

# On the Struggle between Perfection and Learning

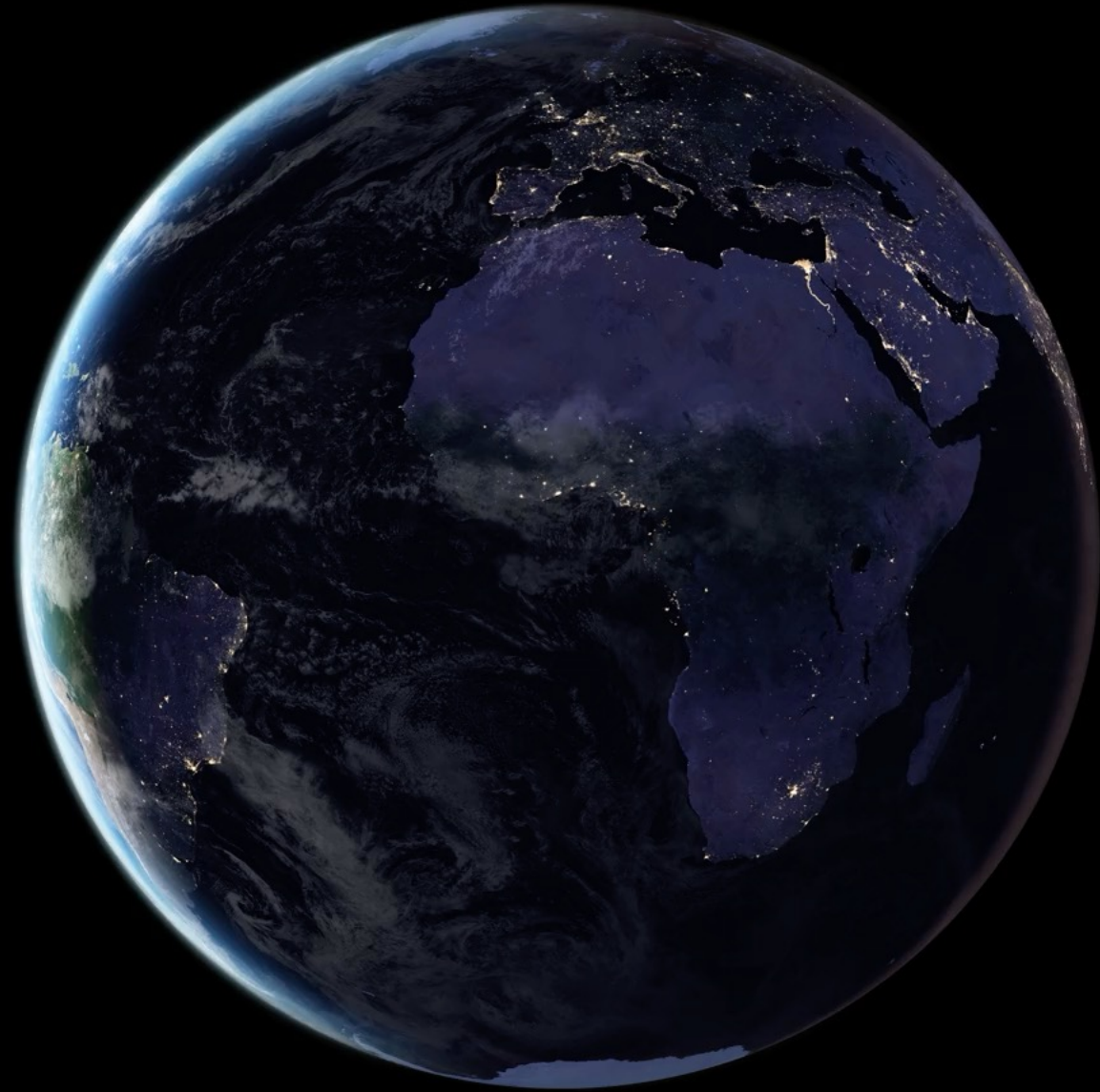


**Dr. Thomas H. Zurbuchen**

Director, ETH Zürich | Space

NASA Head of Science, 2016 – 22

[thomaszurbuchen.com](http://thomaszurbuchen.com)

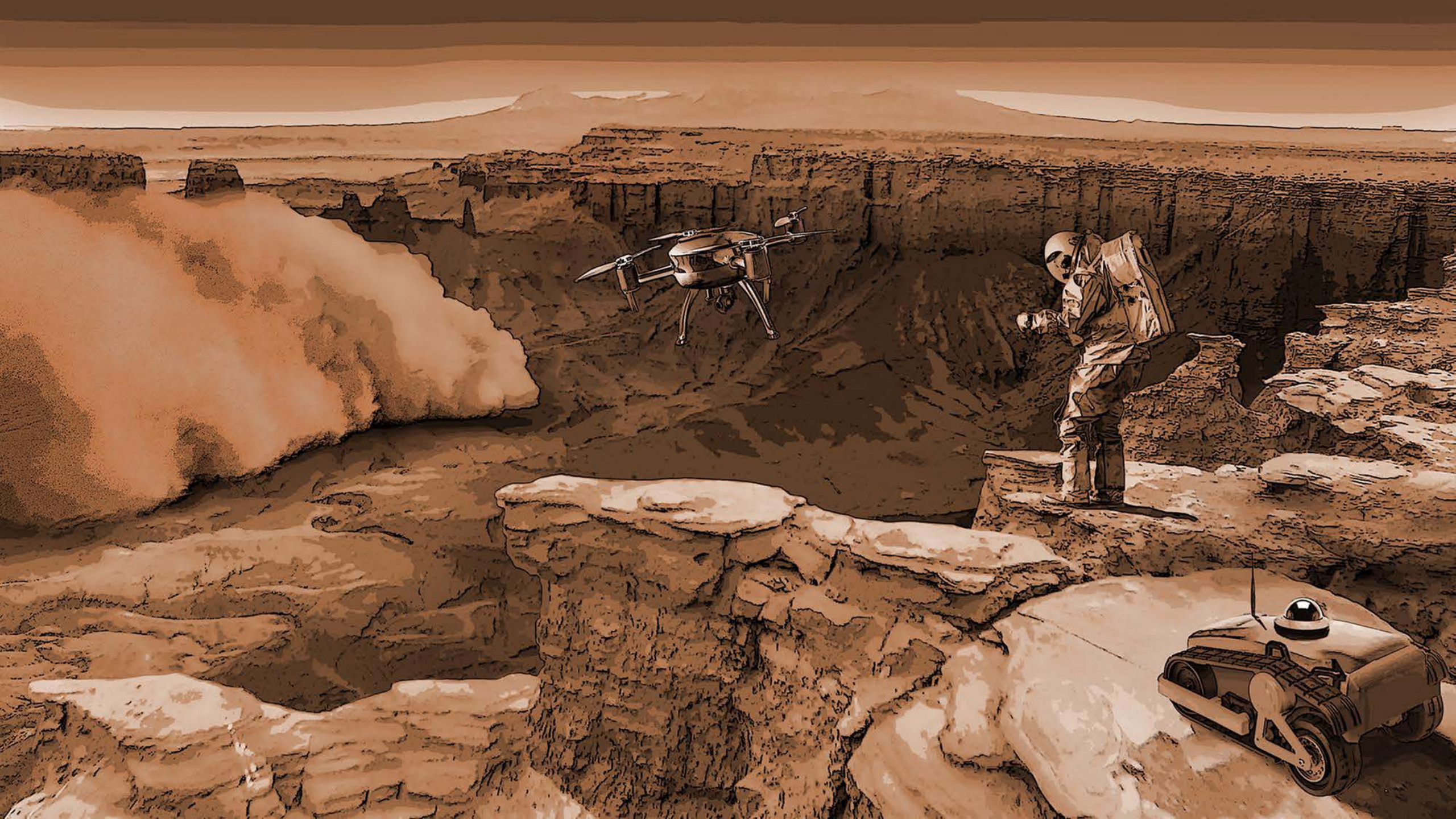




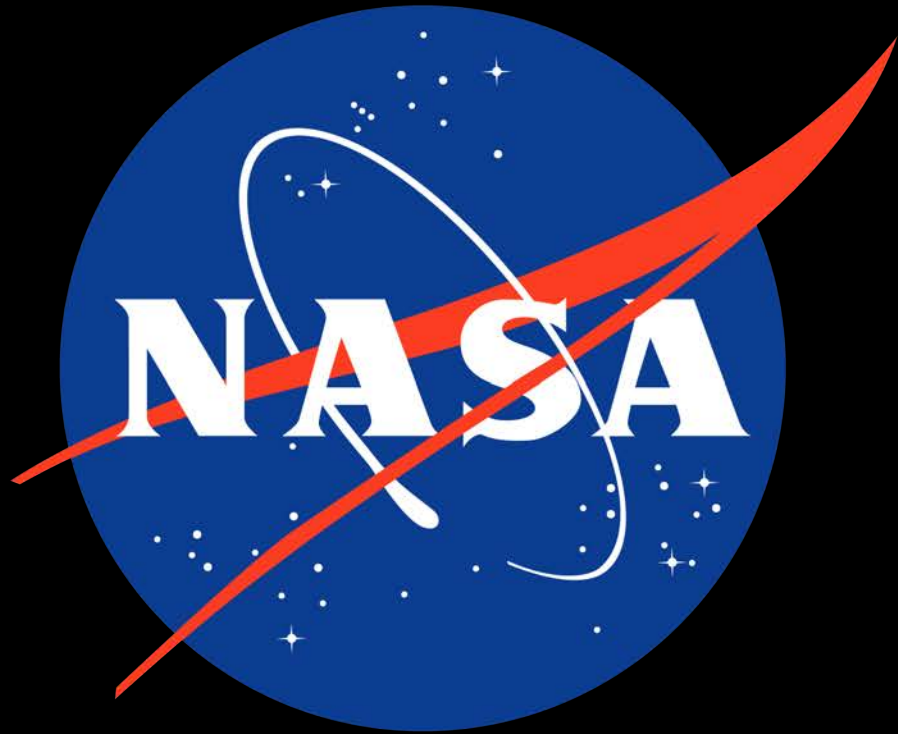
**Gemini 4**  
**June, 1965**



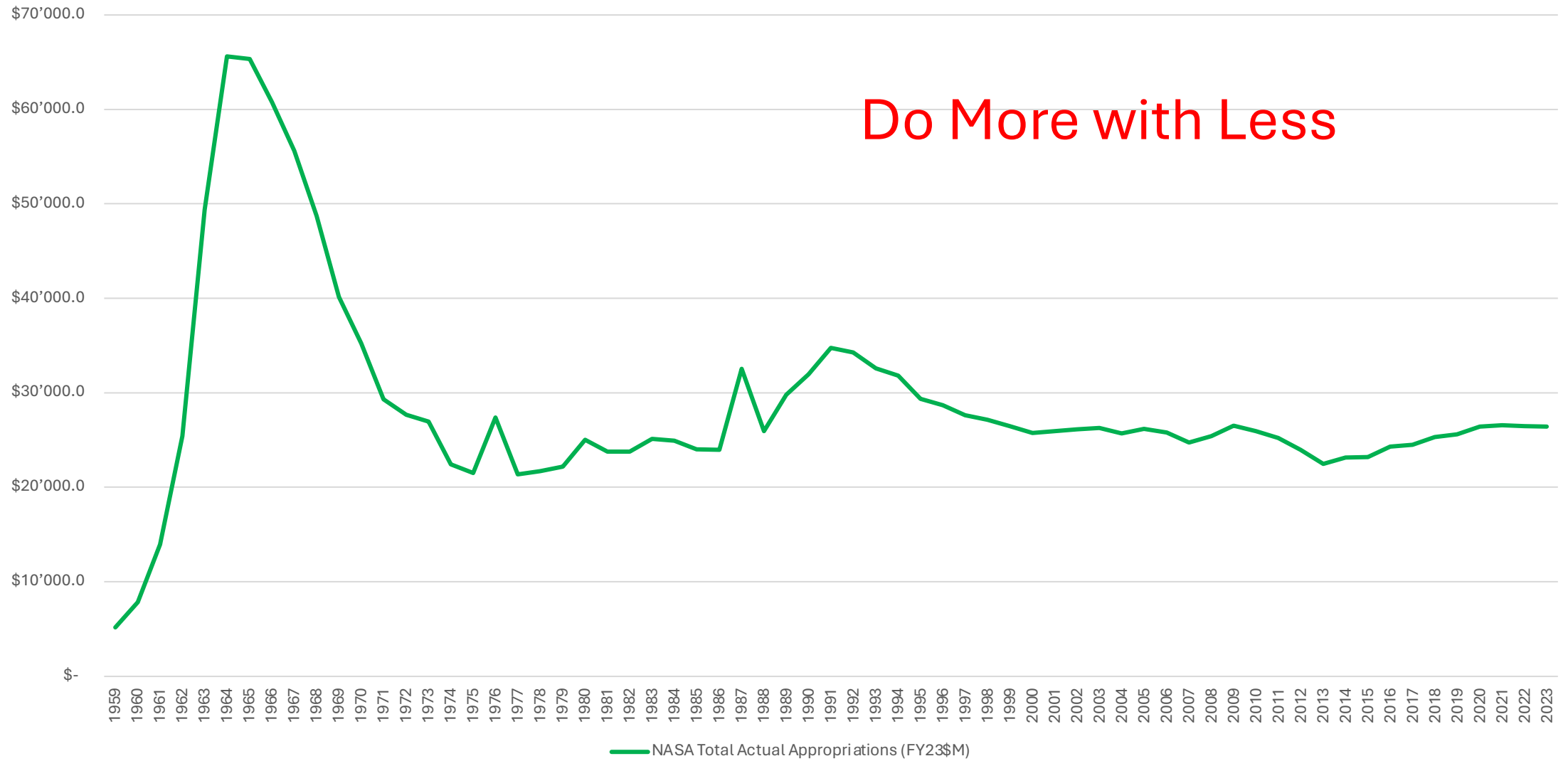
12. Sept. 2024  
Source: SpaceX



# Five Lessons About Learning



- Most great learnings often come from “pain”



Do More with Less

# NASA Budget History

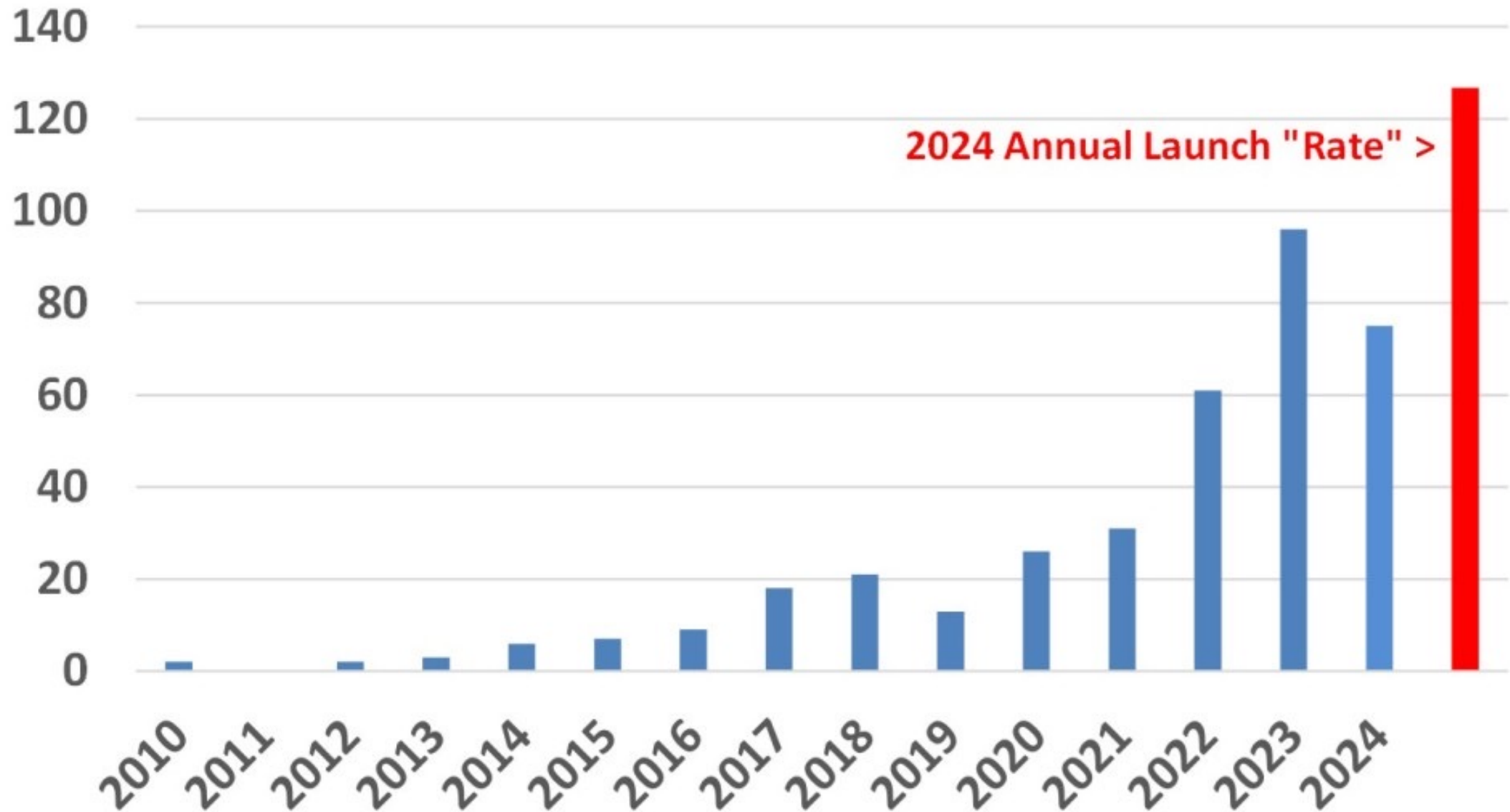
(adjusted for inflation)



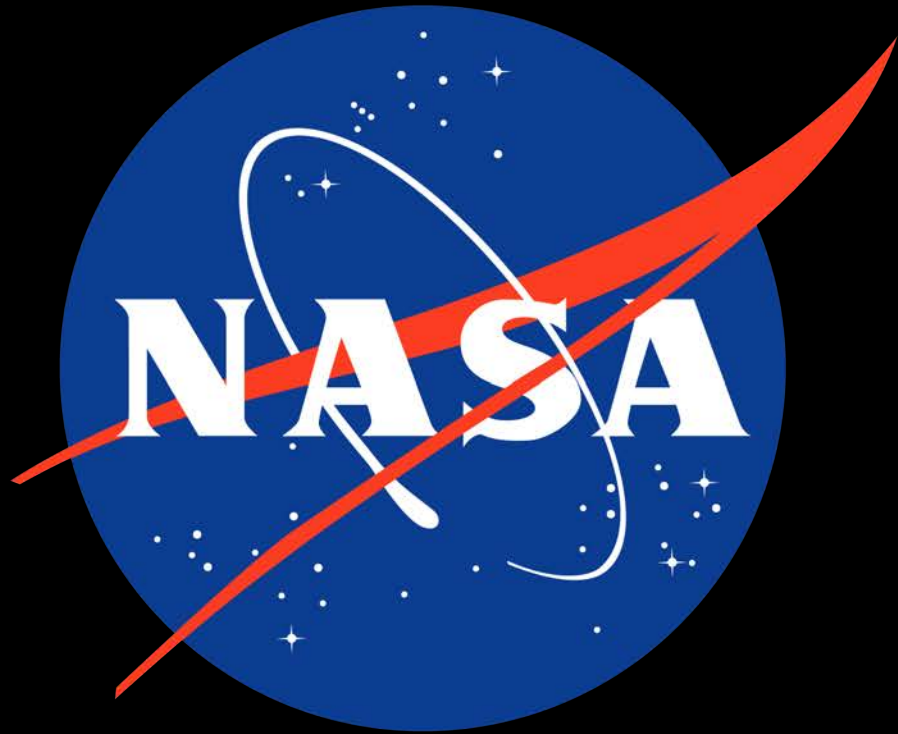




# # of SpaceX launches



# Five Lessons About Learning



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- They are hard and take patience, strong leadership









**SPEED** 1124 KM/H  
**ALTITUDE** 1 KM



**T+00:06:31**  
STARSHIP FLIGHT TEST



**SPEED** 15254 KM/H  
**ALTITUDE** 144 KM



# HUMAN LANDING SYSTEMS

Having two human landing system partners for NASA's Artemis program will increase competition, and help NASA achieve its scientific goals on and around the Moon.

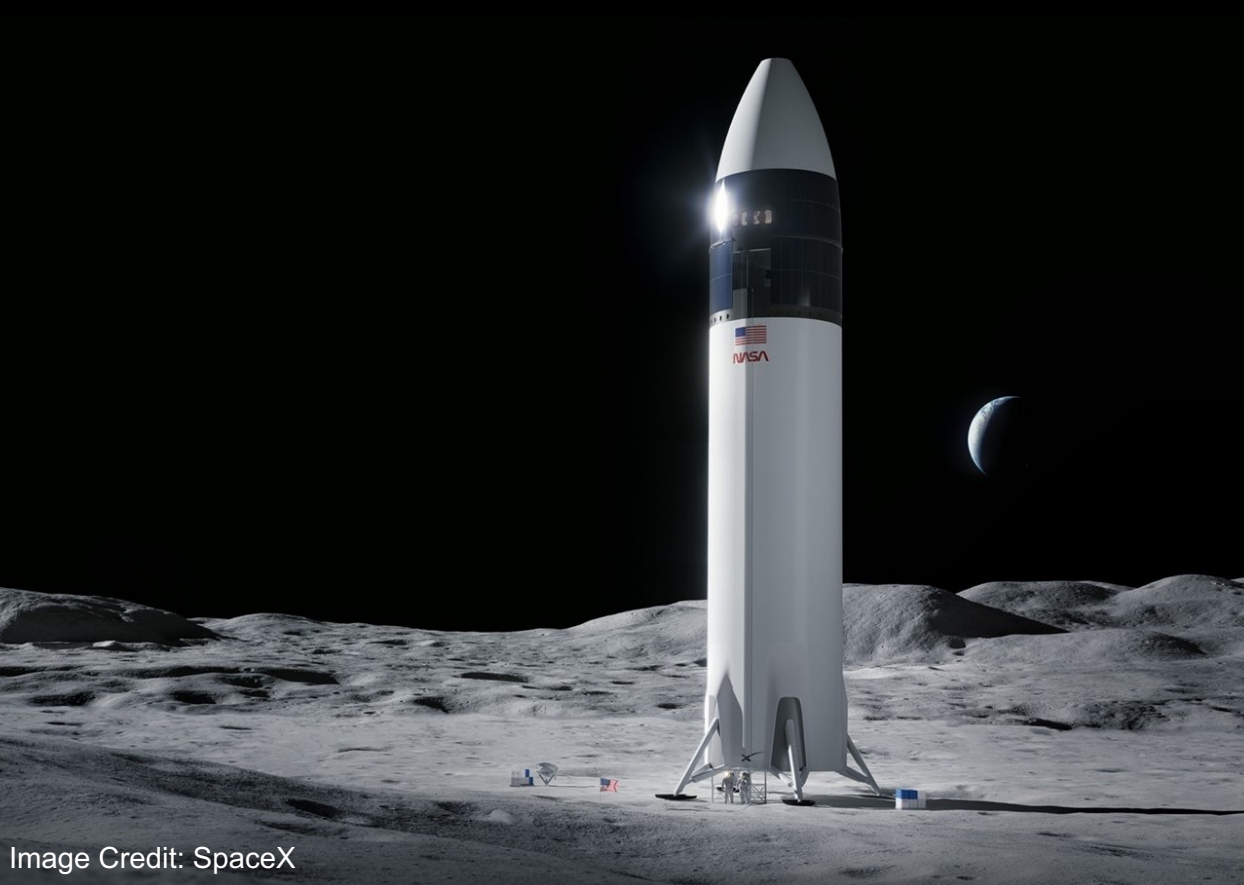


Image Credit: SpaceX

Space X's Starship Lander

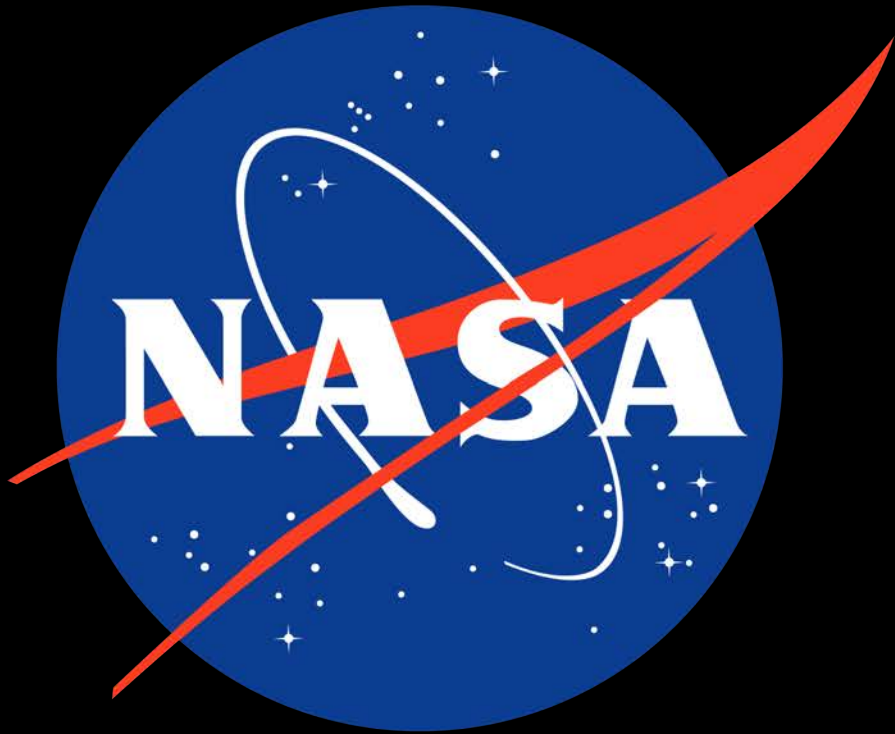


Image Credit: Blue Origin

Blue Origin's Blue Moon Lander



# Five Lessons About Transformation



- Most great learnings often comes from “pain”
- They are hard and take patience, strong leadership
- They require a deep understanding of “why transform”, vision

Vehicle Processing





Innovation

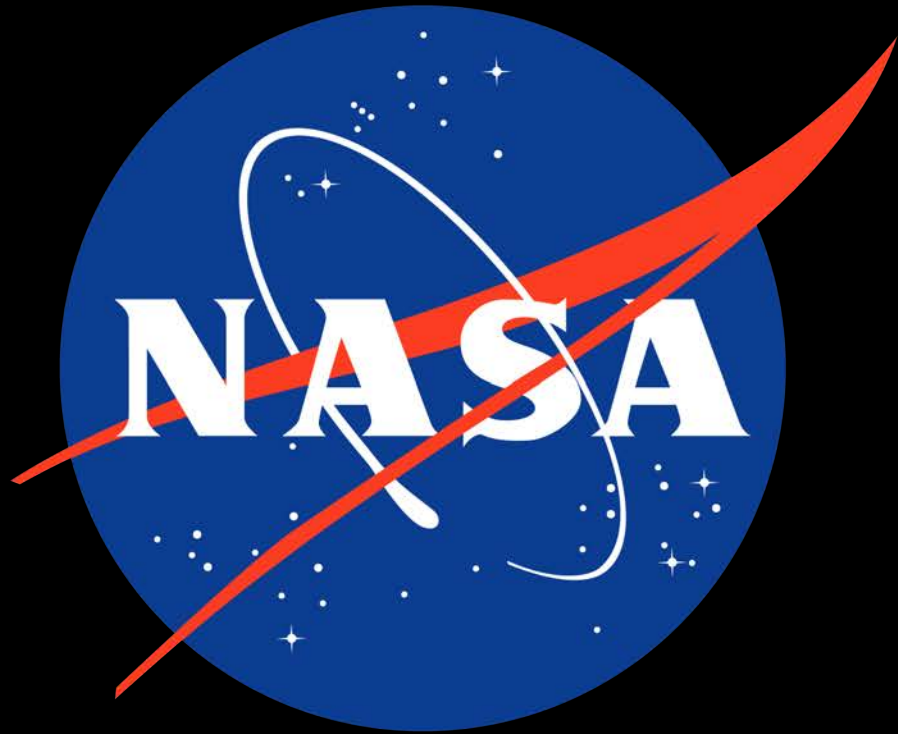
Perfection



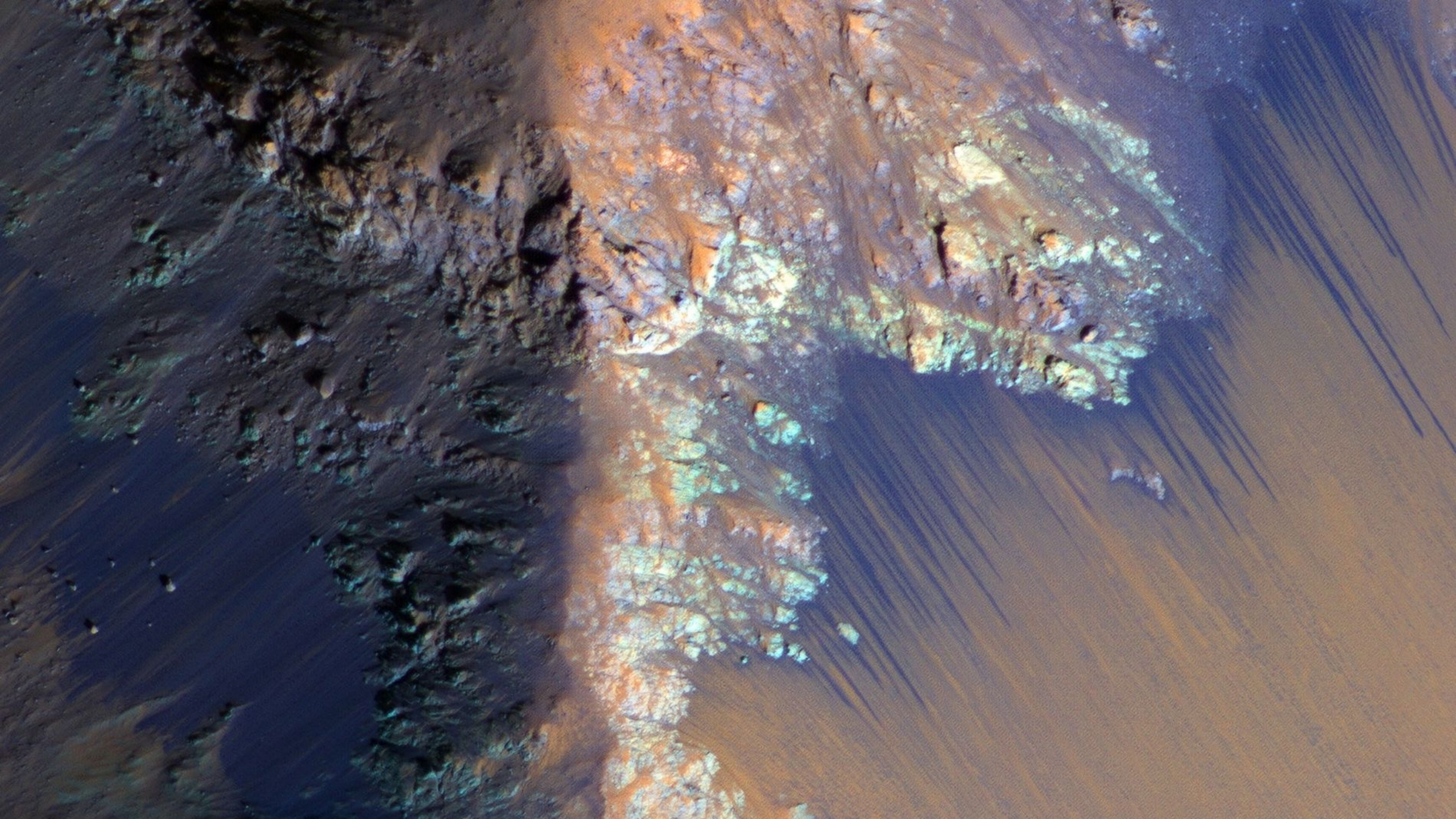
# Key Elements of Culture Leadership

- Leadership
- Employee engagement
- Aligned rewards
- Stories, signals, language
- HR: hires, rewards people aligned

# Five Lessons About Learning



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- They require a deep understanding of “why transform”, vision
- Recognize that ppl who oppose are generally not bad



**Mastcam-Z**  
Zoomable Panoramic Cameras

**SuperCam**  
Laser Micro-Imager

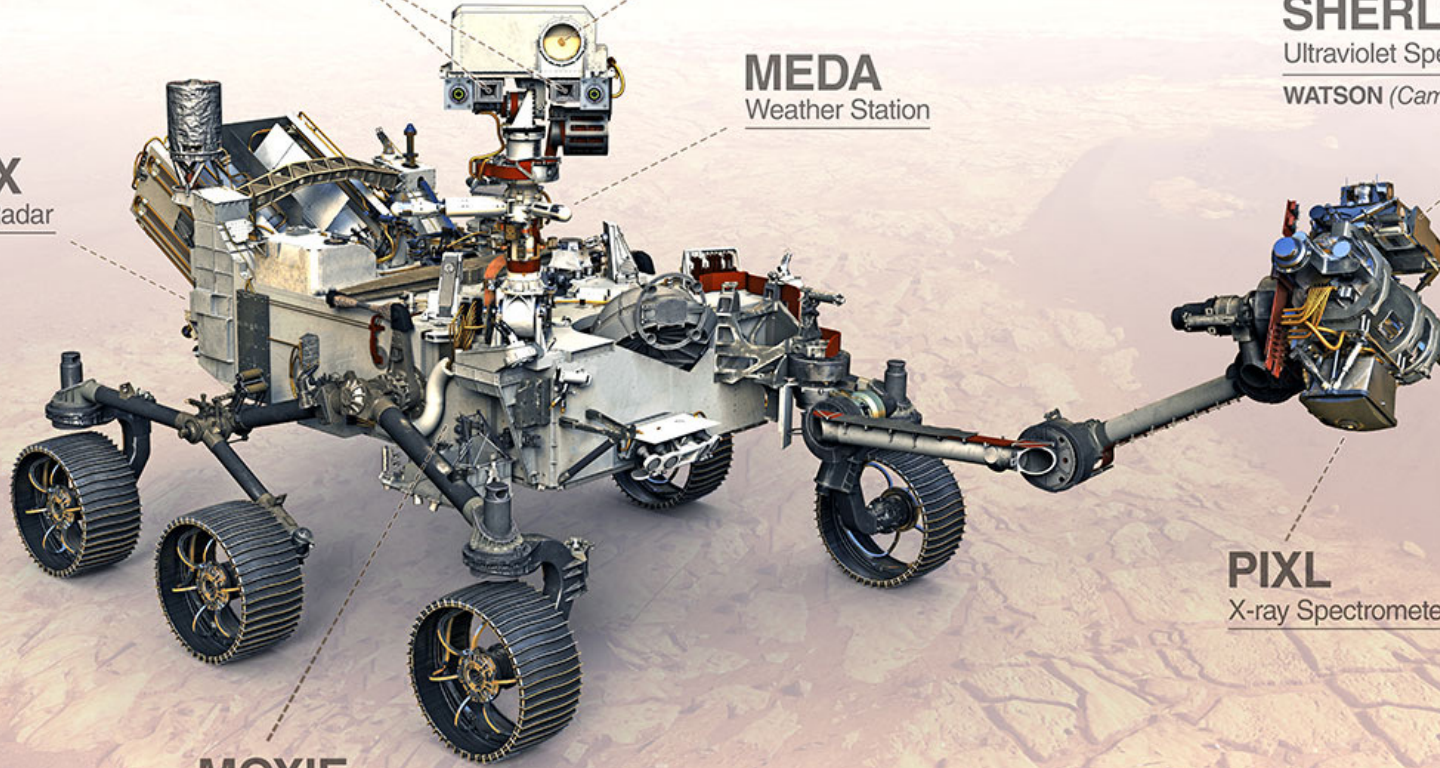
**MEDA**  
Weather Station

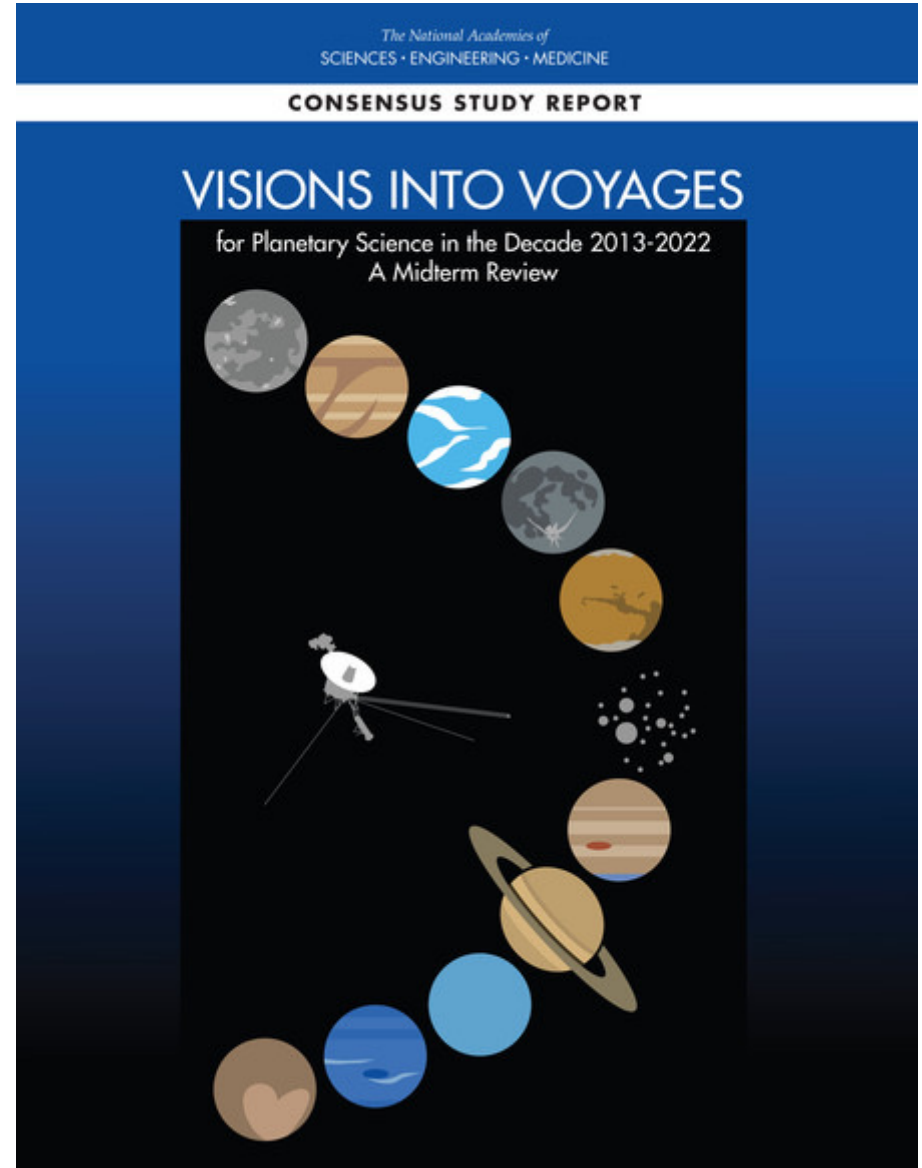
**SHERLOC**  
Ultraviolet Spectrometer  
*WATSON (Camera)*

**RIMFAX**  
Subsurface Radar

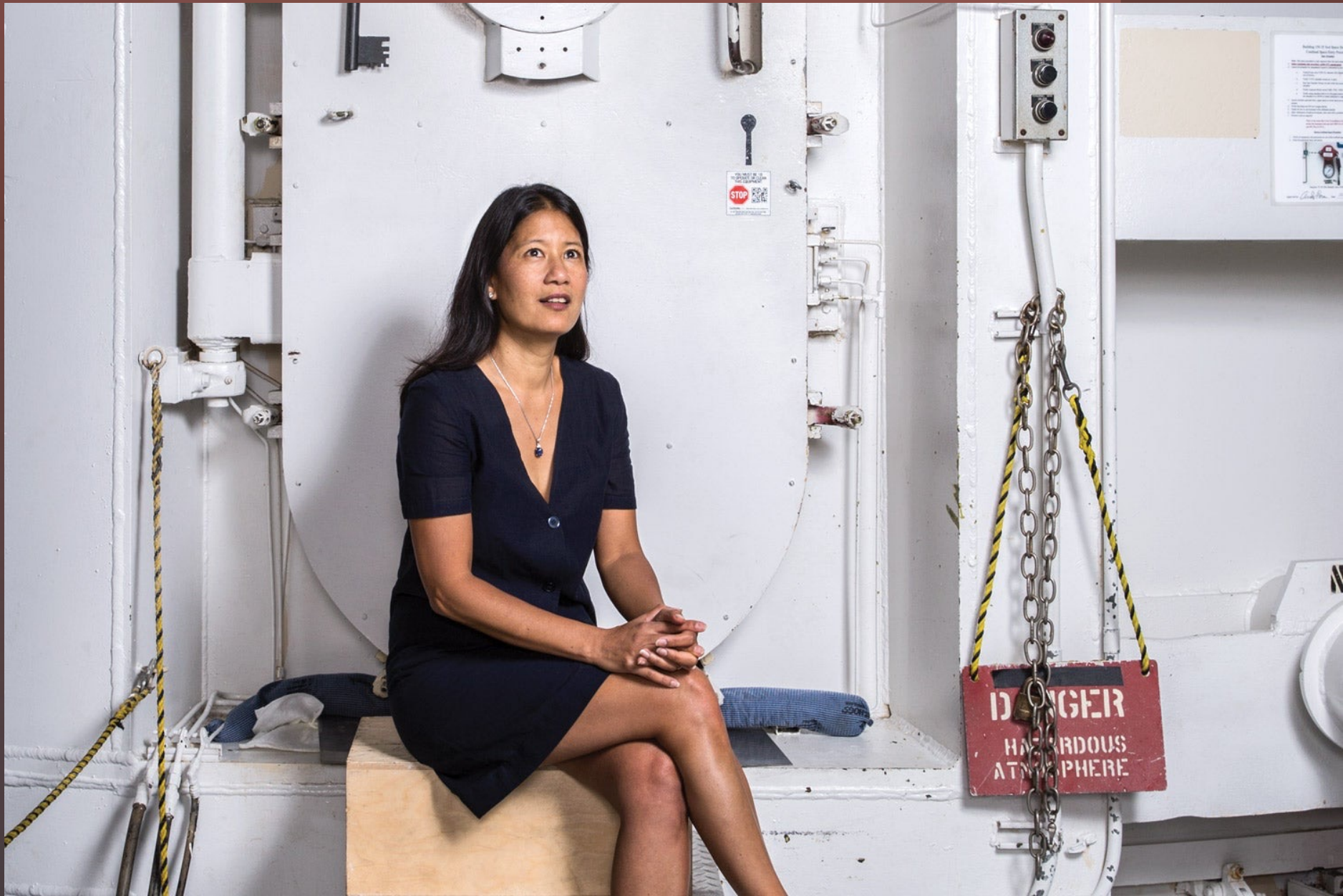
**PIXL**  
X-ray Spectrometer

**MOXIE**  
Produces Oxygen from Martian CO<sub>2</sub>



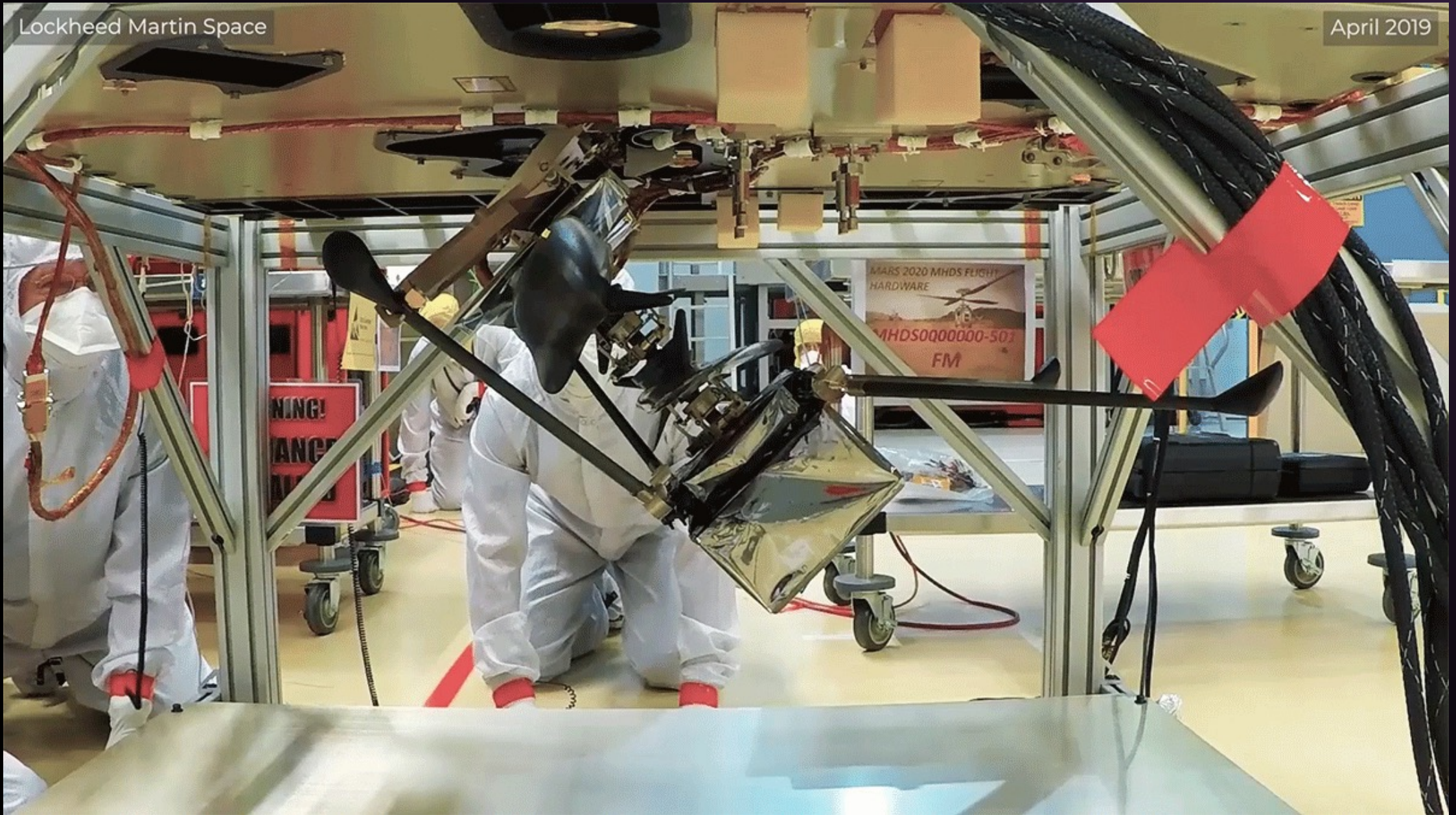


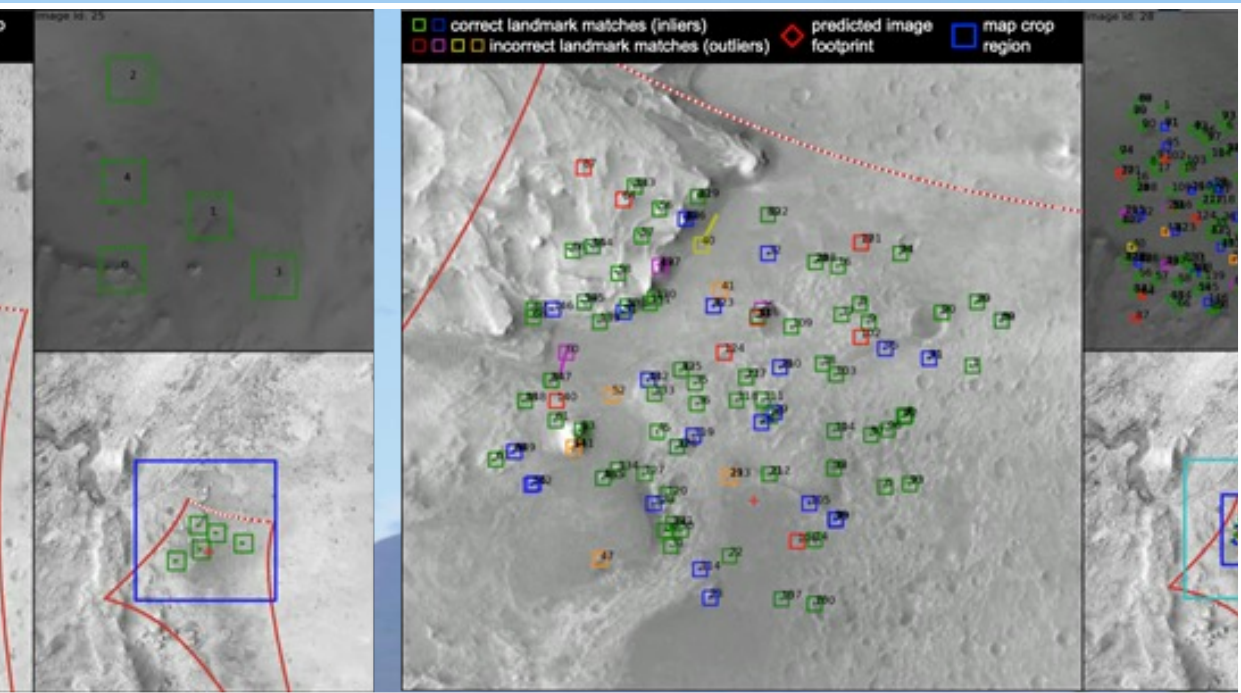




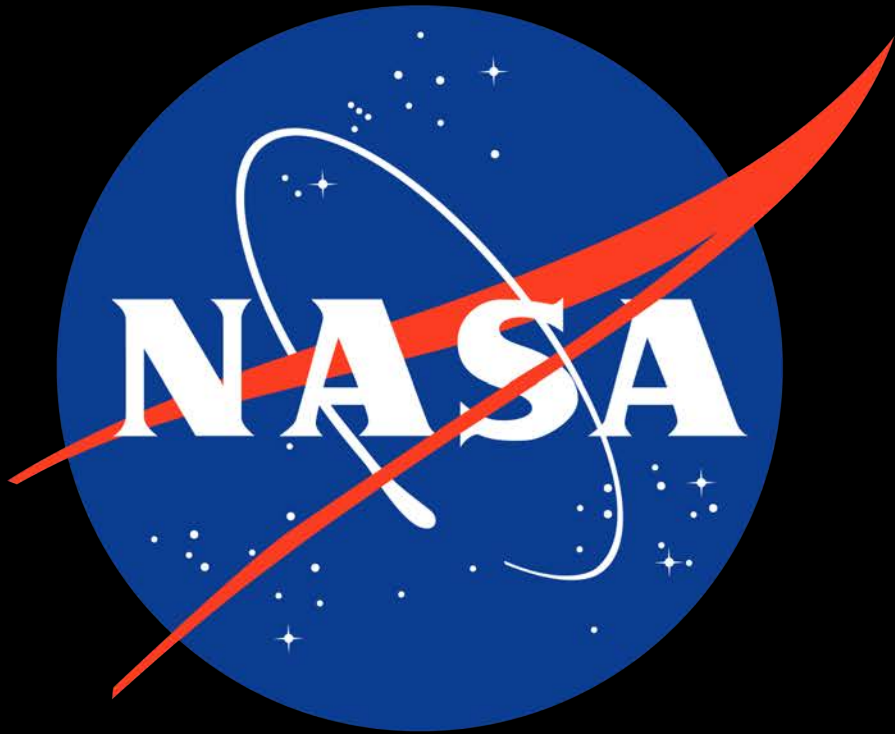
Lockheed Martin Space

April 2019





# Five Lessons About Learning

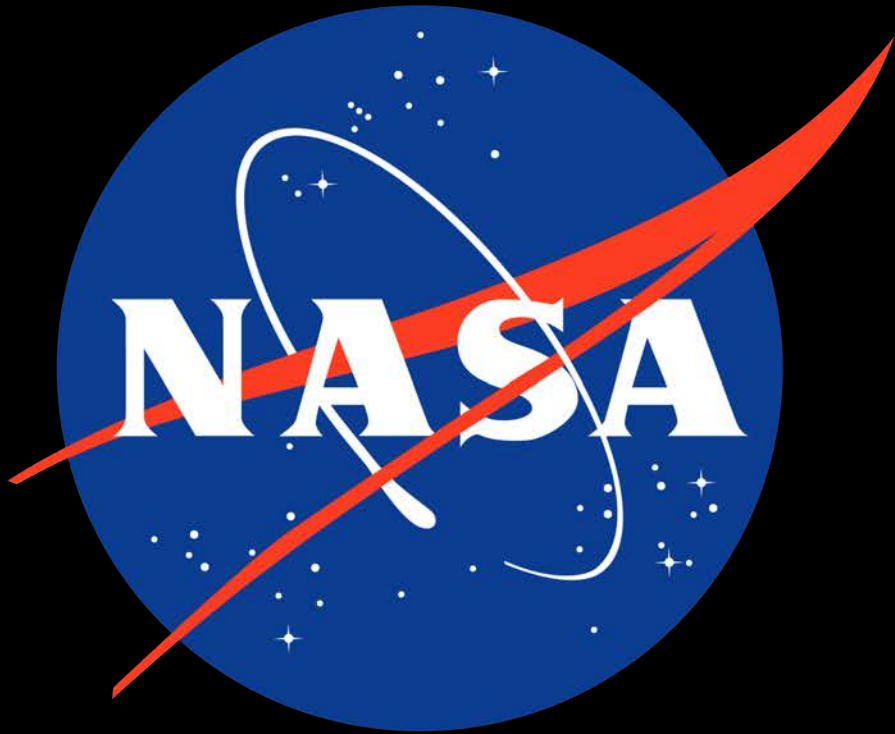


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