June 2005. The deal is for a renewable period of two years and covers the Ku-band, C-band and X-band. EADS Space Services has arranged with Paradigm to provide this service on the Skynet system. Financial details were not disclosed.

Kidnapping a Hoax or an X-File Episode?

The U.K. MoD experienced a major shock regarding the Skynet system in late February/early March 1999 when it was reported that one of the Skynet satellites had been hijacked by unknown computer hackers. It was

rumored that the U.K. government had received a ransom demand after the satellite was apparently altered from its previous geosynchronous orbit. Numerous publications carried the news, but later reports indicated that a computer hijacking was rather unlikely.

On March 2, 1999, the U.K. MoD released a statement confirming that all of its satellites were fine and that no takeover had occurred. Considerable speculation surrounded the alleged satellite hack, but since the denial of the hijacking by the U.K. MoD, no additional reports of an official nature have been released. The hijacking story is presumed unlikely, the confusion resulting from miscommunication between government officials and the media, as well as some circumstantial evidence. Still, government agencies do not have strong credibility, given their penchant for cover-ups when dealing with bad press. The truth is still out there!

Significant News

Third Satellite Added – A third Skynet 5 spacecraft has been added to the production lines at EADS Astrium. The decision to proceed with Skynet 5C came after Paradigm Secure Communications realized that procuring the third satellite would be less expensive than insuring the first two Skynet 5s. Paradigm's move to add another satellite also extends its 15-year, \$4.4 billion operations contract by two years, to 2020. PSC has also ordered long-lead items for a fourth spacecraft from EADS Astrium. Skynet 5C is scheduled to launch in 2008 on an Ariane 5 launch vehicle. (EADS, 1/06)

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Contracts/Orders & Options

<u>Contractor</u>	<u>Award (\$ millions)</u>	<u>Date/Description</u>
Paradigm (EADS)	2,800.0	Feb 2002 – Paradigm chosen as preferred bidder under a PFI to oversee Skynet 4 and Skynet 5 satellites.
BAE Systems	N/A	Oct 2002 – BAE Systems C ⁴ ISR awarded a subcontract from Astrium for Skynet 5 Talon terminals.
Paradigm (EADS)	4,200.0	Oct 2003 – U.K. MoD PFI award to oversee Skynet operations and new satellites for approximately 15 years.
Paradigm (EADS)	N/A	Sep 2004 – Paradigm awarded contract from Portugal to provide encrypted satellite communications.
EADS Astrium	N/A	Dec 2004 – EADS Astrium awards Skynet 5 spacecraft launch to Arianespace.
Paradigm (EADS)	N/A	Jun 2005 – French Ministry of Defense signs agreement with EADS Space Services for satellite communications via the Skynet system.

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Timetable

<u>Month</u>	<u>Year</u>	<u>Major Development</u>
Nov	1974	Skynet 2B launched on Thorad Delta
May	1978	OTS-2, predecessor to Skynet 4C, launched on Delta
Dec	1988	Skynet 4B launched on Ariane 4
Dec	1989	Skynet 4A launched on Titan III
Aug	1990	Skynet 4C launched on Ariane 44LP
Jan	1991	NATO 4A launched on Delta II
Dec	1993	NATO 4B launched on Delta II
Dec	1997	U.K., France and Germany sign MoU to begin work on Trimilsatcom
Jan	1998	Skynet 4D launched on Delta II
Aug	1998	U.K. withdraws from Trimilsatcom program; begins work on indigenous Skynet 5 platforms
Feb	1998	Skynet 4E launched on Ariane 44L
Feb	2001	Skynet 4F launched on Ariane 4
	2003	Paradigm assumes control of Skynet 4 satellites
Oct	2003	Paradigm wins award to oversee all Skynet operations and new satellites
	2006	Launch of first Skynet 5A
	2007	Planned launch of second Skynet 5B
	2008	Planned launch of third Skynet 5C

Worldwide Distribution/Inventories

Skynet is a **U.K. MoD** program.

Forecast Rationale

The United Kingdom's Skynet 5A was successfully launched in late 2006 and is to be followed by Skynet 5B in late 2007, with launch of Skynet 5C scheduled for 2008. These will operate in conjunction with Great Britain's Skynet 4s, but will ultimately

replace Skynets 4D and 4E, whose seven-year design lives expire in the next two years. No further Skynet 5 production for NATO is planned. If anything, additional spacecraft will be procured for the Syracuse III and Sicral systems – one per constellation.

Ten-Year Outlook

ESTIMATED CALENDAR YEAR UNIT PRODUCTION												
Designation or Program	High Confidence					Good Confidence			Speculative			
	Thru 2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Total
Astrium Satellites												
Skynet 5 United Kingdom												
	1	1	1	0	0	0	0	0	0	0	0	2
Total	1	1	1	0	0	0	0	0	0	0	0	2