附件 3

放飞无人机—无人航空器系统(UAS)业界专题讨论会 (DRONE ENABLE 2022)国际民航组织 无人航空器系统交通管理(UTM)信息征集[1]

（ AN 13/66-22/31 号国家级信件的附篇 C ）

1. 背景

过去四年，在收到成员国要求国际民用航空组织(ICAO)作为全球民用航空协调人协助应对将无人航空器系统(UAS)融入航空监管框架的挑战后，国际民航组织主办了多次全球 UAS 专题讨论会("放飞无人机"—DRONEENABLE)，以征求有关 UAS 交通管理(UTM)主题的最新信息。这些活动的目的是通过每年发布的信息征集(RFI)，综合所收集的相关信息，并利用这些信息提供一个全球协调一致的共同框架，支持 UTM 系统的开发和部署，并促进无人航空器(UA)更大程度的整合。

为了确保使用健全的技术做法来草拟这种框架，征集了业界、学术界和科学界广泛的研发举措，以及可以从中吸取教训的国家实施活动情况。

在 2017 年 9 月于蒙特利尔举行的首届"放飞无人机"专题讨论会上，各国、业界和学术界提交了关于 UTM 基础组成部分的答复，包括支持远程识别和跟踪的登记系统、用于控制和管理无人航空器以及跟踪 UTM 区域内的所有无人航空器的通信系统、以及为防止在如机场附近等敏感/安保区域和限制/危险区域进行无人航空器运行而设置类似地理围栏等系统。

2018 年 9 月在中国成都举行的第二次"放飞无人机"专题讨论会以"UTM 到 ATM—从隔离向整合过渡"为主题，专注于促进整合 UTM 和空中交通管理(ATM)系统的解决方案。这包括在 ATM 和 UTM 系统之间划定界限的挑战、以及审视在 UTM 和 ATM 系统之间需要交换的关键信息，从而促进这两个系统之间的过渡。

2019 年 11 月在加拿大蒙特利尔举行的第三次"放飞无人机"专题讨论会以"促进未来创新"为主题，专注于制定 UTM 系统的特定挑战。这些挑战包括用来评估拟议的 UTM 系统风险的有效手段；以及基于所提供服务的关键性，对潜在的 UTM 系统服务提供者(USS)的批准/合格审定流程，从而解决 UTM 系统内的隔离和避免互扰要求，确保应急/紧急情况不会导致更高风险水平的方式。

2021 年 4 月在网上举办的 2021 年"放飞无人机"专题讨论会以"今天解决明天的挑战"为主题，专注于与引进无人航空器系统(UAS)和 UAS 交通管理(UTM)有关的挑战，包括为 UAS 的安全整合提供前进道路的国际民航组织 UTM 框架。这一框架为各国制定必要的监管框架和指导材料提供了帮助，以确保 UTM 系统的安全、高效和有效。

随着工作的进展，得以继续查明了 UTM 框架中的关键差距。为了处理这些问题，

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[1] 本附篇仅为信息征集，并不构成国际民航组织将建议就此事项采取任何特别行动的承诺(无论是暗示的或其他形式的)。此外，对于提供本信息所产生的任何费用，国际民航组织将不予负担。

国际民航组织再次请求各国、业界，学术界和其他感兴趣的利害攸关方提供协助，以协作提供解决方案，从而支持安全和有效的 UTM 能力发展。

应指出，国际民航组织正在建立一个完整的监管框架，以支持遥控驾驶航空器在管制空域和管制机场内的国际运行。此项活动不同于上述工作，但却是上述工作的补充。

2.问题声明

随着 UTM 系统的不断成熟，更多的系统得以开发和部署，有必要总结与这些能力的各个不同方面有关的经验教训和最佳措施。收集并记录这类信息，将有助于持续改进系统和流程，确保 UTM 系统在全球得到协调、安全和有效的实施。

因此，DRONEENABLE2022 问题声明将关注以下问题：从现有的 UTM 系统或服务的部署和实施中整理经验和最佳做法；以及确定如何有效管理 UTM 相关数据，以支持 UTM 环境中的安全运行。在这些题目中，每个题目都突出了关键问题和考量。下文对此进行了更加详细的讨论。

3.信息征集

随着 UTM 的发展向前推进，对无人航空器在有限的空域结构内进行安全整合的能力的下一步演变仍需保持关注。根本的要求仍然是有能力加快此种整合，而不会对有人航空运行的安全或效率或地面人员和财产的安全产生负面影响，同时考虑到安保、环境影响和所有空域用户的平等准入。

为了使各国、监管机构和业界能够继续推进 UTM 系统的发展，列出了以下问题。要求提交的信息提出切实可行的解决方案、成功的研究和开发活动、和/或现有的或拟议的最佳做法。以下与有关的问题声明一起，提供了每个提交信息中应考虑的问题类型。对提交信息的评价，将以提交信息是否很好地解决了一个或其他问题声明作为依据。

A) UTM 系统或服务的部署/实施中产生的经验和最佳做法。随着 UTM 系统和服务持续变得成熟，成为无人航空器运行(超视距飞行(BVLOS)活动)的动因，有必要将注意力转向 UTM 的成功部署和实施方面，以确定哪些做法是有效的，哪些做法有待改进，并将从得出的经验教训和制定的最佳做法进行整理和汇总。

- 基于部署类型(本地、地区、国家、集中化、联邦化、管制/非管制空域等)和实际部署经验：详细说明开展的协调、涉及到的重要利害攸关方/主管当局及每一方特定角色和职责；
- 部署是如何推进的？是否存在着影响推进的依赖性?部署/实施获得的成熟水平如何？
- 目前正在(或预计近期)提供哪些服务？哪些服务是长期渴望？影响到所提供的 UTM 系统/服务选择的标准是什么？
(注：关于潜在服务清单，参见《国际民航组织 UTM 框架》第三版中列出的 UTM 服务)

- 就部署和实施而言，哪些因素起了作用，哪些因素没有起作用，学到了哪些教训？
- 就以下各项内容描述制定/意识到的最佳做法：
  a) UTM 的部署/实施；
  b) 各类服务的提供；或

c) 与现有空中交通管理服务之间的互操作性或整合。

B) 数据要求。 为使 UTM 能够在视距内或视距外支持多项 UAS 安全运行，必须能够获得与天气、3D 结构、其他航空器等有关的数据。请说明支持安全运行所需的数据类型；采集该数据、使之保持最新、与运营人共享的方式；以及某些数据类型是否需要数据质量、安全性和恢复力方面的标准(如，完整性、可靠性、连续性和可获取性)。

- 为支持 UAS 的安全运行，已经使用了哪些数据？

- UAS 在低纬度运行时，将要求新的数据类型或质量(如，天气或障碍物数据)。请描述需要哪类数据以支持安全运行，其精度和准确度如何，以及与现有航空数据要求之间的关系？数据应由谁来提供才是可信的？

- 应对哪些数据进行监管/标准化？为什么？如何保持数据质量、可靠性和安全性？在评估、验证和接受数据来源方面，不同的利害攸关方都发挥着何种作用？

- 请提供有关数据来源、采集、分发和使用的最佳做法。

- 对于某些数据(如，天气、障碍物信息等)，可以预期的是，当前存在的关于传统航空的标准，在传递、更新速率、数据管理和总体维护方面可能存在着不足。应如可管理此类信息，才能满足 UAS 运行的需求？

信息征集的解决方案将有助于加强国际民航组织 UTM 框架，为 UAS 的安全整合提供前进道路。此外，这些信息将有助于各国制定必要的监管框架和指导材料，以确保 UTM 系统安全、高效和有效。

4.提交的信息

提交内容应针对以上问题说明之一加以处理。如果旨在处理一个以上的问题说明，则必须就各个提案分别提交信息征集。通过提交信息征集答复，提交者表明他们准备自费前往加拿大蒙特利尔，在 DRONEENABLE2022 专题讨论会期间进行演讲。关于就其他主题提交的信息，目前不予考虑。

提交内容必须：

- 就可由所有国家实施的解决方案进行高级别说明；
- 允许在国家基础上灵活实施(例如，空域范围)，同时遵守共同框架；
- 顾及所提出的解决方案将在其中运作的运行环境；
- 不超过 2000 字，将使用 MS-Word 的字数统计功能来确定文件字数；
- 以英文书写；
- 以可读/可编写的 MS-Word 文档提交；和
- 国际民航组织通过 DRONEENABLE@icao.int 收件的日期不迟于 2022 年 7 月 15 日。

所有提交的信息均将予以审查。那些被认为最能解决问题说明的提案提交者，将有机会于 2022 年 11 月 14 日至 16 日在加拿大蒙特利尔举行的国际民航组织 DRONEENABLE2022 专题讨论会上介绍其信息。应有所预期的是，将对所有演讲内容进行广泛讨论，而若干提案的某些方面可能获得专题讨论会受众的支持，并通过审议以纳入国际民航组织的 UAS 指导材料。

请注意，差旅和住宿相关费用将由演讲人自理。

DRONE ENABLE, UNMANNED AIRCRAFT SYSTEMS (UAS) INDUSTRY (DRONE ENABLE 2022) SYMPOSIUM
International Civil Aviation Organization Unmanned Aircraft System Traffic Management (UTM)
Request for Information[2]

1. BACKGROUND

For the past four years, after receiving requests from Member States that the International Civil Aviation Organization (ICAO) serve as the global civil aviation facilitator to assist with the challenge of integrating unmanned aircraft systems (UAS) into the aviation regulatory framework, ICAO has hosted global UAS symposia (DRONE ENABLEs) to solicit the most up-to-date information on the topic of UAS traffic management (UTM). The aim of these activities has been to synthesize relevant information gleaned from an annual Request for Information (RFI), and utilize this information to provide a globally harmonized, common framework to support the development and deployment of UTM systems and facilitate the increased integration of unmanned aircraft (UA).

To ensure sound technical approaches were used for drafting the framework, broad industry, academic and scientific community research and development initiatives were solicited as well as any national implementation activities from which lessons could be learned.

At the inaugural DRONE ENABLE, held in Montréal in September 2017, States, industry and academia submitted responses which addressed UTM foundational components including registration systems that supported remote identification and tracking; communications systems for control and management of the UA and tracking of all UA within the UTM area; as well as geofencing-like systems to prevent UA operation in sensitive/security areas and restricted/danger areas such as near aerodromes.

DRONE ENABLE/2, held in Chengdu, China in September 2018, had a theme of "UTM to ATM – Transitioning from Segregation to Integration" and focused on solutions for enabling the integration of UTM and air traffic management (ATM) systems. This included the challenges of defining the boundaries between ATM and UTM systems and examining the key information that needs to be exchanged between UTM and ATM systems to facilitate the transition between these two systems.

DRONE ENABLE/3, held in Montréal, Canada in November 2019, had a theme of "Facilitating Future Innovation" and focused on specific challenges of developing a UTM system. These included an effective means of assessing risks for a proposed UTM system; and an approval/certification process of potential UTM Service Providers (USS) based on the criticality of services provided, addressing separation and deconfliction requirements within

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[2] This is a request for information (RFI) only and does not constitute a commitment, implied or otherwise, that ICAO will recommend any particular action on this matter. Further, ICAO will not be responsible for any cost incurred in furnishing this information.

the UTM system as well as a means to assure that contingency/emergency situations would not result in greater levels of risks.

DRONE ENABLE 2022, held virtually in April 2021, had a theme of "Addressing Tomorrow's Challenges Today" and focused on challenges related to the introduction of unmanned aircraft systems (UAS) and UAS traffic management (UTM). This included the ICAO UTM framework which provides a path forward for the safe integration of UAS. The framework assisted States with developing the required regulatory framework and guidance material to ensure a safe, efficient and effective UTM system.

As work progresses, critical gaps in the UTM framework continue to be identified. To help address these gaps, ICAO is again engaging States, industry, academia and other interested stakeholders to collaborate on and provide solutions in support of the development of a safe and efficient UTM capability.

It should be noted that this activity is separate but complementary to ICAO's ongoing work to build a complete regulatory framework to support international operations for remotely piloted aircraft in controlled airspace and at controlled aerodromes.

2. PROBLEM STATEMENT

As UTM systems continue to mature and more systems are being developed and deployed, it is important to capture lessons learned and best practices relating to various aspects of these capabilities. Collecting and recording this type of information will assist in the continued improvement of systems and processes as well as ensuring the harmonized, safe and effective implementation of UTM systems globally.

As such, the DRONE ENABLE 2022 problem statements will focus on the following: collating the experiences and best practices from the deployment and implementation of existing UTM Systems or Services; and determining how UTM related data will be effectively managed to support safe operations within a UTM environment. Each of these topics brings key issues and considerations to the forefront and are addressed in more detail below.

3. REQUEST FOR INFORMATION

As the development of UTM advances, there remains a need to focus on the next evolution of the ability for UA to safely integrate into a finite airspace structure. The primary requirement remains the ability to facilitate such integration without negatively impacting the safety or efficiency of manned aviation operations or the safety of persons and property on the ground, taking into account security, environmental impacts and equitable access for all airspace users.

To enable States, regulators and industry to continue to advance the development of UTM systems, the issues below are being showcased. It is requested that submissions propose practical solutions, successful research and development activities and/or best practices - existing or proposed. The types of questions that should be considered in each submission are provided below with the associated problem statement. Submissions will be evaluated based

on how well they have addressed one or other problem statement.

A) Experiences and Best Practices from the Deployment/Implementation of UTM Systems or Services. As UTM systems and services continue to mature and act as an enabler for unmanned aircraft operations, including beyond visual line-of-sight (BVLOS) activities, it is important to direct attention towards successful UTM deployments and implementations in order to determine what worked, what could be improved, and to consolidate the experiences gained, lessons learned and best practices developed.

• Based on the type of deployments (local, regional, national, centralized, federated, controlled/uncontrolled airspace, etc.) and actual implementation experience: detail the coordination conducted, the key stakeholders/authorities involved and the specific roles and responsibilities of each.

• How are deployments being rolled out and are there any dependencies that impact the progress of the rollout? What maturity level has the deployment/implementation attained?

• Which services are currently being provided (or expected in the near term), which are longer-term aspirations? What criteria influenced the choice of UTM systems/services being provided?

(Note – reference the UTM services listed in the ICAO UTM Framework, Edition 3 for a list of potential services).

• With regards to deployments and implementations, what worked, what didn't work and what lessons were learned?

• Describe best practices developed/realized with regards to:

a) UTM deployment/implementation;
b) provision of various services; or
c) interoperability or integration with existing air traffic management services.

B) Data Requirements. In order for UTM to support safe multiple UAS operations within and beyond visual line-of-sight, data related to weather, 3D structures, other aircraft, etc. must be made available. Describe the type of data needed to support safe operations, how that data is collected, maintained current, shared with operators, and whether standards for certain types of data are needed in terms of data quality (e.g. integrity, reliability, continuity and availability), security and resilience.

• What data is already being used to support safe UAS operations?

• UAS operation at low altitude will require new types or quality of data (e.g. weather or obstacle data). Describe what type of data would be needed to safely operate, with what precision and accuracy, and what would be the relationship to existing aeronautical data requirements? Who should provide the data so that it can be trusted?

• What data should be regulated/standardized and why? How is data quality, reliance and security maintained? What role do different stakeholders have in evaluating, validating and accepting data sources?

• Provide best practices related to data sources, collection, dissemination and usage.

• For certain data (e.g., weather, obstacle information, etc.), one could expect that the standards that exist today for conventional aviation, in terms of delivery, update rate, data management and overall maintenance, may not be adequate. How should this information be managed to meet the needs of UAS operations?

Solutions to the RFI will serve to strengthen the ICAO UTM framework, providing a path forward for the safe integration of UAS. Furthermore, this information will assist States with developing the required regulatory framework and guidance material to ensure a safe, efficient and effective UTM system.

4. SUBMISSIONS

Submissions should address one of the above problem statements. If the intent is to address more than one problem statement, individual RFIs must be submitted, addressing each proposal separately. By submitting an RFI response, submitters represent that they are prepared to travel at their own expense to Montréal, Canada to deliver their presentation during the DRONE ENABLE 2022 Symposium. Submissions for additional topics will not be considered at this time.

Submissions must:

• describe at a high level, solutions that can be implemented by all States;

• allow for flexible implementation (e.g., dimensions of airspace) on a national basis while adhering to a common framework;

• take into consideration the operational environment within which the proposed solution would operate;

• not exceed 2000 words, the word count function of MS-Word will be used to determine the number of words in the document;

• be written in English;

• be provided as a readable/writable MS-Word document; and

• be received by ICAO at DRONEENABLE@icao.int not later than 15 July 2022.

All submissions will be reviewed. Submitters of those proposals that are considered to best address the problem statement will be offered an opportunity to present their information at DRONE ENABLE 2022 to be held from 14 to 16 November 2022. Extensive discussion of all presentations should be anticipated with the possibility that some aspects of several submissions could be supported by the Symposium audience and considered for incorporation into ICAO UAS guidance material.

Please note that costs associated with travel and accommodations will be borne by the presenter.