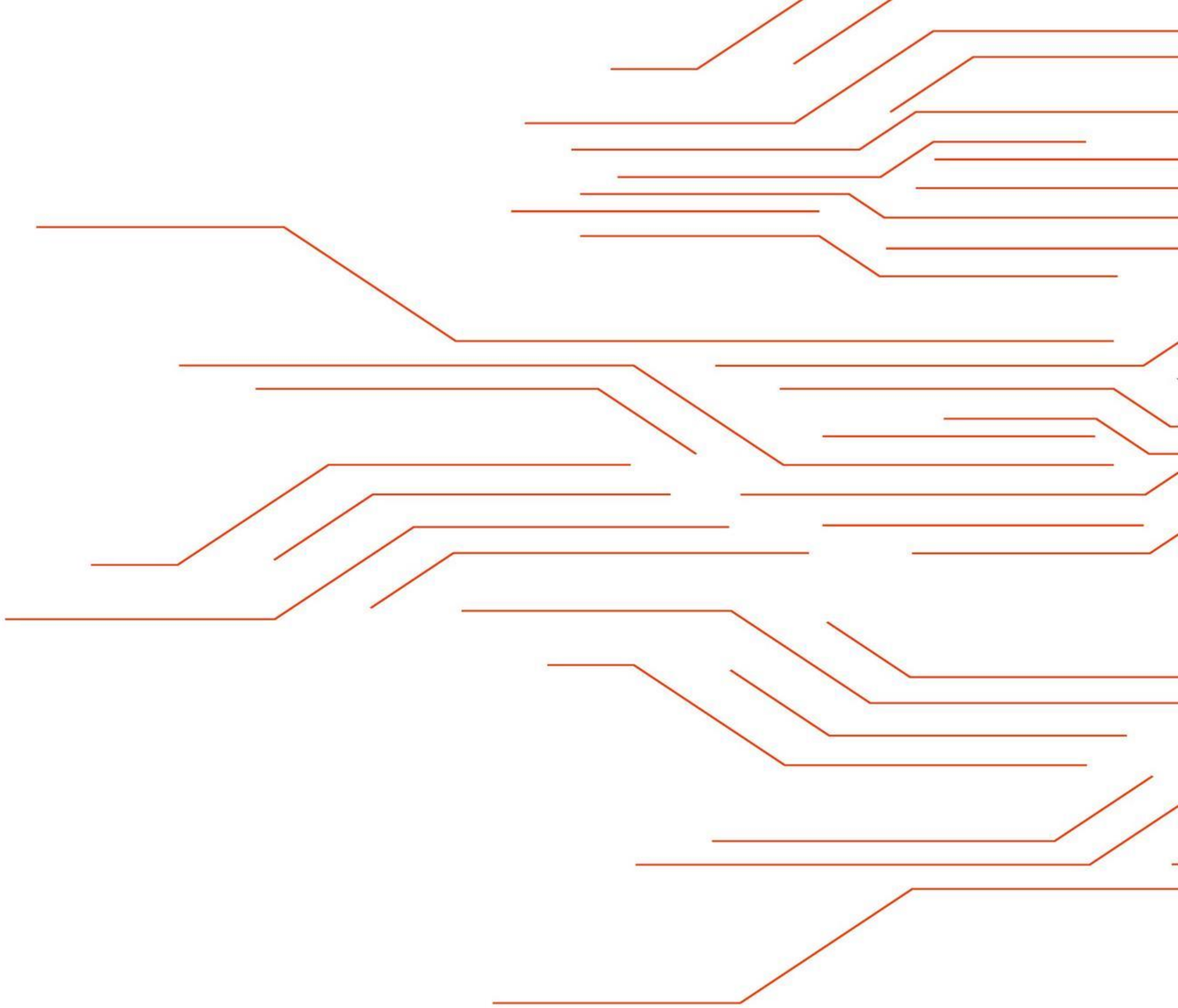
Ensuring Safety in Human Out of The Loop Uncrewed Aircraft Systems



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Acknowledgement of Country

Nova Systems respectfully acknowledges the Traditional Custodians of the land and waters in which we live and work, and we pay our respects to Elders past, present and emerging.

Nova Systems also acknowledges the services of the Aboriginal and Torres Strait Islander men and women who have contributed to defending Australia and its national interests.

Painting By Kiya Watt commissioned by Nova Systems.

Kiya is a Menang/Gnudju Noongar woman. Noongar nation is the southwestern region of Western Australia and is made up of 14 different language and tribe groups, Menang and Gnudju being two of them. For Kiya and Aboriginal people, art is so much more than painting, it is their lifeline, it is how they connect as a community and share and preserve their stories.

This painting represents the story of connection and partnership. We all work together to be strong. The animals, lands and ocean all have journeys and through connection and coming together our stories are made.

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Main Topics

- Importance of HOTL systems
- Safety Methods for HOTL UAS operations
- Recommendations

Background and Motivation

Image Source: NASA Rover

Image Source: TopGear

Autonomy

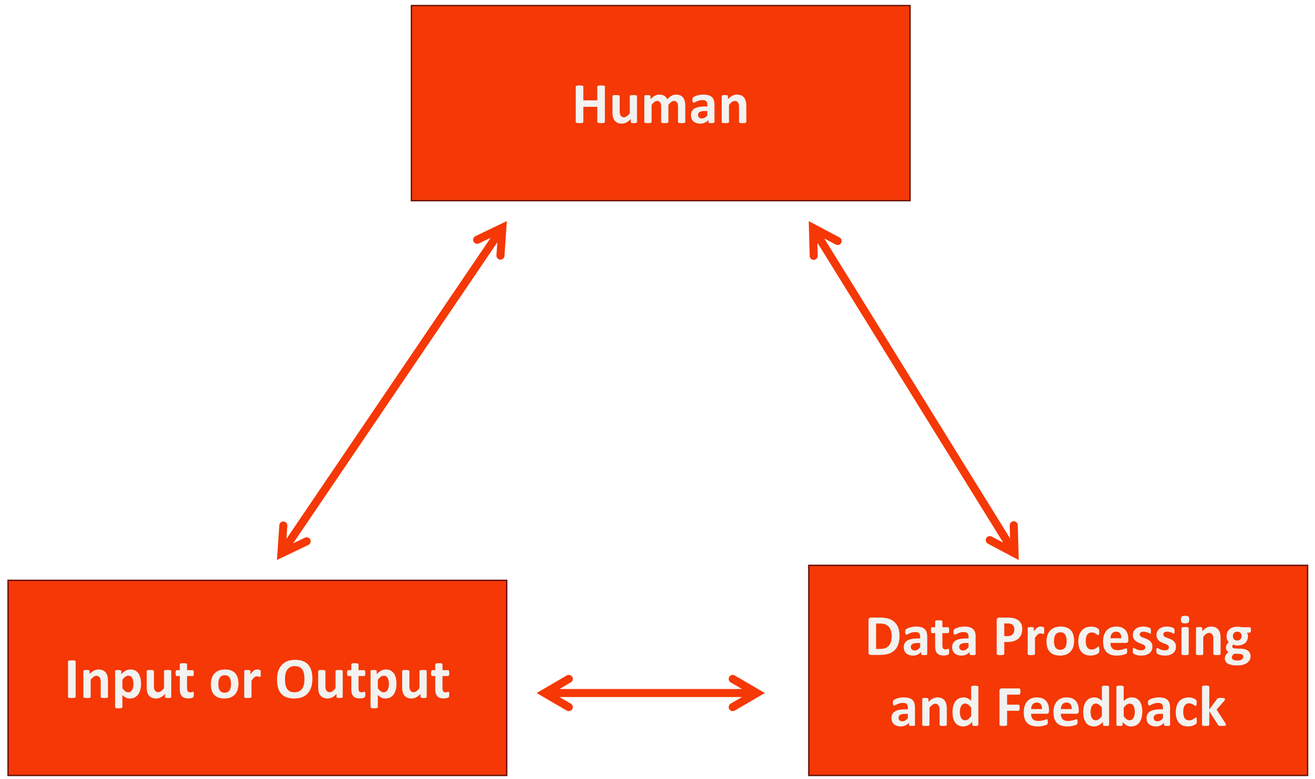
Dictionary Definition

"Autonomy refers to the ability to make your own decisions without being controlled by anyone else." – Cambridge Dictionary

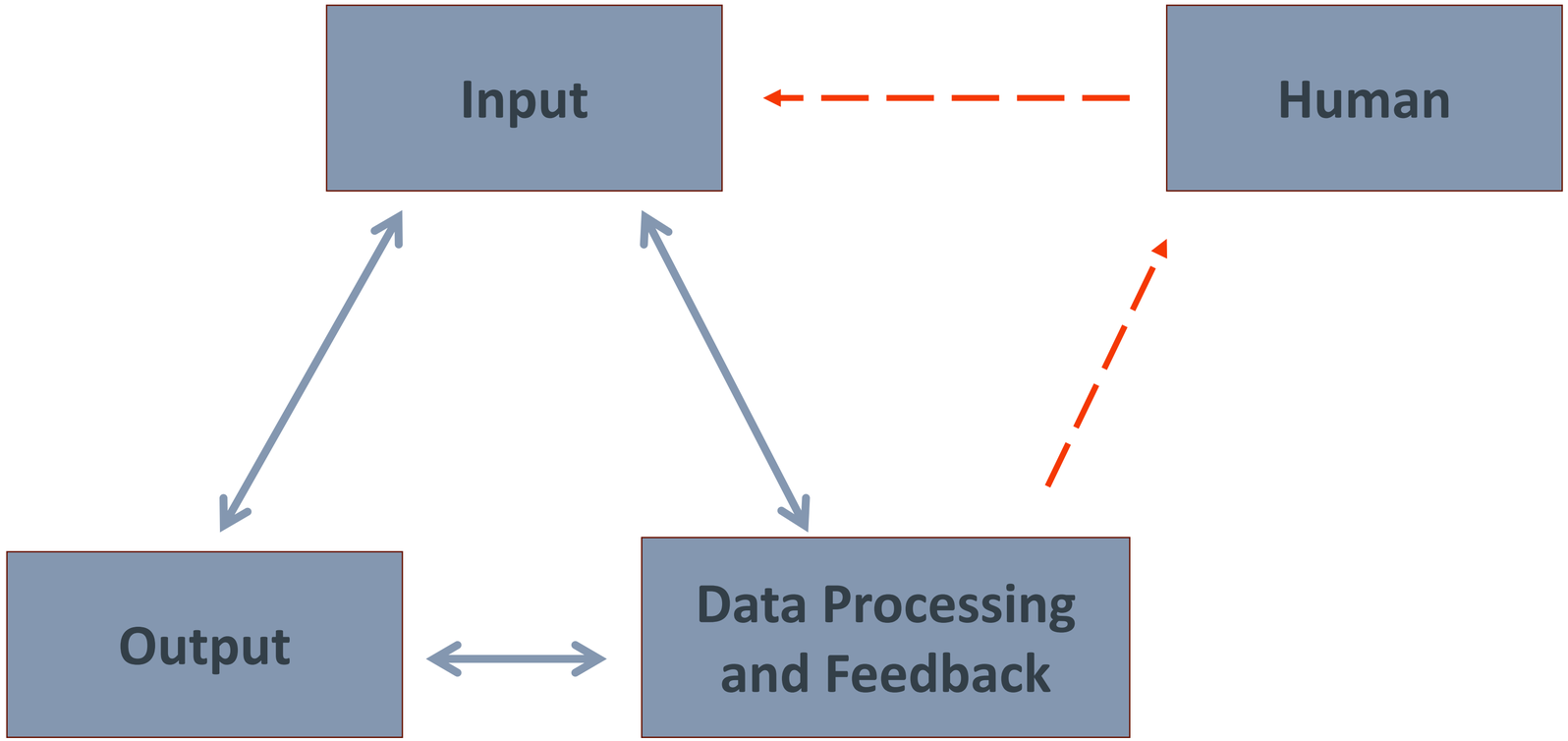
ICAO Definition

Autonomy in UAS refers to the capability of an aircraft to self-manage flight operations with little or no human intervention. Autonomy can apply to various aircraft functions, including but not limited to navigation, collision avoidance, and mission execution. Autonomy is categorised according to levels of human supervision or control, ranging from fully manual to fully autonomous operations.

Human In The Loop (HITL)



Human Out of The Loop (HOTL)



Why HOTL Systems

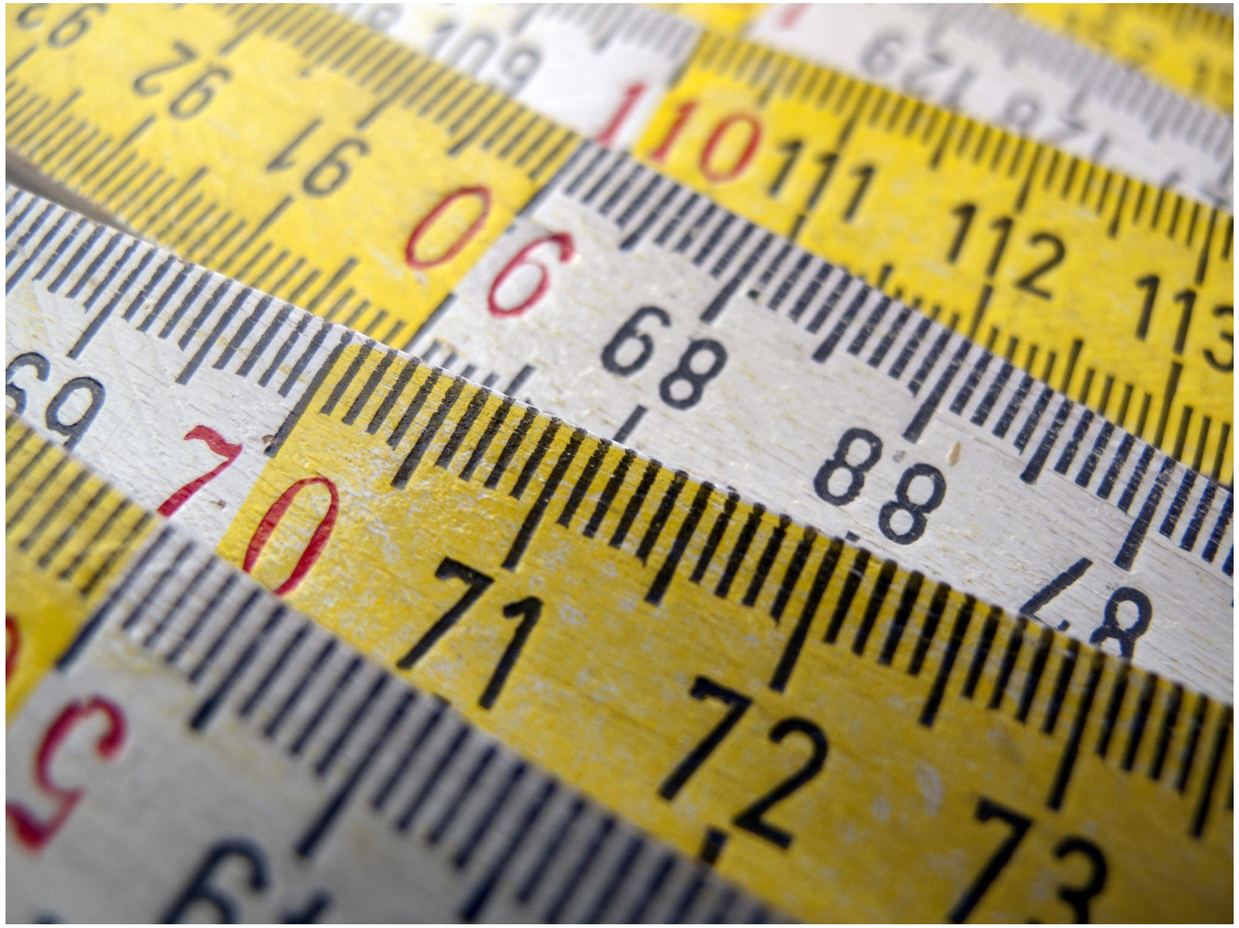
- Future of Engineering Technology
- Provides greater efficiency and consistency
- Reduced overall operational costs
- Systems can be scaled and used for a range of applications
- Assurance of safety in certain scenarios

Level of Autonomy (LoA)

- The concept can be broken down based on LoA
- As the level of human intervention decreases the LoA increases
- Extensive studies on LoA for UAS

LoA Framework Differences

- Measurements
- Measurement Scales
- Number of Levels
- Component properties



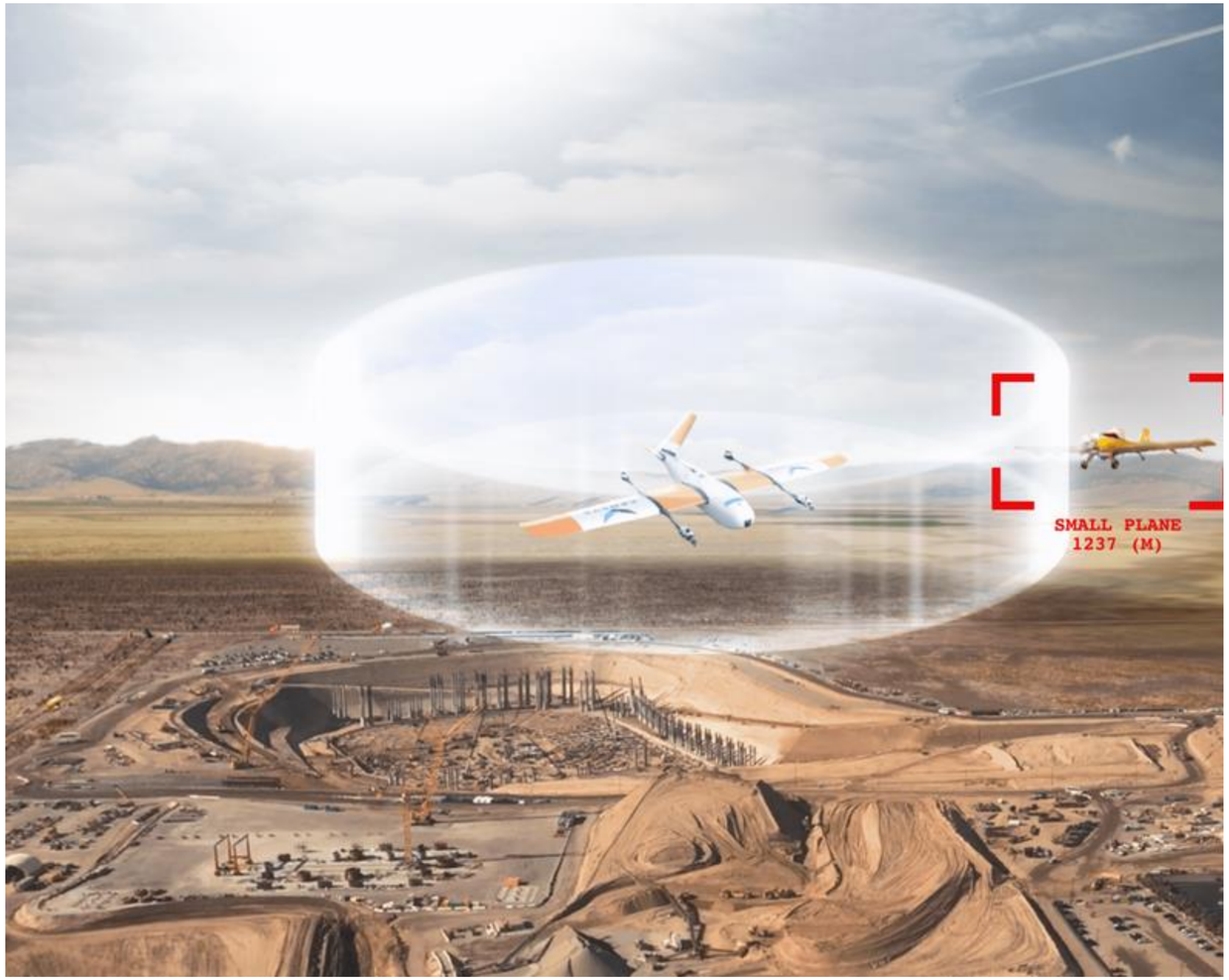
Safety Methods

1. Regulatory Compliance
2. Obstacle Detection and Avoidance
3. Real Time Monitoring and Control
4. Safety Critical Controls

Obstacle Detection and Avoidance

- SAA and DAA
- Complex to identify small UAS
- UAS identification in airspace with other users
- Self-driving cars

LiDAR, autopilots, image recognition software



Conditions for SAA

1. Be aware of all traffic in the vicinity
2. Implement and maintain appropriate separation with all other traffic.
3. Identify traffic that is a threat and establish an appropriate avoidance response.

Real-Time Monitoring and Control

- Crewed Aviation has used this for a while
  - ADS-B and TCAS
  - Greater interaction and operability in shared airspace, increased situational awareness
- Reduced overall operating costs
- Enhanced autonomy

Conclusion and Recommendations

- Continuous development of UAS regulations
- Regulating and assurance of AI
- Need for a well-defined framework on autonomy for UAS
- Greater collaboration across industry, government, SMEs, etc
- Simulation and digital twins for training and CRE definitions
- Autonomous system regulatory/advisory body

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Questions?

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