



RPAS FLIGHT ABOVE FL600



James Powell
Co-founder, CFO & Spaceplane
Chief Engineer

AGENDA

Overview

How we fly

Specifics

Our Flights



OVERVIEW



OVERVIEW

Dawn Mk-II Team: ~30 engineers, technicians, ops crew support staff

Teams: Airframe, Avionics, Cert & Operations, Propulsion, Software & GNC.

Part 102 Certified, analogous to being a Part 119, 145, 146 and 148.

NZSA High Altitude Vehicle license



HOW WE FLY



HOW WE FLY - PAPERWORK

Part 102 Exposition

Manufacturing data

Design compliance reports

Crew training and competency assessment material

About a dozen SOPs for operations



HOW WE FLY - GROUND SEGMENT

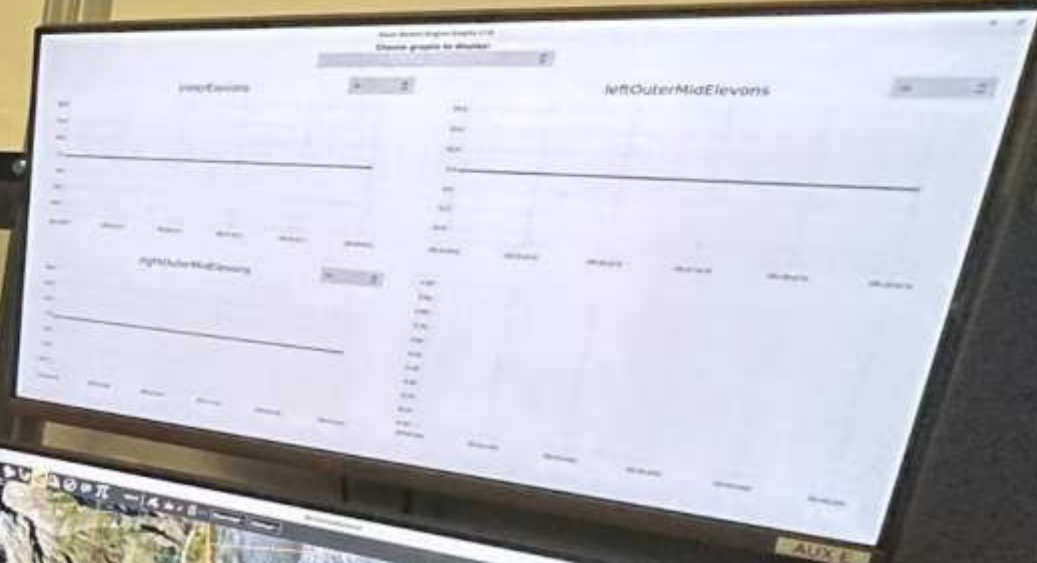
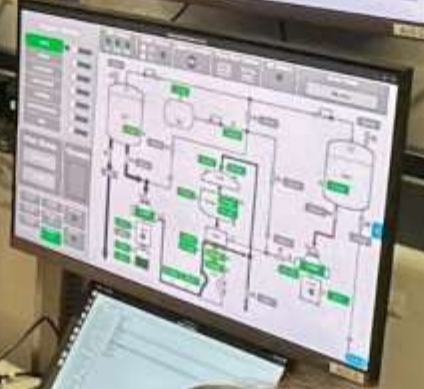
Simulator

Mission Control Station

Propulsion Support System

Tracking Station









HOW WE FLY - AIRCRAFT

Fixed delta wing

Liquid dual mode bi-propellant rocket engine. Thrust to weight greater than 2 at full power.

Avionics including power distribution, flight computer, radio link, sensor suite, actuators, etc.

~270kg MTOW

4.8m long, 2.4m wingspan





SPECIFICS



SPECIFICS - HOW DO WE DO IT?

Like a regular aircraft, just keep the crew on the ground and have a rocket engine.



SPECIFICS

1. Design & Assess - Establish system requirements, features and reliability
2. Design & Assess - Determine required separation from aircraft, people and property
3. Operate - Detect and avoid other aircraft and people



SPECIFICS

1. Establish system requirements, features and reliability

- a. Operations and Design Standards:
 - i. FAA Part 437, JARUS SORA, ASTM Standards, Other FAA standards
- b. Required Equipage
 - i. Visual, ADS-B, FLARM, Radio comms.
- c. Design
- d. Analysis
- e. Structural testing
- f. Environmental testing
- g. Ground testing (engines, radio link, full system)



SPECIFICS – REQUIREMENTS AND ANALYSIS

Disclaimer: The following are examples of some, not all, aspects of requirements and analysis and should not be interpreted as comprehensive or complete.



SPECIFICS – REQUIREMENTS AND ANALYSIS

7 Applicable Safety Requirements

There are two sources of safety requirements that define the compliance objectives of the Mk-II hazard analysis. The high-level requirements are:

- 1. Specific Operations Risk Assessment (Ref. /D/):
 - a. Operations Safety Objective (OSO) #05: UAS is designed considering system safety and reliability (Ref. /D/, Annex E).
 - b. Tactical Mitigation Performance Requirements (Ref. /D/, Annex D, Section 5.4).
 - c. Safety requirements for containment measures (Ref. /D/, Section 2.5.3).

DA02-FS-SFW-REQ-0041	Abort glide reliability	The abort mode shall recover the spaceplane with a reliability better than 99% during the glide phase, below Mach 0.7, up to FL600.	To minimise the probability of loss of spaceplane due to C2 link failures. The time at risk during gliding flight is higher, hence the higher required reliability.
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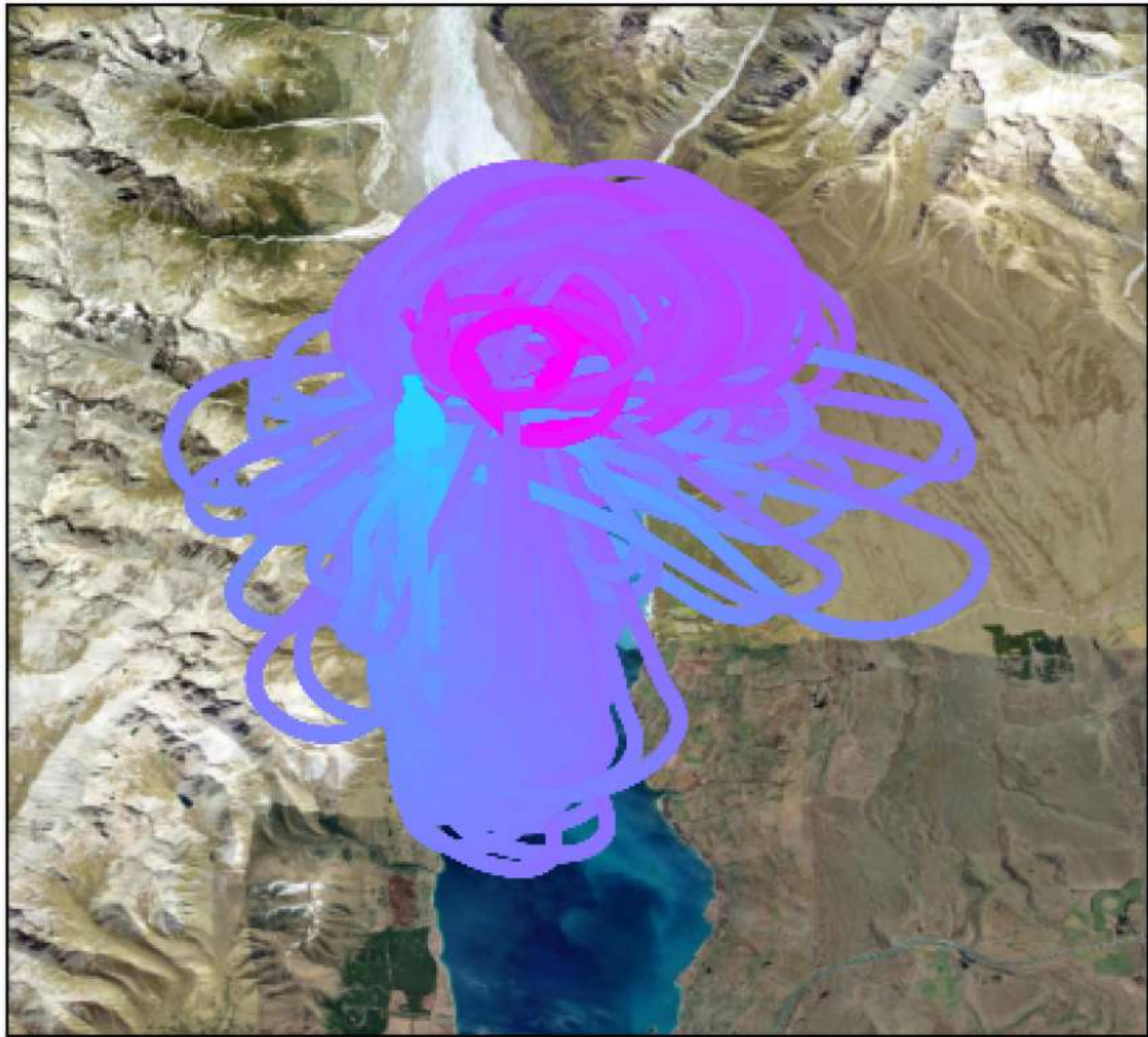


Figure 1: Groundtrack Map



SPECIFICS – REQUIREMENTS AND ANALYSIS

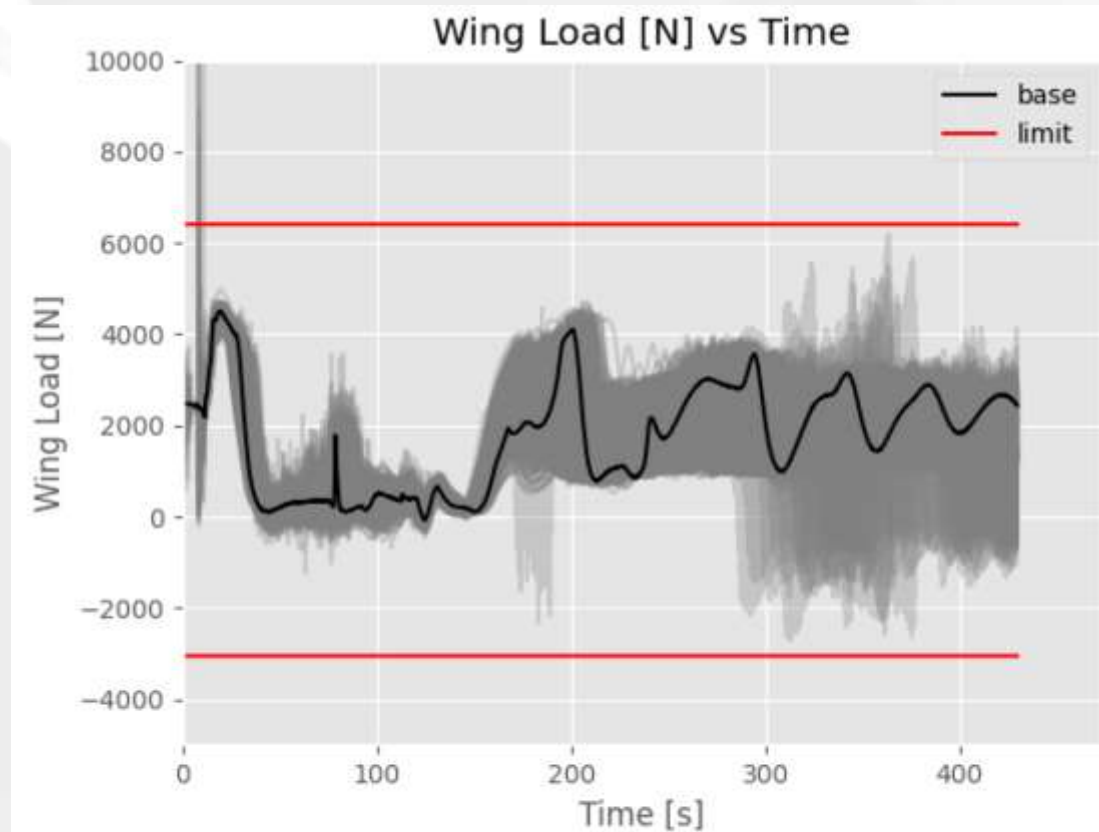


Figure 47: Wing

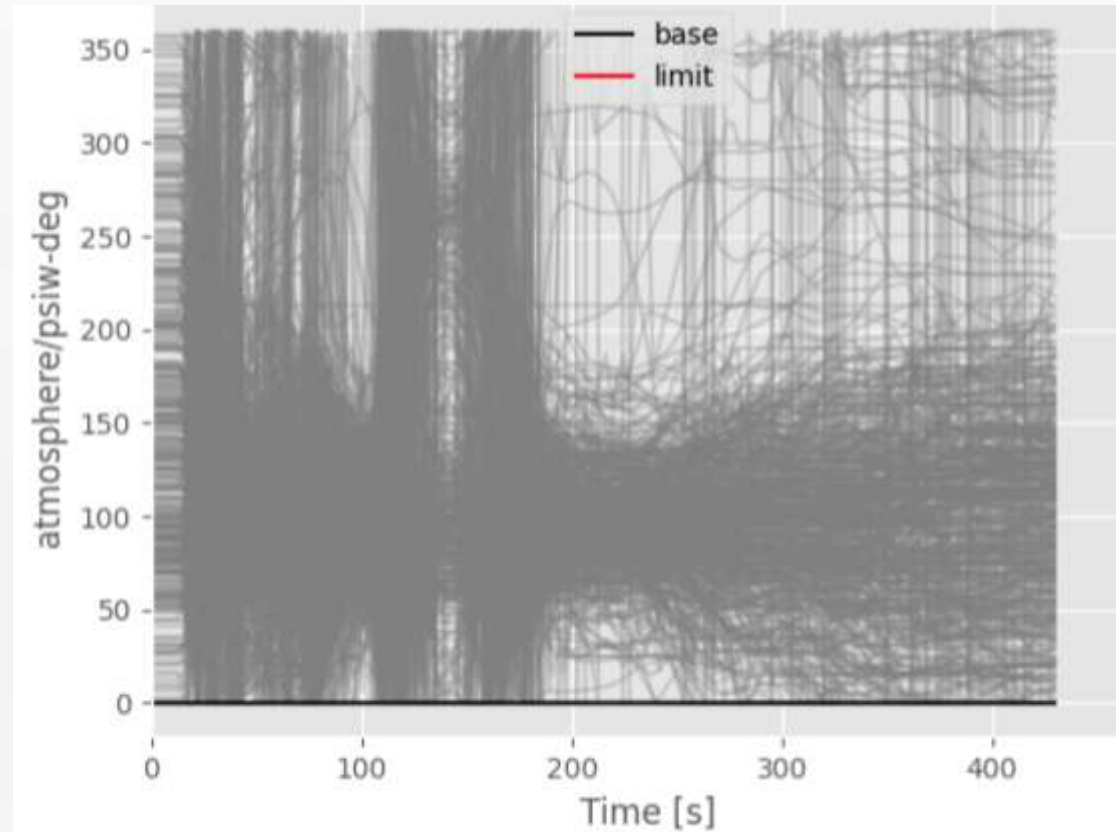


Figure 50: psiw deg

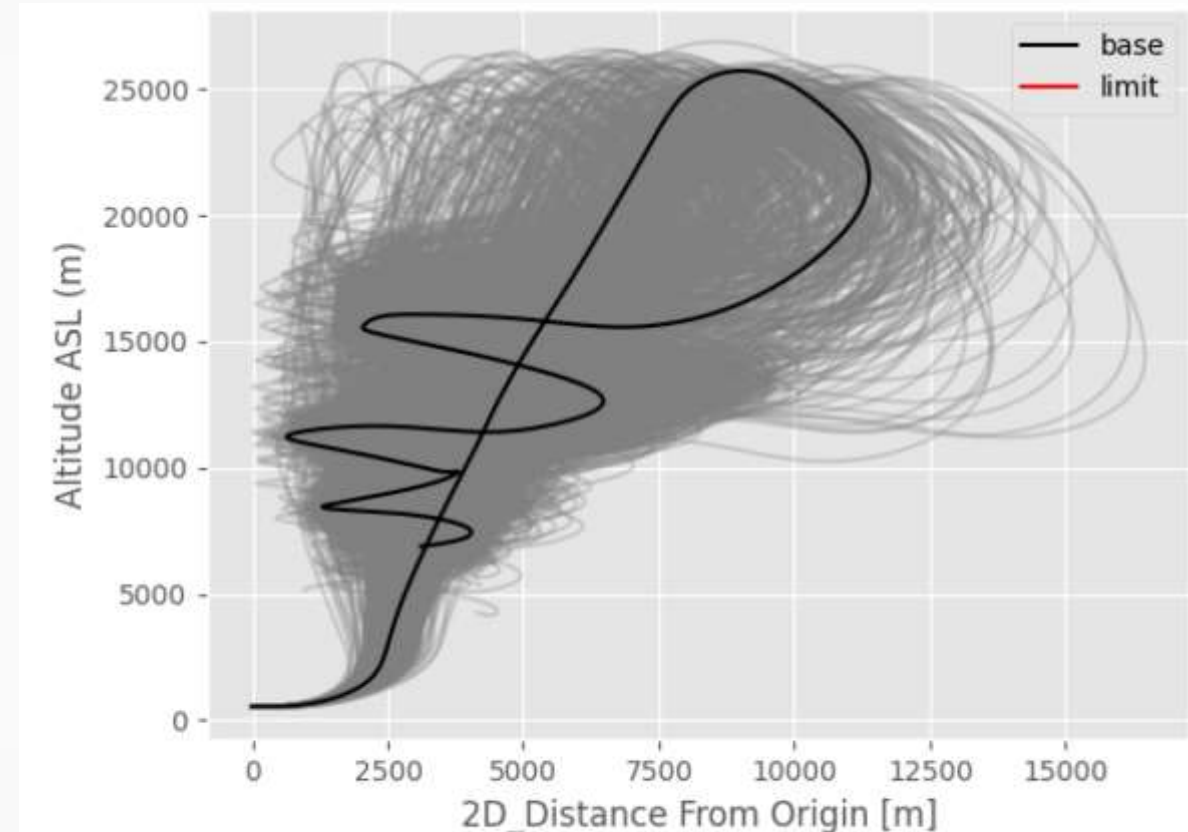


Figure 56: 2D Distance versus Altitude

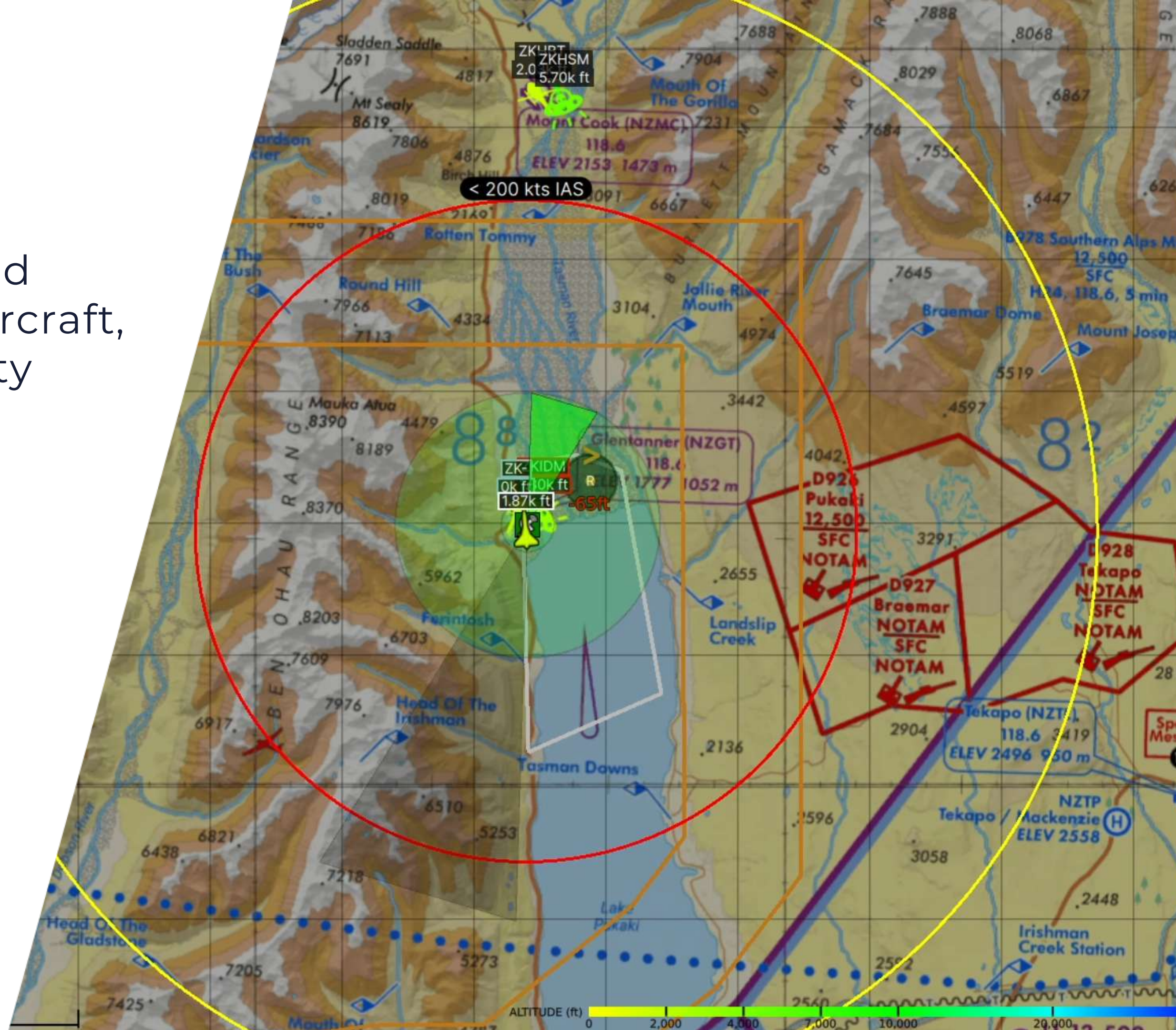


GROUND TESTING

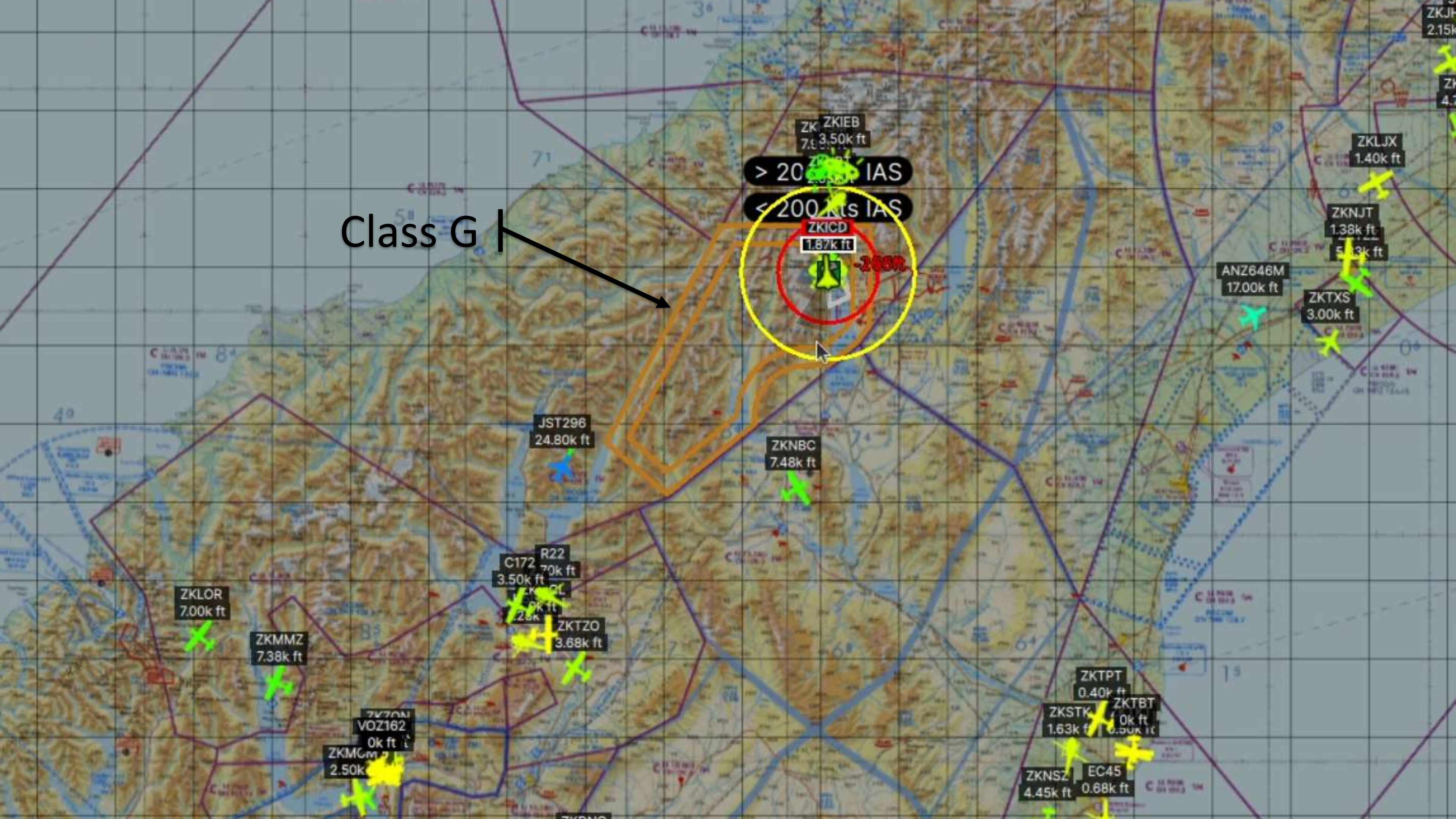


SPECIFICS

2. Determine required separation from aircraft, people and property



Class G



SPECIFICS

3. Operate - Detect and avoid other aircraft and people

1. Flight / Test Plan
2. Mission training and rehearsal
3. Weather assessment
4. Deploy
5. Wind, traffic and environmental assessment
6. Pre flights
7. Flight brief
8. Propellant loading
9. Flight
10. Post flight brief
11. Post flight checks



Lake Wanaka

West Coast

180,000Ha Flight Test Range

Aoraki / Mt Cook

SPECIFICS

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OUR FLIGHTS



OUR FLIGHTS

1. 56 flights in total
2. Only rocket powered vehicle to fly twice in a single day
3. Ground to above FL600 in 2 minutes
4. No Danger Area or Restricted Area.





161

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M
0.00

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G
1.0

1761

3000

2500

2000

1500

1000

500



Flight One
Morning



Flight Two
Evening







DAWN
COSPACE



320

64K0

40

63K5

30

63K0

20

10

62K5
06K5

62K0

61K5

-10

-20

-30

-40

-50

60K8

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0246

M
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0071

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100

90

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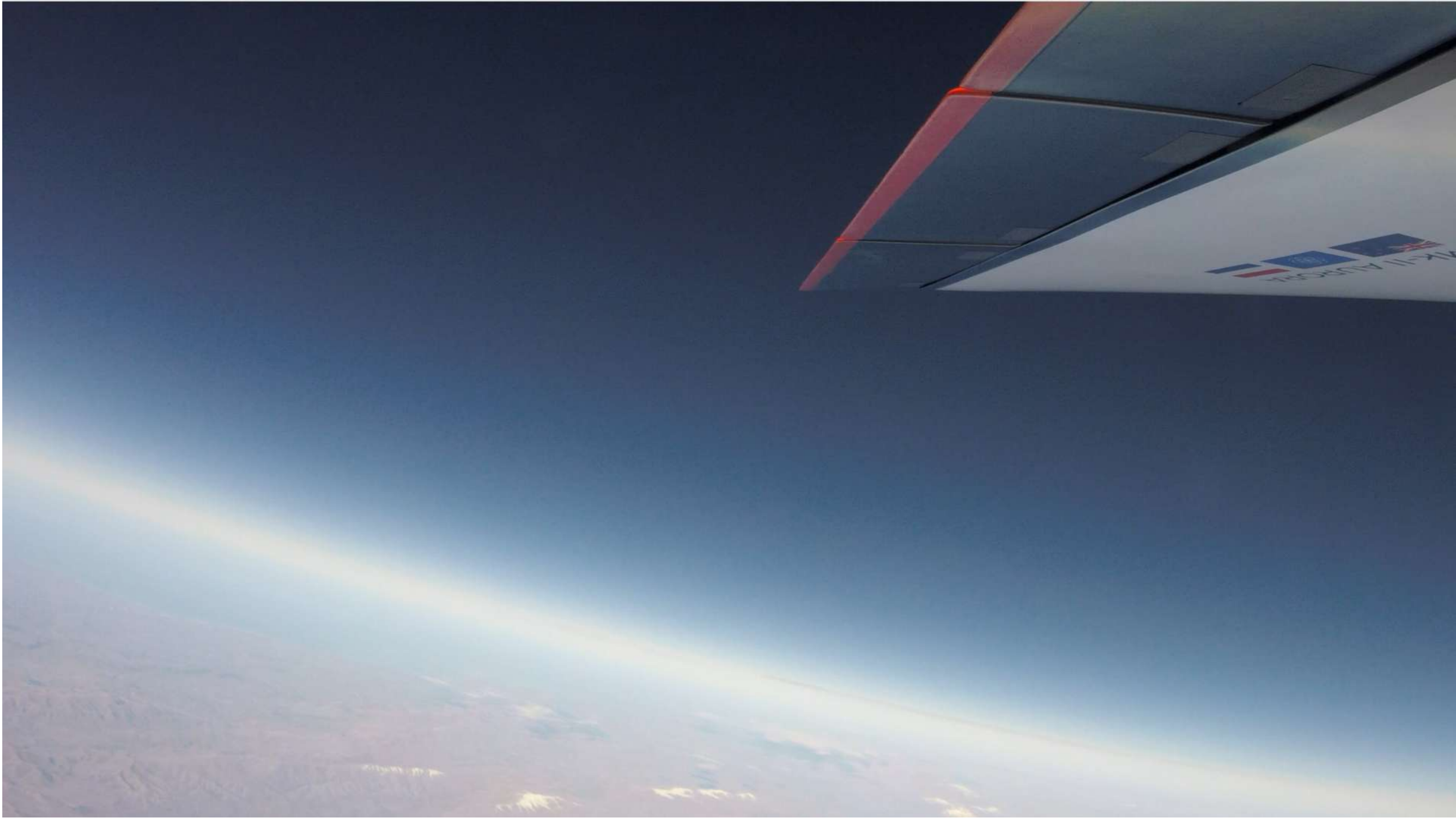
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QUESTIONS?





THANK YOU!



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