Overview of Singapore's UAS Integration Approach: Challenges and Priorities

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CAAS
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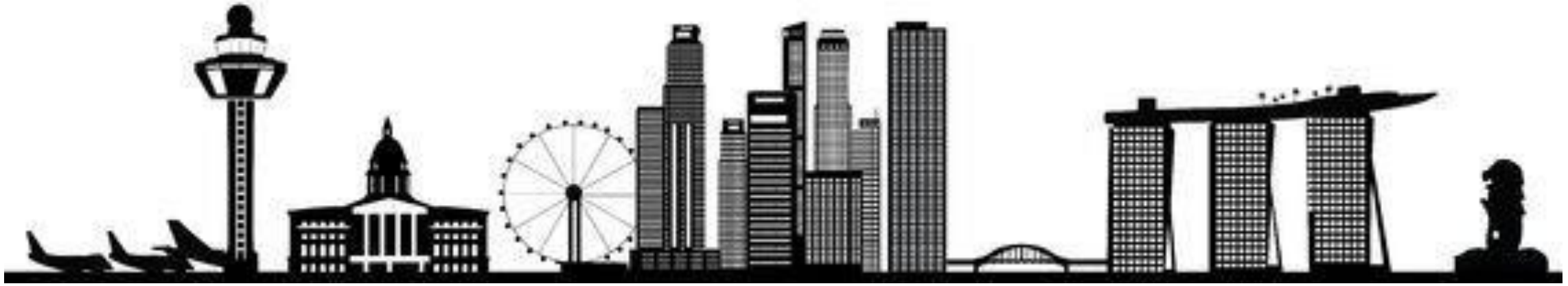
AGENDA

- ✓ Introduction to Singapore's Approach to UAS Integration
- ✓ Overview of CAAS' UTM CONOPs
- ✓ Introduction to Singapore's UAS research & development work
- ✓ Sharing of CAAS' industry partnerships & projects

Singapore's Approach to Unmanned Aircraft Systems (UAS) Integration

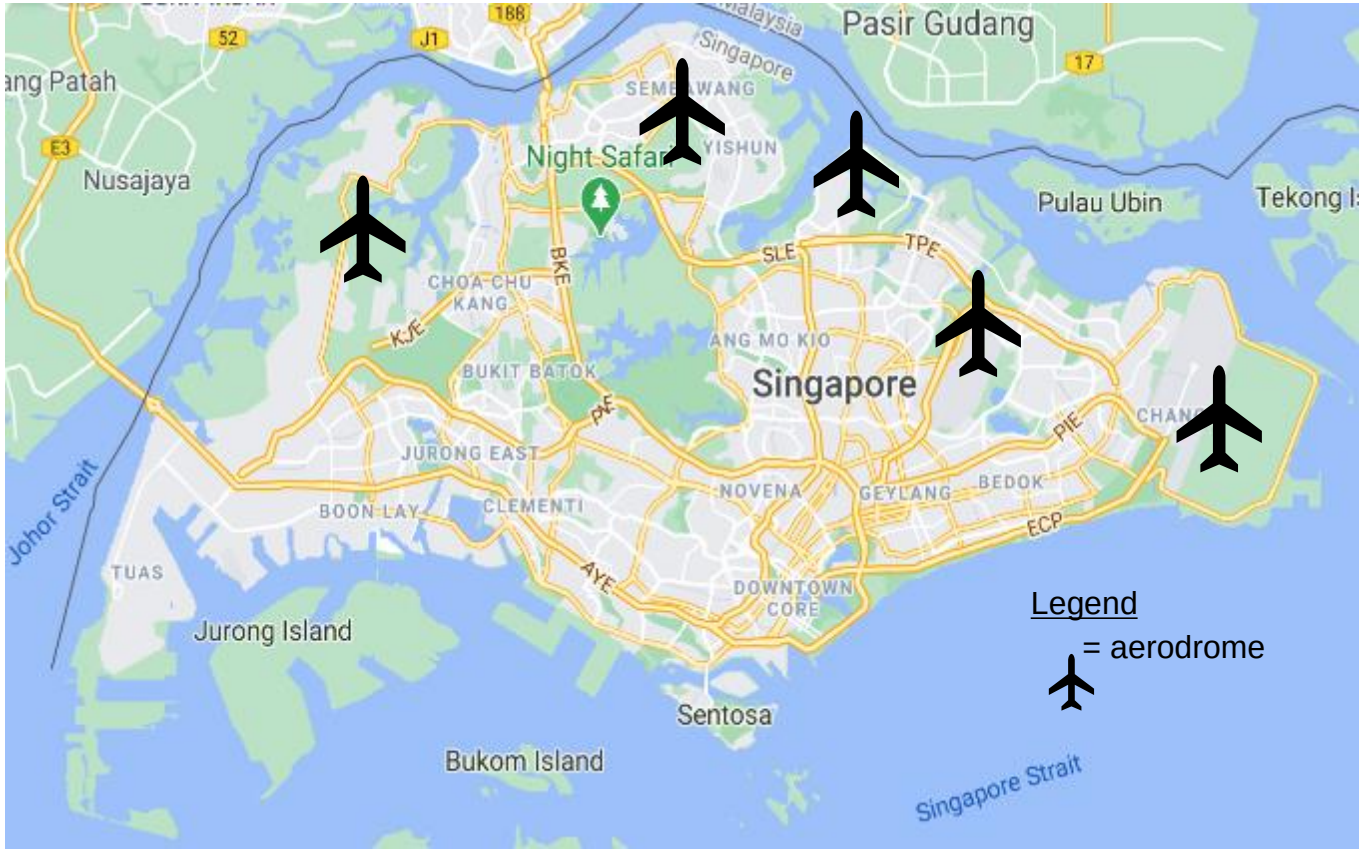
CAAS' Vision for UAS Use in Singapore

To facilitate and enable the beneficial and innovative use of UAS in Singapore as part of our **Smart Nation Vision**



Singapore's Unique Environment

Our urban and densely built-up landscape, coupled with the highly congested and controlled airspace poses significant challenges in integrating UAS operations into the national airspace



- Densely Built-up Landscape
  - Land Area: **721.5** sq km
  - Population: **5.6** Million
- Highly Congested Airspace
  - **5** Aerodromes

Our regulatory approach

Balanced and sustainable approach

- Finding the right balance between beneficial use of UAS benefits and risks that come along with it

Whole of government approach to UAS

- Multiple stakeholders work together to enable the use of UAS

Progressive and adaptive regulations

- In-step with the development and advancement of technologies
- Constant engagement with stakeholders to ensure alignment

UAS Integration Challenges and Priorities

We need to address this unique challenge and open up airspace access in a phased manner via a risk-based approach

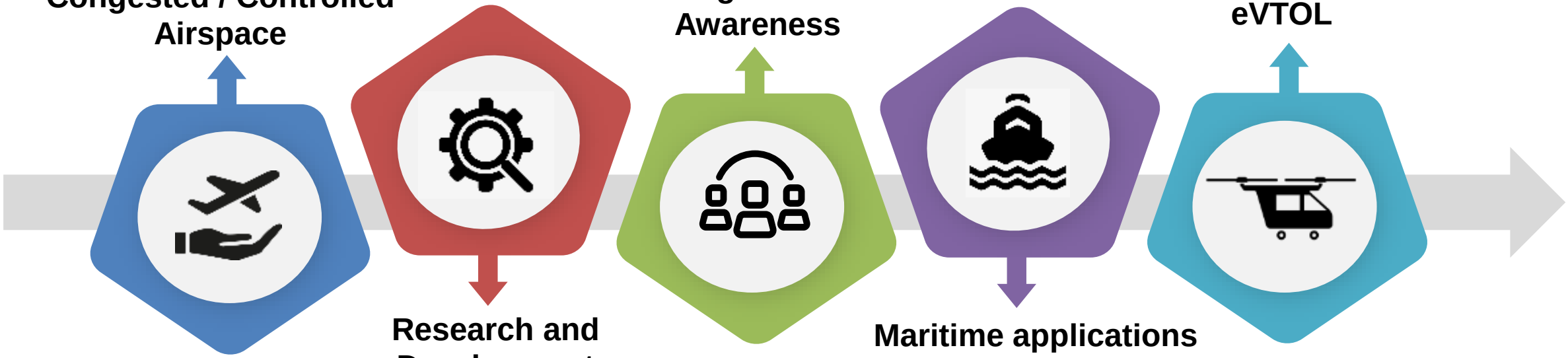
Congested / Controlled Airspace

Involving stakeholders and maximising airspace usage through cooperation

Building Situational Awareness

Accommodating eVTOL systems for future use cases

eVTOL



Research and Development

To understand the risk posed by UA to aviation and public safety and determine ways of integrating UA safely through future technologies

Maritime applications and BVLOS

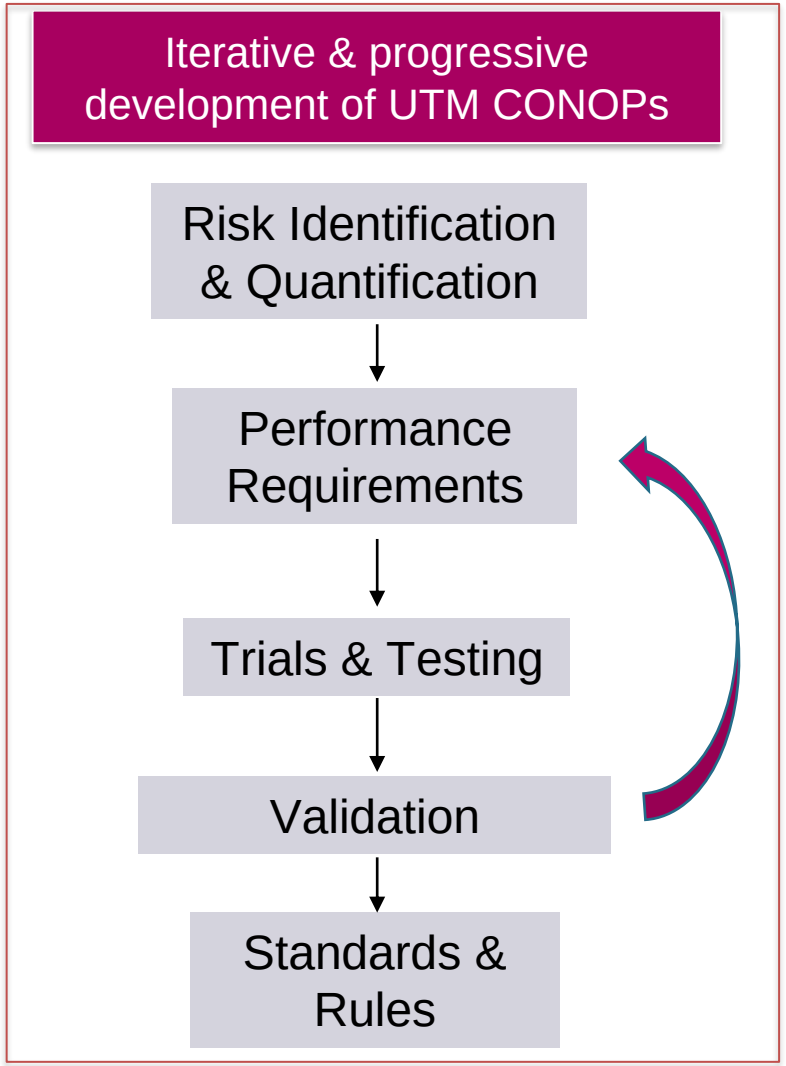
Identifying emerging operational needs from industry

Our UTM CONOPs: Approach

Recognising that UTM is an essential enabler for safe and efficient integration of UAS into the airspace, CAAS is drafting an iterative UTM CONOPs unique to Singapore's environment

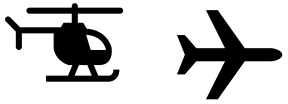
Progressive UTM Implementation

Collaborative Refinement & Development of UTM Rules, Standards & Services



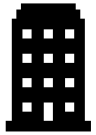
Our UTM CONOPs: Risk Based & Performance Oriented

Risk Identification & Quantification



Air Risk

Ground Risk



Security Risk

Risk Tiering of Airspace Volumes

Low Risk → **High Risk**

Best Equipped, Best Served Principle**:**
Increasing stringency of: **performance requirements**, **flight rules (e.g. separation standards), capacity limits**

Expanding operational boundaries through partnerships

Our Research Efforts

NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE

Partnerships

CAAS entered into a MOA with ATMRI in Feb 2013, with the objective of finding *innovative solutions* and catalysing the transformation of ATM for the region

A dedicated **UAS Research Pillar** was established in 2018

ATMRI's UTM simulation platform - *AirMatrix*

Our Research Efforts: What's Next?

Partnerships

CAAS is embarking on a 3 year R&D programme with ATMRI to enable the implementation of foundational UTM services in low-risk areas

Risk management

Identifying the risk factors and recommendations on preliminary risk tiering framework

UA Performance

Recommendations on minimum UA performance for operations over low-risk areas

Separation Minimas

Recommendations on preliminary separation for UAS operations over low-risk areas

INCORPORATION OF RECOMMENDATIONS INTO UTM CONOPS & ITERATIVE REFINEMENT OF RESEARCH REQUIREMENTS

Industry Partnerships: Call For Proposal

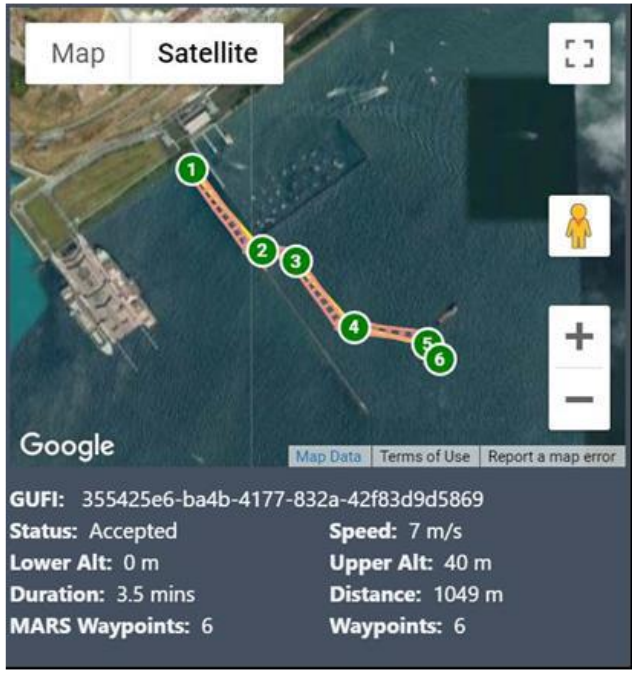
CAAS and Ministry of Transport jointly issued a call for proposal to develop systems and technologies to enable the innovative use of UAS in Singapore's urban environment

	Use Cases	Brief Description of Technology
Aggregate drone services for maritime Avetics	❖Surveillance, shore-to-ship delivery, environmental monitoring, ship inspection and signal data collection	❖Mesh network communication ❖Improve battery life ❖Interchangeable payloads
Safe and effective package delivery via UAV Nova Systems	❖Unmanned traffic management prototype for Singapore	❖Wide-scale, BVLOS, multi-UAV, multi-site product ❖Modelling and analysis of network coverage, route design using CNS principle
Ship-to-shore delivery for maritime services ST Engineering Aerospace	❖Shore-to-ship delivery	❖Ship localisation and precision landing ❖Operations in metallic environments, incl wind resistance and endurance ❖BVLOS flight demonstration

Industry Partnerships: Nova Systems

Developing Unmanned Traffic Management (UTM) Prototype

- Under the call for proposal, Nova has developed a UTM prototype that aims to safely and efficiently manage BVLOS drone traffic
- Live trials with multiple drones are ongoing in the month of March 2021 at the Maritime Drone Estate in Singapore
- The UTM prototype incorporates features such as strategic deconfliction and conformance monitoring.



Industry Partnerships: ST Engineering Aerospace

Beyond Visual Line of Sight (BVLOS)

- In end Jan 2019, ST Engineering Aerospace was the first operator to receive approval for Low-Risk BVLOS operations
- Conducted BVLOS demo over Lower Seletar Reservoir for water monitoring and perimeter surveillance

Adopting a phased approach to BVLOS operations

- After the BVLOS trial, STEA is conducting less complex use cases and clocking hours, before delving into operations within higher risk areas such as within 5km of aerodrome
- The Call-For-Proposal project on Shore-to-Ship delivery is a step towards this goal

Industry Partnerships: Airbus

Urban Air Mobility (UAM) MoU

- Continuing from the Skyways collaboration, MoU was signed in Airshow 2020.
- Airbus and CAAS will collaborate to define and develop an initial set of UTM system and services to enable UTM.
- Serves as a springboard for further development of more advanced UTM services and UAM services.


Thank You
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