

# CAAS ON THE FOREFRONT OF ATM INNOVATION

The Civil Aviation Authority of Singapore (CAAS), a leading Air Navigation Services Provider, has embarked on its research and development programmes to achieve 3 key strategic objectives:

**1** Provide safe and efficient Air Navigation Services to meet current and future needs

**2** Ensure resilience

**3** Develop capabilities to maximise capacity and ensure business continuity

## AIR TRAFFIC MANAGEMENT

CAAS has delivered new concepts of operations and implemented prototypes, built an ecosystem of research institutions supporting technology developments, and grown local capabilities in key Air Traffic Management (ATM) R&D areas.

The projects showcase the key capabilities that CAAS has achieved with research institutions:

- (i) Airspace and Aerodrome modelling
- (ii) Airspace design
- (iii) Open ATM architecture
- (iv) Machine Learning and Artificial Intelligence applications



# CAAS – THALES

## AVIATION INNOVATION AND RESEARCH LAB (AIR LAB)

# AIR TRAFFIC MANAGEMENT

### AIR TRAFFIC MANAGEMENT (ATM) TWIN

#### Project Background

The Air Traffic Control (ATM) Twin supports ATM application research and development. It is a virtualised replica of the live operational CAAS ATM system in a cloud environment.

The ATM Twin allows for new applications and tools to be tested and trialled in an operating environment without disrupting live Air Traffic Control (ATC) operations. It also allows interactions / communication with the ATM System via Application Programming Interfaces (APIs) to ease the development of new applications.

#### Project Outcomes

The ATM Twin project will deliver a high-fidelity digital twin for ATM System in a cloud environment with live data.

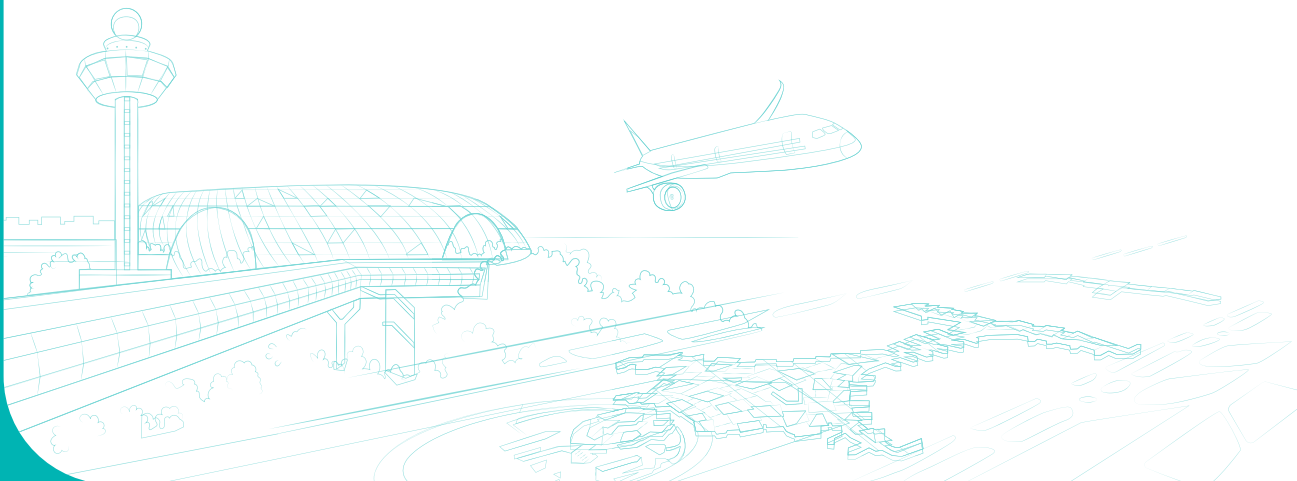
A prototype Continuous Descent Operations (CDO) Advisory Tool (CAT) was developed with the aid of the ATM Twin.

CDO is an aircraft operating technique which enables the pilot to execute an optimised arrival descend profile using instrument flight procedure design and ATC procedures.

The CAT prototype provides the Air Traffic Control Officer (ATCO) with advice on which arriving flights are most suitable for CDO operations.

#### About AIR Lab

CAAS and Thales jointly established AIR Lab in 2019, to conduct R&D into open ATM concepts and the development of an ATM Twin to test and validate new concepts of operations.



# SUTD - ASI

## (AVIATION STUDIES INSTITUTE)

# AIR TRAFFIC MANAGEMENT

## AIRSPACE DESIGN GAME

### Project Background

Route networks exist for air traffic to fly safely and efficiently. When designing these routes, there are some trade-offs. The Airspace Design Game was designed as a tool for engagement to help raise awareness and appreciation amongst students, build understanding of the various design trade-offs and the challenges in developing optimal airspace designs.

### Project Outcomes

ASI developed a software prototype that posed design challenges and required users to make iterative design decisions, with scoring on interdependent metrics.

It aided also in the engagement of students - including raising awareness of how the aviation industry adopts technology (modelling and simulation) to design solutions for complex airspace challenges.

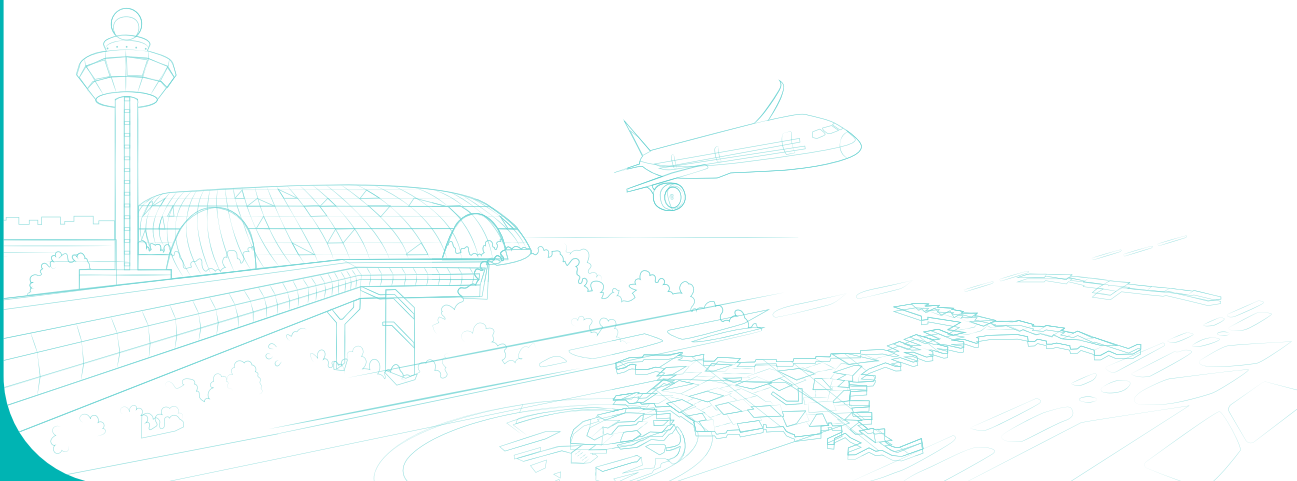
### About The Aviation Studies Institute

The Aviation Studies Institute in the Singapore University of Technology and Design was established jointly with the Civil Aviation Authority of Singapore in 2019. Its goal is to establish a world-leading centre of aviation policy research and thought leadership.

It is dedicated to address the needs of aviation stakeholders in general and ATM policymakers in particular to advance the development of aviation in the Asia Pacific region.



Aviation  
Studies Institute



# NTU - ATMRI

## (AIR TRAFFIC MANAGEMENT RESEARCH INSTITUTE)

**A DEEP REINFORCEMENT LEARNING APPROACH FOR INTELLIGENTLY MANAGING AIRPORT AIRSIDE CONGESTION**

### Project Background

Airport taxi-way delays adversely affect airports and airlines around the world. Such delays waste fuel, lower operational efficiency and may cause poor travel experiences and missed connections.

Airport Departure Metering (DM) is an airport surface traffic management procedure in which departures are held at gates and are released at appropriate times to reduce airside congestion.

### Project Outcomes

The DM helps the departing aircraft reach the runway just-in-time for take-off while preventing long queue formation.

The learnt DM policy was evaluated under different traffic densities. In medium-density traffic scenarios, it shows a reduction of ~44% in taxi-out delays. This corresponds to a 2-minute saving in taxi-out time per aircraft.

# AIR TRAFFIC MANAGEMENT

### About Air Traffic Management Research Institute

The Civil Aviation Authority of Singapore and Nanyang Technological University jointly established the ATMRI in 2013, with the vision to set up a renowned ATM research institute, finding innovative solutions and catalysing ATM transformation in the region.



NANYANG  
TECHNOLOGICAL  
UNIVERSITY  
SINGAPORE

Air Traffic Management  
Research Institute

