Close Call for Close Air Support?

by

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The USAF is eagerly anticipating the deployment of the F-22 fighter in frontline units as a replacement for the F-15. The other major new warplane program, the Joint Strike Fighter (JSF), is planned to replace at the least the F-16 and the A-10. However the JSF is slated to takeover close air support (CAS) duties from the A-10 only after the heavily-worked F-16s are replaced. This would be well into the 2020s. The air force believes that structural and avionic upgrades would suffice to keep the A-10s combat ready up to this time. However would the A-10 continue to be an effective asset in the interim 20 and more years? Would it even be usable or survivable in the threat environment it will encounter? And is the multirole JSF an appropriate design as an A-10 follow-on? This article argues that the air force should seriously consider a replacement much earlier than that and that the replacement should be specifically designed for the CAS environment.

Back in the 1960s the air force concluded that a CAS aircraft should have: the ability to operate from short, underdeveloped airfields; high reliability and maintainability; a large weapons load including an anti-armor capability; long range and endurance; a speed of at least 350 knots; maneuverability; and low cost.

Operation Desert Storm

The A-10 was produced to meet these requirements. The aircraft when used as designed has undoubtedly performed well. For instance in Operation Desert Storm, both the A-10 and the army's more expensive AH-64 Apache flew close support missions. However although the number of A-10s deployed was almost one half that of the Apache they flew over 12 times the number of sorties. The A-10 had over 4000 confirmed kills, which was more than 3 times the number of *credited* kills for the Apache. Although these statistics indicate that the AH-64 averaged more kills per sortie, the A-10's much higher operational readiness rate made the A-10 force considerably more effective than the Apache fleet overall.

Notably the Gulf War was a major theatre war between nations with the targets well defined. However its seems that future conflicts will predominantly be low intensity conflicts (LICs) between factions. In particular, current strategic and operational level doctrine for the use of air power against the enemy (seen as a nation-state), which has been credited for the coalition's military victory in the Gulf War, needs to be reassessed. The use of air power in close support may become more important (than it was in the Gulf War). Pointedly, it may mean targets may not only be close to friendly forces, but to civilians as well, making targeting even more difficult. A study of close air support in two recent LICs may therefore reveal lessons for the future.

Russian CAS in Chechnya (1994-1996)

Important lessons could be learnt from the Russian air force's performance in Chechnya in the last decade. In the late 1970s and early 1980s, the Soviets had also developed a CAS aircraft in the form of the Su-25. However this aircraft was closer in appearance to the Northrop A-9 which lost to the A-10 in the AX competition. The Soviet aircraft had many characteristics in common with the A-10. However the overall design philosophies did diverge. In particular, the Su-25 had a considerably higher top speed than the A-10 and had better agility making it the more fighter-like of the two. A drawback was that it did not feature the same degree of redundancy. Also, except for the cockpit armor and engine protection, the overall aircraft is not designed to sustain the same level of ground fire as the A-10. But it is smaller and at its higher speed, it spends less time over the battlefield and thus should be exposed less to AAA. So although the Russian aircraft was not as revolutionary as the A-10 the design still had merits. These were tested by the conflict in Chechnya (as well as in Afghanistan before).

The threat by Chechen fighter aircraft was negligible but Chechen forces did possess anti-aircraft artillery (AAA) and surface-to-air missiles (SAMs), reportedly including Stingers. Geographical conditions were varied, including both mountains and plains. Russian helicopters included the Mi-24 attack-assault and the Mi-8 and Mi-6, types considered obsolete by Russian fliers. The Mi-28 and Ka-50, genuine attack helicopters like the Apache, were not used. The slow speeds of the helicopters made them more vulnerable to ground fire. The faster Su-25 was not as susceptible because it did not give opponents enough time to react. The Su-25's speed was still slower than the other more conventional fighter-bombers used, such as the Su-22 and Su-24, which flew too fast to acquire small targets. Also, the Su-25's high thrust-to-weight ratio gave it the handling required for operations amongst the mountains.

Indian Air Support in Kashmir

In mid-1999, the Indian air force conducted military operations to evict guerillas who had infiltrated the Kargil region of Kashmir from Pakistan. These operations were also in an alpine environment but even more so. In addition the insurgents had a significant ground based air defense capability including SAMs. Thus the operations provided a very rigorous test for the aircraft and equipment of the Indian armed forces. Aircraft used also included a mix of helicopters and fixed-wing warplanes. However its Mi-25/35 combat helicopters were limited by their operational ceiling. Instead Mi-17s were used in the gunship role. The air force's attack aircraft include the MiG-21 and MiG-27. But the Mirage 2000 with excess power and good low speed, close-to-the-ground handling, performed the best among the fixed-wing types.

The harsh physical environment meant that deficiencies in technology, tactics, techniques and procedures were readily exposed. One conclusion was that a CAS aircraft operating in mountainous areas requires good acceleration. This in fact is one of the major drawbacks of the A-10. The USAF has found itself fighting in mountainous regions in Yugoslavia. And significant mountains exist in other conflict-prone parts of the

world such as Central Asia, East Africa and western South America. So US air force units could again see combat in this type of environment. On the plains SAM operators will have more time to acquire attacking aircraft in their sights so good acceleration is also an advantage there. Even today, the A-10s low acceleration would be a cause for concern.

Future Ground Threat Demands New Capabilities

The A-10 was designed well over 20 years ago for the predicted threat environment of the 1970s and 80s. It is comparable in age to the F-15 (their first flights were within a space of three months in 1972). Since the F-15 and A-10 were designed a plethora of surface-to-air missile systems have emerged. The missile threat that has caused USAF planners so much concern over Kosovo last year was certainly more serious than that faced over Iraq in 1991. It must be expected that the future growth in ground based air defense systems (GBADS) capability will parallel the almost exponential increases in the field of electronics and computing. So this threat in 2020 will be dramatically more advanced.

Air superiority squadrons would begin reequipping with the F-22 this decade followed later by other squadrons replacing earlier types with the JSF, fighters with high altitude, high speed capability. Although these aircraft are expensive the USAF needs them to counter the emerging threats and to conduct future fighter and strike missions.

However A-10 units would have to soldier on with the same aircraft for a further two decades while facing systems from the same generation in the A-10's low altitude and low speed operating regime. CAS occurs in an environment where aircraft are vulnerable to AAA in addition to low level SAMs and its requirements prevent the use of the defensive tactic of high speed flight. The effectiveness and survivability of a design that will be 30-40 years old is questionable. Doesn't the mission of CAS warrant a survivable aircraft too?

A New Russian Design

The Russians have used lessons from recent air support operations in their new CAS aircraft design, the Su-39. The Su-25, as well as the A-10, is considered obsolete by the Russians. Compared to the Su-25, the new aircraft has much improved navigation and electronic countermeasures (ECM) suites. It also emphasizes the ability to use a range of precision guided missiles, has considerable combat protection including a large weight of armor and boasts high maneuverability and reliability. It can operate from undeveloped airfields including mountain bases and use a range of fuels.

Other Approaches

Apart from the A-10 and Su-25/39, aircraft currently used by the world's air arms in CAS have not been designed exclusively for this role. In many cases they have been light attack designs that have been designated to perform CAS (in addition to other attack

roles). They have therefore been less radical but less effective. They include the Jaguar used by the British and French air forces and AMX used in Italy and Brazil. The former, now a dated design, has good agility and rough field performance and is also highly maintainable. The AMX, conceived as a simple, low-cost, attack aircraft, has a notable level of redundancy and modularity. They are both faster than the A-10 or Su-25/39 but cannot compare with the sheer power (and hence acceleration) of aircraft like the Mirage 2000. Also neither of them can endure the AAA punishment that the A-10 or Su-25/39 can withstand. The ability to operate from helipad-sized areas allowing deployment near the frontline was assessed as important by both the British and the Marines in their decisions to acquire the Harrier even though initial versions of the aircraft had limited payload/range. Today's Harrier has performance comparable to more conventional aircraft and has made vectored thrust vertical/short take-off and landing (V/STOL) operations a tried and proven operational concept.

USAF experiments have included modifying the F-16 for the CAS mission as the A-16. However, although the original design *per se* was brilliant, it was never designed for close support and even the tested variant did not adhere to all of the air force's own (1960s) requirements for CAS aircraft.

Why not JSF?

JSF has been turned into something of a jack-of-all-trades machine. The outstanding lesson of the 1960s attempted Navy/Air Force TFX (F-111) project is that an aircraft that is designed to accomplish many roles effectively may end up being both more expensive and not quite as capable as separate specially-designed aircraft would have been in those roles. The JSF program has become considerably more costly because of the need to produce a Marine Corps short take-off and vertical landing (STOVL) variant. The JSF as it is currently projected will need design modifications to take on the CAS role in the perceived future battlefield. This would incur substantial costs in an aircraft that has been designed for quite different missions. In particular, CAS aircraft design parameters are markedly different from combat aircraft performing other roles. For this reason, adapting the expensive JSF apart from being inefficient (due to the cost), does not guarantee an effective or survivable aircraft for close support either. Instead an aircraft should be specially designed for this mission.

The 1960s requirements must be reanalyzed based on US and foreign experience and both technology and doctrine developments, and modified for the projected demands of future CAS. In particular one requirement that may need to be added is good acceleration.

Technology

The overall design philosophy could be reassessed. To reduce costs, proven off-the-shelf components could be used. This approach was successfully employed by the Northrop team which developed the F-20 (competitor to the F-16 in the early 1980s FX competition for a fighter for friendly countries). This aircraft was cheaper and actually

better than the F-16 in some critical areas of performance while being much more maintainable.

Both the A-10 and Su-25/39 are single seat aircraft. A two-place machine is an option that could be further studied. The CAS regime includes flight at low level, negotiating ground based threats, and in mountainous areas, weaving amongst valleys and cloud-obscured peaks while looking for and attacking small, camouflaged, mobile targets. Having a second crewmember aboard would allow the pilot to concentrate on the flying while he performs other duties.

The structure of a new design would probably heavily feature composites. These would provide increased structural strength at low weight. Swing wings could also be revisited. They would shorten runway lengths required, add to the maneuverability and improve the low level handling at low (as well as high) speed. Another feature that could be incorporated in the design is vectored-thrust exhausts. Apart from increasing basing options, unconventional maneuvers permitted by inflight-thrust vectoring would add to the aircraft's agility over the battlefield and make it a more difficult target for both conventional fighters and GBADS. Low observable (LO) (stealth) technology only became widely known after the A-10 was produced. No doubt, a future CAS aircraft would be a good candidate for LO features.

The A-10 was initially designed with minimal electronic equipment. Although its avionics have been added to, including a post-Desert Storm night-capability, it remains an austere aircraft by frontline fighter-bomber standards. Since then electronic systems have become both more capable and more complicated. Standoff weapons such as the JDAM are also becoming more applicable to CAS. They would enable targets once they are properly marked, to be attacked at distance. Unmanned aerial vehicles (UAVs) have also progressed tremendously and may become a prominent feature on the battlefield in the next few decades. CAS aircraft may also be operating in conjunction with them. The possibilities include offloading some of the piloted aircraft's sensors onto accompanying UAVs.

Future CAS Aircraft

In the short term to give the USAF a competent close air support capability in the near future in environments that could include mountainous regions, at the very least the A-10 would have to undergo major modifications. A primary element of this would be a new more powerful engine. Alternatively, if a program is started soon, a simple, cheap and fairly effective (interim) system probably could be fielded around the time the JSF begins squadron service. Even if this aircraft only uses a limited number of the technologies mentioned above, it would be able to take advantage of developments in structure, avionics and weapons since the A-10 design.

As this aircraft rolls off the production lines the focus of industry design teams could turn to a more long term CAS aircraft. So, by the 2020s, a brand new, potent and survivable close support aircraft will be ready to join the USAF.