Titan Accident Disrupts Military Space Program

The Pentagon faces only tough choices after the second consecutive malfunction of its largest launch vehicle, and the destruction of a unique West Coast launch pad

The startling recent explosion of a military rocket as it lifted off a remote launch pad on the California coastline has dealt a serious setback to the space program. Not only has it postponed—possibly for as much as a year or more—the launch of a series of military satellites, it has also threatened to delay the development of a similar, but much larger, rocket designed to rescue the Department of Defense from the consequences of the space shuttle accident last January.

Although public concern has been focused on the destruction of the payload, believed to be a sophisticated reconnaissance satellite, some military experts consider the associated destruction of the rocket's launch pad to be a far more worrisome event. The Titan 34D rocket blew up at roughly 10:45 a.m. on 18 April, when it was less than 1000 feet in the air, and huge chunks of debris fell immediately to the earth. Automobiles at the site were gutted, sidewalks were cratered, trailers were destroyed, and the pad itself was left in ruins, according to several sources. The upper portion of the launch tower was blasted into a mass of twisted steel.

"Obviously, this has had a serious impact," Pentagon spokesman Robert Sims told reporters at a news conference on 22 April. "There will obviously be delays and this is a serious development." Although six identical rockets remain in the Pentagon's inventory, the destruction of the pad at Vandenburg Air Force base means that none can be used to ferry payloads into the polar orbits favored for reconnaissance. A similar pad at the Kennedy Space Center in Florida, used by the Titan 34D to loft military communications and early warning satellites, has been closed until investigators determine the cause of the explosion and make necessary repairs.

The seriousness of the Pentagon's predicament stems partly from the fact that the last Titan 34D launched from Vandenburg also malfunctioned, resulting in the destruction of another photoreconnaissance satellite. Because such devices are routinely launched as the need arises, it is likely that the intelligence community has been unable to meet all of its requirements for roughly 9 months. Fortunately, the satellites involved are only partly geared toward strategic intelligence gathering, and many of their capabilities are not unique, so national security has not been jeopardized as yet, according to industry and congressional sources.

Albert Wheelon, an executive vice president of Hughes Aircraft who serves on the President's Foreign Intelligence Advisory Board, says, for example, that "the real tragedy and the threat of this accident is that we may not be able to launch again for a really long time." Although the situation is not worrisome at present, he adds, "things could clearly get bad if too much time passes" without a successful new launch. "In principle, given a worst case scenario, we could be shut down for as long as 2 years."

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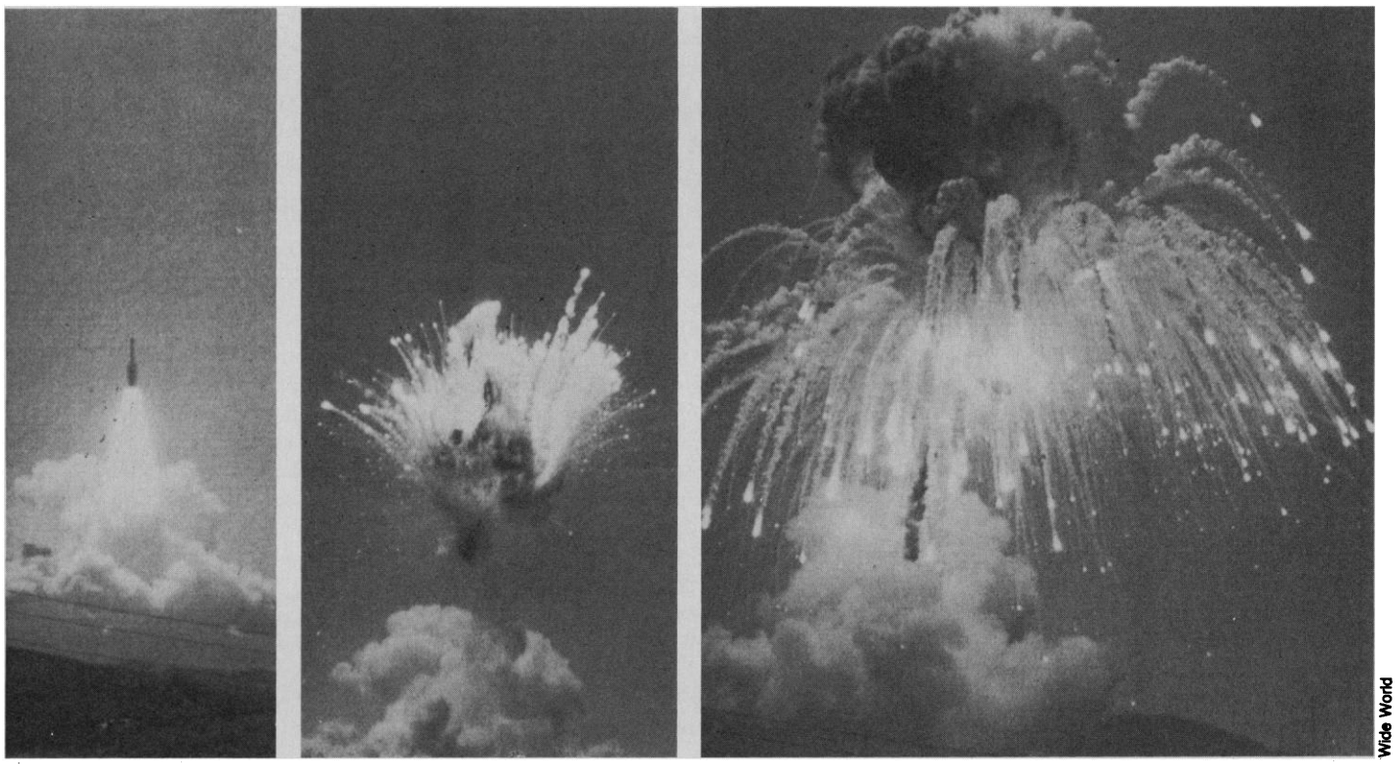
One option being explored by the Pentagon is a plan to rebuild or replace the Vandenburg launch pad, at a potential cost of millions of dollars. But this could easily take a year or more, and the pad would at best be used to launch only one or two of the 6 remaining rockets. (The Pentagon decided several years ago to shut down the Titan 34D production line, in anticipation of the space shuttle's availability as a ferry for photoreconnaissance satellites.)

An alternative is simply to wait until the shuttle actually becomes available, and use an early flight to launch a new reconnaissance satellite, although this too is problematic. The National Aeronautics and Space Administration (NASA) has officially predicted that the next flight will be launched from Florida in January 1987, but the Air Force is more pessimistic, and expects it will be at least mid- to late 1987, with a delay of several months before a launch can occur from Vandenburg.

One potential complication is uncertainty about the reliability of the new solid-fuel boosters specially designed for use on such military flights. Made of spun graphite filament instead of steel, the boosters were developed and produced at a cost of $250 million as a light-weight alternative to those presently used by the shuttle program, so that heavy military payloads could be ferried into space. The filament casings, made by Morton Thiokol, Inc., of Brigham City, Utah, have been test-fired only a few times, and on the most recent occasion, one of them buckled and ruptured a seam. NASA and Pentagon officials are confident that sufficient improvements have been made to the casings since then so that risks are low. But NASA's Aerospace Safety Advisory Panel, chaired by retired Douglas Aircraft president John Brizendine, said in January that "tests and analyses to date leave considerable question" about the strength of the joints between the casings of the rockets and recommended that older, heavier casings be used instead on the first Vandenburg flight (this would prevent the launch of a photoreconnaissance satellite). The panel also expressed concern about some "thrust oscillation" detected during one test, and about the prospect of higher launch accelerations unduly stressing the orbiter and its payloads. Another test firing of the filament-wound rockets, initially set for 13 February, was canceled in the wake of the Challenger explosion on 28 January, and has not yet been rescheduled.

A final option is simply to wait until a new, larger military rocket becomes available in October 1988. But even this choice carries some risk. One of the most advanced U.S. reconnaissance satellites presently in orbit, known as a KH-11, is not expected to remain useful until then, and so the need for a replacement will be acute. But the new expendable rocket is merely a variation of the Titan 34D that exploded, made by the same manufacturer with seven separate segments instead of five and a half, and so it too is now enveloped in a technical cloud. As Larry Hannon, a spokesman for the Air Force space division in Los Angeles, says, "a significant delay in finding the most probable cause of the explosion could impact the delivery date [for the new rocket], but it is too early to predict as yet."

Already, the new rocket, known as a CELV or Complementary Expendable Launch Vehicle, is being developed under



Wide World

Rocket explosion. *A Titan 34D explodes just seconds after its launch from Vandenburg Air Force Base in California, destroying a payload valued in the hundreds of millions of dollars. These photos were taken from a beach 6 miles from the launch site.*

an extremely tight schedule, with a financial incentive written into the contract of $50,000 a day for early delivery of the first launch (the incentive is good for up to 200 days or $10 million), as well as a penalty of $100,000 a day for late delivery. One reason for the urgency is the fact that only the CELV and the shuttle are presently capable of carrying early warning satellites into space. Previously, the satellites were launched on the Titan 34D, but a new model—too large for the 34D—is presently under development, and all of the older models have apparently been launched. Typically, such satellites are replaced every 12 months. As a result, a substantial slip in the CELV schedule may constrain not only intelligence gathering, but warning of a potential strategic missile attack. Various analysts believe this is why Edward Aldridge, the Air Force Secretary, told Congress last year that the October 1988 CELV launch date was "critical" and that any delay "would present an unacceptable national security risk."

Thus far, the cause of the Titan 34D malfunction remains a mystery. The rocket, which stands 157 feet tall and consists of a two-stage liquid propellant core surrounded by two solid-fueled boosters, exploded at a moment when only the boosters were firing. But a burnthrough of the booster joints, similar to that implicated in the Challenger accident, has already been dismissed because the explosion was too violent and too quick (it occurred between 6 and 8 seconds after launch). Suspicion has fallen primarily on an automatic destruct mechanism on the rocket, which ordinarily is triggered only when the rocket heads off course, and on the propellant grain in the boosters, which might have developed fissures or harbored contaminants. However, a variety of alternative explanations, including sabotage, have not been ruled out. A board of inquiry has been formed under the direction of Colonel Nathan Lindsay, commander of the Eastern Space and Missile Center at Patrick Air Force Base in Cocoa Beach, Florida, but all of its proceedings will be classified.

After the previous Titan 34D explosion, no firm conclusions were drawn about the cause. An official Air Force investigation was only able to narrow the range of possibilities to three items: a massive leak of nitrogen tetroxide, a small leak of hydrogen, or a failure of a turbopump. As Aldridge explained at a Senate hearing on the morning of 11 April, only hours before the most recent explosion, "we have done just about everything we know to fix it, and we are confident that we have identified at least the area where it is a problem. . . . Of course we are willing to take a little bit higher risk [because]there is no man on it."

An important factor in the Pentagon's decision-making about a replacement for the Titan 34D might be pressure from various experts to close the entire shuttle complex at Vandenburg. The complex, which has cost $3 billion to date, was conceived at a time when it appeared that virtually all large military payloads would be consigned to the shuttle, as part of the government's effort to make the program cost-effective. In the wake of some early shuttle mishaps and false starts, however, the Defense Department won the right to construct ten CELV's, each capable of carrying payloads the same size and weight as the shuttle—roughly 10,000 pounds to geosynchronous orbit (*Science*, 29 June 1984, p. 1407). According to a deal struck between the Air Force and NASA, CELV flights were constrained to launches from Kennedy Space Center in Florida, leaving a useful role for the shuttle on the West Coast. But the Challenger accident has recently caused the Pentagon to approve the construction of a new CELV pad as well as additional rockets for flights from Vandenburg, essentially duplicating the shuttle's capability.

Wheelon, who also sits on the presidential commission investigating the Challenger accident, says that he personally favors shutting the Vandenburg shuttle complex down to achieve a savings of $400 million a year in operations and maintenance expenses. After the CELV's become available, he says, "there is nothing that has to be launched from Vandenburg that must go up on the shuttle." Military experiments on the shuttle that

require crew participation can probably be performed on flights from Kennedy that use high-inclination orbits, he adds. "The only reason that the Vandenburg complex will be activated is because it was promised . . . as a symbol of the military's commitment to the shuttle. It's just nuts. The country needs that money for other things."

Air Force spokesman Miles Wiley says that mothballing the shuttle complex at Vandenburg was considered but rejected in the aftermath of the shuttle disaster last January. "In the early planning, every conceivable option was looked at," he says. "This one is no longer under consideration. We plan to do a mission out of Vandenburg." But congressional sources say that the Air Force's decision was based in part on the availability of the shuttle within 18 months. After that point, the sources say, the economics begin to shift in the other direction. Wiley denies this, but acknowledges that "we'll have to wait and see if the delay exceeds the baseline from which we're working at this point."

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All of these issues will supposedly be settled by a report of the White House Senior Interagency Group on Space, expected to go to the President in the next few weeks. Although most issues remain hotly disputed, both inside and outside the government, there appears to be a growing consensus on three points. First, the government's decision in the late 1970's to pile both military and civilian satellites into the shuttle payload bay was potentially disastrous, and may eventually cause more than simple economic harm. Secondly, a decision several years ago to order CELV's from the firm that manufactures Titan 34D's, Martin Marietta, on the grounds that it would lower the technical risks, may turn out to have the opposite effect, given the similarity in the design of the two rockets and considerable uncertainty about the cause of the latest explosion. Third, a decision to abandon the shuttle complex at Vandenburg will have serious consequences for the military and civilian space programs, both politically and economically. With everything blowing up on launch, many in the space community believe it is time to reevaluate their standing assumptions. ■ R. JEFFREY SMITH

Briefing:

University Presidents Predict Harm from Uncoordinated Deficit Reduction Policies . . .

In the effort to reduce the federal deficit, a variety of Administration proposals and pending congressional action will converge to do great damage to the health of the nation's large research universities. Possible changes in tax policy, a cap on indirect costs, a reduction in student aid, and Gramm-Rudman cuts in research funds all taken together pose a very real threat, according to members of the Association of American Universities (AAU). Speaking at their annual meeting in Washington, a group of university presidents reviewed the scope of the impending threat as they see it.

Harvard president Derek Bok cited proposed changes in tax law. Currently, he said, all charitable contributions to universities are fully tax deductible. But a House-passed tax reform bill (H.R. 3838) would introduce taxes on "appreciated property." A gift of appreciated property is, for example, a stock that was purchased for $10 a share but now is worth $100 a share. Under the House provision, an individual would be subject to personal taxation on the appreciated portion of the gift. To date, the Senate's draft tax bill would retain current law, allowing a donor a deduction for the full value of the gift.

A second provision in the House bill that would affect universities adversely, Bok noted, is a cap on the amount of tax-exempt bonds that are issued primarily to get capital investment to support construction. This provision is particularly disagreeable, Bok pointed out, because it "unfairly" affects a relatively small number of private institutions that rely on tax-exempt bond issues to finance new buildings, new equipment, and renovation. An AAU statement on this issue says the $150-million cap "would be the first major federal legislative proposal to apply to independent but not to public institutions. . . . "

A third "negative" proposal in H.R. 3838 would eliminate present tax advantages that govern TIAA-CREF, the retirement plan most universities offer. The pension system's tax exemption would be rescinded and the maximum amount a faculty member could add to his pension fund through salary reduction would be reduced from $30,000 to $7000 per year. The additional amount one could contribute would be further reduced for people who put $2000 a year in an IRA (independent retirement account). The Senate version retains present tax status.

Fourth on the AAU list of negative changes in tax law is a proposal to tax student aid. Both House and Senate measures contain provisions to tax scholarships and fellowships.

Peter Magrath, president of the University of Missouri, predicts that the substantial reductions in student aid proposed by the Reagan Administration, coupled with scholarship taxation, will simply drive more talented American students out of graduate education. During the coming decades, the nation will need more, not fewer, Ph.D.'s to fill the ranks of college teachers and university researchers, he observed, noting that measures antithetical to this need are not in the national interest.

Derek Bok *Proposed tax changes would hit private colleges.*

As the university presidents gear up to fight these tax changes, they are also continuing a hard battle against the White House Office of Management and Budget that wants to cap administrative overhead on research grants rates in fiscal year 1987 at 20% of direct costs. On a number of campuses, research faculty support such a cap, believing it will leave more money to pay the direct costs of scientific research, but university presidents argue that they need the money to pay for a variety of things vital to the research environment. Calling indirect costs "one of the more arcane subjects in the Western world," Stanford president Donald Kennedy said there is no way most private schools can make up the $100 million to $300 million that will be lost if the government refuses to pay the full cost of federally sponsored research by paying both direct and indirect costs.

Summarizing the universities' concerns,