A sector In demand

The crucial operation of putting a satellite into space is an incredibly complex and challenging one. The professionals who make it happen on a very regular basis are dedicated and work extremely hard to give their customers the best service possible. Meeting the expectations of an ever-growing launch market is never easy. With customers scrambling for launch slots Satellite Evolution takes a look at what's new in the world of the people who actually put the satellites into the sky.

The launch service sector is going through a very busy time at present. A shortage of launch slots means that companies wishing to launch satellites are booking well in advance and the three big players in the launch industry, Arianespace, ILS and Sea Launch are all working hard to meet those demands. In addition, a new generation of launchers is currently being developed that will be more competitive, cost-effective and more environmentally friendly. Let's look at what has been happening in the launch sector recently and how the development of future launchers is progressing.

ILS

Headquartered in McLean, Virginia, ILS (International Launch Services) is a long-standing, successful US - Russian joint venture with exclusive rights to the worldwide sale of commercial Proton launch services. Since 1995, ILS has signed contracts for more than 100 launches at a value of over $80 billion. The joint venture partners are Space Transport Incorporated, the Khrunichev State Research and Production Centre and RSC Energia. The Proton vehicle launches commercial ILS missions and also Russian government payloads from the Baikonur Cosmodrome operated by RosCosmos and under lease from the Republic of Kazakhstan.

ILS' first commercial launch was made in 1996 and has since worked with all the principal satellite operators and has maintained a steady launch pace. The Proton launch vehicle is the main workhorse of the Russian space programme and, since 1965 has an impressive reliability record of 96 percent in 320 launches. Once a customer secures a slot with ILS, the Proton is configured to suit the payload it will be launching.

In early August 2007, International Launch Services (ILS) and Inmarsat announced a contract for launch of the Inmarsat 4-F3 satellite on a Proton Breeze M vehicle in early 2008.

This satellite, third in the constellation, will enable Inmarsat to offer global coverage with its BGAN mobile broadband service, as well as existing services. Launch from the Baikonur Cosmodrome in Kazakhstan is planned for the March-April 2008 time period. Financial terms were not disclosed.

ILS will provide an enhanced version of its Proton Breeze M vehicle, which is built by Khrunichev State Research and Production Space Centre of Moscow. The Enhanced Proton has the capability to lift payloads exceeding 6 metric tons.

The F3 satellite, weighing more than 5900 kg, will be one of the heaviest commercial payloads to date for Proton. The Inmarsat 4 series of satellites are Eurostar E3000 models built by Astrium, among the most sophisticated commercial satellites ever launched and 60 times more powerful than their predecessors.

ILS President Frank McKenna noted that the Proton demonstrated its enhanced capabilities a month ago with the successful launch of DIRECTV 10, which is similar in mass to the Inmarsat F4 satellite. "Enhanced Proton performed as anticipated, and fits well with Inmarsat's requirements," McKenna said. "We understand how important it is for Inmarsat to complete its BGAN expansion in a timely fashion, and we are focusing on performance to meet Inmarsat's schedule demands for a launch of F4 in the first quarter of 2008."

Andrew Sukawaty, chairman and CEO, Inmarsat, said: "In response to the growth we are seeing from our maritime, aero and new BGAN customers we are pleased to announce the signing of this contract with ILS. This will allow us to take the global services that are standard for Inmarsat into the new fleet of Inmarsat 4's. We will now have global coverage for all services in the future."

The Proton enhancements are the result of more than two years of research, development and testing by Khrunichev, which is a partner in the ILS joint venture. While the primary purpose of the upgrades was to meet the requirements of ILS commercial customers and their larger satellites, the enhanced vehicle will ultimately be used for Russian federal missions as well.

As of the first half of this year, ILS has brought in more than $1 billion in new business and has a backlog of 22 missions. They will have exclusive rights to the next-generation Angara launch vehicle that is currently in development with Khrunichev engineers. Funded by the Russian government, the new family of launchers will use environmentally sound propellants and RosCosmos say that it is expected to be ready for its first test launch in 2010-11.

Unfortunately, ILS suffered the failure of the Proton launch vehicle in early September when it attempted to launch the JSAT-11 satellite into orbit for JSAT Corporation. A press release from Khrunichev State Research and Production Space Centre announced that the Proton had failed to inject the satellite into orbit due to an anomaly in the second stage operation. A State Commission is currently investigating the anomaly and prevention of other such incidents in the future.

Sea Launch

Sea Launch was formed in 1995 and partners include Boeing Commercial Space Company, Aker ASA, RSC Energia and SDO Yuzhnoye. Sea Launch uses a modified oil platform to launch commercial satellites at sea giving excellent environmental conditions. The equatorial launch pad site ensures the most direct route to orbit and maximum lift capacity. The direct routing also means that precious fuel is saved and extends the life of the spacecraft. Sea Launch provides the complete launch package and modern, accessible, user-friendly payload processing, all-inclination launch capability along with the facilities of a US launch site.

Following the unsuccessful launch of NSS-8 from the Sea Launch Odyssey platform the Sea Launch Failure Review Oversight Board (FROB) concluded its review of the findings of an interagency CIS Joint Commission, which has been investigating the cause of the unsuccessful launch of January 30, 2007. All systems have been cleared for operations, pending completion and tests of all repairs on the Launch Platform.

Liftoff of the Ariane 5 ECA with the SPACEWAY 3 and BSAT-3a satellites (August 14, 2007).

The Proton rocket being prepared for launch. Photo courtesy of ILS.

The commission concluded on March 12 that the failure initiated in the liquid oxygen (LOx) turbopump section of the RD-171M main engine. Following the initial FROB meeting in April with the commission, the Sea Launch partners performed internal inspections of already manufactured and tested RD-171M engines, with the objective of confirming the LOx feed system and pumps were free of debris.

The FROB met again with the commission from May 24-June 1, to review results of the engine inspections and further findings. FROB Chairman Kirk Pysher, Vice President and Chief Systems Engineer for Sea Launch, reported that members of the FROB concurred with the commission findings, conclusions and recommendations. It was agreed that the anomaly had occurred as a result of a metallic object becoming lodged between the pump's moving and stationary components. This object ignited and burned as a result of friction-induced heat. The combustion of the object set off a string of events that led to the destruction of the Lox pump, RD-171M engine and ultimately the Zenit 3SL.

The commission performed a thorough review of operations on the RD-171M engine, following the standard full duration acceptance test that each manufactured engine undergoes at the Energomash test stand. This review included the RD-171M return-to-flight engine currently installed on a Zenit-2 vehicle awaiting launch from the Baikonur Space Centre this summer. The commission found two operations with the potential for introduction of foreign object debris (FOD) into the LOx feed system. The FROB confirmed that the commission identified the necessary corrective actions to preclude these operations as potential sources for FOD introduction in the future.

In July, Sea Launch's prime contractor for launch system ground support, the Design Bureau for Transport Machinery (DBTM) of Moscow, Russia, completed fabrication of a new gas deflector for the Zenit-3SL launch system. The massive structure is expected to arrive shortly at Sea Launch Home Port, where it will be installed at the stern of the Odyssey Launch Platform, beneath the launch pad.

The gas deflector was destroyed during the failed January 30 launch attempt, when a Zenit-3SL vehicle lost thrust and impacted the structure. The gas deflector (also known as the flame deflector), is a one-of-a-kind, 280 metric ton steel structure, including truss supports, that directs engine exhaust away from the platform and controls the acoustic environment. DBTM managed construction of the replacement structure near the Baltisky shipyard in St. Petersburg, Russia, where the original deflector was manufactured.

Sea Launch is proceeding on schedule with repairs and re-certification of the Odyssey Launch Platform and associated launch support equipment. A team of specialists have completed the heavy industrial work and painting on the Odyssey at the Victoria Shipyard in British Columbia.

The construction of the gas deflector is considered a major milestone among these activities. Other completed work includes repair and installation of the platform's hangar doors and communication antennas, and replacement of heat-affected wiring and cables. Sea Launch Commander conducted marine tests before returning to Home Port in Long Beach to resume work with the installation of the gas deflector. Following repairs and recertification of all systems, the Sea Launch team will transition to mission operations in preparation for the launch of the Thuraya 3 satellite.

Road to recovery

Mobile Satellite Ventures LP and joint venture partner Mobile Satellite Ventures (Canada) recently announced that MSV has contracted with Sea Launch Company, LLC, for the launch in 2010 of one of two high-powered, next-generation satellites, designed to provide seamless, transparent and ubiquitous broadband wireless coverage of North and Central America to consumer electronic devices. The contract demonstrates the satellite's industry's confidence in Sea Launch who plan to launch the MSV spacecraft on a Zenit-3SL vehicle from a site on the Equator near the island of Kiribati in the Pacific Ocean.

The hard work and determination of the Sea Launch team will see launch activities returning to normal. Now that the FROB have come to their conclusions, it is time to move on.

Arianespace

Headquartered in the French city of Courcouronnes with a launch site in French Guiana, Arianespace has established itself as a world-class competitor in commercial space transportation. Arianespace has a close working relationship with the leading telecommunications providers, organisations and agencies that represent its worldwide customer base. Serving 65 operators worldwide, the majority of its business comes from Europe, the Americas and Asia.

Currently, the Arianespace portfolio consists of the Ariane 5 heavy launcher, the Soyuz medium launcher and the Vega light launcher that will see its first launch from the European Spaceport in French Guiana in 2008.

Astrium has recently selected Arianespace to launch four satellites for the space segment of the ELISA demonstrator. The four ELISA satellites will be placed in heliosynchronous orbit by a Soyuz rocket to be launched from the Guiana Space Center in Kourou, French Guiana. They will be auxiliary passengers on the launch of the first Pléiades satellite in late 2009.

Astrium is lead manager for the programme, working with co-contractor Thales for French MoD procurement agency DGA. Astrium is prime contractor for the demonstration programme, which comprises four satellites, each weighing about 135 kg. The satellites are built on a Myriade platform designed by French space agency CNES. The program is being overseen by a joint DGA-CNES project management team.

ELISA (ELectronic Intelligence by SAtellite) satellites will use radar transmitters to map the entire globe, with precise feature definition. They are a first step towards the future ROEM (Renseignement d'Origine ElectroMagnétique) electromagnetic reconnaissance programme.

Arianespace has already placed the Cerise, Clémentine and ESSAIM satellites in orbit for the DGA defense procurement agency. This ongoing partnership enables the French Ministry of Defense to validate innovative satellite concepts using actual spacecraft in orbit.

Just a few months after the successful launch of Skynet 5A for the British MoD, Arianespace and its launch Service & Solutions offer remain the benchmark in space transport for both civil and military telecommunications operators, guaranteeing access to space for European military missions. In September, Arianespace took delivery of the Ariane 5 launcher for a dual-payload mission, which orbited the Intelsat 11 and Optus D2 satellites from Europe's Spaceport in French Guiana .

The Ariane 5 GS vehicle was transferred from the Spaceport's Launcher Integration Building (where it was assembled under the management of prime contractor Astrium Space Transportation), to the Final Assembly Building (where Arianespace monitored installation of the two satellites). This flight was Arianespace's fourth in 2007 with the workhorse Ariane 5.

EGAS

Arianespace's involvement with the EGAS (European Guaranteed Access to Space) programme began in 2004 in response to calls from several European governments that stated that space should be available to Europe whenever it was needed. With it's own launch base in French Guiana, the time was right to build on the previous successes.

The principal objective of EGAS was to ensure that Ariane 5 launchers would always be available. The decline in the market for commercial satellite launches spurred the EGAS programme to make two pledges: to provide Europe with guaranteed access to space by being capable of offering at least six launches per year over a five year period and to create an institutional market within Europe to ensure the continued production of Ariane 5 launchers. It certainly seems that Arianespace's commitment to lead the industry in Europe is very evident.

Future launchers – ESA's contribution

The ESA Future Launchers Preparatory Programme began in February 2004 with aim of building a next generation launch vehicle by 2020. The first two phases of development are to be completed by 2009. The programme was started with the intention of improving the present launchers and taking them to a more competitive level through analysing new technologies. Using university research facilities and industry it is hoped that the new launchers will be at the fore of research and development. Studies carried out by various institutions and companies will look at the type of launcher systems that will determine the architecture of the launcher, they will provide in-flight experimentation and an insight into rocket propulsion, materials and structures, aerothermodynamics, launcher health management and avionics. By bringing together the concepts and the technology and by examining what it is that Europe needs to create a new generation launcher, the resulting development will be a true reflection of Europe's requirements – secure access to space that is cost effective and reliable.

A buoyant market

The launch market is now buoyant with a shortage of launch slots available due to high demand. It is difficult to believe that the industry saw such a slump not so long ago. The growth in communications, DTH television and other entertainment services mean more satellites must be put into space. This positive outlook is felt throughout the satellite industry. There will be bumps in the road but overall there are many reasons to be cheerful.

Sea Launch is back on track.