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Spaceway

Outlook

- EchoStar agreed to acquire Hughes in February 2011; under current plans, Hughes operations will be merged into EchoStarHughes Communications supports customer base with Spaceway 3 and leased transponders
- New Jupiter satellite reported to have 10 times capacity of Spaceway 3

Orientation

Description. A constellation of broadband communications satellites.

Sponsor. Hughes Network Systems, LLC, a wholly owned subsidiary of Hughes Communications Inc, operates Spaceway 3 and has contracted for Jupiter. DirecTV operates Spaceway 1 and Spaceway 2.

Status. All three Spaceway spacecraft are operational. Jupiter is currently being manufactured by Space Systems/Loral.

Total Produced. Three Spaceway satellites have been produced.

Application. Spaceway 1 and 2 are used by DirecTV to broadcast high definition television (HDTV) channels to direct-to-home (DTH) customers. Spaceway 3 provides two-way, high-bandwidth and high-speed communications for broadband and multimedia applications, from Internet access to LAN/WAN solutions.

Price Range. From conception to launch, the three Spaceway satellites, plus insurance and associated ground systems, cost approximately \$1.8 billion. Jupiter is estimated to cost about \$250 million.

Contractors

Prime

Boeing Satellite Development Center	http://www.boeing.com/defense-space/space/bss/ , 2260 E Imperial Hwy, El Segundo, CA 90245 United States, Tel: + 1 (951) 340-2492, Prime (Boeing-702)
Space Systems/Loral	http://www.ssloral.com , 3825 Fabian Way, Palo Alto, CA 94303-4604 United States, Tel: + 1 (650) 852-4000, Fax: + 1 (650) 852-5656, Email: lewisw@ssd.loral.com , Prime

Subcontractor

Anaren Inc, HQ	http://www.anaren.com , 6635 Kirkville Rd, PO Box 278, East Syracuse, NY 13057-9678 United States, Tel: + 1 (315) 432-8909, Fax: + 1 (315) 432-9121 (Antenna Beamforming Networks)
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Hughes Network Systems LLC	http://www.hughes.com , 11717 Exploration Ln, Germantown, MD 20876 United States, Tel: + 1 (301) 428-5500, Fax: + 1 (301) 428-1868 (Ground Systems)
Mercury Computer Systems Inc, Corporate Headquarters	http://www.mc.com , 199 Riverneck Rd, Chelmsford, MA 01824-2820 United States, Tel: + 1 (800) 229-2006, Fax: + 1 (978) 256-3599 (Downlink Software)
RUAG Space AB	http://www.ruag.com/Space/ , Solhusgatan 11, Göteborg, 405 15 Sweden, Tel: + 46 31 735 00 00, Fax: + 46 31 735 40 00 (Ka-Band Upconverters and Downconverters)
Software Technology Inc	http://www.sti-k12.com , 4721 Morrison Dr, Suite 200, Mobile, AL 36609 United States, Tel: + 1 (251) 639-1851, Fax: + 1 (251) 304-0392 (Systems Integration and Testing)
Sun Microsystems Inc	http://www.sun.com , 4150 Network Cir, Mailstop UMPK18-229, Santa Clara, CA 95054 United States, Tel: + 1 (408) 404-8427, Fax: + 1 (650) 786-4557 (Ground System Software)

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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. Spaceway satellites are based on the Boeing-702 (see separate report in this tab) satellite bus. Each Ka-band Spaceway satellite features four gallium arsenide (GaAs) solar panels with three-axis stabilization. All core UNIX-based ground systems are supplied by Sun Microsystems and use Sun Fire 15K servers, Sun Fire 6800 Midframe servers, Sun Fire 280R servers, Sun StorEdge T3 arrays, the Solaris 8 Operating Environment, and Forte for Java software for faster deployment. The satellites' thermal control is the passive primary rejection type via heat pipes.

Attitude and orbit control systems are powered by bi-propellant nitrogen tetroxide/monomethyl hydrazine

thrusters. The satellite incorporates an onboard control processor, momentum wheels, and Earth sensors. A Boeing-built xenon-ion propulsion unit, operated from the ground, aids in stationkeeping as well.

Spaceway features full mesh point-to-point and multicast communications for high-bandwidth applications, such as file sharing, distributed databases, and decentralized content distribution. To receive Spaceway's variety of services, customers must purchase the associated small satellite dish receiver. Dish receivers cost less than \$1,000 and are approximately 0.7 meters in diameter, or a little over 2 feet wide.

	<u>Metric</u>	<u>U.S.</u>
Dimensions		
Weight (at launch)	6,000 kg	13,230 lb
Weight (in orbit)	3,832 kg	8,441 lb
Length	27 m	88.6 ft
Antenna (ground segment)	13 m	39.4 ft
Characteristics		
Power	12.3 kW (summer solstice)	
Frequencies	17.7-30.0 GHz	
Bandwidth	500 MHz	
Orbit	Geostationary, 99° W and 101° W	
Operational lifetime	15+ years	
Data rates	16 Kbps-155 Mbps	
Transponders	48	
Stabilization	3-axis stabilized	
Propulsion	4 GaAs solar panels; xenon-ion propulsion	

Program Review

Background. Spaceway was originally envisioned as a two-satellite system, though Hughes Electronics altered its plans five times – with projected costs ranging from \$660 million to \$4.7 billion – before settling on the current configuration. The first plan, filed with the U.S. Federal Communications Commission (FCC) in 1993, called for two satellites operating at the 101° W orbital slot.

Early Expansion Plans Ambitious

In the years following, Hughes filed amendments with the FCC requesting expansion to eight satellites, which the FCC approved in 1997. The total was then increased to nine, and later to 17. The plan was to deploy them in 15 separate orbital locations around the globe, and create four subsidiaries to operate the satellites in different regions. The subsidiary plan was later dropped, and 20 medium-Earth orbit satellites were added to the plan.

Hughes finally settled on a plan in 1999 when it announced the intent to invest \$1.4 billion to build and launch two Spaceway satellites, with an option for a third. However, the plan was once again thrown into disarray when News Corp of Sydney, Australia, purchased Hughes Electronics. News Corp doubted the potential of the satellite broadband Internet market. In 2004, the company announced that it had decided to use Spaceway 1 and 2 to broadcast high definition television (HDTV) channels to customers of DirecTV, which News Corp also owned at the time.

Spaceway 1 Launched. The first Spaceway satellite was successfully launched by a Zenit rocket in April 2005 from the Sea Launch Odyssey platform. Spaceway 1 now resides at its assigned orbital position of 102.8° W longitude.

Spaceway 2 Launched. An Ariane 5 ECA launcher lifted off in November 2005 carrying the Spaceway 2 telecommunication satellite. The Boeing-built BSS-702 spacecraft operates at an orbital position of 99.2° W.

In a series of complex financial transactions, Hughes Communications Inc became an independent, publicly traded company in 2006. Hughes was given rights to Spaceway 3, as well as the ground systems it had developed to support its satellite broadband network. Spaceway 3 was launched in August 2007 on board an Ariane 5 launch vehicle. The satellite now provides broadband Internet to consumers and businesses in North America from geosynchronous orbit at 95° W.

Hughes Orders New Satellite

In response to growing demand for its Ka-band services, Hughes ordered a new satellite in June 2009 to augment its Spaceway 3 satellite. The contract for the new satellite with Space Systems/Loral is worth about \$250 million. The total investment, including launch services and insurance, is expected to reach \$400 million. The new satellite, based on SS/L's 1300 satellite bus, will have 10 times the capacity of Spaceway 3 and be able to support between 2 and 3 million customers. The satellite was originally referred to as the Spaceway 4; however, more recent reports refer to the satellite as Jupiter. Jupiter will be launched on board an Ariane 5 in 2012.

In February 2011, EchoStar agreed to acquire all outstanding equity of Hughes Communications Inc and its subsidiaries. The total value of the transaction is approximately \$2 billion, including Hughes' debt that EchoStar will acquire. Hughes will be merged into EchoStar's operations following U.S. government approval of the deal.

Timetable

<u>Month</u>	<u>Year</u>	<u>Major Development</u>
	1993	Hughes granted FCC license to operate two spacecraft
	1997	FCC grants eight-spacecraft license
Apr	2005	Spaceway-1 launched on Sea Launch Zenit 3SL
Nov	2005	Spaceway-2 launched on Ariane 5 ECA
Aug	2007	Spaceway-3 launched on Ariane 5
Feb	2011	Hughes agrees to sell equity to EchoStar
	2012	Launch of Jupiter expected on board an Ariane 5

Forecast Rationale

In February 2011, EchoStar agreed to purchase Hughes for \$2 billion. While the transaction needs U.S.

government approval, it is likely that Hughes' operations will be merged into EchoStar in the near future. This

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merger will likely not affect satellite deliveries, which will continue throughout the forecast period to meet the needs of Hughes' growing customer base.

Hughes' customer base is currently divided between capacity that the company leases from other companies as well as from its own satellite, Spaceway 3. Hughes' ultimate goal is to end lease agreements with all customers eventually being supported by its own satellites. Under Hughes' plan, new customers that subscribe to Hughes' services are added to Spaceway 3,

while existing customers remain on the leased transponders. Through the normal attrition of existing customers and addition of new customers, Hughes hopes to eventually serve its entire customer base with capacity supplied by its company-owned satellites.

By slowly adding customers to its Spaceway 3 satellite, Hughes expects that the satellite will reach full capacity in 2012. After that, Hughes will need a new satellite to continue its growth. To that end, Hughes signed a contract with Space Systems/Loral to purchase Jupiter-1 in June 2009. The satellite is scheduled to launch in 2012. At this time, Forecast International expects satellites to be delivered about once every five years.

These satellites will be delivered to EchoStar, which will take over operations after its acquisition of Hughes is complete. Hughes' billable subscriber list continues to grow, reaching 613,000 in March 2011. Therefore it is likely that EchoStar will continue to serve the satellite broadband Internet market.

Unless the U.S. government does not approve EchoStar's acquisition of Hughes, this report will be archived. Satellites that had been forecast for Hughes will now be forecast to be delivered to EchoStar and covered in a separate "EchoStar" report.

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