

THE COMMERCIAL SPACE REPORT

ISSN 0735-9314



A MONTHLY NEWSLETTER ON FREE ENTERPRISE IN SPACE

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Volume 11, No. 3

March, 1987

Private Space Station Concept Uses Shuttle External Tanks

A company called the External Tanks Corporation (ETCO) is attempting to raise funds to convert used Space Shuttle External Tanks into a manned space facility.

The concept of using Shuttle External Tanks (ETs) as space station elements is not new. It has long been known that a Shuttle could bring its ET into orbit with it for a very small payload penalty. The \$30 million External Tanks are currently jettisoned just before the Shuttle reaches orbit. They then re-enter the atmosphere and burn up over the Indian Ocean.

However, ETCO may be able to actually bring the concept to fruition. Unlike some other companies that have made proposals in this area, ETCO may be the first organization to swing enough financial and political weight to pull it off.

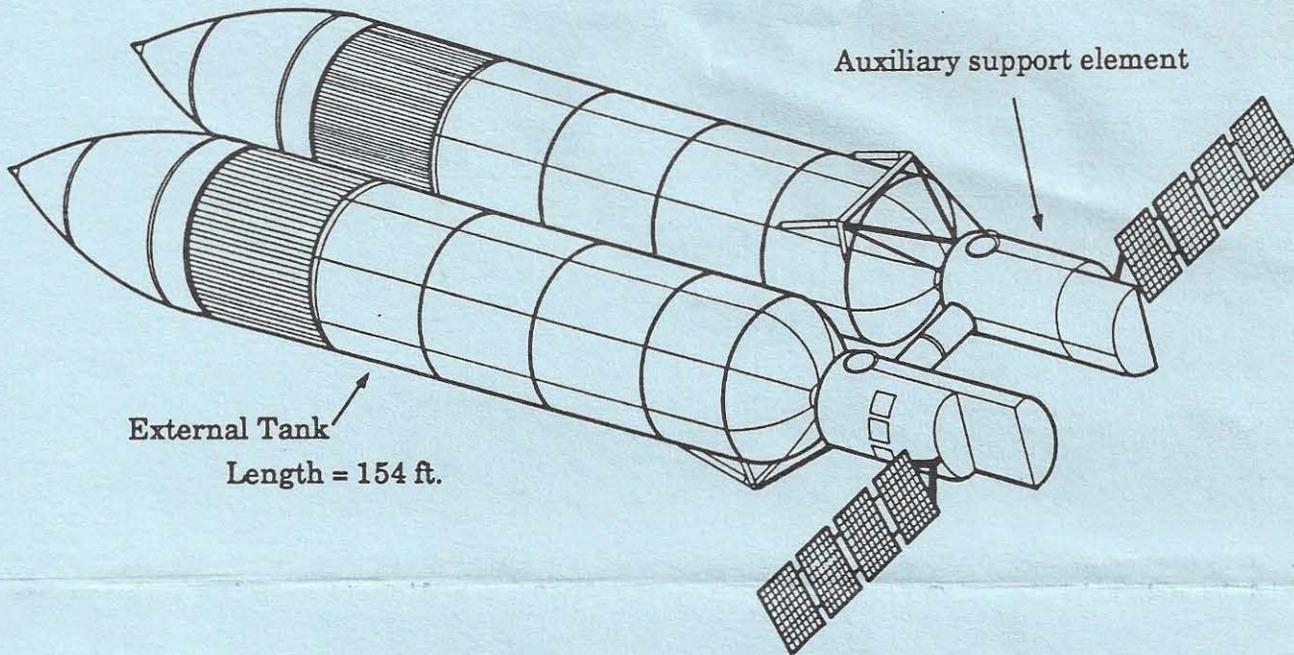
The Boulder, Colo. company is an offshoot of the University Corporation for Atmospheric Research (UCAR), a large non-profit consortium of 57 major universities and research institutions. UCAR carries no small prestige in scientific circles with a history of 25 years of research activity. UCAR manages the National Center for Atmospheric Research in Colorado, the National Scientific Balloon Facility in Texas, and the Institute for Naval Oceanography in Mississippi. The UCAR has an annual budget of \$60 million.

ETCO's initial design for an ET-based space facility, called LABITAT, involves two ETs mounted side-by-side (see illustration on page 2). Auxiliary support elements attached to the ends provide power, life support, and other services. The total usable volume of 140,000 cubic feet dwarfs the 28,000 cubic feet of the fully outfitted version of the proposed U.S. Space Station, or the 18,000 cubic feet estimated for the fully-assembled Soviet Mir space station.

As an aside, readers may note the similarity of the LABITAT's auxiliary support elements with the modules of the Industrial Space Facility proposed by another company working on private space stations, Space Industries, Inc. (SII) (C.S.R., Aug. 1984, pp. 2-6). In fact, the two systems could easily be complementary, and preliminary discussions between ETCO and SII have reportedly already taken place.

ETCO's financial plan involves initially raising \$500,000 via a private offering. This would be used as working capital, and to complete the company's business plan. The remainder of the financing hinges on ETCO's negotiations with the Federal Government and the National Aeronautics and Space Administration (NASA).

ETCO must convince NASA to take the extra steps required to place External Tanks into orbit instead of destroying them. In addition, ETCO must convince the Federal Government to give UCAR the rights to use the External Tanks once they are in place in orbit. The company cites as precedent for this the Morill Act of 1862



A LABITAT Model

which awarded undeveloped "land grants" to universities. Both cases involve awarding Federal resources with little, if any, current value, requiring no Federal appropriations, and allowing the university to develop the resource to fund its activities.

ETCO believes that once UCAR has the rights to one or more External Tanks, that leveraged financing to convert them into an operational space facility would be forthcoming.

The company estimates that the first LABITAT could be operational and generating revenue as soon as 1992, several years before NASA's own Space Station would be operational.

ETCO's estimated costs for building and operating LABITAT are surprisingly reasonable. The company cites a figure of \$100 million to convert two ETs into a spartan version of the LABITAT. This includes the cost of transporting equipment, tools and assembly workers into orbit (compare this to the \$13 - 16 billion required to build the U.S. Space Station). Annual costs of maintenance and operation (including personnel, transportation, ground support and amortization) are figured at about \$27 million per year, or about \$190 per cubic foot of usable space.

NASA has estimated that one human being would normally require about 1000 cubic feet of space station volume. When ETCO's annual costs per cubic foot are multiplied by 1000 and divided by 365, the result is a cost of \$500 per person per day--only about twice the cost of present day luxury hotel accommodations!

ETCO would lease LABITAT space on a two-tiered basis. Discounts would be given to UCAR institutions, and selected government agencies such as NASA or the National Oceanic and Atmospheric Association. Commercial users would pay about three times the operation cost, or about \$570 per cubic foot per year. With commercial profits partially offset by support of non-profit users, gross profits could range from \$26 million in 1992 to \$32 million in 1996.

ETCO cites a wide range of potential uses for its facility: astronomy studies, research in physics and life sciences, earth observation, materials processing, and others.

It is hoped that ETCO's low cost solutions for manned space facilities are taken seriously in Washington. Although NASA has so far responded favorably to this proposal, it should be remembered that a concept like LABITAT could become somewhat embarrassing to the space agency, which is currently trying to sell Congress a Space Station with 1/5 the usable volume of LABITAT for about 160 times the cost. ETCO may have some tough sledding ahead, but I wish them luck.

ETCO's chairman is Mr. Thomas H. Rogers, and its president and Chief Executive Officer is Dr. Randolph H. Ware. The company is located at 1877 Broadway, Suite 405, Boulder, CO 80302. Tel.: (303) 444-6221.

American Rocket Company Preparing For Test Launch

The American Rocket Company (AMROC) has begun full-scale engine tests of their hybrid launch vehicle. Test firings of several 40-inch diameter engine modules are being done on a refurbished Thor test stand at the Air Force Rocket Propulsion Laboratory at Edwards Air Force Base in California.

Two full-sized engines have been fired to date. One engine was fired twice, on December 11 and 12. The second was fired on February 17. A number of other tests are scheduled before a planned suborbital test flight of a single module sometime later this year.

AMROC's step-by-step test program initially involves test engines with heavy metal casings. These are designed for repeat firings and multiple tests. Later test engines will incorporate weight-saving filament-wound casings and lightweight hardware.

Each full-sized hybrid engine module contains about 3,000 lbs. of the rubber-like fuel. This fuel is burned in combination with 8,000 lbs. of liquid oxygen. Engine design thrust is 33,500 lbs. at launch, increasing to 42,000 lbs. in vacuum. AMROC's orbital rocket, called the Industrial Launch Vehicle, will use 19 such modules, in four stages (12-4-2-1) to place 4,000 lbs. into low earth orbit (C.S.R., Sept. 1986, pp. 2-4).

AMROC is continuing negotiations with the Air Force to use Vandenberg Air Force Base in California as a launch site for its suborbital flight. In addition, AMROC has applied to the Department of Transportation's Office of Commercial Space Transportation for a license for the flight.

AMROC is currently planning to move its headquarters to new facilities in Camarillo, Calif. The new plant will be larger, and closer to both Vandenberg and Edwards. The move is scheduled for the beginning of April. Camarillo is located in Southern California between Los Angeles and Santa Barbara.

Soviets Ready Heavy Lift Booster For Flight

The Soviet Union has performed a static firing test of its new heavy-lift booster. The booster's engines, with a thrust level of 6.6 million lbs., were fired for several seconds on the vehicle's launch pad at the Baikonur cosmodrome at Tyuratam.

The Soviet booster has a payload of about 220,000 lbs. to low earth orbit, and is designed to carry either an unmanned load of cargo, or the new Soviet manned shuttle. The booster has a central core with several liquid-fueled engines at its

base. Mounted around this core are four or more auxiliary liquid-fueled boosters for additional lift-off thrust.

The Soviet shuttle has no main engines of its own, and simply rides to orbit mounted on the side of the heavy-lift booster. This means that the test firing of the booster is essentially equivalent to a test firing for the Soviet shuttle's propulsion system.

An unmanned launch of the Soviet heavy-lift booster is expected sometime this summer. Future unmanned flights could launch large space station modules, components for manufacturing large space structures, or elements of a space-based missile defense system.

A manned launch of the Soviet shuttle could occur as early as late this year-- beating the U.S. Space Shuttle (not due to fly until sometime in 1988) back into orbit.

The United States is considering developing its own heavy-lift launch vehicle (HLV), which could launch payloads for both the Space Station and the U.S. Strategic Defense Initiative. Target payload for the HLV: 100,000 - 150,000 lbs. (considerably less than the Soviet booster). Target launch costs: as low as \$600 per pound of payload delivered into low earth orbit. Target launch date: around 1993.

The U.S. Air Force will be handing out a number of \$5 million contracts to the aerospace industry to study the HLV. Companies like Rockwell, General Dynamics, United Technologies, and Boeing are all preparing concepts.

We had a heavy lift launch vehicle once. In its glory the Saturn 5 moon rocket could hurl 240,000 lbs. into low earth orbit. Now the sole remaining representatives of the Saturn family lie in repose where they have lain for two decades, on display at NASA facilities. At one time there were plans to make the Saturn cheaper to operate--partial recovery of the stages was one concept. Whether Saturn launch costs would ever have gotten as low as \$600 per pound is open to argument, but for that matter whether the new Air Force HLV will actually cost only \$600 per pound to launch is also open to argument. In any case, the Saturns are now museum pieces. At least a number of mice and birds have a dry place to sleep.

Until next time,

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.

Subscription rates are: U.S., Mexico, Canada: 1 year--\$15.00, 2 years--\$28.00, 3 years--\$39.00. Foreign Air Mail: 1 year--\$20.00, 2 years--\$38.00, 3 years--\$54.00. Back issues are available at \$1.50 each from September, 1977. Xerographic copies may be substituted as stocks are depleted.

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