

# UNMANNED AIRCRAFT SYSTEMS

By Leonardo Arcadio Zarza



Unmanned Aircraft Systems (UAS) tend to be the eyes of the Armed and Security Forces and, additionally, with intelligence and recognition units as well as exploration and surveillance manned aircraft, they may be the perfect support to achieve information superiority.

## INTRODUCTION

Talking about Unmanned Aircraft Systems is not something new today as all armed forces in the Latin American region are incorporating this technology and amalgamating their own tactics to the new horizons of remote exploration and surveillance of the operations area.

Being Argentina the eighth largest country in the world and with only 40 million inhabitants, Unmanned Aircraft Systems would be used in the military environment to contribute to the extension of the exercise of effective sovereignty, security, surveillance, civil protection, support

to the community and control within the framework of a defensive strategy as the value of human life is crucial. All activities that entail a high risk of execution due to eventual casualties in hostile operational environments, natural disasters, catastrophes or places with radioactivity should be carried out by unmanned systems.

What we know as Unmanned Aircraft Vehicle (UAV) is currently being referred to as Unmanned Aircraft System (UAS) as it is actually not only an aircraft, but a system, because of the following components, among others: Ground- Control Station, Sensor Operators, Unmanned

Aircraft Vehicle and Head of Mission.

In these lines, we will explain the proposal to incorporate this technology of Unmanned Aircraft Systems to the Argentine Armed Forces and to adapt the doctrine, especially the organizational culture, to the new abilities they may provide with.

## UNMANNED AIRCRAFT SYSTEMS

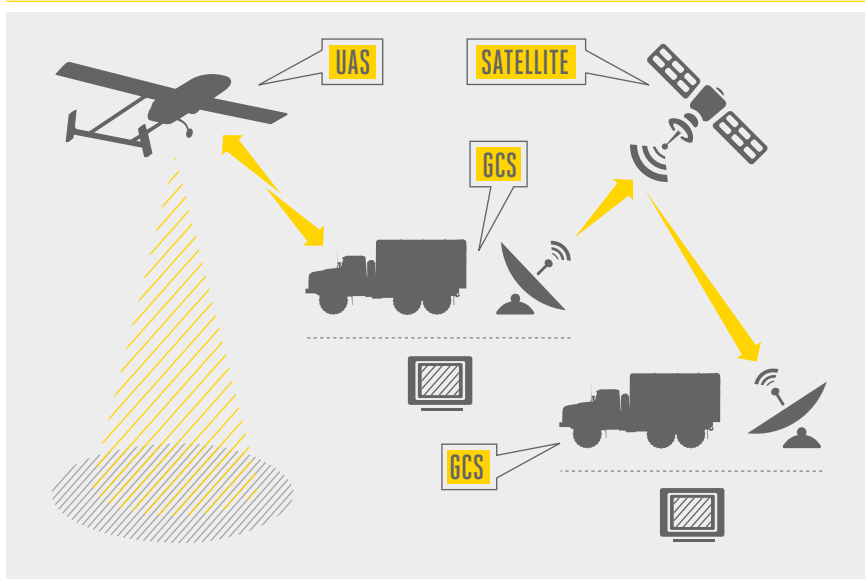
In the military environment, the NATO Standardization Agency defines it in its flight requirements for Unmanned Aircraft Vehicle (UAV), number 4671 (STANAG 4671) of the year 2009 as an aircraft able:

- a. To fly without a pilot on board and not to transport personnel.
- b. To sustain flight by means of aerodynamic forces.
- c. To be manned remotely or sustain autonomous flight following a pre- designed and scheduled flight profile.
- d. To be re-used.
- e. Not to be classified as a weapon or guided ammunition.

The ICAO Circular 328-AN/190 of the year 2012 defines the Unmanned Aircraft System (UAS) as: the aircraft and its related elements that operate without a pilot on board.

The operational concept is that the Unmanned Aircraft Vehicle gets the image of the target during the flight with multiple sensors that may be cameras, synthetic aperture radar or recordings in videos and it transmits

**FIGURE 1. OPERATIONAL CONCEPT: UNMANNED AIRCRAFT SYSTEM**



Source: Author

**FIGURE 2. OPERATIONAL CONCEPT: GROUND- CONTROL STATION, AIR OBTAINING BOARD OF THE COMBAT INTELLIGENCE DETACHMENT 601 OF THE ARGENTINE ARMY OPERATING THE SANT "LIPÁN"**



the information to a Ground- Control Station via data link in real or almost real time. It can operate in extensive operational ranges to get information: Line of sight (LOS) or Beyond Line of Sight (BLOS) with satellite aid (figure 1).

These systems extend the exploration horizon to the tactical units and provide with surveillance and protection to forces at all levels of conduct. It is necessary to classify and stagger the different types of Unmanned Aircraft Vehicle according to their performance, maximum takeoff weight and operational range.

As it was previously mentioned, the Unmanned Aircraft System is not only the aircraft, but a whole system that operates in a synchronized way with all its components to obtain information. Some of these components are in the Ground- Control Station (figure 2).

The location of the Ground- Control Station (GCS) and the place

for launching and recovering the Unmanned Aircraft Vehicle are important. These points will be permanent targets sought by the enemy.

### USE OF UNMANNED AIRCRAFT SYSTEMS

Unmanned Aircraft Vehicles are not new. In 1915, Nicola Tesla introduced

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the concept of unmanned flight during a speech referring to an armed aircraft without pilot designed to defend the United States of America<sup>1</sup>.

Nowadays, within the NATO, the use of Unmanned Aircraft System (Unmanned Combat Aircraft Vehicles – UCAV) has given rise to controversy. On the one hand, there are detractors that cause high collateral damages influenced by the comments of social media from the places where they are used.

On the other hand, those who use these Unmanned Combat Aircraft Vehicles (UCAV) state the opposite. They refer to these media as high precision technological instruments that fulfill missions for which they were programmed. Even specialists in neuroscience state that these robots would not violate human rights as easily as a soldier could respond due to fatigue as a result of the long combat or post- traumatic stress disorder<sup>2</sup>. The Department of Human Rights of Columbia Law School, in the United States, refers to these exhaustion effects in human beings as an echo chamber effect<sup>3</sup>.

The use of these systems in Argentina would serve, among other things, to: support national, provincial, municipal security systems; border surveillance; maritime control and

1. U.S. Army UAS Center of Excellence; "Eyes of the Army"; US Army Unmanned Aircraft Systems Roadmap, 2010-2035, Fort Rucker - Alabama- Ed 2010.

2. Asimov, Isaac y Pryer, Douglas; "The rise of the machines"; Military Review; March - April 2013; p. 15.

3. Amitai Etzioni; "The Great Drone Debate"; Military Review; March - April 2013; p. 3.

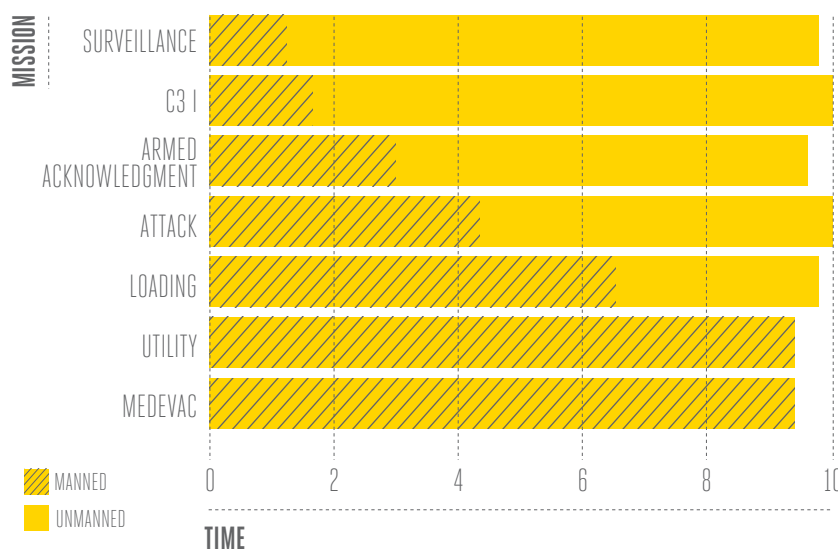


surveillance; soil fertility; shoal follow-up; control of the exclusive economic zone; surveillance and control of air space; damage assessment; nuclear radiation monitoring; detection of seats of fire and command and control in case of catastrophes.

In the military environment, for the short term (next 10 years), Unmanned Aircraft Systems will especially be used in: surveillance missions; Command, Control, Communications, Intelligence (C3I); armed recognition; attack and load. Instead, item transport missions and aerodynamic evacuations (MEDEVAC) will mostly be manned.

Anyway, care must be exercised in the use of these means with lethal effects as the social perception at global scale, after the results in Lebanon, Irak, Afghanistan and Pakistan has not been the best because of the collateral damage informed by the media. Also, during work meetings held between Argentina and Brazil, it was concluded that it is necessary to be very careful with respect to the names of these systems and it is preferred to refer

**MILITARY USE - TRANSITION FROM MANNED TO UNMANNED - SHORT TERM**



Source: U.S. Army UAS Center of Excellence; "Eyes of the Army"; US Army Unmanned Aircraft Systems Roadmap, 2010-2035, Fort Rucker - Alabama - Ed 2010.

to them as remotely piloted aircrafts rather than unmanned aircrafts. This supports the idea that Men are still the center of the system.

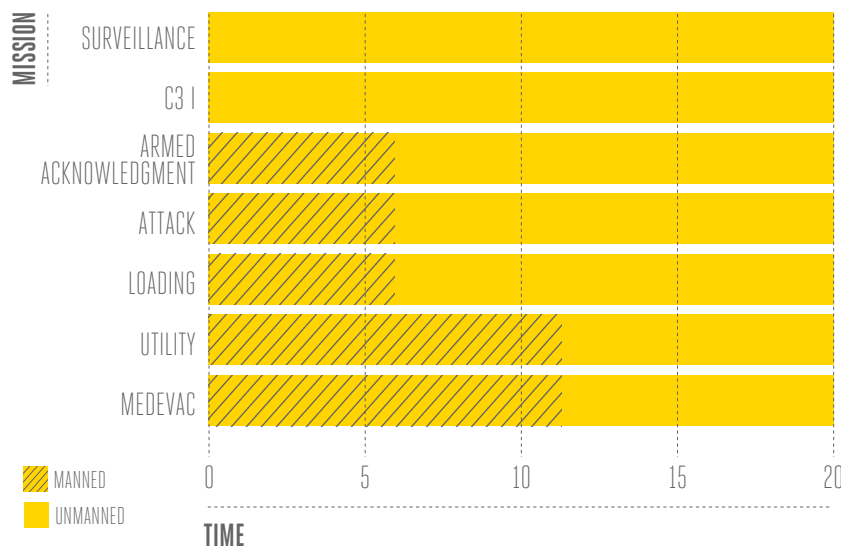
In the long term (next 20 years), the use would be greater in all areas,

both civil and military as this type of means would be enhanced and more accepted in technological, social and cultural terms.

It is necessary to acknowledge the fact that modern manned planes have guidance and navigation systems in which the pilot is often an observer and only provides data and input for the computers from which they monitor the plane since it takes off until it lands. This, obviously, does not mean that a human being is not necessary in the cockpit of an aircraft, but they could make decisions and turn to manual mode to fix any emergency or operation error in case of failure.

Nowadays, we have seen how first level military powers, and also Hezbollah have carried out military operations in which they used Unmanned Aircraft Systems. There are crews from micro Unmanned Aircraft Vehicles to get air images from multiple dispersed targets (swarming) to find targets in a very accurate manner and then defeat them with proper fire support systems. Also, large- sized Unmanned Aircraft

**MILITARY USE - TRANSITION FROM MANNED TO UNMANNED - LONG TERM**



Source: U.S. Army UAS Center of Excellence; "Eyes of the Army"; US Army Unmanned Aircraft Systems Roadmap, 2010-2035, Fort Rucker - Alabama - Ed 2010.



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Vehicles are being used at strategic level by doing transoceanic flights with a high reliability level.

#### **NATIONAL DEVELOPMENT**

The Argentine Republic has historically been a pioneer in the region regarding cutting-edge technological developments. History has showed this and by the times of the *Triple Alianza* war against Paraguay, there were captive balloons for the purposes of exploration of land forces.

In 1912, the Argentine Army had an aircraft air unit and by the end of World War II, Pulqui was built in the country. In this sense, what currently happens with the Unmanned Aircraft Systems follows the same path in the Latin American region.

The Ministry of Defense of the Argentine Republic currently has some projects to develop Unmanned Aircraft Vehicles within the framework of the Argentine Robotic Air System which are able to be driven by companies that have an adequate know how in technology and space terms.

The Argentine Armed Forces have been developing projects of air means for information acquisition for several years, such as the Unmanned Aircraft Systems reaching satisfactory targets in the conceptual sense.

The Argentine Army has had for more than 15 years the Escuadrón de Aviación de Apoyo de Inteligencia [Intelligence Support Aviation Squadron] (a tactic unit of the Army Aviation) and the Compañía de

Obtención Aérea del Destacamento de Inteligencia de Combate 601 [Air Obtaining Board of the Combat Intelligence Detachment 601] (intelligence tactic unit) aimed at operating the system with the Unmanned Air Vehicle “Lipán”, of which version four (“Lipán” M4) of said design is available today.

The Argentine Air Force and Navy also have other projects such as the “Yarará” and the “Guardián”, among others.

This is why it is important to capitalize the national effort that has been made for several years with respect to this. The Ministry of Defense, through the Joint Board, has unified efforts and will use resources for these developments that will render social, economic, security and national defense benefits which will be quickly seen.

#### **MILITARY USE: PROTECTING CIVIL POPULATION AND BRIDGING THE SENSOR- TRAITOR DECISION GAP**

Current military operations are complex and care must be exercised

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specially with respect to non-combatant civilians. Unmanned Aircraft Systems are multipliers of combat power and, in particular, help in the decision of the different command positions by providing surveillance, early warning by reducing time between the detection of the threat and the opening of fire and reducing collateral damage.

In any military operation, the list of targets include a great number of **non-fire areas** (hospitals, hydroelectric plants, schools, monuments, prisons, etc.), these unmanned systems are the essential means to guarantee the respect for these coordination and control measures.

The era of information in real time, the advance of the Internet and

the execution of military operations with forces in non- adjacent areas require spaces that are free from forces to be controlled mainly with these means in order to have an efficient situation alert and exercise a proper command and control.

These systems are called Unmanned Aircraft Systems in which, although they can operate in an autonomous way, most of the times, the pilot is present on the ground or any other air or maritime platform.

Above all things, precision and prevention of collateral damage are required; if these requirements are not met, a manned system and the manned human criteria must be chosen.

It is necessary to unify the criteria of design and an open architecture to

permanently enhance these systems. Advances in technology and artificial intelligence present unimaginable perspectives in which the difference between science fiction and real science is merely a question of time.

### TRAINING OF PILOTS REMOTE AIRCRAFT OPERATORS

It is worth mentioning that training is not only for pilots/ remote aircraft operators, which is only a part of the system, but also for operators of sensors, mechanics, Unmanned Aircraft Vehicles and heads of Mission.

Training Pilots/ Remote Operators is a real challenge. The three Armed Forces are already experiencing the tension in the teaching and learning process in order to acquire the proper skills in order to operate these systems in a secure manner.

Each Armed Force, similar to what happens with manned aviation, requires pilots/ operators with a general basic profile and, then, a specific characteristic that is particular to the operational environment of each force for the use of Unmanned Aircraft Systems.

The Argentine Army, for instance,

### 3. UNMANNED AIRCRAFT VEHICLES FIGHT SIMULATOR: TRAINING OF PILOTS/ REMOTE AIRCRAFT OPERATORS (VIRTUAL PHASE)





#### 4. PRACTICE FLIGHT: TRAINING COURSE FOR REMOTE PILOTS/ OPERATORS OF THE ARGENTINE ARMY (REAL PHASE)



makes a distinction between remote operators (petty officers) and pilots (officers) of aircraft. Unmanned Aircraft Vehicles of smaller size for exploration and surveillance at sub-unit level, regiment and Great Combat Unit (Brigade) require intelligence operators, petty officers or civil staff. Instead, the ones of greater maximum take-off weight, which would be used at Great Battle Unit (Army Division), will need remote pilots that need the skills of Army aviator officers.

Training staff implies model aeroplane flight practice that may have a virtual phase (figure 3) based on simulators and a real phase with Unmanned Aircraft Vehicles on the field (figure 4).

On the other hand, it is also required to have basic theoretical knowledge on aerodynamics; air transit; meteorology; aeronautical engines; aeronautical laws; communications and electronics; performance; air security; human factors; basic instruments.

#### ADEQUATE LEGISLATION TO AVOID A MACHINE REVOLUTION

To begin with, it is necessary to mention that Unmanned Aircraft Vehicles are not missiles (they are different from this because of the purpose) nor spaceships (they operate in a different space, in particular, in air space instead of outer space although they may enter and re-enter). The aeronautical laws on the use of Unmanned Aircraft Systems are under development at national level because

they are also starting to be developed at international level.

Our Aeronautical Code will surely be timely updated. The operation of these systems is restrained to limited or segregated air spaces and is not shared yet with manned aviation, whether military or commercial due to air security questions.

It is worth mentioning that Unmanned Aircraft Systems are not conveniently regulated at international level in the air space, but unmanned

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*The real experience regarding the operation of Unmanned Aircraft Systems in Argentina is structured over the basis of efforts made by our aeronautical engineers, deep software knowledge, missile technology, aeromodelling skills, experience in the operation of drones of anti-air defense and the teaching process that is still based on learning by doing.*

spaceships are regulated in the outer space with space laws.

However, in the United States of America and the NATO, there has been an advance towards operational integration in the military

environment of these unmanned systems with manned systems (especially helicopters and attack manned aviation) in the air space.

The Circular 328-AN/90 of the International Civil Aviation

Organization (ICAO) issued in April, 2012 sets forth the first regulations of these systems in the civil environment.

In the military environment, regulatory guidelines are being structured for the use of Unmanned Aircraft Systems in military operations. We are already seeing the need to have a specialized team of lawyers, both in the Ministry of Defense and the tactic units that order so with the purpose of guaranteeing an adequate system for obtaining targets and assessing damage.

Several questions remain in this environment which is a real legal uncertainty and society does not fully accept to see a plane landing

**UAS. NATIONAL DEVELOPMENT: PAE 22365 - LIPAN - YARARA - CABURE - GUARDIAN - ADS PETREL JET**





without a pilot. Certifications must be implemented for operators of these systems as well as for the airworthiness of aircraft, the modus operandi of insurance in the event of damage caused to third parties on land, among other things.

## CONCLUSIONS

*The saddest aspect nowadays is that knowledge science goes faster than society wisdom<sup>4</sup>.*

The use of Unmanned Aircraft Systems in Argentina must be consistent with the leadership that has had this country in Latin America and the policy to turn the region into a peace zone.

Similar to what nuclear power used to be, the use of Unmanned Aircraft Systems gives benefits both in the civil and military environments. Development policy and strategy should be based on the human being as the center of the

4. Asimov, Isaac- Pryer, Douglas; op. cit.; p. 15.

5. Author's note

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system and an adequate state policy with clear rules and operations that are limited by the total respect to International Humanitarian Law.

The real experience regarding the operation of Unmanned Aircraft Systems in Argentina is structured over the basis of efforts made by our aeronautical engineers, deep software knowledge, missile technology, aeromodelling skills, experience in the operation of drones of anti- air defense and the teaching process that is still based on learning by doing.

In the military environment, the purpose of obtaining deep target images from the air provides another perspective for the decision- making process, it aims at overcoming physical obstacles and bridging the “sensor- traitor” decision gap. These

Air Systems for the Acquisition of Information allow to extend the scope of exploration and surveillance of the tactical, operational and strategic maneuver facilitating the control of non- adjacent operation areas<sup>5</sup>.

The staff that acquires the basic skill for the operator of Unmanned Aircraft Vehicles needs to have a close relationship with the aeronautical culture. Afterwards, they must keep the skills in order to be authorized (basic minimum flight requirements).

Training of remote Pilots/ Operators must be achieved, in the short term, in all units of the Argentine security and Armed Forces, in state institutions and entities that require these means and in allied countries in the region.

