Aerial Surveillance: Eyes in the Sky*

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Military patrols by foot, jeep, and armoured personnel carriers are the norm in UN peacekeeping. Fixed observation posts and road checkpoints also contribute to missions. Such ground-level surveillance is obviously indispensable for gaining situational awareness, but there are distinct advantages to observation from the air.

While the United Nations has conducted aerial reconnaissance in some of its operations, the use of observation aircraft in peacekeeping has been ad hoc and unsystematized in both doctrine and practice. Dedicated observation aircraft were employed in the United Nations Emergency Force in the Sinai (1956–1967)[1] and the United Nations Operation in the Congo (ONUC) in 1961 after it was discovered that pilots conducting transport flights observed important activities on the ground during their journey. This prompted ONUC to begin mandatory debriefings of pilots. Later the mission deployed specialized reconnaissance aircraft, including jets (see Chapter 2). In Lebanon (1958), Yemen (1963–1964),[2] and Central America (1989–1992); and in several other locations helicopters were important tools for observation, as well as transportation. The current mission in the Democratic Republic of the Congo (DRC) is believed to have the largest and best heliborne capability in UN history, now complemented by unmanned aerial vehicles (UAVs). However, current commanders complain that UN capacity is still far from adequate for the mandated task.

There is, unfortunately, no systematic record of the UN's aerial observation experience, nor is there any listing of the aerial imaging equipment used in past UN missions.[3] Furthermore, there are no studies comparing the reconnaissance technologies in UN missions with those of other military operations, for example, the North American Treaty Organization (NATO, considered later). This chapter looks at the relative merits of ground versus aerial reconnaissance, drawing upon selected operations and experiences from the United Nations and other organizations. It also compares manned and unmanned reconnaissance flights, since the latter are increasingly used for both military and civilian applications in the wider world. The details of all such comparisons (air versus ground, manned versus unmanned) are, of course, case specific; that is, dependent in part on objectives, terrain, weather, and so on. But the broad factors outlined here point to the relative merits and the optimum configurations for effective monitoring in a wide range of environments, while also highlighting the problems of the different approaches.

Advantages of Aerial Reconnaissance

From the earliest days of peacekeeping, UN operations recognized the advantage of observation from altitude. Static observation posts were placed on hilltops in the Middle East (Palestine, Lebanon and the Golan Heights) and in Kashmir. But they provided useful views of specific fixed areas only – hilltops, unlike aircraft, are not moveable!

The bird's-eye view that is possible from aircraft provides quicker coverage, a longer line of sight and a wider area of observation than on the ground, though usually with less resolution. Aircraft can travel with great speed and usually experience fewer obstacles blocking the way or the view for outdoor targets. Once at the site, they can adopt the observation altitude and angle for optimum viewing.

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Since aircraft can move faster than ground vehicles and go directly ("as the crow flies") to their destination, airborne observers can arrive at distant areas much more quickly. In addition, more territory can be covered during the observation period. Ground vehicles (for example, four-wheel drive utility vehicles) can travel at a maximum of about 120 km/hr. Under the poor road conditions typical of many conflict areas, jeeps often move as slow as 10 km/hr with many mountainous, riverine and jungle areas being impassable by automobile. By contrast, aircraft can easily overcome such terrestrial restrictions. Jets fly at typical cruise speeds of 500 km/hr (jets), helicopters (and two-seater planes) at 200 km/hr, small tactical UAVs at 100 km/hr, and mini-UAVs at 50 km/hr. During an observation period, aircraft can slow down to linger over a particular area – circling by plane or hovering by helicopter. Additionally, cameras can be gyrostabilized to increase picture resolution by reducing the effects of aircraft vibration and wind caused turbulence. With appropriate software, cameras can "lock on" to their targets, that is, keep them in the centre of the picture even as the plane is moving.

Since aircraft (like ground vehicles) might be at risk of taking fire from the ground, aircraft may have to fly at higher altitudes. Fire from an AK-47 rifle, the most prevalent weapon in current conflict areas, cannot reach altitudes above 1,000 m. Even flying at much higher and safer altitudes (for instance, at 3,000 m) advanced aerial observation equipment(gyrostabilized) can still provide a resolution of 0.5 m or better, allowing tracking of groups of individuals or vehicles.

The ability to vary the altitude of an aircraft allows the pilot to control the visibility of the aircraft from the ground. Aircraft can also fly above clouds for cover or find an altitude where they are nearly impossible to spot or hear. This makes it possible to monitor some illegal and clandestine activities that would otherwise be deliberately hidden as soon as the aircraft was detected. In addition, if criminal/violent elements are aware that the United Nations can operate silently and without detection, a powerful deterrent is created, instilling fear in violators even when aircraft are not present.

If, on the other hand, a show of UN presence is desired, aircraft can fly at low altitudes. A highly visible eye-on-the scene could deter illegal activities or make them more difficult. Aircraft could even buzz an area to create a distinct impression.[4] During Operation Artemis, which assisted the UN Mission in the Democratic Republic of the Congo (MONUC) in the Ituri province in summer 2003, a French Mirage jet on reconnaissance would deliberately break the sound barrier in the region to create a sonic boom that was clearly noticeable by all, including presumed wrongdoers. Aircraft can be painted in UN white or even with "glow" colours for greater visibility. Laser pointers/designators aboard aircraft could even notify individual perpetrators that they are being watched, by shining a laser beam on them.

Flying at higher altitudes can offer much less intrusiveness than a ground presence, when desired. At times, the United Nations must reduce the visibility of its presence to accommodate local sensitivities or because national authorities have placed limitations on the freedom of movement of UN ground vehicles, for example, with road blocks or checkpoints. While still observing national and international laws, UN aircraft can observe without being detected and move without attracting attention. Of course, take-off and landing sites are needed, but they do not need to be near the observation area and can potentially be based in neighbouring countries. Permission to enter the airspace of a country would be required, of course, unless otherwise mandated by the Security Council.

Especially at night, aerial surveillance can provide a tremendous magnifying effect. When travel by ground is difficult and vision is limited (the range of most night-vision goggles is 1 km or less), airborne forward-looking infrared (FLIR) and synthetic aperture radar (SAR) can alert the United Nations to illegal activities and movements of rebel fighters. Night flights for any purpose, however, are generally prohibited under UN rules because the United Nations rarely possesses nighttime search-and-rescue capabilities and its aircraft are usually not equipped with weather radars. In a few missions, however, UN member-state contributors are sufficiently equipped to carry out such operations. Examples can be found with Norway and others operating in the former Yugoslavia, Australia's work in East Timor, a UN-chartered company in Kosovo, and Russia's capabilities in Sierra Leone.[5] In November 2006, MONUC was able to "break the night barrier" in the DRC after gaining permission from UN Headquarters. Its Mi-35 helicopters used advanced infrared sensors to detect the movements of a renegade force advancing to attack the town of Goma. With this aerial intelligence, a combined UN-DRC force was able to halt the advance using the night-flying attack helicopters.

In the future, UAVs could be used for night surveillance, removing the applicability of the search and rescue rule. Indeed, the European Union Force (EUFOR) did fly UAVs at night in the DRC from July to November 2006 with some remarkable successes, especially in uncovering illegal shipments of arms. For instance, the FLIR cameras were able to detect imported tanks moving by rail and small arms being transferred in small boats across the Congo River. UAV video imagery was viewed at EUFOR headquarters in real time, so that commanders and analysts at headquarters could share a "common operating picture" and consider responses. Although there was no image feed to MONUC headquarters, recordings were shown to UN officials, for example, to clearly demonstrate illegal import activities clearly, thus allowing UN leaders to confront the violators.[6]

Generally reconnaissance by air is less constrained than on the ground. Host nations often insist that UN ground vehicles be escorted by the nation's troops or liaison officers, whose purpose is, more often than not, to keep an eye on the United Nations (to observe the observers) and prevent unauthorized detours, especially to areas of atrocities that the host nation does not want the United Nations to see. Air observation typically involves a lesser set of restrictions and limitations, though some may still be imposed by the host nation.

Aerial observation also has some distinct disadvantages. Aircraft may not be able to get sufficiently close for observation of individual actions. They cannot see indoors or under jungle canopy. They can sometimes be shot at and shot down and are in need of a great deal of maintenance. They also require host nation permission for use of national airspace.

Advantages of Integrated Systems

Aerial and ground surveillance are complementary. The combination of the two creates a more effective monitoring and response system. By air, large swathes of land can be reconnoitered separately or at the same time as by ground patrols. Advance surveillance flights can alert peacekeepers to dangers, locate them precisely through the global positioning system (GPS) and automatically update databases, accessible using laptops, with the latest imagery for immediate ground viewing. Aerial images can help peacekeepers familiarize themselves with the terrain, their objectives and the dangers. They can assist training, planning and the operations themselves, as well as post-mission evaluation. In conflict zones, where time is of the essence, ground patrols can receive advance notification of routes that are impassable or roads and bridges that are washed out, closed, or subject to militia checkpoints (or even ambush!). Lives can be saved if potential threats are identified beforehand using aerial reconnaissance. For instance, during a MONUC battle with renegade militia leader Cobra Matata in the stronghold of Tchey in May 2006, heliborne spotters warned ground troops of the militia fighters approaching stealthily. This allowed the UN forces to avoid the surprise attack and to respond with force.[7]

For UN operations to be robust, they must be situationally aware, an aspect that is much enhanced by the availability of aerial reconnaissance. Quick Reaction Forces (QRFs), for instance, need to insert themselves with great accuracy at precise locations, which requires excellent geospatial awareness. This level of information, particularly about the hideouts of rogue militias or spoilers, requires advanced surveillance, soldier briefings with detailed imagery, and cueing from aerial assets to respond to the movements and actions of hostile forces. Operating ahead of important convoys, aircraft can alert the latter to potential threats in order to avoid them through rerouting. Wide-area surveillance from aircraft can make the ground action quicker, more precise, more aware, and safer.

During robust peace operations, reconnaissance from above is especially valuable in the pre-dawn period, since attacking militia often move into position at night and wait for dawn before shooting. For instance, in the early morning of 28 May 2006, a joint Congolese–UN force walked into an ambush near Fataki soon after they began their march to search for rebel leader Peter Karim. An attack helicopter was called to suppress militia fire during their withdrawal but it arrived too late for one Nepali soldier, who lost his life in the initial shooting.[8]

In the eastern DRC, airborne reconnaissance has located many militiamen, deserting soldiers, and stragglers prior to their being apprehended and arrested, or becoming part of the peace process through *brassage* (that is, merging into the national army). More about the surveillance capabilities and work of the Mi-35 armed helicopters in the Congo in 2008 is found in Chapter 14 of this volume.

In summary, ground and aerial surveillance have different but complementary effects. The air provides a grand view of the terrain, whereas ground forces have the ability to interact more closely with people. A combination of air and ground surveillance permits a more persistent and precise presence over larger areas. Aerial reconnaissance acts as a force multiplier. Locations that are too distant, numerous, or dangerous for UN bases are better observed by aircraft. Various types of aircraft can be considered to optimize aerial effectiveness, including cost-effectiveness.

Enter the Unmanned Aerial Vehicle

Reconnaissance (unarmed) UAVs come in many different sizes, weights, capabilities, and configurations. The payload can include many different types of sensors. Table 7.1 categorizes and characterizes the main types of UAVs that could be used in UN peacekeeping.[9]

The smaller UAVs (especially mini-UAVs) are unstable in strong winds, making it hard to get steady video imagery, but sharp still images are possible using a fast shutter speed. Further, high-resolution devices are becoming lighter and smaller. Mini-UAVs tend to run on batteries, whereas the larger ones use gasoline or jet fuel. The petroleum-powered UAVs can attain a fuel efficiency of over 200 km/litre. Larger UAVs can support heavier payloads. SAR payloads are of the order of 50–100 kg, so they are available only for the larger, tactical UAVs.

Ever-smaller and smarter UAVs are under development. The near future might offer ultra-light UAVs (eventually, possibly, nano-UAVs) that are less than 2 cm in wingspan and less than 10 g in weight, entering the world of insect mimicry.[10] Autonomous take-off and landing UAVs are readily available, as well as self-navigating UAVs using GPS waypoints. Generally these should be used only in a well-defined territory where other aircraft are not present, though collision-avoidance systems are available for UAVs, as they are for manned aircraft.

	Weight (kg)	Range (km)	Max. speed (km/hr)	Time Aloft	Payload (kg)	Cost (SUS)*	Example functions	Example models
Micro-UAV	0.1–2	0.1–2	2–20	30 mins	0.1–1.0	500	Aerial view of buildings below	AR2 Drone, IdeaFly
Mini-UAV	2–5	4–10	20–100	2 hrs	0.5–1.3	25,000	Perimeter surveillance of UN sites and refugee camps	Desert Hawk, Dragon Eye, Raven
Sub-tactical UAV	10–20	Up to 1,000	50–150	20 hrs	2–5.5	50,000+	Tracking humanitarian convoys; patrolling border segments	Aerosonde, Luna, Scan Eagle, Silver Fox
Tactical-UAV	120–500	1,000	100–200	30 hrs	3–200	1–10 million	Long-range patrolling, large-area surveillance, monitoring from high altitude	B Hunter, Crecerelle, CL-289, Falco, Phoenix, Shadow 200, Sperwer

Table 7.1 Unmanned aerial vehicle types and typical characteristics
Note: * Typical cost per UAV and may not include the ground station with console and launcher, if required. *Source*: Survey of models on the commercial market.

The smaller UAVs have the benefit of being easier to transport (for example, carried by an individual), to launch (by hand or slingshot) and to operate (for example, with joystick controls or even from cell phones). They are cheaper to operate and to purchase (starting from under US$500 per UAV), and they usually cause less damage if they crash. They can also fly slower than large ones since the stall speed generally increases with weight. On the negative side, they have limited range, endurance, and payload capacity, as illustrated in Table 7.1.

The deployment of "mixed packages", involving different categories of UAVs, allows the different advantages of each to be exploited, including cost and capacity benefits. For instance, travelling ground reconnaissance units could control mini-UAVs flying a short distance ahead, viewing imagery, over the side of the next hill, for example, while a tactical UAV is used for more distant reconnaissance.

In early 2013, the United Nations held a bidding process for a commercial UAV to overfly the skies of the eastern Congo. Building on the lessons of previous uncompleted competitions (2007 and 2009), a successful bidder, Selex ES (a branch of Finmeccanica), was announced in August and flew the first operational flight of its Falco UAV in December 2013. The UAV system attained Full Operational Capability in April 2014, marking a significant achievement for the United Nations in the aerospace domain.

Manned versus Unmanned Aircraft

Advantages of UAVs

Unmanned flying vehicles are generally smaller, lighter, and more fuel-efficient than manned aircraft.[11] The greatest benefit of UAVs – also called "remotely piloted vehicles" or "drones" – in peace operations is that there is little danger to pilots or other crew, because there are none on board! This makes it possible to fly over high-intensity conflict zones that would otherwise be considered too dangerous for aerial surveillance.

To control UAVs, remote pilots cam remain at distances of 200 km or even further using repeater stations (which may be on the ground or in other UAVs in the air). With satellite communications, remote operators can even be on the other side of the Earth. The controllers can vary the altitude, direction and speed of the aircraft, as well as the angles and zoom of the onboard camera(s). The imaging suite can include devices to capture visible light, infrared and radar signals. Autonomous (pre-programmed) UAVs exist, but this feature is less likely to be used in peacekeeping in the near future, except for take-off and landing.

For night flying, UAVs offer tremendous advantages. As mentioned earlier, the United Nations generally does not allow its planes to fly at night for fear of crashes. UN aircraft are typically not equipped with weather radars, which help spot approaching rains, stormy winds or other hazards at night. Nor does the United Nations have nighttime or combat search and rescue capabilities to react properly and quickly at night or in heavy conflict areas. With downed UAVs, recovery operations are not as time-sensitive. Consequently, UAVs do not have the same stringent night-flying rules applied to them. Given the current lacuna in night surveillance in peacekeeping operations, UAVs offer a powerful tool to enhance effectiveness and security after dark.

UAVs are generally harder to detect and shoot down than manned aircraft, given their smaller size and decreased noise. Battery-powered UAVs make hardly any noise at all; certainly nothing detectable above the din of battle. For example, at 2,000 ft above ground level, some smaller UAVs can be neither seen nor heard.[12]

If a UAV crash does occur, in daytime or at night, the costs are much less than for a plane, most importantly in terms of human life. In terms of fiscal loss, UAVs are much less expensive to purchase or replace than manned aircraft. A mini-UAV with its control system typically costs less than US$25,000; subtactical UAVs are available for US$50,000 or less. And costs are decreasing while capability is increasing each year. Requirements for licensing, clearance, and flight planning are also decreasing as the technology proliferates. Though UAVs still need remote pilots and a crew for launch, control, and maintenance, the number of such support personnel is less than for manned aircraft. Typically, a five- to ten- member crew is needed to form a "flight" of two or three tactical UAVs – much less for mini-UAVs. UAVs also require less training. Some mini-UAVs can be flown and operated successfully with only a few minutes of training (like model aircraft).

UAVs can also be launched from many more locations than standard planes. Short runways are sufficient for most UAVs and some take off vertically. UAVs are also easier to transport: most mini-UAVs are human-portable; that is, they can be carried in a case (or even a backpack) by a single individual. Subtactical UAVs can be transported in a minivan or on top of a utility vehicle (jeep), whereas tactical UAVs usually come with their own transport vehicle. UAVs are also easier to store, maintain and repair. All these features mean that UAVs have a "smaller operational footprint" in the field, but the area coverage can be larger than for manned aircraft.

UAVs also offer benefits to observers and analysts. In manned aircraft, onboard observers can easily become fatigued. Having more space and a greater ability to rotate personnel, ground-based observers at convenient locations can study monitors on large screens for longer periods of time, though not unlimited, given observer fatigue. The endurance for human observers on a plane is typically four to six hours, and most midsize planes need refuelling in even less time. UAVs can fly for longer periods because they are lighter. They can be controlled by ground personnel on rotating shifts at a safe base to support longer flights – any number of personnel can observe the video feed from the UAV, not just the crew.

Most UAVs are capable of longer loiter periods than traditional planes, not only because they have greater fuel efficiency but also because they can achieve lower stall speeds, as low as 30 km/hr (16 kt) for mini-UAVs, compared with 80 km/hr (43 kt) for small manned aircraft. Of course, rotary-wing aircraft have no stall speed. This "loiter on station" capacity is particularly useful to observe a localized activity closely for extended periods of time.

Advantages of Manned Aircraft

Unlike UAVs, the use of manned observation aircraft has historical precedence in peacekeeping. The United Nations has considerable experience in manned aerial operations, but (until this volume) little of it was described or analysed. The first (and perhaps only) reconnaissance jets were used in the Congo as part of ONUC in the early 1960s. The subsequent mission in the DRC (MONUC) in the 2000s has, remarkably, less reconnaissance capacity, though the need is as great. MONUC has four Alouette helicopters with a “glass bubble” for visual observation but no recording equipment except any still or video cameras that might be carried aboard.[13] The Mi-35 helicopters have considerably more capacity: a variable field-ofview, low-light television, and a FLIR recording system, as well as a helmet-mounted sighting and display system. But, being a prized national asset (Indian and Ukraine) whose exact resolution is kept classified, the fourth-generation FLIR video imagery is not generally shared with the rest of the mission. Only freeze-and-crop frames are provided to highlight certain observations, although a live feed would be technically possible for remote viewing. The Mi-35 FLIR cameras proved very useful during combat in spotting militia and allowing the helicopter gunship to engage them with weapons systems slaved to the reconnaissance devices. More on these systems is provided in Chapter 14.

The greatest benefit of manned aircraft over UAVs is their multipurpose capability for transportation and combat, as well as observation. Soldiers can become familiar with the terrain from the air and be dropped close to their target, particularly with helicopters. Commanders can direct ground movements from helicopters, as they have done in the Congo. This dual use of manned aircraft allows cost efficiencies such as carrying out reconnaissance during or after the transportation of personnel or materiel.

Manned aircraft generally can fly at higher altitudes than most commercial UAVs. Also a typical operational range of 1,000 km is greater than most UAVs can sustain, except American UAVs such as Global Hawk, which are well beyond the current means of the United Nations. Some aircraft, such as the Cold War-era U-2 spy plane (used by the United Nations for weapons inspections in Iraq), are designed to fly and photograph at very high altitudes of over 60,000 ft.

Aircraft also travel at greater speeds and offer a more commanding presence. As has been mentioned, UAVs can provide a modest “show of presence”, but a jet aircraft can streak rapidly and impressively above conflict areas; UAVs could not break the sound barrier as the Mirage jets did in Ituri. Pilots in manned aircraft also have a better feel for their aircraft than for any UAV they may fly, since they benefit from direct flight sensations (such as vibrations and engine sounds), unlike ground-based pilots. That is one of the reasons manned aircraft have a much lower crash rate than UAVs, where the pilot’s safety is not at risk.

Finally, direct observation from inside aircraft has advantages over remote viewing through computer screens of UAV imagery. Onboard personnel have three-dimensional and wide-angle (panoramic) views that cannot be achieved on computer screens. Furthermore, onboard cameras and computer systems can greatly increase the capacity of the unaided human eye for closer observation and for recording.

Like the complementary ground and aerial systems, the integrated use of unmanned and manned aircraft can offer the advantages of both types. And still other aerospace platforms are also available for synergistic use.

Aerospace Platforms for Reconnaissance

Overhead imaging can also be carried out from balloons and satellites. These offer some comparable advantages to the aerial platforms already examined. For instance, satellites can travel freely in outer space, permitting them to observe virtually any area of the Earth legally, without national consent. The relative merits of each aerospace platform are presented in Table 7.2. Each is evaluated on eight basic characteristics: six beneficial ones, and two undesirable ones.

The strengths and drawbacks are easily compared in Table7.2. Simply put, they are: the high costs of manned aircraft; the limited payloads of unmanned aircraft; and the very limited manoeuvrability of balloons and satellites, which follow given trajectories. One advantage of satellites is that they cannot be shot down, at least not by the types of weaponry found in peacekeeping areas.

For some UN purposes, aerial manoeuvrability is not always needed. For instance, tethered balloons can be useful for observing important areas, corridors or choke points on a near permanent basis. Cables keep the observation platforms in place and allow for the conveyance of electrical power and data signals. These large balloons can also serve as visible markers of borders or ceasefire lines, as navigation aids, as communications relays and as radio-station transmitters. Of course, these static objects might also be favourite targets for frustrated combatants. If shot at, however, they come to the ground smoothly because of their separate compartments. This allows the equipment to be saved and the platform to be repaired and reflown quickly and cheaply. Some aerostats are rapidly deployable (or redeployable) in as little as 10 minutes from the back of a pickup truck.

	Range	Endurance	Speed	Altitude	Manoeuvrability	Payload Capacity	Cost (US$)	Vulnerabilities
Fixed-wing aircraft (manned)	HIGH (up to 10,000 km)	Medium (max. 15 hr)	HIGH	HIGH (up to 20,000 m)	HIGH (but cannot fly as slowly)	HIGH (up to 250,000 kg)	HIGH (for purchase, maintenance, fuel and personnel)	Possible fatalities, needs airfields for takeoff and landing
Rotary aircraft (manned helicopter)	Medium (300 km)	Low (typically 3 hr)	Medium (up to 350 km/hr)	Medium to HIGH (up to 10,000 m)	VERY HIGH (easy turns and stationary capacity)	Medium (up to 10,000 kg)	HIGH (for purchase, maintenance, fuel and personnel, incl. onboard pilots)	Possible fatalities
Unmanned aerial vehicles (UAV)*	Low to HIGH (from 1 km to 1,000 km)	Low to HIGH (from 15 min to 20 hr)	Medium (from 40 km/hr to 300 km/hr)	Low to Medium (from 50 m to 5,000 m)	HIGH	Low (from 1 kg to 150 kg)	MEDIUM (lower than manned aircraft, though dependent on type of UAV)	Can be shot down; weather-dependent (esp. wind conditions)
Balloons (free or tethered)	Low (up to 100 km a day)	HIGH (10 or more days)	Stationary or very low	Medium (up to 5,000 m)	Very Low (wind-dependent)	Low to Medium (up to 500 kg)	Low	Easily targeted
Satellite	VERY HIGH (but has fixed trajectory)	VERY HIGH (years, but revisit time can be days)	VERY HIGH (25,000 km/hr)	VERY HIGH (100 to 1,000 km)	Low (only certain types)	Medium (up to 5,000 kg)	HIGH (expensive to build and launch, imagery can be purchased cheaply)**	Limited availability at specific time and place

Table 7.2 Comparing different types of aerospace surveillance
Notes: * Subtactical UAVs are considered.
** A high-resolution imaging satellite can cost over US$1 billion to build and US$50 million to launch. Satellites of much lower cost, such as microsatellites, are now coming into the market.

Radar-equipped aerostat (balloon) systems are currently employed on several international borders (for example, on the United States–Mexico border) as part of national interdiction programmes for drugs and human trafficking. Held at a typical altitude of 500 m, the view can extend for several kilometres. In Afghanistan, the 14-m long Rapid Aerostat Initial Deployment aerostats are tasked with area surveillance and force protection against small arms, mortar and rocket attacks. They can stay aloft for weeks. The Canadian Forces deployed a Persistent Threat Detection System in southern Afghanistan. When shots were fired, the acoustic sensors on the aerostat would automatically trigger camera movement toward the area of fire. This was of immense help before and during the dispatch of Quick Reaction Forces to the area.

In addition to working with ground systems, aerial systems can be multilayered and hybrid to complement each other. Although aerospace reconnaissance provides unique advantages over ground reconnaissance, the best option is an integrated system to detect threats and explore opportunities for peace and stability. Multiple layered information sources are needed to corroborate and probe sensitive and uncertain information in dangerous environments found in many peacekeeping operations.

Comparison with the North Atlantic Treaty Organization

To get a sense of the relative "poverty" of aerial UN operations, one need only make a comparison with the North Atlantic Treaty Organization (NATO). When that military alliance deployed peace operations, as in Bosnia or Kosovo in the 1990s, or counter-insurgency operations, as in Afghanistan in the 2000s, it does so with a plethora of reconnaissance aircraft.

For instance, in its first peace operation, in Bosnia (1995– 2004), NATO took a proactive approach in an attempt to achieve "information dominance", to show the former warring parties that the NATO mission could watch closely what they were doing. The aerial surveillance component employed an impressive array of aircraft. Apache and Kiowa helicopters provided imagery from video cameras that relayed images automatically to command posts within 90 seconds, a feature not possible with the UN's most robust platform, the Mi-35 helicopters. The NATO helicopters also had thermal infrared sensors capable of monitoring troop movements several kilometres away. Aerial surveillance was also achieved with high-altitude U2 aircraft, P-3 maritime patrol aircraft and the RC135 reconnaissance aircraft. Perhaps most significantly, the sophisticated Joint Surveillance and Target Attack Radar System aircraft provided high-resolution imagery of the ground, including synthetic aperture radar images both day and night and in virtually all weather conditions. SAR, in the Doppler mode, was especially effective at detecting moving targets. UAVs have gathered signals intelligence and provided imagery in near real time in NATO operations. For instance, a Predator UAV was able to display the faces of people opposing US entry into the town of Han Pijesak. Ground units deployed their own shorter-range UAVs such as the US Army's Pioneer UAV. Remote Video Terminals allowed soldiers across the mission area not only to view UAV imagery but also to control the onboard camera angle and zoom in order to "zero in" on desired objects and people.

Complete awareness of the airspace was achieved with Airborne Warning and Control System (AWACS) aircraft. NATO's E-3A Sentry is the "world's only integrated, multinational flying unit, providing rapid deployability, airborne surveillance, command, control and communication for NATO operations".[14] All flying objects within a radius of over 300 km could be tracked: a single AWACS aircraft could monitor the entire Bosnian airspace.

NATO had an even greater aerospace reconnaissance capability in Afghanistan. Though not necessarily achieving success in the 15-year operation, NATO made good use of aircraft to give a much better operational picture of the situation on the ground; International Security Assistance Force commanders would not want to operate without the observation provided from the air.

While the United Nations need not take such a sophisticated and costly approach to aerial reconnaissance, its record of technology leverage is dismal, though improving. In 2013 it finally deployed UAVs to the field (DRC mission), following proposals first made in 2005. The United Nations only achieved real-time image transmission from helicopter cameras in 2010, when the Haiti mission achieved this goal. The observation helicopters used in the Congo (Lamas) did not even have gyrostabilized cameras; recordings were simply made by hand-held cameras brought on board by crew. The United Nations has not deployed AWACS aircraft to monitor vast areas of airspace. Nor has it used aerostats (tethered balloons), which could effectively monitor conditions around UN bases, refugee camps, border areas and other trouble spots. Taken together, this shows how aerially ill-equipped the United Nations has been while it tries to succeed in the enormous task of keeping the peace. There is much room for improvement in the air above the ground-based peacekeepers!

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Endnotes

[1] The United Nations Emergency Force (UNEF, 1956–1967) used dedicated aircraft for surveillance: single-propeller Otter aircraft from Canada. They helped maintain a vigil along the Armistice Demarcation Line and the international frontier between Egypt and Israel.

[2] The United Nations Yemen Observation Mission was mandated to observe an agreed disengagement between forces of Saudi Arabia, Egypt, and Yemen. Air patrols, carried out by a Canadian unit with a dozen or so planes and helicopters, were essential in the mountainous border region, where foot patrols could cover only very limited ground. But as in Lebanon in 1958, the United Nations came up against two limitations on UN patrols in Yemen: traffic monitoring could be done confidently only during daylight; and air-triggered ground inspections of moving caravans was difficult.

[3] Air flight is one of the most regulated forms of human activity worldwide, with detailed standards and specifications for safety and flightworthiness. The United Nations generally abides by the standards set by the International Civil Aviation Organization (ICAO). UN missions also have standard operating procedures for flights and an Air Operations Manual. By contrast, the sub-activity of aerial reconnaissance is not well documented and is only briefly mentioned in the standard operating procedures.

[4] Even the sound of approaching aircraft can be intimidating, stimulating or warning (depending on the context). In the eastern Democratic Republic of the Congo (DRC), the mere sound of an approaching Mi-25/35 helicopter gunship caused militia forces to break up and flee.

[5] Information provided by the Air Transport Section of the Department of Peacekeeping Operations, 28 February 2007.

[6] EUFOR offered to provide images extracted from its UAV video feeds to MONUC within about 1–2 hours (in near real-time).

[7] Personal interview with Brigadier-General Duma Dumisani Mdutyana (Deputy General Officer Commanding MONUC's Eastern Division), Kisangani, DRC, 30 November 2006. The militia leader signed a peace agreement later that year.

[8] The helicopter provided armed protection for a group of seven Nepali soldiers who became separated from the rest of the UN force, but when the helicopter went back to refuel, the soldiers found themselves surrounded by more than 300 militia and were taken hostage. After 42 days of negotiations, they were finally released unharmed.

[9] Larger UAV systems exist, for example, the US-owned Global Hawk UAVs, but they are not appropriate for the United Nations. They are not generally commercially available, their payloads are highly classified and the cost is extremely high. For example, the price of a Global Hawk aircraft, which can fly at extremely high altitudes – over 20,000 m – is US$18–$20 million.

[10] For an example of lightweight sensors for UAVs, see the Optical Alchemy, website. Available at: http://www.opticalchemy.com [accessed 10 January 2011].

[11] From Finmechanica's specifications, the Falco UAV is 5.25 m long, with a wingspan of 7.2 m and a height of 1.8 m. It can attain a maximum speed of 216 km/hr and fly as high as 6,500 m (21,325 ft). Its range is 250 km and endurance is 8– 15 hours. It can carry a payload 70 kg for a maximum takeoff weight of 420 kg. The payload can be electro-optical sensors (visible and infrared) or synthetic aperture radar. Specifications available at http://www.selex-es.com/documents/737448/3702599/body_mm07806_Falco_L [accessed 7 May 2014].

[12] It should be noted that a Belgian UAV was shot down by a hunter in the Congo in 2006; however, this was considered a highly improbable hit.

[13] Given the lack of permanent observation equipment onboard, when the Lama helicopters were deployed in Kinshasa in 2006 to observe crowd movements, the television cameras from MONUC's public TV unit and from Radio Okapi were used to produce some higher-resolution imagery. Personal interview with François Grignon (former chief of Joint Mission Analysis Centre, MONUC), Toronto, Canada, 4 February 2007.

[14] North Atlantic Treaty Organization. "NATO AirborneEarly Warning and Control Force, E-3A Component". Available at: http://www.e3a.nato.int [accessed 18 January 2011].