

Space science needs a variety of launch vehicles

It is widely known that the space-science program in the United States is a shambles. This is not because of a lack of promising scientific missions—some ready for launching, some being built. The Hubble Space Telescope; the Jupiter orbiter and probe, named Galileo; the gyroscope experiment, called Gravity Probe B; the Upper Atmosphere Research Satellite; and five other approved scientific projects promise a rich harvest of exciting results—if they can ever get into orbit. The destruction of Challenger on 28 January has delayed the launching of these missions, for more than two years in some cases. But the trouble did not begin with the Challenger disaster. It began more than 15 years ago when the United States decided to continue its space program after Apollo without deciding what it wanted the space program to accomplish. This lack of purpose resulted in NASA's taking whatever it could get at that time and promising to do a lot more with what it got than it could reasonably expect to deliver. NASA got a bargain-basement space shuttle and an annual budget of \$7.5 billion (corrected for inflation to 1986 dollars)—about one-third of the maximum annual budget it had to spend during Apollo. NASA promised to use this shuttle as an all-purpose launch system and orbiting laboratory that would serve the needs of military, scientific, applications and commercial customers alike, to launch about one shuttle a week and to carry hardware into orbit at a cost of \$600 per kilogram. In doing so, NASA not only overcommitted itself but also confused the proper roles of the manned and unmanned elements of the space program in a way that has disastrously compromised the welfare of both.

Astronauts have no important role to play in launching spacecraft from the shuttle. So it makes no sense to use the shuttle to put payloads such as planetary spacecraft and free flyers into low Earth orbit unless attributes of the shuttle such as reusability would reduce costs significantly without incurring unacceptable penalties. Even if the shuttle had fulfilled the promises made for it, the loss of redundancy caused by eliminating alternative means of launching payloads before the first shuttle was ready was a serious mistake strategically. When the shuttle failed to meet its schedule, long delays ensued for scientific missions. Then pressures to meet an unrealistic launch schedule caused lapses from good management that led to the Challenger accident and the present debacle. But, in fact, the cost to the government of launching each shuttle has remained so large that the cost of getting a kilogram into low Earth orbit is about \$12 000, some 20 times the promised cost of \$600. The shuttle has failed

to meet both scheduling and economic goals, and there are no good reasons to use the shuttle to launch spacecraft, only bad ones.

The Space Science Board recently released a position paper urging that the United States acquire a balanced fleet of launch vehicles that would provide assured access to space for all users of our national space program, military and civilian. The Rogers commission on the Challenger accident made a similar recommendation. It is far from clear that this recommendation will be accepted. Instead there is a non-negligible probability that Challenger will be replaced with another shuttle orbiter and that NASA will press on toward deployment of a space station, at the expense of some of the eventual or virtual users of these systems, such as space science and applications. In that case the effect will be to perpetuate a seriously flawed system, albeit with some of its serious technical defects eliminated. The nation must not allow this to happen. Before the American people proceed with a space program we should insist that our leaders set goals for the program with which we concur and then direct NASA to design and develop the technical means required to execute that program. If a consensus should mandate continued use of the shuttle, it is important that no deadline be set for reaching the stage of routine operations and that proven alternative launch systems continue to be available. If there is to be a space station the first version should be modest. Let's take a cue from the Soviet approach, which is to make incremental improvements on existing launch systems and space stations. This evolutionary process has been much more productive since the 1960s than the American propensity for grandiose technological quantum jumps.

THOMAS M. DONAHUE

Chairman

Space Science Board

National Research Council