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A-10 FACs over Kosovo

By Lieutenant Colonel P Haun USAF

One of the most interesting and tactically successful innovations of Operation Allied Force in 1999 was the introduction of A-10 Forward Air Controllers (FACs) as mission commanders. In the absence of friendly ground forces, A-10 FACs commanded forty-ship strike packages in the direct attack of the Serbian 3rd Army in Kosovo. Supported by Suppression of Enemy Air Defences (SEAD) and air-to-air fighters, A-10 FACs operated overhead radar-guided SA-6 surface-to-air missiles and Serbian MiG-21 fighter bases. A-10 FACs were given the daunting task of locating, identifying, and attacking Serbian armour while simultaneously minimising collateral damage. Target identification was particularly difficult, given the steps taken by the Serbian army towards concealment and deception, and the potential for collateral damage was enormous, as nearly a million ethnic Albanian refugees streamed toward the Albanian and Macedonian borders. The large number of AAA and man-portable surface-to-air missiles (MANPADS) dictated Rules Of Engagement (ROE) which restricted operations at low altitude and forced A-10 FACs to develop tactics for medium altitude visual reconnaissance.

A-10 FAC expertise resided within a small cadre of some 30 FAC-qualified pilots who flew most of the FAC missions over Kosovo. These pilots improvised tactics for the real time use of Intelligence, Surveillance, and Reconnaissance (ISR) assets to include Joint Surveillance Target Attack Radar System (JSTARS) and Predator Unmanned Aerial Vehicles (UAV). Heavily loaded with general purpose bombs, air-to-surface missiles, and rockets, A-10 FACs struck and marked targets for NATO aircraft from ten different nations. These FACs proved to be NATO's most effective use of airpower against Serbian forces deployed in Kosovo.[1]

This article analyses the A-10 FACs, first by summarising the political and military situation over Kosovo which led to the introduction of A-10 FACs. It then highlights the history of A-10 operations during Kosovo. The final section focuses on the tactics developed by the A-10 FACs, by following a typical A-10 FAC sortie from start to finish.

KOSOVO: DIRECT ATTACK OF THE SERBIAN 3rd ARMY

Tensions between Belgrade and Kosovo increased during the late 1980s. Slobodan Milosevic used protests by minority Serbs residing in the majority Albanian province as the foundation for his Serbian nationalist platform and his subsequent rise to the Serbian presidency in 1987.[2] By 1989, Belgrade revoked Kosovo's status as an autonomous region and placed restrictions on land ownership and government jobs for Kosovar Albanians.[3] During the 1990's, Kosovar dissension spawned a series of both violent and non-violent protests.[4] Opposition rose in 1997 with the formation of a small group of lightly-armed guerrilla fighters known as the Kosovo Liberation Army (KLA). In response to KLA ambushes of Serbian police in early 1998, Serbian forces conducted brutal retaliatory attacks against suspected KLA positions.[5] KLA support swelled within Kosovo and led to an escalation of KLA activity. In July of 1998, Serbian forces conducted a village-by-village search for KLA members, displacing over 200,000 Kosovars in the process.[6] The magnitude of the humanitarian crisis captured the attention of the international community.

Serbia and Montenegro [7]

In response to the KLA and Serbian exchanges, the United Nations Security Council passed Resolution 1160 in March, and Resolution 1199 in September of 1998. The resolutions condemned Serbia's excessive use of force, established an arms embargo, and called for an immediate cease-fire and the introduction of international monitors.[8] The latter demand was met in the cease-fire negotiated between U.S. envoys and Belgrade in October.[9]

However, the massacre of 45 Kosovar Albanians at Racak on 19 January 1999 quickly brought the cease-fire to an end.[10] Under threat of NATO air strikes, Serbian and Kosovar representatives were summoned to Rambouillet, France, to negotiate a peace agreement.[11] The compromise included the key items of a NATO-led implementation force, the recognition of the international borders of the Former Republic of Yugoslavia (FRY, made up of Serbia, Montenegro, and

Kosovo), and an interim 3-year agreement, after which a final settlement of Kosovo could be arranged.[12] The Kosovar delegation initially refused to agree unless reference was made to a future referendum to decide the fate of Kosovo. Under the threat of the withdrawal of international support, including financial and military aid to the KLA, they reluctantly signed on 18 March, 1999.[13] The Serbs, unwilling to accept a NATO-led military force within Kosovo, remained recalcitrant. In the face of diplomatic impasse, NATO air strikes were ordered to commence on 24 March.

Initial planning for NATO air strikes against Serbia began as early as June of 1998.[14] Targeting for the strikes focused on fixed command and control and military facilities in Kosovo, Montenegro, and Serbia. These targets were selected for a variety of reasons, foremost being the low risk of collateral damage.[15] The strikes were intended as the punishment portion of NATO's coercive carrot and stick strategy. The initial target list included only 100 targets.[16] Of these, only 50 were eventually approved by the North Atlantic Council, sufficient for only 2 or 3 nights of strikes.[17] Hence, the constrained nature of the strikes reflected the overarching concern for maintaining consensus among the 19 NATO countries.

In February of 1999, in the midst of the Rambouillet talks, General Wesley Clark, Supreme Allied Commander Europe (SACEUR), became concerned over the prospect of increased ethnic cleansing operations by the Serbian Army within Kosovo once NATO air operations commenced. Two of NATO's stated military objectives involved dealing directly with the Serbian fielded forces: to deter further Serbian action against the Kosovars and to reduce the ability of the Serbian military to continue offensive operations against them.[18] Clark ordered his Combined Forces Air Component Commander (CFACC), Air Force Lieutenant General Mike Short, to increase the scope of air planning to include direct attacks on the Serbian fielded forces in Kosovo. This planning did not include the insertion of U.S. ground troops, commensurate with President Clinton's public announcement that no U.S. troops would enter Kosovo until after a settlement was reached.

With the breakdown of the Rambouillet peace talks and subsequent withdrawal of international observers on 19 March, 1999, Serbian ground forces commenced the systematic expulsion of Kosovar Albanians from Kosovo, codenamed Operation Horseshoe.[20] Ethnic cleansing operations were stepped up once NATO bombing began, leaving several hundred thousand refugees to seek safety in Albania and Macedonia, or to flee to the foothills within Kosovo as internal refugees.

At 1900 Greenwich Mean Time on 24 March, 1999 NATO air forces began bombing Serbian targets.[21] These targets focused on Serbian IADS, military

Kosovo[19]

command and control nodes, and airfields and aircraft.[22] NATO commenced the war with 214 dedicated combat aircraft, 112 of which were from the United States.[23] Initial NATO strikes were met with minimal resistance from Serbian surface-to-air missiles and fighters. The primary response, rather, took place within Kosovo and was directed at the Kosovar population. Concealed within the verdant, cloud covered valley of Kosovo were 40,000 soldiers of the Serbian 3rd Army equipped with hundreds of tanks, APCs and artillery pieces and interspersed among over a million Kosovars. In addition, a wall of mobile radar-guided surface-to-air missiles, man-portable missiles (MANPADS), and AAA, as well as a squadron of MiG 21 fighters protected the 3rd Army against NATO air forces.[24]

In developing air plans against the Serbian 3rd Army, U.S. planners assumed air superiority and relied on Suppression of Enemy Air Defences (SEAD) and electronic jamming assets to confuse and degrade the Serbian Integrated Air Defence System (IADS). Assuming strike aircraft could safely enter Kosovo, two tactical problems still remained: how to locate and identify the targets and how to successfully attack them while limiting collateral damage. A-10 Forward Air Controllers (FACs) trained in visual reconnaissance and air strike control were selected for the task.[25] A-10 FACs would search out targets identified by either Intelligence Surveillance and Reconnaissance (ISR) assets during pre-mission planning, or in real time by the Joint Surveillance Target Attack Radar System (JSTARS). Once targets were identified, the A-10 FACs would control strikes with available NATO fighters. These fighters ranged in strike capability from USAF F-15Es with laser-guided bombs to Italian AMXs with manual bombsights for their unguided, 500-lb bombs.

Responding to the rapidly deteriorating situation within Kosovo, General Clark ordered General Short to commence attacks on Serbian fielded forces on 30 March. While poor weather delayed the first successful strikes until 6 April, A-10 FACs would fly over 1,000 missions controlling the skies over Kosovo until 9 June, 1999, when a peace agreement was reached.[26]

HISTORY OF A-10s IN KOSOVO

A-10s first flew over the Balkans in 1993 when NATO aircraft began conducting air operations over Bosnia. The 81st Fighter Squadron, based at Spangdahlem Air Base, Germany continually deployed to Aviano Air Base until 1997.[27] The A-10s were the only Night Vision Goggle (NVG) fighter aircraft capable of providing both day and night CAS and airborne FAC coverage for UN and NATO ground forces. Only the U.S. had specially trained and combat ready airborne FACs. The other countries had only trained with NATO ground FACs or U.S. airborne FACs for their CAS missions. Eventually, F-16CG squadrons of the 31st Fighter Wing at Aviano were trained to use NVGs and assumed most of the FAC duties over Bosnia. With the continual presence of A-10s in the Balkans no longer required, the 81st needed only to conduct yearly deployments to Aviano, thus remaining familiar with Balkan operations and providing FAC coverage when the 31st FW was deployed elsewhere.

In January, 1999 the 81st deployed 6 A-10s to replace an Aviano F-16CG squadron on a stateside deployment. With tensions rising in Kosovo following the Racak massacre, the A-10s were ordered to remain at Aviano and the squadron increased the number of aircraft to 15 by the commencement of NATO air strikes on 24 March.[28]

Photo of combat loaded 81st A-10s refuelling over Macedonia[29]

A-10s were initially tasked only with providing Combat Search and Rescue (CSAR) for NATO aircrews. An A-10 pilot from the 81st Fighter Squadron was the mission commander for the dramatic rescue of an F-117 pilot shot down near Belgrade on the fourth night of strikes.[30] A-10s provided on-scene command, tracked the survivor's location, co-ordinated the rescue effort, and provided cover for rescue helicopters during the ingress, survivor pick-up, and egress of enemy territory.[31] A-10s went on to provide CSAR coverage for all NATO aircraft flying over Kosovo and Serbia, both day and night, throughout the war.

On 26 March, the 81st was notified by the Combined Air Operations Centre (CAOC) at Vicenza, Italy to commence FAC missions on 30 March. While all NATO airstrikes to this point had taken place at night, a shortage of EA-6B Jammers and F-16CJ SEAD aircraft prevented adding FAC missions to the number of strike missions they were already supporting.[32] Although initially short of airframes, NATO had sufficient aircrew to double turn SEAD aircraft in support of FAC missions during the day and strike missions at night. Launching from Aviano, A-10s began flying sorties of six to seven hours down the Adriatic, across Albania and up into Kosovo. Low level clouds over Kosovo prevented aerial attacks until 6 April, when A-10 FACs located and struck a Serbian truck park, followed by two more successful days of attacks against convoys of Serbian tanks and APCs.

Serbian T-55 destroyed by A-10 with AGM-65 Maverick

A-10S MOVE TO GIOIA DEL COLLE

The lengthy enroute time from Aviano to Kosovo reduced time on station and prevented double turning the jets for two daylight missions per day. Fifteen days into the war, the CAOC ordered the 81st FS to further deploy to an Italian Air Force base at Gioia Del Colle in southern Italy. Sortie duration could thus be cut by over one hour per sortie, increasing on-station time, allowing the jets to fly two daylight missions per day, and giving a much needed respite to pilots. On 11 April, 1999 the jets in Aviano were joined in the move to Gioia Del Colle by an additional three aircraft from Spangdahlem.[33]

Other NATO squadrons deployed to Gioia Del Colle included British Harriers GR7s, Italian Tornados and F-104 Starfighters. The Harriers flew as strike aircraft for A-10 FACs on a daily basis and the proximity of operations made for a close working relationship.

A-10 FAC operations at Gioia commenced on 12 April within 24 hours of arrival. With the growing success of strikes against its 3rd Army, the Serbs increased their active air defences. A-10 FACs began reporting barrage-fired AAA and surface-to-air missile launches. On 2 May, an A-10 lost an engine to an SA-14 infrared-guided surface-to-air missile and was forced to recover at Skopje Air Base, Macedonia. On 11 May, another A-10 was struck beneath the cockpit by a mobile surface-to-air missile. The missile failed to fuse, however, allowing the jet to recover to Gioia.

FAC operations over Kosovo grew to include most of the day and half of the night. A-10s covered two four-hour daylight windows over Kosovo while maintaining four aircraft on CSAR alert for night operations. F-16 CGs provided some day FACing, as well as a 2-3 hour night window. The US Navy provided additional day FAC coverage, flying F-14s

Map of deployed A-10 locations during Allied Force

Photo of Harrier returned from Kosovo mission

off the USS Theodore Roosevelt.[34] Even more FACs were needed, however, to provide full 24/7 coverage over Kosovo. It was the Air National Guard that stepped in to create the 104th Expeditionary Operations Group. This rainbowed Expeditionary Operations Group from three different A-10 ANG units in Michigan, Massachusetts, and Idaho totalled 18 aircraft. By early May, the 104th had deployed to Trapani Air Base in western Sicily. While the lengthy trip from Trapani to the Area of Operations precluded the 104th from being able to double turn for day missions, they were able to cover a midday FAC window and then turn for late night missions. Additionally, the 104th deployed 3 of their aircraft to Taszar, Hungary in mid-May to perform CSAR alert.[35] This improved the response time for A-10s in the event of a shootdown over northern Serbia. The final aircraft to join the FAC mission was the US Marine F/A-18D, when a full squadron joined the 104th CSAR detachment at Taszar, Hungary and began flying over Kosovo by late May.

Late May also ushered in the apex for air attacks against Serb ground forces. Improved weather and a KLA offensive in western Kosovo forced the Serbian 3rd Army out hiding and made the Serbs especially vulnerable to NATO air attacks. NATO increased the number of FACs and strikers for near continuous daylight operations until combat operations ceased on 10 June, 1999. A-10s then remained on airborne and ground CAS alert until the end of June as Serbian forces departed and NATO occupation ground forces entered Kosovo.

A-10 FAC TACTICS

The decision to use A-10 forward air controllers as mission commanders for daytime strike missions over Kosovo was based on the need to locate and attack

Photo of damaged A-10 at Skopje, Macedonia

the Serbian 3rd Army without the aid of a friendly ground force. Along with over 40,000 troops, the Serbians deployed a sophisticated Integrated Air Defence System (IADS), including a squadron of MiG 21s, mobile SA-6 radar-guided missiles, hundreds of shoulder-launched Man Portable Air Defence Systems (MANPADS) and AAA.[36] In response, NATO manned continuous air-to-air CAPs (Combat Air Patrol) to keep the MiGs in their underground bunkers, while Suppression of Enemy Air Defence (SEAD) fighters carrying HARMs (High Speed Anti-Radiation Missiles) and Marine and Navy EA-6B radar jammers kept the SA-6s silent.[37] Restrictions to flight operations below 15,000 feet further decreased the threat from MANPADS and AAA. A-10 FACs led up to 40-ship packages into Kosovo, comprised of aircraft from ten NATO countries. The A-10 FACs searched and located targets from medium altitude, then attacked and controlled strikes by NATO fighters onto the Serbian armour, artillery, trucks and AAA.[38]

This section depicts an actual A-10 FAC mission in late April, 1999. It includes the essential mission elements of visual reconnaissance, strike control, and strike, all conducted with extraordinary effort to minimise collateral damage to the hundreds of thousands of Kosovar refugees.

The first flight of the day, Cub 31, is scheduled to arrive on station in the eastern half of Kosovo, codenamed NBA, an hour after dawn.[39] The A-10 FACs fly single-seat in two-ship formations for additional mutual support and firepower. The mission commander, Cub 31, is a qualified forward air controller accompanied by his wingman, Cub 32. A total of four A-10 FAC 2-ships are required, two in the east and two in the west, to cover Kosovo for this three-hour vulnerability window. The Air Tasking Order (ATO) calls for three FAC packages during the day, followed by a single night vulnerability period to be controlled by F-16 FACs.[40]

In addition to being the FAC package mission commander, Cub 31 is assigned the duties of embedded Sandy.[41] Should one of the aircraft in the package be shot down, Cub 31 will assume Combat Search and Rescue (CSAR) mission command. These duties include locating and authenticating the survivor and suppressing any threat to the survivor or rescue helicopter. Other Sandys also escort the helicopter in and out of enemy territory. The insertion of Sandys into the FAC package reduces the response time by as much as two hours over the alternative of maintaining A-10 Sandys on strip alert.

Intel has spent the night surfing classified websites in search of potential targets.[42] They have prepared the daily 'Hog Menu du Jour,' a folder which today is composed of five photographs of Serbian armour and artillery taken by U-2s and national satellites.[43] An additional source of imagery comes from Tactical Reconnaissance (TACRECCE) photographs taken by Harrier GR7s collocated with the A-10s at Gioia del Colle Air base in south-eastern Italy.[44] The physical proximity of the two units allows for promising photos to be expedited to the next A-10 before launch. Unfortunately, only one photo of the five is less than 12 hours old and none have been taken within the last 6 hours.[45] Six hours is the threshold beyond which most FACs consider it unlikely the target will remain in place. While the Serbs tend to keep their vehicles stationary on a clear day, they will relocate them on overcast days and at night.

Cub 31 spends several minutes reviewing the frag order, including the SPINS (Special instructions) and the banners that accompany the ATO. Of particular interest are any changes to the Rules of Engagement (ROE). Altitude restrictions have remained fairly constant since the 14 April bombing of a refugee column. That incident has reduced to 5,000 feet the minimum altitude FACs may fly to positively identify targets.[46] What has changed are the restrictions to targets and the process for target approval. No-attack zones within 10 miles of the Macedonian border have created a sanctuary that Serbian armour has quickly taken advantage of.[47] Although strikers are still free to attack armour,

artillery, and AAA, concern over NATO cohesion in the face of another collateral damage incident means Cub must now get approval from the CAOC to attack any trucks.

Informed of the latest changes, Cub heads for the mass briefing room, an entire wall of which is dominated by a 1:50,000 scale map of Kosovo. On it are marked the latest updates on Serbian activity and NATO strikes from yesterday's missions. After the weather and intelligence briefings, Cub 31 quickly gives the other FACs the plan for the mission. Most of the information is already on the line-up cards, courtesy of the squadron's Mission Planning Cell (MPC). Co-ordination with other aircraft for this mission comes from Aviano Air Base in northern Italy, where the wing MPC has generated a mission data card. This includes all the aircraft callsigns, frequencies, tanker times and tracks, and a plethora of deconfliction information required to co-ordinate so many aircraft within such a confined airspace.

An hour prior to takeoff, Cub 31 dons his flight gear and checks out a pair of 12-power space-stabilised binoculars.[48] These binoculars are his primary means of positively identifying Serbian armour. Meeting his wingman at the duty desk, Cub 31 gets the tail number for his aircraft, and a final brief from the squadron supervisor before stepping to the jet.

A-10 AND A-10 FAC MUNITIONS LOAD

The A-10 'Warthog' is a great choice for a FAC aircraft for several reasons. The greatest advantage lies in its pilots, specifically trained in FAC, CAS, and CSAR missions. Most A-10 FACs have over one thousand hours in the airframe and have spent that time training to kill armies. The pilot is afforded

A-10 FAC flying over Macedonia with full combat load

exceptional visibility and an extensive communications suite of radios which provide UHF (including Have Quick II), VHF AM, and FM frequencies.[49] The jet has excellent self-protection capabilities: an ALR-69 Radar Warning Receiver (RWR), the ALQ-131 Electronic Combat Measures (ECM) pod, 120 bundles of chaff, and 180 flares. In addition, the rugged, twin-engine jet was designed to take hits; it comes equipped with a redundant flight control system and a titanium armoured cockpit.

The A-10 is a large fighter aircraft built around a 30mm, tank-killing Gatling Gun. With a total of eleven hardpoints on its wing, it can carry a wide variety of munitions. It also carries the Pave Penny Pod, a laser spot tracker that indicates in the Heads Up Display (HUD) the position on which a striker has trained its laser. This enables the FAC to confirm the target before strikers release their bombs. Although the A-10 is assigned primarily to daytime FACing over Kosovo, the jet is the first USAF fighter with a Night Vision Goggle (NVG) compatible cockpit. Its slow speed, for which it is often maligned, is a tremendous asset in the FAC role, allowing for longer, more accurate looks at targets than can be gained from faster aircraft.[50] Also, the fuel efficiency of its bypass fan engines gives the jet up to 1 hour of loiter time between refuellings. Such features have been critical to the success of A-10 FACs in locating Serbian positions.

The A-10's weapon load-out is custom built for the FAC mission. On the outside stations, stations 1 and 11, hang two AIM-9 (Air Interceptor Missile) heat-seeking missiles and the ALQ-131 ECM pod. The next inboard stations, 2 and 10, carry two rocket pods for a total of fourteen 2.75-inch Willie Pete (White Phosphorous) rockets.[51] Willie Petes are the primary method of marking targets as their smoke is easily seen by the naked eye or through a targeting pod.[52] Stations 3 and 9 boast two 500-lb., precision-guided AGM-65D (Air to Ground Missile) Maverick missiles. This infrared version of the missile locks onto the heat contrast between the target and its background. The long stand-off range and the 125-lb., shaped warhead make this fire-and-forget munition ideal against armour.[53] The centre stations 4, 5, 7, and 8 hold Mk-82 low drag, 500-lb. general purpose bombs configured with FMU-113 radar proximity fuses.[54] Detonation of the bomb at 10-25 feet above the ground enhances the fragmentation pattern and is more effective against mobile targets than an impact fuse. Internally, the seven-barrel GAU-8A Gatling Gun carries over 1,100 armour-piercing and high explosive rounds.

Though an exceptionally well-constructed Close Air Support aircraft, the A-10 has its weaknesses. Designed for low altitude flight, the aircraft is underpowered at medium altitude. It also lacks the technical sophistication of a radar, a GPS navigational system, a datalink, and a targeting pod.[55] The jet has a high radar cross section that makes it easily detectable by enemy radars and its slow speed makes it susceptible to AAA and MANPADS at low altitude.

A-10 FAC FLIGHT PROFILE

Upon takeoff from Gioia del Colle, Cub begins a turn to the east and climbs to Flight Level 190 (19,000 feet). The flight then contacts Magic, the NATO Airborne Early Warning (NAEW) aircraft responsible for airspace control over the Area of Responsibility (AOR).[56] It takes 45 minutes to cross the Adriatic and reach the tanker track over central Macedonia where a KC-135 is already waiting. After topping off the jets, Cub turns north and contacts Moonbeam for the first of their two vulnerability windows.

Moonbeam relays the CAOC's top two target priorities and confirms that both the required F-16 CJ HARM shooters and EA-6B jammers are on station. Cub 31 plots a course to these targets and updates his search plan. The sky over the southern half of the border is clear, but low clouds to the north threaten to blanket the entire valley. Cub 31 arms his weapons, his flares, and his electronic self-protection systems as he approaches the border. He begins searching the foothills along the major LOCs as he proceeds to the two CAOC target areas. Finding nothing at these locations, he moves on to check out his preplanned targets, comparing the terrain with the target photographs. When these do

A-10 FAC Flight Profile

not pan out, Cub continues to expand his search for the remainder of his 45-minute vulnerability window, looking for any unusual signs which might indicate enemy activity.

Bear 11, another two-ship of A-10 FACs, checks in on frequency, taking over control of NBA as Cub heads for the second tanker. After refuelling, the flight will return for a second vulnerability window. This sortie is scheduled for a total of 4.0 hours, of which 1:45 will be spent in Visual Reconnaissance/Strike Control (see Table 1 for an A-10 FAC mission profile).

A-10 FAC Mission Profile
April 1999

Reference Time (T Hour)	Takeoff Time
T minus 2:00	Premission Briefing
T	Takeoff
T – T+:45	Enroute to Macedonia tanker track
T+:45 – T+1:00	Refuelling (4-5,000 lb offload)
T+1:00 – T+1:45	Visual Reconnaissance/Strike Control
T+1:45 – T+2:15	Refuelling (4-5,000 lb offload)
T+2:15 – T+3:15	Visual Reconnaissance/Strike Control
T+3:15 – T+4:00	Return to base
Total Area Time	1:45
Total Flight Time	4:00

Table 1: A-10 Flight Profile

THREAT AVOIDANCE

The primary threat to the A-10 comes from heat-seeking MANPADS. Cub 31 limits this threat by remaining at 15,000 feet above ground level (AGL) to the maximum extent possible. When conducting lower altitude passes (5,000 – 10,000 feet) for target identification, he limits himself to one pass only and uses a combination of jinks and flares when climbing back up to altitude. Cub 32 trails a mile behind slightly above and offset from Cub 31. As a wingman, Cub 32's purpose in life is to provide mutual support by covering the lead and calling out all SAM launches.[57] This is a difficult task in the case of MANPADS launches, as the missiles are extremely fast and their pencil-thin smoke trail hard to see. Wingmen barely have time to call for flares before the missile zips through the flight.

As indicated before, one key to avoiding the hundreds of MANPADS spread throughout the Kosovo countryside is to limit the number of passes made on any given target. While this may seem commonsensical, the less obvious reason lies in the limitations of the aircraft. For the underpowered A-10, each pass bleeds off energy in terms of both altitude and airspeed. Diving attacks performed back-to-back leave the jet low and slow, vulnerable to attack during the climb back to altitude.

For SA-6 operators to get a kill they must to lock up the aircraft with the tracking radar and then launch a missile, which homes in on the reflected radar energy bouncing off the aircraft. However, the threat from the SA-6 is greatly diminished by the presence of HARM shooters. An F-16CJ or German ECR Tornado SEAD aircraft can launch HARMs at the SA-6 radar while it is illuminating its target. So the dilemma for the operators becomes whether or not to target strikers and run the risk of being killed. For the most part, the SA-6s in Kosovo have remained silent.

SA-6 operators have been even more reluctant to fire missiles during the day, when the huge, white smoke plume from the launch and rocket motor creates a prominent trail straight back to the operator's location. One A-10 FAC, tongue in cheek, believes the biggest threat from an SA-6 launch is the potential for a mid-air collision of fighters in pursuit of the smoke trail, all vying for the kill. This has hardly been the case at night, however. Although an SA-6 launch is easy to see, its precise whereabouts have proven difficult to locate, even with targeting pods and NVGs.

Remains of a destroyed SA-6 launcher abandoned in Kosovo

AAA is in abundance but easily avoided by staying above 5,000 feet. Most of the AAA is 37 mm or less, with only a few 57mm pieces and no radar-guided AAA in Kosovo. The only visible signs of AAA fire during the day are the small, white clouds that appear as shells explode below the jets. Given that, it is still difficult to locate the gun positions. Unlike night-time operations, when tracers and muzzle flashes are evident, the use of muzzle flash guards on AAA barrels prevents the daytime sighting of all but the small, brown dust clouds generated as the rounds are fired. Even then, the A-10 FAC must be looking directly at the AAA pit when it is firing in order to see the dust kick up. Small arms, on the other hand, have a distinct red muzzle flash which is easily identifiable, particularly if the they are fired from a shaded area. More than one Serbian infantry company has highlighted its position by recklessly firing at A-10s circling overhead.

VISUAL RECONNAISSANCE AND TARGET IDENTIFICATION

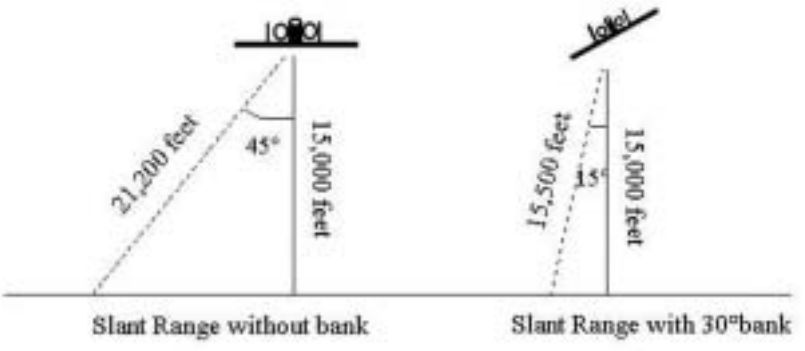
The most important quality of a good FAC is the ability to locate targets. A saying among the A-10 FACs is, '95% of tactics is simply finding the target.' First, it takes hours of visual reconnaissance to get sufficiently familiar with the area to begin to discern Serbian armour and artillery. Although Kosovo is 60 x 60 miles, the Serbian army operates in a relatively small area in and around the larger towns, along the major LOCs, and near the border. Learning where not to look streamlines the VR effort. Pre-mission study of the reported Serbian positions helps determine where the focus of the day will be. If unsuccessful, the scope can then be increased to widen the search area.

The key to locating targets is knowing what indicators to look for. The first rule is to note anything unusual or out of place. Clues are as subtle as knowing that Kosovo farmers, when harvesting hay, produce several large bales of hay per field. A field with only one or two large, rectangular hay bales warrants closer inspection and may reveal a tank's main gun barrel protruding through the straw.[58] As the spring rains begin to subside and the ground begins to dry, the night-time movement of the heavy military vehicles produces tracks in the grass. The soil is tan in colour, leaving visible tracks in a tank's path. The tracks leading from an empty berm may be used to locate Serb armour hidden in a nearby barn or tree line. In forests, any shape with a 90-degree angle is suspicious. In addition, the Serbs, knowing A-10 FACs will not strike civilian vehicles, have begun using white buses for transporting troops. A bus parked near a stand of trees is a neon billboard to a smart FAC to begin a search of those woods. Though a trail leading to berms inside a stand of trees may seem well concealed, it actually stands out when viewed from directly overhead. Even Serbian Army barracks already destroyed by NATO bombs can be a lucrative location to start a search. The area may still be home to some of the Serbian soldiers and stray vehicles can be found in and near the compounds. Such insights and trade secrets are often exchanged between FACs at the squadron after a mission or at a restaurant over the evening meal.

Second, a disciplined scan pattern has to be developed, along with a proficiency in the use of binoculars. While aircraft vibration makes it difficult to focus high power binoculars, the introduction of commercially available, space-stabilised binoculars has alleviated this problem. From 15,000 feet it is now possible for a skilled FAC to identify armour and even distinguish between tanks, APCs and self-propelled artillery. With the naked eye, he first selects an area of interest, then concentrates on a specific point for 3-4 seconds before moving to the next.[59] The binoculars are not used until a potential target has been located. Due to the narrow field of view of the binoculars, it takes practice for the FAC to be able to relocate the target while looking through the binoculars. He must first note a nearby prominent landmark to ease the transition before peering through the lens. Likewise, once a target is

identified and before the binoculars are put down, the relationship between the target and the landmark is noted. More than one Serbian tank has escaped because the failure of a FAC to relocate it after lowering his binoculars.

One flight technique for reducing the slant range when viewing targets is to keep the jet in a 30-degree bank, this allows the pilot to search almost directly underneath the jet's flight path. As seen in the figure below, this reduces the slant range by over a mile in comparison to a level flight path.[6]



Decreasing VR slant range with bank angle[61]

Finally, some FACs are simply better at finding targets than others. Good mission prep, a positive attitude, and keen vision seem to be common denominators of exceptional FACs. Even a highly skilled FAC can use the help of other assets, though, the most important of which are the Joint Surveillance Target Attack Radar System (JSTARS) and the USAF Predator Unmanned Aerial Vehicle (UAV).

JSTARS

JSTARS is a long range, air-to-ground surveillance system on board an E-8C, a modified Boeing 707. It consists of a Synthetic Aperture Radar (SAR), capable of producing a radar image of a selected area, and a Moving Target Indicator (MTI), designed to locate slow-moving ground targets. JSTARS has the unique capability of tracking hundreds of vehicles throughout Kosovo with its MTI, but lacks a viable onboard target identification system.[62] While JSTARS can see all the vehicles moving around Kosovo, it cannot distinguish a T-72 tank from a tractor pulling a trailer loaded with refugees.[63] Collateral damage concerns, which dictate a visual target identification criterion, greatly reduce the potential utility of JSTARS in this conflict. To overcome this challenge, JSTARS has developed tactics to correlate its tracking data with positive target identification from UAVs and has, on occasion, been able to provide real time targeting information to FACs.

While UAVs such as the Predator have been used in the past for surveillance, they also show great promise in locating and identifying targets from low altitude without risk to pilots. Over Kosovo, Predators conduct surveillance and for the first time provide real time targeting information to the A-10 FACs flying overhead. The effectiveness of the tactics is somewhat limited by the lack of previous Predator experience with FAC procedures, making tasks such as altitude deconfliction and target talk-ons difficult.[64] Although UAVs have never been fully integrated into the ATO with strike packages before, operational techniques have quickly been patched together to test their capabilities. Qualified ground FACs at the CAOC can now monitor the Predator's video and conduct target talk-ons directly with A-10 FACs overflying the target area.[65]

The occasions when such efforts have proven successful provide a glimpse into the real time use of UAV platforms with conventional strike aircraft. On one occasion, Moonbeam directed Uzi 11, an A-10 FAC flight, to a specific set of co-ordinates.[66] Once there, they received a target talk-on from the CAOC's ground FAC to an L-shaped building. Given immediate permission to attack the building, they struck it with three 500-lb. bombs. Later, when Predator detected Serbian soldiers walking next to the building, the flight was directed to re-attack the site.

RQ-1 Predator

Despite the aid of JSTARS and the Predator, the efforts of Serbian 3rd Army at concealment and deception continue to complicate target identification. The Serbs have placed their armour in such politically sensitive locations as next to churches and inside houses. They have also placed dozens of artillery and armour decoys throughout Kosovo to draw off NATO bombers. Although it is very difficult to tell the difference between real armour and decoys from altitude, the A-10 FACs have developed a few tactics to compensate. The simplest way to determine if a target is a decoy is to blow it up; if there is nothing left of the target afterwards, then it was a decoy.[67] Still other decoys are conspicuous because of their location. If a tank is sitting out in the middle of a field in broad daylight, it is likely a decoy. Another telltale sign is the lack of any fresh track marks or other indications of recent vehicle movement in the area. Again, the only way to know for sure is to blow it up. The thought of wasting munitions, particularly expensive precision-guided weapons is disconcerting to most FACs. No one wants to make the mission report that they have just killed an inflatable tank decoy with a $100,000 Maverick missile. Still, to pass up on a target simply because it looks too good to be true is self-defeating. There have been many instances of FACs taking a target for a decoy, only to be pleasantly surprised when it sends up a secondary explosion.

The FAC mission of Swine 01, ended in just such a discovery.[68] Locating an incredible ten artillery pieces, Swine directed British Harriers to drop a single Mk 83, 1,000-lb. bomb onto one of the 'decoys.' When a massive explosion rose up from ammunition stored nearby the pit, Swine moved in for more kills, attacking and controlling the Harriers and some F-15Es for strikes on all the remaining pits.[69]

Artillery Decoy

Artillery Destroyed by Swine 01

A-10 STRIKE CONTROL

Once Cub 31 has identified a target as valid, he must determine what aircraft and weapons can best be used to attack it. Along with the weapons carried by his flight, there are also NATO fighters scheduled throughout the vulnerability window. These strikers have been given secondary targets on which to drop their bombs if the FAC does not find fresh targets.[70] NATO strikers potentially available to Cub come from 9 different nations (see table 2).[71] The arsenal varies greatly from F-15E Strike Eagles carrying laser-guided bombs to Italian AMX fighters with neither precision munitions nor a computing weapons delivery system for the Mk-82s they do carry. Although B-2 and F-18 aircraft carry the newest GPS munitions, these weapons are not made available to the FAC missions. Still, the majority of strikers are fully capable of hitting the targets assigned them. Once an A-10 FAC identifies a target, it can be destroyed.

U.S.	A-10, F-16CG, F-15E, F-14, F-18, AV-8B, F/A-18D
France	Super Etendard, Jaguar
U.K.	Harrier GR7
Netherlands	F-16AM
Belgium	F-16A
Canada	CF-18
Spain	EF-18
Italy	Tornado IDS, AMX
Turkey	TF-16

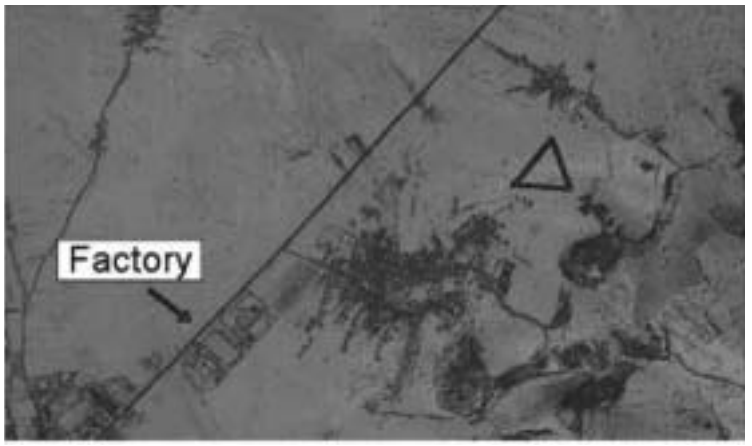
NATO Strike Aircraft[72]

The weapons to be used, then, depend upon the nature of the target found. Precision weapons, such as laser-guided bombs or the Maverick, are required against tanks, artillery, and AAA. These targets are either armoured or protected by earthen berms and require a direct hit to be taken out. CBU and general purpose bombs are best used against soft-skinned vehicles and dispersed targets, such as troops in a tree line.

Returning for the second vulnerability window, Cub 31 finds that clouds have moved in, leaving only the south-eastern part of NBA visible. Cub heads to the city of Gnjilane to begin a search of the surrounding foothills where there has been previous enemy activity. Locating a row of 8 freshly occupied artillery pits, he calls up Moonbeam, who quickly lines up a 2-ship of CF-18s, callsign Merc 11.[73] The CF-18s are carrying 500-lb laser-guided bombs (LGBs). Cub passes co-ordinates, gives them a target area update and begins a talk-on. 'Call visual the factory that is just east of the huge town that is on the east-west hardball.' G-town (Gnjilane) is the only large town in eastern Kosovo. On the east side of G-town is an enormous factory complex next to the highway, leading east out of the town.

Target area near Gnjilane

Merc 11 replies, 'Copy. I see one factory. Large structure has a blue roof building to the west.' Merc 11 not only responds that he sees the factory, but he confirms it by giving a positive description of a distinct feature.



1:5 metre imagery of target area

'That's affirmative, let's use that factory east-west one unit. From the eastern edge of factory go two… let's make that three units east on hardball. Then use factory from hard-ball. You'll see a pull-off on the north side of the hardball. Go one unit to the south off the hardball. In between two small towns you'll see some light revetments.' Cub continues the talk-on by setting the length of the factory complex east to west as a unit. He treats that unit as a yardstick and measures the distance along the road to another feature (a pull-off). He talks Merc 11 down between two towns where the artillery is lying.

Merc 11 responds, 'Copy light revetments, there appears to be 4 to the south and 4-5 to the north.' Merc 11 has the revetments in sight and again gives a description of what he sees. The revetments appear light due to the light sandy soil in this region of Kosovo in contrast to the darker green grass of the field where the revetments have been dug.

'Copy. That is affirmative. Say your laser code.' Cub wants the laser code to enter in his Pave Penny Pod to ensure Merc's laser is actually pointed at the right target.

'Laser code is 1633.'

Merc is ready to attack and extends to the south-east some ten miles from the target for his run in. Cub clears Merc to drop when he calls inbound. Merc shacks (directly hits) the artillery piece. He sets up for a subsequent attack and takes out another piece before running low on fuel and departing.

In the meantime, Dragon 61, a 2-ship of F-15Es checks in carrying 500-lb. LGBs as well. Dragon locks up Cub with his air-to-air radar. Dragon is to call when he is visual Cub, a fairly easy task, as a 2-ship of A-10s circling a target looks like a pair of large Xs in the sky. Dragon calls visual and Cub rolls in to mark, this time with Willy Pete rockets. He shoots three rockets, expecting to get them to blossom into small white phosphorus clouds near the target. As long as Dragon is watching the general target area he will easily see the smoke generated by the rockets.

With the A-10's computing weapons delivery system, an accurate rocket can be shot from as far off as 4 miles slant range. This allows Cub to recover well above 10,000 feet. He shoots multiple rockets in case one is a dud. He can also refer to the distance between the rockets as an additional unit of measure, if necessary. In this case, though, the rockets land next to the arty pits.

Dragon 61 confirms the smokes, '61 is contact two smokes.'

'Copy. Look at the further north-east smoke. It's sitting just on the east side of four arty pits south of a

road.' Even though the smokes are visible, the arty pits are so small that Cub has to ensure Dragon has them in sight.

Dragon calls contact the target area. Cub is starting to run low on fuel and wants to get the F-15Es dropping as soon as possible. Dragon is not a FAC and therefore not authorised to pick his own target to drop on. He can, however, continue an attack once Cub gives him permission. Cub passes Dragon control of the targets. 'You have flight lead control on that target area. I'd like [you] to take out as many of the arty sites [as you can] at that position. Two have already been struck. Those are two just north of the east-west road.'

Cub 31 departs for the tanker and Dragon continues his attack, destroying an additional three artillery pieces. Heading home, Cub 31 contacts Moonbeam and passes on the BDA for his flight and the fighters he has controlled.

Serbian Artillery Piece destroyed by F-15E controlled by A-10 FAC[74]

Not all attacks run so smoothly. In this case, these artillery pits were found in an open field with little risk of collateral damage. Also, there were no AAA or MANPADS launches seen, although the area is known for having active air defences. Likewise, two sets of precision bomb dropping strikers were readily available, both of which were manned by native English speakers. Though the official language for NATO is English, there is a considerable range of language skills among pilots, with particular difficulties for those from nations such as Turkey and France.[75]

A-10 STRIKE

An advantage that Cub 31 has is the large number of munitions that he and his wingman carry. This gives Cub the option of destroying targets without having to call in strikers, a capability especially useful against fleeting targets. Although, for the most part, the Serbs do not move their vehicles under clear skies, an occasional mobile APC or tank will be spotted. Other fleeting targets include those in areas where cloud cover is beginning to form. The weather over Kosovo for much of April has been chronically disruptive to strikes. In this case, there may not be time to bring in other fighters before the hole in the clouds closes up. This added flexibility for A-10 FACs has proven a great asset.

Against armour, the weapon of choice is the AGM-65 Maverick. As long as there is good heat contrast, Cub can fire this 500-lb. air-to-surface missile from 3-4 miles out.[76] The Maverick, while good at killing armour, does not make for a good mark. Too often, Cub has to come off target dry (without firing) because of inadequate contrast. Also, unless the strike produces secondary explosions, the fighters will not be able to see the impact. Cub therefore reserves his Mavericks for armour and other precision deliveries, such as those against dug-in artillery pieces.

A-10 firing an AGM-65 Maverick

The four Mk-82 airburst bombs that Cub carries are excellent against soft targets. With the computing sight on board, the bombs can be delivered very accurately, even against individual vehicles. They can also be used as marks, adding killing power beyond that of a rocket.[77] However, the cloud generated from a Mk-82 dissipates rapidly and, unless a fighter is looking directly at the target area at impact, he will likely miss the mark. Also, the bomb cloud is darker, providing less contrast than that of a Willie Pete mark.

The last weapon available to Cub is the 30mm gun, which he uses as his tertiary weapon. As an embedded Sandy, he must reserve half of the rounds for use in case a rescue is required. Also, the extreme slant ranges required at medium altitude greatly reduce the gun's armor killing potential.[78] To enhance its effectiveness, Cub must descend to below 10,000 feet. Given the shortage of targets and the wide availability of other weapons, he rarely resorts to the gun.

RETURN TO BASE

Cub lands at Gioia del Colle 4.0 hours after departure. Upon landing, the pilots head straight to intelligence. Cub 31 goes to the briefing map and points out all the target areas identified and those attacked. The next set of A-10 FACs are just arriving for their briefing, allowing Cub 31 to take the mission commander aside for an update on the weather in Kosovo and likely target areas.[79] Next, Cub 31 and 32 must review their HUD videotapes and answer any additional questions for the intelligence mission report. Cub 31 then debriefs his wingman over a sandwich before heading to the hotel for their 12-hour crew rest for tomorrow's mission.

A-10 FAC EFFECTIVENESS

Measuring the effectiveness of A-10 FAC operations is difficult. Clearly, NATO strikes failed to prevent Serbian ground forces from conducting widespread ethnic cleansing operations against Kosovar Albanians. In fact, the majority of Serbian atrocities occurred prior to the start of A-10 FAC operations.[80] Other critics claim the attacks against the Serbian 3rd Army had only a marginal impact on Slobodan Milosevic's decision to capitulate. They point instead to other factors, such as strategic strikes on Belgrade, the withdrawal of Russian political support, and even the remote threat of a NATO ground invasion.[81] Still others assess the direct attacks as inefficient. One senior Air Force officer estimated that as many as 15 sorties were required to kill a single Serbian tank.[82] However, others have pointed to desertions by Serbian soldiers and to civilian demonstrations against the deployment of further army reserve units to Kosovo as evidence of the influence the attacks against the Serb 3rd army was having on Serbia.[83]

Yet, A-10 FACs were indeed successful in keeping the Serbian 3rd Army from using its armor to conduct ethnic cleansing operations. In order to empty a village, the standard operating procedure of the Serbian Army had been to take a company of tanks and form a wide horseshoe around the village, with the opening of the horseshoe pointed toward the nearest border.[84] Serbian para-military police would then enter the village and grant the villagers as little as 30 minutes to leave their homes with whatever possessions they could manage to take with them. The introduction of A-10 FACs stopped the use of these tactics. The Serbs had to hide during the day and disperse their equipment to avoid detection. The threat from A-10s circling overhead forced the Serbs into a defensive posture, slowing their daytime movements and reducing the effectiveness of subsequent attacks on Kosovar civilians.

Unfortunately, the Serbs adapted by using civilian vehicles to continue their attacks. While A-10 FACs had the ability to keep the roads clear of all vehicle movement, NATO's concern over collateral damage prevented such strikes. The 14 April attack on a Kosovar refugee column by NATO fighters made the situation particularly tense. Serbian soldiers were free to jump out of their APCs and into Kosovar Albanian's abandoned Yugos to continue their operations. The requirement for positive identification of all vehicles severely restricted the use of JSTARS, as well as all nocturnal FAC operations. While FACs using NVGs and targeting pods could locate moving vehicles, these night devices lacked the clarity required for positive target identification. While U.S. fighters over Kosovo had the capability to destroy targets they lacked the permission to do so.

In addition to target ID requirements, theatre ROE also restricted most NATO aircraft to above 15,000 feet. This meant that cloud decks over Kosovo could be no lower than 20,000 feet for A-10 FACs to operate.[85] As the campaign progressed, the poor weather of late March and early April gave way to

blue skies in late April and May. This granted A-10 FACs more coverage time, greatly increasing the number of targets identified and attacked. Likewise, the number of Serbian claims of collateral damage began to rise. In response the CAOC systematically wrested control authority away from the FACs. By June, FACs were forced to seek clearance for attack on each target acquired.

The refusal of U.S. political leadership to deploy ground forces further complicated matters. This freed Serbian forces to defend almost exclusively against attack from the air. Serbian armor, which would have been lined up to protect entry routes from Albania and Macedonia, was instead dispersed throughout Kosovo. This lack of a ground threat greatly vexed the air campaign, making the A-10 FAC mission all the harder. A-10 FACs did take advantage of the Kosovo Liberation Army's offensive in Western Kosovo which forced Serbian forces out of hiding. Though the KLA was soundly defeated, the Serbs suffered mounting losses from NATO strikes just days before Milosevic capitulated.

The final critique of A-10 FAC operations lies in the assessment of attrition to the Serbian 3rd Army during the 78-day air campaign. However, producing an accurate assessment proved just as problematic as locating and identifying Serbian armour. Unlike Desert Storm mission objectives, which called for a 50% attrition of Iraqi armour, no such quantitative objective was ever set for Kosovo. Furthermore, the total number of Serbian armoured vehicles in Kosovo was never well tracked, leaving no way for NATO intelligence to adequately assess attrition rates, even if that had been an objective.

The question of BDA count was not raised until after the war when the press filmed the Serbian 3rd Army as it withdrew from Kosovo. The measure of effectiveness of the air attacks was then reduced to the question of how much armour was destroyed. In a September, 1999 NATO news conference, General Clark was asked how much of the 3rd Army was destroyed, to which he simply replied, 'Enough.'[86] This alludes to the fact that NATO air strikes against the Serbs in Kosovo were designed for coercion, not attrition. Two of NATO's objectives were those of deterring Serbian action against the Kosovar Albanians and of reducing the ability of the Serbian military to continue offensive operations. The success in meeting these objectives was measured not by the number of vehicles destroyed, but by the action of the Serbs. In the end, the Serbs conceded to NATO demands and withdrew from Kosovo.

Nonetheless, the fact remains that the primary target of NATO warplanes over Kosovo was the 3rd Army's armour and artillery. It seems reasonable that an accurate BDA would shed light upon the effectiveness of attacking fielded forces at the tactical level. Unfortunately, BDA has been clouded by controversy since the final day of strikes. Table 3 reflects the BDA reported from several sources. Regardless of which set of numbers are closest to being accurate, having an accurate number/percentage of vehicles destroyed is meaningless without a yardstick to measure overall effectiveness.

BDA Source	Tanks	APCs	Artillery
Shelton, 10 June 99	120	220	450
Serbian, 16 June 99	13	6	27
Newsweek 15 May 00	14	18	20
NATO, 16 Sep 99	93	153	389

Table 3: Allied Force Tactical BDA estimates[87]

CONCLUSION

The intent of this article has been to depict a typical A-10 FAC sortie from briefing to debrief. The tactics used by A-10 FACs have been followed from visual reconnaissance to strike control to target attack. Though fewer than forty A-10 aircraft were flown over Kosovo, they became the focal point of NATO attacks against the Serbian 3rd Army. With limited imagery, JSTARS hampered by ROE, and Predator integration in its infancy, A-10 FACs were forced to rely on their own skill and cunning at finding targets. U.S. ground forces were prevented from entering Kosovo to assist in locating and identifying the enemy. The difficulty of positively identifying camouflaged military equipment from 15,000 feet, along with the restrictions on which the targets could be struck, further complicated this already complex mission. Though helpless in keeping the Serbs from systematically expelling Kosovars from their homes, A-10 FACs did stop the Serbs from using their military equipment to do so and ate away at the 3rd Army's combat capability, as well as the Army's political support for Milosevic's ethnic cleansing campaign.

The A-10 proved an excellent platform for conducting daylight FAC operations over Kosovo. Trained in the use of space-stabilised binoculars, A-10 pilots could reliably distinguish civilian from military vehicles, isolate valid targets, and control a plethora of NATO strikers.[88] The large quantity and variety of weapons aboard the airframe itself insured that targets meeting the stringent ROE were attacked and destroyed.

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[1] Christopher Haave and Phil Haun, *A-10s over Kosovo,* (Maxwell Air Base, Alabama: Air University Press, 2002), 303.

[2] Noel Malcolm, *Kosovo: A Short History.* (New York: New York University Press, 1998), 341.

[3] Tim Judah, *Kosovo: War and Revenge.* (New Haven, CT.: Yale University Press, 2000), 62.

[4] For purposes of this discussion, Kosovar refers to Kosovar Albanians.

[5] William Buckley (ed.), *Kosovo: Contending Voices on Balkan Interventions.* (Grand Rapids, M.I.: William B. Eerdmans Publishing Co., 2000), 100. For purposes of this discussion Serbia and Serbian will be used to refer to those forces from the Federal Republic of Yugoslav. Likewise, Macedonia will be used to refer to the Former Yugoslav Republic of Macedonia.

[6] Judah, 171.

[7] Unites States Central Intelligence Agency Map, Available on line: www.lib.utexas.edu/maps/europe/serbia_montenegro_pol_97.jpg, accessed 18 Nov, 2001.

[8] United Nations, Security Council Resolution 1160 (1998), Available on-line: www.un.org/Docs/scres/1998/sres1160.htm. Accessed 15 Nov, 2001. United Nations, Security Council Resolution 1199(1998), Available on-line: www.un.org/Docs/scres/1998/sres1199.htm. Accessed 15 Nov, 2001.

[9] Dick Leurdijk and Dick Zandee, *Kosovo: From Crisis to Crisis.* (Burlington, VT: Ashgate Publishing Co, 2001), 34. Though the insertion of 2,000 Organization for Security and Cooperation in Europe (OSCE) observers were agreed to, OSCE was never able to get that many into country before their withdrawal in March, 1999. U.S. State Department, *Erasing History: Ethnic Cleansing in Kosovo.* 6.

[10] Albert Schnabel and Ramesh Thakur (ed.), *Kosovo and the Challenge of Humanitarian Intervention: Selective Indignation, Collective Action, and International Citizenship.* (New York: United Nations University Press, 2000), 35.

[11] Judah, 195. While Serbia was threatened by the air strikes if they did not come to an agreement, Kosovars were threatened by the possibility of NATO leaving them to the mercy of the Serbs if they did not sign.

[12] Ibid., 206.

[13] Ministry of Defence, *Kosovo: Lessons from the Crisis,* (London: The Stationery Office, 2000), 9.

[14] Paul Strickland, 'USAF Aerospace-Power Doctrine: Decisive or Coercive?' *Aerospace Power Journal,* (Maxwell Air Force Base, AL, Fall 2000), 16.

[15] Ministry of Defence, *Kosovo: Lessons from the Crisis,* 34.

[16] Wesley Clark, *Waging Modern War.* (New York: PublicAffairs, 2001), 176.

[17] Strickland, 21.

[18] HQ/USAFE Initial Report. *The Air War over Serbia: Aerospace Power in Operation Allied Force.* 25 April, 2000, 9.

[19] Unites States Central Intelligence Agency Map, Available on line: www.lib.utexas.edu/maps/europe/kosovo_93.jpg, accessed 18 November 2001.

[20] United States Department of State, *Erasing History: Ethnic Cleansing in Kosovo*. May 1999, 6.

[21] *AWOS Initial Report*, 15.

[22] Ministry of Defence, *Kosovo: Lessons from the Crisis,* 34.

[23] *AWOS Initial Report* , 16. By the end of the war the number of USAF aircraft alone would rise to over 500.

[24] R. Jeffrey Smith and William Drozdiak, *Anatomy of a Purge*, Washington Post, April 11, 1999, A1.

[25] Lt Col Phil M. Haun, A-10 unpublished war diary. F-16CG (Block 40) FACs with LANTIRN targeting pods were also used primarily as night FACs. FAC duties eventually expanded to include US Navy F-14s and Marine F/A-18D Hornets.

[26] Steven Lee Myers, 'Serb Forces Under Attack as Weather Clears,' *The New York Times,* 6 April, 1999. By this time, over 400,000 Kosovar Albanians had crossed over into Albania and Macedonia. Christopher Haave and Phil Haun (ed.), *A-10s over Kosovo*, (Maxwell Air Base, Ala: Air University Press, 2002), 23.

[27] The 81st Fighter Squadron was relieved to some degree from the continual deployment to Aviano by other active, reserve, and guard A-10 units from 1993-97.

[28] Haave, 15. The total number of A-10s continued to grow during the War reaching 23 aircraft with the 81st at Gioia Del Colle, Italy and an additional 18 Air Force Reserve aircraft at Trapani, Sicily.

[29] USAF Official photograph accessed online at www.af.mil/photos/fighters2.shtml, 9 Jan 02.

[30] Ibid., 42.

[31] SANDY was the callsign for A-1D Skyraiders that performed on-scene command of CSARs during Vietnam. A-10s continue to use the SANDY callsign to this day to signify the type mission being conducted.

[32] Though there was a shortage of aircraft, there were enough aircrew available to turn the EA-6Bs and F-16CJs for day and night operations. All conventional fighter and bomber aircraft operating in Serbia or Kosovo were required to operate with jamming and SEAD support.

[33] An additional 5 aircraft from the 74th FS at Pope AFB, North Carolina arrived in late April with 5 aircraft, 9 pilots and 65 maintenance personnel to augment 81st FS operations.

[34] Haave, 22.

[35] Ibid., 43.

[36] *AWOS, Initial Report*, 9.

[37] Phil Haun, 'Airpower Versus a Fielded Army: A Construct for Air Operations in the 21st Century', *The Royal Air Force Air Power Review,* Winter 2001, 74.

[38] Haave, 39.

[39] The western half of Kosovo was codenamed NFL.

[40] Haave, 40. The length and number of vulnerability periods increased as additional FACs, including Navy F-14s and Marine F/A-18Ds, arrived in theater.

[41] Only Sandy qualified A-10 FACs were designated as embedded Sandys.

[42] Captain Larry Card, A-10 FAC 74th Fighter Squadron, Weapon Questionnaire Gioia Del Colle, Italy, June 1999.

[43] Haave, 146.

[44] Captain Chris Short, A-10 FAC 81st Fighter Squadron, Weapons Questionnaire Gioia Del Colle, Italy June 1999.

[45] Captain 'Itch' Callich, A-10 FAC, Weapons Questionnaire Gioia Del Colle, Italy June 1999.

[46] Ibid., 149.

[47] Haave 151.

[48] The squadron also had Canon 15-power, space-stabilized binoculars, slightly larger than the 12-power binoculars. The squadron A-10 FACs were split down the middle on which they preferred to carry.

[49] Have Quick II is a jam-resistant, frequency hopping UHF radio. In addition, the A-10 has a KY-58 secure radio for its UHF and FM radios.

[50] The A-10 has a top speed of 350 KIAS, compared to the more common 450 – 550 KIAS flown by other fighters.

[51] Haave, 50.

[52] Captain Richard Johnson, A-10 FAC 81st Fighter Squadron Weapons Questionnaire Gioia Del Colle, Italy, June 1999.

[53] *Weapons File 1999,* 2-2.

[54] Station 6 is the center line station, but cannot be used if 5 and 7 are loaded.

[55] The A-10 has now been upgraded with a GPS inertial navigational system.

[56] NAEW looks similar to a U.S. AWACS, however NAEW does not have the manning, communications suite, or train to control mass strike packages as does AWACS.

[57] Captain 'Boo' Bullard, A-10 pilot 74th Fighter Squadron Weapons Questionnaire Gioia Del Colle, Italy, June 1999.

[58] Dave Gross, 'This Time It's Real,' *A-10s over Kosovo,* Chris Haave (ed.), 71.

[59] Major Wade Thompson, A-10 FAC 81st Fighter Squadron Weapons Questionnaire Gioia Del Colle, Italy, June 1999.

[60] Captain James Meger, A-10 FAC 81st Fighter Squadron Weapons Questionnaire Gioia Del Colle, Italy, June 1999.

[61] The A-10's cockpit visibility allows for a downward 45÷ view angle in level flight.

[62] Major Pete Brotherton, A-10 FAC 81st Fighter Squadron, Weapons Questionnaire Gioia Del Colle, Italy, June 1999.

[63] Phil Haun, *RAF Air Power Review,* 77.

[64] Captain John Cherrey, A-10 AFAC 81st Fighter Squadron, Weapons Questionnaire Gioia Del Colle, Italy, June 1999.

[65] Haave, 214.

[66] 11 May, 1999. Mark Koechle, 'Big Brother' *A-10s over Kosovo,* Chris Haave (ed.), 249.

[67] The Serbs also placed some antiquated tanks out in the open.. Since these were real tanks, it was impossible to distinguish them from more modern tanks from altitude.

[68] 7 June, 1999, 2 days prior to cease-fire.

[69] The validity of the artillery pits was confirmed by the NATO Mission Effectiveness Assessment (MEA) team, which went to the location after the war and found the destroyed artillery. It was suggested by the team that the late date of the attack did not allow the Serbs enough time to remove the artillery before their departure from Kosovo.

[70] These secondary targets, commonly called dump targets, include Serbian Army barracks, weapons storage bunkers, and other fixed Serbian military targets. By the end of the conflict, these targets had been obliterated.

[71] Germany did not provide strike aircraft but did send ECR Tornados for SEAD support.

[72] Haave, 41.

[73] Haun, 'A-10s over Kosovo', *Flight Journal Magazine,* August 2001, 41. The following strike was flown by the author on 15 April, 1999.

[74] This artillery piece was destroyed on 7 June 99, by an F-15E's laser-guided bomb. The target was located and the F-15Es controlled by an A-10 FAC.

[75] Pilots from Germany, Belgium, and the Netherlands have little difficulty with English since most already have excellent English skills and many have been through pilot training in the United States.

[76] Captain James Meger, A-10 FAC 81st Fighter Squadron Weapons Questionnaire, Gioia Del Colle, Italy, June 1999.

[77] Captain John Cherrey, A-10 FAC 81st Fighter Squadron Weapons Questionnaire, Gioia Del Colle, Italy, June 1999.

[78] Captain Michael Shenk, A-10 FAC 81st Fighter Squadron Weapons Questionnaire Gioia Del Colle, Italy, June 1999.

[79] Captain Joseph Brosious, A-10 FAC 81st Fighter Squadron Weapons Questionnaire Gioia Del Colle, Italy, June 1999.

[80] *Air War Over Serbia, Initial Report*, 15.

[81] Daniel Byman, 'Kosovo and the Great Air Power Debate,' (International Security, Vol. 24, Spring 2000), 5.

[82] U.S. General Accounting Office, *Kosovo Air Operations: Need to Maintain Alliance Cohesion Resulted in Doctrinal Departures,* July, 2001, GAO-01-784, 11.

[83] 'Kosovo and Around It: Bargaining Goes On,' *Belgrade BETA,* 20 May 1999.

[84] The Serbian ethnic cleansing operations of January, 1999, Operation Horseshoe, was so called because of the characteristic formation of Serbian armor.

[85] Although A-10 FACs could operate below lower clouds, the necessity for SEAD and Jammers on station increased the minimum weather ceiling.

[86] Wesley Clark, General (USA) and John Corley, Brig General (USAF) at NATO press conference, Brussels, 16 Sep 1999. www.eucom.mil/operations/af/nato/1999/meabriefing.html, accessed 24 Feb, 2002.

[87] Secretary of Defense, William Cohen, and Chairman of the Joint Chiefs of Staff, General Henry Shelton, provided an initial BDA assessment in a 10 June, 1999 briefing. Henry H. Shelton, Chairman Joint Chief of Staff briefing, Washington, DC: www.defenselink.mil/news/Jun1999/t06101999_t0610asd.html. 10 June, 1999. These numbers were refuted by a much lower total given on 16 June, 1999 by Serb Army Lieutenant General Nebojsa Pavkovic. Rebecca Grant, 'True Blue: The Real Story Behind the Kosovo Numbers Game,' AFA Issue Brief, 1 June, 2000. www.afa.org/library/issues/trueblue.html. · By mid-July, General Clark ordered an Air Force Mission Effectiveness Analysis (MEA) team to go see what was on the ground. General Clark then gave NATO's BDA assessment on 16 Sep, which was similar to Cohen and Shelton's assessment. The numbers are slightly lower because of multiple strikes, which had previously been double counted. Wesley Clark, General (USA), and John Corley, Brig General (USAF), at NATO press conference, Brussels, Belgium, 16 Sep, 1999.

[88] Marty McDonough, 'The Call Sign was Cub 31,' *A-10s over Kosovo,* Chris Haave (ed.,), 180. This is evidenced by the 14 April attack on the Kosovar refugee column by F-16CJ FACs. The CAOC called upon A-10 FACs to verify the targets as military. Upon finding tractors and refugees near the destroyed vehicles, the FACs promptly called off the attack.