

# THE COMMERCIAL SPACE REPORT

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A MONTHLY NEWSLETTER ON FREE ENTERPRISE IN SPACE

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## Space Services To Begin New Commercial Undertaking

Space Services, Inc. (SSI) has entered into a joint venture to launch cremated human remains into space. The Houston, Tex. company has signed a contract with the Celestis group, a Florida-based consortium of individuals that will market the launch service through regular funeral service outlets. The first launch is expected to take place sometime in 1986 or 1987, and a request for mission approval has already been submitted to the Dept. of Transportation.

"The Dead Travel Fast..." SSI will use the Conestoga II solid-fueled launch vehicle to place a spacecraft containing the cremated remains into a high earth orbit at an altitude of about 1,900 miles. This orbit, within the Earth's Van Allen radiation belts, is well above and below those orbits typically used by other types of satellites, thus avoiding any crowding problems. The orbit is expected to remain stable for at least 63 million years (future missions are planned wherein the ashes would be launched into higher orbits or escape trajectories).

"The Dead Also Travel Light..." The Celestis group plans on charging between \$2,500-3,000 for this service, comparable to the price of a typical Earth burial. However, a Conestoga II launch is expected to run about \$15 million. This means that just to break even, each launch would have to carry the mortal remains of at least 5,000 customers. Now, the standard cremation process will reduce dear old departed Uncle Aloysius to a pile of ashes weighing between 2 and 8 pounds. 5,000 such ash piles would create a payload of at least 10,000 lbs., far more than the approximately 300 lbs. Conestoga II is capable of carrying into a 1,900-mi. orbit.

Fortunately, a process is available called "recreation," which can supposedly reduce Uncle Aloysius to less than 1/4 cubic inch of residue (about the size of a healthy hunk of ash tapped off the end of a good-sized cheroot). This will be placed in a small, labeled capsule about 3/8" in diameter and 2" long. Packed in this manner, up to 15,000 necronauts can be stuffed into the small satellite, resulting in a successful launch and a decent profit.

As an added bonus, the satellite will have a highly-polished exterior to reflect sunlight and increase the spacecraft's visibility, hopefully allowing relatives to watch the late Uncle Al twinkle across the night sky.

## A Modest Proposal:

It seems to me that the real breakthrough here is the distillation of fat old Uncle Aloysius to half the weight of an airmail letter. Even allowing for combustion and dehydration, common sense and conservation of mass indicate that a considerable percentage of Uncle Al has either gone up the chimney or ended up in the clinker drawer. Nevertheless, it seems that people are willing to consider this tiny residue of ash acceptable as being the remains of the deceased, at least insofar as the symbolism of a final resting place is concerned.

This creates an opportunity for an entirely new concept in space burials: if one assumes that the tiniest fragment of the departed can represent that person in funeral ceremonies, then I suggest an alternate procedure of using the heat from a cremation to drive an electrical generator which would then power a laser. Through the process of combustion (and disregarding the heat contributed solely by the crematorium's gas jets) a scientific case can be made that an infinitesimal portion of the mass of the deceased has been converted into photons in the form of the laser beam. This beam can then be fired into space.

Imagine the possibilities: The formerly stodgy Uncle Aloysius can be projected into the cosmos at the speed of light, either at random or at a chosen planetary or stellar destination (perhaps the constellation of one's zodiacal sign?) Even allowing for interstellar dust and gravitational bending, eventual arrival at the destination can be guaranteed. At least a few tired photons are bound to arrive at even the most distant galaxy after millions of years...and if not, does it matter? In this business, as in many others, it's the thought that counts.

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#### Reusable Launch Vehicle Efforts Outside the U.S.

A major step forward in reducing the costs of launching payloads into space is the ability to reuse the launch vehicle. This was the goal envisioned by those in the National Aeronautics and Space Administration (NASA) and elsewhere who proposed the concepts that later evolved into the NASA Space Shuttle. Unfortunately, in its final form the Shuttle has largely failed to realize this goal, with actual costs still far too high to bring about the large-scale exploitation of space.

A number of private companies in the United States are attempting to pick up where NASA left off. These efforts have led to launch vehicle proposals such as Pacific American Launch Systems' "Phoenix," Third Millennium's "Space Van," and Truax Engineering's "Excalibur" and "Seadragon" (all of which have been covered in detail in past issues of this newsletter).

However, companies and organizations outside the U.S., most with resources far exceeding those of the aforementioned U.S. companies, are also pursuing the goal of fully or partially reusable launch systems with a variety of concepts.

#### U.S.S.R.: The Soviet Heavy Lift Shuttle and Spaceplane

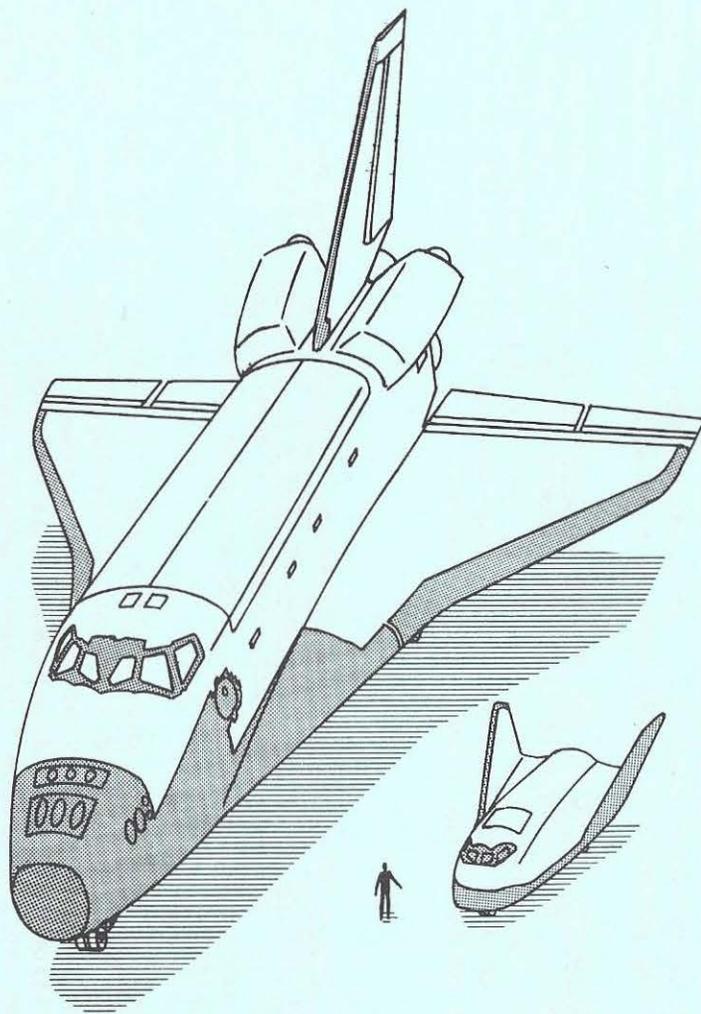
The Soviet Union has been working hard at developing reusable, winged launch systems (C.S.R., April 1983, pp. 3-5). Tests are being performed on two vehicles: the Soviet Heavy Lift Shuttle (HLS); and the smaller Soviet spaceplane.

The HLS orbiter is remarkably similar in size and appearance to the U.S. Shuttle orbiter (an excellent example of either parallel evolution or microphotography technology). Like the U.S. Shuttle, the HLS is launched attached to an external propellant tank along with a cluster of strap-on boosters. Unlike the U.S. Shuttle, there are no engines on the orbiter itself. All engines are located on the external tank and the strap-on boosters. In addition, the Soviet strap-ons are liquid-fueled rather than solid-fueled like the U.S. strap-on boosters.

The lack of a heavy engine package to be carried into orbit, and the larger liquid-fueled external boosters, give the HLS a big payload advantage over the U.S. Shuttle: 130,000 - 200,000 lbs. into low earth orbit compared to 65,000 lbs.

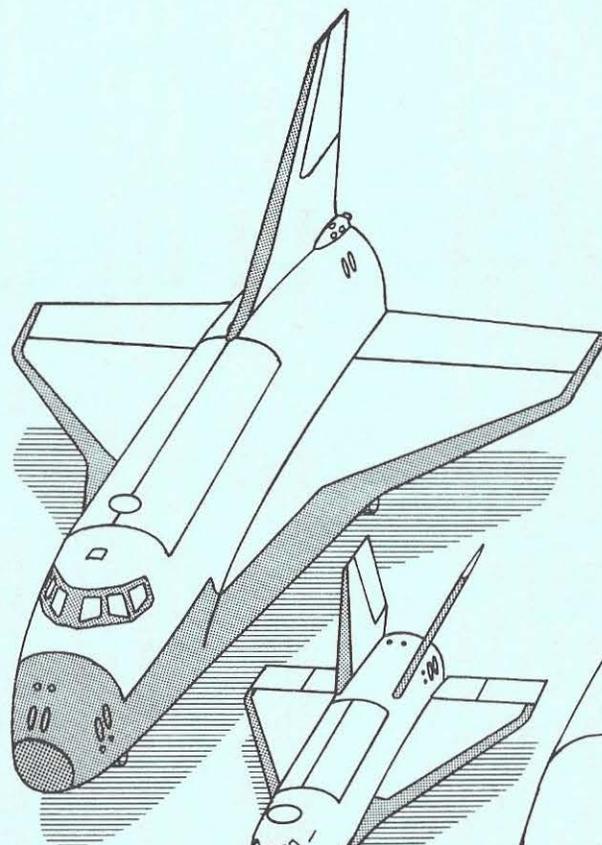
An HLS orbiter, or at least an atmospheric test version, has already been

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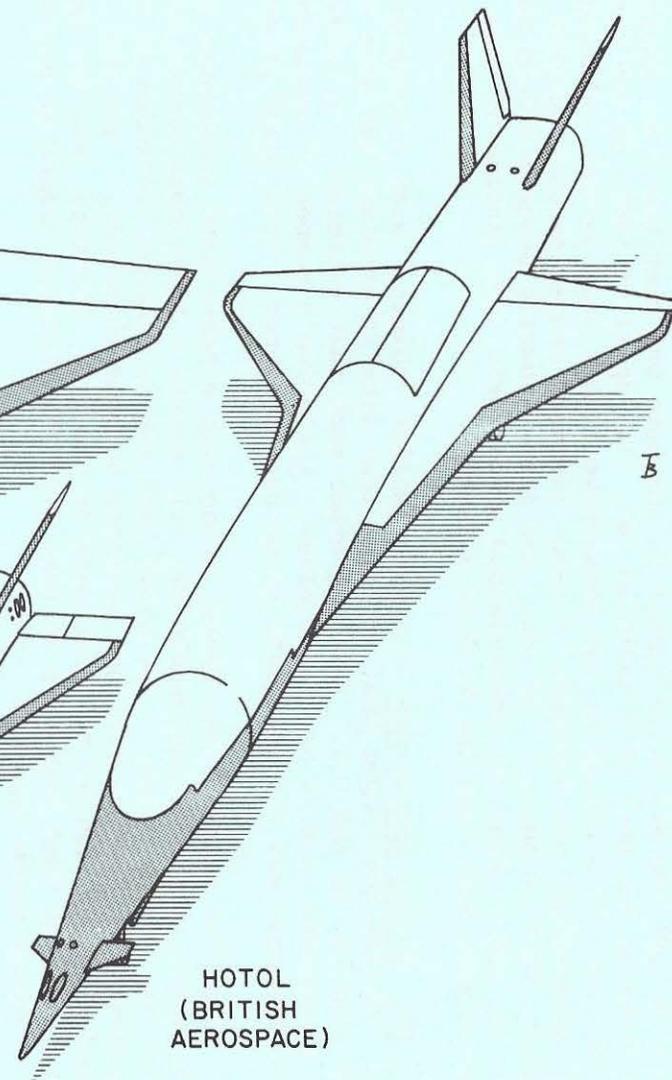
SPACE SHUTTLE  
ORBITER  
(NASA)

"SPACEPLANE"  
(USSR)



"SHUTTLE"  
(USSR)

HERMES  
(CNES)



HOTOL  
(BRITISH  
AEROSPACE)

constructed. Tests are underway where the orbiter is being carried piggyback on board a modified M-4 Bison bomber in the same way that the U.S. Shuttle Enterprise was flown on the back of a modified 747. (In April of 1983, an M-4 carrying the HLS orbiter ran off a runway at the Ramenskoye flight test center. Although the orbiter was apparently not damaged, a major recovery operation was required to pick the orbiter back up again.) By now, the Soviet shuttle program should be well along, but as yet no publicly acknowledged atmospheric drop testing of the orbiter has taken place, much less any kind of a launch.

The Soviet spaceplane is a much smaller vehicle, with a wingspan of about 30 feet. Unlike the larger HLS, it looks less like an airplane and more like a lifting body (similar to the U.S. X-24 and other such test vehicles). Considerable testing of a subscale version has taken place, including a number of unmanned tests where the spaceplane was launched into space and recovered in the ocean after reentry.

These two reusable launchers, along with a heavy-lift expendable launch vehicle (ELV) which is also being developed, will create a formidable manned space capability for the Soviet Union. The heavy lift ELV is probably intended to launch massive components for space stations or space weapons platforms. The HLS will perform manned missions similar to those done by the U.S. Shuttle, and the spaceplane will most likely be used primarily to take over the missions presently performed by Soyuz and Progress space capsules.

#### France: "Hermes"

The Hermes reusable shuttle is designed to be launched on the nose of the proposed Ariane 5 launch vehicle (C.S.R., Aug. 1984, p. 4). Hermes, about 50 ft. long with a wingspan of 33 ft., could carry a crew of four and a 4 - 5 ton payload.

The primary mission of Hermes would be servicing a space station, such as the "Columbus" space station concept being proposed by Germany and Italy to the European Space Agency (ESA). Columbus is intended to be a contribution to the U.S. Space Station program as well as a stand-alone system.

France originated the Hermes concept, and is trying to get it accepted as a project by the ESA (which is holding a major meeting on funding in Rome at the end of January). If the ESA turns it down, France may decide to proceed on its own, along with any other interested countries. At present, the Hermes project is having a harder time gathering support from ESA members than either Ariane 5 or Columbus.

Estimated development cost of the Hermes project is \$1.4 billion through the first two test flights. This compares with development costs of \$2 billion each for the Ariane 5 program (including two test launches) and the Columbus program (including the first three years of operation). The first Hermes flights would take place in the late 1990s or early in the twenty-first century.

#### Britain: "HOTOL"

The British Aerospace Dynamics Group, Stevenage, England, is studying a concept for an unmanned Horizontal Take-off and Landing (HOTOL) reusable launch vehicle (C.S.R., Sept. 1984, p. 2). The vehicle would use a combination of rocket propulsion and advanced air-breathing engines, and would be about 178 ft. long with a wingspan of about 56 ft.

HOTOL is a promising concept. Unlike other vehicles mentioned in this article, this one is probably the closest to a privately developed launch system (British Aerospace is a semi-private company at the present time). Just to make a point, compare the \$650 million estimated development cost of HOTOL with the \$3.4 billion required for Hermes and its Ariane 5 booster (adding insult to injury, HOTOL's

15,400 lb. payload is larger than that of Hermes). The argument that the difference is because Hermes and the Ariane 5 are "man rated" while HOTOL need not be cannot be reasonably made to account for the five-fold discrepancy in costs.

#### Japan: Waiting in the Wings

Japan has not as yet brought forward any "official" plan for a reusable launch system. However, work is being done behind the scenes on a number of concepts and technologies, and reports on these surface periodically. Some of these reports have indicated that the Japanese may simply develop a small, Hermes-like winged vehicle that would be launched atop one of Japan's expendable launch vehicles.

Other reports reveal more ambitious plans. Japan's Institute of Space Science proposed in 1983 a vertical take-off, horizontal landing single-stage-to-orbit launch vehicle. Larger than the U.S. Space Shuttle (171 ft. long with a wingspan of 92 ft.), it would have only about half the payload since it launches to orbit without external tanks and boosters. Development costs at the time were estimated at an astonishingly low \$297 million.

Mitsubishi Heavy Industries, Ltd., is working on rocket engines with an air-breathing cycle (similar to that used by the HOTOL) for use in reusable launch vehicles. It is uncertain how far this research has advanced, and exactly what sort of vehicle the company has in mind to accommodate such an engine. It should be noted, however, that papers on the subject show designs for engines with a thrust of over 800,000 lbs., and mention vehicles with at least three or four such engines and payloads to orbit of over 1 million pounds!

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#### Shuttle America Planning Stock Sale

Shuttle America, a subsidiary of Astrotech International, College Park, Md., intends to purchase a fifth Space Shuttle orbiter to supplement NASA's Shuttle fleet (C.S.R., June 1984, p. 1). About \$2 billion will be required for this project. While it is planned to acquire early funding from investment banks, Shuttle America intends becoming an independent, publicly owned corporation.

To this end, Shuttle America plans to issue a large number of shares of common stock in the company to the general public (Astrotech would still keep some equity). If Shuttle America's plans work out, this may be the first real chance for the average investor to actually own a piece of a Space Shuttle as a stockholder (rather than simply pay for it as a taxpayer). The public response to this offer may indicate the future success of other space transportation companies (Third Millennium, Inc., previously mentioned as the developer of the "Space Van," for example) that plan to raise large amounts of funds through public stock offerings.

#### Air Force Playoffs Will Be Titan vs. SRB-X

Martin Marietta's Titan 34D 7/C was selected over the General Dynamics Atlas II/C as the commercial finalist in the contest to develop an expendable launch vehicle to back up the NASA Space Shuttle for military missions (see last month's C.S.R.) General Dynamics has not been left out in the cold, however, since the Titan concept utilizes General Dynamics' Centaur G-prime as an upper stage.

The Titan will now compete against NASA's Shuttle-Derived Booster (SRB-X) for the contract, with a final winner to be announced in February. This contest represents the first commercial challenge to the Shuttle in the large payload category (10,000 lbs. to geosynchronous), and the results may indicate the outcome of future challenges to the Shuttle in the space transportation field.

Update: Truax Engineering

Truax Engineering has secured about \$50,000 in additional funding. The funding was provided by investor Dexter Hermsted, who received an undisclosed amount of company equity in return. This brings the number of stockholders to three, including Hermsted, company president Robert Truax, and volunteer astronaut Fell Peters (who has previously invested money in the company). This new capital should be enough to finish construction of the flight-weight version of the company's "Private Enterprise" rocket which is presently under development. However, it probably will not be enough money to begin the rocket's flight test program.

Truax intends to eventually use the 40-foot rocket to launch Peters on a short, suborbital flight to become the first human being to fly into space aboard a private launch vehicle (at least, keeping SSI in mind, the first living one).

Fourth Annual Space Development Conference

On April 26-28, 1985, the fourth in a series of space development conferences will be held at the Shoreham Hotel in Washington, D.C. The conference is designed to attract a wide variety of participants, including representatives of industry, government, academia, and the general public. The theme of the conference is "Returns From Space," and will cover topics like space science, space industrialization, and the politics of space. In addition, the programming will link the importance of space to other major interests such as health, education, and international affairs. For information write to: Fourth Annual Space Development Conference, 2400 E. Devon Ave., Suite 205, Des Plaines, IL 60018; or call toll-free: 800-323-5155 (in Illinois, 312-299-3131).

"Great Idea, Wish I'd Thought of It" Dept.

The publishers of Aviation Week and Space Technology have announced the publication, beginning in the first quarter of 1985, of a new magazine on business in space. The title? Commercial Space. Aviation Week is an excellent magazine, and their new publication promises to be a useful reference as well. However, there has already been some confusion with the Commercial Space Report. Please note that the two publications are in no way related. (You are holding an Original. Accept No Substitutes!)

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 space transportation and exploitation.*

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*Address all correspondence to: Commercial Space Report, P.O. Box 60547, Sunnyvale, CA 94088. Editor: Tom A. Brosz. Tel: (415) 965-8666. Comments, ideas, or requests for information are welcomed, as are any items which may be of interest to our readers. Unless otherwise noted, contents are ©1985 by The Commercial Space Report and may not be reproduced in any form without written permission. The opinions contained in the Report are those of the writer or writers, and do not necessarily reflect those of any organization or company.*