



Sacrifice Fly

THE WAY TO honor the *Columbia* dead, we are now being told, is to ensure that the space shuttle program goes on. No. The way to honor the *Columbia* dead is to *stop* the space shuttle program—a program that kills

valiant astronauts, accomplishes almost nothing in space, and wastes huge amounts of money for political rather than scientific reasons. If kept flying, the space shuttle is certain to fail again. Honor the *Columbia* seven by replacing the shuttle with a new system for reaching space—new, unmanned rockets that fly without risk to life, coupled with a new, smaller spacecraft or “spaceplane” designed just for people and incorporating the new technology developed in the quarter-century since the first space shuttle was built.

Yes, space exploration is inherently risky: No one expects the National Aeronautics and Space Administration (NASA) to build a spacecraft that never malfunctions. But the shuttle, the manned spacecraft that first launched in 1981 and flies only to “low-Earth” orbit, has proved far more deadly than, say, the moon missions, which were conducted before pocket calculators existed. In the 42-year history of men and women journeying into the infinite dark, shuttle-flight failures have killed 14 astronauts and destroyed \$5 billion worth of hardware. *All other manned spacecraft failures combined* have taken the lives of four cosmonauts and destroyed a few million dollars’ worth of hardware in two Soviet accidents. NASA seems unwilling to address the fact that the shuttle is killing its own people—nothing fundamental in its program has changed in the 17 years since the *Challenger* came apart in the air—so how can the agency be trusted on complex policy judgments about space priorities? Nor has Congress, which views space policy primarily with an eye toward pork, mandated change in the face of tragedy.

WHY IS THE shuttle prone to catastrophe? Though technologically impressive and expertly crewed, it is too big and too complex a piece of equipment, with too unrealistic a mission. Decades of reuse, for one, is an unrealistic goal. The *Columbia* broke up on its twenty-eighth flight—its twenty-eighth cycle of three times the force of gravity at liftoff, followed by absolute zero in orbit,

followed by 3,000 degrees of heat at reentry, followed by a jarring “dead-stick” (no power) landing at twice the speed of a commercial airliner landing. Meticulous maintenance—NASA and its contractors do an extraordinary job of caring for the shuttles, or they’d all be rattling apart—kept the *Columbia* in one piece through 27 flights. It was unreasonable to think this could go on, and it is now unrealistic to think the three remaining shuttles, all of which have

completed approximately the same number of flight cycles as the *Columbia*, will not eventually meet similar fates.

The space shuttle’s size and complexity also reflect unrealistic goals. It was designed to be able to lift a 25-ton payload of space probes or satellites, requiring maximum size, power, and high stress. In actual use, the typical payload weighs far less. Had NASA continued launching its heavy payloads on standard “throwaway” rockets—ones that carry no crew and are not expected to make repeat journeys—as it did reliably in the 1960s at lower real-dollar costs than the shuttle requires, then the shuttle could have been designed as a smaller, lower-stress vehicle for people alone. Insisting that the space shuttle be huge and max-tech meant, for example, main engines with thousands of moving parts and famously temperamental turbocompressors that spin at 30,000 rpm; other simpler and more reliable rocket engines produce almost as much thrust with far fewer parts and far less repair time. NASA wanted something mammoth, max-tech, visually impressive, and astonishingly costly. What it got was a mammoth, max-tech, visually impressive, and astonishingly costly flying machine that has twice ended up in glowing metal shards. The old Soviet space program also built a shuttle, called the *Buran*, of similar size and specifications to the *Columbia*. The *Buran* flew into orbit once, and then the Soviet shuttle program was cancelled for being ridiculously expensive—and equally important, of little value, considering there is essentially nothing that shuttles accomplish at higher prices that rockets and other spacecraft cannot at lower ones.

In terms of lifting payloads, the shuttle also does nothing unmanned rockets could not do more cheaply and without risk to human life. Industry turns out to have little interest in shuttle-born experiments or manufacturing; hardly any shuttle payloads have been commercial because it has turned out that industry has no interest in orbital manufacturing. All the shuttle is really useful for is “life science”—studying the human body’s response to space—and for keeping the astronaut corps skilled at going into orbit, on

the assumption that astronauts may someday prove essential to society. There isn't any pure science done aboard the space shuttle that could not be done at a fraction of the cost on unmanned launches, as (among others) Robert Park, director of public information at the American Physical Society, a physicists' organization, has noted. It was heart-wrenching to see *The New York Times*, on February 4, devote an article to the suggestion that the science packages aboard the *Columbia* were worth an astronaut's life. No one had to be there to push the buttons on the Mediterranean Israeli Dust Experiment or to spin the wheel on a little gizmo that made a microgravity flame-ball.

NASA defenders say the core problem is agency underfunding. "I don't think you can continue to make draconian cuts in this budget and accomplish our mission safely," Senator Kay Bailey Hutchison pronounced the day of the *Columbia* loss. But Hutchison and others who decry "draconian" cuts in the budget don't say that NASA funding has barely changed in the last decade. Five years ago, the NASA budget was \$14 billion, which inflates to \$15.5 billion in current dollars; last year, the NASA budget was \$15 billion. That's a 3 percent real-dollar cut over five years, during a period when the price of electronics, which NASA uses heavily, has declined fast. It's true that NASA budgets have fallen in real-dollar terms since about 15 years ago. But that was the moment when the Air Force, once a shuttle user, formally divorced from operations with the civilian space agency; the Air Force has since been granted a budget that makes it the world's second-most expensive space program, surpassing Russia's spending. Those who claim "draconian" U.S. space cuts never mention that, when numbers for NASA and the Air Force are combined, appropriations have steadily increased.

Most important, while the NASA budget has declined somewhat in real terms in recent years, shuttle launches have also declined during the same period. The essential number—spending *per shuttle mission*—has gone up, not down. In 1997, for example, the NASA budget of \$15.5 billion in today's dollars funded eight shuttle flights. In 2002, the NASA budget of \$15 billion funded five shuttle flights. That's a 3 percent funding drop but a 38 percent reduction in flights. NASA figures from the past decade show the same trend: steadily increased spending per shuttle flight as the number of launches declines by a greater amount than overall budget contraction. Discounting for one year when the fleet was grounded, since 1997 the average price of a shuttle mission in current dollars has been \$448 million. Last year, NASA spent \$640 million per shuttle launch. The notion that the shuttle program is starved for funds is a total fiction intended to justify budget featherbedding.

And why not? Featherbedding has become the essence of the shuttle program. Senator Hutchison wants more shuttle spending—and what a coincidence, she hails from Texas, where the shuttle's flight-control center is located. You'll likely be hearing similar calls from politicians from Florida, California, Maryland, Alabama, and Ohio—the primary states for NASA operations—as well as from Illinois, Washington, Colorado, and Georgia—states where Boeing and

Lockheed Martin, the shuttle's prime contractors, have important presences.

The space shuttle's price and unreliability are especially dismaying since the whole reason the program came into existence was to cut costs and increase reliability. As the *Apollo* moon missions wound down at the beginning of the 1970s, Congress approved shuttle construction on the promise that a winged, mostly reusable spacecraft would be much cheaper than throwaway rockets. Congress was originally told the shuttle would cost about \$20 million per launch in today's dollars. Had Congress been told the real price per launch would be \$640 million, the current number—about the same as the cost of an entire *Apollo* mission to the moon—the shuttle proposal would have been laughed off Capitol Hill. Congress was also originally told the fleet would be so reliable that a shuttle would fly into orbit once a week. Had Congress been told the shuttle would operate only five times per year, again the original proposal would have been laughed off Capitol Hill.

THE DEEP IRONY in all this overspending is that, in many respects, the shuttle program is actually standing in the way of ambitious space exploration. NASA isn't even considering a return to the moon or sending men and women to Mars because the shuttle is so expensive and fallible that big plans are currently out of the question; everything NASA might spend on grand plans is instead going down the shuttle drain. Commentators complain that NASA has not had grand ambitions in two decades. It is no coincidence that this is also the period of the space shuttle, which stands in the way of the next great space achievement.

Which brings us back to how to memorialize the daring and valor of the seven men and women who perished amid the shards of the *Columbia*. End the space shuttle program now, and use the next decade of shuttle funding to design new space-launch systems that would be less expensive and more reliable, taking advantage of the last three decades of technology. Many analysts believe that a new generation of low-cost throwaway rockets for launching heavy loads, plus a small spaceplane for those occasions when people really are needed in orbit, would cut costs and improve safety so much that grand ambitions in space would become possible again. Such suggestions are not pipe dreams: Improving technology should make throwaway rockets cheaper, and the United States had a functioning spaceplane called the X-15 *half a century ago*, but research into spaceplane ideas was effectively sidetracked by NASA when the shuttle was authorized because spaceplanes, being affordable, would undercut shuttle constituent funding.

Making grand space ambitions, such as a return to the moon or flight to Mars possible again—and allowing the next generation of astronauts to pursue them aboard spacecraft that don't fall apart—would be a lasting monument to the *Columbia* crew. And, if designing the successor to the shuttle means no space flights for a decade, space will still be there when the United States is finally ready to return in force. ■

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