

Failure is Not an Option

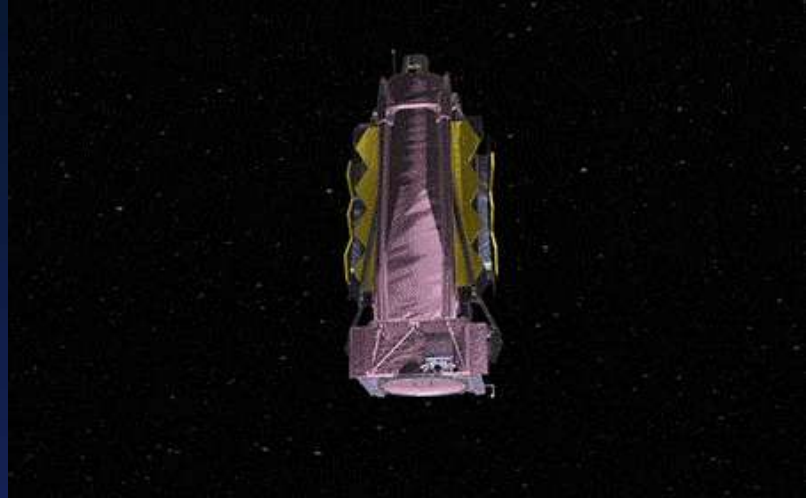
Testing for Resilient Space Systems

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SPACE TECHNOLOGY



<https://www.britannica.com/technology/Sputnik>

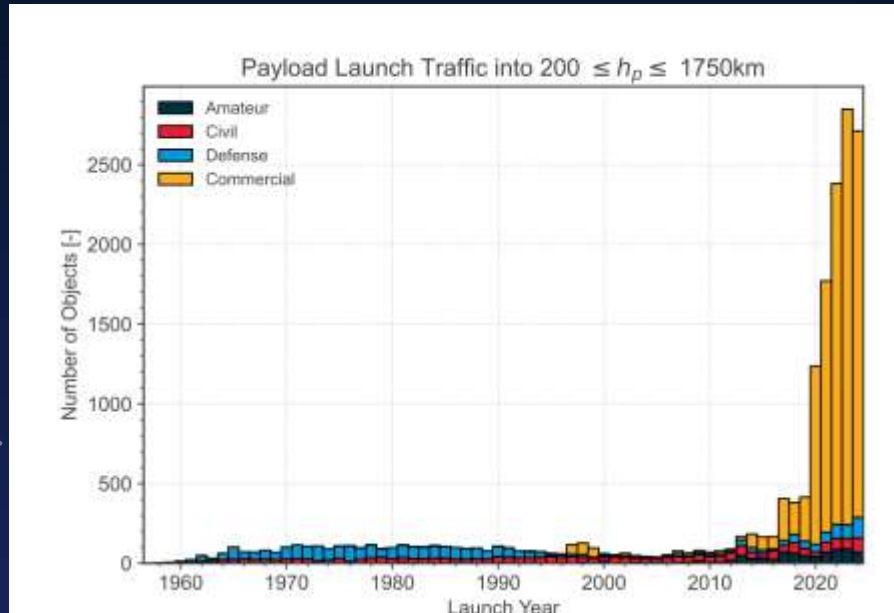


Courtesy of NASA: <https://giphy.com/gifs/nasa-space-jwst-webb-telescope-3o6ZtrDdmPIyO550U8>

SATELLITE SERVICES



SATELLITE POPULATION



ESA Space Debris Office, "ESA's Annual Space Environment Report," European Space Agency, GEN-DB-LOG-00288-OPS-SD, Mar. 2025. Accessed: Apr. 02, 2025. [Online]. https://www.sdo.esoc.esa.int/environment_report/Space_Environment_Report_latest.pdf





**WHAT HAS
THIS GOT TO
DO WITH
TESTING?**



WHAT HAS THIS GOT TO DO
WITH TESTING?

FAILURE
IS NOT AN
OPTION



WHAT HAS THIS GOT TO DO WITH TESTING?

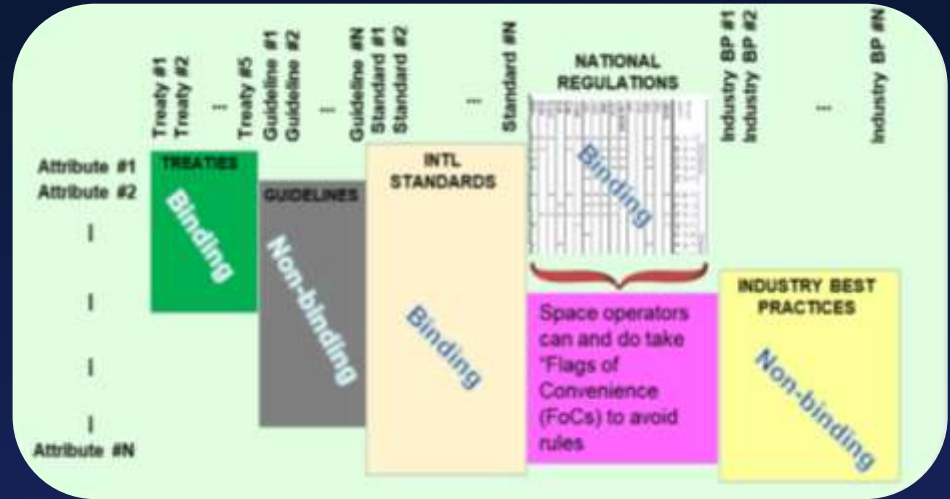
- SAFETY
- RESILIENCE



https://www.esa.int/esatv/Videos/2019/02/Distribution_of_space_debris_in_orbit_around_Earth/Distribution_of_space_debris_in_orbit_around_Earth

WHAT HAS THIS GOT TO DO WITH TESTING?

- SAFETY
- RESILIENCE
- COMPLIANCE
- AGILITY
- IN SPACE!



Oltrogge, Daniel L., and Ian A. Christensen. 'Space Governance in the New Space Era'. *Journal of Space Safety Engineering, Space Debris: The State of Art*, 7, no. 3 (1 September 2020): 432–38. <https://doi.org/10.1016/j.jsse.2020.06.003>.

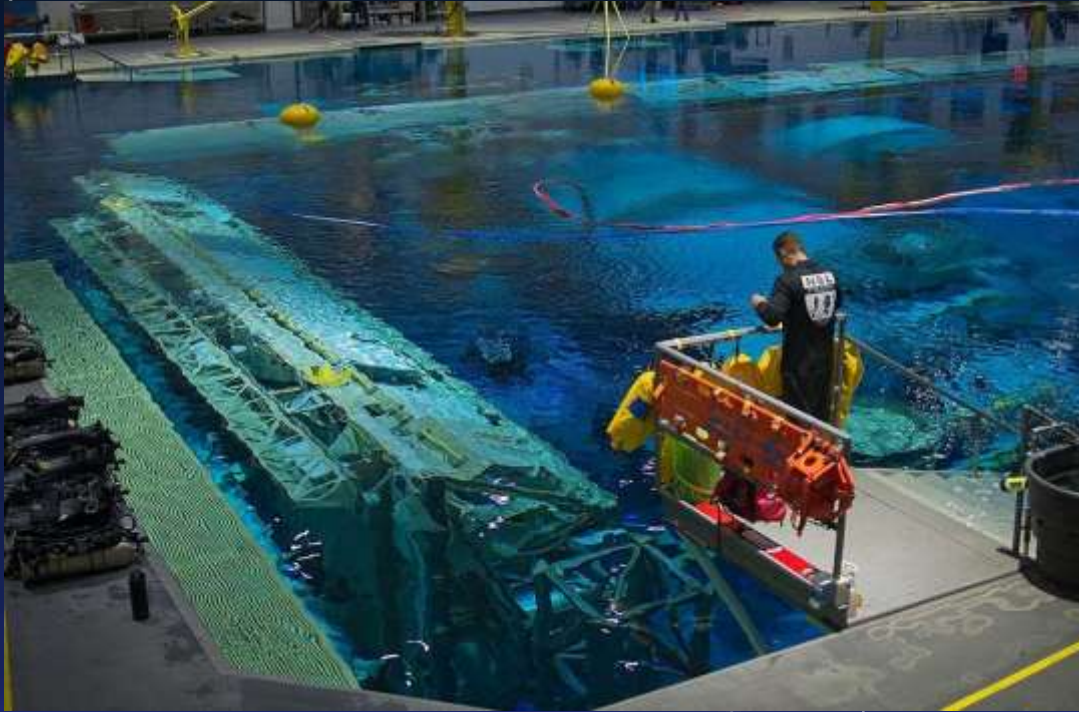


**TEST AS WE
FLY – FLY AS
WE TEST**

TESTING SPACE SYSTEMS



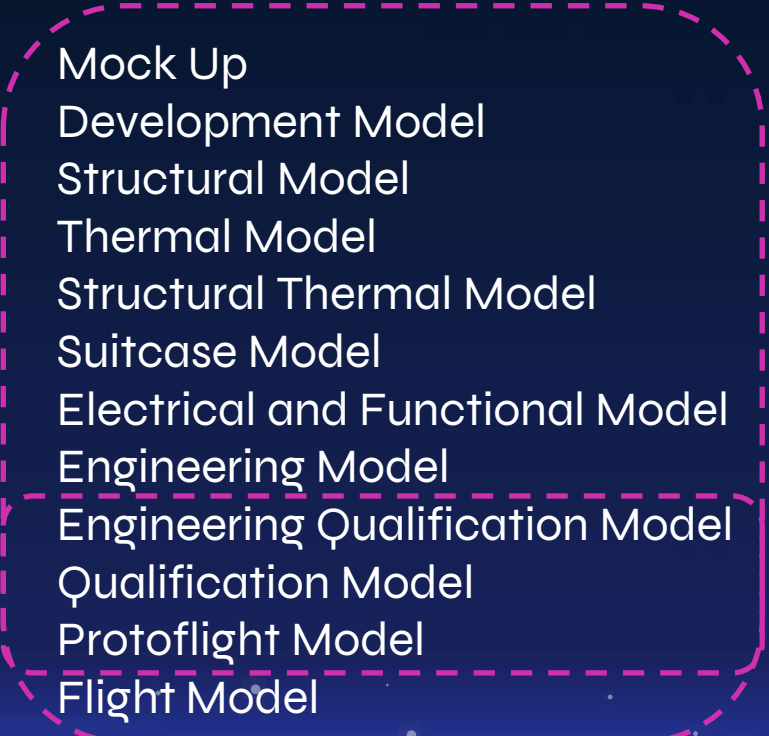
TESTING SPACE SYSTEMS



TESTING SPACE SYSTEMS

Less complex /
Earlier in
development

More complex /
Later in
development



Mock Up
Development Model
Structural Model
Thermal Model
Structural Thermal Model
Suitcase Model
Electrical and Functional Model
Engineering Model
Engineering Qualification Model
Qualification Model
Protoflight Model
Flight Model

**Protoflight
Approach**

TESTING SPACE SYSTEMS

20 YEARS



TESTING SPACE SYSTEMS



<https://www.gao.gov/assets/700/690693.pdf>

TESTING SPACE SYSTEMS



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HOW IS THIS LIKELY TO CHANGE?

‘Fail fast,
Learn Fast’



FAILURE
IS ~~NOT~~ AN
OPTION

Thanks!

Do you have any questions?



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