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## THE 1 AIRCRAFT INDUSTRY GOES GLOBAL IS THE U.S. READY?

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## FirstLine



## **Continuity and Change**

wouldn't mind if a few readers didn't even notice our new design. We have made changes not for their own sake but when we saw good reason for them. In several cases we examined dozens of possibilities only to end up not far from where we started.

The Technology Review logo is a case in point. A redesign in 1967 changed the typeface of the entire magazine, including the logo, to Helvetica. Though this clean, sans-serif face later became widely popular, Technology Review's early adoption of it was bold and controversial. Today, fashion is returning to classical typefaces. We reviewed earlier logos stretching back to 1899 with an eye to resurrecting one, but thought better of the idea.

True, there is merit in today's classical revival. Helvetica is difficult to read. Ironically, when type is stripped of all adornment, the eye has trouble taking in entire words at a glance. I suspect this does not result entirely from a centurieslong habituation to serif type but illustrates a psychological principle. People prefer the tiny foot or flag, the serif, that punctuates the top and bottom of letters: we want beginnings and endings to be articulated. Nevertheless, a large Helvetica logo is perfectly readable and has an advantage for *Technology Review*. Designed in the Bauhaus tradition, the type embodies an optimism about technology and modernism that is lacking in today's resurrections of classical styles. Though well aware of technological setbacks, we wish to maintain the guidance of this optimism. We have kept the Helvetica logo, but the interior of the magazine is now entirely in serif type.

In the decade since the design last received careful scrutiny, the magazine had grown piecemeal and needed to be brought to order. The Trends section was announced in Lubalin type, dropped out white on a black background, while other section heads were Baskerville, and running heads remained Helvetica. Now all section heads and titles are in a single, handsome typeface, Garamond.

There were geographical problems, too. Reporter, covering developments at MIT, once occupied only the last page of the magazine but had begun taking up two or three pages. The editors slipped through a solution that horrified the upper echelons of the design department: we started the section on the prominent last page and asked readers to flip backwards. We have now moved Reporter to the front of the Covers from 1916 to the present

magazine, an arrangement that allows for several pages and emphasizes the section's importance.

Our design director, Nancy Cahners, oversaw the entire revamping process. Our design manager, Kathleen Sayre, took the critical step of translating a set of verbal requirements into handsome physical form. Our publisher, William Hecht; our managing editor, Sandra Hackman; and the rest of the staff, including myself, kibitzed.

An ad-hoc design committee advised us throughout. Robert Mann, the chair, and Woodie Flowers, both professors of mechanical engineering at MIT, brought from their experience intuitions about design that I found sometimes startling and almost always unerring. Edward Thompson, chair of our Advisory Board and former editor of Reader's Digest, kept us from running off the rails at perilous junctions. Other committee members we are indebted to include Emily Wick, former dean of students at Mount Holyoke; Warren Seamans, director of the MIT Museum; and (particularly for insights about the logo) Jacqueline Casey, former director of Design Services at MIT.

JONATHAN SCHLEFER

## Letters

#### THE CASE FOR STEALTH

After reading "In Search of the Elusive Stealth Bomber" by Michael Brower (TR May/June 1989), I am compelled to add some balance to the author's onesided view. First of all, Mr. Brower asserts that the strategic penetrating bomber is obsolete, but in fact it will play an even larger role in the future. Thoughtful people, including those who formulate the arms-reduction positions of the United States and the Soviet Union, agree that greater reliance on penetrating bombers is necessary for stable deterrence. One of the rules established in the talks at Reykjavik explicitly recognizes this by counting each penetrating bomber as one warhead regardless of the bomb load. Moreover, such craft allow for unparalleled capability and versatility in strategic nuclear deterrence, conventional operations, and support of maritime operations.

None of this argues against airlaunched cruise missiles (ALCMs); Mr. Brower's statement that ALCMs are "relegated to a secondary and wasteful role of paving the way for penetrating bombers" is nonsense. The plan is to use cruise missiles against the targets they cover best—as is the case with every element of the triad of strategic deterrent forces.

Mr. Brower's argument that the B-2 mission has little to do with preventing war and much to do with fighting one is apparently based on a misunderstanding of the fundamentals of deterrence. The B-2 deters by convincing the Soviets that if they attack they will lose highly valued assets. And it makes little difference whether the retaliatory devastation would take place in an hour or a day or a week, since it is the inevitability of the destruction that deters. The B-2 provides impressive retaliatory capability without the threatening characteristics that could lead to rapid, unthinking escalation.

As to the impact of the B-2 on Soviet air-defense plans, the United States is not building the system to encourage expansion of the already massive Soviet spending in that area. Granted, the B-2 negates a huge Soviet investment over



the past two decades in conventional air defenses, but the suggestion that the plane might be vulnerable to unconventional defenses, requiring even greater expense and sophistication, is merely conjecture.

Mr. Brower also exaggerates the problems associated with "concurrency"-the policy under which the B-2 has gone into production before testing is complete. He even expresses some concern that the absence of a tail might make the craft "hard to fly." Yet the truth is that over 24,000 hours of wind-tunnel testing have been done, as well as extensive flight testing of the flight-control software. Thousands of hours of ground simulation have been performed, too. Our very high confidence that the system would do exactly what it was designed to do was verified on first flight. Not only that, but each aircraft is being built efficiently, using the same well-thought-out production setup, thanks to extensive development efforts early on.

Finally, it is not valid to compare the B-2's production scenario with that of the B-1. The B-1 was built under pressure to meet dates agreed to at the outset by the Defense Department and later mandated by Congress. In contrast, the B-2's pace depends on when development and performance milestones are reached, and the program's schedule and costs have been adjusted to ensure that concurrency and risk are well under control.

It is important that we safeguard the revolutionary technology embodied in the B-2, which is why access to the program has been limited. Even so, as Sen. John Warner (R-Va.) of the Senate Armed Services Committee recently pointed out, members of Congress with oversight responsibility have been fully informed of the B-2's costs for the past ten years and have approved each step of the program since its inception. For the past two years, any member approved by the chair of an oversight committee has been cleared into the B-2 program. All pertinent cost information and most relevant production and schedule details are now part of the public record.

Fourth-generation stealth technology is not inexpensive, but the author's contention that the B-2 costs almost twice as much as the B-1 is simply not true. The B-2 figures he uses reflect the higher cost of producing an aircraft a full decade after the B-1's peak production years. They include the substantial R&D costs of the revolutionary technologies embedded in the B-2. In the most valid cost comparison, the B-2 costs only about 20 percent more than the B-1. Moreover, because all future fixed-wing combat aircraft will use stealth technology, the R&D effort on the B-2 will yield a stream of benefits for decades to come.

Mr. Brower's closing observation is completely correct. If the B-2 program is stretched out or the number of aircraft reduced, costs will increase and U.S. security will decrease. We need the full complement of 132 B-2s produced on schedule, and we are working closely with Congress to achieve that goal, gathering strong support from many members who understand the strategic needs of this nation. Contrary to Mr. Brower's characterization, Sen. Sam Nunn (D-Ga.) is one of those wellinformed supporters. With most of the development effort on stealth behind us, we are now focusing intensely on an ef-

#### CORRECTION

In "Doing Something About High-Level Nuclear Waste" by George Wicks and Dennis Bickford (*TR November/ December 1989*), the radiation exposure figures on page 58 are incorrectly presented as the doses that would be absorbed by workers in glassifying, transporting, and burying waste. The authors intended the figures to represent the maximum individual doses that the public would receive in the vicinity of these operations. The authors stress that workers' exposure would be higher, but well within regulatory limits.

fective flight test and economic production program to ensure that highconfidence nuclear deterrence continues.

> LARRY D. WELCH Washington, D.C.

Larry D. Welch is chief of staff of the Air Force.

#### **B-2 BLOOPERS**

While I certainly enjoy your magazine, I find that I differ with some of the statements Jay H. Goldberg makes in "The Road to Stealth" (*TR May/June 1989*). He says that in the 1960s, after the Soviets shot down the U-2 flown by Francis Gary Powers, "manned overflights were banned." I believe that *all* overflights, except for satellites, were banned. Also, Goldberg refers to the SR-71 Blackbird as "an unmanned reconnaissance plane." It is my understanding that the SR-71 is in fact manned.

Finally, the author reports that in the 1973 Yom Kippur War, Israel suffered heavy losses when confronted with "new surface-to-air missiles" resistant to jamming. The truth is that the Arabs had very old continuous-wave-radar surface-to-air missiles, and the jamming equipment aboard the Israeli aircraft was designed to deal only with new pulse-Doppler radar.

GLEN CLOSSON San Jose, Calif.



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The author responds:

In the Yom Kippur War, Israel's air force was perfectly able to handle the older SAM-2s and SAM-3s, with which it had gained experience in the War of Attrition against Egypt. However, by 1973 the Soviets had installed the newer SAM-6 in Egypt. This missile, which had radar and guidance systems that were much different from those on the earlier SAMs, foiled the Israeli jammers. The United States was able to provide Israel with electronic countermeasures to the SAM-6 by war's end, but not before the Israelis had lost a number of aircraft.

It was specifically manned overflights that were halted after the Powers incident—presumably so as not to interfere with the nascent spy-satellite programs of both superpowers. I should have said that an unmanned drone called the D-21 (which looked rather like the SR-71 and was equally stealthy) was fired from the SR-71 to fly over the Soviet Union and take photos. It is likely that the SR-71 itself eventually performed the overflights.

The SR-71 is, of course, manned. Evidently, I either pruned too much of a sentence or mistook the pilot—clearly visible in the adjacent photo—for the dummy some of us urban folk use to ride in the car-pool lanes.

#### **NEW USES FOR HDTV**

In "Who Needs HDTV?" (*TR May/June 1989*) Langdon Winner ignores a very real—and widespread—occupational health need that high-definition television might address. Specifically, many employees who work at computer terminals experience eye strain, sometimes suffering permanent damage. Since poor resolution of letters and

numbers on the display screen directly contributes to this problem, HDTV could help.

> JUDITH A. PERROLLE Boston, Mass.

Langdon Winner's assertions to the contrary, HDTV could indeed meet social needs. If the number of horizontal lines is doubled and the horizontal resolution improved accordingly, the amount of information that can be presented on a television screen increases by a factor of four. When I recently saw a demonstration of high-resolution TV, I found that I could read alphanumeric characters with striking ease. My friend in Switzerland has a new TV that can display "teletext" channels in German, French, and English; he can also command it to display detailed information on a variety of subjects.

I agree with Winner that not all technical innovations are worthwhile. Those that are worthwhile meet the needs of a progressing society—not so much because they do old things better, but because they create opportunities to do things no one ever conceived of before. H.I. FLOMENHOFT

Palm Beach Gardens, Fla.

#### **ECOLOGY IN WARTIME**

As an ecologist who worked for five years on the Atlantic coast of Nicaragua, I appreciate Robert Rice's excellent article "A Casualty of War: The Nicaraguan Environment" (*TR May/June 1989*). Given the military and economic pressures the Nicaraguan government has had to contend with for most of the 10 years since the Sandinistas came to power, it's quite remarkable that officials have been as concerned with environmental matters as they have.

I had occasion to witness this ecological concern when I returned to Nicaragua in January 1989 to coordinate some research on the state of the southeastern rainforest after Hurricane Joan. The Research and Documentation Center of the Atlantic Coast, an autonomous institution, solicited the