An alternative is for the American delegates to go to Leningrad and ask that any agreement on a COSPAS/SARSAT system be deferred until the U.S. government can get its act together. Such a position would be embarrassing to say the least.

As a final alternative, NOAA, NASA, and the OMB could resolve their differences before the Leningrad meeting, and the delegates could go back to talking about a two-satellite system. Some of the principals are optimistic, others are not. The outcome remains to be seen.

—M. MITCHELL WALDROP

Scientists Warm to the Space Station

The space science community seems to be growing more reconciled to the National Aeronautics and Space Administration's (NASA's) plans for a permanently manned space station. A gathering at Stanford University during the week of 13 to 17 August saw flashes of outright enthusiasm—together with continued concerns about the station's flexibility, its cost, and its impact on ongoing space science.

The occasion was a meeting of NASA's Task Force on Scientific Uses of a Space Station, chaired by Stanford's Peter Banks. The 29 task force members were joined by some 100 guests from NASA and all the major space science disciplines, and their recommendations will soon be submitted formally to agency administrator James M. Beggs.

The primary conclusion is that a manned space station will indeed be a beneficial tool for research—which would be a motherhood statement except that so many space scientists have been so dubious about the station in the past (*Science*, 7 October 1983, p. 34). The two factors cited most often at Stanford were the station's capability for the assembly and repair of satellites, and the crew's ability to interact with the experiments directly.

NASA's cost estimate of $8 billion neglects some items; the true cost could be closer to $12 billion, Banks says.

However, the participants also remembered quite clearly what happened to their programs during the development of the space shuttle. To avoid a repeat of that experience while NASA builds the space station, they want the agency to simultaneously maintain a strong program of research with the shuttle and Spacelab. "It would provide protection for space science," points out Banks, "and it would give us some leeway for the arrival of the station."

In the same vein, the task force would also like to see the shuttle's stay-time on orbit extended from its current limit of a week or so, to 20 days. The modifications to the shuttle orbiter would be fairly straightforward, the extra time would be very useful both for scientific missions and for assembly of the station itself, and the longer missions would provide a base of experience for the permanent habitation of the space station.

As for the design of the space station, the scientists' major bone of contention with NASA involves the so-called platforms. The idea of a platform is to get the more sensitive instruments away form the vibration and outgassing of the manned station, while keeping them together on a single structure where they can share power, communications, and stabilization. NASA's current plan is to have two quite large platforms, one in polar orbit and one in equatorial orbit near the manned station.

However, "large" in this case also translates as "expensive" and "inflexible," with lots of potential for instruments to interfere with one another. What the scientists at Stanford favored instead were mid-sized platforms in polar orbit for earth observations and space plasma physics, and a spectrum of small- to mid-sized platforms in equatorial orbit for astronomy and perhaps materials science.

For the interior of the station, it was clear that a lot of specialized laboratory modules will be needed. For example, the people in life sciences want to work with animals, and they were concerned about having a place to keep the animals separate from humans. They also talked about having a centrifuge to control the gravitational forces precisely.

In another example, the Stanford participants suggested having a pressurized module for doing satellite repair in a shirt-sleeves environment. NASA has always assumed that such work would be done by astronauts in space suits. However, the experience so far on missions like the Solar Maximum repair indicates that extravehicular activity is exhausting, both physically and mentally; moreover, work time is sharply limited by the spacesuits' fuel and air supply.

Meanwhile, the planetary scientists at Stanford wanted NASA to take an early look at using the space station to stage advanced missions to the moon and to Mars—including possible manned missions. This is interesting, since some of the most persistent critics of the space station have also come from the planetary science community.

The cost of all this is very difficult to project, says Banks. NASA estimates $8 billion for the initial operating capability of the space station in the early 1990's. But that includes neither the launch costs nor the cost of scientific instrumentation. Banks told the Stanford gathering that his best guess for the total cost of the station is closer to $12 billion in 1985 dollars, with operating costs to be added in on top of that.

All in all, however, the Stanford meeting demonstrated a notable shift in scientists' opinions about the space station. "The working group as a whole began with great caution," agrees Banks, "but at this point we feel more optimism." It has become clear that the science community *will* have a voice in planning the station, he says, and that furthermore the budgetary aspects are receiving a great deal of attention at NASA headquarters. No one there wants a repeat of the shuttle experience, either.—M. MITCHELL WALDROP