

# Manned Vs. Unmanned Aerial C4-ISR. An Analysis.

by Michael D. Long, Aerial Surveillance Systems, Inc. December, 2011

*"The human factor will decide the fate of war, of all wars. Not the Mirage, nor any other plane, and not the screwdriver, or the wrench or radar or missiles or all the newest technology and electronic innovations. Men—and not just men of action, but men of thought. Men for whom the expression 'By ruses shall ye make war' is a philosophy of life, not just the object of lip service." Israeli Defense Forces-Air Force Commander Ezer Weizman: On Eagles' Wings.*

"Unmanned aircraft may perform as effectively as and more cheaply than either satellites or manned aircraft. Thus, UAVs complete the array of capability necessary to fully populate this dimension of the rapidly growing information world."

- Richard T. Wagaman, Past President, Association of Unmanned Vehicle Systems (AUVS)

## **Overview:**

The term "Unmanned Aircraft System" (UAS) describes the entire weapon system that the US Department of Defense (DoD) has historically referred to as an "Unmanned Aerial Vehicles" (UAV's). The tactical reconnaissance and weapon system includes the unmanned aircraft (UA), surface components (Ground Control Stations, Ground Support Equipment, Launch and Recovery personnel and equipment and Maintenance), and architectural command and control elements (satellite for Beyond Line Of Sight [BLOS] and Microwave for Line Of Sight [LOS] and C-4 for Command, Control, Computers and Communication). "UAS" is the politically correct and DoD terminology and many simply call them "drones", although in this Analysis "UAV" is going to be used as it is the more commonly understood and utilized acronym around the world.

The debate on whether Manned aircraft or Unmanned aerial vehicles are the most effective means of employing combat power and surveillance has intensified over the last few years. While Manned aircraft have been employed to good effect since the first use of aircraft in the Intelligence, Surveillance and Reconnaissance (ISR) role, the potential of UAVs is just beginning to be exploited and it seems everybody in the aerospace industry around the world is trying to grab their share of the pie. The technology for the employment of UAVs is evolving quickly and new uses are being developed rapidly. The technology for the application of UAVs in the tactical reconnaissance role has matured and the capabilities available rival those of Manned aircraft and satellites.

The most obvious advantages of UAVs in the tactical reconnaissance role are cost, the capacity to undertake missions where expendability is an issue, and endurance. Manned aircraft offer the advantages of flexibility, quick response, survivability and onboard human intelligence processing.

Certainly missions that require the use of human intuitive reasoning for survival are still outside the ability of UAVs. The UAV survives by flying high, slow or hiding, but once it is found it has little chance of survival. During peacetime and the pre-hostilities phase of a confrontation, political fallout can be avoided by using UAVs, and it is in this phase that they seem to be the most attractive option.

Also, hostile air defense environments, with a high density of lethal weapons that are high-risk for the use of costly piloted aircraft are suited for UAV operations. They are also capable of all weather operations. Clearly the utility of UAVs is undeniable and we can ignore them only at our peril.

Military experience with Manned aircraft has cast the organization of UAV units within the USA and NATO along traditional operational and support structures. Future developments indicate that the concept of operations will focus on the Ground Control Station (GCS) as the hub of activity. This will lead to a more efficient means of employment. Future doctrine refinements of centrally tasking UAV assets for multi-service tasks and in-flight mission tasking and re-tasking will also increase efficiency.

The requirement for information is likely to keep increasing as warfare and precision strike in Counter Insurgency (COIN) confrontations becomes more oriented towards reconnaissance-strike type mission. In future scenarios, no one system is going to be able to meet all data collection requirements. Manned aircraft will not be available for all the intelligence needs of the warfighter. Satellite systems also have limitations that will prevent them from being the sole suppliers of information and human and electronic signals intelligence (HUMINT and ELINT) also have their limitations.

The capabilities of UAVs make them ideally suited to fill the increasing void between intelligence requirements and existing data collection capability. As more experience is gained in UAV operations invariably there will develop the means to counter UAVs and the enemy has already learned how to easily shoot-down, jam or plant viruses which will make future UAV operations even more risky.

In fact, as of the writing of this analysis, (12/2011) Iran has now captured four Israeli and three US unmanned aerial vehicles which it has either shot down or hacked and successfully landed under its control. The most advanced drone in its possession is the American one that crashed recently -- the RQ-170 Sentinel which is the US government's most sophisticated "Stealth" UAV. Iran announced Dec 4 '11 that the US drone was brought down by the country's armed forces. Iran says the drone had entered the country from Afghanistan.

The UAV platform is far from perfect as it is low on performance and self defense. It is therefore not intended to replace Manned aircraft in the tactical reconnaissance role but complement it, so that it can close the information gap and "preserve the high-cost systems for combat missions for which they were specifically designed".

While the U.S. military during the last eight years has become enamored of remotely piloted aircraft, (ie. UAV's or UAS's) the Air Force is rapidly fielding a new Manned twin-propeller airplane to monitor battlefields in Iraq and Afghanistan, the Beechcraft King Air 350 based MC-12 Project Liberty aircraft.



US Air Force Project Liberty King Air 350ER/MC-12 Airborne C4-ISR Aerial Surveillance Platform



US Air Force Northrop Grumman Global Hawk UAS

“What we’ve been told is, ‘I don’t want all Unmanned systems,’” said Maj. Gen. Bradley A. Heithold, commander of the US Air Force intelligence, reconnaissance and surveillance agency. “There is something special, if you will, about a Manned ISR platform.”

The recent emphasis on Manned ISR systems, such as those being fielded by US Task Force ODIN and MARSS, have led to a running argument of the value of Manned ISR vs. Unmanned ISR. But it is not necessarily a choice of one or the other; it is how to best provide the capability. There is most certainly a place for both types of assets. And certainly with the Manned assets that are there in-theater, the control of those assets by a tactical commander down to the boots-on-the-ground is a very important attribute to those types of systems. Regional commanders have greater control over these Manned assets versus most of the higher flying UAV’s. The importance is to balance the two different types of capabilities.

Brig. Gen. Thomas Cole is the US Army’s program executive officer for intelligence, electronic warfare and sensors (IEW&S) at Fort Monmouth, N.J., which is part of the Army’s Team C4ISR. IEW&S supports a wide range of Unmanned Aircraft Systems and their operations. Before his current duties, Cole served as deputy program executive officer for IEW&S, deputy program manager for Future Combat Systems Brigade Combat Team Platform Integration, and program manager for the Warfighter Information Network-Tactical program.

He spoke recently with Defense Systems contributing Editor Barry Rosenberg about some of the challenges facing the seven program management offices within IEW&S. He said this: “We don’t need any more sensors! We have enough sensors.”

Gen. Cole was making a point: Sensors do provide invaluable information to the warfighter, but they also produce an enormous amount of data. Before that data can make it to the tactical level, it has to be filtered and disseminated through layers of machinery and humans. The flood of data is threatening to breach the capabilities to analyze it all, Cole said. In this case, the limitations are the analysts and the troops who must process all that vital information needed on the ground.

The point to be taken here and in practical terms, is that UAV’s, Satellites, Human Intelligence (HUMINT), ELINT, high altitude photography, manned aircraft and other ISR assets still have to gather, process, analyze, evaluate and then disseminate the information in a timely manner to the people – all the people – up and down the command chain – who need it most.

And for all the opinions for or against, pro or con, good or bad in the Manned vs. Unmanned debates there is one overriding argument that simply cannot be overcome:

## **“HUMAN EYEBALLS IN THE AIR MEANS HUMAN EYEBALLS ON THE GROUND!”**

What this signifies, is that most Manned C4-ISR aircraft will have 2 highly trained aircraft commanders (pilots), a highly trained Mission Systems Operator (MSO) and usually one or more observers on-board (8+ human eyeballs). These crew members have years of on-the-job training and experience and they live, work, fly, eat, relax and share base facilities and meals (and sacrifices) with the men who are fighting the battles, the “boots-on-the-ground”. And because of these irreplaceable and unique, in-theatre, onboard human intelligence analysts and surveillance experts who are there to make minute-by-minute complex snap judgment calls and who are able to re-task a mission in the air without delay based on ever changing conditions (which no UAV operator sitting in the comfort of a bunker outside Las Vegas, Nevada who goes home to his wife and kids every night will ever be able to accomplish) - they are uniquely suited for the airborne ISR role in a way that no UAV will ever be.

When asked about the need for more and more capable Manned platforms Lt. Col. Tadd Sholtis a spokesman for the US Air Force ISR task force said, “The secretary, Congress, joint commanders and, despite reports to the contrary, the Air Force, have emphasized the importance of expanding ISR capability.” The MC-12 (King Air) acquisition is a viable — although not the only — solution to the Air Force’s ISR needs.” When pressed, Sholtis said: “Yes, we need more [UAVs], which is why through the budget process we’ve programmed to buy more. I just don’t want to promote a misconception that buying more platforms alone makes ISR available or that UAVs alone can provide all needed ISR coverage.”

At the same time, some in the Army continue to stand by their piloted ISR aircraft. “These manned platforms are more effective than unmanned platforms currently,” said Army Lt. Col. James Cutting, the service’s unmanned air systems division chief. “They don’t replace the requirement for the unmanned systems, nor does the unmanned system replace the requirement for manned systems. They are complementary, not contradictory. I will acknowledge there is some overlap.” Cutting, who recently returned from his second deployment in Iraq, said there has been “phenomenal growth” there in the use of unmanned systems by the Army and Marines, and there remains an “insatiable demand” for aerial reconnaissance to aid ground commanders.

In the months since his Maxwell speech, United States former Secretary of Defense Robert Gates has said both Manned and Unmanned ISR would be required.

One of the most pervasive arguments “for” UAV’s is their cost and in this argument it is frequently ***and incorrectly*** stated that UAV’s are much more cost effective (less expensive) than Manned aircraft systems. This is simply not true, as most of the DoD funded studies focus on direct operational costs and do not adequately address the costs of additional ground support, networking

infrastructure and most importantly satellite air time charges which can and do run into the tens of thousands of dollars per hour but are ignored in these budget calculations by using the faulty argument that this satellite air-time is already being paid for by the military. But with constrained and limited bandwidth available for all military use, this heavy use by UAV's forces other users to pay for expensive commercial satellite air-time (Inmarsat, Iridium etc.) forcing incorrect budget assumptions when figuring the true cost of flying and fielding UAV systems.

Another serious factor affecting the use and flight of UAV's and where their Manned counterparts have no issues, is flight in the civilian airspace system and mixing with other airborne traffic. The task of detecting, seeing and avoiding (DSA) airborne objects, ranging from balloons, ultralights, military aircraft, other UAVs up to airliners, is the next challenge for the unmanned aircraft community. The challenge is multifaceted, and also very demanding. In congressional testimony in July 2006, Nick Sabatini, [FAA](#) associate administrator for aviation safety, stated: "Currently, there is no recognized technology solution that could make these [UAV] aircraft capable of meeting regulatory requirements for see and avoid, and command and control."

The requirements Sabatini referred to cover operations in the U.S. and worldwide National and ICAO Airspace Systems (NAS), the safety of which is his specific responsibility. Within the NAS, air traffic controllers continuously monitor separation between aircraft, while most larger aircraft supplement this by carrying traffic alert and collision avoidance systems (TCAS), which perform cooperative DSA functions with smaller aircraft equipped only with conventional transponders. UAV's do not yet have this fully developed functionality and at the end of the day it is the human input that will be needed inside the cockpit to make those snap **"see and avoid"** decisions that can prevent a disaster from taking place.

*"The most sophisticated intelligence collector in the world is worthless if the information it provides does not reach the commander in a timely manner. ...The U.S. has very efficient battlefield collection systems today, but management of these collection assets. ...is extremely inefficient.."*C4-ISR Magazine 3/2011.

Thus while the operator will remain a key part of mission success, the increasing endurance of UAVs will require multiple shifts to enable this success. In addition, with increasing data being gathered as time passes, and with more analysis, the missions will likely need to be modified during flight. UAV's and their command structure are simply not very good at making those re-tasking decisions and are not efficient in getting up-to-the-minute tactical intelligence into the hands of the troops on the ground who need it most.

**Manned aircraft are!**

## **Conclusions:**

The information factor directly impacts the mission of tactical reconnaissance. As far back as 1979, General Charles A. Gabriel (then the Air Force deputy chief of staff for plans and readiness) had summarized an ideal surveillance and reconnaissance system as “what is needed is a single invulnerable system that sees the entire battlefield or area of operations, in very high resolution, 24 hours a day, under all weather and light conditions, filters the information according to individual commander’s needs and instantly transmits all pertinent information directly to the user just as events are occurring on the battlefield”.

The need of such a system will not diminish in the future; in fact the requirements are going to become more stringent and more important. Tactical reconnaissance is going to be just one of the processes within that system.

The threat environment in the future is also going to be characterized by increased threat density and lethality, complex orders of battle, smaller and more mobile urban targets, COIN operations, all weather 24-hour operations, and increasingly responsive and creative enemies. The tactical reconnaissance mission is going face increasing resistance by enemy forces as they try to deny the means to collect information. As the enemy develops effective counter measures to the warfighting techniques of the future the effect of cover and concealment, underground and subsurface operations, and increased mobility will create a challenge for reconnaissance, surveillance, and target acquisition (RSTA) systems.

The need for more detailed, faster, and more precise information will continue to increase. Current and future surveillance requirements will continue to impose exacting requirements on tactical reconnaissance systems. The systems will be required to provide operational information to decision makers in a timely manner. Space based systems, airborne stand-off surveillance platforms, unmanned aerial vehicles, and manned penetrating aircraft are going to be the core of reconnaissance and surveillance now and in the future. These systems are complimentary as they provide separate and synergistic capabilities. The increasing demand for continuous coverage of the battle area will require that an increasing load be taken on by UAVs to meet the demands of the warfighter. Some of the missions at the high risk spectrum currently undertaken by manned aircraft will be assumed by UAVs.

Overall both Manned and Unmanned C4-ISR aerial platforms will be required - but the current belief that someday Unmanned Aerial Systems will *replace* Manned aircraft - is in fact a myth and a dangerous misconception!

***“The human factor will decide the fate of war, of all wars. ....”***

**This has and will always be true!**