



**Federal Aviation
Administration**



ICAO Drone Enable 2023 RFI Topic 1

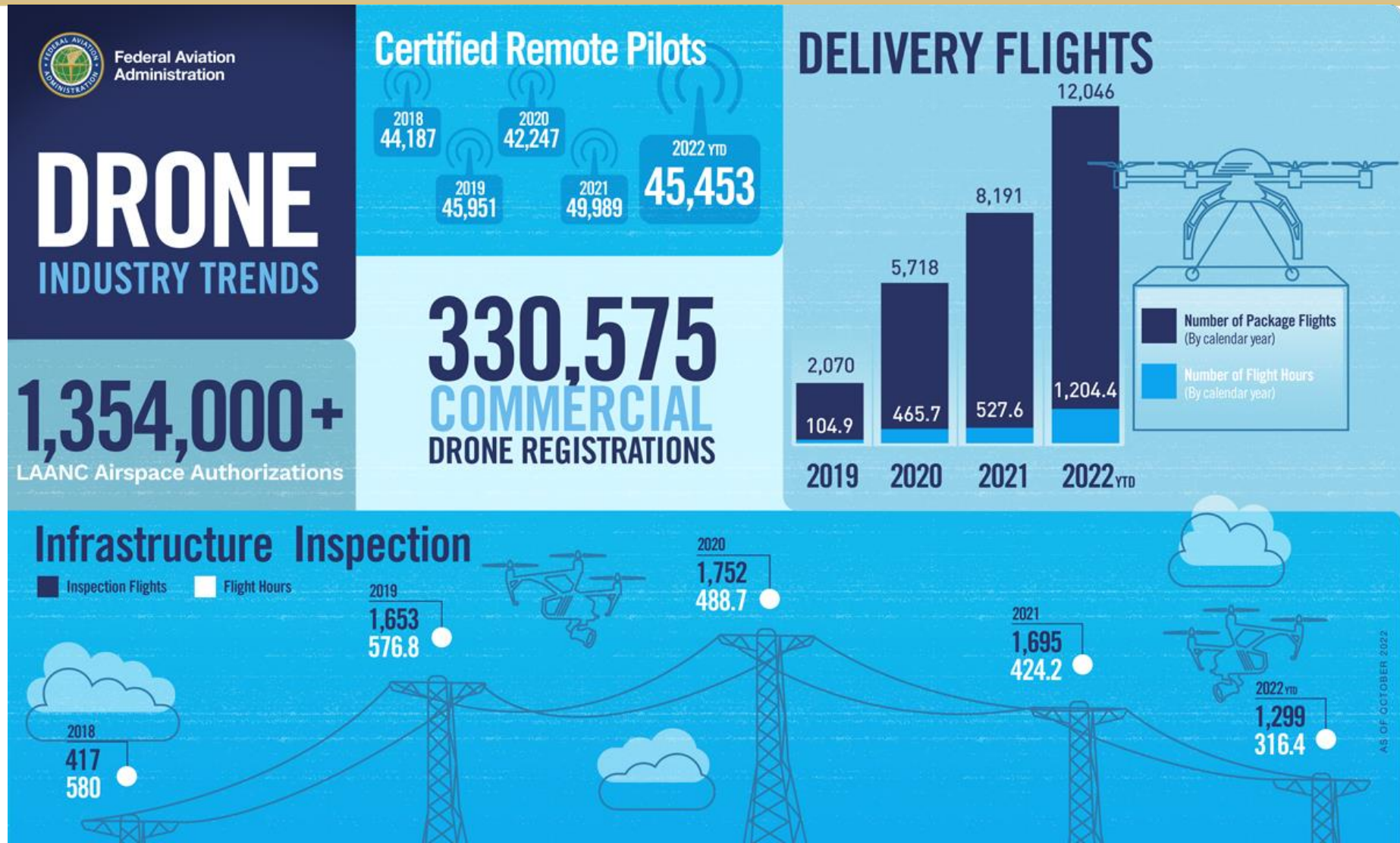
A solution to address CNS requirements in low-level airspace

12/05/2023 Presented by David Chen

Drone BVLOS operations at large scale

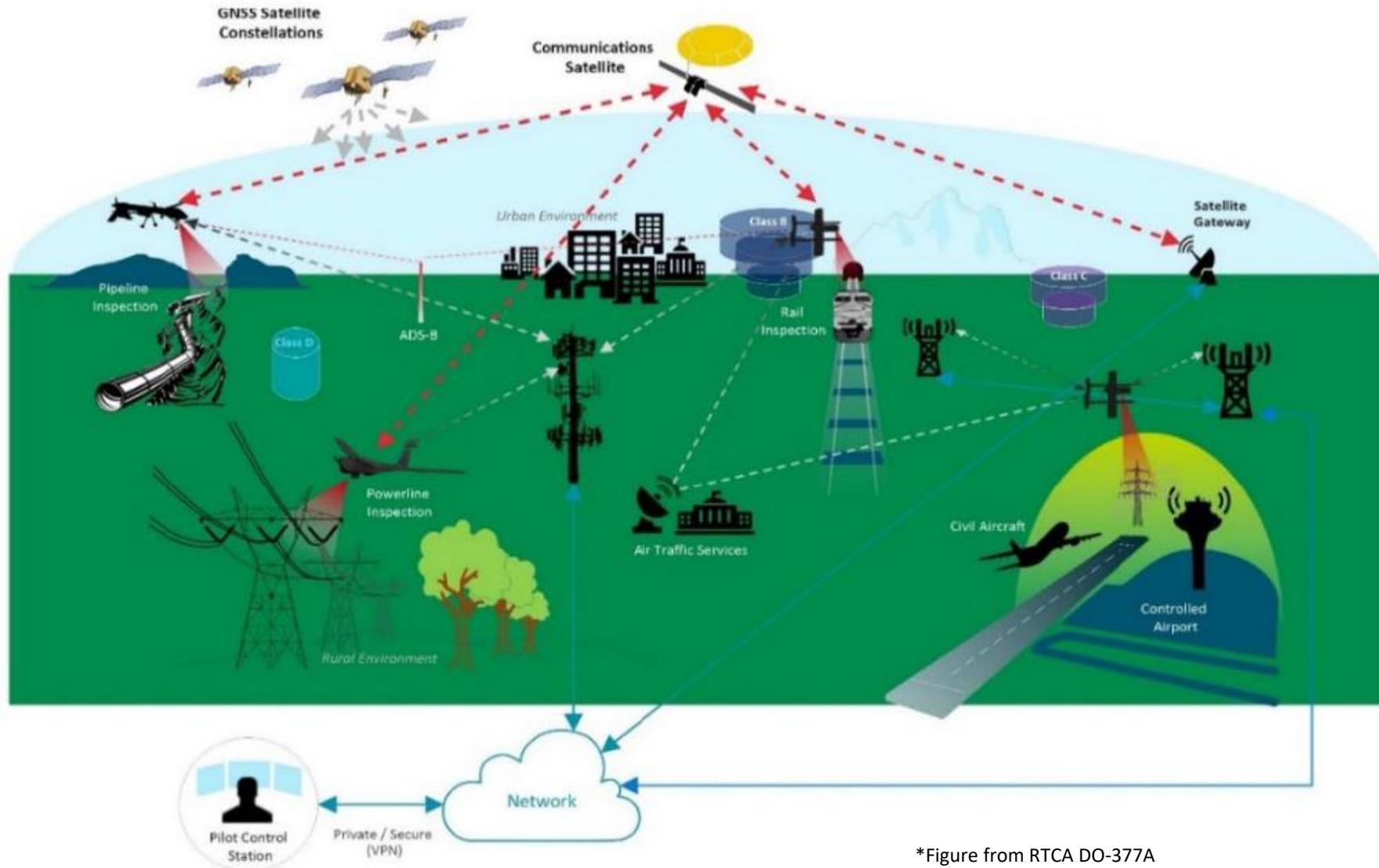
CNS challenges:

- Diverse geographic environments
- Low altitude
- Implementation Flexibility



Current Approaches

- ISM band
- SATCOM
- Cellular
- C Band (5030-5091 MHz)



Current Approaches (cont.)

Different approach	Pros	Cons	Common issues and concerns
ISM band	<ul style="list-style-type: none"> • Low cost • Low technology barrier 	interference	<ul style="list-style-type: none"> • During different flight phases • diverse terrain conditions • CNS infrastructure • Flexible implementation by all States
SATCOM	Wide coverage especially for remote areas	<ul style="list-style-type: none"> • Too bulky for sUAS • Expensive data subscriptions 	
Cellular technology	<ul style="list-style-type: none"> • Small SWAP • Infrastructure 	Sudden drop due to side lobe	
C Band (5030-5091 MHz)	<ul style="list-style-type: none"> • Allocated by WRC-12 • RTCA DO-362A/377A • U.S. Federal Communications Commission (FCC) published the Notice of Proposed Rulemaking (NPRM) 	<ul style="list-style-type: none"> • Infrastructure 	

Proposed Solution

Multi-link "Smart" Radio Module

--A Technical Solution to address CNS requirements for Drone BVLOS operations at large scale in diverse geographic environments at low altitude

Path Diversity

Link Diversity



Proposed Solution in the Field Tests

- 2022 FAA Broad Agency Announcement (BAA) Call #3 awarded programs
 - Honeywell project
 - uAvionix project

- uAvionix at the Choctaw Nation UAS Test Site



Questions?

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