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DIGITAL NOW:

WHY THE FUTURE OF AVIATION STARTS WITH CONNECTIVITY

Digital Aviation Roadmap

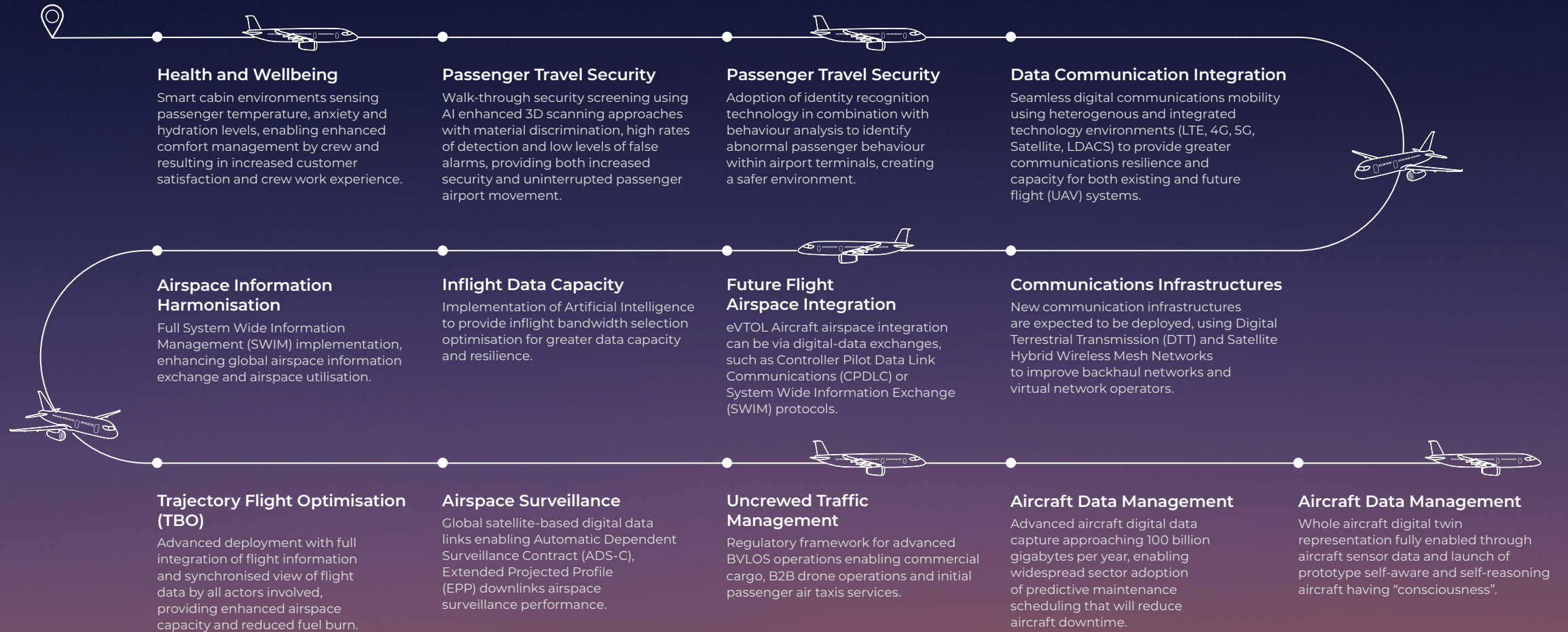Presented in partnership between Inmarsat and Cranfield University
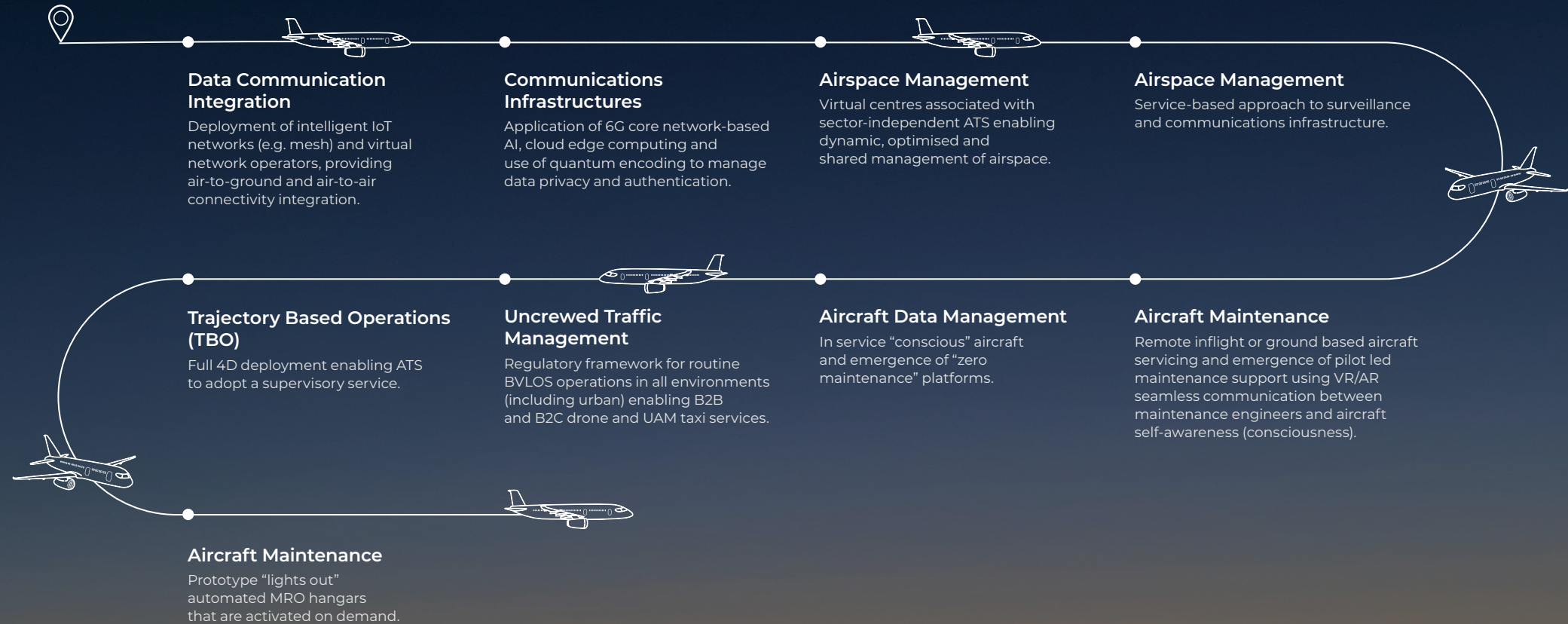
DIGITAL AVIATION ROADMAP

WITHIN 5 YEARS

Health and Wellbeing
Enhanced onboard sanitation using UV-C cleaning of cabin surfaces, and widespread adoption of digital health passports.

Travel Personalisation
Real-time travel information and personalised wayfinding using computer vision techniques, supported by tailored commercial offerings to enhance journey experience.

Passenger Travel Security
Adoption of early biometric monitoring for increased airport security.

Onboard Passenger Digital Experience
5G streaming of digital media content to personal devices, offering new e-commerce and entertainment opportunities to the airlines and operators.

Aircraft Data Management
Improved flight and aircraft data management through the deployment of Electronic Flight Bag services, inflight transmission of aircraft maintenance data and aircraft predictive maintenance scheduling.

Airline Asset Management
Application of big data principles, predictive analytics and machine learning for enhanced airline asset management through fleet operational optimisation and human resource planning.

ATS Management
Increased ATM operational capacity through reduced dependence on ATC voice commands (via satcom enabled data link services), next-generation multi-channel programmable software-defined VHF radio and remote provision of Air Traffic Services (ATS).

Uncrewed Traffic Management
Initial Beyond Visual Line of Sight (BVLOS) operational frameworks with operator enabled configuration and control through virtualisation and satellite communication elements via 5G network integration.

Airspace Information Harmonisation
Initial framework design and services from ICAO's System Wide Information Management (SWIM) initiative within the Global Air Navigation Plan (GANP).

Trajectory-Based Operations (TBO) and Green Descents
Initial 4D deployment and Single European Sky Imaging through initial technology and multilink interface designs that include satellite communications and L-Band Digital Aeronautical Communication systems (LDACS).

Airport Multi Stakeholder Interoperability
Enhanced multi-vendor airport terminal and hub interoperability through providing seamless system of system (SoS) interface characterised by technical specifications including architecture, protocol stack and radio access levels.

DIGITAL AVIATION ROADMAP

5 TO 10 YEARS

Health and Wellbeing

Smart cabin environments sensing passenger temperature, anxiety and hydration levels, enabling enhanced comfort management by crew and resulting in increased customer satisfaction and crew work experience.

Passenger Travel Security

Walk-through security screening using AI enhanced 3D scanning approaches with material discrimination, high rates of detection and low levels of false alarms, providing both increased security and uninterrupted passenger airport movement.

Passenger Travel Security

Adoption of identity recognition technology in combination with behaviour analysis to identify abnormal passenger behaviour within airport terminals, creating a safer environment.

Data Communication Integration

Seamless digital communications mobility using heterogenous and integrated technology environments (LTE, 4G, 5G, Satellite, LDACS) to provide greater communications resilience and capacity for both existing and future flight (UAV) systems.

Airspace Information Harmonisation

Full System Wide Information Management (SWIM) implementation, enhancing global airspace information exchange and airspace utilisation.

Inflight Data Capacity

Implementation of Artificial Intelligence to provide inflight bandwidth selection optimisation for greater data capacity and resilience.

Future Flight Airspace Integration

eVTOL Aircraft airspace integration can be via digital-data exchanges, such as Controller Pilot Data Link Communications (CPDLC) or System Wide Information Exchange (SWIM) protocols.

Communications Infrastructures

New communication infrastructures are expected to be deployed, using Digital Terrestrial Transmission (DTT) and Satellite Hybrid Wireless Mesh Networks to improve backhaul networks and virtual network operators.

Trajectory Flight Optimisation (TBO)

Advanced deployment with full integration of flight information and synchronised view of flight data by all actors involved, providing enhanced airspace capacity and reduced fuel burn.

Airspace Surveillance

Global satellite-based digital data links enabling Automatic Dependent Surveillance Contract (ADS-C), Extended Projected Profile (EPP) downlinks airspace surveillance performance.

Uncrewed Traffic Management

Regulatory framework for advanced BVLOS operations enabling commercial cargo, B2B drone operations and initial passenger air taxis services.

Aircraft Data Management

Advanced aircraft digital data capture approaching 100 billion gigabytes per year, enabling widespread sector adoption of predictive maintenance scheduling that will reduce aircraft downtime.

Aircraft Data Management

Whole aircraft digital twin representation fully enabled through aircraft sensor data and launch of prototype self-aware and self-reasoning aircraft having "consciousness".

DIGITAL AVIATION ROADMAP

BEYOND 10 YEARS

Data Communication Integration

Deployment of intelligent IoT networks (e.g. mesh) and virtual network operators, providing air-to-ground and air-to-air connectivity integration.

Communications Infrastructures

Application of 6G core network-based AI, cloud edge computing and use of quantum encoding to manage data privacy and authentication.

Airspace Management

Virtual centres associated with sector-independent ATS enabling dynamic, optimised and shared management of airspace.

Airspace Management

Service-based approach to surveillance and communications infrastructure.

Trajectory Based Operations (TBO)

Full 4D deployment enabling ATS to adopt a supervisory service.

Uncrewed Traffic Management

Regulatory framework for routine BVLOS operations in all environments (including urban) enabling B2B and B2C drone and UAM taxi services.

Aircraft Data Management

In service "conscious" aircraft and emergence of "zero maintenance" platforms.

Aircraft Maintenance

Remote inflight or ground based aircraft servicing and emergence of pilot led maintenance support using VR/AR seamless communication between maintenance engineers and aircraft self-awareness (consciousness).

Aircraft Maintenance

Prototype "lights out" automated MRO hangars that are activated on demand.

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