



**Twenty-first Meeting of the CAR/SAM Regional Planning and Implementation Group
 (GREPECAS/21)**

Santo Domingo, Dominican Republic, 14 to 17 November 2023

Agenda Item 3: Global and Regional Developments
3.3 CAR/SAM Air Navigation Services (ANS) Implementation Level

**CONCEPT OF OPERATIONS (CONOPS) FOR ENHANCED TRAFFIC MANAGEMENT IN
 THE SAM REGION**

(Presented by Brazil)

EXECUTIVE SUMMARY

In view of the disruptive leap, it is necessary to establish guidelines for implementing Enhanced Traffic Management (ETM) through an ETM Concept of Operations (ConOps) to meet the demand of this sector. Higher Airspace has well-defined characteristics regarding low atmospheric density. However, there is no consensus among States regarding vertical limits. Some States adopt 60,000 feet as a lower limit and other States 66,000 feet. In this volume of airspace, technological advances have allowed the use of high-altitude platform systems (HAPS). The ETM concept of operations is a direct response to the pressing need to coordinate, optimize and ensure the safety of air operations in a complex and rapidly evolving environment.

Action:	<p>The Meeting is invited to:</p> <ul style="list-style-type: none"> a) Take note and review the content of this Working Paper; b) Encourage States, in a collaborative approach, to share their experiences, knowledge and requirements for implementing enhanced air traffic management (ETM); and c) Forward this proposal to the ICAO SAM Office in order to encourage the joint development of an ETM Concept of Operations (ConNops) in the SAM Region.
<i>Strategic Objectives:</i>	<ul style="list-style-type: none"> • Air Navigation Capacity and Efficiency • Economic Development of Air Transport • Environmental Protection
<i>References:</i>	<p>CANADA. International Civil Aviation Organization. Manual on Remotely Pilots Aircraft Systems (RPAS). Doc 10019, 1st Ed. Montreal, 2015. CANADA. International Civil Aviation Organization. Doc 9750-AN/963, 2013–2028. Global Air Navigation Plan. Quebec, Montreal. 2013.</p>

	<p>EASA. European Union Aviation Safety Agency. Proposal for a Roadmap on Higher Airspace Operations. 23 Mar 2023.</p> <p>EUROCONTROL. European Concept for Higher Airspace Operation (ECHO). Concept of Operations. Ed. 1.0, Supported by SESAR, 16 Dec 2022.</p> <p>U.S. Federal Aviation Administration. Upper Class E Traffic Management (ETM) Concept of Operations. V. 1, Washington D.C., 22 Apr 2020.</p>
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1. Introduction

1.1 The continuous advancement of the aeronautical segment in several technological areas, including aerodynamics, lighter materials, engines, renewable energy, wireless communication, electronics and sensor systems, as well as high-resolution cameras and data communication systems has culminated in the development of unmanned aircraft (drones), initially used for military purposes.

1.2 However, due to the versatility of its application in different areas, the unmanned aircraft segment quickly expanded to the point where it was necessary to create its own air traffic management system (UTM, “Unmanned Traffic Management”), applied in very low-level (VLL) operations, up to 400 feet high.

1.3 Soon, whether in the context of security/sovereignty, research or for commercial purposes, driven by incessant technological advances and a disruptive applicability of the sector, several projects emerged for the use of unmanned aircraft in low atmospheric density airspace, defined in this Paper as above 60,000 feet, also called Upper Class E or Higher Airspace.

1.4 In this airspace range, a wide array of vehicles can be operated, from low-speed balloons, airships or high-altitude long-endurance (HALE) unmanned aerial vehicle (UAV) to new types of high-speed vehicles, such as supersonic or hypersonic aircraft, spaceplanes or even the so-called mini/micro-launcher.

1.5 The large difference in performance between these vehicles, the difference in trajectory profiles (ballistic, linear and stationary) and the accommodation of unmanned platform operations through airspace segregation have a huge impact on airspace management and maintenance of safety, in addition to hindering the scalability of operations in Upper Class E or Higher Airspace. These problems tend to get worse, as there is an expectation of an exponential increase in operations over a short period.

1.6 The increase in the number of operations is due to the various applications of the unmanned aviation sector at high altitudes, such as: monitoring, observation, research, communications, connectivity and even reconnaissance missions. The expectation of scalability in operations and some incompatibilities with the current air traffic management system lead to the urgent need to improve air traffic management in this portion of airspace.

1.7 In view of mankind’s disruptive leap, with the advent of drones and their use in low atmospheric density environments, it is necessary to establish guidelines for implementing Enhanced Traffic Management (ETM) through an ETM Concept of Operations to meet the demand of this sector, including the use of automation and artificial intelligence.

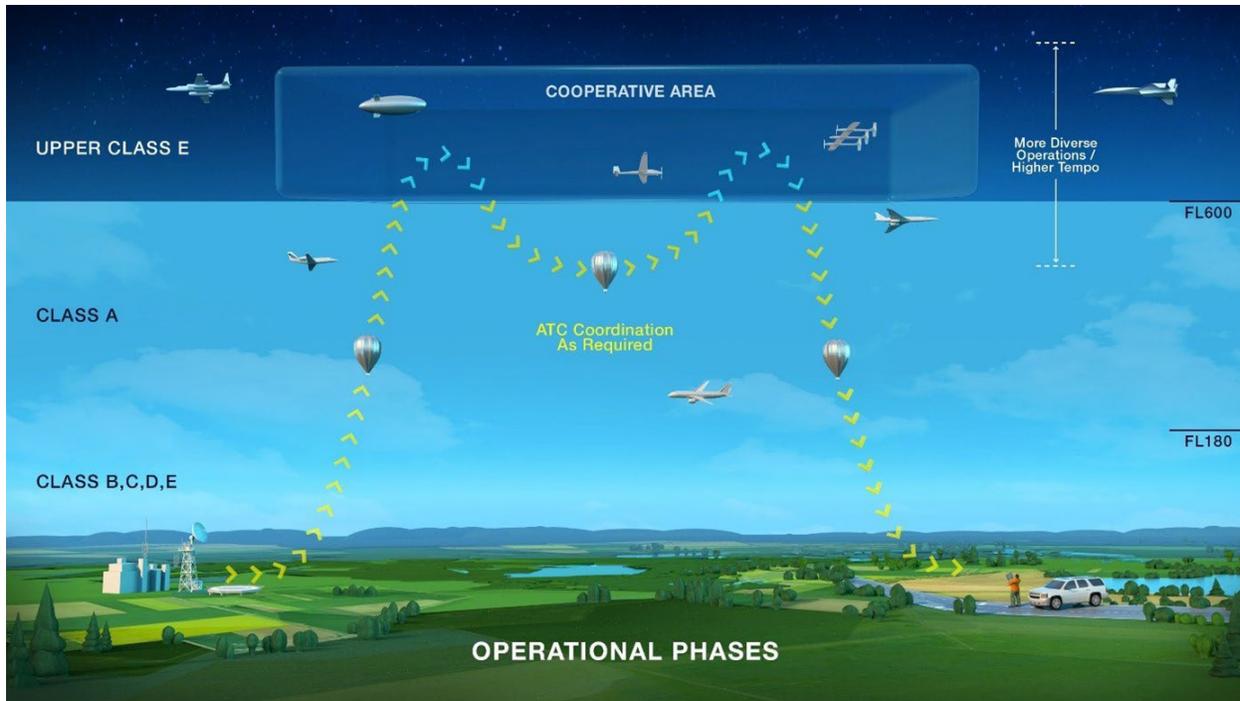


Figure 1: Representative scheme of the ETM environment

2. Description of the Higher Airspace Environment

2.1 Higher Airspace has well-defined characteristics regarding low atmospheric density. However, there is no consensus among States regarding vertical limits. Some States adopt 60,000 feet as a lower limit and other States 66,000 feet. As for the upper limit, there is not enough bibliography to define the limit that separates it from the lower stratosphere.

2.2 In this volume of airspace, technological advances have allowed the use of high-altitude platform systems (HAPS). These unmanned aircraft are designed to remain in orbit for long periods, either by using helium gas to maintain their buoyancy, in the case of balloons and airships, or by using electric engines powered by solar battery cells in the case of HALE. This allows them to operate for weeks, months or even years, depending on the project and mission needs.

2.3 In addition to HAPS, some manned aircraft, mostly military, have enough performance to reach this environment, in addition to rockets and mini/micro launchers. With performance far superior to balloons, airships and HALE, unlike HAPS, these manned aircraft remain in Higher Airspace for short periods and have strategic deconfliction as their main and indispensable instrument.

2.4 With the exception of the manned aircraft mentioned above, other operations can only occur through the segregation of certain volumes of airspace in the current ATM structure. In order to provide equal access to airspace and enable scalability in the sector, a collaborative environment needs to be established to allow access to airspace users and promote situational awareness for all parties involved.

3. ETM Concept of Operations

3.1 The increasing integration of unmanned aerial platforms and manned aircraft at very high altitudes represents a complex challenge that requires innovative and safe air traffic management solutions.

The operational design of an advanced air traffic management system in Higher Airspace through an ETM Concept of Operations for the SAM Region emerges as a response to this growing demand for coordination and safety in airspace, offering a set of significant reasons for its implementation.

3.2 Challenges in air traffic management range from processing flight plans lasting months or even years in the case of HAPS, to the use of new technologies in CNS. It is expected that the architectural principles and modus operandi regarding data sharing will be similar to those applied in UTM, with more stringent performance-based requirements.

3.3 The existing airspace structure and point-to-point navigation must give way to Free Route Airspace (FRA), allowing the flexibility of trajectories necessary for the operations of this new aeronautical segment. However, transition procedures for entering or leaving this collaborative airspace must be established and disseminated to the entire aeronautical community.

3.4 In addition to ETM ConOps, coordination procedures must be established between the States of the SAM Region to maintain the safety and efficiency of air operations, as well as to establish contingency, emergency, take-off points and other procedures. The establishment of FRA in Higher Airspace in a single block throughout the SAM Region will pave the way for the employment and development of these platforms in South America.

3.5 The ETM concept of operations is a direct response to the pressing need to coordinate, optimize and ensure the safety of air operations in a complex and rapidly evolving environment. This proposal aligns with the demands of modern aviation, promoting safety, efficiency and harmonious integration of all vehicles at high altitudes.

3.6 It is necessary to develop an ETM Concept of Operations (ConOps) capable of guiding the actions and undertakings necessary to implement the air traffic management system at very high altitudes in the SAM Region in an orderly, safe, timely and environmentally-sustainable manner, promoting efficient air operations and harmonious airspace integration.

3.7 In parallel with the development of ETM ConOps, other studies must be developed in the context of airspace management with a view to the possible creation of a single ATS Unit for the SAM Region in Higher Airspace, since the imaging, connectivity and remote sensing services provided, for example, should not be restricted to international borders.

4. Suggested Actions:

4.1 The Meeting is invited to:

- a) Take note and review the content of this Working Paper;
- b) Encourage States, in a collaborative approach, to share their experiences, knowledge and requirements for implementing enhanced air traffic management (ETM); and
- c) Forward this proposal to the ICAO SAM Office in order to encourage the joint elaboration of an ETM Concept of Operations (ConNops) in the SAM Region.