THE FOUNDATION
COMMERCIAL SPACE REPORT

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Dear Subscriber December

Once again we come to the close of a year, our third of bringing you news and opinions about space industrialization and commercial space activities world wide. In keeping with tradition, this issue will summarize the important events of the last year with some additions and elaborations that have recently come to our attention.

1980 may be remembered in the history books as the end of one era and the beginning of another. For the first time, not only the appropriateness of government funded commercial space enterprises has been questioned but also the ability of those agencies responsible to develop systems useable by business and industry. The technical problems of the Space Shuttle and the Ariane have been reported by even the popular press. The effects of budget cuts have both NASA and Aerospace industry officials speaking nostalgically for the heyday of the sixties and yet some have been quoted as saying that even with unlimited access to funds and manpower, NASA could not put a man on the moon again in ten years. The growth of bureaucracy has pushed the lead times on new projects beyond what industrial markets can tolerate.

At the same time, the first privately funded commercial space projects are beginning to gain momentum. Development of low-cost launch vehicle systems got off the drawing board and into construction on at least three separate projects around the world. Like any new business endeavors, they have all had their share of opportunities, problems and plain bad luck, but they are a start toward making commercial business in space feasible. At the same time the markets for various space-based industries have become more and more apparent. The worldwide needs for energy, resources and communications have continued to increase. Space based solutions have begun to look more attractive as the cost of non-renewable resources rises and the cost of data-processing and communications systems comes down.

What all this will mean in the long run remains to be seen. For the short run it looks like the next few years could be very exciting. Technology is no longer the problem. The next innovations must be in financing strategy, capitalization of new ventures and marketing. A new era of private commercial operations in space has begun. Here is a summary of the year in which it happened.

This year a variety of government and private organizations began or continued construction of launch vehicles intended for commercial operations. Despite problems earlier this year with thermal protection tiles and a rumored problem with the Orbital

Maneuvering System, the Orbiter Columbia has been transferred from the Orbiter Processing Facility to the Vehicle Assembly Building at Kennedy Space Center for interface tests. Installation of the thermal tiles is almost complete and will not interfere with other testing. Following tests include final testing of the main engines, initial cryogenic flow tests on the stack and the 20-sec. main engine flight readiness firing on Pad 39A. Current scheduling calls for a first launch sometime in the next four to six months, though rumors persist that a delay to fall of 1981 is possible.

Technical problems and cost overruns on the Space Shuttle have resulted in legislation of a new review requirement for major NASA program changes. The requirement is contained in the fiscal 1981 NASA budget recently completed by House and Senate conferees. Future program changes will not be approved by the House and Senate Appropriations Committees unless prior approval has been given by the National Academy of Sciences. Proposed by Sen. Harrison Schmitt (R.-N.M.), the review requires coordination between NASA's chief engineer and the National Academy of Engineering which is part of NAS. NASA must report on progress to establish the review process by March 31, 1981. Report readers may remember that the National Academy of Science published a report in 1978 (CSR Vol. 2, No. 8, August 1) claiming that it had not discovered "...any examples of economically justifiable processes for producing materials in space..." and recommending that such technology not be emphasized in NASA's program. The report also called for a shift in emphasis from applications to science and recommended peer review of all future experiments flown on the Shuttle. Given this attitude, the new NASA review requirement may mean a gradual decline in applications projects and more empahsis on pure science... good news for scientists but not for transportation customers that depend on NASA.

In the meantime, however, NASA is hedging its bets. McDonnell Douglas Astronautics, Co. has received a contract for 14 new Delta launch vehicles. Total price: $101 Million. Not bad for a production line that was due to be shut down within six months of first shuttle flight. We can only assume that demand for satellite launches is already outstripping the Shuttle's capacity and that continued growth of this market will increase the opportunities for other launch vehicle services.

The Ariane has also had its share of troubles this year. The failure on May 23rd of the second Ariane space launcher due to an engine failure was repeated on Nov 3rd during a static firing of injectors at Lampoldshausen, Germany. By prefiring injectors, investigators hope to screen out the possibility of another operational failure when Ariane 3 is launched in 1981. No. 3 will be carrying the European Meteosat 2 weather satellite and India's Apple communications test satellite. The dual-satellite payload launch system developed for EAS by Aerospatiale is expected to increase Ariane's competitive edge over U.S. launch systems.

Meanwhile, work on private commercial launch vehicles went forward on three fronts this year:

Otrag (Orbital Transport-und Rakenten-Ag.) is alive and (for the moment) well and launching from Libya. Readers will remember the disastrous effects of the Shaba province invasion and subsequent ouster of Otrag from Zaire in April, 1979 (CSR: Vol. 3, No. 5, May 1st). For over a year rumors circulated that Otrag was searching for a new launch site, but no clues surfaced as to where and Otrag was not talking after their experiences with Eastern Bloc press. Accusations that Otrag was a tax fraud that never intended to become profitable circulated also. Well, what ever else Otrag is doing, it is building and launching booster modules. The new launch facility was set up seven months ago about 600 miles south of Tripoli in the Sahara. Libyan leader, Col. Muammer Gaddafi is permitting Otrag to conduct launches on Libyan territory free of charge at present.

Three suborbital flights have already taken place this year and another is scheduled for next month. Using the expendable module design announced last year (CSR: Vol. 3, No. 2, Feb. 1st) Otrag expects to cut present launch costs to low-earth and geostationary orbits in half. Company officials announced that six unidentified options for launches, totaling $6 million in orders, have already been placed. The first commercial orbital launch is scheduled for winter of 1982. The firm is pursuing contracts with Third World countries and feels it has advantages over the Space Shuttle by "...being entirely free to launch reconnaissance and earth resources satellites for any country, some of which may be politically too sensitive for NASA."

We commented last month on Otrag's present business strategy and remind our readers of the meaning of "reconnaissance." Oh well, if Otrag's stock holders are happy...we will be watching their activities and experiences with great interest. We hope we won't have any more opportunities to learn from their mistakes.

Project Private Enterprise, Inc. developed by Bob Truax (former head of the military space program of the Advanced Research Projects Agency, DOD) held its first engine test firing in July of this year in Fremont, California (CSR: July, 1980). The effort to fly a single astronaut to a 50 mile altitude and thereby show that space flight can be accomplished simply and cheaply, suffered a recent set-back when the consortium of Chicago businessmen who were backing the project financially withdrew their support. However, thanks to the volunteer efforts of his staff, Truax is persevering and construction of the X-3 rocket vehicle goes forward. Additional funding for the project is being sought and Truax is still hopeful that the target launch date late in 1981 can be met.

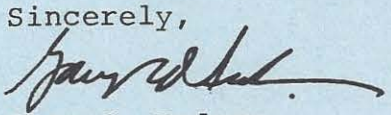
And on the home front, the Advanced Propulsion Technology Division of G.C.H., Inc. has moved into construction of test articles on the Percheron Project using a conventional Lox-Kerosene engine system. Preliminary engine tests are scheduled for early 1981 and a subsequent suborbital flight of one module could take place as early as next Spring. The global earth-resources market is being studied as a possible near-term profit center with commercial communications satellites and other space applications markets for the longer term.

As long as we are on the subject, the folks at APT would like to thank all of those who have submitted resumes in the last month in response to the request in last month's Report. Screening is presently taking place and letters will go out over the next few weeks. While a variety of skills are being sought, we have been asked to put out a specific request for Machinists and Shop Technicians (professional experience preferred), B.S. EEs and MEs and MBAs with management experience (or individuals with business, legal or accounting backgrounds and experiences). Please send resumes to Gary C. Hudson, G.C.H., Inc., 1288 Anvilwood Ave., Sunnyvale, California 94086 as soon as possible. Positions will be opening up at various phases of the project during the next year and a half so they are considering long-term possibilities as well as short-term immediate needs (if you know any machinists have them call!!!).

As you can see, the year was an exciting one for Space Transportation. What about the other areas of space industrialization that we have traditionally reviewed at the end of each year? As has happened so often in the past, more studies were done in the fields of Energy, Resources and Communication and they all point to the same problem. None of them are going to become commercially feasible until the cost of transportation comes down, but the cost of transportation is the only major stumbling block. The report from a $25 million DOE study on SPS was presented last spring in Lincoln, Neb. The study was a thorough one and examined SPS from every angle. The study found no major problems and we noted that of the $100 billion projected budget, 75% was for transportation costs. The same is true for Resources and Communcations. The present state of the raw materials market is causing havoc in the aircraft industry and is being felt throughout the economy. The need for earth sources data is becoming critical and the market for extraterrestrial resources is growing right here on earth. The demand for satellite communication systems can be seen in the number of new contracts going out each year from countries all over the world. 1980 has been an exciting and pivotal year and it looks like the best is yet to come.

Until next year,

Sincerely,



Gary C. Hudson