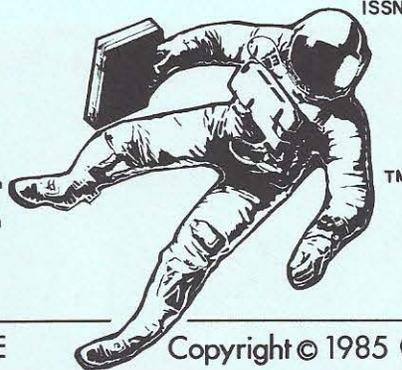


THE COMMERCIAL SPACE REPORT

ISSN 0735-9314



A MONTHLY NEWSLETTER ON FREE ENTERPRISE IN SPACE

Copyright © 1985 C.S.R.

Volume 9, No. 10

October, 1985

Shuttle Users Competing For Scarce Orbiter Middeck Space

The National Aeronautics and Space Administration (NASA) is having trouble trying to accommodate a mushrooming demand for experiment space in the Space Shuttle orbiter's middeck (the lower deck inside the pressurized crew cabin). There is apparently an enormous number of users who want to run space experiments and processes where a payload specialist can operate the equipment in a "hands on" mode on the middeck, rather than by remote control in the payload bay. Many experiments can be properly run in no other way, requiring constant observation and fiddling by the operator to keep everything working correctly.

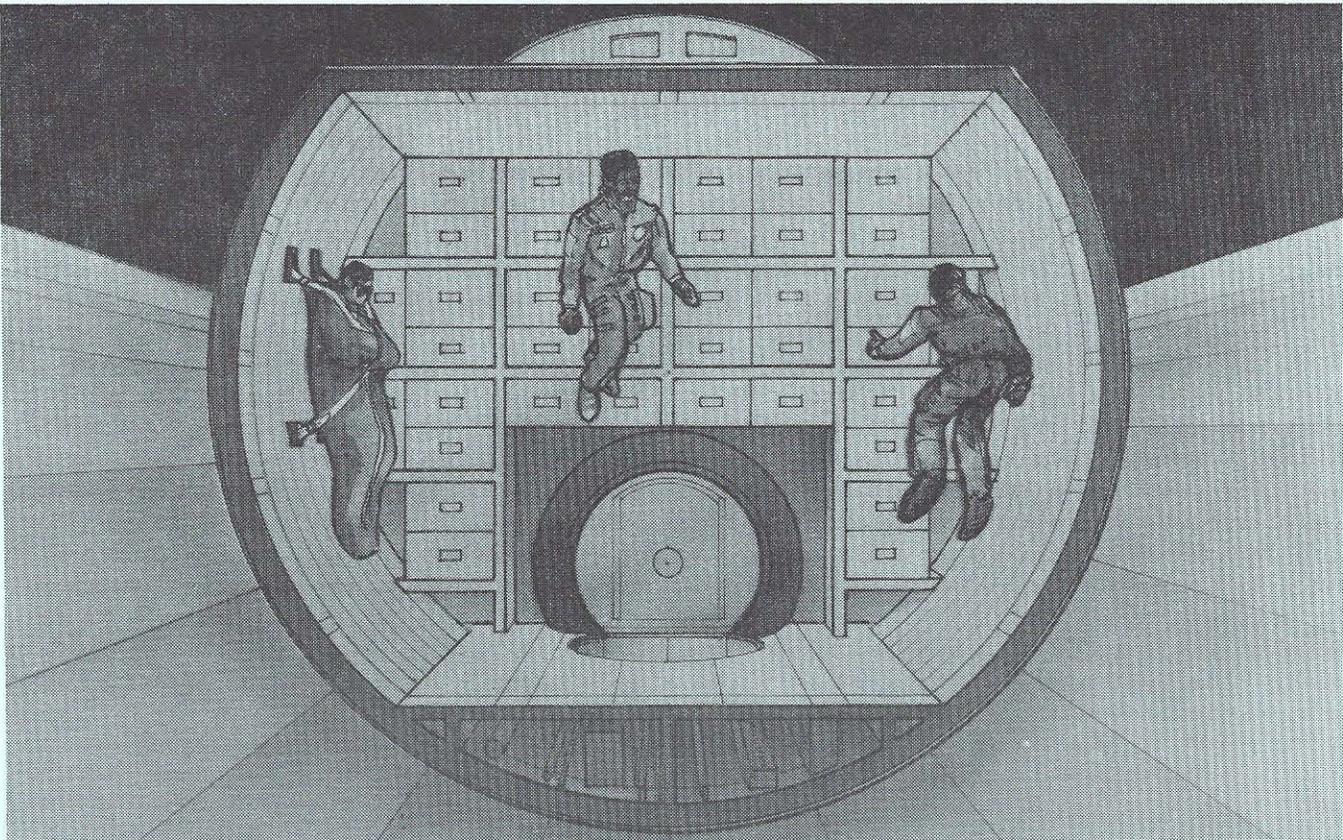
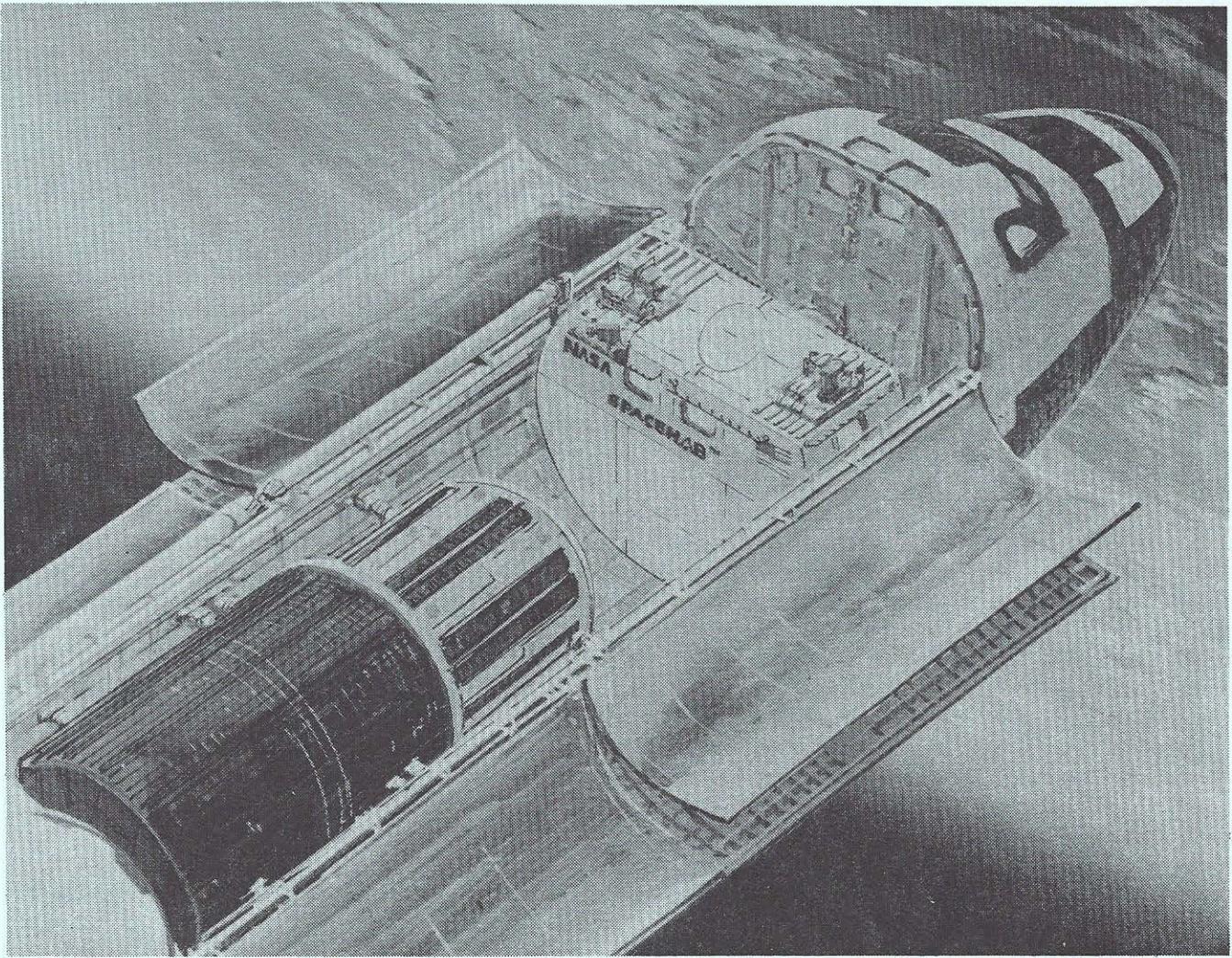
This intense demand for middeck space is no surprise to advocates of manned space systems. Direct human intervention has already saved numerous experiments on several Shuttle flights--experiments that would have failed if crew members had not been able to quickly gain access to the equipment to repair or modify it. However, NASA did not anticipate this flood of potential users. There are over 100 experiments waiting in line...some have been waiting for years.

There is not normally much available room for experiments on the middeck. Middeck storage space is divided into "lockers," each with a volume of about two cubic feet, and able to hold about 60 lbs. There are 42 such lockers on the middeck. However, many of these are required for storage space for the Shuttle crew. A seven-day mission with a crew of five uses up about 27 of these lockers for food, clothing, etc. leaving only about 15 lockers for experiments. Adding more payload specialists (such as experimenters) uses up even more locker space. A full Shuttle crew of seven requires about 34 or 35 lockers worth of storage, leaving a mere 7 or 8 for experiments. Many such experiments require the equivalent of several lockers' worth of space, so there is obviously not much lab room to go around.

Users seeking middeck facilities include commercial customers, scientists, and the Department of Defense (DOD). The severe shortage of middeck space and apparent lack of a solid NASA policy on the matter has resulted in an aggravating game of Musical Chairs. Experiments are constantly being "bumped" off flights in favor of others, with the criteria for priority seemingly changing daily. Rarely do small middeck experiments create the headlines generated by the cargos riding back in the payload bay, so most of these shenanigans go unnoticed by all except the industry insiders and the frantic middeck users.

Some examples of commercial requirements: the McDonnell Douglas electrophoresis middeck experiment setup uses 4 lockers and the entire galley area. McDonnell Douglas wants to fly 15 such experiments over the next five years. The 3M Company wants to fly its experiments up to three times a year, with each one using 3 lockers. Other companies have similar requirements.

The Department of Defense anticipates a huge need for middeck space to accommodate Air Force and Strategic Defense Initiative experiments. In fact, the DOD went



so far as to actually request the equivalent of four dedicated lockers on every single Shuttle mission. This request was politely shot down in flames by NASA, which pointed out that eventually one-third of all Shuttle flights will be committed totally to the DOD, which could use all available middeck space on those flights. On other flights, the DOD would have to stand in line like everyone else (this issue is still being discussed).

Often lowest on the totem pole are those users without the pull or other attributes required to "bump" their way into the front of the line. These include small companies, and a number of frustrated scientists. Ironically, many scientists in NASA's own life sciences and microgravity departments are having trouble getting on flights! The line grows longer, and the grumbling gets louder. Fortunately, a private company has come up with a proposal that may take some of the pressure off...

Spacehab, Inc. Proposes Middeck Extension Module

Spacehab, Inc., a private company based in Seattle, Wash., is developing a pressurized habitat module that will fit into the payload bay of the Space Shuttle and provide additional living and working space.

The Spacehab module will nearly double the existing pressurized volume of the Shuttle's crew compartment. Empty, it will provide up to 1,000 cubic feet of working space. The module may be configured to provide as many as 100 standard middeck lockers, and still contain 750 cubic feet of working space. Its payload capacity is about 6,000 lbs.

Spacehab modules are truncated metal cylinders, 10 feet long and 13 feet in diameter (see illustrations). A module would be connected to the Shuttle payload bay airlock using standard Spacelab tunnel adapters. The short length of the Spacehab module, combined with its flat ends, permits it to fly on the Shuttle while occupying only one quarter of the payload bay. This permits a Shuttle flight to carry a module and still carry additional revenue-producing payloads, such as communications satellites.

Early versions of Spacehab modules will rely entirely on Shuttle systems for life support and power, and have passive thermal control. More advanced versions will contain major subsystems and utilities, including hard vacuum access, life support and power augmentation, and active thermal control capabilities.

Spacehab, Inc. is aiming this module directly at the Shuttle middeck space bottleneck. The module has advantages over the standard middeck for potential users. Aside from the additional room, the physical separation of the module from the rest of the Shuttle will permit dedicated, proprietary operations to take place inside. Such separate facilities are not only attractive to companies developing proprietary space processes, but also to the Department of Defense, which can perform many activities within the module without compromising security, or bumping any other users off the flight.

Spacehab also hopes to accommodate research projects related to the NASA Space Station, which will require on-orbit testbeds to test certain Space Station systems prior to the Station's construction.

Spacehab plans a full-service operation that will cover all of the customers' requirements. Planned payload services will include assisting customers with NASA payload requirements and scheduling, payload storage, processing and integration at Spacehab's planned payload facility, transportation of the payload from the processing facility to the launch site, insurance, engineering services, mission support, and post-flight services.

The company is negotiating a memorandum of understanding with NASA. One of the problems Spacehab will have to overcome is NASA's skittishness about dealing with a system that appears to compete with the European Spacelab. NASA's Spacelab agreement with the European Space Agency (ESA) states that NASA will not engage in separate and independent development of any Spacelab-type facility substantially duplicating Europe's Spacelab unless the ESA fails to produce Spacelabs according to the specifications in the agreement (the agreement is in force for another three years). Whether or not this agreement will be an obstacle to Spacehab remains to be seen. For one thing, NASA is not actually developing the module. For another, Spacehab is apparently seeking out positive relations on its own with the European space industry. Major Spacelab contractors such as Aeritalia of Italy and MBB-ERNO of West Germany are currently negotiating for large roles in the manufacture and marketing of Spacehab modules, including eventual equity participation in Spacehab, Inc. Such European involvement could go a long way towards eliminating any potential ill feelings about the Spacehab project (one hopes that something will be done about the Spacehab/Spacelab name problem...a typo on a blueprint or contract could throw both projects into chaos).

On its present schedule, Spacehab plans to launch its first module in the first quarter of 1987. The company hopes to fly five modules per year by 1990, and possibly up to one per month thereafter.

Preliminary estimates put the cost of leasing a Spacehab module at about \$5 million per flight. This does not include Spacehab services such as integration or processing, or the cost NASA will charge for the Shuttle flight (about \$25 million for a payload occupying 1/4 of the payload bay, although this may be negotiated downward).

The August, 1985 C.S.R. reported on another private space venture, Space Industries Inc.'s Industrial Space Facility, a normally unmanned orbital free-flying module. Spacehab's module, a constantly-manned system that flies with the Shuttle fills many orbital operations niches left unoccupied by the ISF. Between these two, and more advanced private systems which will appear in the future, free enterprise will be filling many of the needs of the customer requiring space facilities.

* * *

The Incredible Shrinking Space Station

A NASA official has stated that the initial size of the agency's Space Station may have to be reduced from the currently planned five modules to three modules or even two in order to stay within the current \$8 billion budget (!!). David Weeks, working with an Artificial Intelligence group at NASA's Marshall Space Flight Center, made the statement at a conference on Expert Systems in Washington on Sept. 30. Weeks also expressed doubts about making the 1992 launch date for the Station.

The signs that the Space Station budget is about to be busted are showing up all over. A major factor, as always, is the pressure to use the Station as a "technology driver," creating advanced, complex solutions to problems that can be solved in simpler ways. One big culprit is the Congress, which has been putting pressure on NASA to incorporate advanced automation and robotic systems into the Station whether or not they are necessary to do the job.

One of the motivations for this attitude is the promise of numerous "spin-offs" for application on Earth. These spin-offs have often been pointed to in the past as a benefit of massive government spending on space programs. Admittedly, such spin-offs have resulted from past space programs, and some new and useful technologies would probably result from an "ultra-high-tech" approach to Space Station construction and operation.

However, it should be pointed out that these grand new technologies will be developed at the taxpayer's expense--a fact which takes a lot of the shine off of the spin-offs for many people. Justifying forcible removal of money from other people's wallets by expounding on the Wonderful Things one will do with it is at the root of the majority of the problems of our government and our nation.

In addition, these new technologies will be developed at the cost of pricing access to space facilities far beyond the reach of private entrepreneurs who would otherwise be able to bring their own new space-born technologies into the world--market-driven technologies that would be more valuable by far by virtue of being directed more precisely to real human needs, and funded by voluntary capitalization and trade.

Knowing Which Side Your Bread Is Buttered On Dept.: Part Two

Another politician is about to receive a free Shuttle flight to encourage support of NASA programs. Rep. Bill Nelson (D.-Fla.), chairman of the House subcommittee on space science, will fly aboard Columbia on Dec. 20. Nelson has been a big supporter of NASA programs, and was a major voice against raising Shuttle prices (judging by the previous item on Space Station costs, NASA looks like its going to need all the help it can get in Congress).

Unfortunately, Nelson's flight will bump a Hughes Aircraft Corp. middeck experiment to another flight in January, along with payload specialist Gregory Jarvis. Apparently the Shuttle middeck space shortage is not so severe as to prohibit NASA's greasing yet another Washington wheel. To add insult to injury, Jarvis has already been bumped once when Sen. Jake Garn (R.-Utah) took his free flight last April.

Long Duration Exposure Facility Exposed Longer Than Expected

NASA Long Duration Exposure Facility (LDEF) has, for all intents and purposes, been stranded in space. The LDEF is a large satellite consisting of a framework on which 57 experiments were mounted to test the orbital environment and the reaction of different items to that environment. These experiments, costing from \$10,000 to \$400,000 each, include experiments in a wide variety of fields such as materials, electronics, astrophysics, planetary science, and life sciences.

The LDEF was launched from the payload bay of the Shuttle orbiter Challenger on Mission 41-C (the mission which also included the repair of the Solar Max satellite) in April of 1984. It was to have been retrieved by another Shuttle mission in March of 1985 on Mission 51-E. However, that mission was scrubbed, and since the LDEF is about 30 feet long, and weighs over 21,000 lbs., it has not been easy for NASA to reschedule a pickup among all the other payloads on the Shuttle manifest. Presently, the retrieval of the LDEF is tentatively scheduled for late in 1986.

Unfortunately, the overlong stay in space will ruin over half the experiments, killing life sciences projects, oversaturating sensors, and rendering useless experiments whose results depend on a timely return from orbit. The stranding of the LDEF threatens to disappoint many, including researchers from government labs, private industry, foreign countries, and universities. Among the experiments were 175,000 sets of seeds from the George W. Park Seed Co. that were to have been distributed to children in school science classes over the 1985-86 school year. It is likely that these seeds will be dead by the time the LDEF is finally retrieved.

This scheduling mishap does little to help NASA enhance the image of the Shuttle as a reliable, on-time space transportation system. Although the LDEF retrieval is not as critical as some other missions (except, of course, to the users), NASA is giving this problem a high priority. The space agency's performance on this highly visible science project will have a large effect on its already-

suffering reputation with the science community.

Articles of Interest In Other Publications

The November, 1985 issue of Discover magazine contains a special report on space consisting of three articles:

The first article, "The Shuttle: Triumph or Turkey," by Alex Roland, is a fascinating history of the development of NASA's Space Shuttle. Step right up! See for yourself the Weird and Unnatural workings of Government and Bureaucracy that changed the Space Shuttle from a low cost transportation concept into the World's Most Amazing Technical Mutation!

The second article, "Success Amid The Snafus," by Dennis Overbye, deals with the traumas faced by scientists aboard the Shuttle as they battle Murphy's Law and floating monkey manure on their way to crushing failures as well as tremendous successes--a few of which were utterly unexpected.

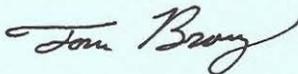
The third article, "The New American Frontier," is a relatively routine view of the future in space by Dr. Gerard O'Neill.

The Cola Wars: Final Body Count

In response to the letter that poured in, I will now report on the outcome of the contest between Pepsi and Coca-Cola to decide on which cola and which specially designed zero-G can would be ruled the Favorite of the Astronauts on Shuttle Mission 51-F (C.S.R., July 1985, pp. 4-6). The flight was preceded by a public relations battle between the two soft drink companies involving T-shirts, baseball caps, and free cans of cola (regular Earth cans, of course).

The results: The Coke space can worked better than the Pepsi space can. However, the cans of warm soda (there is no refrigerator on the Shuttle) went over like, well, cans of warm soda. "Not on anybody here's favorite list of things," stated Mission Commander Gordon Fullerton. "There was no desire to drain the cans." No ill effects on the part of the astronauts were reported, probably because no one drank much of the stuff. So, there you go. Now you can sleep nights again.

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.

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.