

elements as they exist now in plans exceed the design requirement of 512,200 lb. Meanwhile, the demand for "house-keeping power"—the electricity unavailable to experimenters and other station users—is running 20.7% over the limit of 45 kw.

But as recently as June 26, the weight and power limits were exceeded by 28% and 34%, respectively. Such overruns are normal at this point, NASA's leaders insist, pointing to similar problems encountered in designing the Apollo, Skylab and shuttle spacecraft. It took four years to bring the Apollo lunar and command modules within weight targets; a similar effort on the shuttle orbiter lasted nine months, according to Richard H. Kohrs, the space station program director.

This is how the NASA centers and their lead contractors stood on July 17 in their efforts to reach weight and power limits, according to Kohrs:

■ Marshall Space Flight Center/Boeing (Work Package 1)—Allocated 191,900 lb., the weight of the laboratory and supply modules, environmental control systems and other hardware had climbed to 237,800 lb. by June, but the total was trimmed to 203,997 lb. Allocated 20.3 kw. for housekeeping power, the elements were drawing 26.32 kw.

■ Johnson Space Center/McDonnell Douglas (Work Package 2)—With 127,700 lb. earmarked for the truss, airlocks, nodes that connect modules, equipment in the habitation module and other hardware, the weight had been trimmed only to 197,735 lb. Allotted 10.7 kw. to run the hardware, the designs required as much as 15.8 kw. last November, but were down to 11.05 kw.

■ Goddard Space Flight Center/GE Astro Space (Work Package 3)—At 6,785 lb., the weight of the telerobotic servicer and equipment to attach payloads to the truss and other hardware was well within the limit of 7,900 lb. The power needed stood at 1.6 kw., though the goal is 1.19 kw.

■ Lewis Research Center/Rocketdyne (Work Package 4)—Allowed 86,500 lb. for solar arrays and other electrical power equipment, the design was at 100,610 lb. (As the supplier of electricity, no power allocation is applicable.)

One bright spot is that the Lewis/Rocketdyne team's designs now suggest the station will provide 2-4 kw. more than the 75 kw. of power that is the goal, Kohrs said.

An example of a recent design change made to save weight is the substitution of Inconel alloy for stainless steel in the specifications for some tanks.

Power consumption has been reduced by limiting the time budgeted for running appliances, such as washers and microwave ovens, which were as high as 24 hr./day. □

Panel Seeks Competition Of Navy, USAF Launchers

WASHINGTON

A Senate panel has proposed a competition that would pit the Navy's SEALAR concept against the Air Force's Advanced Launch System program to spur development of a new, low-cost launch vehicle.

In a report on next year's Defense bill, the Senate Armed Services Committee outlined plans for the competition and harshly criticized Air Force management of the Advanced Launch System (ALS) program.

Lawmakers said in the report that the Navy's Sea Launch Recovery concept could reduce costs and improve operational responsiveness "for a fraction of the cost of the Air Force's advanced launch system."

The proposed competition reflects longstanding concerns about U.S. space access capabilities, which the committee labeled serious enough to warrant significant near-term initiatives.

In addition, the committee added \$20 million to the Navy's Fiscal 1991 SEALAR program request for a total of \$22.5 million. It also instructed the Navy to seek "adequate funding" for Fiscal 1992 and beyond.

Lawmakers think the initial goal of the

program should be to demonstrate by Fiscal 1993 the feasibility of a sea-launched and recoverable booster capable of carrying at least 10,000 lb. into low Earth orbit.

The competition would seek to demonstrate that a "technically feasible, operationally sound and affordable launch vehicle" can be developed for military, civilian and commercial applications, according to the report.

Key challenges would include demonstration that an operational vehicle would require far less launch support than current launch systems, and that recovery and reuse of first and second stages are possible and affordable.

USAF PLANS 'UNREALISTIC'

Another technical milestone would be to demonstrate that pressure-fed engine technology can be scaled up to significantly larger boosters, according to the report.

Language in the report encourages the Navy to seek industry participation and other partners in the technology and demonstration program.

Elsewhere in the report, the committee cited several unresolved issues stemming from the Air Force's decision not to put the ALS program on a development and acquisition track. One of these is that current systems lack flexibility and cannot meet operational needs.

The panel reported that no significant changes were likely without a major departure from current systems and procedures. It also complained that the operational deficiencies of current systems are matched by "exceedingly high costs, which appear to be growing larger rather than smaller."

Members of the panel took aim at the ALS development program laid out by the Air Force, calling it "entirely unrealistic." It is based on a vehicle design three times the size of the Titan 4 and included facilities for a launch rate three times higher than planned for the Titan 4.

Moreover, the panel charged that the Air Force's decision to curtail the ALS program because of the lack of a heavy-lift requirement ignored serious operational deficiencies of current launch vehicles. The committee expressed doubt that "a payload weight criterion ever inhibited development" of new generations of combat aircraft, ships or fighting vehicles.

The committee approved the full \$60.3-million ALS request for Fiscal 1991, directing the Air Force's senior space official to review the baseline development program. □

Hydrogen Leak Forces Shuttle Launch Changes

KENNEDY SPACE CENTER

The hydrogen fuel leak problem stalling the U.S. space program persisted in a launch pad test last week, forcing a reduction in the number of space shuttle flights this year and a shift in the mission schedule.

Orbiter Atlantis flight hardware will be rolled back from the pad within the next two weeks, with the exact time dependent on storm activity in the region. A leak was generated in the external tank 17-in. fuel umbilical's flange area in the Atlantis Mission 38 hardware during the July 25 test. Mission 38, designed to orbit a secret military satellite, will be rescheduled for launch in November.

NASA said the seal in the flange that leaked in last week's test had once been rejected. It was reworked and accepted. With other parts of the assembly, it will be taken apart and examined.

The orbiter Columbia, with the Astro astrophysical telescope, will replace Atlantis on the pad and will be scheduled for launch in early September. □