



ALTISCOPE

Air taxis, drones, and planes: Safe integration in dense and complex airspace

Joe Polastre, Ph.D.

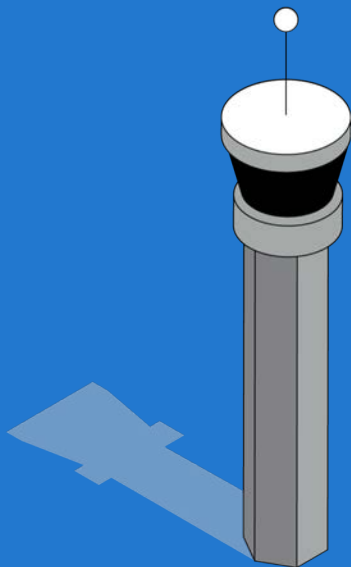
Head of Product, Altiscope, A³ by Airbus

j@altiscope.io

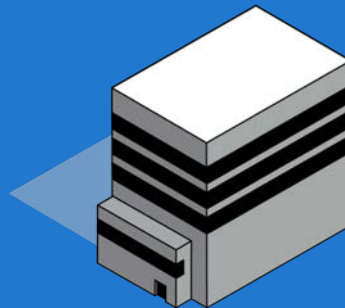




ALTISCOPE



ATM



UTM







FL600

30 knots



FL350

500 knots



3000 feet

150 knots



300 feet

30 knots





Separate where appropriate

1



Coordinate when it's needed

2



Handle Exceptions

3



Separate where appropriate

1



Coordinate when it's needed

2



Handle Exceptions

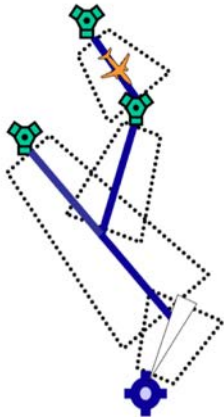
3

Procedural Separation

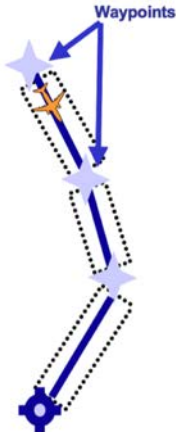
VFR & IFR Flights Today:



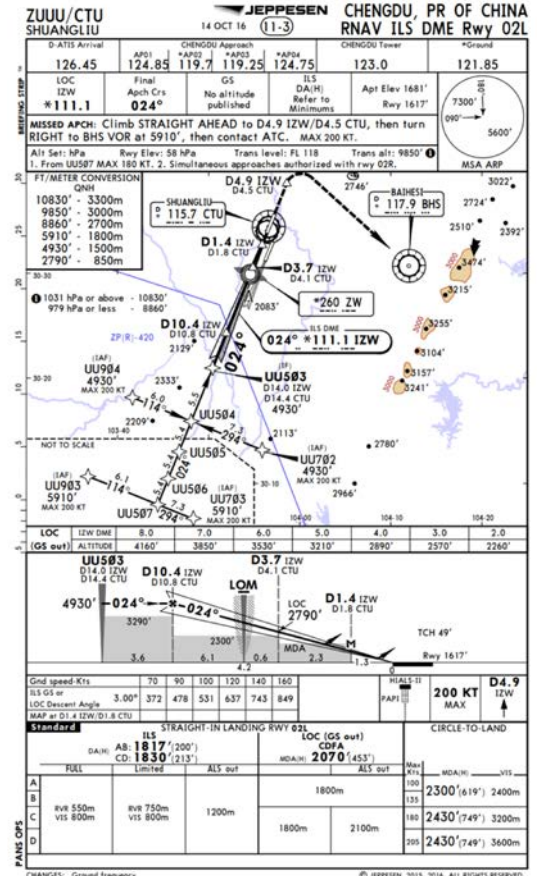
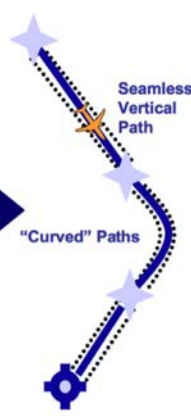
Current Ground NAVAIDS



RNAV

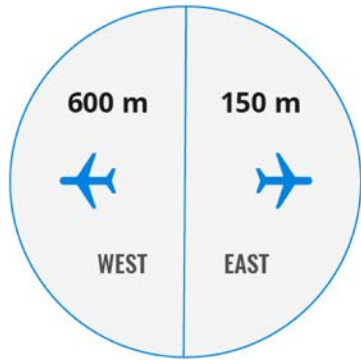


RNP

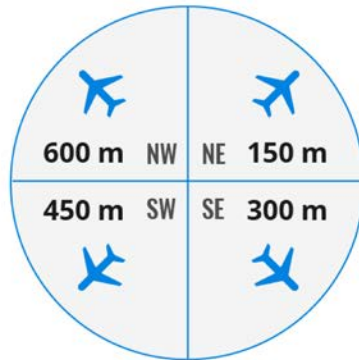


Simulation Results: Separation by Altitude Bands

Study Setup:

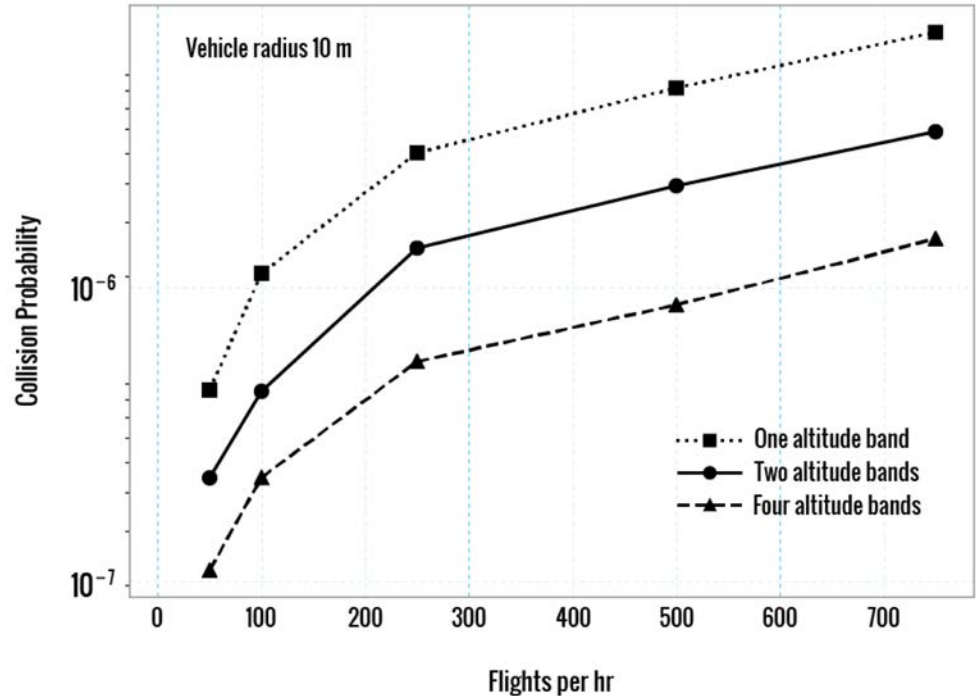


Heading	Altitude
1-180°	150 m
180-360°	300 m

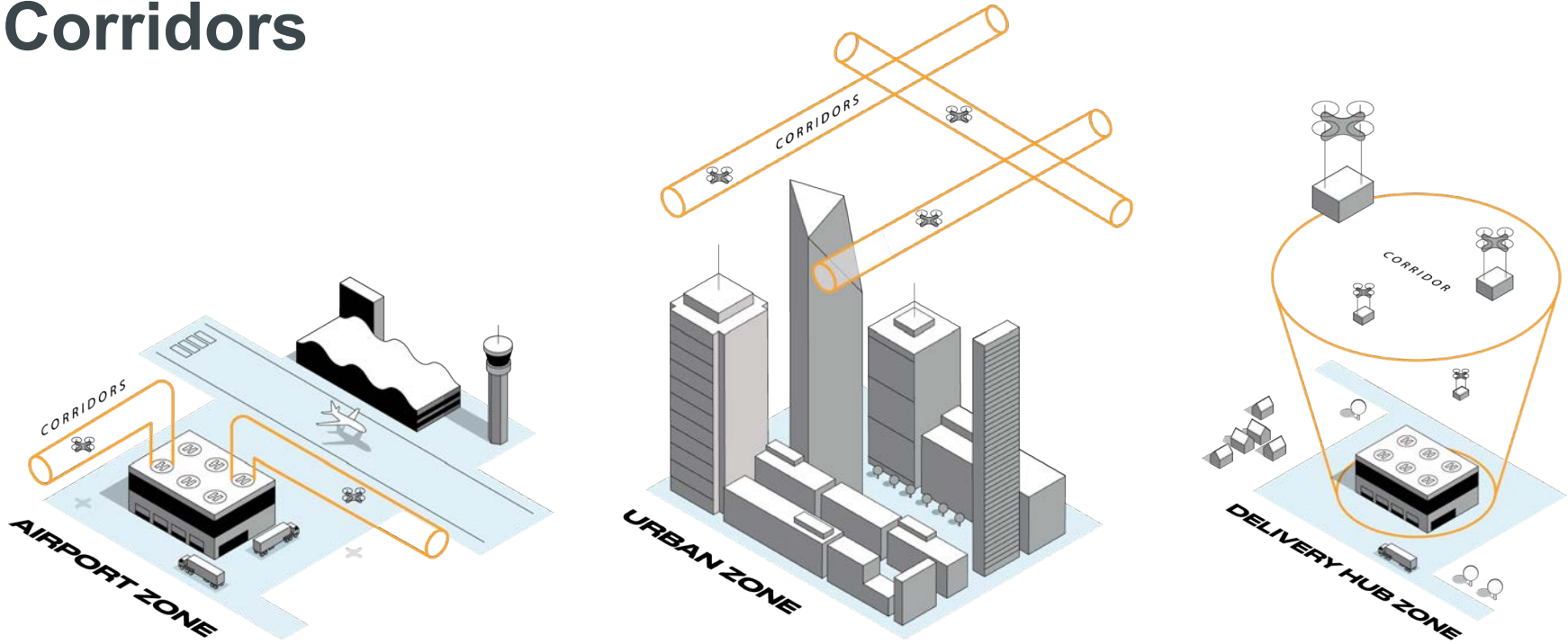


Heading	Altitude
1-90°	150 m
91-180°	300 m
181-270°	450 m
271-360°	600 m

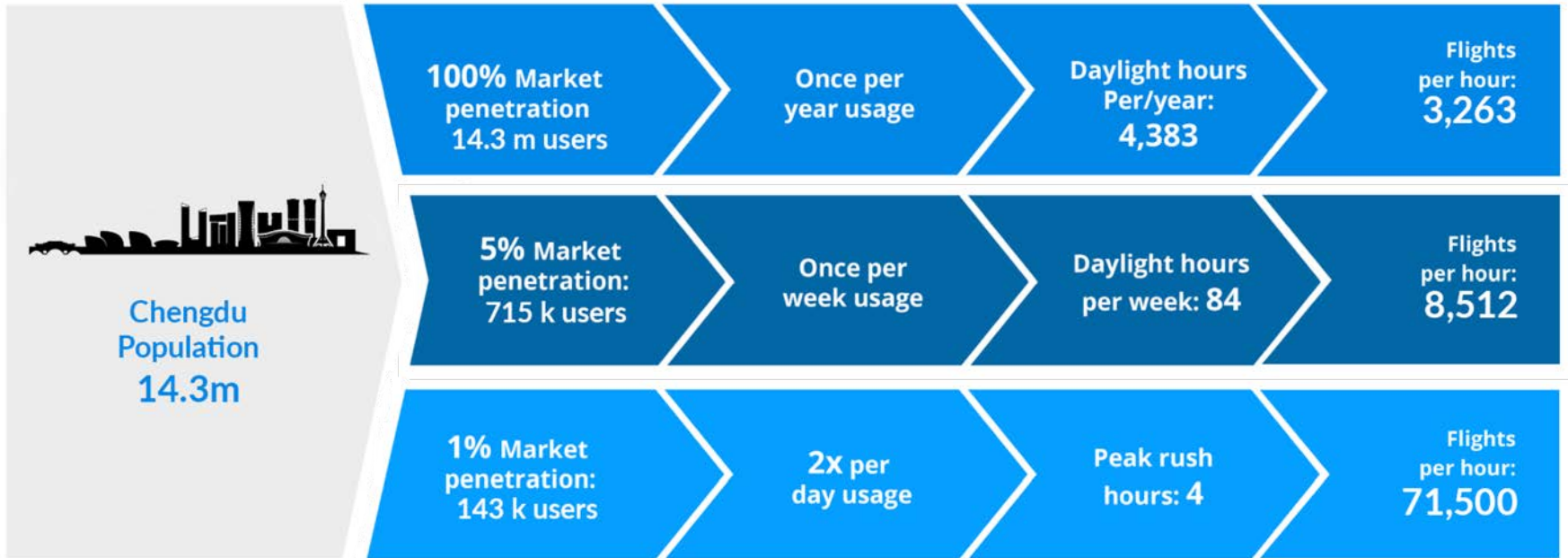
Collision probability as a function of flight rate



Corridors



Back-of-the-envelope math for air taxi service





Separate where appropriate

1



Coordinate when it's needed

2



Handle Exceptions

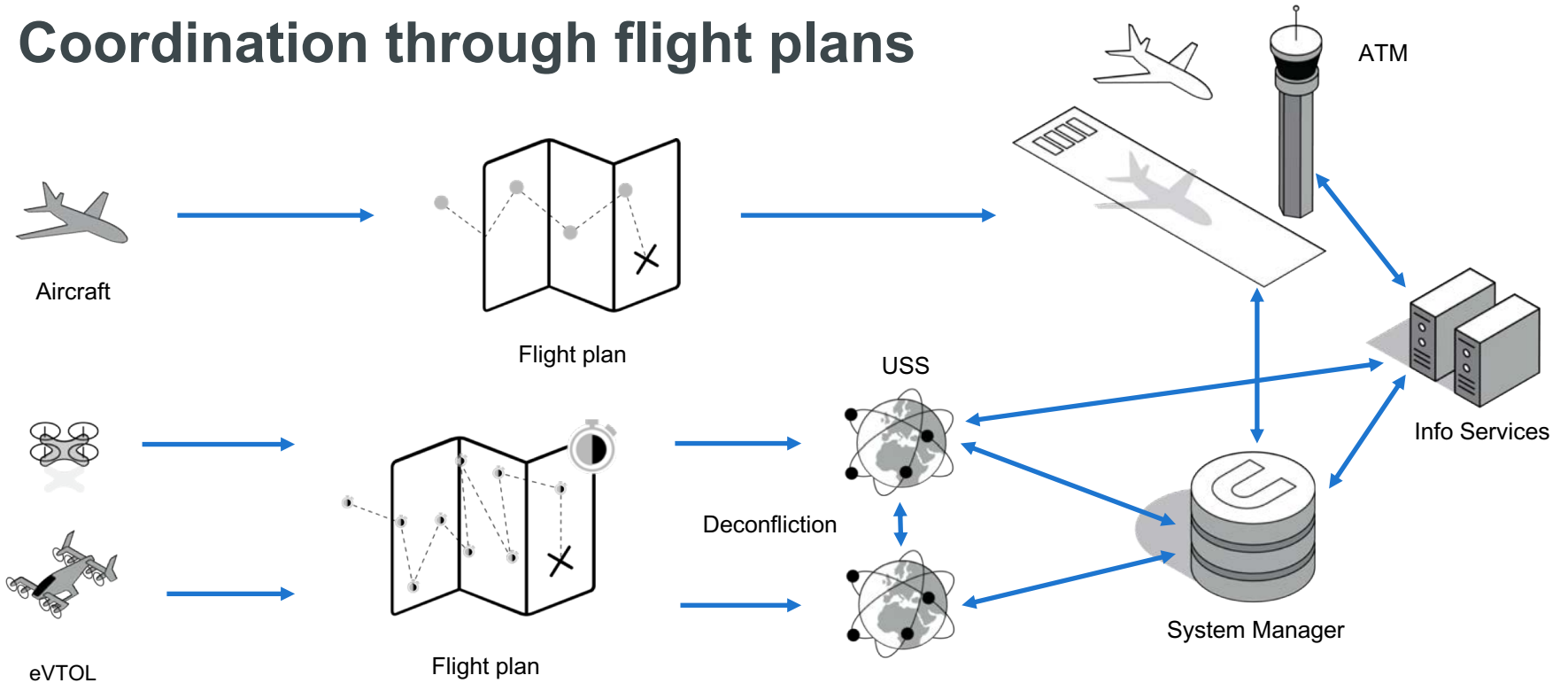
3

Flight rules: Evolving beyond VFR and IFR

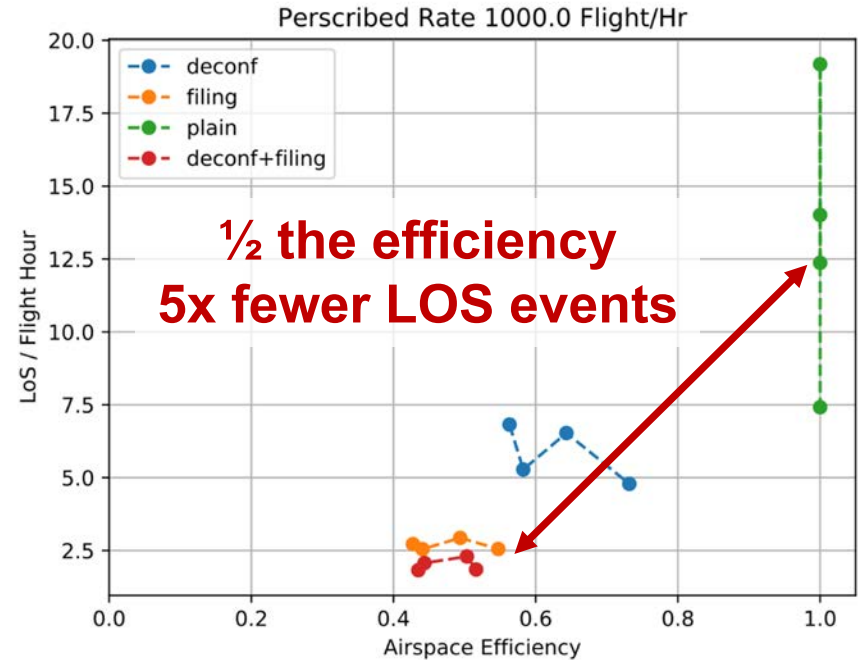
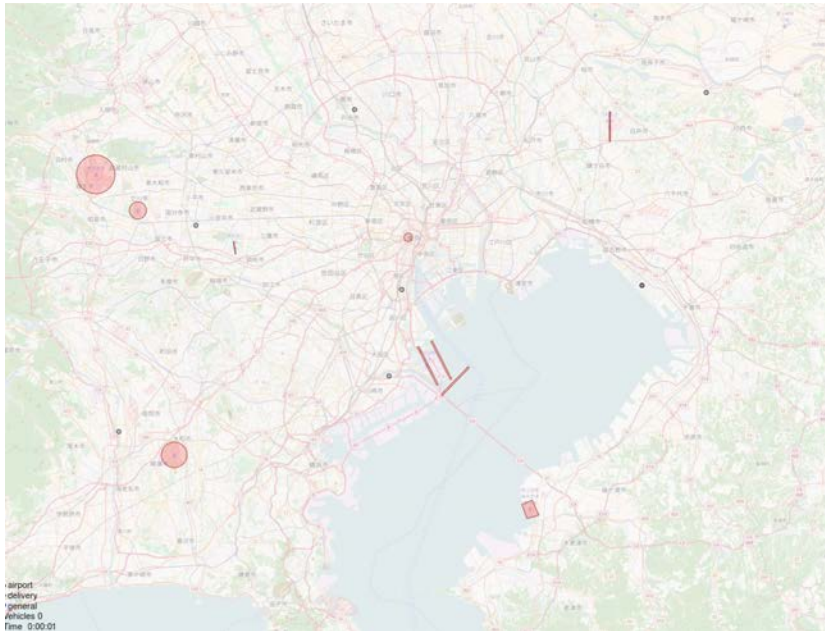
Flight Rules	Controlled by	Usage	Separation	Service Requirements
VFR Visual	Onboard pilot	Flight in visual conditions	See and avoid	May use ATC services
IFR Instrument	Onboard pilot	Flight below visual minimums	Provided by ATC	Must use ATC services
BFR Basic	Remote pilot or autonomous system	Flight independent of any service	Detect and avoid	Outside of controlled airspace, independent
MFR Managed	Remote pilot or autonomous system	Flight managed by a service provider	Managed by USS	Must use USS services

For integration with national airspace system, **BFR** is compatible with **VFR**; **MFR** is compatible with **IFR**

Coordination through flight plans



Airspace efficiency vs safety





Separate where appropriate

1



Coordinate when it's needed

2

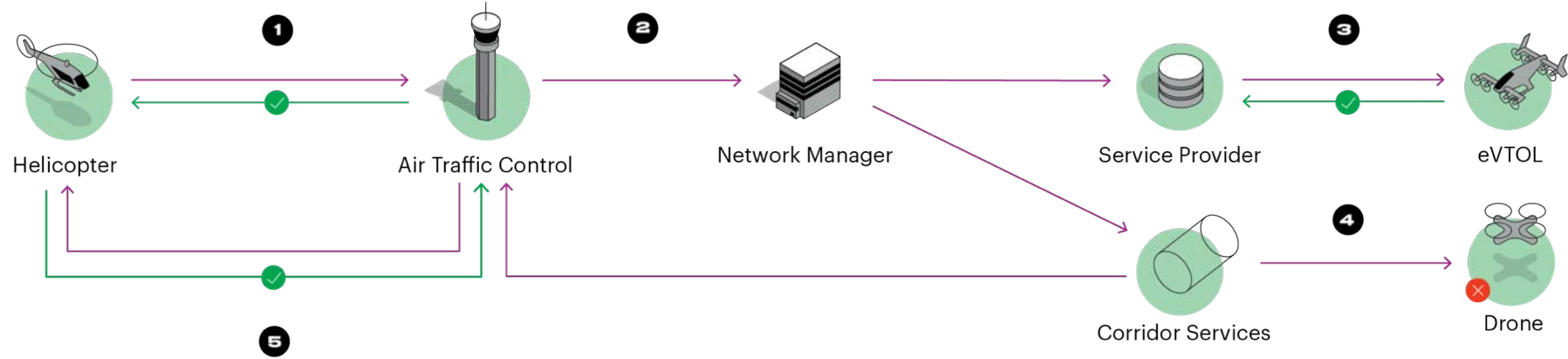
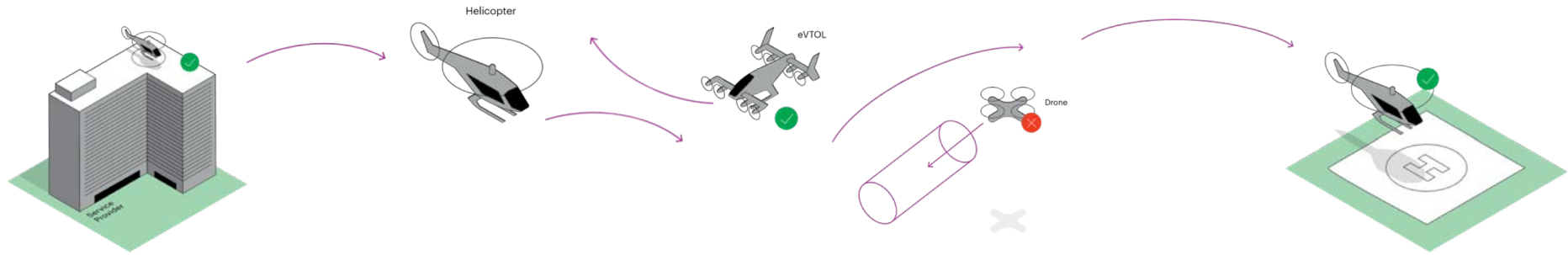


Handle Exceptions

3



ATM-UTM Interaction during emergency missions





ALTISCOPE

What's needed?

Necessary components



Standards



Security

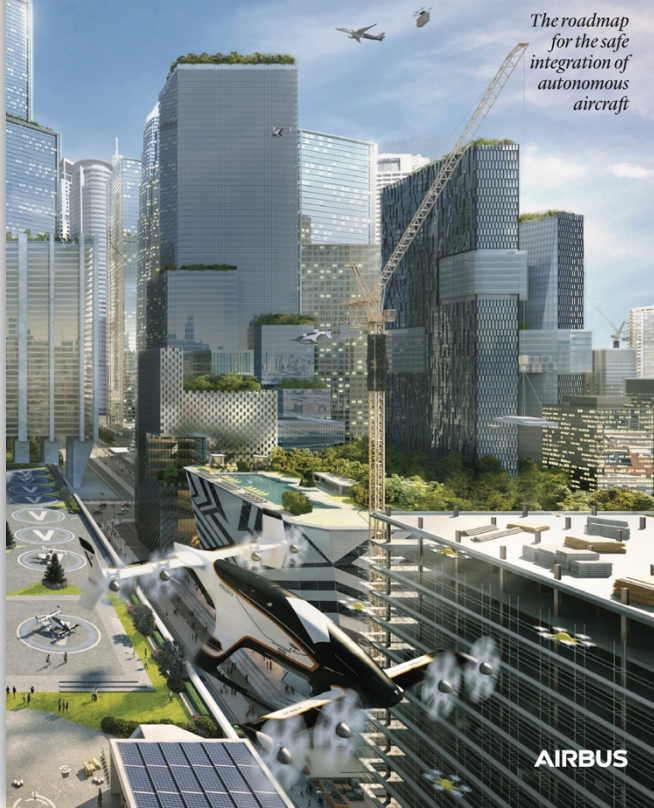


Architecture

BLUEPRINT

FOR THE SKY

*The roadmap
for the safe
integration of
autonomous
aircraft*



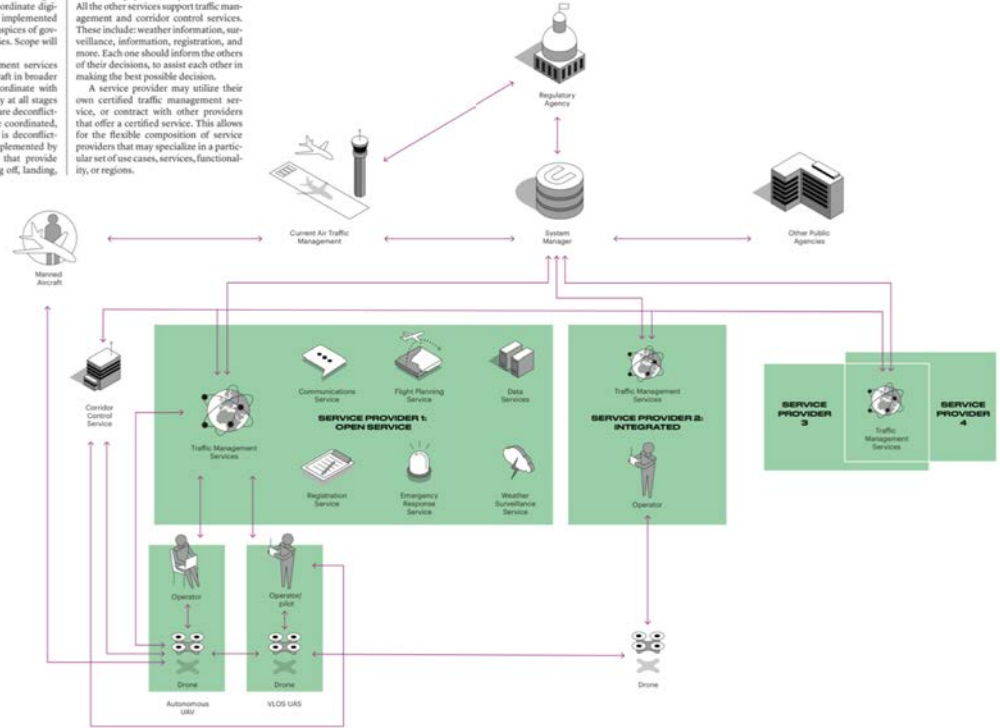
A UTM Service Stack

The system manager provides a single, authoritative system to coordinate digital traffic services. This is implemented and operated under the auspices of government regulatory agencies. Scope will vary between countries.

Digital traffic management services manage the flights of aircraft in broader airspace. The services coordinate with each other to ensure safety at all stages to ensure that flight plans are deconflicted, aircraft maneuvers are coordinated, and emergency response is deconflicted rapidly. These are complemented by corridor control services that provide guidance for drones taking off, landing,

or traversing specific airspace corridors. All the other services support traffic management and corridor control services. These include weather information, surveillance, information, registration, and more. Each one should inform the others of their decisions, to assist each other in making the best possible decisions.

A service provider may utilize their own certified traffic management service, or contract with other providers that offer a certified service. This allows for the flexible composition of service providers that may specialize in a particular set of use cases, services, functionality, or regions.



UTMBlueprint.com

LEVEL 0: NO AUTOMATION	LEVEL 1: HUMAN ASSISTANCE	LEVEL 2: PARTIAL AUTOMATION	LEVEL 3: CONDITIONAL AUTOMATION	LEVEL 4: HIGH AUTOMATION	LEVEL 5: FULL AUTOMATION
OPERATIONS ENABLED					
Visual line of sight (VLOS), commercial drone operations	Improves safety for VLOS commercial drone operations and Beyond Visual Line of Sight (BVLOS) operations	Autonomous BVLOS operations in low-density airspace	Safe integration of BVLOS in controlled airspace	Fleet operations at moderate scale	On-demand autonomous operations in dynamic, high-density airspace.
POLICY MAKERS AND REGULATORS					
<ul style="list-style-type: none"> VLOS Flight Rules (eg. US Part 107, NZ 101/102) 	<ul style="list-style-type: none"> Waiver program VLOS pilot licensing 	<ul style="list-style-type: none"> Authorization policy Registration ID equipment requirements Emergency and priority access 	<ul style="list-style-type: none"> Basic & Managed Flight Rules Pilot/System rating Flights over people Equitable access provisions 	<ul style="list-style-type: none"> Autonomous certification Detect and Avoid certification Fleet operating certification Risk-based approval 	<ul style="list-style-type: none"> Third-party accreditation for certification services
TECHNICAL PROVIDERS AND STANDARDS BODIES					
<ul style="list-style-type: none"> Wireless command and control 	<ul style="list-style-type: none"> Basic sense and avoid (ex. ACAS-X) Basic surveillance (ex. ADS-B) 	<ul style="list-style-type: none"> Vehicle-to-infrastructure comms Security requirements ID surveillance equipment 	<ul style="list-style-type: none"> Navigation and DAA performance requirements Traffic Manager accreditation Risk assessment 	<ul style="list-style-type: none"> Service-to-service coordination Corridor control accreditation 	<ul style="list-style-type: none"> Vehicle-to-vehicle information sharing Multi-modal transport coordination
AIRSPACE OPERATORS (ANSPS AND REGULATORS)					
<ul style="list-style-type: none"> Published aeronautical charts No fly zones Altitude restrictions 	<ul style="list-style-type: none"> PinS Procedures VFR corridors Altitude restrictions Automated geofencing and altitude limits 	<ul style="list-style-type: none"> UAS tracking Expanded Instrument Procedures Automated approvals 	<ul style="list-style-type: none"> Unmanned procedures Corridor configuration 	<ul style="list-style-type: none"> High-density controlled airspace established 	<ul style="list-style-type: none"> Dynamic and performance-based rules for access to airspace
AIRSPACE AND UNMANNED SERVICE PROVIDERS					
<ul style="list-style-type: none"> Flight plan filing Aircraft and pilot registry 	<ul style="list-style-type: none"> SWIM 	<ul style="list-style-type: none"> Network Manager Operator flight planning Unmanned Aeronautical Information Service 	<ul style="list-style-type: none"> Digital Traffic Managers ATM-UTM coordination Info Service Providers High assurance IT infrastructure Service provider marketplace 	<ul style="list-style-type: none"> Corridor control services Specialized traffic management 	<ul style="list-style-type: none"> ATM integration Congestion avoidance



Sign up for “Closing the Loop”
and download the UTM Blueprint:
utmb Blueprint.com

Joe Polastre, Ph.D.
Head of Product, Altiscope, A³ by Airbus

j@altiscope.io



AIRBUS