As USAF and the Army package their forces for the 1990s, the distinction between close air support and battlefield air interdiction will blur.

New Roadmap for AirLand Battle

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THE Army and the Air Force—through the former's Training and Doctrine Command (TRADOC) and the latter's Tactical Air Command (TAC)—have agreed on a comprehensive forecast about what the battlefield of the 1990s might look like and what it will take to prevail on it. The dynamics of technology and the predictable growth of the Soviet threat form the basis of this roadmap and have generated new thinking about where tactical airpower is headed and how to get there.

Among the central conclusions to emerge from the TAC/TRADOC analysis is that the battlefield of the 1990s will be dominated by Soviet attack strategies centered on fast-moving, around-the-clock, multiechelon operations linked to coordinated rear actions designed to disrupt US offensive and defensive moves. As a consequence, the separation between close air support (CAS) and battlefield air interdiction (BAI) will become blurred.

Another key finding was that tactical airpower will have to work in concert with and support friendly ground forces that have greater mobility and weapon lethality than in the past. The TRADOC/TAC roadmap to the battlefield of the future also posits that the AirLand Battle doctrine extends the combat zone from close-in and rear areas to deep battle areas. Because of this, the need emerges for improved surveillance with real-time intelligence to find and destroy fixed as well as moving and emitting and nonemitting targets.

Because the ground forces will require close air support well beyond the FLOT (forward line of own troops) during deep maneuvers, CAS and BAI coalesce. Combat effectiveness will have to be bolstered by "force packaging," including force protection with air-to-air fighters and Joint Suppression of Enemy Air Defenses (JSEAD) by employing lethal and disruptive techniques against the surface-to-air threat. The joint roadmap also points out that tactical airpower will have to operate around the clock and under adverse weather conditions in order to exploit the Soviet ground forces' lag in night-fighting capability.

The roadmap forecasts steady qualitative increases in the Soviet tactical air threat along with improvements in Soviet surface-to-air capabilities. The forecast specifically envisions boosts in Soviet multiple-target engagement capability, larger engagement envelopes, and faster gun-slew rates. Predictable quality improvements in the Warsaw Pact's fighter and fighter-bomber forces might well enable the enemy's air-to-air fighters to deny US tactical airpower the traditional low-altitude sanctuary because of the addition of look-down/shoot-down features. Also, the Soviets are well on their way toward providing their fighters with around-the-clock surface attack capabilities, including night and adverse weather weapons delivery capability. Lastly, there is convincing evidence that the Soviets are stepping up the lethality of their already dense electronic warfare environment.

The Case for Modernization

When juxtaposed with these emerging requirements, the aircraft now in the Air Force's tactical air forces...
clearly require major modernization. The A-7 will be "aged out" of the force unless upgraded, and while the A-10, with upgrades, will remain capable of conducting close air support operations in less intense threat environments throughout the 1990s, it will not be able to penetrate and provide support of deep maneuvers at operational depth. In addition, TAC believes that the A-10 is not compatible with force packaging because of its relatively slower speeds.

The Air Force, at present, has assigned the equivalent of 3.8 tactical fighter wings of A-7s and of 6.5 tactical fighter wings of A-10s to the close air support mission on a dedicated basis. This force of 10.3 equivalent TFWs (seventy-two aircraft per wing) is designated to support the US Army. Of the total dedicated CAS force, about 1.5 equivalent wings are bedded down in Europe and about 0.7 equivalent wings in the Pacific and Alaska. The remainder of the force is stationed in the CONUS and is operated predominantly by the Guard and Reserve.

The rule of thumb is that fighters average a life cycle of about twenty years. As a result, the ideal age of the fleet is assumed to be about ten years. An FY '86 snapshot taken by TAC puts the average age of the A-10s at 6.3 years and of the A-7Ds at 13.2 years. Applying the twenty-year rule, TAC projects that the last of the A-7Ds now in the inventory will have to be decommissioned by 1994, while the last of the some 450 A-10s currently operational won't reach that point until about the turn of the century.

In April 1985, the civilian and military heads of the Air Force and the Army signed a memorandum of agreement (MOA)—in fact an extension of the Joint Force Development Initiatives of the previous year—that outlined their joint position on the need to field a follow-on CAS aircraft. Basing its conclusions in part on the age and performance of the existing CAS fleet, the MOA called for the timely fielding of a follow-on CAS aircraft (dubbed CAS-X) and noted that the program should focus "on existing airframes available for procurement in the late 1980s." The CAS-X, the two services agreed, must be able to perform air interdiction (AI) consonant with J-SAK, the concept of Joint Attack of the Second Echelon.

Finally, on August 22, 1986, Deputy Secretary of Defense William H. Taft IV provided official "guidance" on close air support as part of the Pentagon's Program Decision Memorandum, which included the request to "provide funds in FY '88-93 for research, development, test, and evaluation and procurement of follow-on CAS aircraft." OSD's guidance also requested an analysis of the effects on other missions "if multirole aircraft are to be used for the mission."

Enumerating the "Musts"
The obvious first step by the tactical air forces (TAF) commanders—supported firmly by TRADOC—was to look at the requirements associated with the unavoidable replacement of the A-7s. A number of "musts" surfaced quickly and unambiguously.
In the category of responsiveness and flexibility, there is no arguing the need for high sortie rates and effective night systems. Another obvious, central requirement is the ability to locate and identify targets reliably. In turn, this consideration drives the need for jam-resistant communications to coordinate attack operations with friendly forces as well as devices that aid the pilot in visually "acquiring" targets and target areas.

Other fundamental requirements associated with an A-7 replacement hinge on sufficient lethality to destroy or neutralize targets. This, in turn, is predicated on sufficient survivability of the aircraft to carry out the mission in the first place. In the view of the TAF commanders, this translates into a set of specific features, such as precision kill of nearby targets and heavy firepower to delay the advance of enemy forces by creating disruption and confusion. Equally crucial are threat avoidance against the gamut of surface-to-air and air-to-air weapons, self-protection against all aspects of the enemy's air defenses, as well as means to reduce the time of exposure by dint of speed, maneuverability, and surprise.

As Gen. Robert Russ, Commander of Tactical Air Command, points out, the Air Force has three paths it could pursue to ensure adequate close air support. A new aircraft could be developed and acquired, an aircraft now in production could be procured, or the existing A-7 force could be modified.

Past experiences helped the Air Force and OSD in arriving at a decision to initiate an A-7 upgrade. The time from program startup to IOC (initial operational capability) was nine years in the case of the F-16, ten years for the F-15, and eleven years in the case of the A-10. Another pragmatic benchmark that affected the decision was the fact that the development costs for a new aircraft with capabilities similar to the F-16 would come to between $2 billion and $2.5 billion. Helping cement the case for modifying the existing A-7 was an unsolicited proposal by its builder, LTV, to do precisely that in a fashion that extends the airframe life beyond the year 2010.

After review of the performance capabilities that result from A-7 modifications already under way, TAC and TRADOC concluded that the added night capabilities—by themselves—"will significantly enhance the ability of the [Air Force] to support ground forces." TRADOC pointed out that the Army considers the current A-7 upgrade program "essential and wants to ensure [that] this capability becomes and remains available to respond rapidly in wartime and in peacetime contingency operations."

### The Case for the A-7 Plus

In the fall of 1986, the TAF commanders (TAC, PACAF, USAFE, and AAC)—after a comprehensive review of the modernization program proposed by LTV and designated the A-7 Plus—asserted: "We continue to believe that the A-7 Plus program offers an unprecedented opportunity to preserve and further enhance our [close air support/battlefield air interdiction] aircraft inventory at reasonable cost." The TAP commanders "strongly endorse a [demonstration] program that permits us to preserve the decision option of acquiring [without delay] A-7 Plus aircraft with greatly increased survivability and lethality."

The Director of the Air National Guard, Maj. Gen. John B. Conaway, in similar fashion, endorsed the A-7 Plus program as "a logical and cost-effective approach to providing the Air National Guard with a modernized, credible attack capability."

A combination of factors favors the A-7 Plus beyond the fact that the aircraft will apparently come in at about half the cost of new F-16s. Even in its present incarnation, the A-7 is well suited for the CAS/BAI mission in an AirLand Battle environment because of its mature air-to-ground capability, range, survivability, and high payload capacity. Additionally, the A-7 Plus can easily be plugged into the existing maintenance and logistics structure of the Air Force Logistics Command and the Air National Guard.

Further, the $600 million modification program of the A-7 now under way is already enhancing the aircraft's CAS/BAI capabilities to a major degree. These modifications include the addition of antijam radios in the form of the Air Force's "Have Quick" and the US Army's SINCgars-V (Single-Channel Ground and Airborne Radio Subsystem).

Equally important are improvements of the aircraft's navigation and attack capabilities that range from the addition of a FLIR (forward-looking infrared) and ring-laser gyro navigation system to a linkup with the Navstar Global Positioning System (GPS). The FLIR system is called LANA, for low-altitude night attack, and is scheduled initially to go on three squadrons of A-7Ds. Other modifications call for the retrofit of state-of-the-art weapons delivery computers and wide-angle HUDs (head-up displays).
The third facet of the A-7 modifications provides for boosts in the aircraft’s reliability and maintainability (R&M) through the addition of automatic test equipment, leading-edge flaps, a combined altitude radar altimeter, and a central air data computer.

The Next Step

The next step—the transformation of the upgraded A-7 into the A-7 Plus—pivots on the retrofit of an afterburning turbofan engine and enhanced aerodynamics to provide the aircraft with the speed and maneuverability essential for survival in a high-threat environment. The addition of an afterburning engine requires stretching the airframe by the insertion of two “plugs.” Adding on strakes, trailing edge flaps, and lift dump spoilers rounds out the aerodynamic modification. The result is a highly maneuverable aircraft capable of operating in the high subsonic or possibly even the supersonic regime.

Three types of engines are under consideration by the Air Force. They are the Pratt & Whitney F100, GE’s F110, and an afterburner-equipped version of the Allison TF41. Allison officials believe that the company can retrofit the TF41s powering the A-7Ds with an afterburner from the F100 engine and thereby come in at lower costs than either Pratt & Whitney or GE. Such an approach entails some technical risks compared to buying mature engines. The Air Force has not yet selected from among the three candidate designs.

The A-7 Plus program hews closely to the recommendations of the President’s Blue Ribbon (Packard) Commission on Defense Management in such key areas as off-the-shelf acquisition, full-scale development and test of prototypes, and “fly and know cost before buy.”

Overall, the TAF commanders believe that the A-7 Plus modification meets central near-term CAS/BAI requirements at a lower cost than other options by providing improved night attack capability, improved aircraft survivability, and a new “twenty-year-equivalent” airframe. In addition, the A-7 Plus program leads to a broad modernization of the Air National Guard force.

The Ninety-ninth Congress authorized $35 million for evaluation of the modified A-7 by the Air Force. With this mandate—and subsequent OSD approval—the Air Force will continue currently programmed and funded modifications of the A-7 as well as startup development of two A-7 Plus prototypes that are to begin flight testing in 1989. Development and test of the two prototypes will be accompanied by the compilation of a data package. If the tests are successful and the data package supports the Air Force’s cost criterion—meaning an overall price tag of no more than half of what it would cost to buy such new aircraft as the F-16—then a production decision will be made. Once that decision is made—probably in 1989, according to Maj. Gen. Jimmie V. Adams, TAC’s Deputy Chief of Staff for Requirements—requests for competitive production bidding, based on the data package and involving both government-furnished engines and about 335 A-7 airframes, will be issued.

Replacing the A-10

The Army and the Air Force agree that the CAS/BAI modernization requirements, over the longer term, can’t be met by the A-7 Plus upgrade program alone. The two services underscored in their MOA the requirement for a more effective and survivable fixed-wing aircraft that can function “across a broad spectrum of combat scenarios and threats, ranging from the friendly rear area to the traditional main battle area and the deep maneuver arena.”

Imperative traits of the follow-on aircraft, the two services concluded, involve an airframe and support systems tailored to penetrate and operate within enemy territory under adverse weather day/night conditions. The aircraft, further, must have an armor-killing capability—possibly by means of a gun—and be optimized for the air-interdiction mission. The need for this type of aircraft—basically a more versatile and broadly capable replacement of the A-10—is sufficiently urgent to justify selection of a design that is already in production.

On the basis of longevity considerations, the two services agree that the current A-10 fleet might last until 1998, but have concluded that a replacement aircraft is needed earlier. The reasons are operational, owing to changes in the modern battlefield. Key here are such intrinsic deficiencies of the A-10 as the inability to operate at night and to penetrate enemy defenses to support deep maneuver operations.

These handicaps, General Adams points out, are not the fault of the aircraft, which “is doing exactly what we asked it to do. We put a high-lift wing on the aircraft because we thought we were going to operate out of austere fields. This concept never materialized, and we are paying a large penalty for the big wing.”

As in the case of the A-7D replacement effort, the Air Force can choose from among several ways of modernizing the A-10 force. For one, there is the option of
developing and buying new, from-the-ground-up aircraft. But such an approach places two major and possibly insurmountable hurdles in the path of the CAS/BAI modernization drive. It would take about ten years and between $2.5 billion and $3 billion to develop a new aircraft.

The second option—upgrading the A-10 force—was spiked quickly. Because of the big wing and its “draggy” aerodynamics, the A-10 does not lend itself to major upgrades. The addition of advanced engines, the Air Force feels, would enhance the aircraft’s speed capabilities only marginally since “we still would be pushing a big desk through the air.” The only viable option, apparently, is to procure an in-production aircraft.

The case for the A-16, the TAF commanders believe, is persuasive. For one, it would represent a commonsense approach to acquisition that avoids competition for the sake of competition. The A-16 would capitalize on the economy of scale in the F-16 buy as well as on stable, known costs by obviating developmental risk and long-term contractor investments.

The proposed A-16, General Adams points out, even though operated by the Air Force, “would be an Army airplane with Army communications links,” down to being camouflaged by an air-to-ground paint scheme. Many of the features and capabilities that TAC and TRADOC consider essential for a follow-on CAS/BAI attack aircraft are being added to F-16 production aircraft in the future. This includes heavyweight landing gear and other structural improvements pioneered by the Israelis in order to accommodate increases in the aircraft’s gross weight. Other programmed mutations of the F-16 that would stand an attack version in good stead include incorporation of OBOGS (an on-board oxygen-generating system that eliminates a cumbersome ground-support requirement), an increased chaff/flare capacity, a wide-angle HUD, and the addition of Navstar GPS transponders.

**Changes Under Consideration**

But an attack version of the F-16 would require a number of specific changes, according to General Adams. One change being considered is the addition of a navigation FLIR pod with a wide field of view, low drag characteristics, and ready availability. The benefits of this sensor are that it depicts the “thermal scene” at night, highlights detected hot-spot cues in a cluttered scene, and is designed for hands-off operation. There is no dearth of off-the-shelf navigation FLIR pods, begin-
ning with Martin Marietta's LANTIRN system, with the terrain-following radar feature deleted. Others include systems built by Ford Aerospace, Texas Instruments, and Britain's GEC Avionics.

Other possible add-ons involve a laser spot seeker, a digital terrain system, and a jam-resistant Army data link. All three sensors would "read out" on the A-16's HUD. The laser spot seeker—which facilitates rapid, positive identification of targets designated by airborne or ground-based FACs by displaying target location on the pilot's HUD—could be the A-10's Pave Penny system. This day/night system would be removed from the A-10s and put on the A-16s.

The digital terrain system would have a threefold function: navigation, terrain following, and ground-proximity warning. The system would use the Defense Mapping Agency's digital map data for both navigation and terrain avoidance. The digital terrain system would display such information as steerpoint corrections and "vertical steering box" on the HUD. The system works somewhat like the ground-launched cruise missile's (GLCM) terrain-contour matching (TERCOM) feature and is available in several existing variants, including one fielded by British Aerospace (BAe). When used to provide ground-proximity warning, the digital terrain system can be set for clearances as low as 200 feet to provide "pull-up cues." TAC expects the system to be a low-cost and effective solution for the A-16 mission.

Maverick missiles for the A-16 can be "cannibalized" from decommissioned F-4s.

If OSD and Congress opt in favor of the A-16s, replacement of the A-10s could start in FY '93 and be completed by the year 2000, meaning that USAF's attack force designated for ground support would number about 800 combat-coded aircraft consisting of both A-7 Pluses and A-16s. If the decision goes against the A-16 and in favor of a totally new aircraft, this schedule would slide by many years.

Whatever the outcome of the current impasse, the Army and the Air Force agree that the US ground forces will continue to require close air support to the tune of about twenty-six wings, or some 1,900 combat-coded aircraft. About ten and a half wings of this "CAS-capable" force must be "CAS-designated," while the remainder would serve in a swing role.

The current inventory of CAS-capable but not CAS-designated aircraft consists of F-16 and F-4 aircraft. Because of aging, the F-4s will be gone from the inventory within four years. Within the CAS-designated category—numbering some 750 combat-coded aircraft—the last A-7Ds will have been replaced by the A-7 Plus by 1999, and the A-10s, one way or another, will be out of the inventory one year later. If there are no A-16 or equivalent aircraft available to replace the A-10s, additional quantities of F-16s configured for CAS/BAI will have to be acquired.

A degree of irony attends the CAS modernization effort. Two years ago, when the Air Force came forward with a CAS-X proposal (a follow-on aircraft to the A-10), the Defense Resources Board killed the request; in FY '87, when for budgetary reasons the Air Force did not include funds for CAS-X, the DRB complained that the service is obviously not interested in having a new close air support aircraft. This contention is at odds with the Air Force's interest in a missionized A-16 to meet CAS and BAI requirements beginning in the 1990s as well as its commitment to maintain support of the Army at current numerical levels but with more capable attack aircraft.

**Airborne FACs Not Passé**

The TAF commanders averred last year in a formal memorandum that "we continue to see a role for FAC aircraft in the TAF," but acknowledged at the same time that fiscal and mission constraints militate against coming up with a single FAC aircraft for all theaters: "We believe it prudent to tailor our existing resources according to the threat." The TAF commanders, therefore, see a need for a "wide variety of FAC aircraft." Specifically, the need boils down to some 200 aircraft, of which about fifty-five percent should be tailored to low- and medium-threat environments, while forty-five percent need to be capable of coping with medium-high and, if possible, high-threat conditions.

USAF's inventory of FAC aircraft, at the end of FY '86, consisted of sixty OV-10s, seventy-three OA-37s, and twenty-nine OT-37s, totaling 162 combat-coded aircraft. By using T-37s to replace the Vietnam War-vintage O-2 FAC aircraft, the Air Force resorted to a makeshift arrangement. These aircraft were not designed or optimized for this mission, which is of integral importance to the AirLand Battle concept. The FAC fleet today, therefore, is handicapped by an excess of aircraft for low- and medium-level conflict, a shortfall of aircraft for medium-high intensity conflict, and a need for a survivable aircraft for high-intensity conflict.

TAC's commonsense conclusion is that this shortfall for medium-high intensity conflict can be eliminated by converting A-10s from the attack force to OA-10s when a new CAS/BAI aircraft enters the inventory.