Hidden Beliefs in Verification Strategies

INCOSE International Symposium 2024

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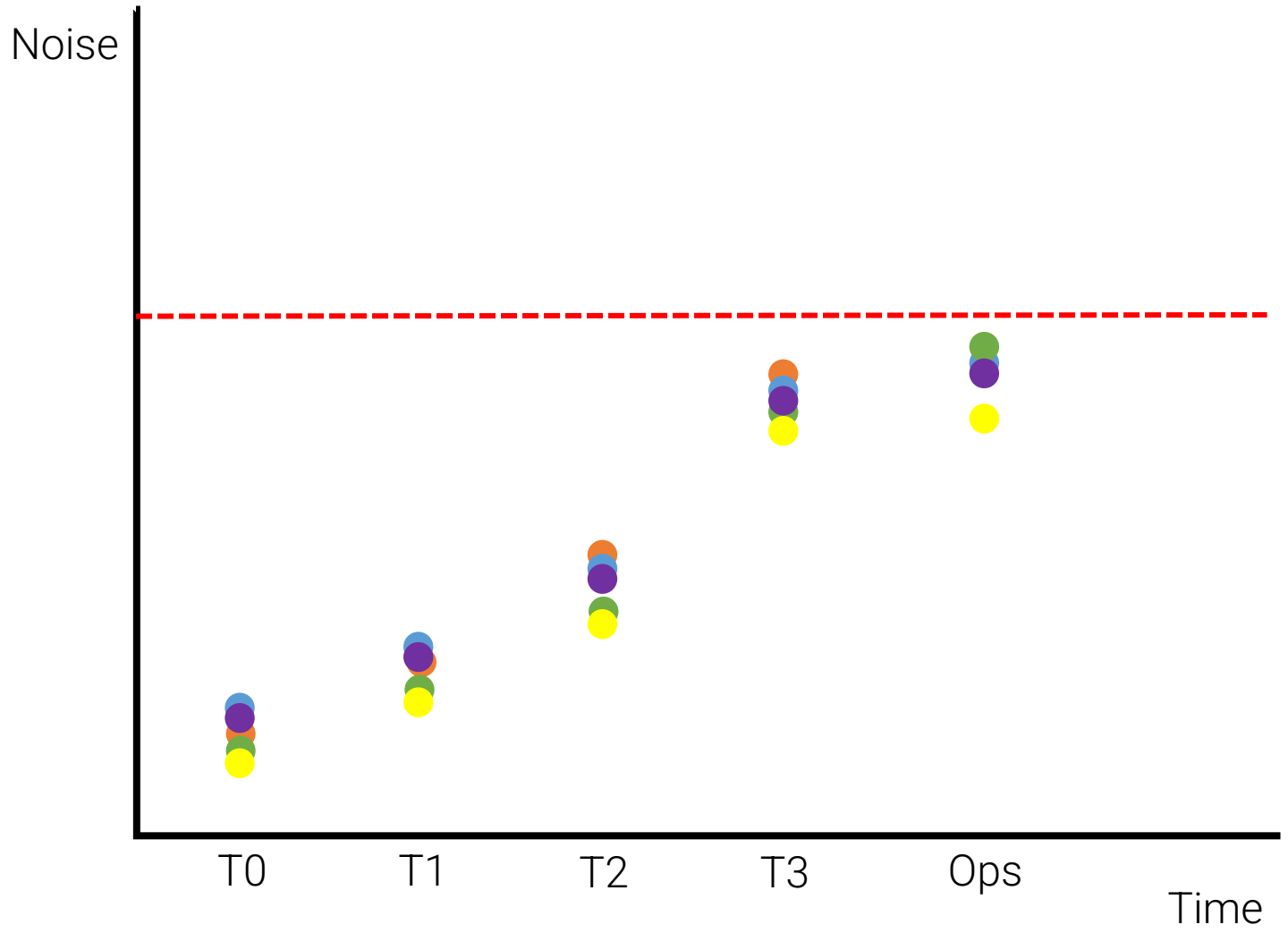
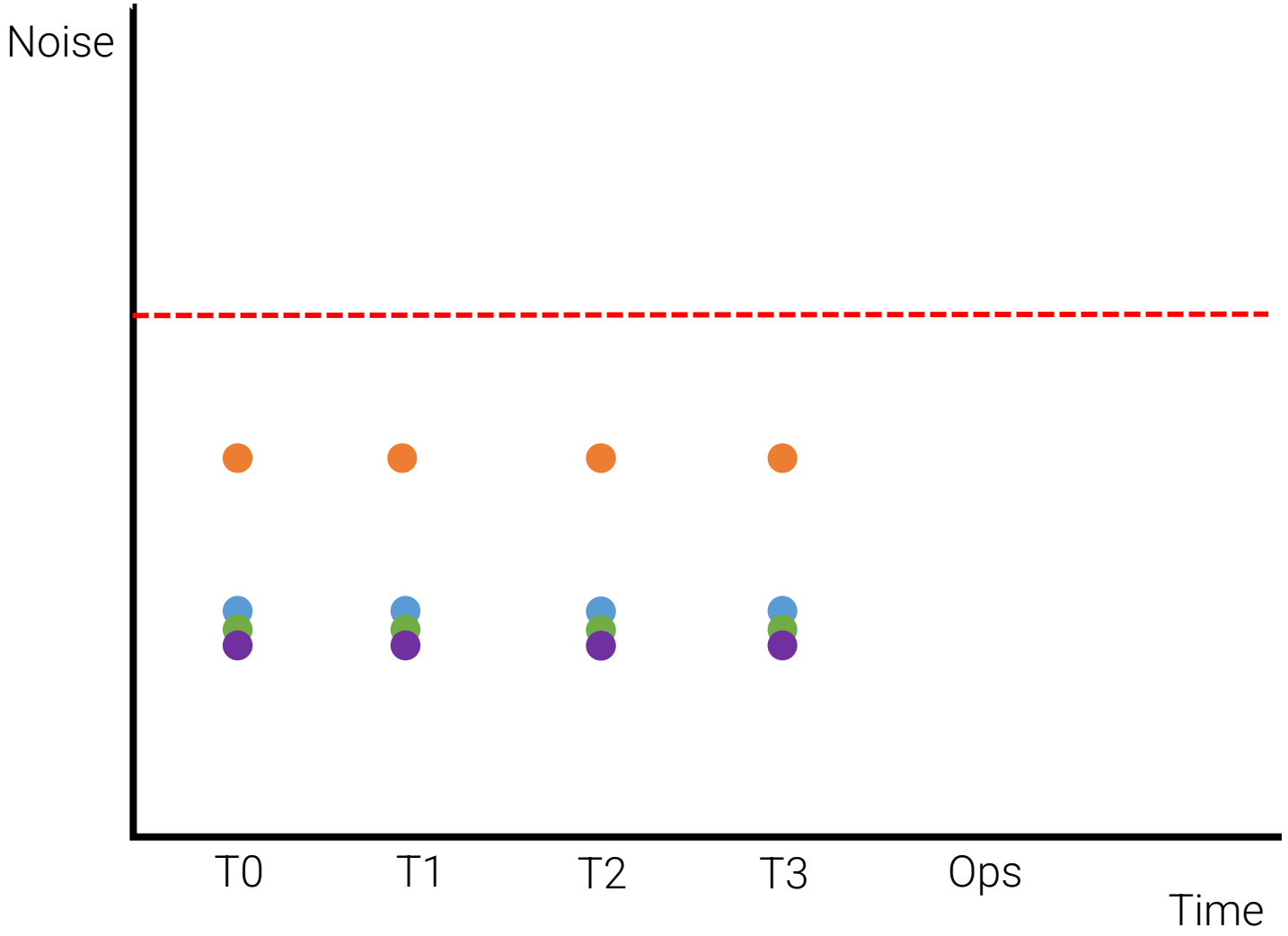




m: mass of the system

v: mass of the system reported by the scales

$$K(v) \rightarrow B(m)$$

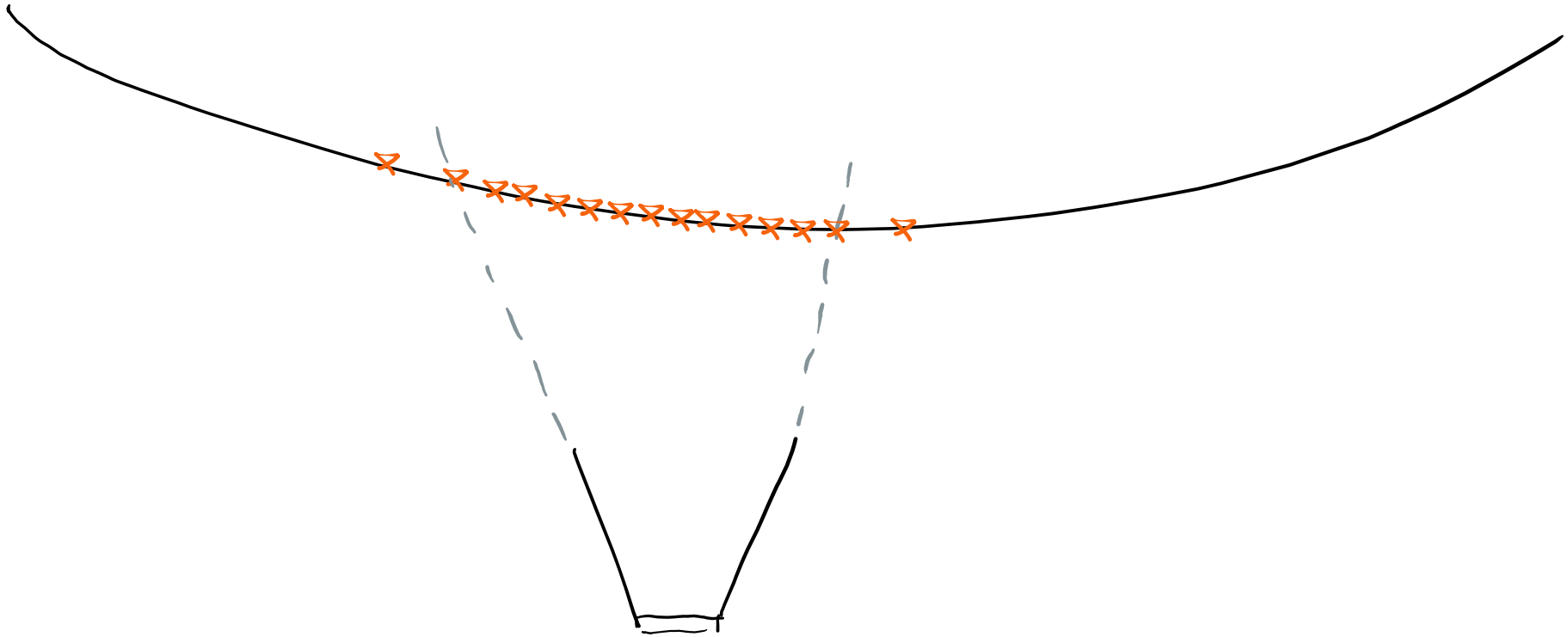
t: calibration tag of the scales

$$K(t) \wedge K(v) \rightarrow B(m)$$

o: operator or company doing the calibration

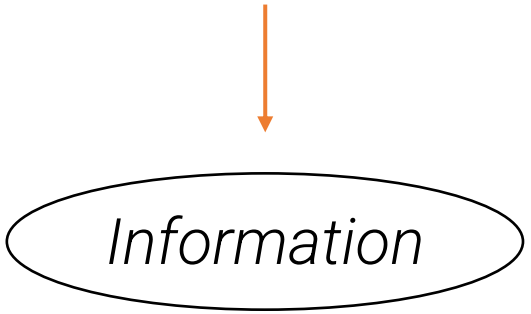
$$K(o) \wedge K(t) \wedge K(v) \rightarrow B(m)$$

$$B(o) \wedge B(t) \wedge B(v) \rightarrow B(m)$$



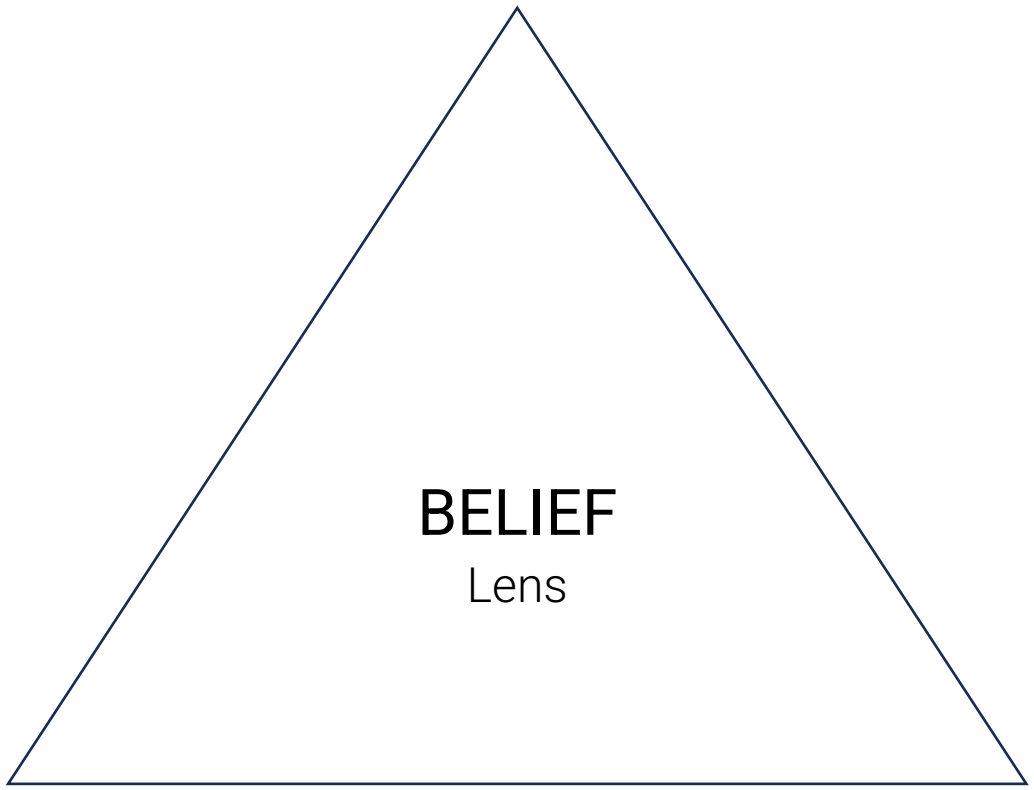
Verification ACTIVITY

Verification EXECUTION -> Verification EVIDENCE



Verification MATRIX

Requirement	Description	Compliance	Verification Evidence	Method	Report
Thrust	Aircraft shall produce thrust of at least 110kN	Yes	Engine Test Report	Test	Thrust produced by the engine measure through on-wing testing.



Do HIDDEN BELIEFS exist?

Why does this MATTER?

Different People = Different Lens

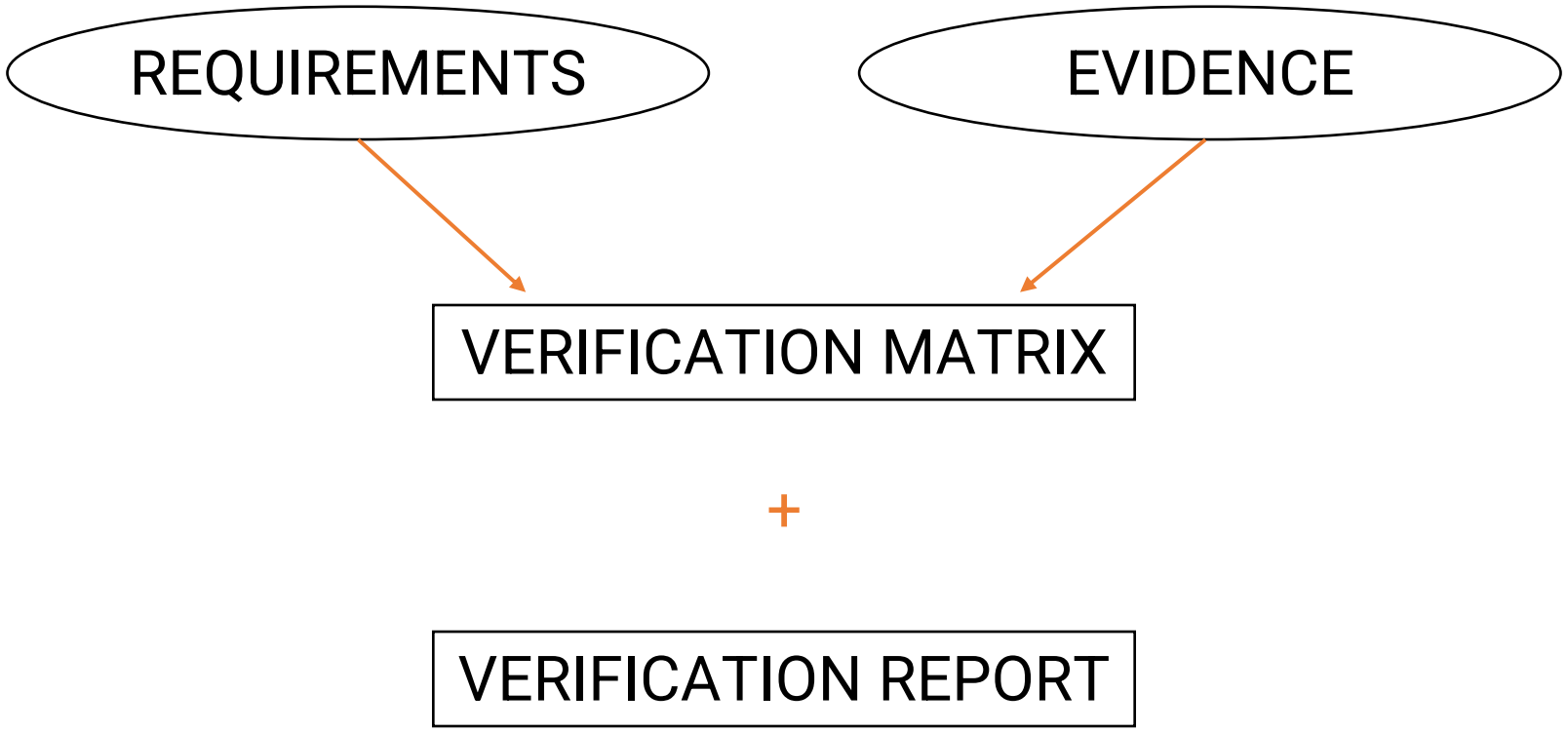
Training AI Models

Varying Expertise

Gaps in Knowledge

Let’s TEST it!

- Aerospace Engineering Students
- Third of Fourth Year
- Familiar with Aircraft Design



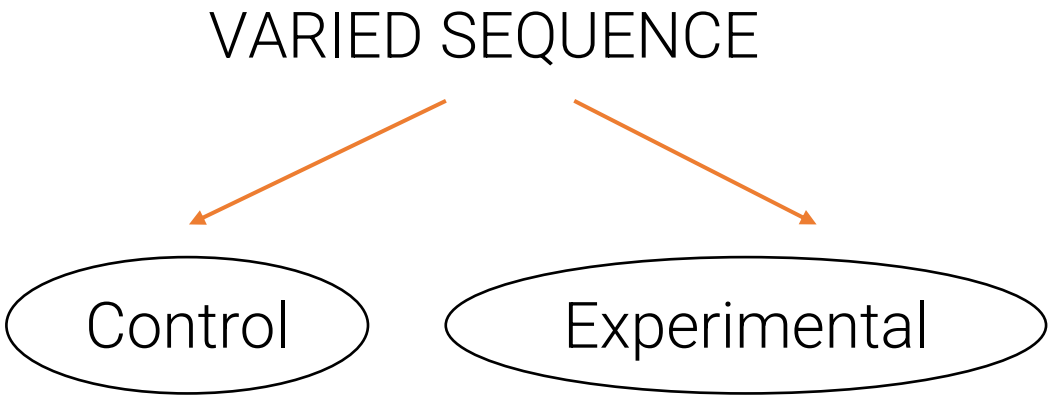
Step 1
Requirements Document

Step 2
Verification Matrix 1
Verification Evidence Set A

Step 3
Verification Report

Step 4
Verification Matrix 2
Verification Evidence Set B

Step 5
Verification Report



EVIDENCE

- Aircraft Interior Configuration
- Mass Budget
- Aircraft Drawing (as designed)
- Engine Test Report

Requirement		Description
1	Internal Configuration	Aircraft shall fit at least180 passengers and 4 crew members (flight attendants)
2	Dimensions	Aircraft shall fit in hanger of at least length 45m, height 20m, width 40m
3	Takeoff Specifications	$V_{TO} \geq 1.18V_s$ $V_{CT} \geq 1.1V_s$
4	Cruise Specifications	Aircraft shall achieve service ceiling of at least 11000m
5	Thrust	Aircraft shall produce thrust of at least 110kN
6	Cruise Specifications	Aircraft shall achieve minimum range of 5500km
7	Mass	Aircraft maximum takeoff weight (loaded and fueled) (MTOW) shall be no more than 80,000kg
8	Dimensions	Wingspan not to exceed 37m (34m desired)

6.0 RESULTS AND CONCLUSION

The AirJet engine tested by Jet Engine Test Wing (JETW) in accordance with regulations set forward by the UD Transportation Department (US TD) and the Federal Aviation Ministry (FAM) was found to be in compliance with the requirements of airworthiness.

Among the tests conducted (detailed above), this report details findings of On-Wing and Test Cell testing of the jet engine **SRB42 SE-40.** Summary of results are as follows:

	Unit	**Engine Type**
		SRB42 SE-40 NH1
Engine thrust produced	kN	90
Flat rate temp.	°C	30
Fan diameter	in	63
Bypass ratio	-	5.4
Climb pressure ratio	-	35.8
Cruise sfc	Ibf/lb/h	0.543
Fuel consumption	kg/h	3500

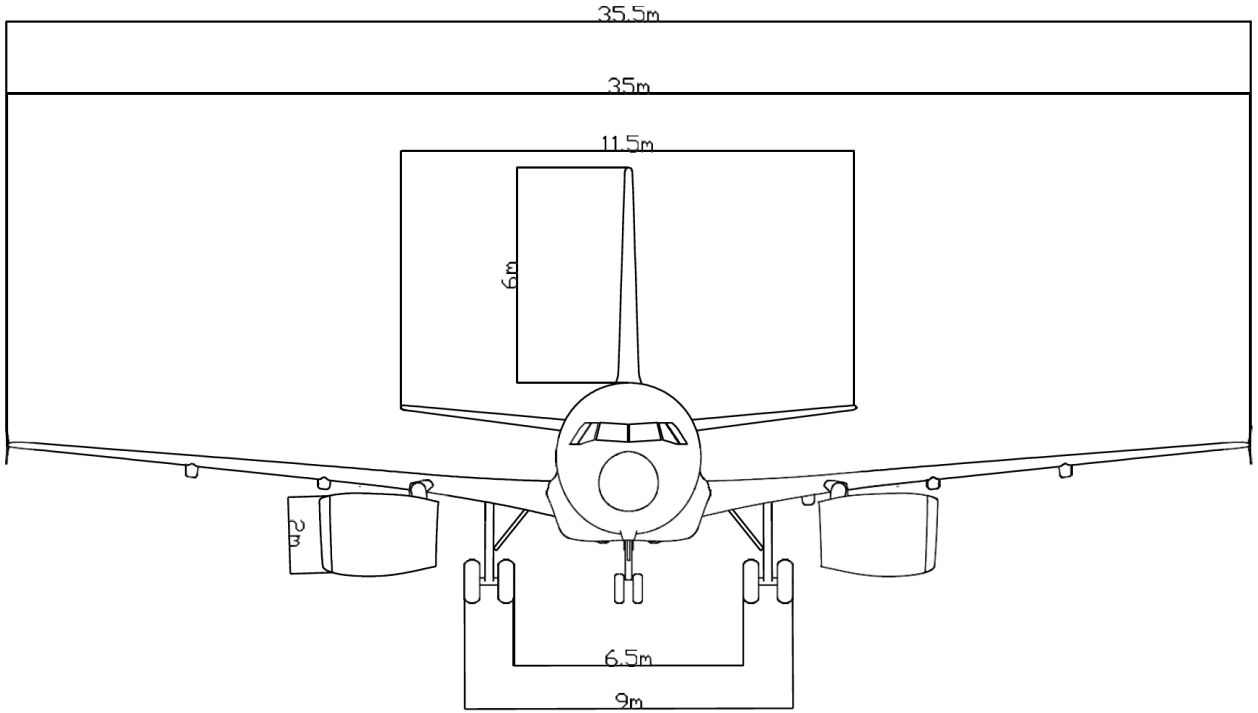
This report focuses on the engine thrust produced by the engine under specified test conditions, which was found to be 90kN. Being in compliance with airworthiness standards, the engine **SRB42 SE-40** is certified as required.

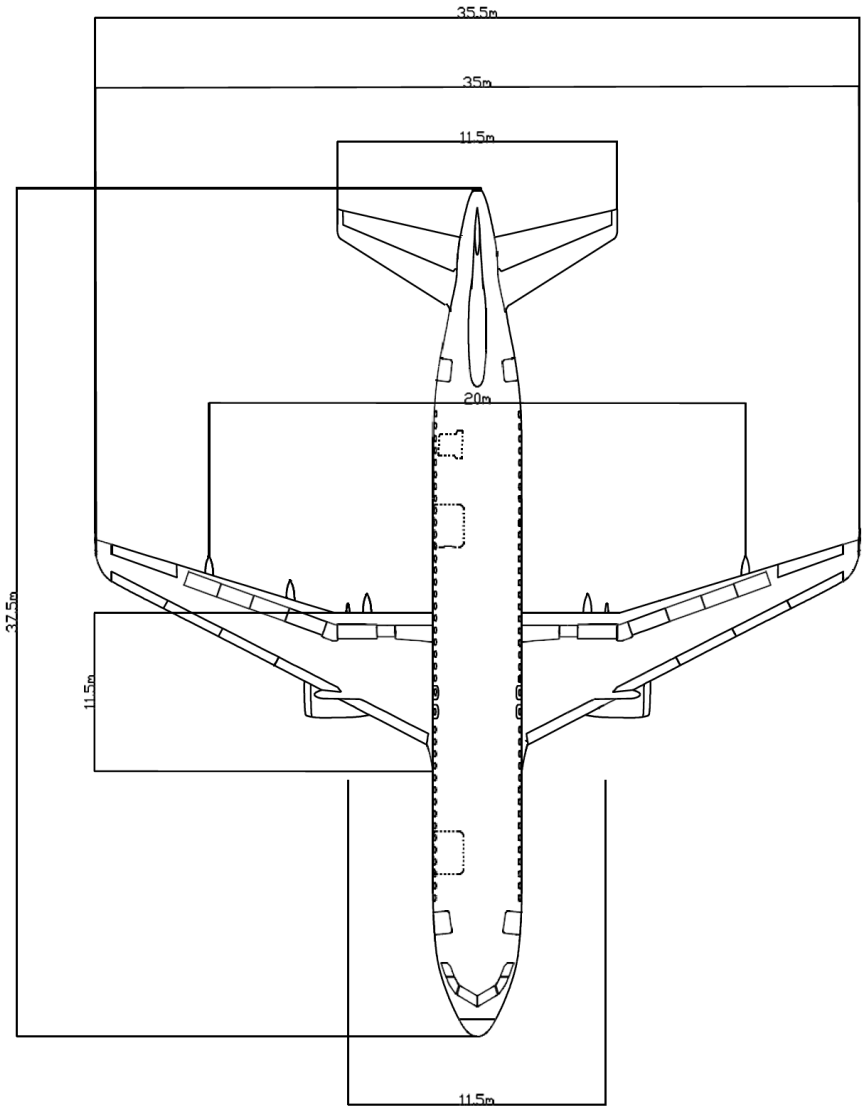
2. Aircraft Specifications





Aircraft	Fan Diameter	Entry into Service	Bypass Ratio	Number of Engines
SkyCorp 007	63”	1989	5.4	2





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EXPECTATION.....

Thrust Requirement

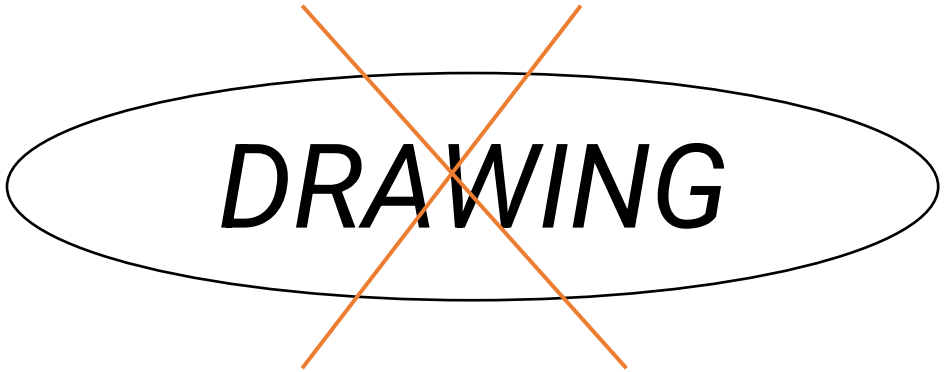
Range Requirement

Speed Requirement

Cruise Requirement

DRAWING

REALITY !!!



2 engines?

dimensions?

disbelief

misinterpretation

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HIDDEN BELIEFS exist!

THANK **YOU**

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