



DRONE ENABLE, ICAO's Third Unmanned Aircraft Systems
Industry Symposium (DRONE ENABLE/3) Montréal , CANADA



Deconfliction and separation management for Drones in UTM/ATM airspace

Abdelali ACHACHI

University of Batna2- Algeria

12 - 14 November 2019

Plan

- Introduction
- Separation between manned and unmanned aircraft
- Communication, navigation and surveillance (CNS) equipment
- Supporting deconfliction at strategic level
- Supporting tactical separation management
- Conducted modeling and simulations
- Conclusion

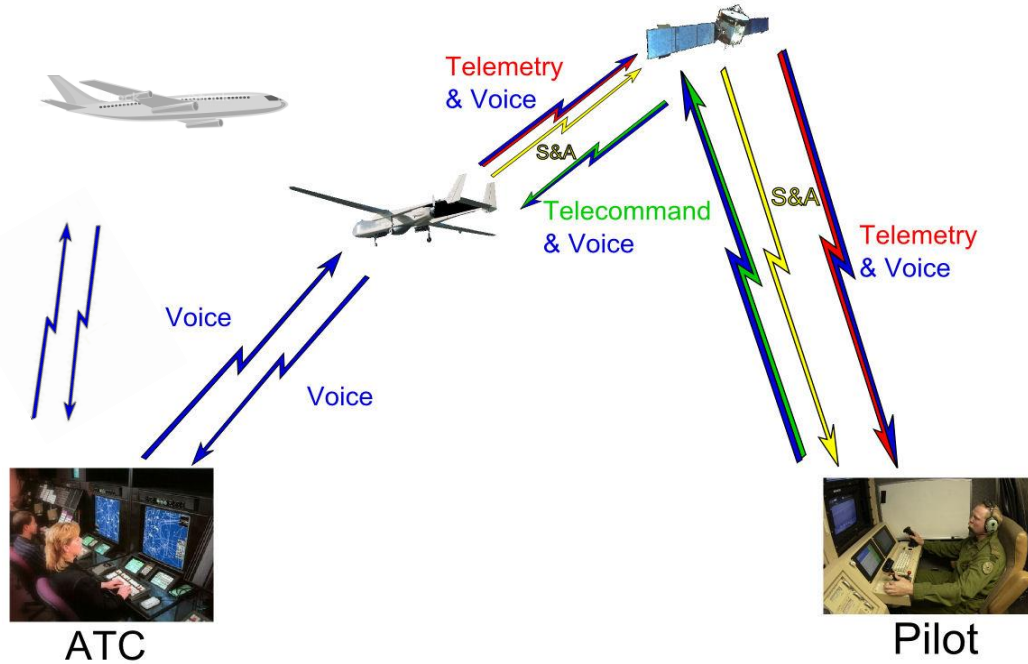
Introduction

The demand for airspace access is growing fast for UAS. They have to fly safely into different airspace separation should be applied between UAS.

What solutions have to be performed?

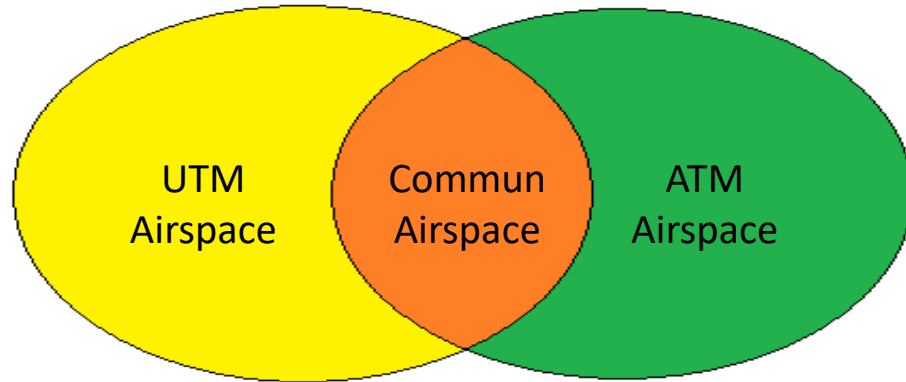
UTM separation standards has to be established in order to maintain the high level of safety and allow UAS activities.

Separation between manned and unmanned aircraft



Separation between manned and unmanned aircraft

The integration of UTM and ATM airspace



UTM/ATM airspace

- Defining the boundaries between ATM and UTM systems
- Examining the information to be exchanged between UTM and ATM

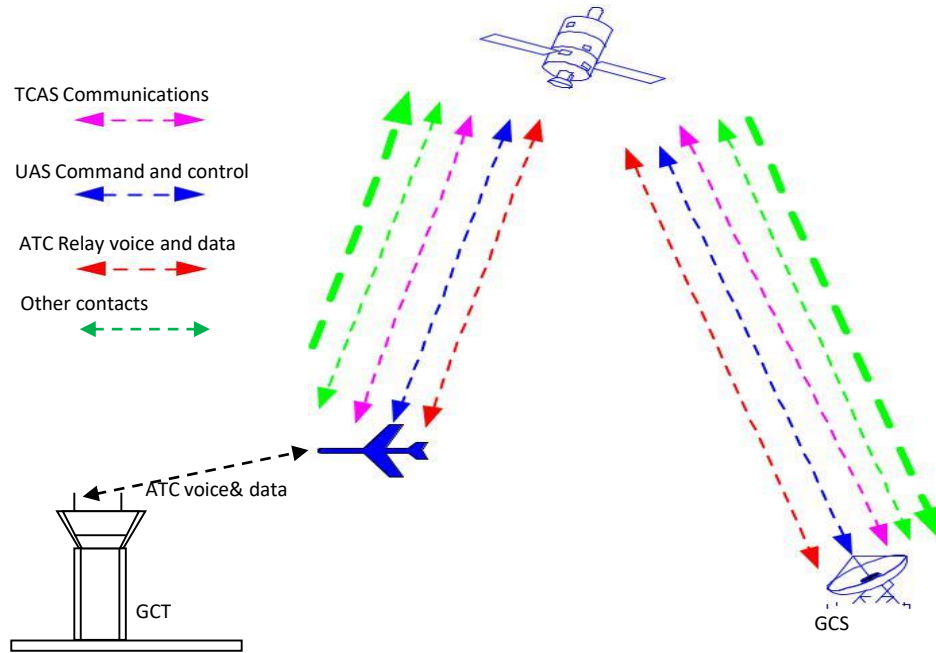
Reduced separation standards between unmanned aircraft

Separation level	Low traffic density				Average traffic density				High traffic density			
	UAS rotating wings		UAS fixed wings		UAS rotating wings		UAS fixed wings		UAS rotating wings		UAS fixed wings	
	Vertical separation	Horizontal separation	Vertical separation	Horizontal separation	Vertical separation	Horizontal separation	Vertical separation	Horizontal separation	Vertical separation	Horizontal separation	Vertical separation	Horizontal separation
First level of separation	150 ft	500 m	250 ft	900 m	100 ft	300 m	200 ft	600 m	50 ft	150m	150 ft	500 m
Second level of separation	100 ft	300 m	200 ft	600 m	60 ft	150 m	150 ft	500 m	30 ft	100 m	100 ft	300 m
Third level of separation	50 ft	100 m	150 ft	300m	30 ft	70 m	100 ft	400 m	15 ft	50 m	50 ft	100 m

To ensure a perfect integration separation standards (horizontal and vertical) should be reduced between unmanned aircraft:

- UAS type and ground speed
- Traffic density

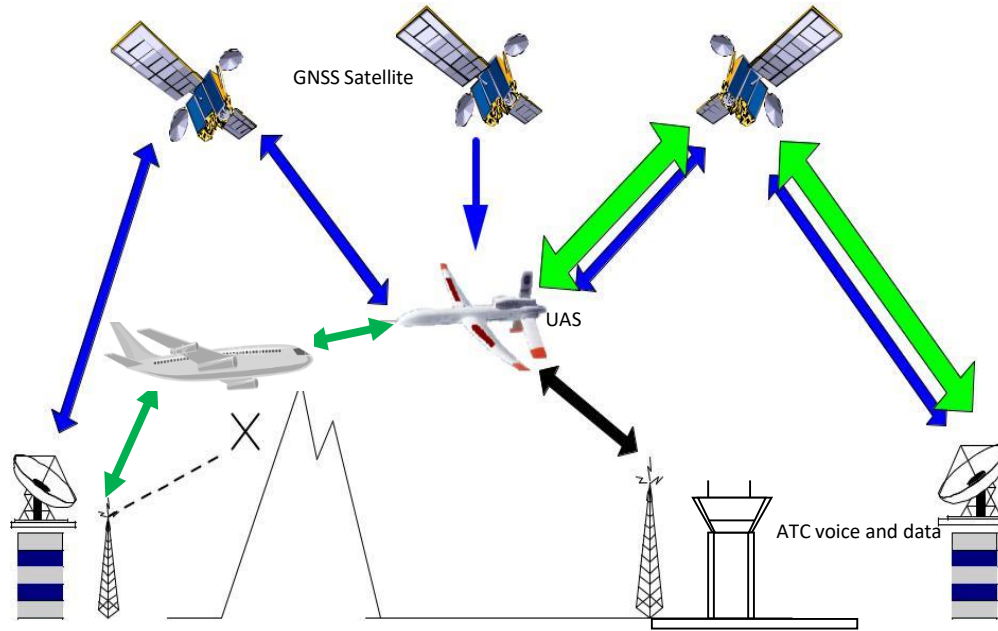
Communication, navigation and surveillance equipment



UAS specific safety communications

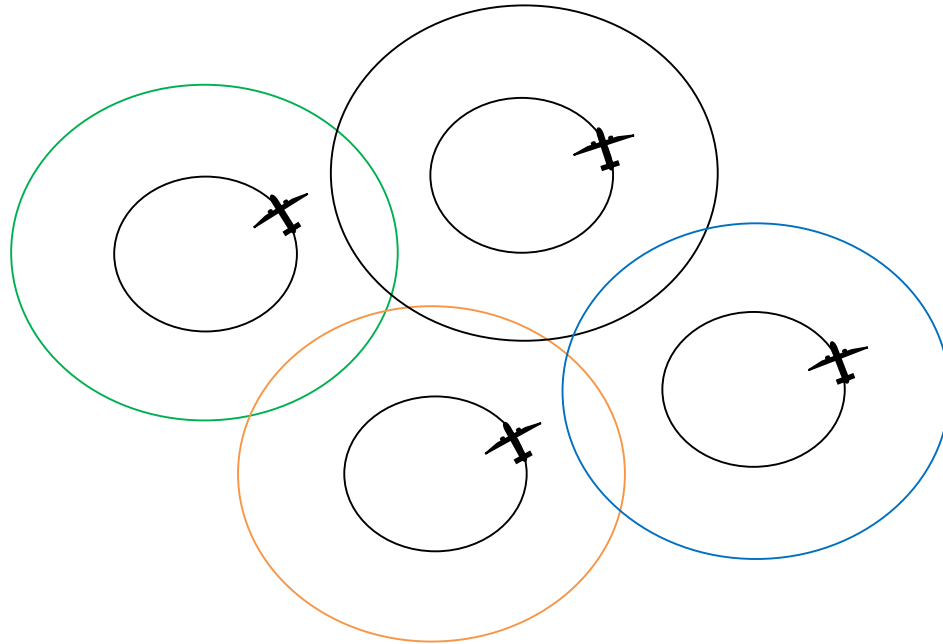
- Detection
- Tracking
- Identification
- Avoidance
 - VHF and UHF
 - GNSS and ADS-B
 - TCAS and transponders
 - Avoidance Obstacles System (AOS)

Improving communication efficiency



GNSS satellite and UAS communication system

Supporting tactical separation management



Solar UASs constellation

Complex scenarios

In order to identify the capabilities of operating UASs into complex airspace including:



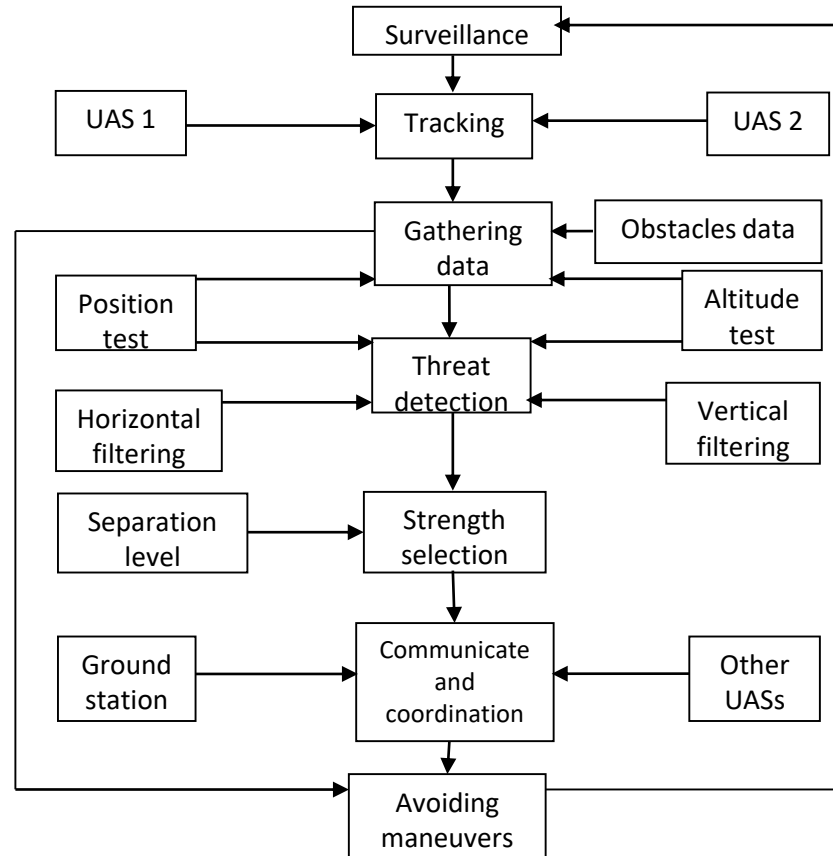
- progressing in difficulty and complexity
- Flight plan data
- Weather
- Surveillance
- Scheduling
- Contingency
- Separation services

Artificial intelligence

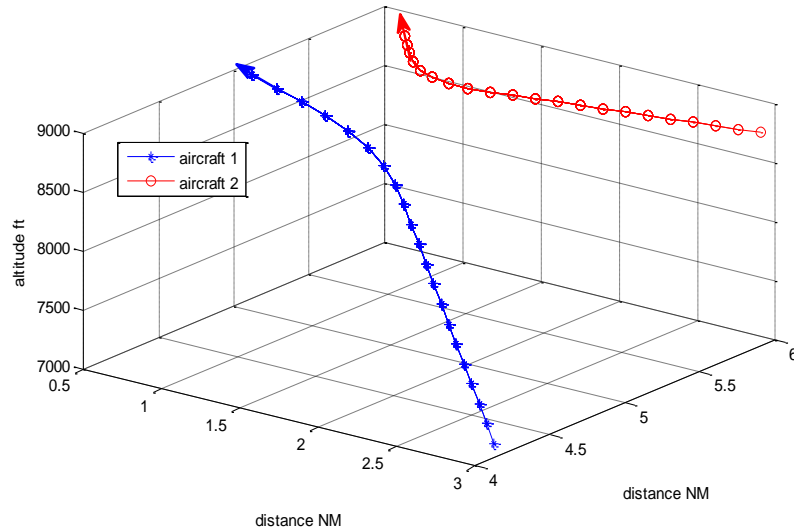


- UASs are intelligent machines that move and react in different situations.
- The artificial intelligence can be used to improve problem solving by teaching UASs using data base in order to react in some critical situations.

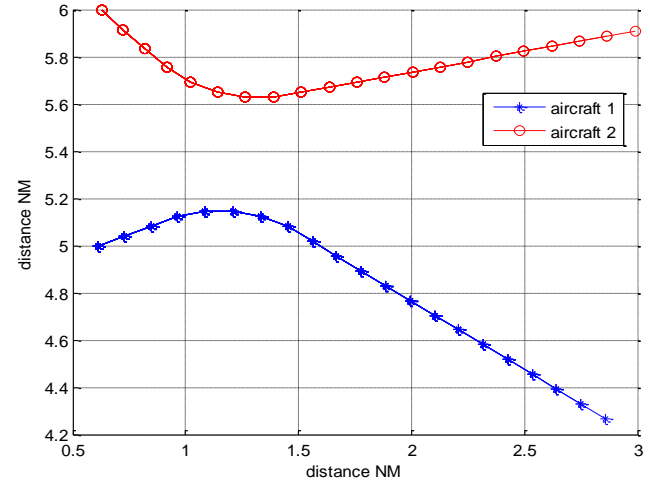
Collision Avoidance System Logic



Conducted modeling and simulations

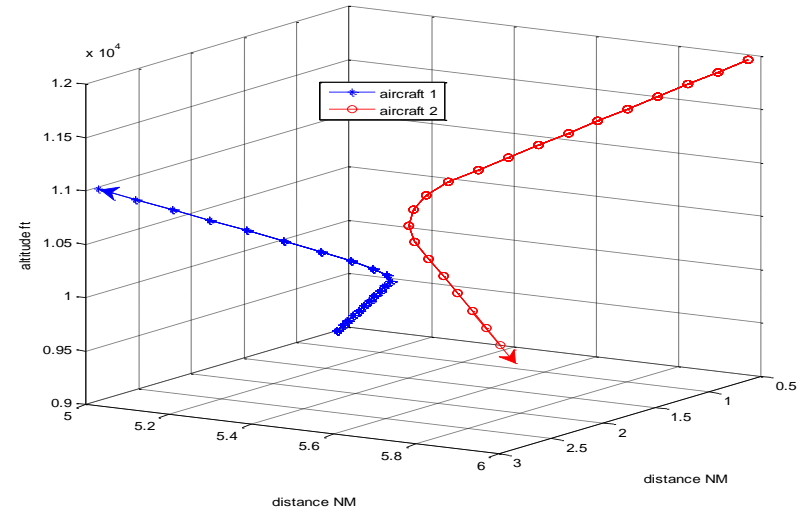
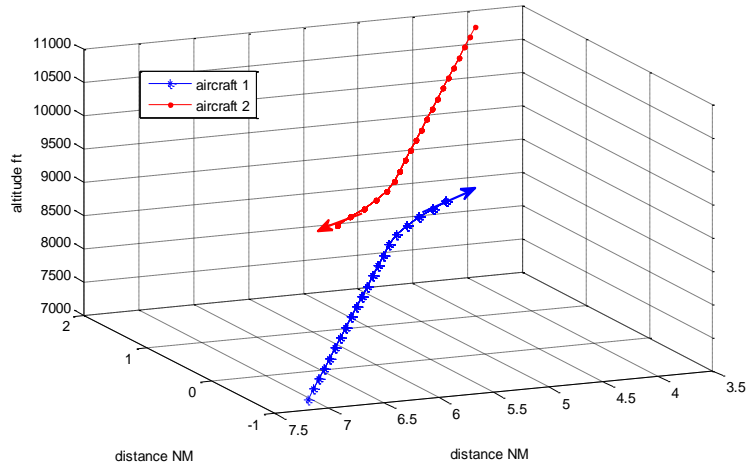


3D scenario



Horizontal scenario

Conducted modeling and simulations



Face-to-face scenarios

The certification testing and operational evaluations



They must be done with:

- Conforming prototypes; procedural
- Technology innovation
- A method of measuring/verifying
- Efficiency and reliability

Conclusion

- Potential services involving into UAM sectors have to work together in order to establish UTM separation standards using the high technology equipment.
- Separation standards currently exist for manned aircraft such as vertical and lateral separation should be applied between unmanned UAS and manned aircraft at ATM airspace.
- The integration of UTM and ATM systems must be performed to facilitate the transition between these two systems
- Simulations and modeling are the best way to test and certify new separation standards in order to improve the airspace capacities.

Thank You

CONTACT MAIL

achachiabdelai1979@yahoo.fr

12-14 / 11 / 19