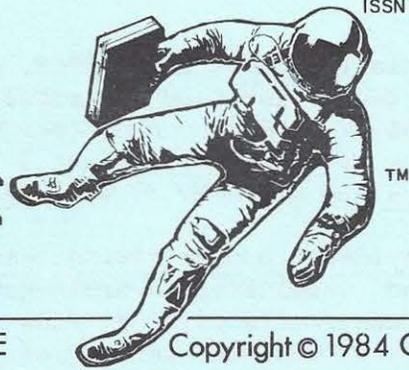


# THE COMMERCIAL SPACE REPORT

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Dear Subscriber:

## Satellite Rescue Missions

### The Missions:

The U.S. Space Shuttle has succeeded in repairing the Solar Maximum observatory satellite ("Solar Max") in orbit, which may result in similar rescue efforts for other troubled satellites, including the two "lost" communications satellites, Westar 6 and Palapa B-2, and the Landsat 4 earth resources satellite.

The Solar Max rescue was to be accomplished by bringing the Shuttle orbiter Challenger near the satellite, and sending a spacesuited astronaut out with a manned maneuvering unit (MMU) to grapple onto the satellite and stabilize it enough for Challenger's remote manipulator arm to grab the satellite. Solar Max would then be placed onto a repair platform mounted in the cargo bay, and spacesuited astronauts would then complete the necessary repairs.

In practice, the astronaut was unable to successfully grapple the MMU to the satellite. However, commands to the satellite from the ground succeeded in stabilizing Solar Max enough so that the Challenger crew could manage to grab it with the remote arm anyway. After the repairs were finished, the operational Solar Max was returned to its orbit.

Indonesia's Palapa B-2 and Western Union's Westar 6 communications satellites may be salvaged, using similar tactics, as early as the end of 1984. These two satellites were trapped in a useless orbit when their PAM-D orbital transfer motors failed after the satellites were deployed from the cargo bay of the orbiter Challenger during Mission 10. Either one or both of the satellites could be salvaged during a single Shuttle mission. The satellite (or satellites), once captured and anchored in the payload bay, require repairs that cannot be done in orbit, so the Shuttle will return them to earth for refurbishment, and another launch later. Indonesia is more enthusiastic about the mission than Western Union, probably because the country has no backup satellites available. However, Western Union will likely go along with the idea once the Palapa B-2 rescue is approved. The National Aeronautics and Space Administration (NASA) is eager to use the Shuttle on another rescue mission, which, unlike missions involving ordinary payload launches, is impossible to carry out with any other existing launch vehicle and highlights the Shuttle's unique capabilities. Needless to say, the insurance companies covering the two satellites are the most enthusiastic of all.

A more ambitious mission would be the orbital repair of the Landsat 4 satellite. This mission, using the Shuttle orbiter Discovery, is tentatively scheduled for April of 1986. In this case, it is hoped that the repairs can be completed in orbit. Capture of the satellite will be performed using the same techniques, but the Discovery will have to be launched into a polar orbit from Vandenberg AFB in

California (C.S.R., Aug. 1983, pp. 2-4). In addition, the repairs would involve a complex and potentially hazardous refueling process using liquid hydrazine to refill the satellite's maneuvering fuel tanks.

#### The Costs:

Considerable cost savings can, theoretically, be realized by the practice of repairing satellites in orbit rather than writing them off and launching new ones. From a customer's point of view, this is already the case with the Space Shuttle. For example, take the three missions already discussed:

The Solar Max satellite repair, according to NASA, was much less expensive than a new satellite would have been. According to CBS News, the repairs saved \$190 million over the \$235 million cost of a new Solar Max satellite (placing the price of the mission itself at about \$45 million).

In the case of the Palapa B-2 communications satellite, insurance companies have estimated that the rescue mission would result in a savings of \$20 million and at least one year's time compared to building and launching a new satellite.

As for Landsat 4, NASA as yet has released no firm cost figures, but states that a repair mission would result in considerable savings over an estimated \$225 million required to build and launch a new Landsat satellite.

#### The Real Costs:

How accurate are these cost savings? They are, as mentioned, from the customer's point of view. In fact, due to NASA's Shuttle subsidy policy, most of the missions' real costs are bypassing the users and falling directly on the taxpayer. As has been stated before in these pages, NASA charges prices for Shuttle launches that are far lower than the estimated \$250 million that each flight presently costs. Examining these rescue missions in this light reveals a different answer.

To launch a brand new Solar Max on a Delta rocket would cost about \$260 million, \$235 million for the satellite (a considerable increase over the \$70 million the satellite cost in 1979) and approximately \$25 million for the Delta launch (which is not subsidized). This \$260 million is slightly more than the \$250 million cost of a Shuttle flight, but hardly the \$190 million claimed. If other costs are added in, for special equipment, astronaut training, etc., the actual savings are probably nil.

Indonesia's Palapa B-2 communications satellite was insured for \$75 million, of which somewhat less than \$50 million is probably due to the actual cost of the satellite and its associated solid rocket motors. If a \$50 million satellite were launched on a Delta rocket for about \$30 million, then the total cost of a new system would be \$170 million less than the \$250 million that a Shuttle flight would cost. If the mission involves the salvage of both Palapa B-2 and the Westar 6, the Shuttle flight cost would drop to \$125 million per satellite, still \$45 million more than the cost of building and launching new satellites.

A new Landsat would probably run about \$225 million. NASA places the cost of a new Landsat at a minimum of \$200 million, and a Delta launch for this satellite would cost about \$25 million. This, too, comes out cheaper than the \$250 million minimum for the Discovery's rescue mission.

Other than the taxpayers, is anyone else penalized by this particular subsidy situation? Obviously, those operators whose expendable launch vehicles could be used to launch new satellites would lose some business. Transpace Carriers, Inc., which presently markets the Delta rocket, is one example since the Delta is the

major alternative to the Shuttle for all of the aforementioned salvagable satellites. According to the figures given, a Delta launch, combined with a new satellite, underprices most unsubsidized Shuttle repair options.

Others who are penalized are those companies attempting to develop new and inexpensive commercial launch systems. Some of these proposed launch systems are manned, or have the potential for being manned, and could also carry out on-orbit repair missions or satellite return missions. As with any other launch service, including the Space Shuttle, the price to the end user of such a mission must be kept below what it would cost to launch a new satellite (the difference is that, unlike the Shuttle, commercial launch services must charge at least as much as it actually costs to perform the mission). This would not be hard...two proposed manned, reusable systems, the Pacific American Launch Systems' "Phoenix" (C.S.R., Jan. 1983, pp. 2-3) and TranSpace, Inc.'s "Space Van" (C.S.R., Nov. 1981, p. 1), have costs per launch of about \$1 million and \$3 million respectively. The cheapest satellite I have discussed here was the Palapa B-2, an HS-376 which costs \$50 million or less. Even allowing for additional costs for special equipment, Phoenix or Space Van could probably recover, and relaunch such a satellite several times before the process became more expensive than a new satellite would cost just to build, much less launch. Yet, as long as NASA can set its prices without regard for its costs, there will be no market pressure to encourage customers or other investors to put money into these, or any other new concepts.

#### Freedom and Space

It may seem to many that this newsletter has dwelt excessively in recent months on NASA's economic and political space policies, and how they are detrimental not only to the private sector space effort, but to the long-term exploitation of space in general. In point of fact, this issue is becoming more critical every day. The NASA monopoly on spaceflight was not seriously threatened until recently, when the agency began to realize that private space companies were making serious inroads into space transportation. This, combined with the present Administration's favorable stand on private launch systems, has generated a very real conflict between private space projects, and those government space programs that have already greatly distorted the path of man's progress in space.

The government monopoly on spaceflight has generated the following situation: **One** group, including NASA and many aerospace industries, has staked its future on a specific, monopolistic manned space approach which largely excludes automated and teleoperated systems. However, under this approach, manned spaceflight has become unbelievably costly. The Shuttle eats \$250 million every time it throws five astronauts into space, and a single, permanently manned space station will cost \$8 billion--probably even more. At these prices, even extraordinary levels of automation are cheap by comparison, and another growing contingent, including scientists, legislators, and beleaguered taxpayers, is pressing for an alternate, robotic approach which largely excludes manned operations. Those who are enthusiastic about increasing human activity in space in general see themselves trapped between these two extremes, with no way to turn.

In fact, either approach alone would result in a narrow, ineffective space program that would inevitably fail. Space is best explored and exploited by choosing from a wide variety of approaches involving automated systems, teleoperators, and manned spacecraft. Every space operation usually has its own unique requirements, and no single approach can adequately deal with all possible missions.

In order for this wide range of choices to become a reality, space operations at reasonable prices, both manned and unmanned, must become a reality first. This will never happen through government programs, and, unless the government is kept out of the way, it may never happen through the private sector either.

The battle is a very real one. NASA has announced, publicly, that their goal is 75% of the free world's launch market, to be achieved by hook or by crook. When one notes that the goal of Europe's Arianespace is 25% of the same market, one begins to see the survival problem faced by free enterprise competitors who do not have access to the taxpayers' pockets, and, by extension, the survival problem of effective human action in space.

The choice is not, as has often been presented, between two roads into space: free enterprise and government programs--the true choice is between the road of free enterprise, and not getting there at all.

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#### Recommended Space Periodicals

The Commercial Space Report seeks to report and analyze developments in the field of private enterprise in space, particularly in the specific area of space transportation systems. However, for a number of reasons, mostly lack of room, the Report cannot cover everything that happens in its field in a given month, or offer long, detailed treatments of many subjects. For those who want further and more extensive information on commercial space activities, I have collected a short list of some of the other publications which may be useful in this regard.

Please note that this is not intended to be a complete bibliography of all space publications. There are many excellent publications that are not listed here because of high cost, subject matter, or because a listed publication simply gives you a better value in my judgement. Choices are based only on my own opinions of what C.S.R. readers might find interesting.

One of the best of the bunch is Aviation Week and Space Technology. (Subscription prices: Qualified aerospace professionals, \$45.00/yr., \$72.00/2 yrs., \$98.00/3 yrs. Others, \$58.00/yr. Address: Fulfillment Manager, Aviation Week and Space Technology, P.O. Box 1022, Manasquan, NJ 08736.)

Aviation Week is a weekly glossy-paper magazine of approximately 100 pages. Primarily a news publication, it contains enough detailed background information to make it an excellent general reference. It includes many photos, both color and B & W. Often, new space pictures appear here before they show up in any other general publication. The publisher's target subscribers are the military/aerospace companies (note price variation between professionals and others), and contents, including the advertising, are mostly on this subject. However, the magazine does not neglect any area, and contains thorough coverage of all space activities, including commercial ones. The price is a real bargain for what you get, and this publication is highly recommended. Normally not available on newstands, but unlike many exclusive newsletters, commonly found in most public libraries.

Some publications involve membership in a space society. Among these are Spaceflight and the Journal of the British Interplanetary Society. (Subscription prices for either title, included with annual membership fees: Member (under 18), \$26.00; Member (18-20), \$30.00; Member (21 +), \$36.00; Fellow, \$40.00. Address: British Interplanetary Society, 27/29 South Lambeth Rd., London, SW8 1SZ, England. NOTE: BIS members receive a choice of either Spaceflight or JBIS free with their membership. The other publication can be received as well for an extra \$34.00.)

Spaceflight, published monthly, is about 50 pages long. It contains many B & W photos and illustrations, as well as detailed information on all aspects of spaceflight, including much on Soviet space programs. JBIS, also monthly, publishes papers from people involved in space professionally or otherwise. It is oriented towards a professional audience, but is not too esoteric for laymen. JBIS addresses

a specific space-related subject each month. Of particular interest is the "Red Cover" issue, appearing every few months, containing, exclusively, papers dealing realistically with interstellar travel and communications. Both magazines are excellent references, but not much use (outside of England) for getting up-to-the-minute reports due primarily to the great delays involved in overseas mail.

The British Interplanetary Society has been in existence since 1933. Membership is recommended, even if all you get are the publications (members in England also have easy access to many other BIS functions and benefits). In the late 1930s, the BIS published designs for workable methods to land man on the moon. This was before anyone had even heard of the V-2. Thirty years later, a manned lunar landing was actually accomplished. In this context, it should be noted that the BIS recently completed Project Daedalus, a valid conceptual design for an unmanned interstellar space probe.

Another membership publication is the L-5 News. (Subscription prices, included with annual membership fees: Regular, \$25.00; Student, \$15.00. Address: L-5 Society, 1060 E. Elm, Tucson, AZ 85719; (602) 622-6351).

The L-5 News is approximately 20 pages in length, containing articles, B & W photos and illustrations. An average publication, it deals primarily with internal Society activities and chapter news. However, its space-related articles are occasionally excellent, and there is often information on recent political events that affect space activities.

The L-5 Society is a central touchpoint for many groups and individuals interested in promoting space. The organization strongly promotes government spending in space, but private space enthusiasts are becoming more predominant. Membership is worth the price, and the annual L-5 Conference on Space Development is an important event for anyone interested in the field.

Recently, the larger newsletter companies, those who normally publish several titles on various subjects, have begun to take notice of the commercial space field. One result of this is Pasha Publications' Space Business News. (Subscription prices: \$295.00/yr. (U.S., Can., Mex.), \$175.00/6 mo., or \$325.00/yr. airmail foreign. Address: 1401 Wilson Blvd., Suite 910, Arlington, VA 22209; (703) 528-1244.)

Space Business News is a biweekly, 8-page, typeset newsletter containing excellent up-to-date information on private enterprise in space, and government activities affecting it. The price is prohibitive, but a good value for those who can afford it, in particular space-related companies.

Two other organizations, the Phillips Publishing Corp. and Television Digest, Inc. are also in the process of starting commercial space newsletters similar to Space Business News. (Phillips and Television Digest also publish two well-known newsletters on communications satellites, Satellite News and Satellite Week respectively.) Phillips' publication is called Space Enterprise Today, and its first monthly issue was released just recently. This first issue looked good, but it is too soon to tell how valuable the newsletter will be in the future. Television Digest's offering (which has not yet begun publication as of this writing) is reportedly going to be called the Space Commerce Bulletin.

For further information on Space Enterprise Today contact: Phillips Publishing, Inc., 7315 Wisconsin Ave., Suite 1200N, Bethesda, MD 20814; (301) 986-0666. To find out what's happening with the Space Commerce Bulletin, contact: Television Digest Inc., 1836 Jefferson Place NW, Washington, DC 20036; (202) 872-9200.

Space Enterprise Today, a 12-page monthly, runs \$347.00/year, plus \$33.00/year

for overseas airmail. The Space Commerce Bulletin will probably be in the same price range. These prices, typical for most industry newsletters, are unfortunately out of reach for many people interested in the field of space commercialization.

Other publications of some interest:

Lift-Off. (Subscription price: \$11.70 for six issues (subject to change--see NOTE below). Contact: Lift-Off Publications, Inc., 8 North Liberty Ave., Endicott, NY, 13760; (607) 797-9165.)

A bimonthly magazine, approximately 50 pages. Contains informative articles along with many B & W illustrations and photos. An excellent publication, dealing with a wide variety of space activities, and a strong supporter of private space development.

NOTE: at present, Lift-Off is in the middle of a temporary publishing hiatus pending company improvements. Contact Lift-Off Publications for up-to-date information on magazine status and prices.

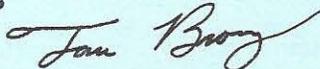
Space Calendar. (Subscription prices: Individual, \$59.00/yr., \$99.00/2 yrs.; Institution, \$99.00/yr., \$179.00/2 yrs. Special introductory subscription offer to members of space development organizations (L-5, AAS, AIAA, ASAP, NSI, SSI, Planetary Society, etc.): \$39.00/first year, \$79.00/2 yrs. Contact: 3210 Scott Blvd., Santa Clara, CA 95051; (408) 988-0592.)

A weekly newsletter including some B & W illustrations and photos. Contains day-by-day documentation on what has happened in space that week. Also contains several regular special information sections, including one on space entrepreneurs.

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Note to Overseas Subscribers: The C.S.R. will no longer offer foreign subscriptions sent by surface mail to new subscribers. Air mail subscriptions will, of course, continue to be offered, and present subscribers receiving this newsletter by surface mail will continue to receive it with no change, but will have to renew their subscriptions by airmail when their present subscription runs out. Surface mail creates sorting and postage problems and is simply too slow to provide the type of service the C.S.R. wants to deliver. Air mail is much faster, and will cost foreign subscribers only an additional \$5.00 or less per year.

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.

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