

## To Fix the Shuttle: Change American Culture

by Marsha Freeman

The release of the report by the Columbia Accident Investigation Board (CAIB) on Aug. 26 garnered numerous headlines blaming “NASA’s culture” for the loss of the Shuttle and its crew on Feb. 1. While that might be an easy and convenient way to dispose of the accident, a careful reading of the report paints a quite different, and even more disturbing picture. As Lyndon LaRouche said the day after the accident, if you want to find the cause, “blame the bookkeeper mentality.”

The flaws in “NASA’s culture” are a reflection of the cultural paradigm shift from the values of the early 1960s to today. Policies to advance technology and breakthroughs in science, in order to develop the economy vectored toward a qualitatively improved future, have been replaced by shareholder value, a fixation on what things “cost,” rather than what they are worth, and by the population’s willingness to give up progress and exploration because of an emotionally driven perceived personal “risk.”

It was certainly the case that NASA managers made flawed decisions before and during that Shuttle mission.

The loss of foam insulation from the Shuttle’s External Tank had been observed on previous missions, but its potential for damage to the orbiter had been underestimated. From that flawed analysis came the decision not to investigate the extent of the damage over the course of the Columbia’s two-week mission, or consider it a “safety of flight” issue that required immediate attention before any more orbiters could be launched.

But, the board asks, how did this happen, in an agency that prides itself in making safety the paramount consideration for flight? What priorities were competing with safety considerations in carrying out Shuttle launch decisions and operations? What external pressures were acting upon NASA managers that led to this tragic result?

The board found that the answers lie as far back as 30 years ago, when the Space Shuttle program began. The issues span Democratic and Republican administrations, and Congressmen from all varieties of ideology.

The board decided from its inception—just a few hours after the accident—that finding the physical cause of the break-up of Columbia alone would not “fix” the Shuttle; that other problems could well be lurking in the background, only to produce another catastrophic accident in the future. The members decided that their investigation would include “a safety evaluation of the entire Space Shuttle Program.”

The board stated in its report, that it “recognized early on that the accident was not an anomalous, random event, but rather likely rooted to some degree in NASA’s history and the human space flight program’s culture.” And the board had the integrity to probe the history of the manned space flight program, and the external pressures on the space agency that shaped NASA’s “culture,” without holding back criticism of people and institutions who they determined should be held accountable for the Columbia accident.

The board sees the organizational causes of the accident as rooted in “the original compromises that were required to gain approval for the Shuttle, subsequent years of resource constraints, fluctuating priorities, schedule pressures, mischaracterization of the Shuttle as operational rather than developmental, and lack of an agreed national vision for human space flight.” The “NASA culture” that helped cause the accident stemmed from the resignation particularly on the part of managers responsible for the program, to the fact that they were unlikely to have available the resources or authority they needed to operate the Shuttle the way it should be operated, and the compromises they had to make in order to have any manned space program, at all.



*The Columbia Accident Investigation Board, seen here at a May 28 press conference, found that the history of the political environment and budgetary constraints of the space program were as much the cause of the accident as the shedding of foam. Left to right: Lt. Col. Woody Woodyard, public affairs officer; Chairman Adm. (ret) Harold Gehman; Brig. Gen. Duane Deal; Maj. Gen. Kenneth Hess; and Dr. Sheila Widnall.*

The “culture” at NASA that was allowed to develop in response to this environment can be described as a “siege mentality,” where engineers were overruled or not listened to by managers who were under constant political and budgetary pressures. In this environment, criticism from outside was seen as hostile, and often went unheeded.

The space program is at a crossroads. The board’s report calls for a broad national debate about the future of space exploration, and places the lack of vision squarely at the doorstep of the White House and Congress.

The initial response from lawmakers to the report is disappointing. During the first hearing on the CAIB report, before the Senate Committee on Commerce, Science, and Transportation on Sept. 3, Senators did *exactly* what the board warned against. Sen. Ernest Hollings (D-S.C.) railed at the board for not finding individuals at NASA who should be blamed for the accident and fired, which the board had specifically stated would not solve the problem.

Sen. Ron Wyden (D-Ore.), asked NASA Administrator Sean O’Keefe to prepare a cost-benefit analysis of human space flight to present to the committee within six months. It is precisely this accountant’s mentality, the board report makes explicitly clear, that contributed to the “culture” responsible for the accident.

The CAIB report states repeatedly that flying the Shuttle is “rocket science.” The accident “shows that space flight is still far from routine. It involves a substantial element of risk, which must be recognized, but never accepted with resigna-

tion. The seven Columbia astronauts believed that the risk was worth the reward.”

## **Failed Policies From the Beginning**

The CAIB states that the Feb. 1 accident “reaches more than 30 years into the past, to a series of economically and politically driven decisions that cast the Shuttle program in a role that its nascent technology could not support.” Thirty years ago, it fell to President Richard Nixon, as President Kennedy’s lunar Apollo program drew to a close, to decide what was next for manned space flight. NASA envisioned a constellation of space stations, reusable vehicles to service them, and the manned exploration of Mars. President Nixon “rejected NASA’s ambitions with little hesitation,” the report states, “and directed that the agency’s budget be cut as much as was politically feasible.”

NASA’s leadership knew that if there were to be any manned space flight program at all, it would have to be “sold” to Nixon’s Budget Office. With no long-term justification for a Space Shuttle on the horizon—after Earth-orbiting space stations and trips to Mars had been shot down—the only remaining selling point to the accountants was that a reusable vehicle would make space flight “cheaper.”

To do that, and recover the huge sunk cost of developing a new manned vehicle, the flight rate would have to be high, which would depend upon, not only NASA’s science missions, but payloads paid for by commercial interests and the military. But to interest the Department of Defense in using this new capability, NASA had to tackle “tremendous technological hurdles,” designing the orbiter to be able to carry 40,000 pounds of cargo in a 60-foot-long payload bay, and accommodate landing requirements that led to larger stresses on the vehicle’s delta-shaped wings and thermal protection system.

As the technical design for the Shuttle grew in complexity to meet these demands, “the Office of Management and Budget forced NASA to keep—or at least promise to keep—the Shuttle’s development and operating costs low,” the report states. “In May 1971, NASA was told that it could count on a maximum of \$5 billion spread over five years” for the Shuttle program. NASA had no choice but to “promise” it could do that.

Summarizing these earliest years of the Shuttle program, the report states: “It is the board’s view that, in retrospect, the

increased complexity of a Shuttle designed to be all things to all people created inherently greater risks than if more realistic technical goals had been set at the start. Designing a reusable spacecraft that is also cost-effective is a daunting engineering challenge; doing so in a tightly constrained budget is even more difficult. Nevertheless, the remarkable system we have today is a reflection of the tremendous engineering expertise and dedication of the workforce that designed and built the Space Shuttle within the constraints it was given.”

In 1979, the Carter Administration wanted to make sure the Shuttle program, which was over its budget, was worth the cost. That White House decided that the Shuttle would be important in launching military intelligence satellites to verify the Strategic Arms Limitation Treaty, and so continued development. Due to a combination of the technical challenges for the world’s first reusable spacecraft and the continuing budgetary challenges, the first Shuttle launch slipped from 1978 to April 1981.

The day of the first launch, the *New York Times* editorial described the winged orbiter as a “white elephant.” Diatribes were printed about how the Shuttle had run over budget and was not worth the cost. In fact, the board’s report states, the development of the Shuttle was only 15% more than its projected cost, “a comparatively small cost overrun for so complex a program.”

### The Challenger Accident

President Ronald Reagan had the honor of welcoming the first Space Shuttle crew back to Earth, after their 54-hour mission in April 1981. Anxious to cut back government funding for the Shuttle program, along with many other research and development programs, such as second-generation nuclear energy technology, the Administration pressured NASA to offset some of the cost of operating the system through the launch of commercial satellite payloads.

To make this shift, from an experimental manned vehicle for science and engineering, to an “operational” vehicle, or a “space truck,” President Reagan declared on July 4, 1982, when he welcomed Columbia home after only its fourth flight, that “beginning with the next flight, the Columbia and her sister ships will be *fully operational*, ready to provide *economical and routine access to space* for scientific exploration, commercial ventures, and for tasks related to the national security” (emphasis added by the board).

NASA was under the budgetary gun to fly as often as possible, in order to lower the cost of each mission, even though the Shuttle system was “proving difficult to operate, with more maintenance required between flights than had been expected.” The board reports that the pressure of “maintaining the flight schedule created a management atmosphere that increasingly accepted less-than-specification performance of various components and systems, on the grounds that such deviations had not interfered with the success of previous flights.”

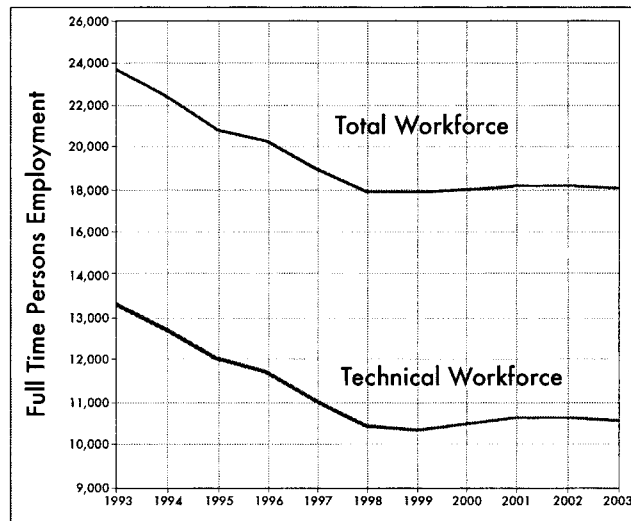


Figure 5.4-2. Downsizing of the overall NASA workforce and the NASA technical workforce.

NASA went along with this new “operational” designation also because it was anxious for the Administration to approve the next step in the infrastructure for manned space flight—a space station—which would give the Shuttle a mission, beyond that of a “space truck” to make deliveries in Earth orbit, but as the stepping stone to the Moon and Mars.

The budget and schedule pressure on the Space Shuttle program led to a similar chain of flawed decisions on Jan. 28, 1986 when the Shuttle Challenger was launched, as it did during the Columbia mission.

One of the conclusions of the CAIB, in juxtaposition to the designation of the vehicle as “operational,” is that the Shuttle “is a developmental vehicle that operates not in routine flight, but in the realm of dangerous exploration.”

During its investigation of the Challenger accident, the Rogers Commission noted that the increasing flight rate before 1986, led to schedule pressures including “the compression of training schedules, shortage of spare parts, and the focusing of resources on near-term problems.”

In discussing the shift in NASA’s culture during the period of transition between the manned lunar exploration program and the operation of the Space Shuttle, the Columbia Board makes the important point that through Apollo, NASA had been characterized as a “can-do” agency, which, when presented with near-impossible missions, achieved success.

The board states that NASA’s culture at that time, “valued the interaction among research and testing, hands-on engineering experience, and a dependence on the exceptional quality of its workforce and leadership that provided in-house technical capability to oversee the work of contractors. The culture also accepted risk and failure as inevitable aspects of

Fiscal Year	Upgrades
1994	\$454.5
1995	\$247.2
1996	\$224.5
1997	\$215.9
1998	\$206.7
1999	\$175.2
2000	\$239.1
2001	\$289.3
2002	\$379.5
2003	\$347.5

Figure 5.5-3. Shuttle Upgrade Budgets (in millions of dollars). (Source: NASA)

operating in space, even as it held as its highest value attention to detail in order the lower the chances of failure.”

By the end of the 1980s, two things changed. NASA’s premier engineering and scientific cadre were to operate a Shuttle which repeatedly went around the Earth, with no challenging long-term vision; a different kind of “mission” than Apollo.

As the report describes the situation: “NASA’s human space flight culture never fully adapted to the Space Shuttle Program, with its goal of routine access to space, rather than further exploration beyond low-Earth orbit. The Apollo-era organizational culture came to be in tension with the more bureaucratic space agency of the 1970s, whose focus turned from designing new spacecraft at any expense, to repetitiously flying a reusable vehicle on an ever-tightening budget.” While the board errs in suggesting that during the Apollo program, NASA had a “blank check” in terms of funding, it was an agency established with a mission of exploration, which the nation decided it could not “afford” when Apollo ended.

Secondly, values were changing from exploration to cost-benefit analysis. The end of the Cold War, and dissolution of the Soviet Union, removed one of the motivating principles of the space program in the minds of lawmakers, which, in the 1960s, had given it an urgency, and something of a priority.

Former astronaut Dr. Sally Ride, a Columbia Accident Investigation Board member, remarked during the board’s deliberations, that in the Columbia investigation, she heard “echoes of Challenger,” on which investigating board she had also participated. Her reference was to the flaws in decision-making and the “NASA culture” that had not changed appreciably over the 17 years since Challenger.

The board reviewed many of the reports produced by panels of experts independent of NASA over the past decade, and found that not many of their recommendations to improve

safety had been implemented, nor their warnings heeded, by the space agency. More important, however, than any internal “bureaucratic” resistance to change, was the continued substitution of ideologically driven political decisions for sound engineering, or sound economic policy.

### ‘Reinventing’ NASA

Through the Reagan and George H.W. Bush Administrations, NASA’s budget was in continuing decline. In 1990, the White House chartered a committee to review NASA’s programs. The Augustine Committee concluded that the space agency was trying to do “too much with too little,” and that a “reinvigorated space program” would require a 10% per year real growth rate in funding, to reach a level of about \$30 billion by the year 2000. In actual Fiscal Year 2000 dollars, the amount would have been \$40 billion. NASA’s budget that year was \$13.6 billion—in real dollars, about one-third of the level during the Apollo program. The board observes that over the past decade, “neither the White House nor Congress has been interested in a “reinvigorated space program.”

On the contrary, during the Clinton Administration, “faster, better, cheaper,” became the slogan of the space agency, with the tenure of former TRW executive Dan Goldin as NASA Administrator, under the rubric of Vice President Al Gore’s “reinvesting government” scam. Between FY 1993 when the Clinton Administration took office, and FY 2000 after which it left, NASA’s budget continued its downward slide from \$14.3 billion to \$13.6 billion. This represented a 13% loss in purchasing power over the decade.

During that decade, the Space Shuttle budget, however, declined by 40%. A major reason, was the insistence by the Office of Management and Budget (OMB) in 1994, that any cost overruns in the International Space Station program had to be made up from within the budget allocation for human space flight, rather than from the agency’s overall budget. With the political turn in the 1994 elections that brought a Republican majority to the House of Representatives, there was even greater pressure to loot the space program to help “balance the budget.”

Administrator Goldin was anxious to concentrate resources on new initiatives, such as robotic missions to Mars, which he believed would garner public interest and support, and provide the agency with a longer-term vision. These efforts themselves ended up suffering from his “faster, better, cheaper,” policy, when three Mars missions ultimately failed, due to a rushed schedule and underfunding. But the Space Shuttle—an already-established and less sexy effort—would bear the brunt of NASA’s new philosophy.

Over the 1990s, the Shuttle workforce was “downsized” to cut costs. The board report states that Goldin also de-emphasized engineering in the Shuttle program, preferring to use those skills for completing the Space Station, and his Mars projects. Even before Goldin’s arrival in Washington, squeezed by rising station costs, NASA announced a goal

of saving 3-5% per year in Shuttle budgets over five years. Between 1991 and 1994, contractor personnel working on the Shuttle declined from 28,394 to 22,387, while NASA Shuttle personnel fell from 4,031 to 2,959. When the “Conservative Revolution” took over the leadership of the House of Representatives in 1995, the budget level NASA projected it needed for the Shuttle over the following five years, was \$2.5 billion more than the White House budget office was likely to approve.

By the middle of the 1990s, “spurred on by Vice President Al Gore’s ‘reinventing government’ initiative, the goal of balancing the Federal Budget, and the view of a Republican-led House of Representatives,” the report states, NASA was told to “privatize” the Shuttle, to cut costs.

The awarding in November 1995 of the Shuttle flight operations contract to Lockheed Martin and Rockwell’s joint company, United Space Alliance, was designed specifically to reduce cost. (See *EIR*, Feb. 14, 2003 for a discussion of the impact of “privatization” on the space program.) This first step did not satisfy all of NASA’s overseers. In 1998, Congress passed the Commercial Space Act, directing NASA to “plan for the eventual privatization of the Space Shuttle Program.” Sheer madness!

There were other failures of policy throughout the 1990s. There was an uncertainty about how much money should be allocated for Shuttle improvements, repairs, and upgrades, due to an uncertainty about how much longer the fleet of vehicles would be flying. In reviewing a series of false starts in efforts to design replacement vehicles, the board concludes that each—from President Reagan’s “Orient Express,” to the 1990s X-33—was a pattern of “optimistic pronouncements about a revolutionary Shuttle replacement, followed by insufficient government investment, and then, program cancellations, due to technical difficulties.”

By the late 1990s, even Dan Goldin realized that NASA’s Shuttle funding and manpower had been cut to the bone. Some funding was added, new were people hired, and some upgrades were approved.

Although the Columbia Board had complete cooperation from NASA, and the Congress tried to stay out of its way as much as possible, the Bush Administration, citing executive privilege, refused to give it access to budget deliberations between NASA and the OMB. Each year, every agency prepares a request for its budget level for the following year; it then negotiates with the OMB. The Budget Office sets the final amount, which goes then to the Congress from the White House. If the board were privy to those discussions, it would have been able to find out how much funding NASA determined it needed, versus what the White House was willing to approve. This action by the Bush Administration was a repeat of Vice President Cheney’s refusal to allow the Congressional General Accounting Office access to the deliberations of his energy task force, which formulated an energy program upon

the advice of Enron and other corporate looters.

The board reports that in 2000, NASA identified 100 Shuttle ground infrastructure items that demanded immediate attention. There had been complaints, even by Congressmen, that parts of the ceiling were falling down in the Vehicle Assembly Building at the Kennedy Space Center, where the Shuttle orbiters are prepared for launch. Investigators had described the situation as “deplorable.”

NASA submitted a request to the Office of Management and Budget during the White House deliberations on the FY 2002 budget at a level of \$600 million for an infrastructure initiative. No funding was approved. Nothing much had changed.

In 2001, a new Administration rode into Washington.

### **Budgeteers in the Space Agency**

When the Bush Administration decided to replace Dan Goldin at NASA, its major concern was the report by NASA that the International Space Station was more than \$4 billion over the projected cost to complete the orbital facility. By appointing former OMB official Sean O’Keefe as NASA Administrator, the Bush Administration made plain where its priorities lay: budget constraints and “competitive sourcing.”

To deal with the immediate budget crisis, O’Keefe made a devil’s deal with the White House: Not only would the Shuttle budget continue to be looted to pay for Space Station cost overruns, but the schedule of Shuttle launches would be determined to meet an artificial date O’Keefe promised the White House NASA could meet. The first phase of station construction would be completed in February 2004, he proposed, within budget. This would establish “NASA’s credibility with the Administration and the Congress for delivering on what is promised,” O’Keefe stated. The White House agreed that if NASA could prove itself, the Administration would reconsider whether or not to complete the station.

As the report states: “The White House and Congress had put the International Space Station, the Space Shuttle Program, and indeed NASA on probation.” Managers now had to convince themselves the Shuttle was able to fly on schedule, even if the vehicle was telling them it was not ready. The pre-Challenger pressure on the launch schedule had returned, with a vengeance.

The Columbia Board has made 29 recommendations, 15 of which are prerequisite to the return the Shuttle to flight. They deal with improvements in the foam and thermal protection system, other Shuttle components and systems, and management “culture” issues at NASA.

Although the board clearly states which institutions, and ideologies, are ultimately responsible for the Columbia accident, it could not legislate that the nation’s political leaders toss out 30 years of failed policies and cultural values that made an accident inevitable.

It is now up to those leaders to do so.