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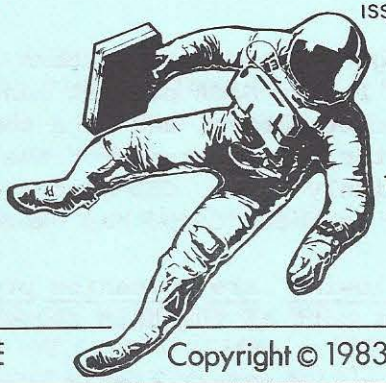

A MONTHLY NEWSLETTER ON FREE ENTERPRISE IN SPACE

Volume 7, No. 8 August, 1983

Dear Subscriber:

Space Services Finalizes Design

Morton Thiokol Inc. has agreed to supply solid rocket motors to SSI for their Conestoga II launch vehicle. The announcement confirms the vehicle configuration that was pictured in the April, 1983 C.S.R. (at that time, Thiokol was the leading contender as the motor vendor, but the choice had not yet been finalized).

Likely solid fuel motors to be used are as follows: first and second stages will be Castor 4H boosters (85,000 lbs. thrust each). The third stage will be a STAR 48 motor (15,000 lbs. thrust), and the fourth stage will be a STAR 30 (6,000 lbs. thrust). Exact figures on the number of motors under consideration and their costs are not yet available, but industry estimates put the approximate cost of the STAR 30 at $.5 - 1 million, the STAR 48 at $1 million, and the Castor 4 at $500,000.

Cat Island, Mississippi, is being considered as a Conestoga II launch site, along with other sites in Hawaii and on Matagorda Island (the site of the original Conestoga test launch). Cat Island is located in the Gulf of Mexico about ten miles south of Biloxi, Miss., and is an excellent location for earth sensor satellite launches into polar orbit. The state of Mississippi is enthusiastic about the idea, which could attract other high-technology industries to the area.

Starstruck, Inc. Considering Larger System

Starstruck, Inc. plans to develop a larger version of their hybrid rocket as the next step toward missions into low earth and geosynchronous orbits. The existing full-size motor is 42 inches in diameter. The larger version will be approximately 60 inches in diameter. Various combinations of the two sizes are being considered for different missions, but no final configurations are available. The low-earth orbit version has been dubbed "Pathfinder," and the version for geosynchronous missions, "Constellation."

Companies Interested in Commercial Expendable Launch Vehicles (ELV's)

NASA will issue a formal request for proposals in the next few weeks to companies interested in commercializing the Atlas/Centaur and the Delta, NASA's expendable launch vehicles. Companies which have expressed interest to date are:

Atlas/Centaur: General Dynamics, RCA, and FEDEX/SpaceTran. General Dynamics builds the Atlas/Centaur. RCA's interest may stem from their involvement in satellite construction and use. It is possible that an RCA-owned launch vehicle could result in lower satellite costs to both RCA and its customers. FEDEX/SpaceTran is interested in any boosters with commercial applications.

Delta: Transpace Carriers, Inc., RCA, FEDEX/SpaceTran, and CSD (United

Technologies Chemical Systems Division). Transpace Carriers is headed by David Grimes, former NASA project manager for Delta launch operations. CSD manufactures solid rocket motors, and is a competitor to Morton Thiokol, which presently provides the Castor solid motors for the Delta boosters. If CSD commercializes Delta, it seems likely that CSD motors would replace the Castors in future Delta flights. Computer Sciences Corp. has expressed interest, but not in a specific vehicle.

Following are companies presently interested in commercializing other ELV's, those not part of the NASA request for proposals.

Titan: Martin/Marietta (builder of the Titan) and FEDEX/SpaceTran. On July 1, the exclusive Titan marketing contract between the two companies (C.S.R., June 1983, p. 1) expired, and has not yet been renewed. Both sides are in negotiation now, and as yet, no firm decision has been made on whether or not the two organizations will continue to work together.

Scout: Space Services, Inc.. It seems likely that Vought Corp., builder of the Scout, may also consider commercializing this small vehicle.

"I Think I Can, I Think I Can!"

The first Tracking and Data Relay Satellite (TDRS) entered its proper orbit June 29. The event deserves notice as an example of human resourcefulness coupled with sheer good luck. When the satellite was launched by the shuttle in April, the solid-fuel Inertial Upper Stage (IUS) intended to propel it into geosynchronous orbit malfunctioned, leaving the satellite in an eccentric orbit with a perigee thousands of miles too low.

Human resourcefulness came in when the ground controllers invented a method of rescuing the $100 million mission. They chugged the 5000 lb. satellite into the correct orbit by firing its tiny attitude control thrusters (about 1 lb. thrust each) a few at a time. The process required several weeks, and was somewhat akin to pulling a railroad car with a moped.

Where did the luck come in? It seems that the originally, the normal TDRS mission was estimated to require about 1,300 lbs. of hydrazine (the propellant used by the attitude control thrusters). For some reason the mission was changed before launch. The new mission required only about 200 lbs. of propellant. Rather than change all of the launch weight parameters by deleting propellant, the TDRS was launched with over 1000 lbs. more hydrazine than anyone thought it would ever need. Fortunately, they were wrong. The painfully slow maneuvers that saved the satellite used up over 800 lbs. of propellant.

The Tracking and Data Relay Satellite System (TDRSS) will eventually consist of four satellites. The system is essential to the space shuttle (especially during Spacelab missions) and to a number of other projects such as Landsat (see below).

Landsat Problems

Landsat 4 is close to final failure, with its electrical power system breaking down. Four separate cables carrying electrical power into the satellite from four solar panels are breaking apart. The insulating material in which the cables are imbedded is expanding and contracting due to thermal cycling, and the stresses are severing the cables.

In addition, the X-band transmitter has broken down, preventing transmission to earth of data from the thematic mapper, Landsat's most important sensor system. Landsat 4 was designed to work in combination with the TDRSS, broadcasting thematic mapper data on the Ku-band to the TDRS, which would relay it to the ground. The X-

band could also be used for direct satellite-to-earth broadcast, but it is no longer available. Also, due to the above-mentioned TDRS problems, that satellite has up until now been unable to act as a data relay, rendering the thematic mapper nearly useless (other sensors, which use other bands, still operate).

Finally, a computer unit has failed, leaving only a single backup unit to maintain control of the Landsat.

Landsat D-prime (D'), the backup satellite, will be launched in Feb., 1984, 18 months early, to preserve U.S. civilian earth sensing capabilities. The design errors leading to Landsat 4's failures have been corrected on the new satellite.

As originally planned, Landsat 4's design lifetime was three years. Launched in July, 1982, it should have worked until July, 1985. At this point, Landsat D' could have been launched to carry the program until at least 1988.

A shuttle mission to rescue the malfunctioning satellite may also be possible. Landsat 4 is in a polar orbit 435 miles high. When the Vandenberg shuttle launch site is ready in late 1985, the shuttle will be able to fly into a polar orbit as well. Unfortunately, the shuttle cannot attain an orbit as high as 435 miles. However, Landsat 4, designed with the shuttle in mind, contains sufficient fuel to allow it lower itself into the shuttle's 335-mile high orbit. It is also designed around Fairchild's Leasecraft-type modular unit system (C.S.R., Feb. 1983, p. 3-4) to allow easy shuttle servicing.

Servicing and repair would involve several operations. Repair of the solar panels will be simple, involving replacement of the wires. The transmitter repair will be more difficult, requiring replacement of an electronics box which is difficult to get at. The computer unit is part of the Fairchild modular system, and can be easily repaired by simply replacing a module designed for space repairs. The final operation would involve refueling the Landsat, since it will have nearly dry tanks after the required orbit change.

The problem is now one of timing the satellite's move to lower orbit. Two of the four solar panel electrical conduits have already failed. Indications are that the other two will fail as well. The satellite requires power to obey the command to lower its orbit. If ground controllers wait too long, power failure will strand the satellite beyond the shuttle's reach.

However, the satellite is useful where it is, too. In a lower orbit, the satellite could not provide even the limited usable data that it is now. In addition, officials need the satellite where it is to test thematic mapper coverage through the TDRS, which should ideally be checked out while the satellite is in an orbit allowing good data to be acquired. This checkout is not only important to test the function of the TDRS, but also to check to see if the Ku-band transmitter is falling prey to the same problems which shut down the X-band transmitter.

Some officials feel that the shuttle's Landsat repair mission is infeasible. If so, then Landsat D' must carry the load alone from 1984 through 1988, a year longer than its design lifetime. This puts considerable pressure on the National Oceanic and Atmospheric Administration (NOAA) to construct a third, new Landsat just in case. Cost for this is estimated at $300 million.

What does all this mean for the commercialization of Landsat? Although hard to believe, a large portion of the private sector considers Landsat's profit potential to be relatively low. This opinion was expressed when the purchase of an existing, operating Landsat program was under consideration (C.S.R., May 1983, p. 1-3). The waters are now considerably muddier. Landsat 4 is dying, and may or may not be resurrected. Landsat D' has yet to prove itself. As far as the question of a third

Landsat goes, it does not seem likely that a private company will pay $300 million to get one new satellite. (Remember that that the Comsat offer for NOAA's entire five-satellite Landsat and Metsat system was $300 million total). The present Administration is similarly reluctant to part with this amount of money.

In the present situation, commercial interests may simply wait and see what happens in 1984 and 1985 with Landsat D', the Landsat 4 repair effort, and the possible funding of a third satellite. In any case, the earth resources commercialization problem has only become more complicated than before.

Japan Continues Space Efforts

Japan plans development of a launch vehicle in the Atlas/Centaur payload range. This vehicle is planned for operation in the late 1990's. Other Japanese expendables include the N-II, an existing Delta-type vehicle; and the H-1, under development, an N-II first stage with a LOX/Hydrogen upper stage.

A Japanese second generation space shuttle is under consideration at Japan's Institute of Space Science. As presently configured, the vehicle will be a single-stage-to-orbit, probably vertically launched, but landing on a runway like the U.S. shuttle. Due to the lack of auxiliary boosters, the Japanese shuttle will be larger than the U.S. vehicle (171' long x 92' wide), but carry only half the payload.

Development costs are estimated at $297 million (!), and the first manned flight could be in 15 or 20 years if the project receives the go-ahead.

Publications Available

Copies of the U.S. policy on commercialization of ELV's (NSDD 94) are available to subscribers at no charge. Send a business-sized, self-addressed, stamped (2 oz. postage) envelope to the Commercial Space Report. (Document is 5 pages).

High Frontier, the space defense organization, is offering new publications. A monthly newsletter is available for $30.00/year. A smaller paperback version of the High Frontier study is also available for $7.95. Write High Frontier, 1010 Vermont Ave. NW, Suite 1000, Washington, DC 20005.

A biweekly newsletter on commercial space has just begun publication. Called the Space Business News, it covers space manufacturing, remote sensing satellites, and private launch services. Subscriptions are $295.00/year, or $175.00/six months. Write Space Business News, 1401 Wilson Blvd., Suite 1000, Arlington, VA 22209.

Until next time,

Tom Brosz

The Commercial Space Report (C.S.R.) is published monthly, and endeavors to report and analyze developments in the field of private initiatives in the exploration and exploitation of space.

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