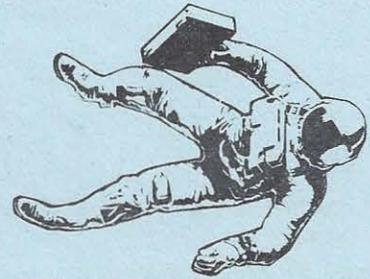


THE  
**COMMERCIAL  
SPACE REPORT**



PUBLISHED MONTHLY

Gary C. Hudson, Editor

©G.C.H., INC. 1981

Dear Subscriber:

October, 1981

Notes from all over:

Contract complete. G.C.H. Inc. has completed the Percheron limited partnership contract with Space Services Inc., and has turned over the test results. Reportedly, Space Services will endeavor to complete production of the Percheron system on its own. G.C.H. is continuing its own line of research into launch vehicles, with an eye on larger payloads. More on Space Services later in this issue.

Big Dumb Booster update. The "Commercial Large Launch Vehicle" (CLLV) concept has been mentioned in the Report several times, and one variation was covered in some detail in the April, 1979 issue (Vol. 3, No. 4). At present, G.C.H. market research indicates that long term profitability requires the larger payload capacity of this type of vehicle, and the company is proceeding on that basis.

In review, the basic CLLV system is a standard cylindrical rocket approximately 15 feet in diameter and up to 150 feet long. It consists of a reusable engine capsule capable of reentry from orbit, and a disposable propellant tank mounted forward of the capsule. Considerable cost savings are realized by having the complex apparatus (engines, pumps, avionics) recovered, while throwing away the lightweight, relatively inexpensive tank. This is similar to the basic concept of the Shuttle, without the expensive winged system and solid boosters.

G.C.H. is attempting to modify the concept to decrease launch costs still further. One design presently under study would endeavor to eliminate the original parallel staging system and create a single-stage-to-orbit system with its inherently lower operational costs. This might be accomplished without resorting to extremely high technology by utilizing a "mixed mode" system. This type of system uses a low-energy, dense propellant (RP-1 or liquid propane) for the initial portion of the flight, and switches to a higher-energy, less dense propellant (liquid hydrogen) during the latter part of the flight. Liquid oxygen is used as the oxidizer for both fuels. A "mixed mode" system makes the best compromise between the high performance of hydrogen (delivering greater engine efficiency) and the high density of hydrocarbon fuels (allowing for low tank weights) and results in mass ratios that permit single-stage-to-orbit.

At present, the major G.C.H. design goal is to be able to deliver a marketable payload into geostationary transfer orbit, permitting access to geostationary orbit. This is at present a major market,

which includes the rapidly growing communications satellite market. The same system would also be able to deliver a larger payload into low earth orbit, to serve future markets such as earth resources satellites, space stations, processing facilities, and others. Launch system designs are by no means finalized, and other concepts are under study as well. Further details will appear in later issues of the Report.

Geostationary platforms. A prime market for commercial launch systems is the market for payloads into geostationary orbit. More and more companies and institutions are looking to geostationary satellites for communications, navigation, and other uses. One of the major problems confronting the burgeoning satellite industry is that of crowding or "saturation" in the geostationary orbit. This seems at first to be preposterous. There aren't all that many satellites up there yet, less than 100, and the equatorial orbit, for example, has a total circumference of over 160,000 miles. It would seem that around 2000 miles between satellites would be sufficient.

However, there are some faulty premises involved in that statement. First of all, not all of the geostationary orbit is ideally suited for communications or navigation. Due to the mechanics of satellite communication, there are certain prime locations that are better for communication relay systems or navigation systems than others. These are filling up much faster than the remainder of the orbit. Also, present transmission systems require large spacing between satellites to avoid interference, since many satellites use the same frequencies (there are only so many frequencies to go around) and the communications systems on these satellites are not precise enough to be highly directional.

The simplest solution is to create satellite systems capable of generating highly directional beams that do not interfere with other nearby beams of the same frequency. This would allow far greater use of the existing communications frequencies than is now possible. This "point-to-point" system requires large multi-beam antennas and switching systems, too large for present satellites and launch systems. One solution is construction of geostationary platforms (GEO platforms), which are assembled in space. These large platforms, using construction technology similar to that proposed for solar power satellites, could combine multitudes of functions on board the same platform. New customers would simply add modules to the platform to add new functions. Such a platform could deliver far more communications capability than any existing system or group of systems. It is estimated that a system of 6 GEO platforms could meet total point-to-point communications requirements of the year 2000.

Longtime readers of the Report will be familiar with this concept. The October, 1977 issue (Vol. 1 no. 2) of the Report (then called the Foundation Institute Report) covered the satellite concept proposed by Comsat Laboratories. These satellites were called "Orbital Antenna Farms" (OAF's), and were also large structures in geostationary orbit. Applications for such systems were suggested in the Space Industrialization Study conducted by Rockwell International, and were covered in the June, 1978 (Vol. 2, no. 6) issue of the Report. New applications included direct-broadcast TV, pocket

telephones, electronic teleconferencing, a national data network, and electronic mail.

Many of these features are not only made possible by the increased amount of bandwidth made available, but also by the increased power of a large satellite platform. At present, communications satellite require small, lightweight methods of generating transmission power. The size and weight requirements lead to low available power for transmissions. With low-wattage signals, large receivers and amplifiers are needed on the ground to receive the satellite's transmissions.

With the increased power of a GEO platform, the ground receivers can be small and inexpensive, with the complex switching and other systems on board the satellite. This opens up the lucrative markets of personal communication and navigation devices, among others.

Space Shuttle schedule. A spill of nitrogen tetroxide, the oxidizer for the shuttle's reaction control system (RCS) has resulted in a launch delay while assorted tiles are replaced. The oxidizer dissolved the adhesive which held the tiles in place, and 365 tiles worked loose. There was also some damage to a fuel tank in the RCS system. There were some fears that the highly toxic propellant had leaked into the shuttle nose, which would have required extensive, time-consuming repairs. So far, this does not seem to have occurred to any serious extent, and repairs will be completed in October with the vehicle still on the launch pad. Originally, it had been feared that the shuttle would have had to be removed from the pad and hauled back to the Vehicle Assembly Building, causing even more delays. Fortunately, this was not necessary. It would have marked the first time that a manned vehicle had ever been removed from the pad once it had been set up there. At present, the launch is not precisely scheduled, but early November is a suggested target.

Nitrogen tetroxide is a commonly used storable oxidizer in rocket engines. It is the same propellant which has caused some controversy in the Titan ICBM, where propellant tank leakage resulted in an explosion in a launch silo earlier this year. Nitrogen tetroxide is hypergolic with many substances, resulting in spontaneous ignition when contact is made with a spill or a leak, and the vapors can cause death with relatively small doses. However, great care is normally taken when storing and handling this propellant, and very few injuries have resulted in recent years. As a matter of fact, the oxidizer is preferred over many others, due to high performance and great ignition reliability, and has been used in many unmanned and manned spacecraft.

New Shuttle Administrator. Major General James A. Abrahamson, former test pilot and manager of the F-16 fighter development program, has been named to head the NASA shuttle project. He will become associate administrator in charge of the Office of Space Transportation Systems in November. Abrahamson succeeds John F. Yardley, who resigned the post in May to become president of McDonnell Astronautics Co. in St. Louis. Abrahamson's primary responsibility will be the completion of the shuttle tests and its transition to full operations.

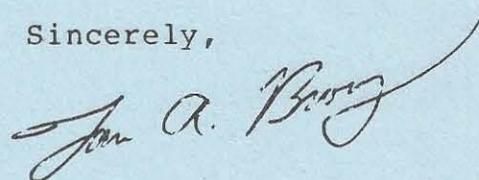
Regulation and red tape. According to a note in the "Industry Observer" column of Aviation Week and Space Technology (Sept. 28, 1981), Space Services Inc. president David Hannah Jr. appeared before the House Science and Technology Committee last week and requested the Committee to designate a lead regulatory agency to give permission for the company's future operations. Certain sources in the commercial space industry fear that this may set a bad precedent. Generally, in the free market faction of the industry it is felt that heavy government regulation is a cross to be borne rather than something which one sets out to create for oneself, and that permission should not have to be granted for normal operation of a business. One opinion is that spacecraft should operate under liability arrangements similar to that for airline companies, with private insurance sources taking up the load.

OTRAG. According to Satellite Week, (Sept. 21 and 28, 1981), OTRAG, the German rocket company is leaving German territory, and splitting up into two separate groups. One group, directed by Lutz Kayser, will continue to perform tests in the Libyan desert. (You have to admire the persistence, if nothing else.) The other group, headed by Frank Wukasch, will be entirely independent and concentrate on the high altitude sounding rocket market. Wukasch says he recently signed a contract for a launch site in a "neutral" country outside Africa or the Arab states, possibly in South America. Where in South America he found a neutral country is still unclear.

Project Magellan. Barbara Hubbard has proposed the private purchase of a shuttle flight for a general public-interest science flight. Similar in concept to the popular Jacques Cousteau ocean science voyages, the flight would cost up to 50 million dollars. Funds for the flight would be made up by sales of motion picture and book rights. A number of people have been suggested to lead the "expedition" of several people and experiments, including astronaut Gene Cernan. Reportedly, some senior NASA officials are enthusiastic about the idea.

Until next time...

Sincerely,



THE  
**COMMERCIAL  
SPACE REPORT**

The **Report** is published monthly, and has a subscription price of \$12 per year. Back issues are available at \$1 each from September, 1977. Xerographic copies may be substituted as stocks are depleted. Address all correspondence to G.C.H., Inc., 85 East Geranium Avenue, St. Paul, MN 55117 or call (612) 489-4466. Editorial Direction: Gary C. Hudson. Phone orders accepted at (612) 489-4466. No collect

calls please. **G.C.H., Inc.** is a diversified research and development organization formed to engage in advanced scientific and technology business. Capabilities include theoretical research and study, systems research and development of services and products. A high level of effort is presently being expended in astronautics, especially the commercial utilization of outer space and the need for economical space transportation. **G.C.H., Inc.** has a permanent and consulting staff of professionals to call upon including engineers, designers, scientists, communications experts, management specialists and the like. The **Commercial Space Report** is a concentrated effort to report all areas of private and industrial initiatives in the development of space. We hope it will stimulate ideas by raising questions and offering innovative concepts contributed by acknowledged leaders in the field. If you have any comments, ideas or requests for information we encourage you to contact us.