BVLOS Future & Standards Adoption

James Howard - PX4 Developer Summit

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TYPE: CESSNA 172

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James Howard

Co-Founder & VP Engineering at Iris Automation

- Mechatronics Engineer
- Space Systems & UAS background
- Founder of Iris Automation
- Developer of Casia onboard DAA
- Computer Vision, AI, Autonomy, Safety

Overview

- Practical BVLOS Today

- The Future of BVLOS

- UAS Standards Overview

- Where PX4 & Open Source Can Lead

Outcomes

- What BVLOS means from a regulatory perspective

- Spark ideas, give insight

- Begin a conversation and collaborate!

Practical BVLOS Today

- Beyond Visual Line of Sight (BVLOS)
  - First step to full autonomy in airspace and aviation
  - No or remote operator, limited situational awareness
  - Concerns about airspace integration from Civil Aviation Authorities (CAAs)

- Required for many applications and industries
  - Search & Rescue in remote locations
  - Scalable linear infrastructure inspection
  - Package delivery
  - Land and resource management
  - Urban Air Mobility (flying taxis)
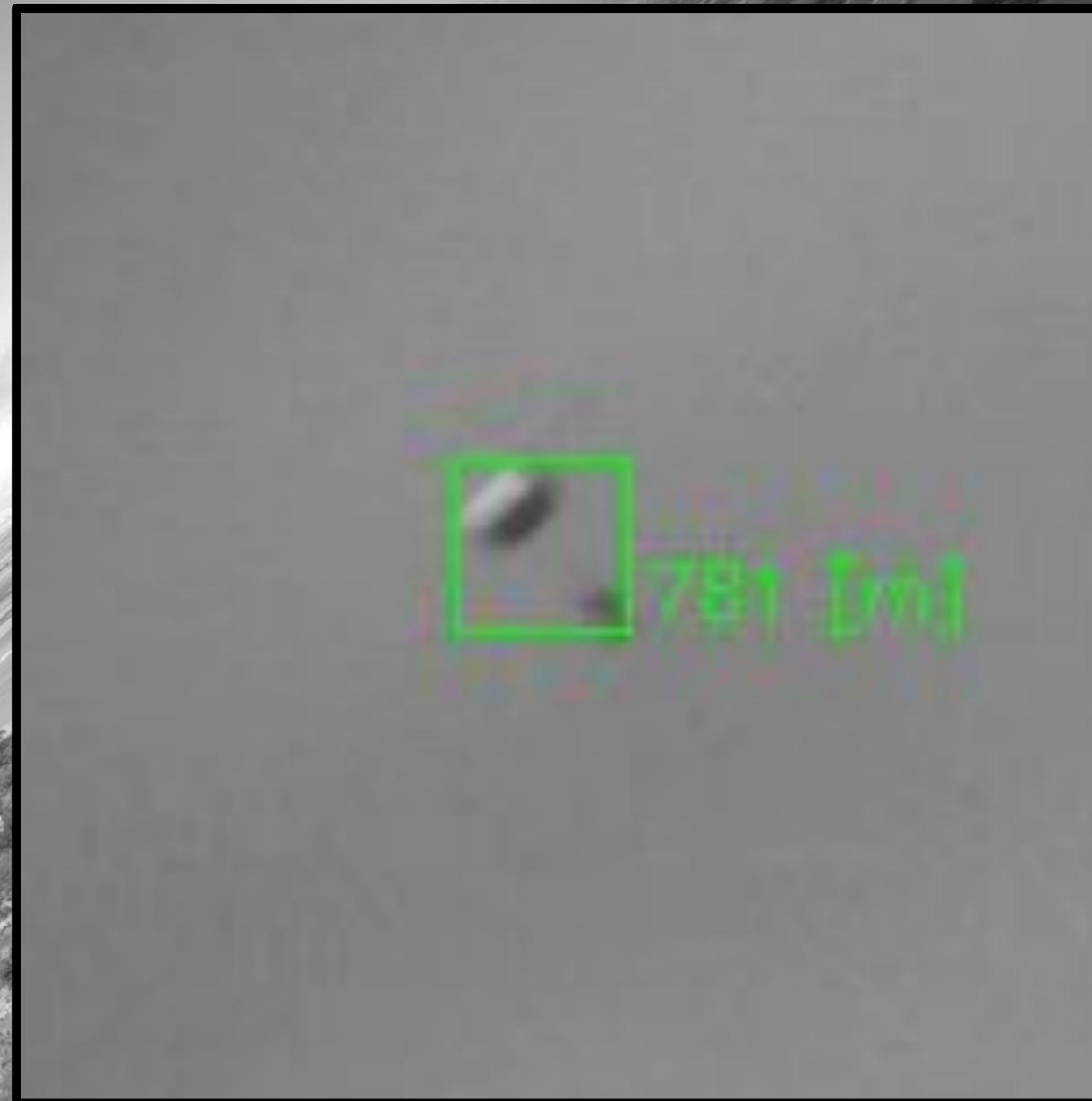
Practical BVLOS Today

- What's the greatest challenge to flying BVLOS?
  - SAFETY!

- Paraglider
- Small
- Unannounced
- No radio, ADS-B, etc
- No engine noise
- Low Altitude

Practical BVLOS Today

- BVLOS is achievable today with appropriate safety technology!

- Risk-based approach from CAAs

- The path is different globally but commonalities exist
  - Low to moderate risk airspace
  - Detect & Avoid (DAA) system required
  - Systems & operations approach (via SORA)

U.S. BVLOS waiver approval trends

23

11

9

2

2016   2017   2018   2019

FAA Part 107.31 waivers issued

Future of BVLOS

- Adoption of standards for hardware, software, systems, and procedures

- Moving from permissions to regulations
  - Expansion of permissions as standardisation grows
  - Conversion to regulations as procedures and technology mature

- Industry cooperation to build BVLOS solutions
  - Current piecewise components approach is messy
  - Lots of integration and test overhead for the operator
  - Regulators have a hard time with analysis and approvals

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Future of BVLOS

- Regulatory certification of systems and sub-systems
  - Technical Standards Order (TSO) process
  - Standards compliance product testing
  - Type Certification of UAS

- Systems that meet standards receive higher trust, face a simpler approval process, set the future of the industry

- **Goal: Repeatable standard procedures to fly fully-autonomous aircraft!**

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Standards Overview

- Who is defining the standards that will be adopted?
  - ASTM - Small UAS (today's talk)
  - RTCA - Large UAS

- Where do the existing standards fit in?
  - e.g. DO-178, DO-256, DO-160
  - Currently, when people are on-board

- How do we know what will be adopted?
  - Direct feedback from global regulators

Standards Overview

- ASTM standards FAA are expected to adopt 2020/2021
  - UAS Software Dependability
  - Detect & Avoid Minimum Operating Performance (MOPS)

- What does the ASTM DAA MOPS standard cover?
  - DAA system performance & functionality
  - UAS system integration & functionality
  - Groundstation integration & functionality
  - Human factors in remote operation

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Standards Overview

- Who is impacted by the standard?
  - DAA system manufacturer
  - UAS manufacturer
  - UAS integrator
  - UAS operator

- Why adopt the standard proactively?
  - Simpler path from procurement to BVLOS for everyone involved
  - Helps grow and further the industry and build trust with regulators

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Where PX4 & Open Source Can Lead

- PX4 & Open Source software are already global leaders within the UAS market

- Begin adoption of UAS standards into development discussions and working groups within the community

- Open Source is all about change and collaboration, that's what is needed to make this shift happen

Where PX4 & Open Source Can Lead

- Leverage existing community and collaborative approach to the adoption of new UAS standards
  - Dronecode
  - Forums
  - Contribution from industry

- Take a systems level approach to design decisions and tradeoffs
  - Collaborate between working groups
  - e.g. Changes to GCS could affect complete system standards compliance

Requirements Gaps

- QGroundControl
  - Require continuous alerting for detected failures
  - Adoption of AC 25.1322-1 (colors, terminology, etc)
  - Visual awareness of suppressed functions (e.g. auditory)

- PX4 Autopilot
  - Pass-through of messages to GCS from peripherals

- MAVLink
  - Geospatial alerts (e.g. alerts with coordinates, vectors)

Requirements Met

- QGroundControl
  - Alerts are visual to operator
  - Alerts require active dismissal
  - Alerts can be auditory via text-to-speech

- PX4 Autopilot
  - Peripheral device heartbeat monitoring and failsafe
  - Generated alert from failed peripheral

Summary

- BVLOS today is a stepping stone to the future

- Standards adoption will be key across the industry

- PX4 & Open Source can continue leading as it has to date

- Collaborate and continue the conversation!

Questions

Contact: james@irisonboard.com

Learn More: www.irisonboard.com

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