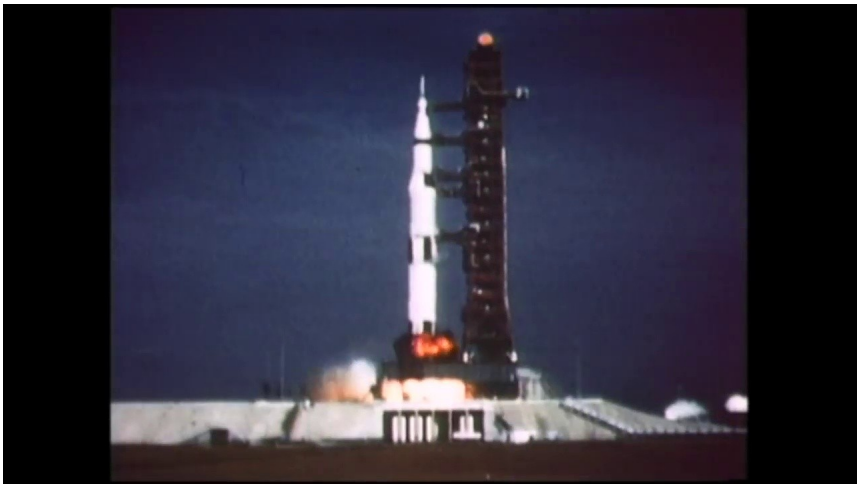
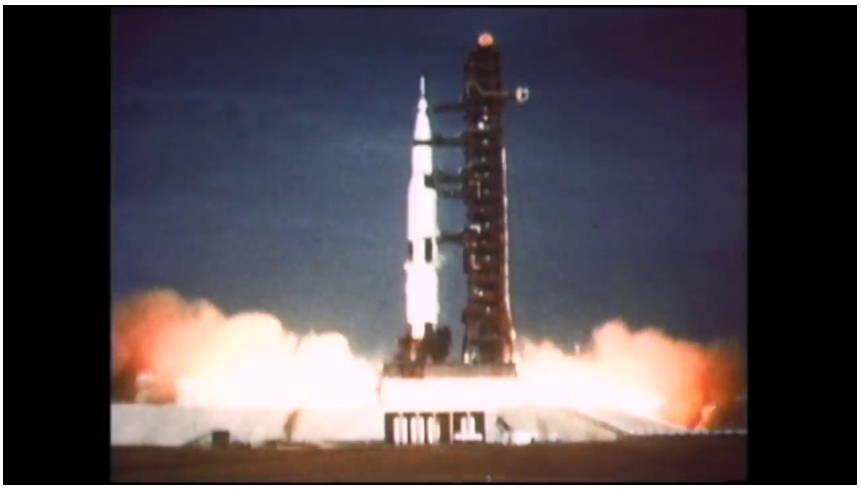
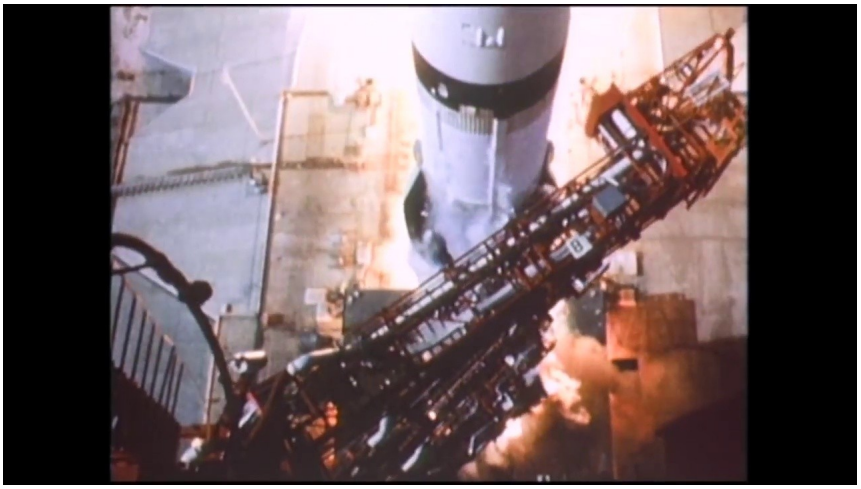
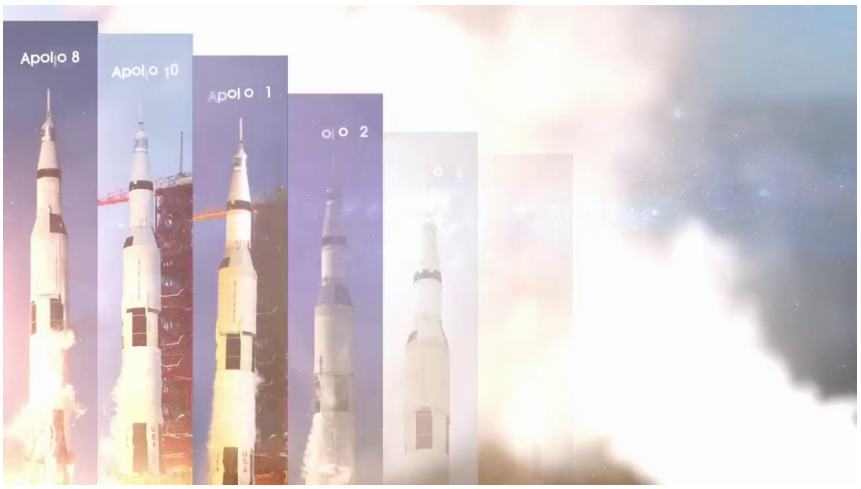
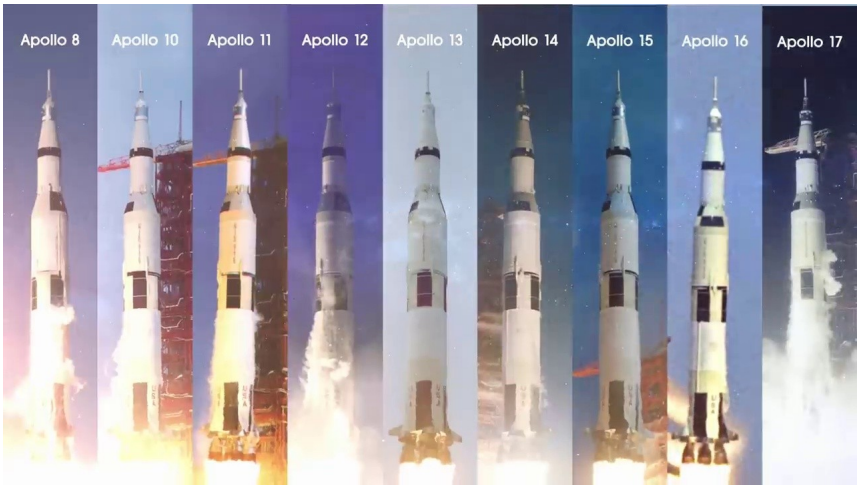
How We Are Going to the Moon - NASA

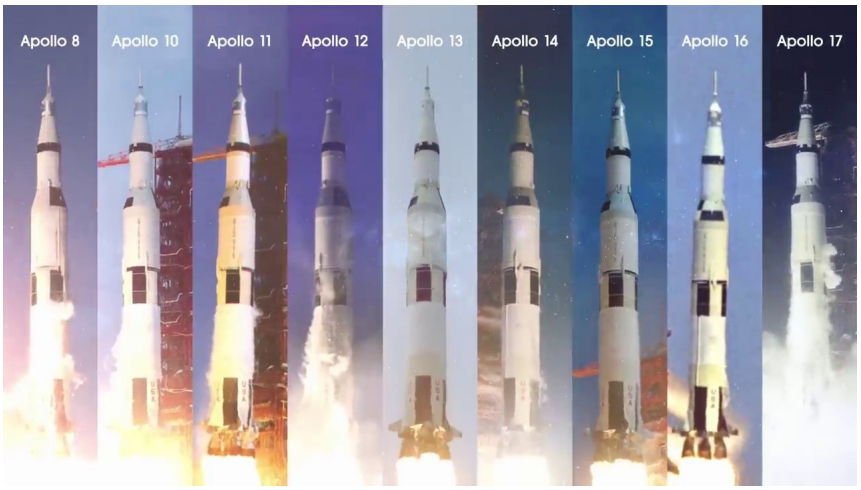


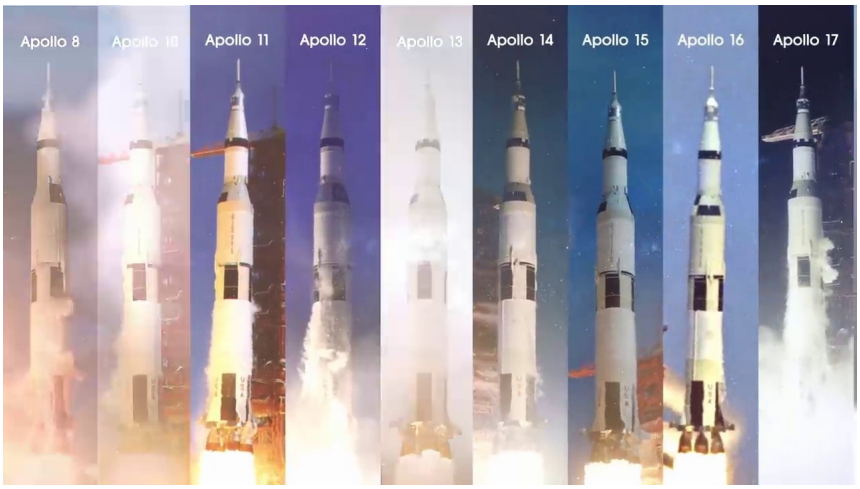





Apollo 8
Apollo 10
Apollo 1
Apollo 2

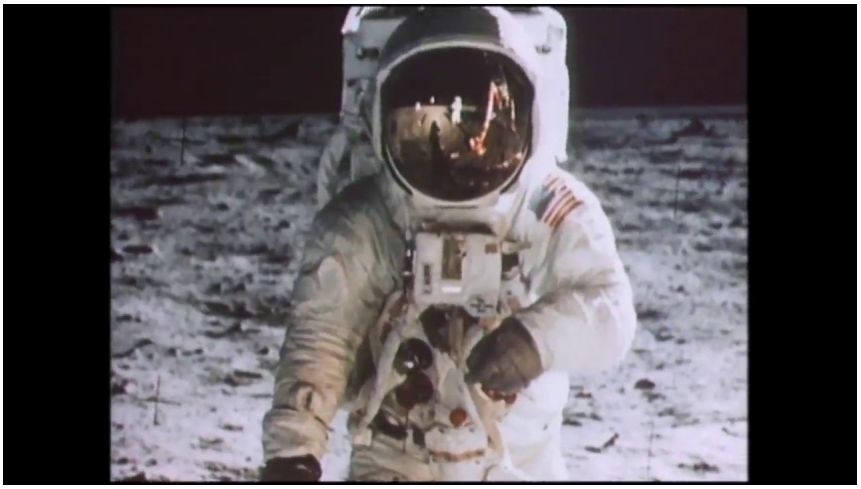

Apollo 8
Apollo 10
Apollo 11
Apollo 12
Apollo 13
Apollo 14
Apollo 15
Apollo 16
Apollo 17


Apollo 8
Apollo 10
Apollo 11
Apollo 12
Apollo 13
Apollo 14
Apollo 15
Apollo 16
Apollo 17


Apollo 8
Apollo 10
Apollo 11
Apollo 12
Apollo 13
Apollo 14
Apollo 15
Apollo 16
Apollo 17

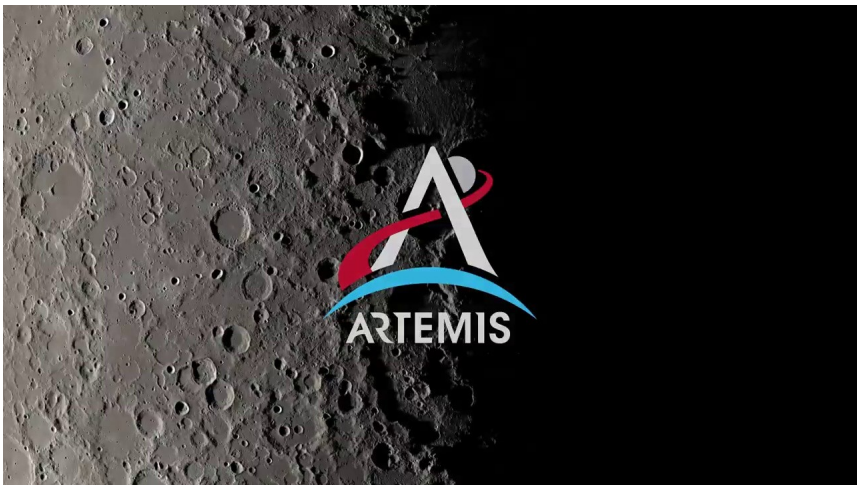

Apollo 11
Apollo 12
Apollo 14
Apollo 15
Apollo 16
Apollo 17

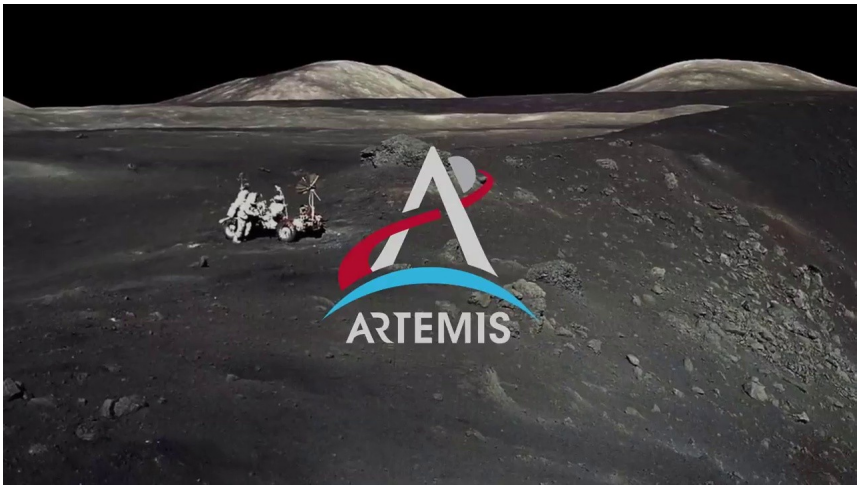

Apollo 11
Apollo 12
Apollo 14
Apollo 15
Apollo 16
Apollo 17




NASA UHD


ARTEMIS

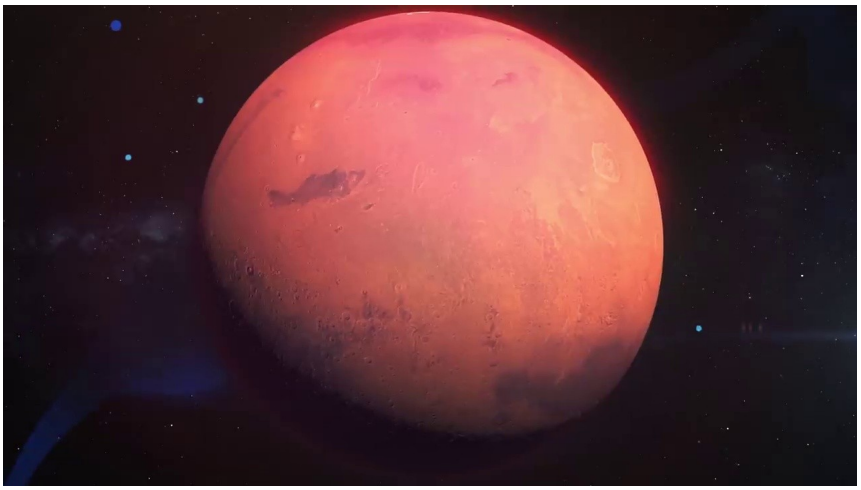

ARTEMIS


ARTEMIS


ARTEMIS


ARTEMIS

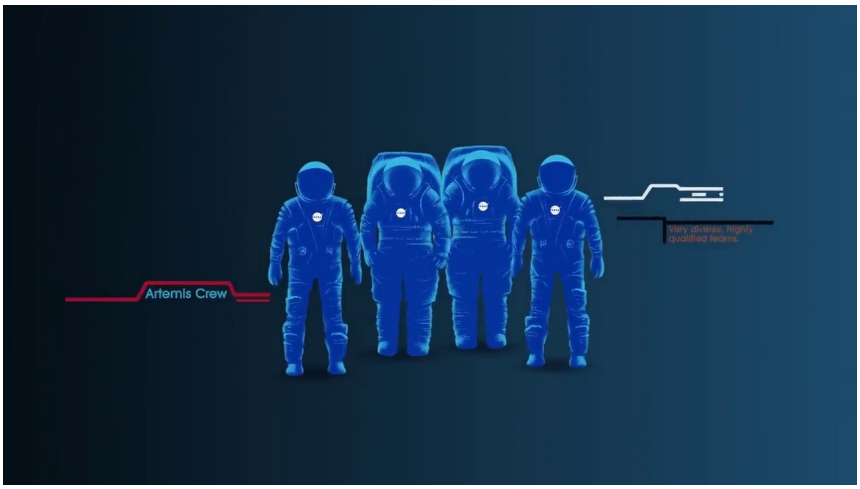

Ascent/Entry Simulator
NASA

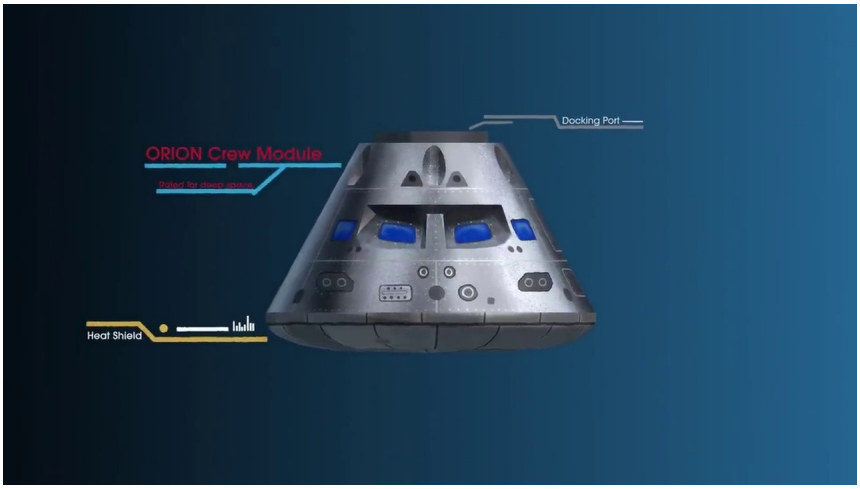


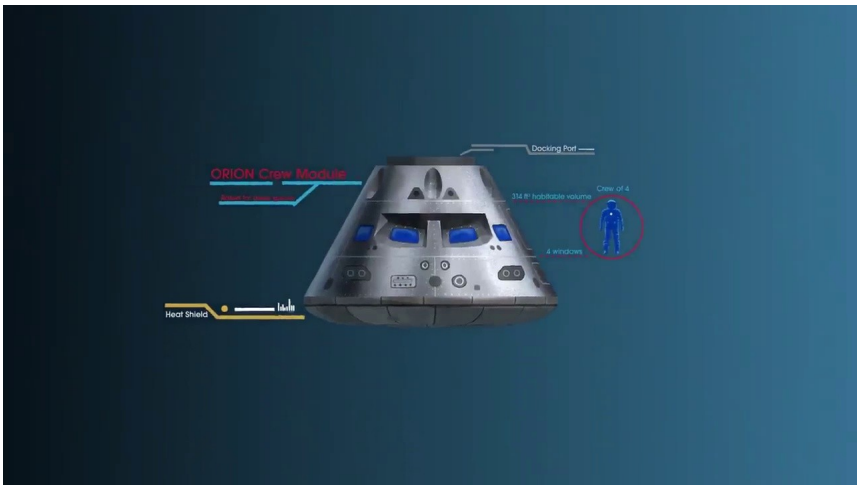

EARTH
MARS
140,000,000 Miles
a 6 month journey

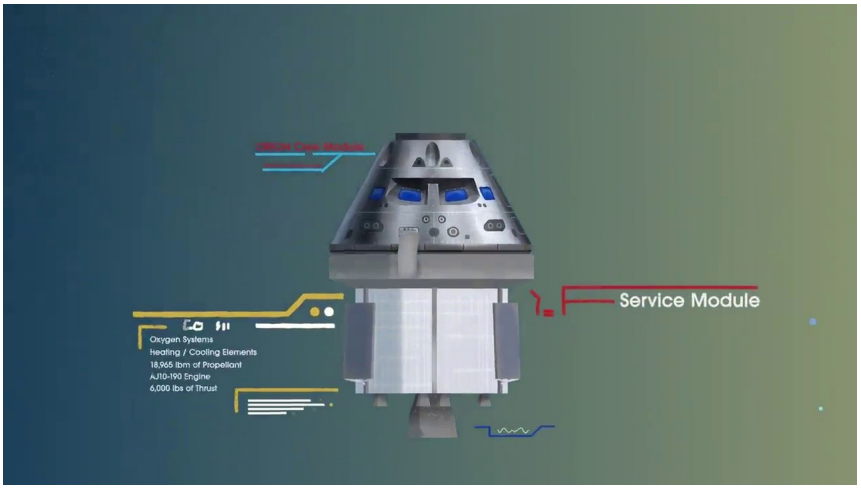

EARTH
MOON
240,000 Miles
a 3 day journey

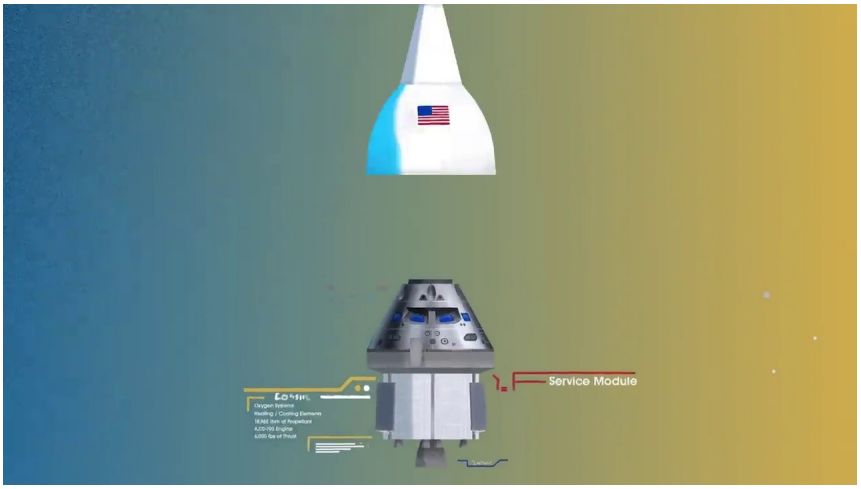

NASA
ARTEMIS
HOW WE ARE GOING TO THE MOON

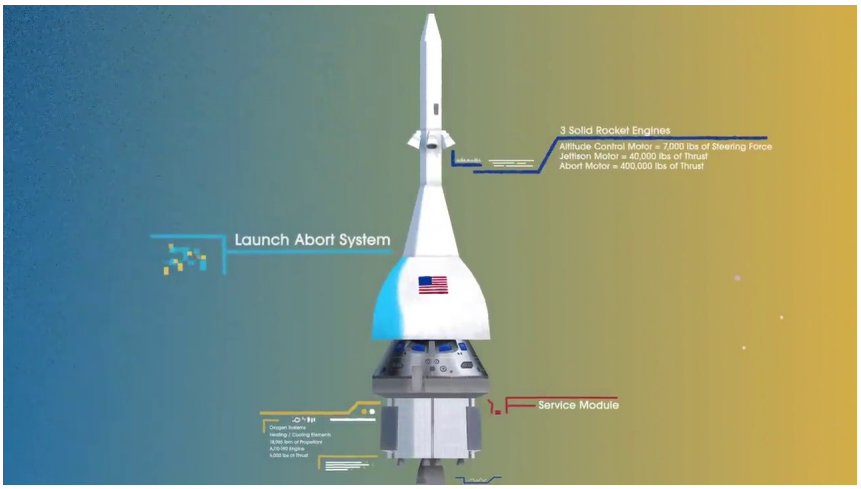

Artemis Crew
Very diverse, highly qualified teams.

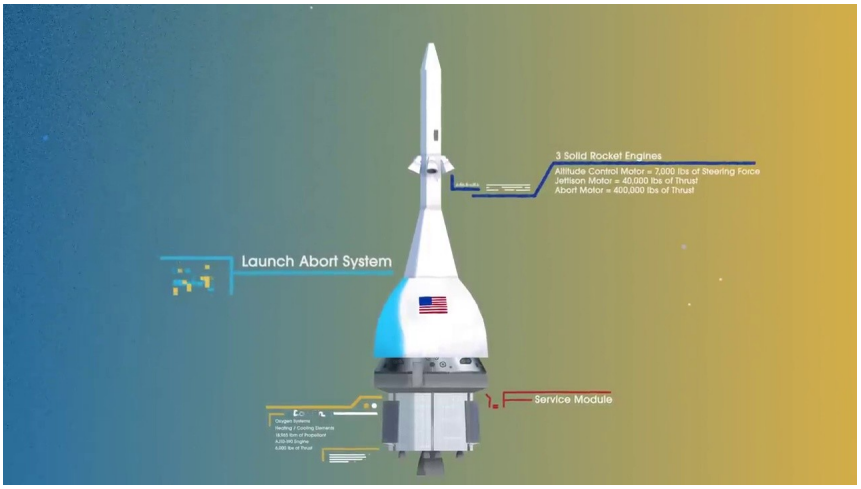

Docking Port
ORION Crew Module
Heat Shield


ORION Crew Module
Docking Port
Crew of 4
4 windows
Heat Shield


Service Module
Oxygen Systems
Heating / Cooling Elements
18,965 lbm of Propellant
AJ10-190 Engine
6,000 lbs of Thrust


Service Module


3 Solid Rocket Engines
Altitude Control Motor = 7,000 lbs of Steering Force
Jettison Motor = 40,000 lbs of Thrust
Abort Motor = 400,000 lbs of Thrust
Launch Abort System
Service Module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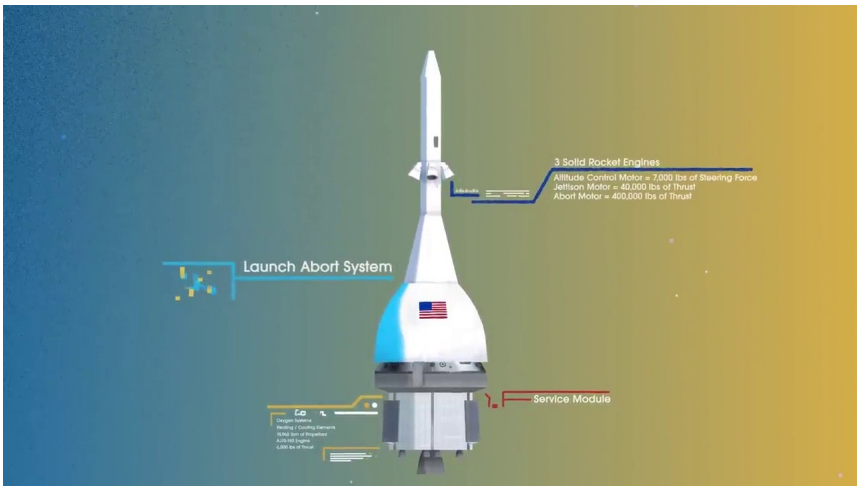
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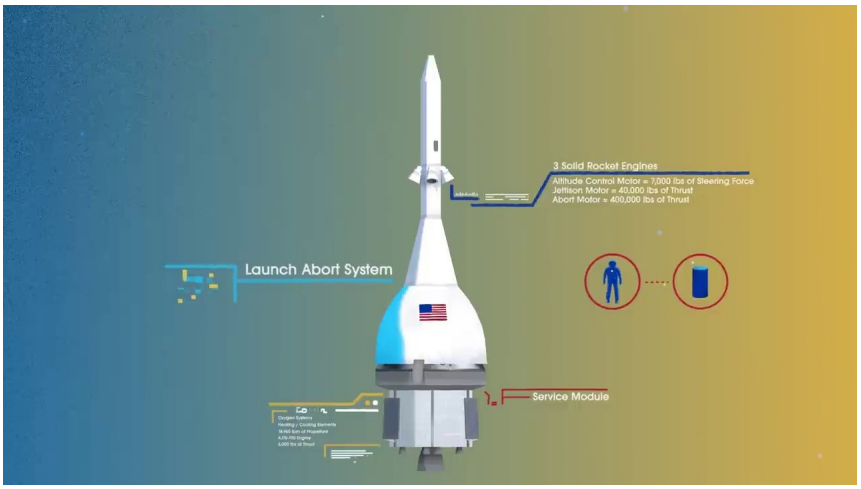
Launch Abort System
Service Module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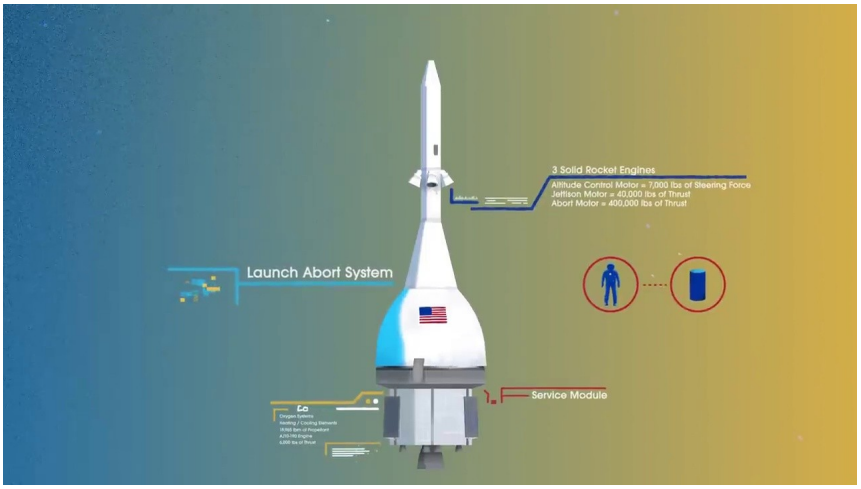
Launch Abort System
Service Module


3 Solid Rocket Engines
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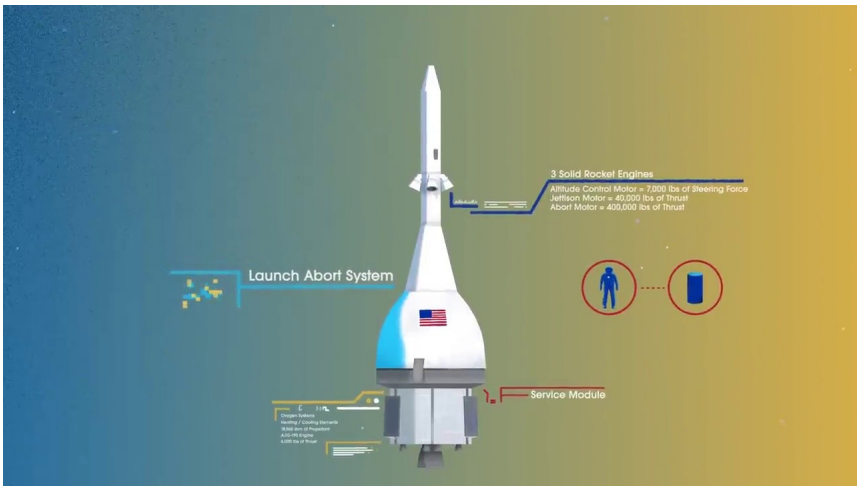
Service Module


3 Solid Rocket Engines
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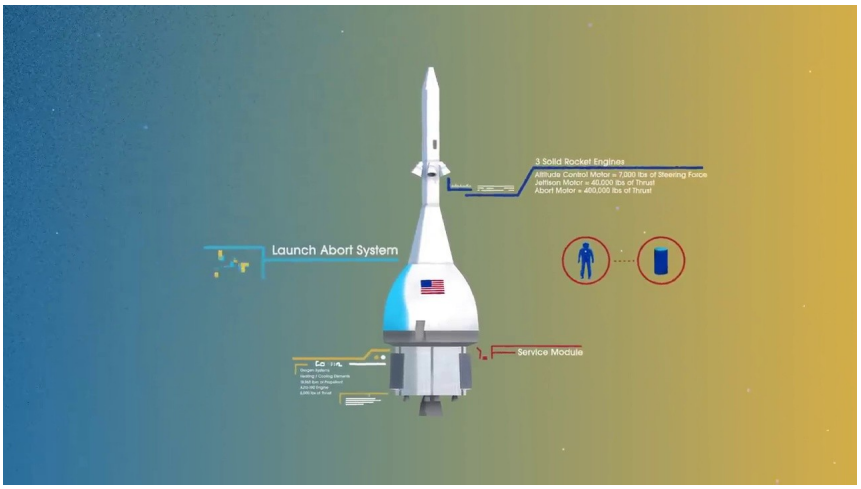
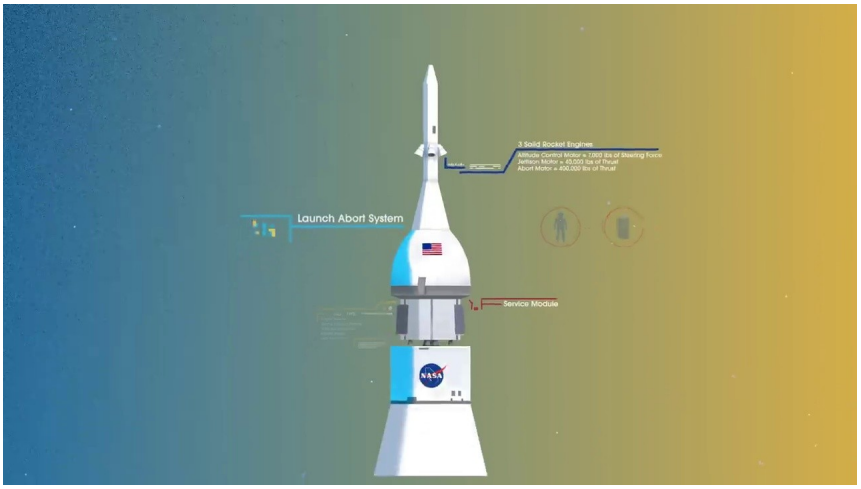
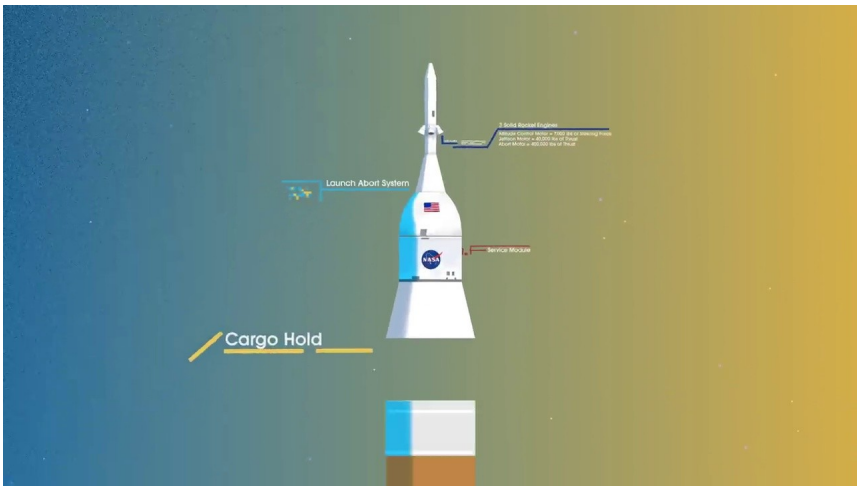
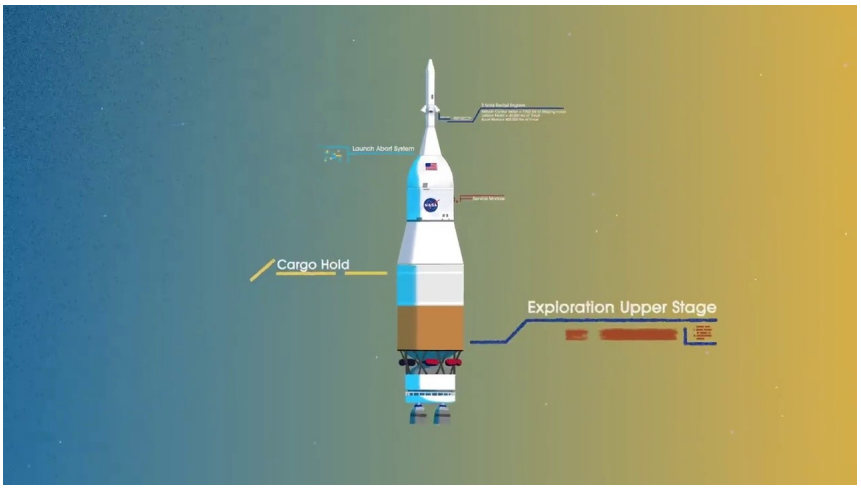
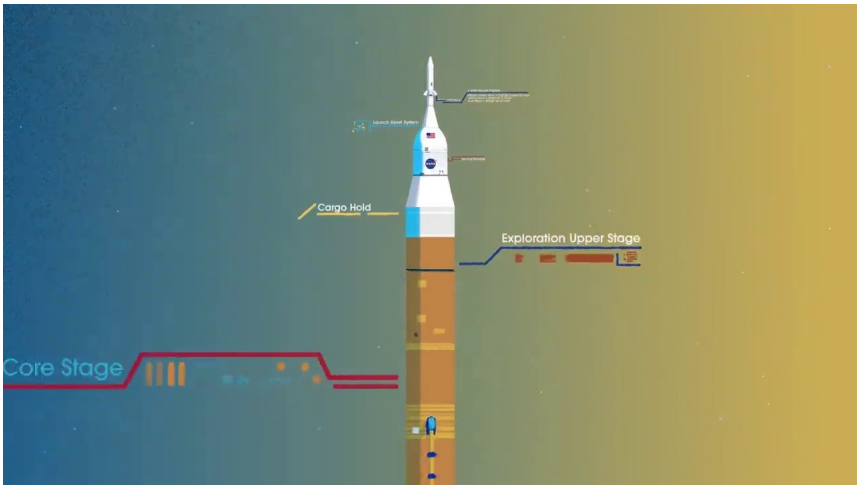
Launch Abort System
Service Module

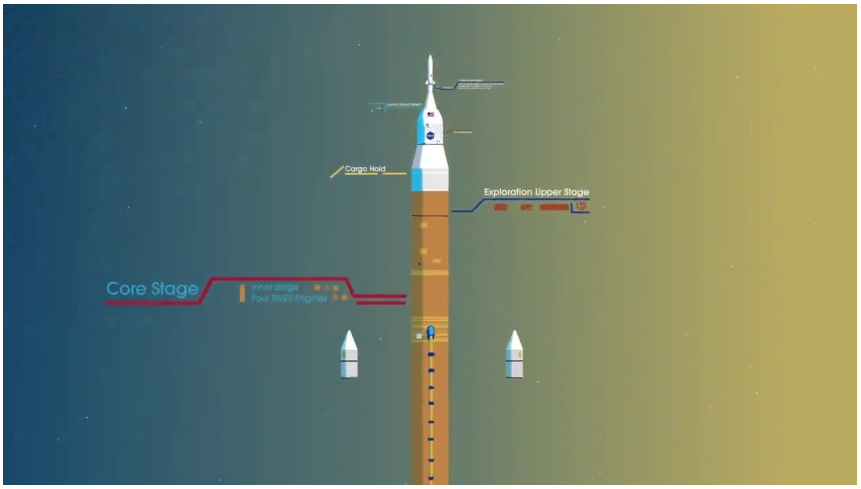

3 Solid Rocket Engines
Launch Abort System
Service Module

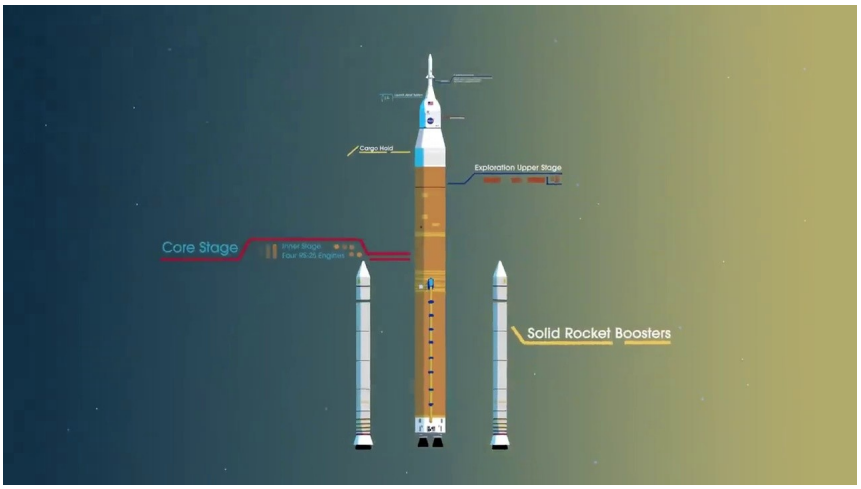

3 Solid Rocket Engines
Launch Abort System
Service Module

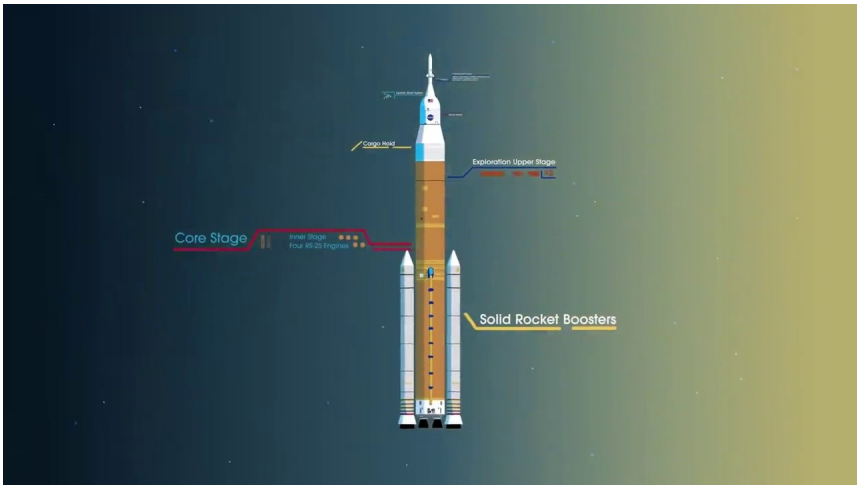

Launch Abort System
Service Module
Cargo Hold

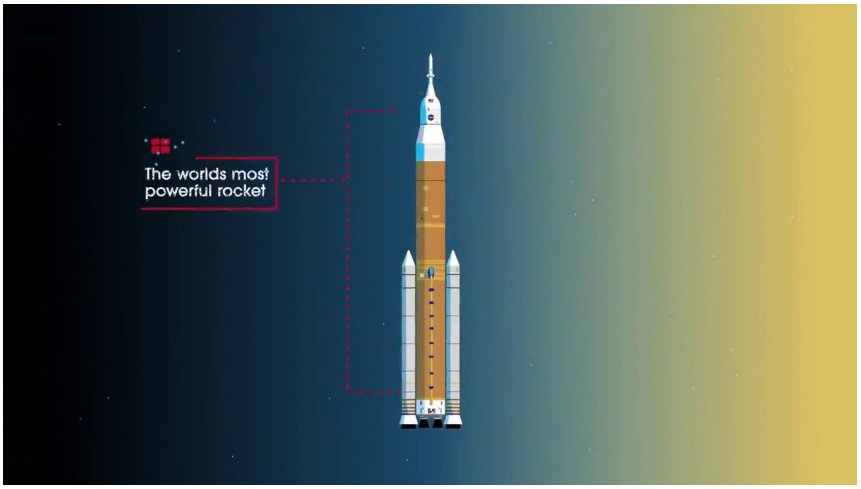

Launch Abort System
Cargo Hold
Exploration Upper Stage

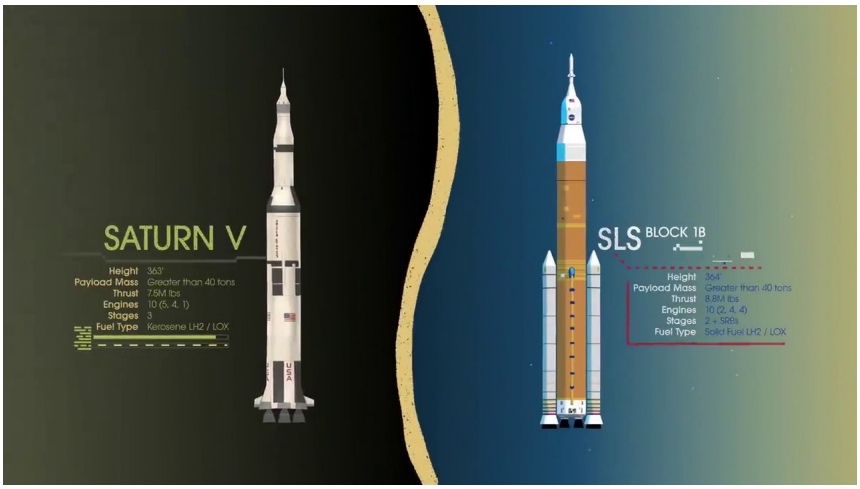

Launch Abort System
Cargo Hold
Exploration Upper Stage
Core Stage

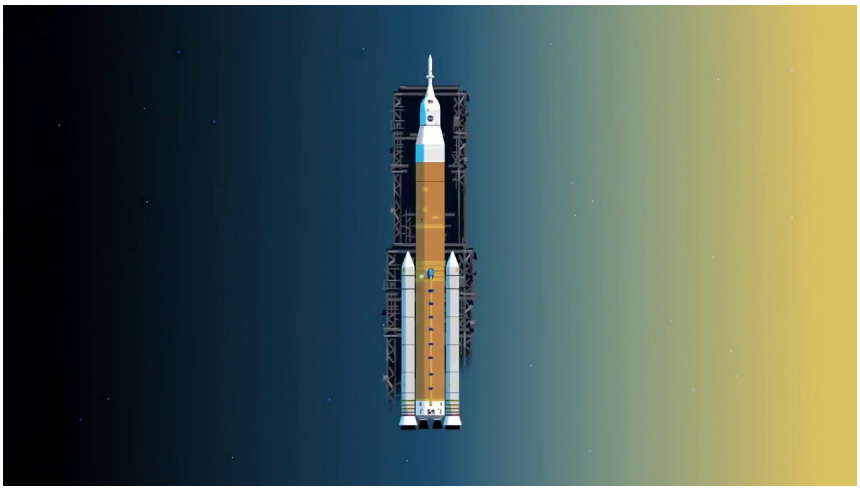

Cargo Hold
Exploration Upper Stage
Core Stage


Cargo Hold
Exploration Upper Stage
Core Stage
Inner Stage
Four RS-25 Engines
Solid Rocket Boosters

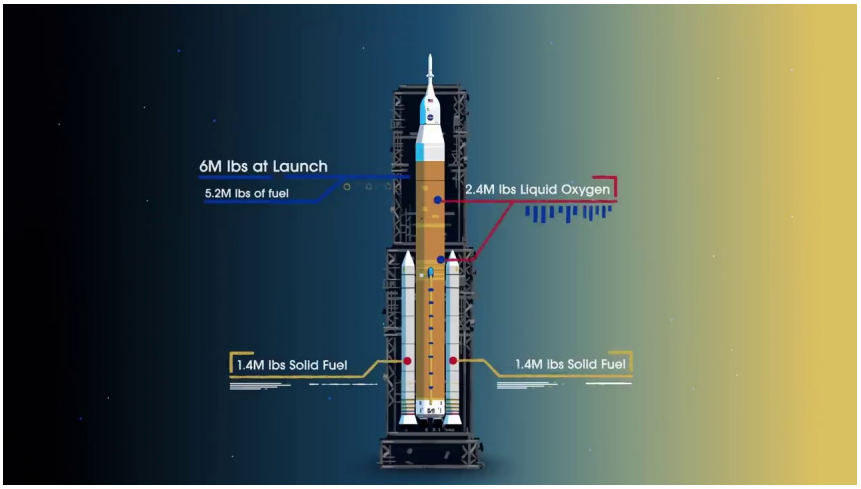

Cargo Hold
Exploration Upper Stage
Core Stage
Inner Stage
Four RS-25 Engines
Solid Rocket Boosters

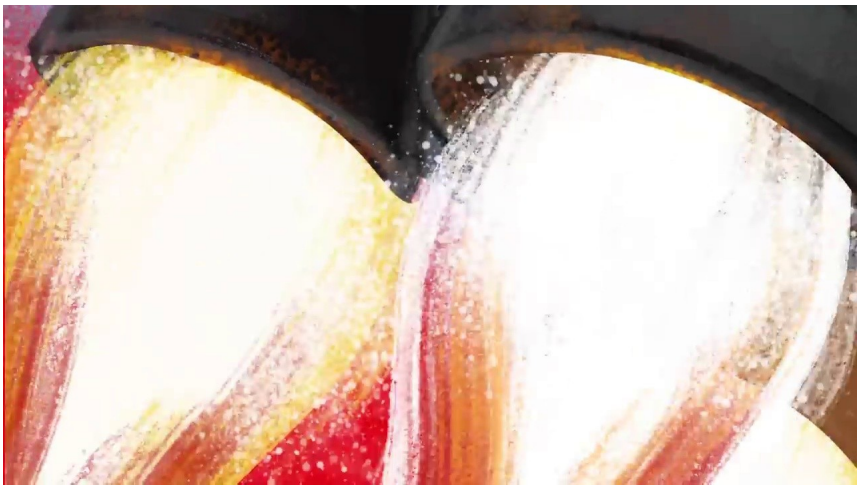

The worlds most
powerful rocket

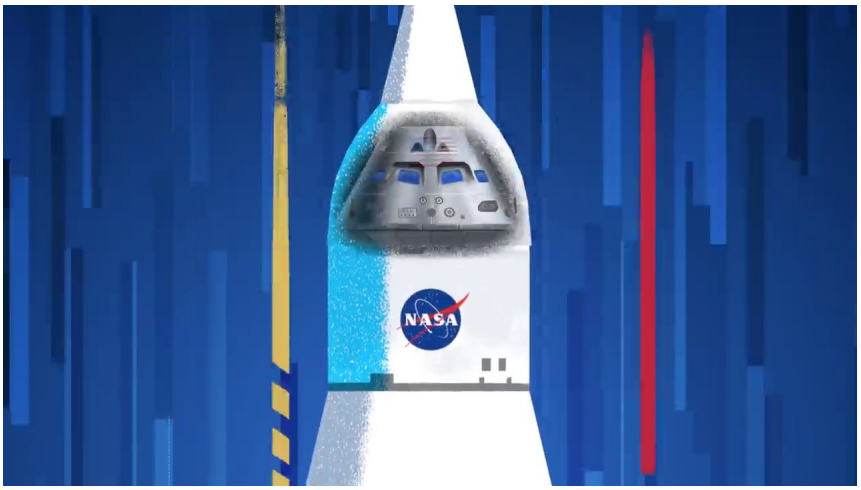

SATURN V
Height 363'
Payload Mass Greater than 40 tons
Thrust 7.5M lbs
Engines 10 (5, 4, 1)
Stages 3
Fuel Type Kerosene LH2 / LOX
SLS BLOCK 1B
Height 364'
Payload Mass Greater than 40 tons
Thrust 8.8M lbs
Engines 10 (2, 4, 4)
Stages 2 + SRBs
Fuel Type Solid Fuel LH2 / LOX



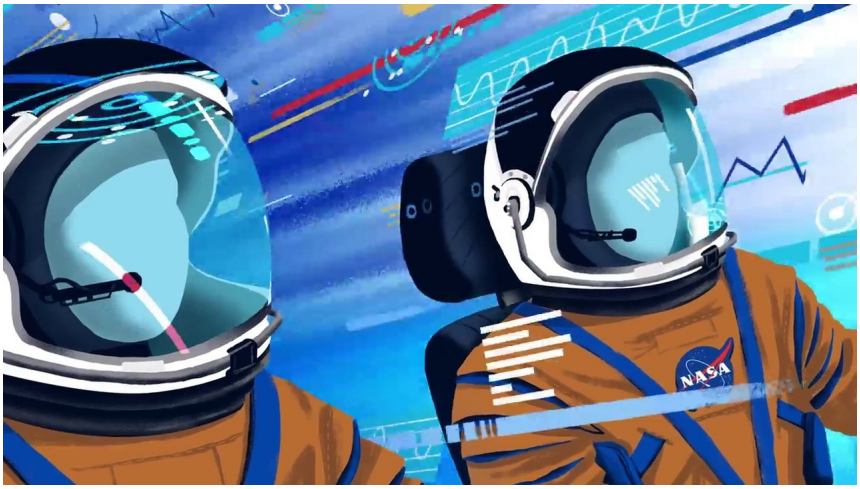

6M lbs at Launch


6M lbs at Launch
5.2M lbs of fuel
2.4M lbs Liquid Oxygen
1.4M lbs Solid Fuel
1.4M lbs Solid Fuel

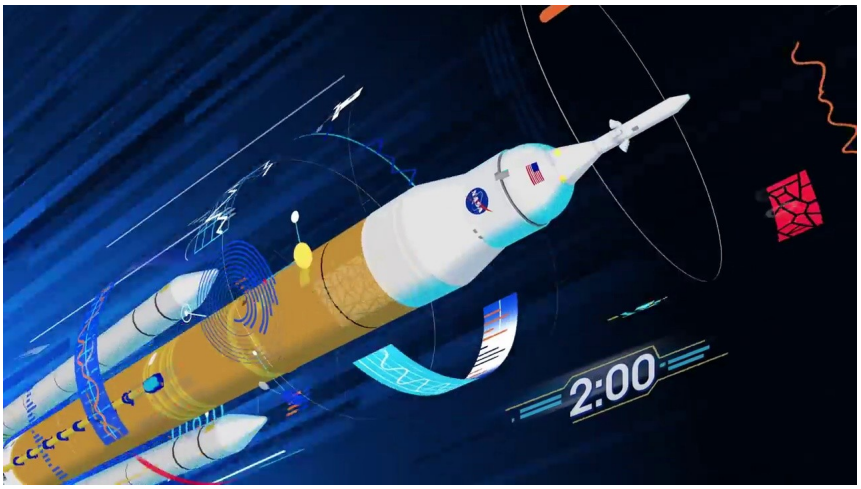



NASA


NASA


NASA


NASA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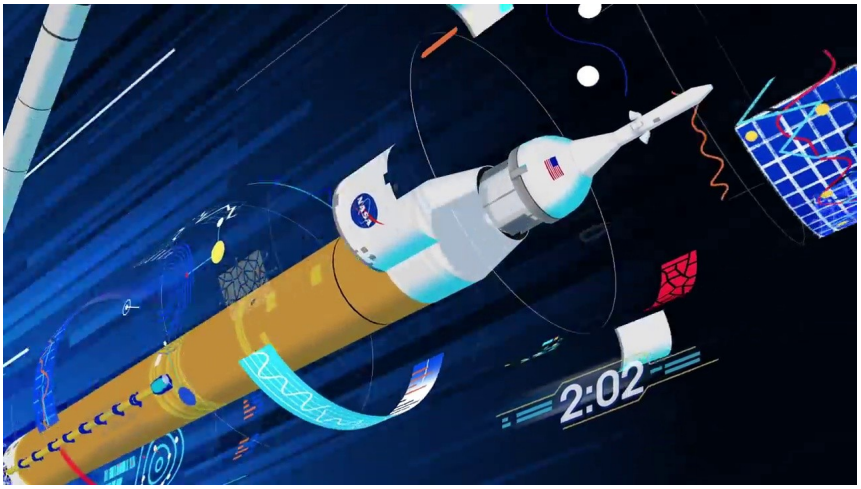
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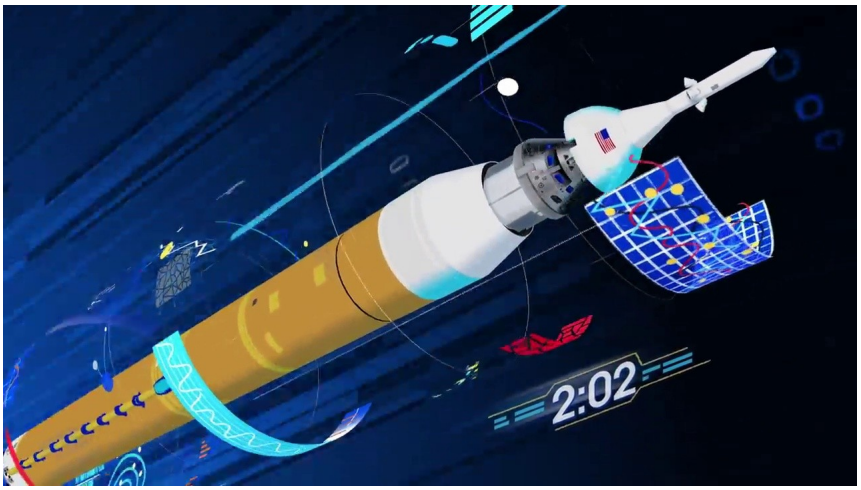
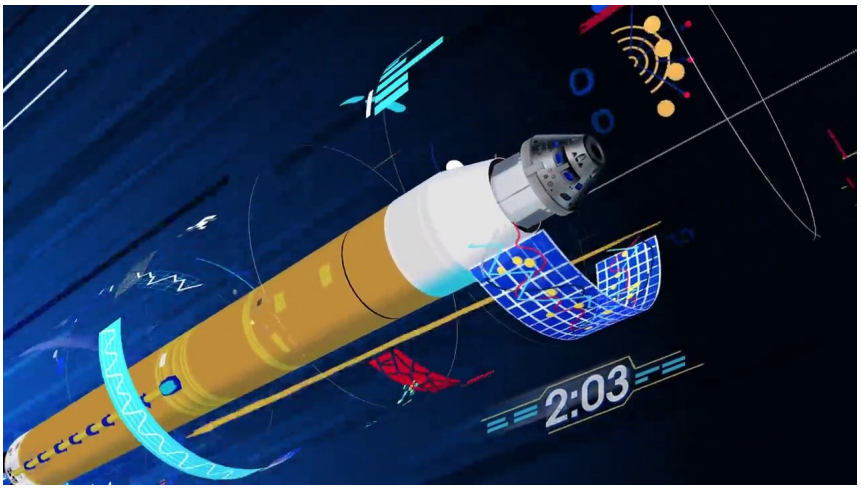

2:02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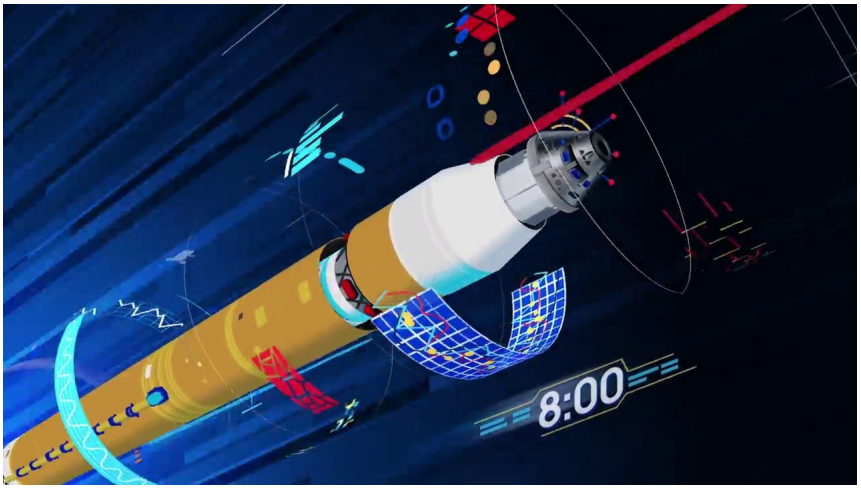
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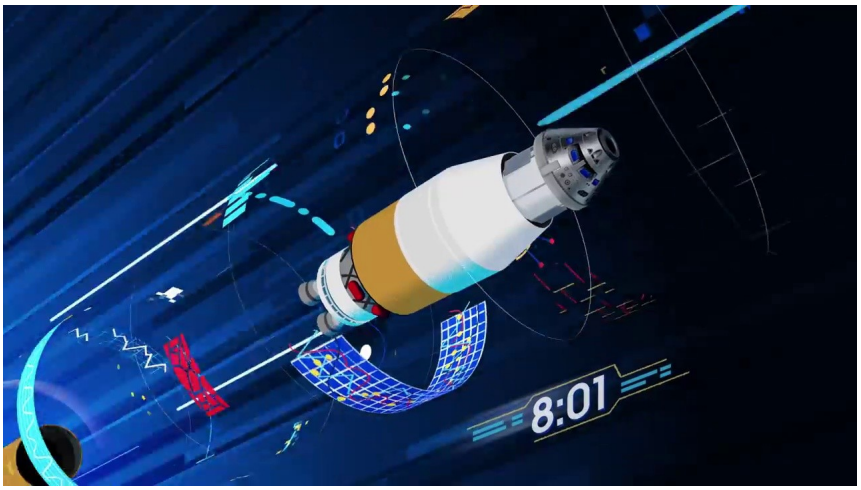
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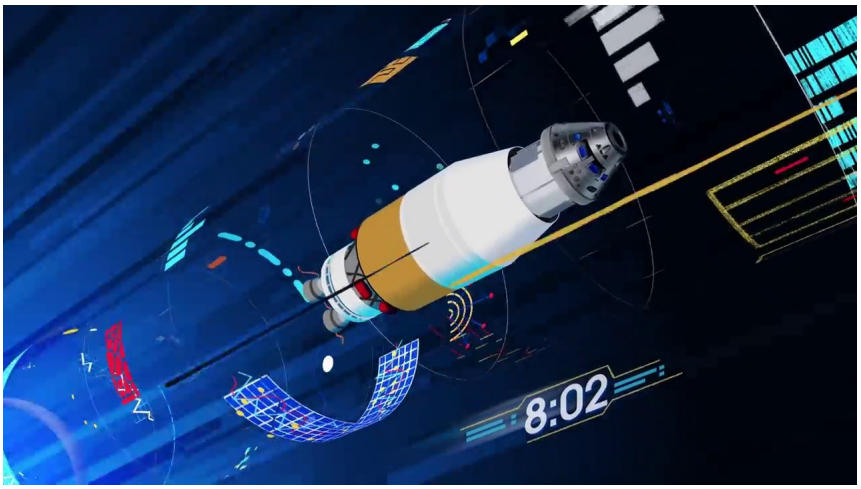
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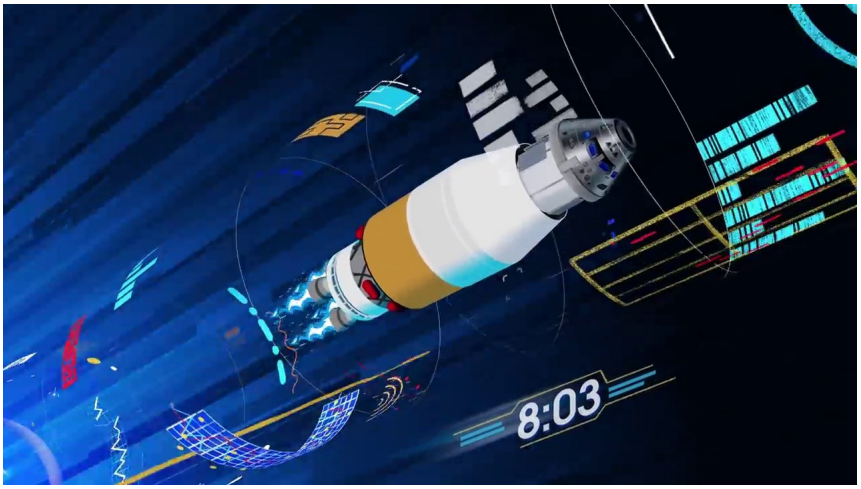
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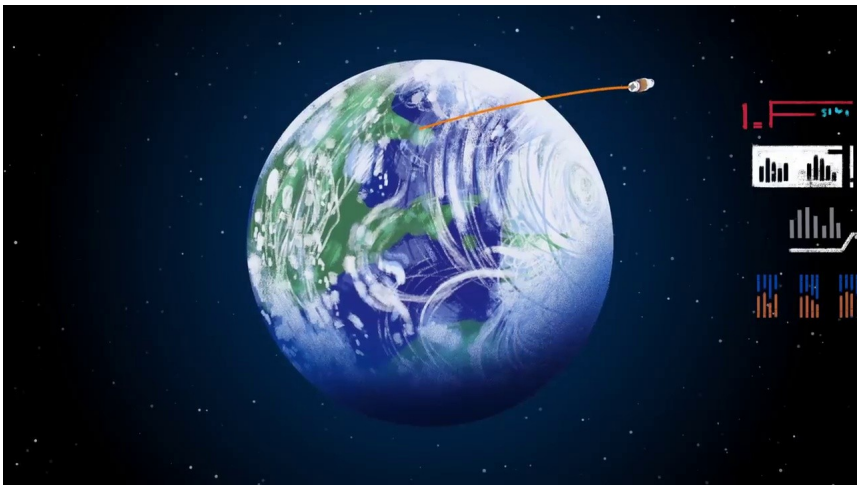
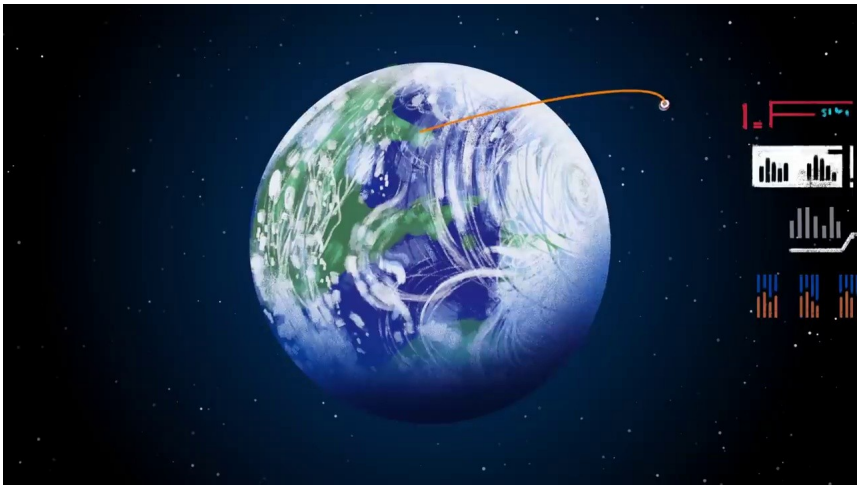
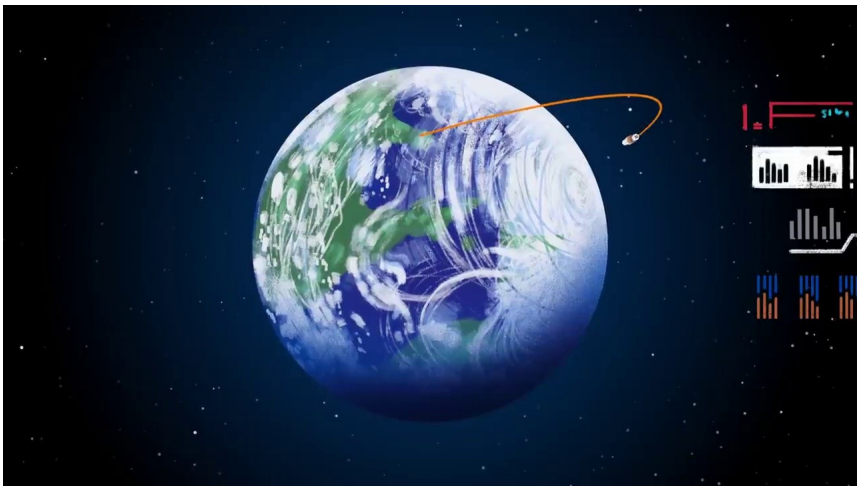
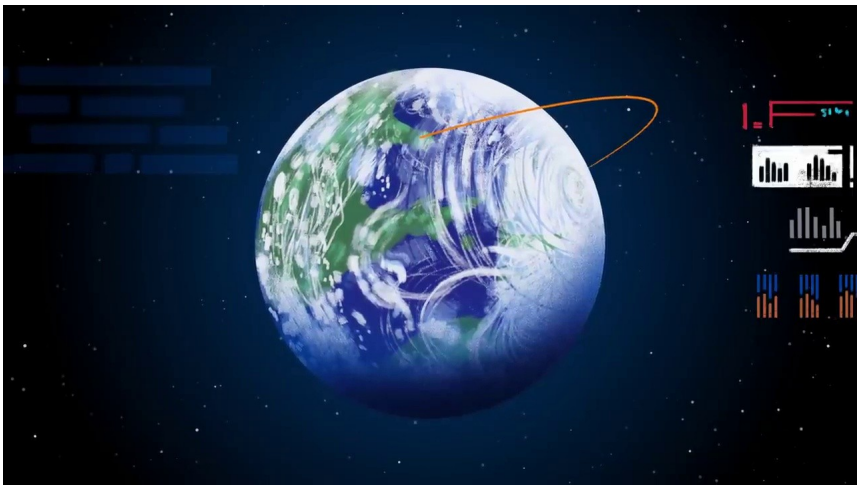
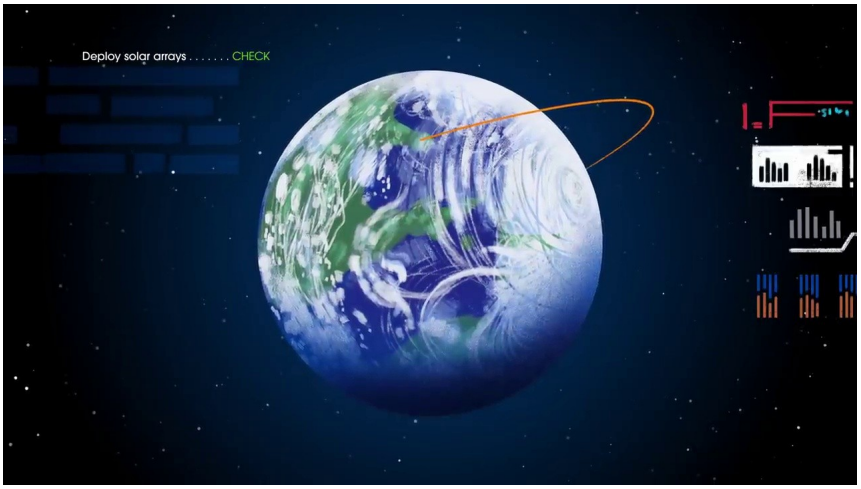
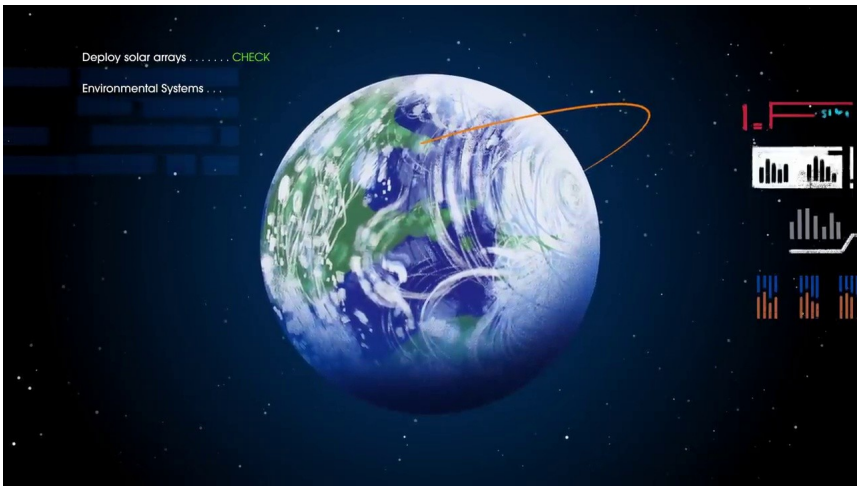


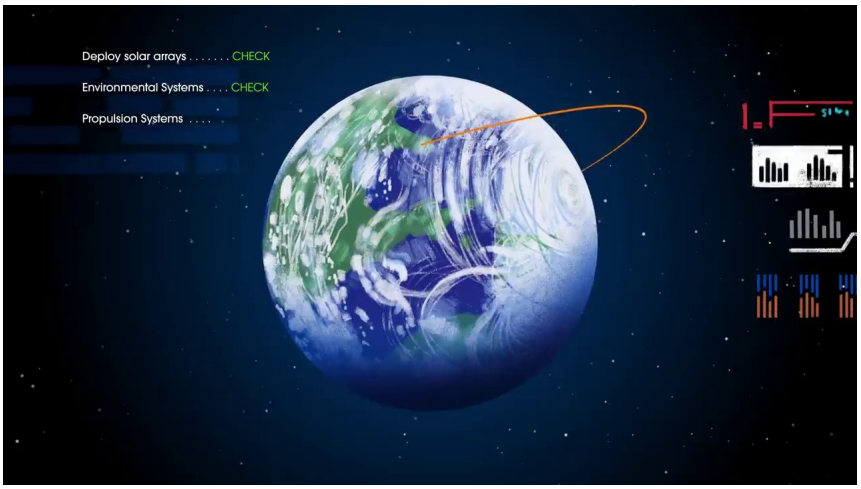


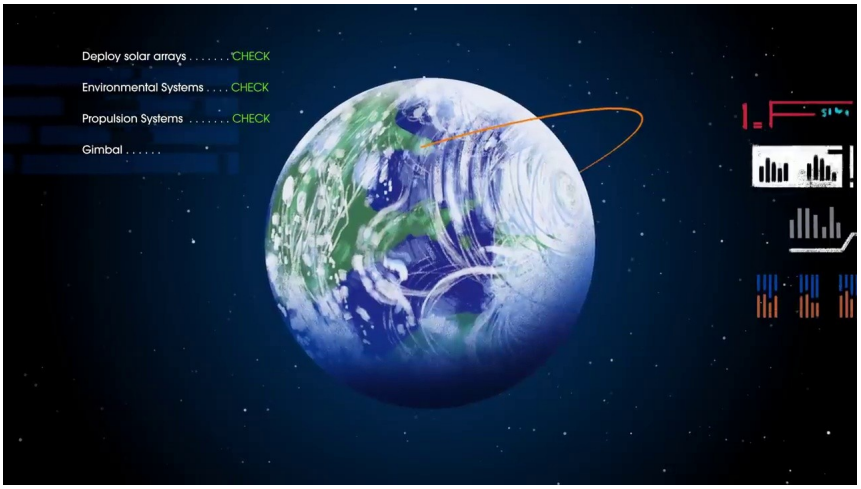


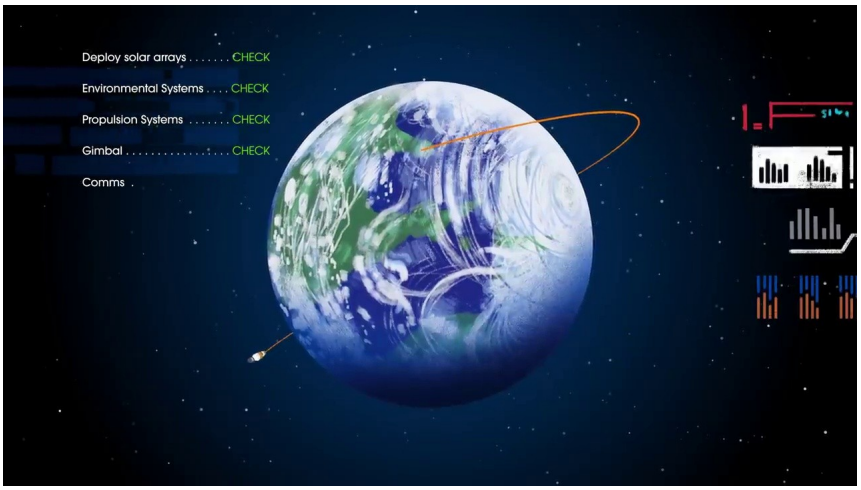


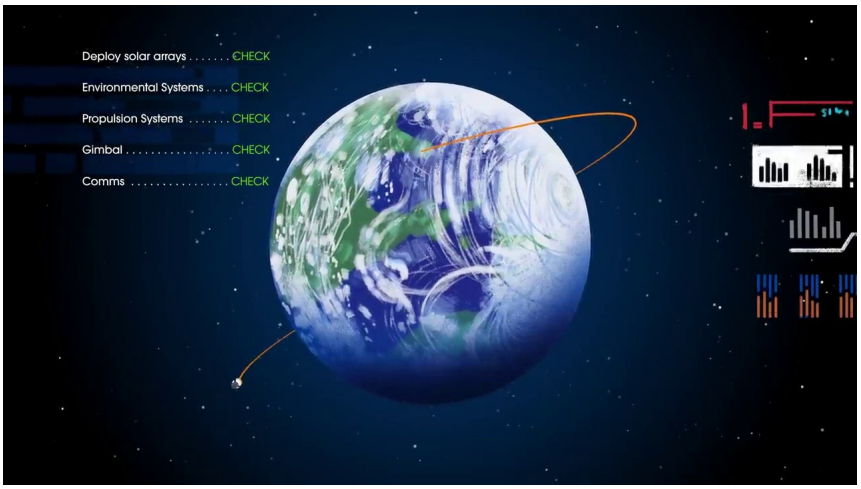

Deploy solar arrays . . . . . CHECK

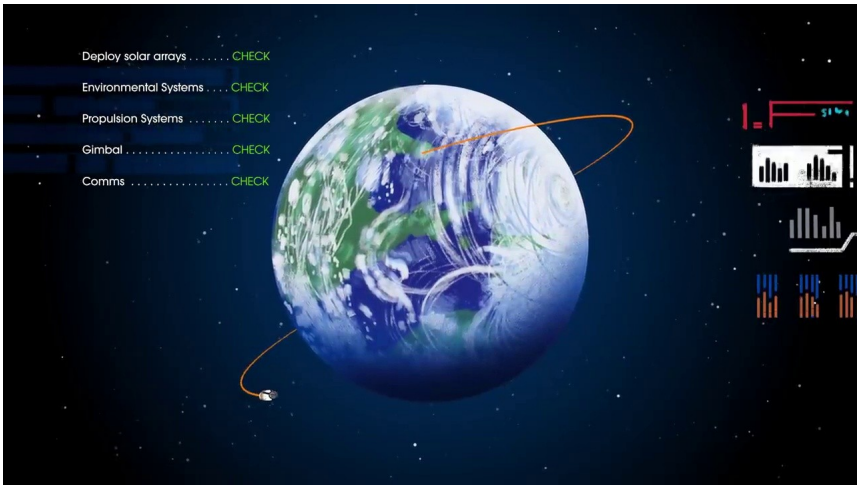

Deploy solar arrays . . . . . CHECK
Environmental Systems . . .

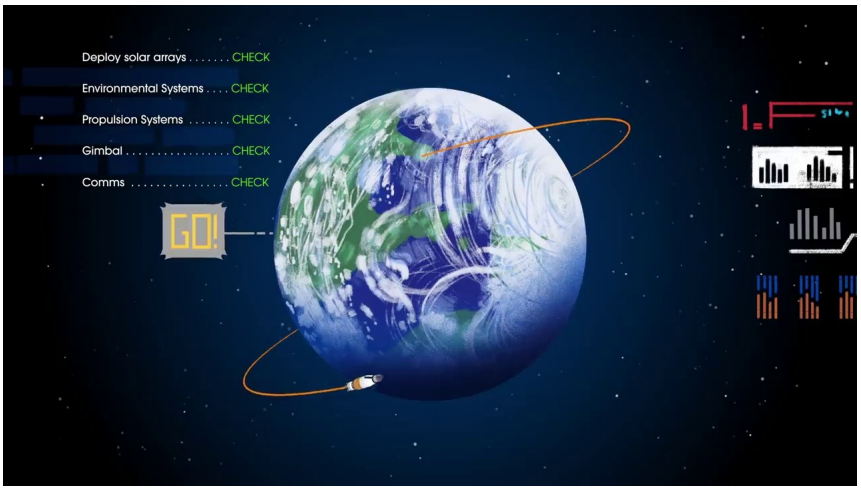

Deploy solar arrays . . . . . CHECK
Environmental Systems . . . . CHECK
Propulsion Systems . . . .


Deploy solar arrays . . . . . CHECK
Environmental Systems . . . . CHECK
Propulsion Systems . . . . . CHECK
Gimbal . . . . . .

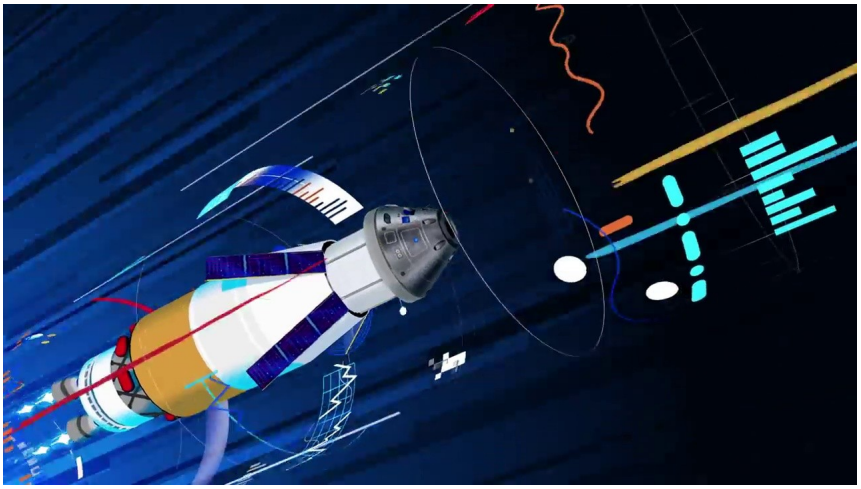

Deploy solar arrays . . . . . CHECK
Environmental Systems . . . . CHECK
Propulsion Systems . . . . . CHECK
Gimbal . . . . . CHECK
Comms .

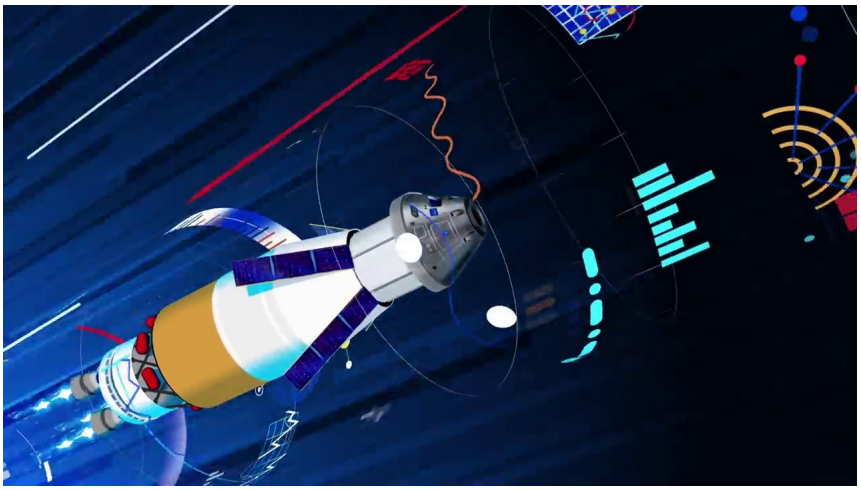

Deploy solar arrays . . . . . CHECK
Environmental Systems . . . . CHECK
Propulsion Systems . . . . . CHECK
Gimbal . . . . . CHECK
Comms . . . . . CHECK

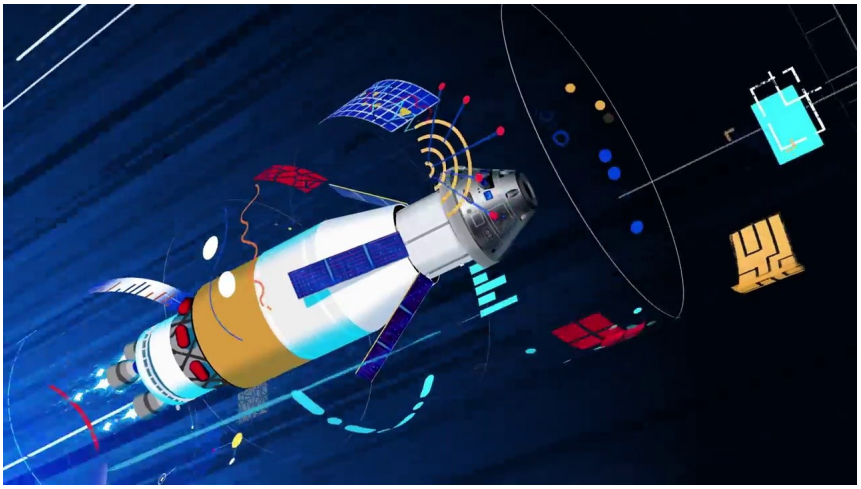

Deploy solar arrays . . . . . CHECK
Environmental Systems . . . . CHECK
Propulsion Systems . . . . . CHECK
Gimbal . . . . . CHECK
Comms . . . . . CHECK

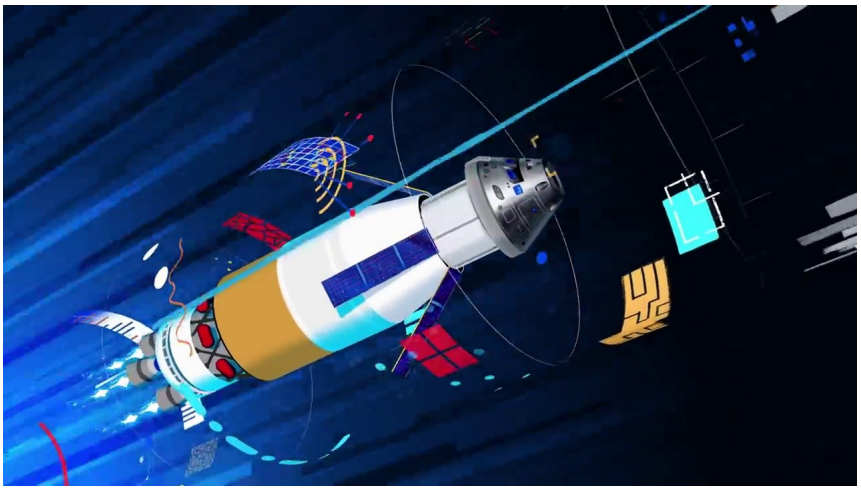

Deploy solar arrays . . . . . CHECK
Environmental Systems . . . . CHECK
Propulsion Systems . . . . . CHECK
Gimbal . . . . . CHECK
Comms . . . . . CHECK
GO!

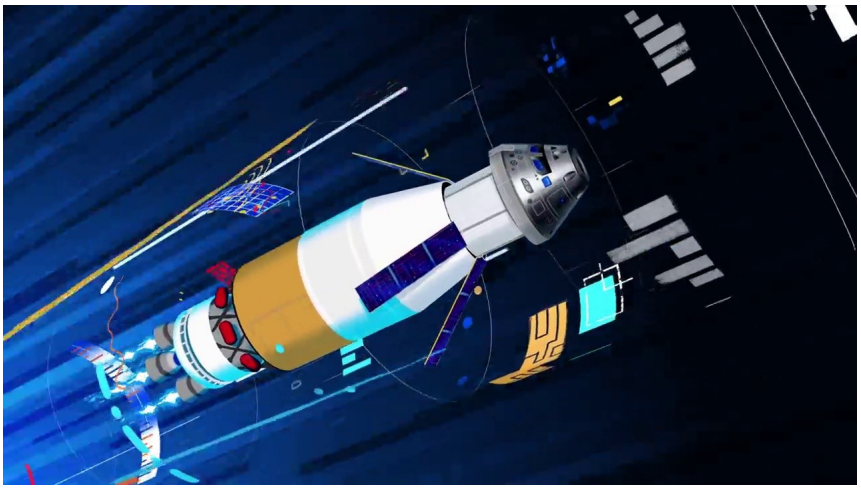

Deploy solar arrays . . . . . CHECK
Environmental Systems . . . . CHECK
Propulsion Systems . . . . . CHECK
Gimbal . . . . . CHECK
Comms . . . . . CHECK
GO!

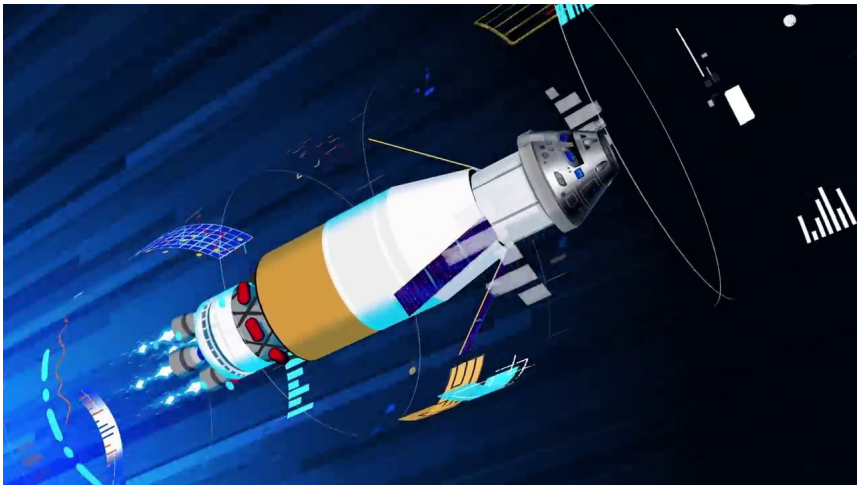


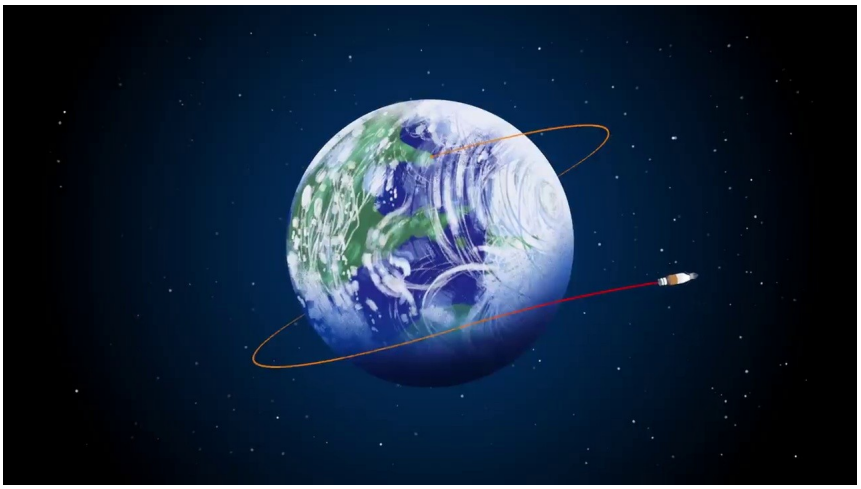


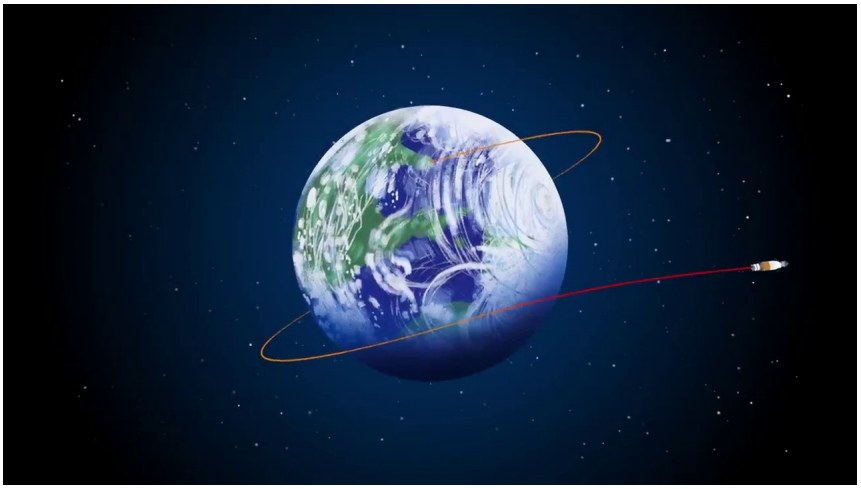


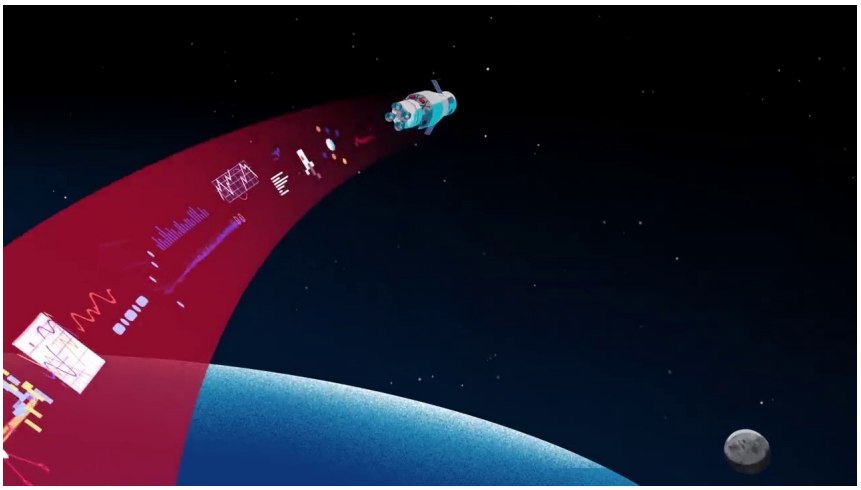


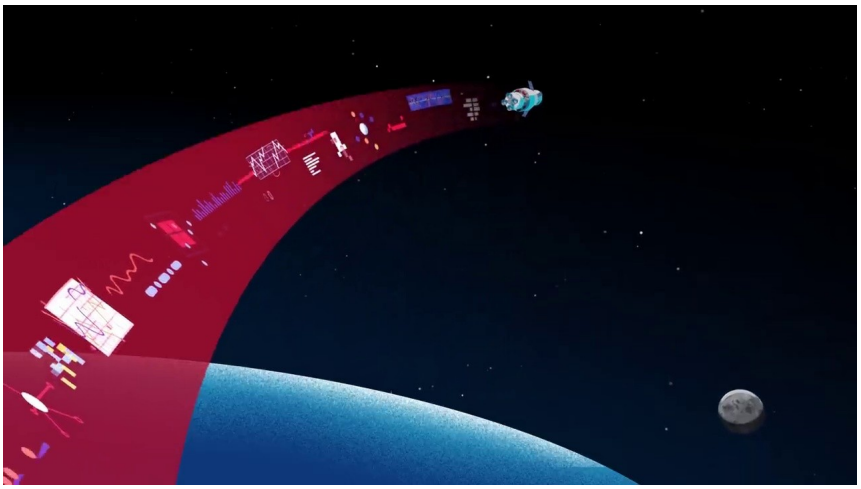


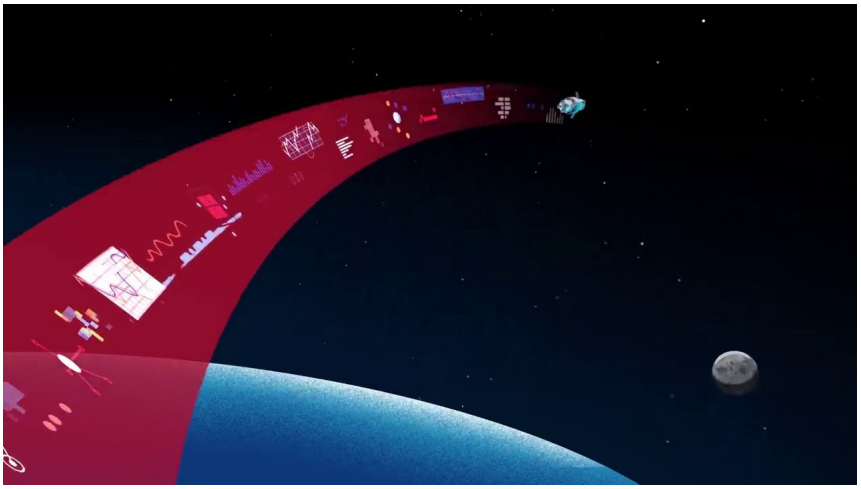


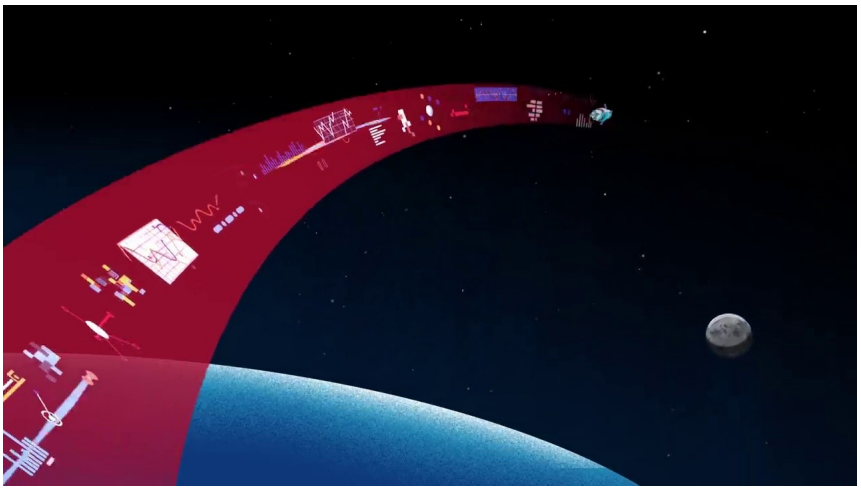


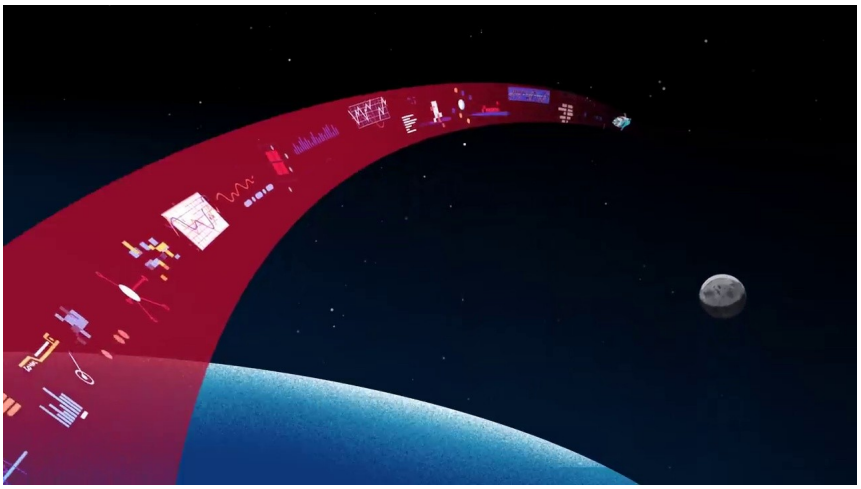


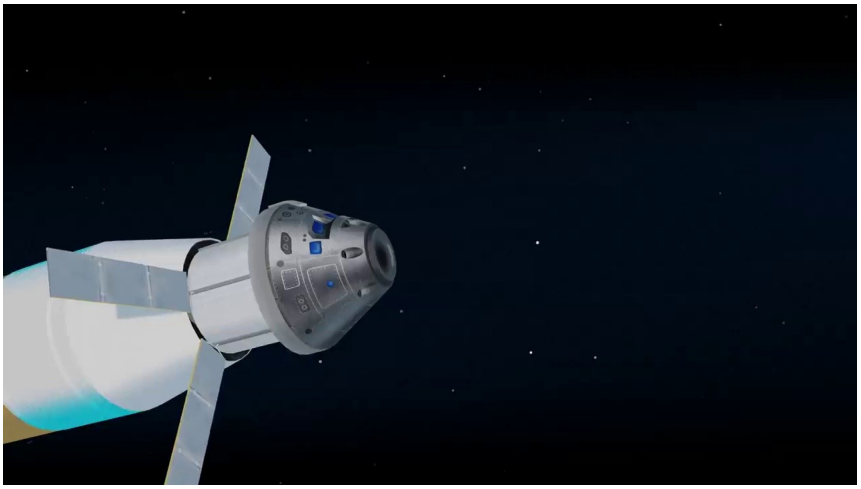


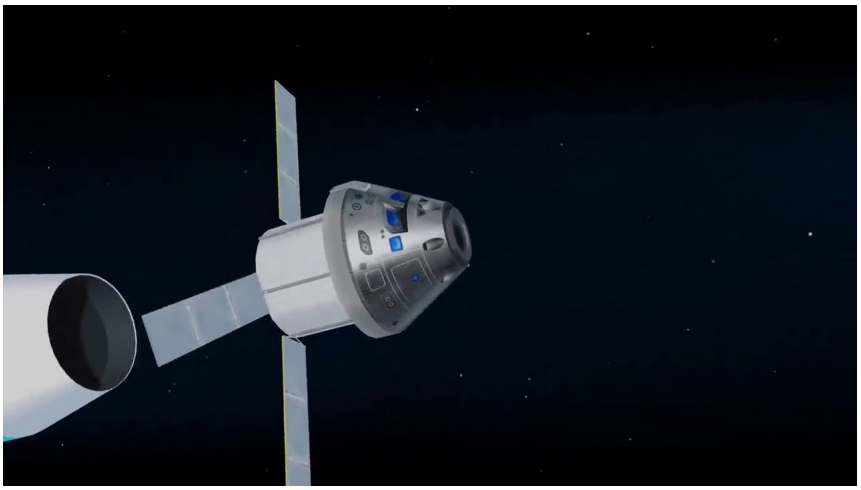


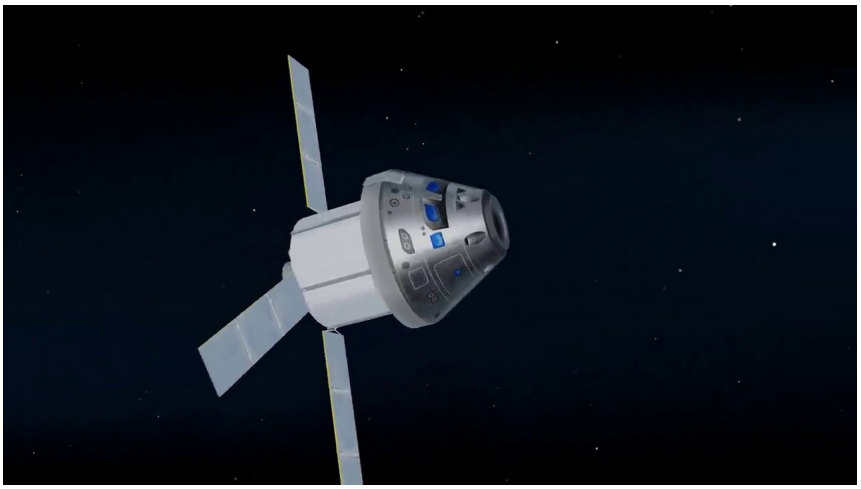


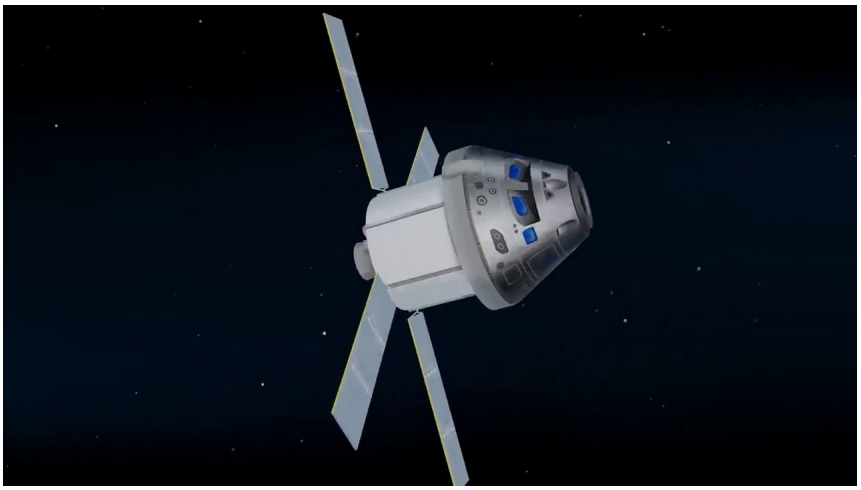


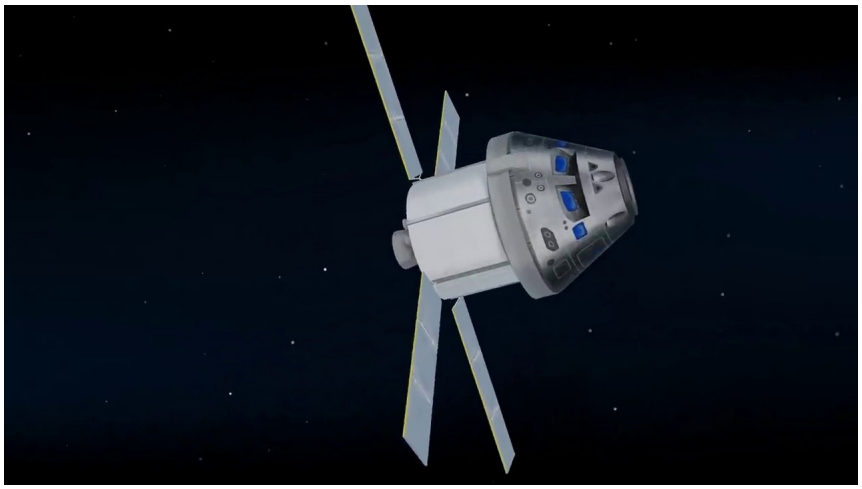


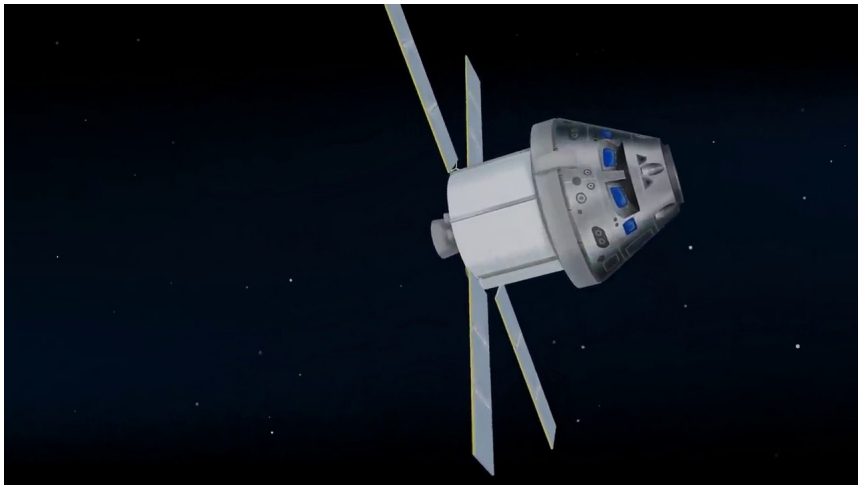


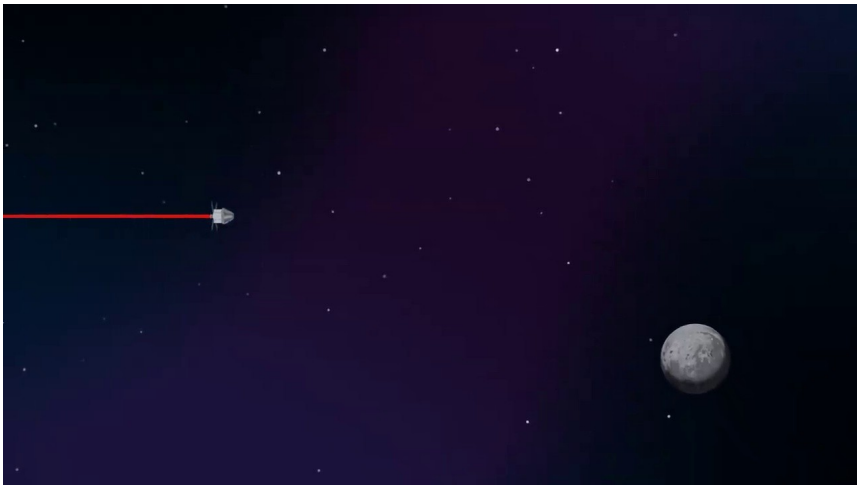


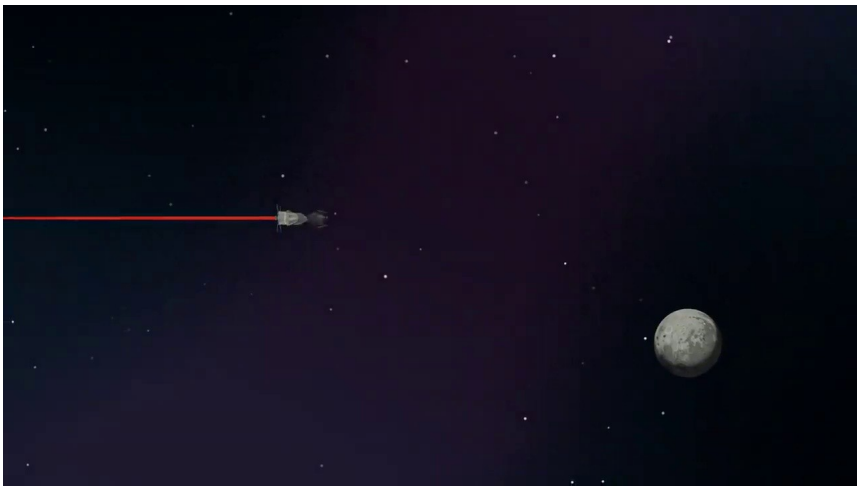


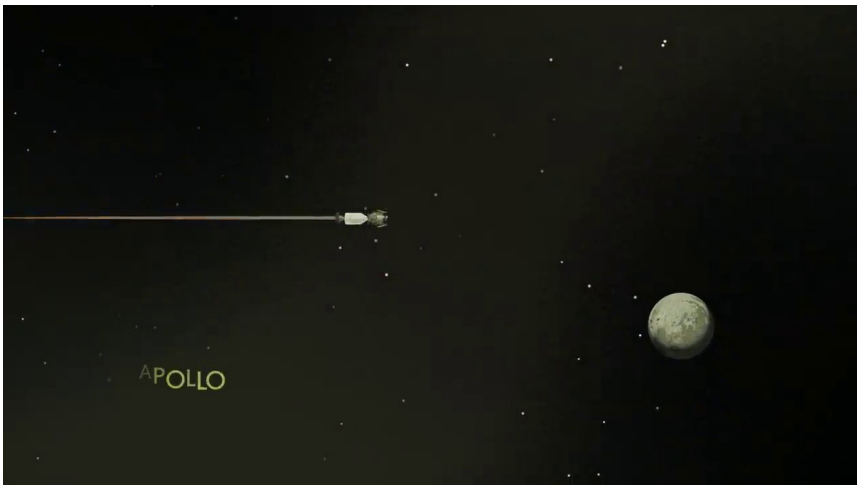











APOLLO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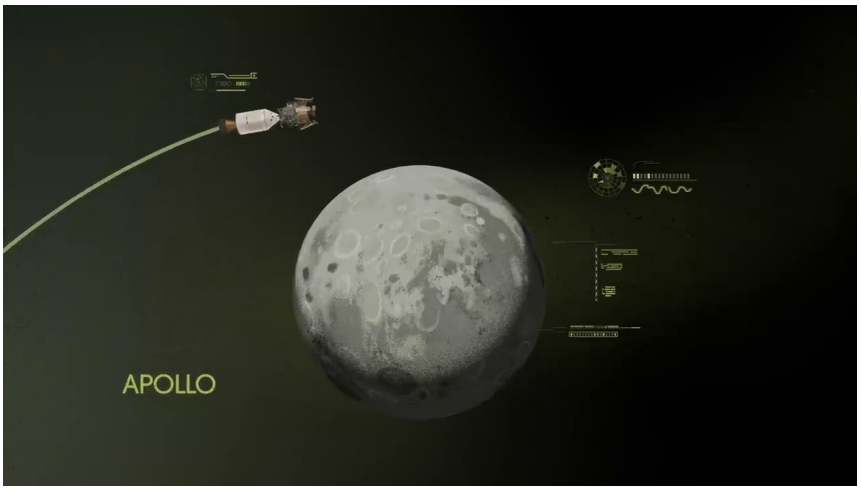
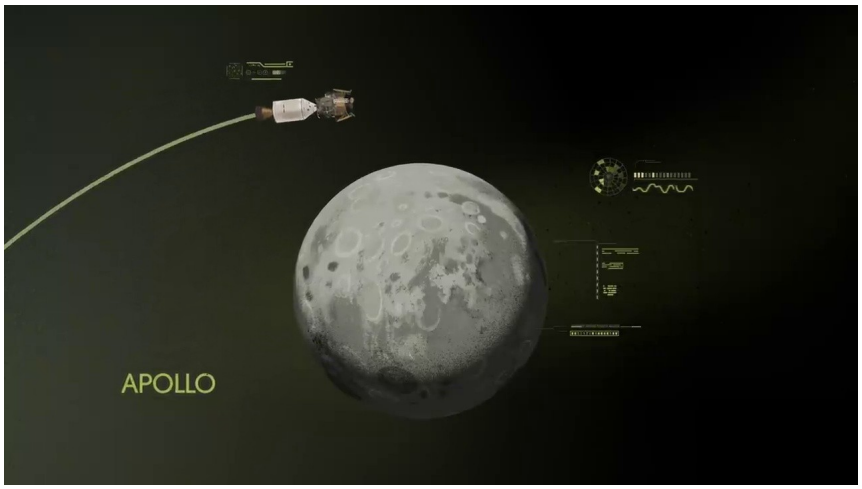

APOLLO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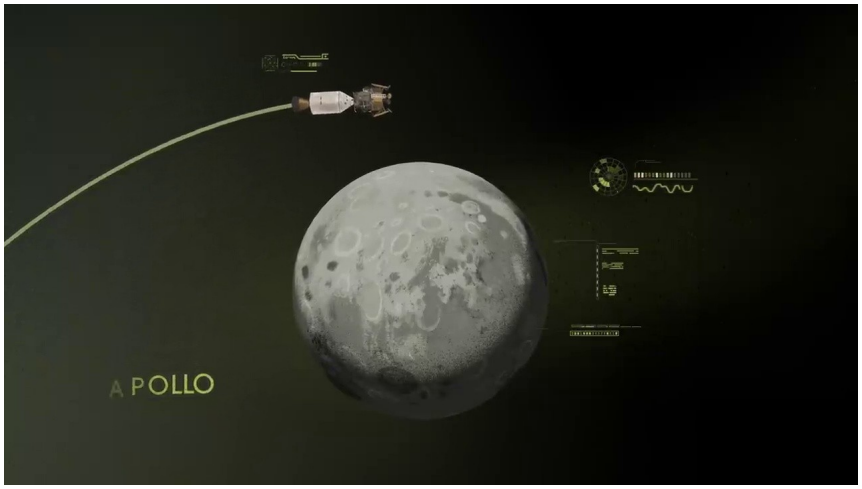
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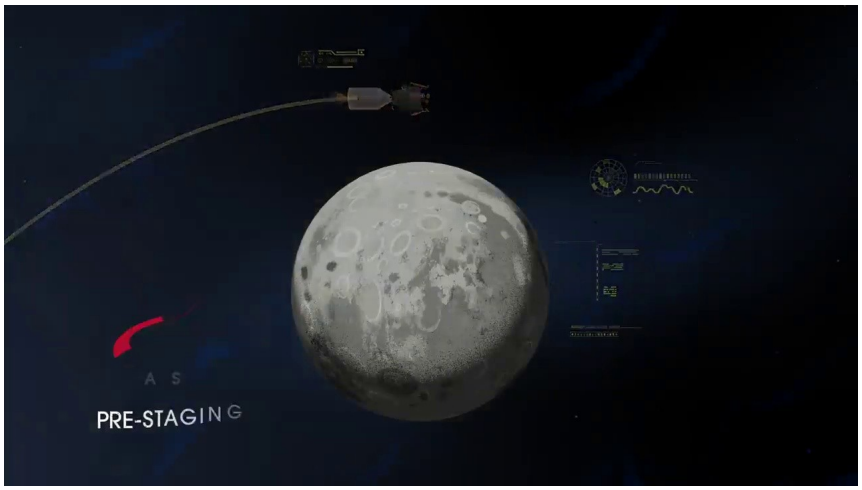
PRE-STAGING


ARTEMIS
PRE-STAGING


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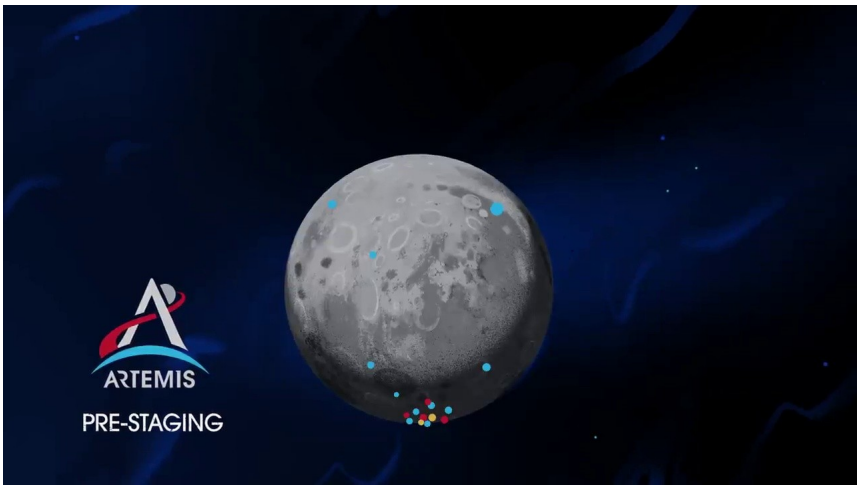
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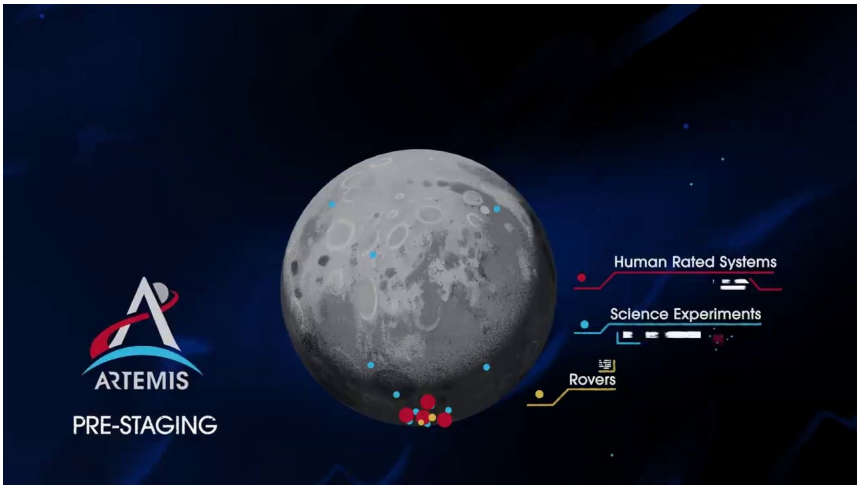
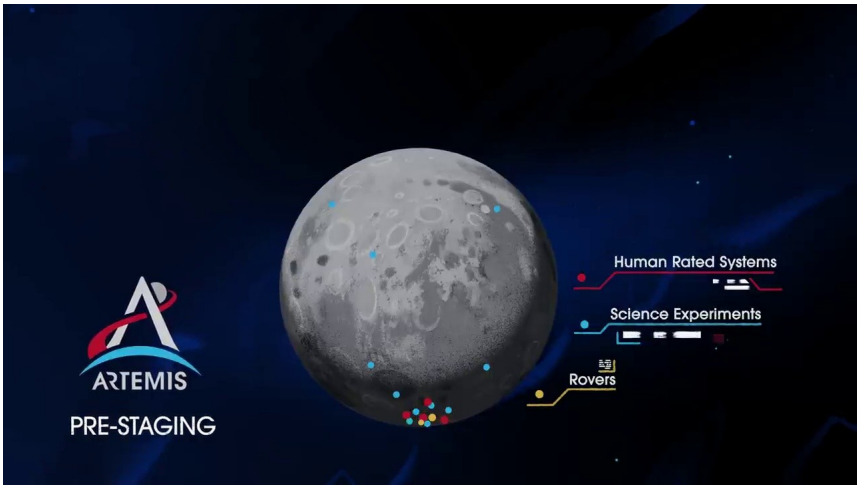
PRE-STAGING


Human Rated Systems
Science Experiments
Rovers
ARTEMIS
PRE-STAGING


Human Rated Systems
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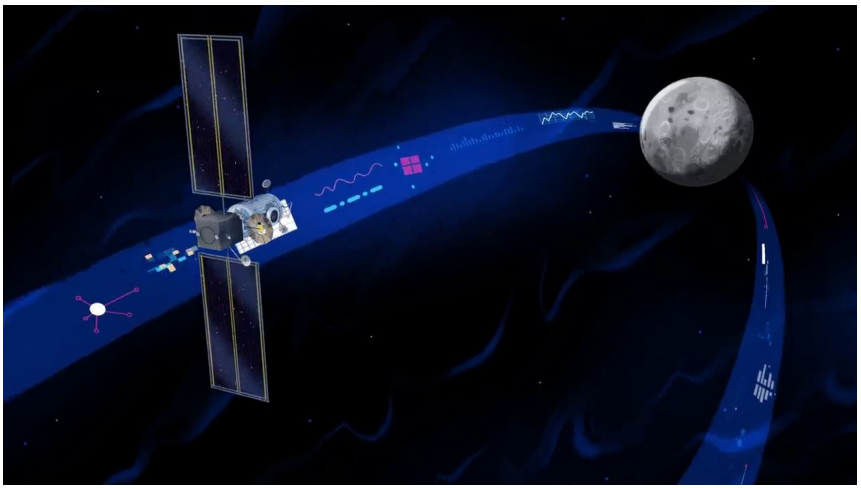

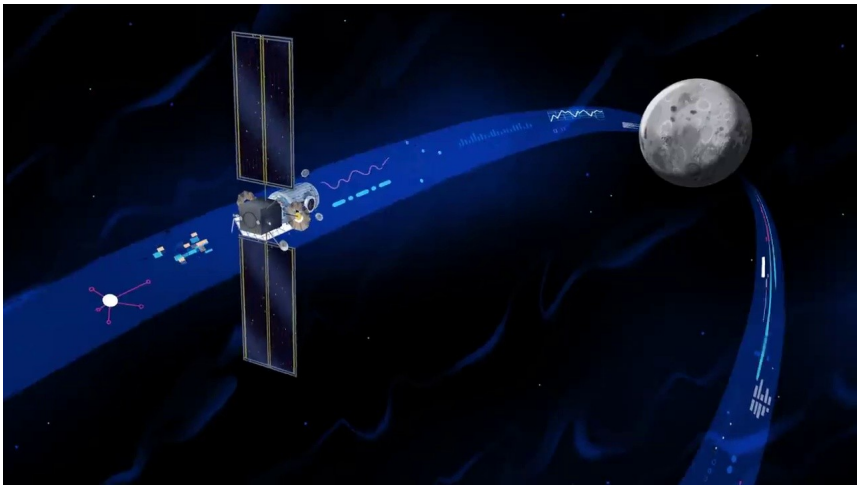

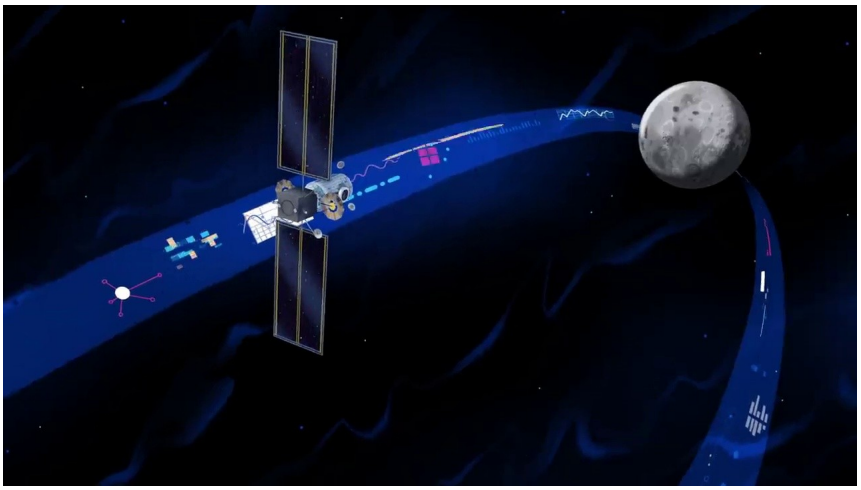

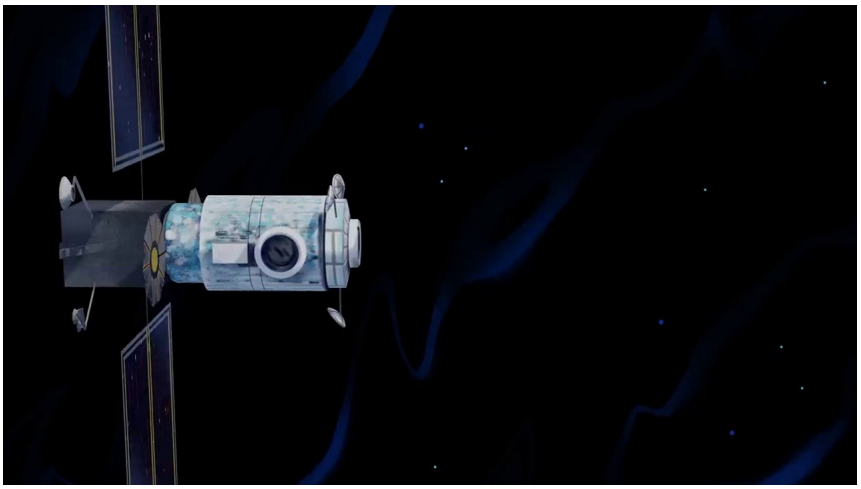

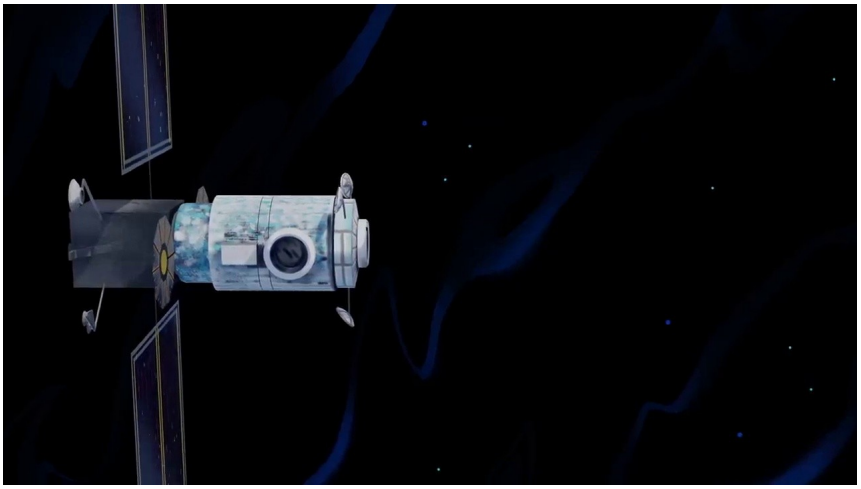

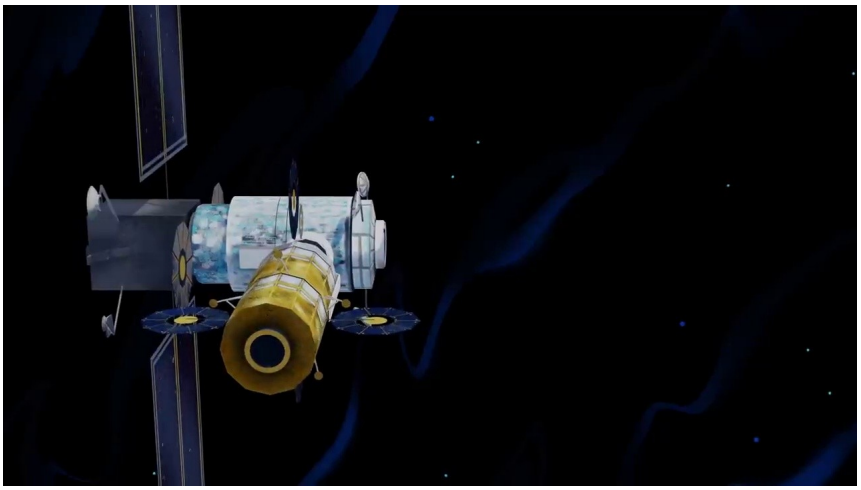

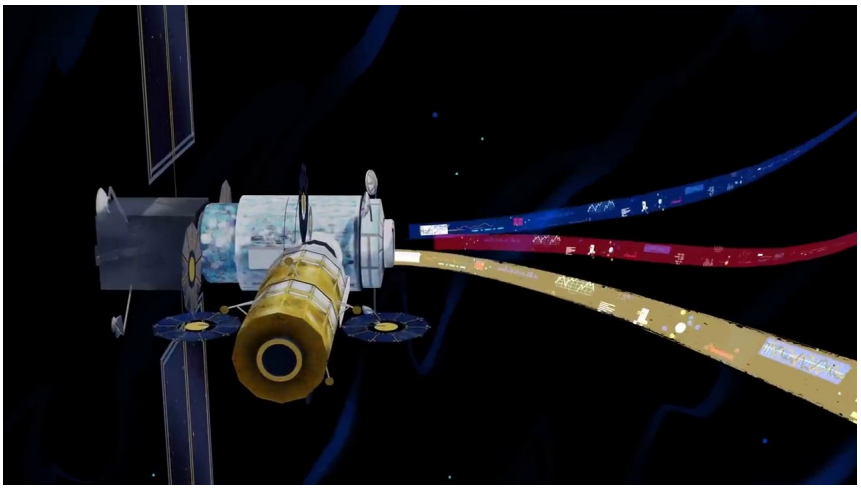

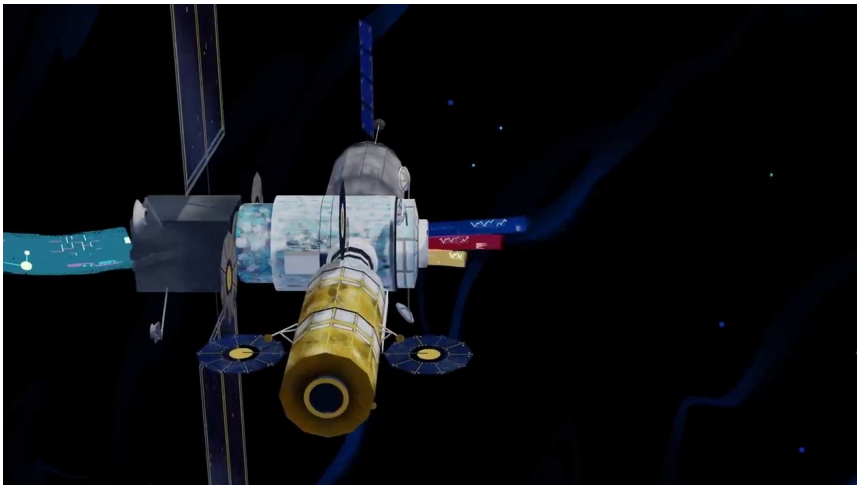

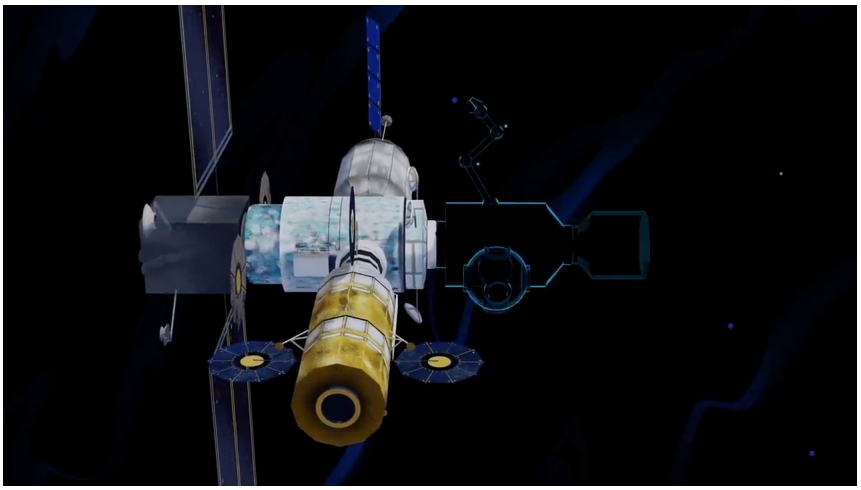

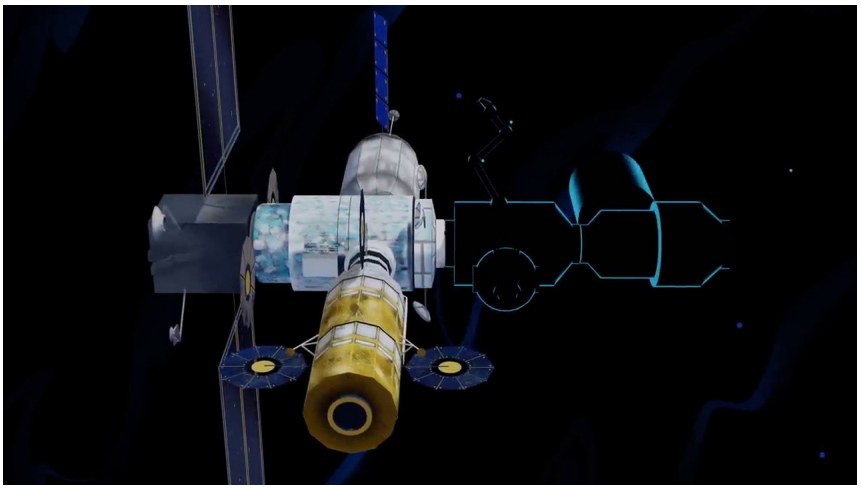

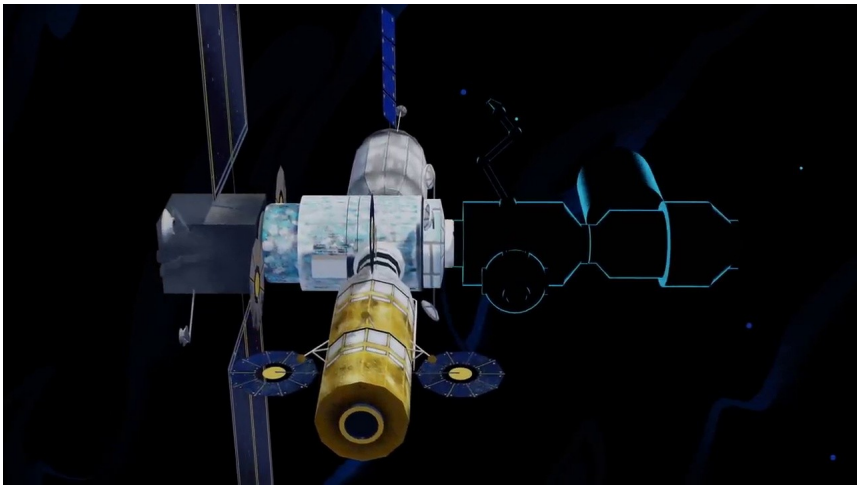

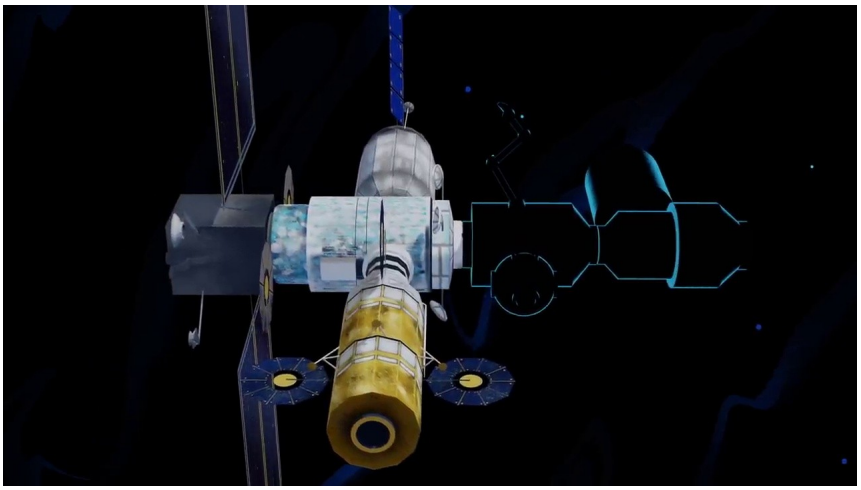

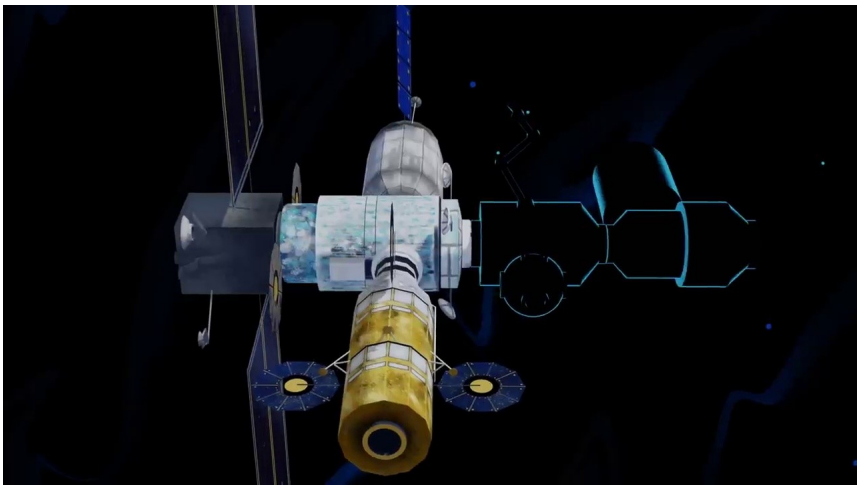

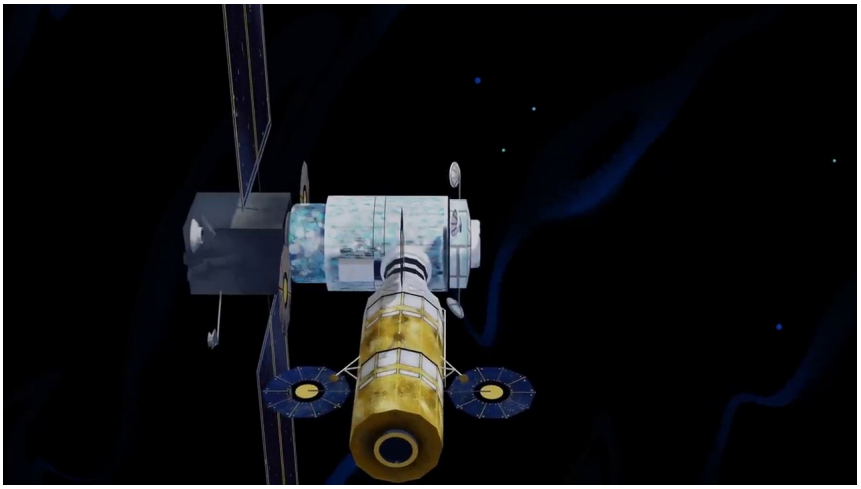

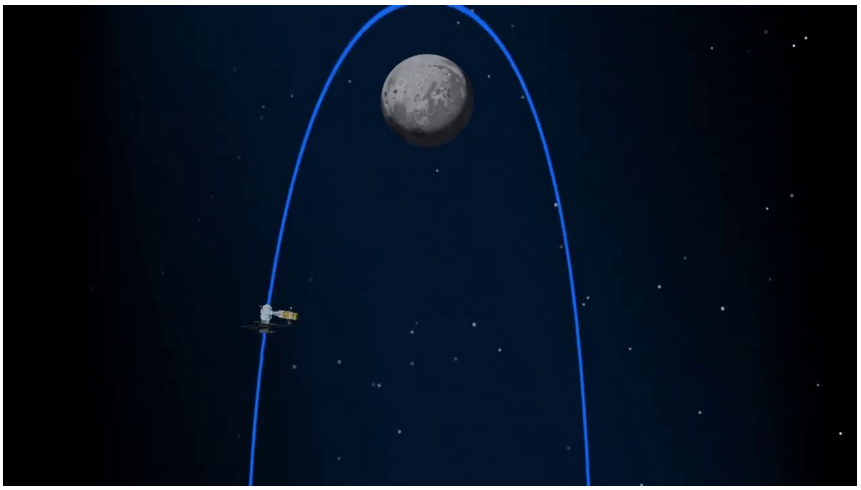

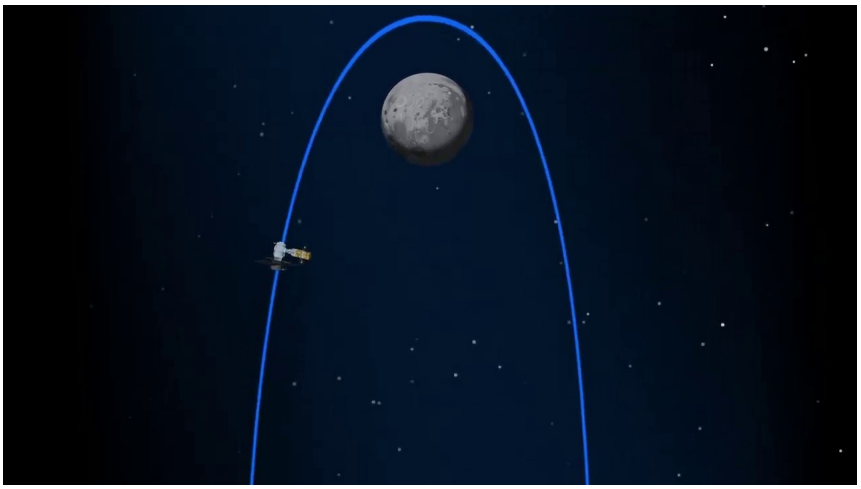

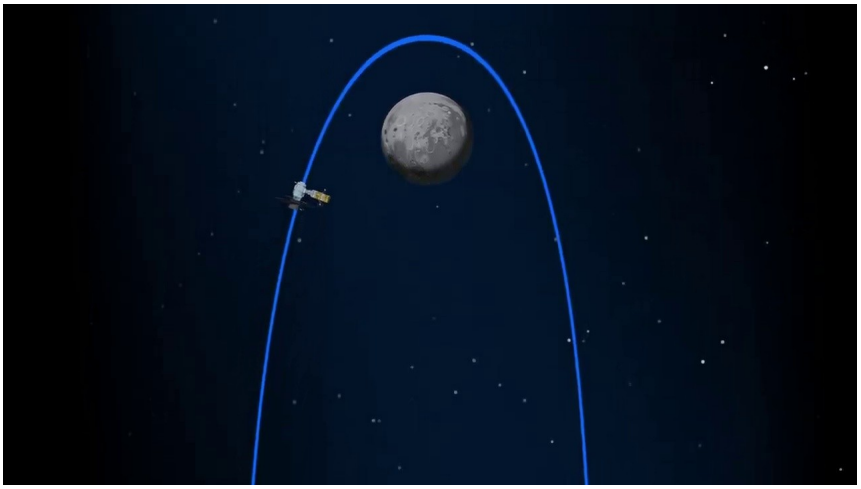

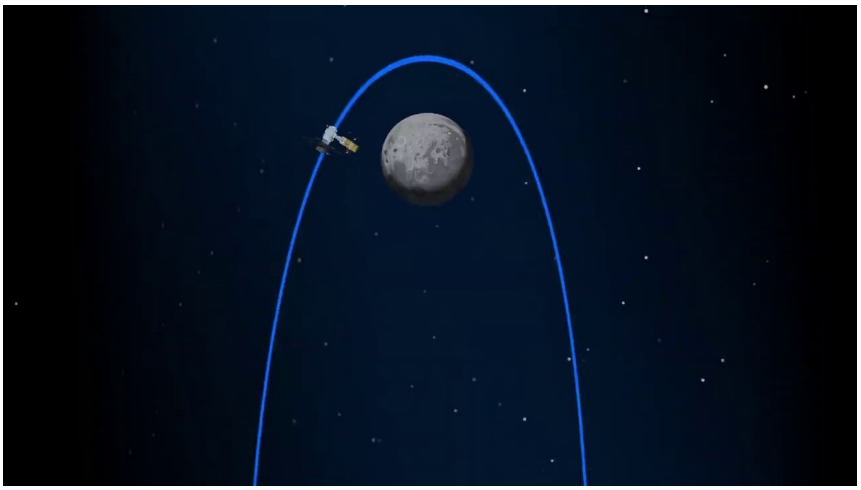

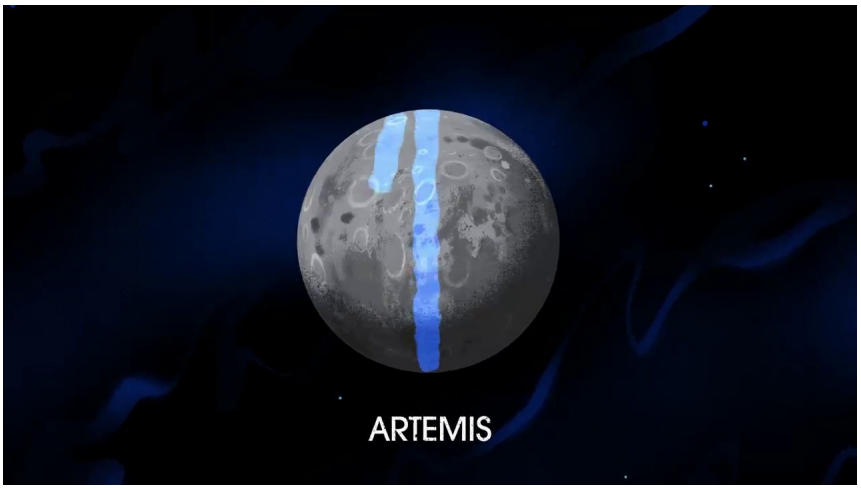
ARTEMIS


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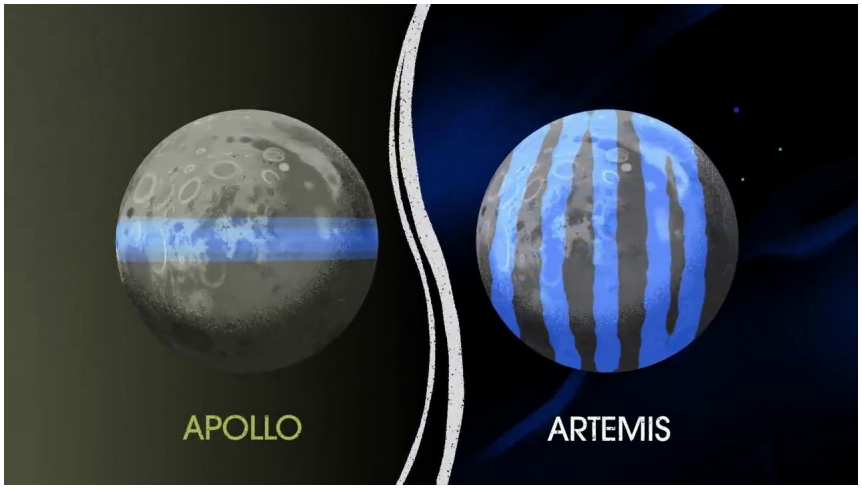
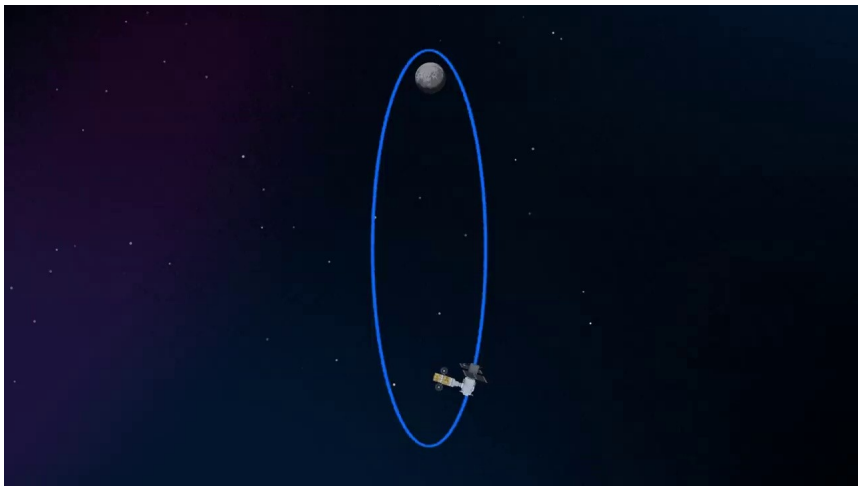
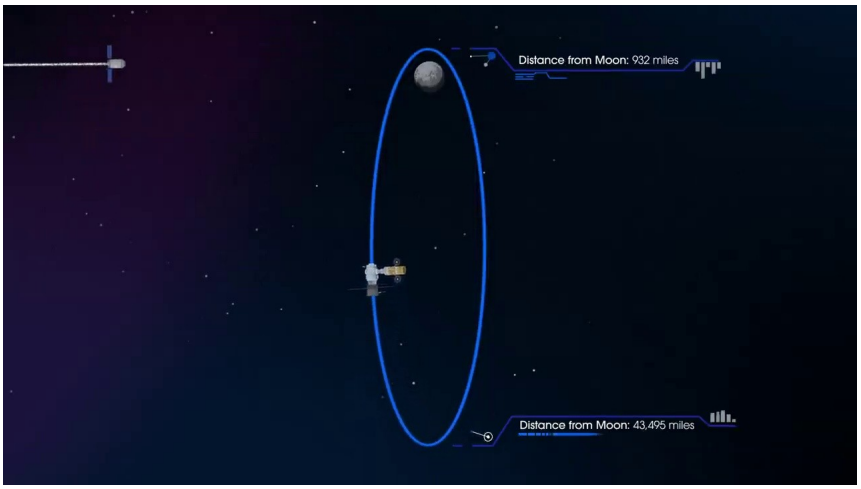
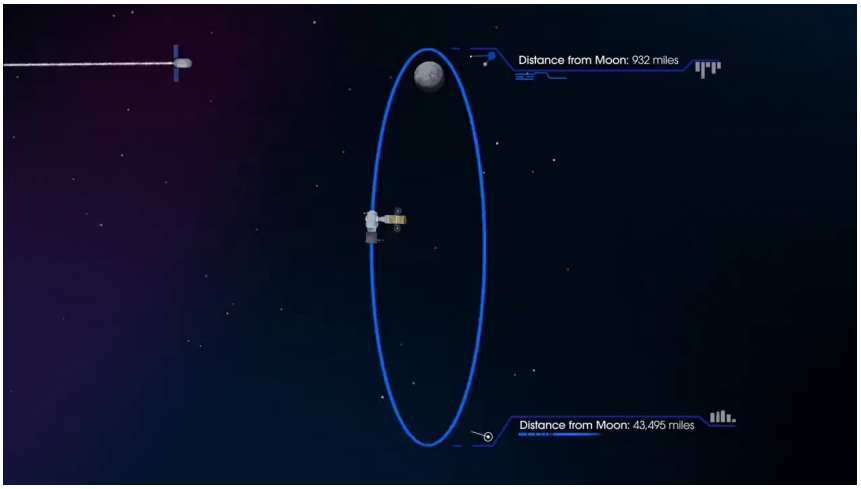

APOLLO
ARTEMIS




Distance from Moon: 932 miles
Distance from Moon: 43,495 miles


Distance from Moon: 932 miles
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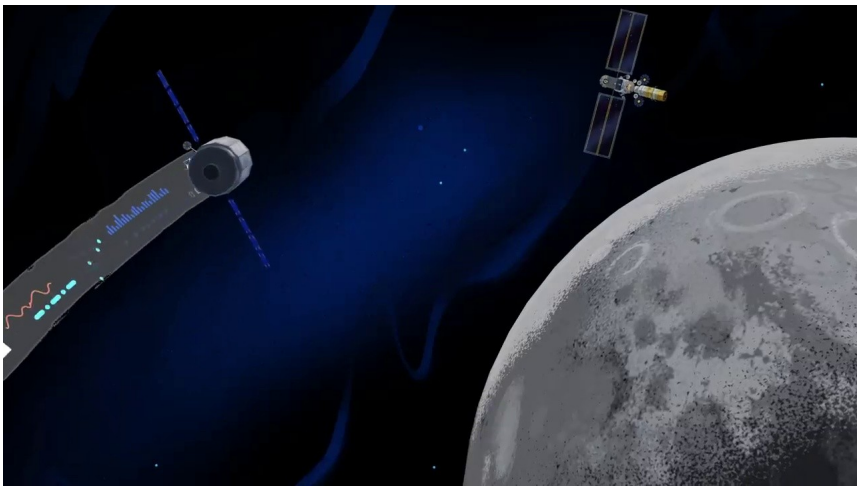

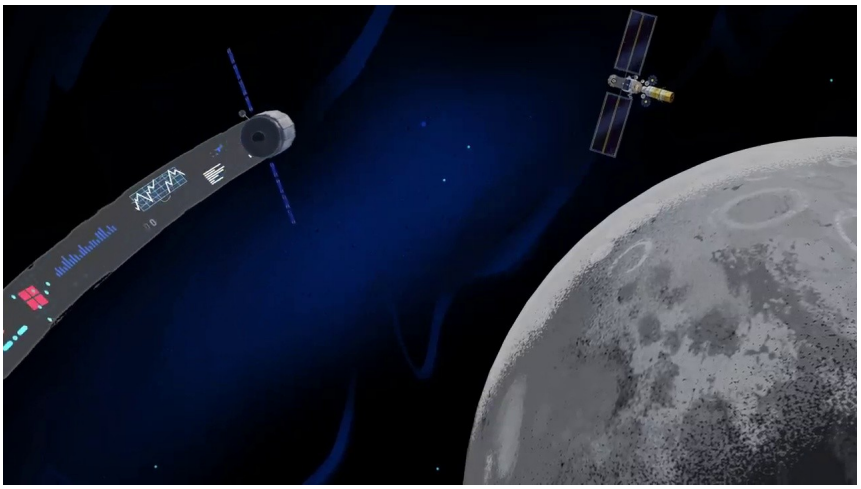

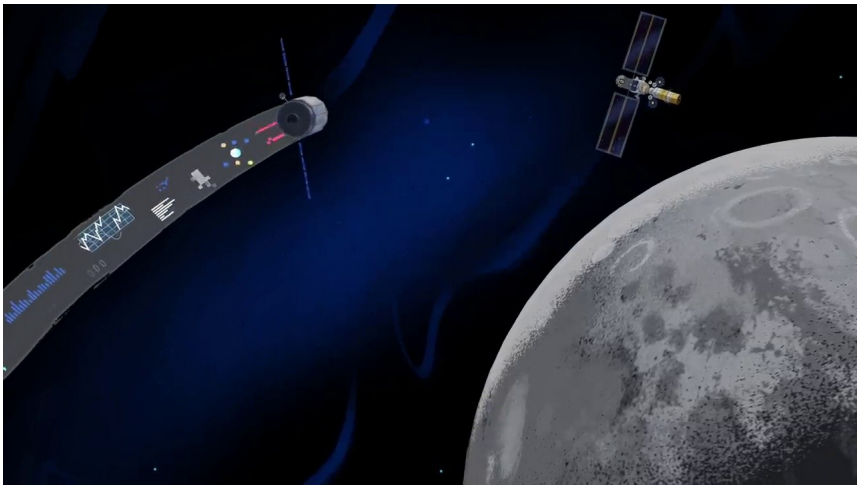

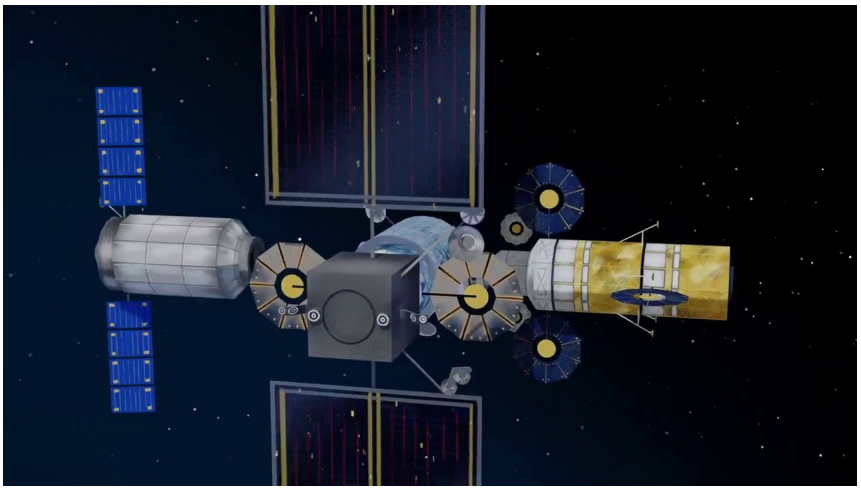

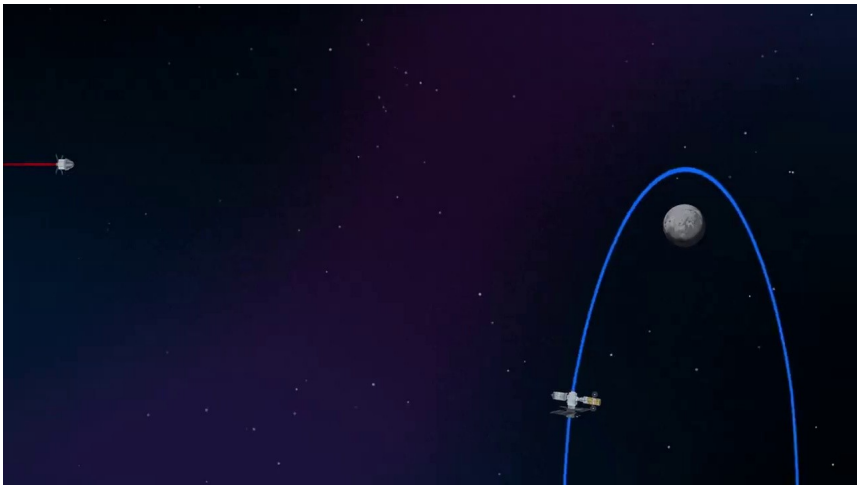

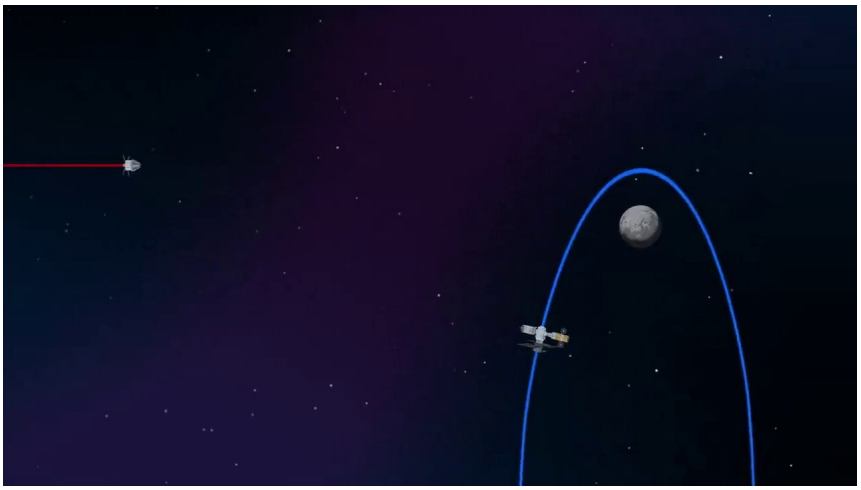

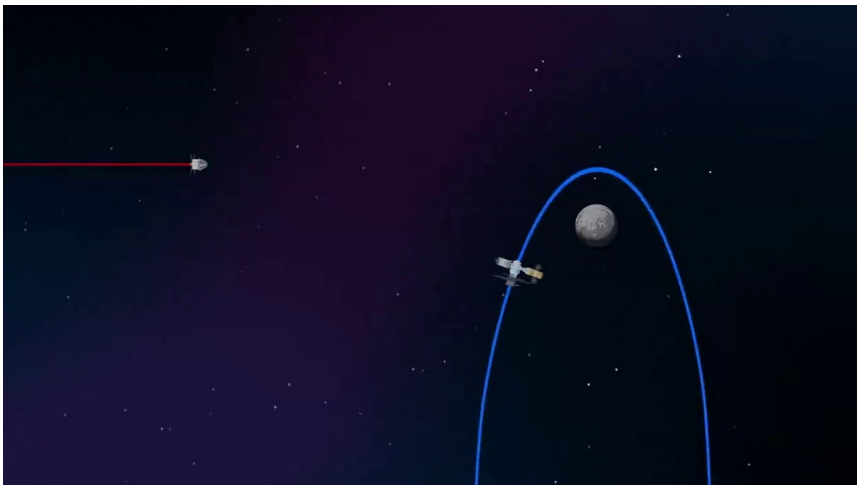

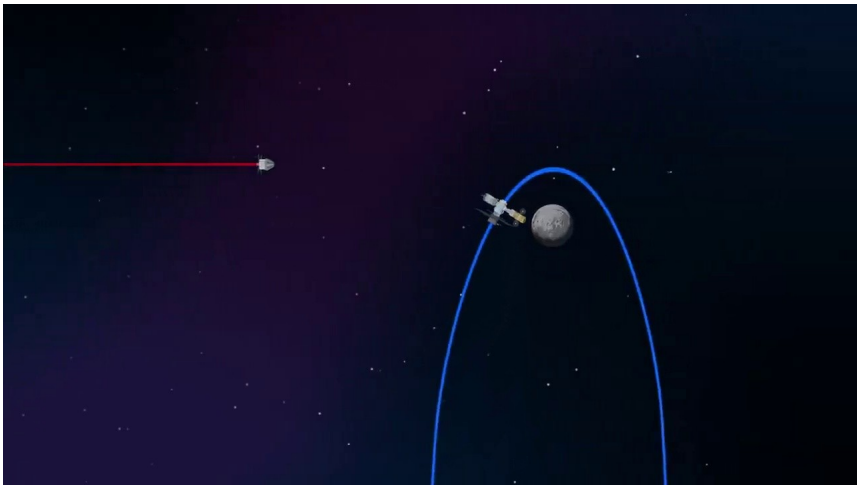

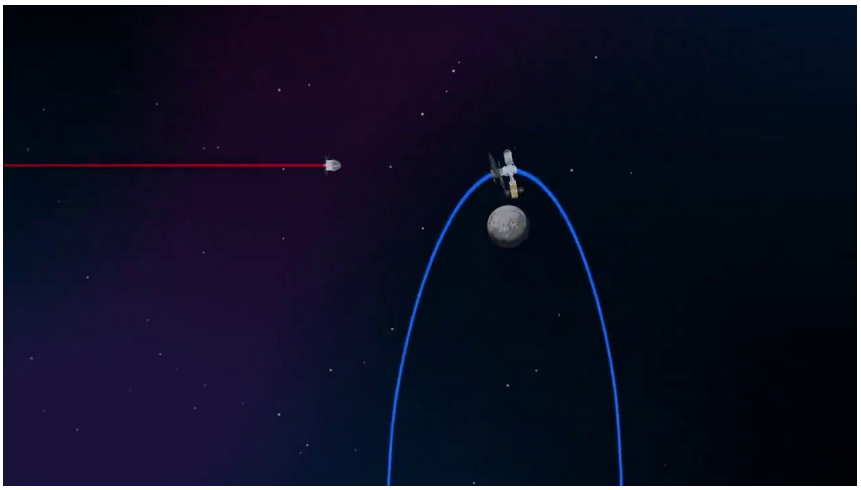

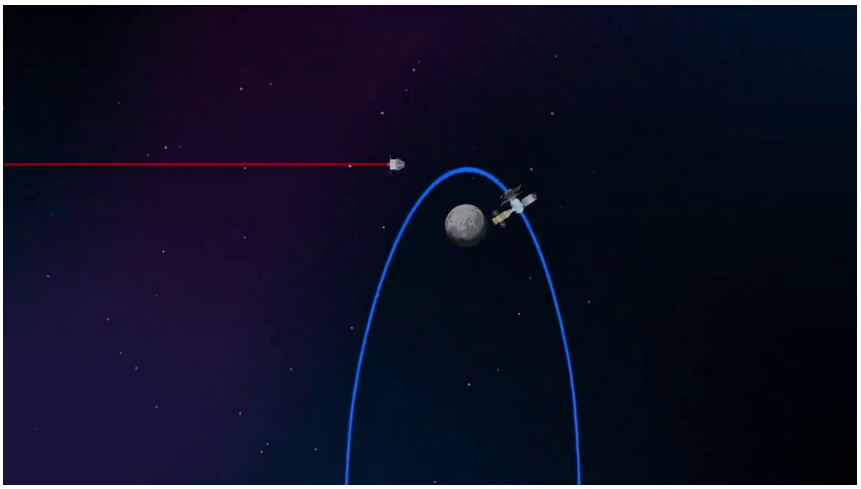

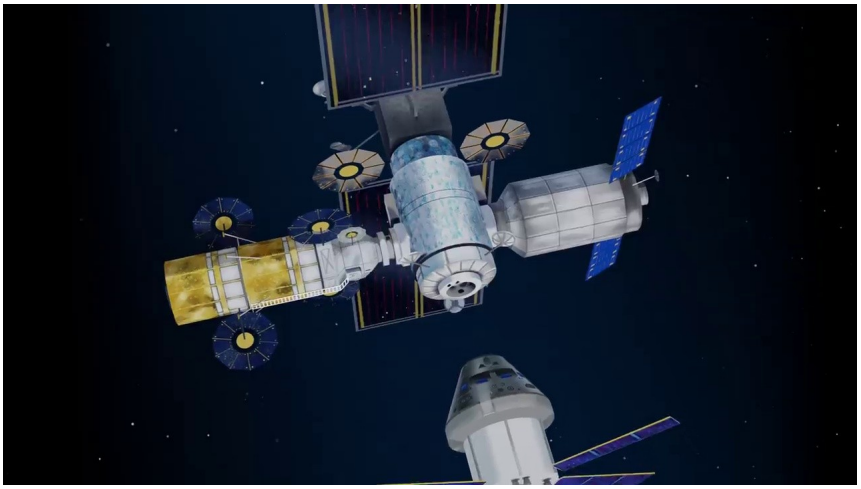

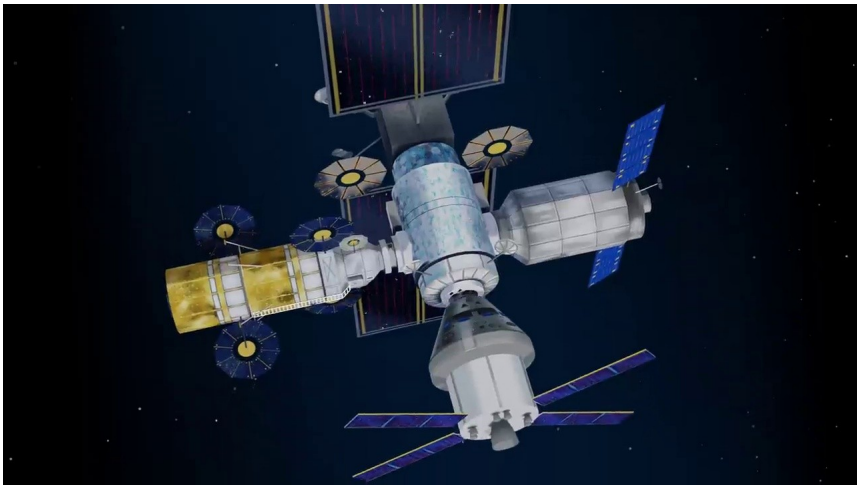

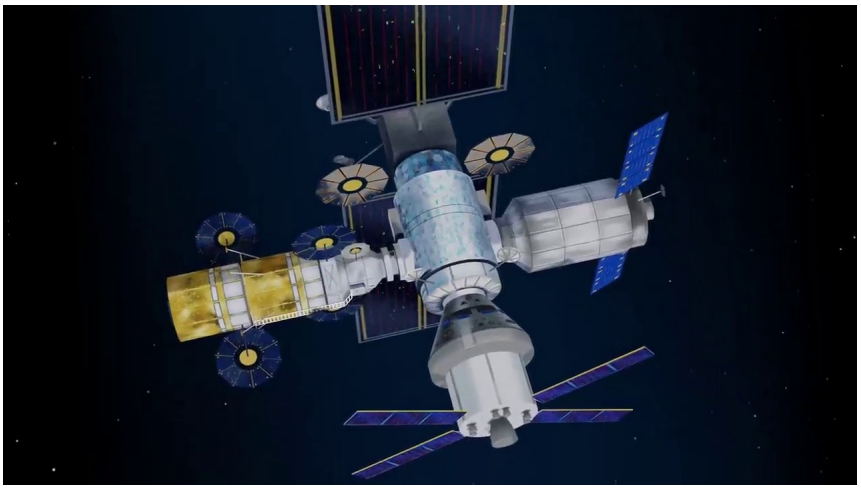

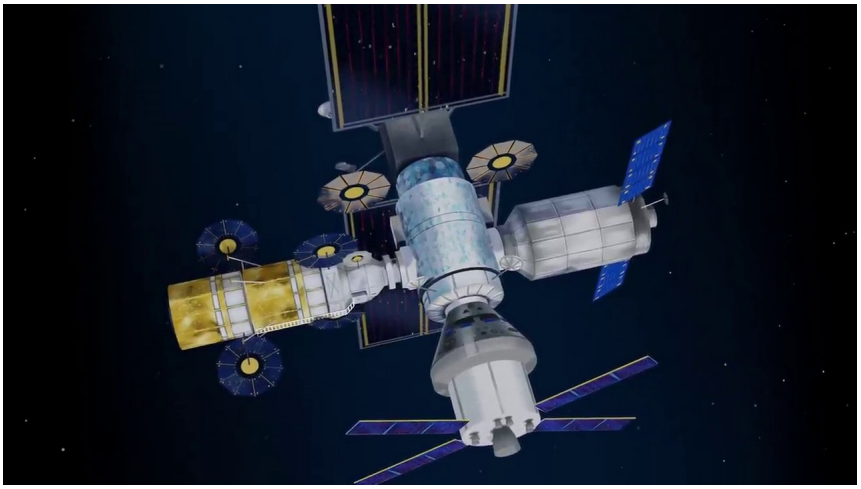

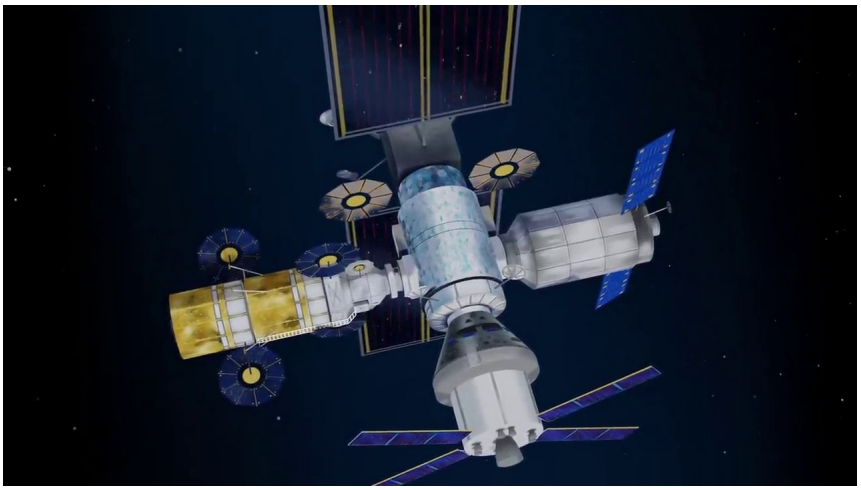

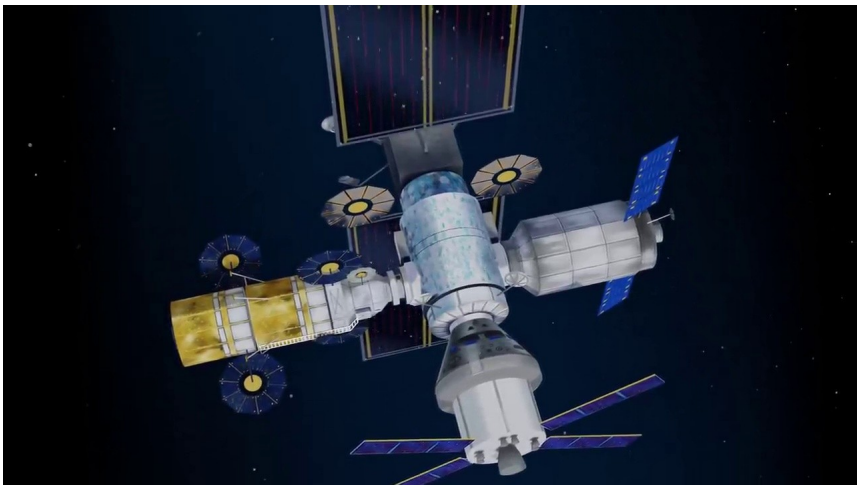

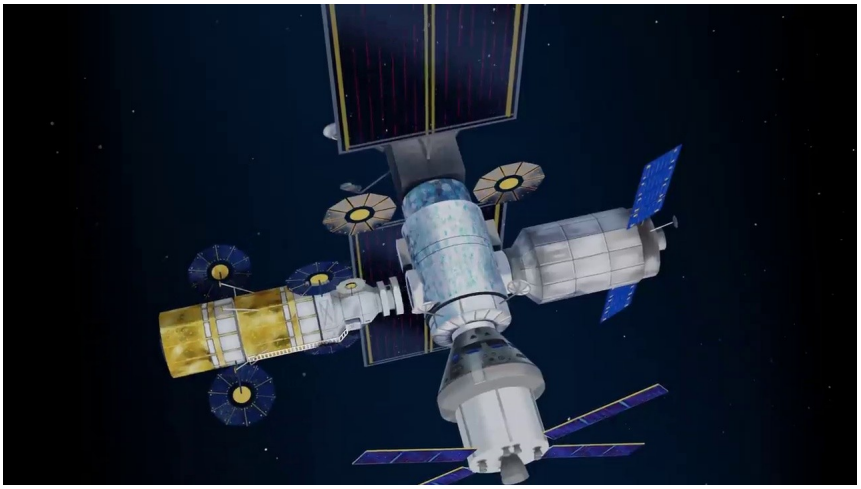

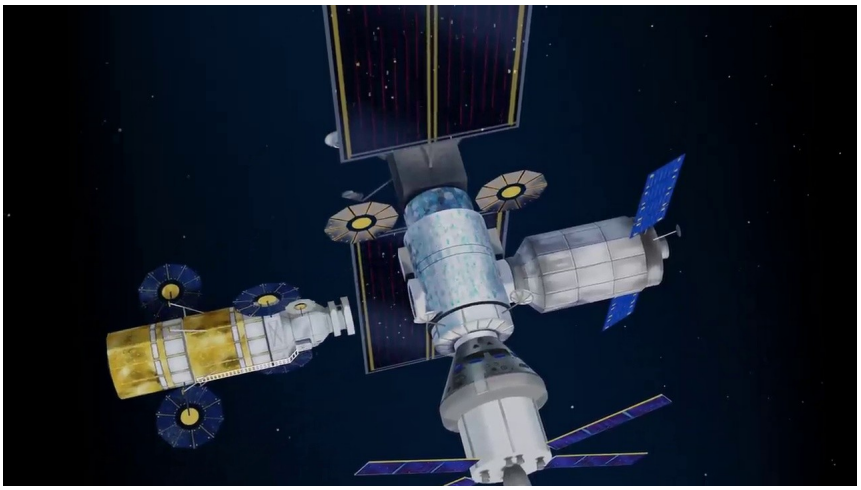

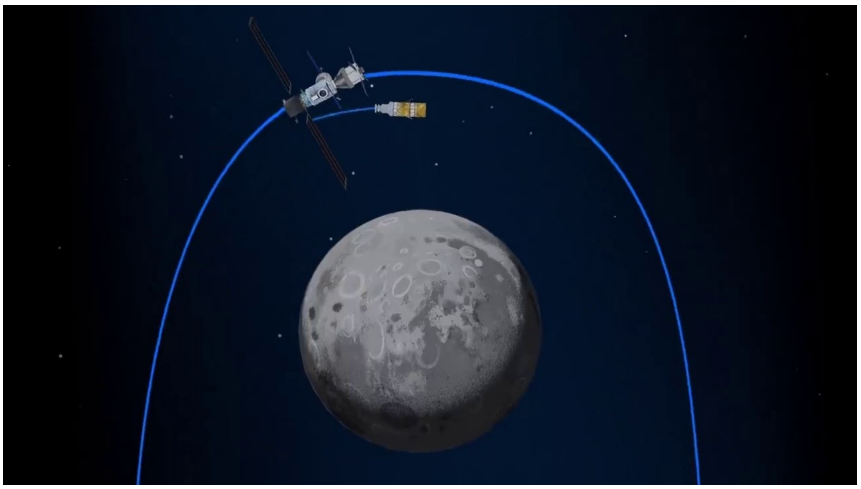

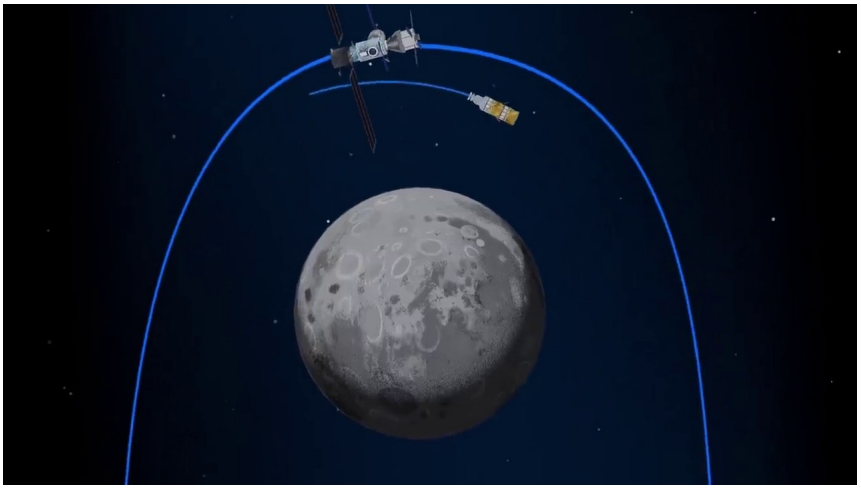

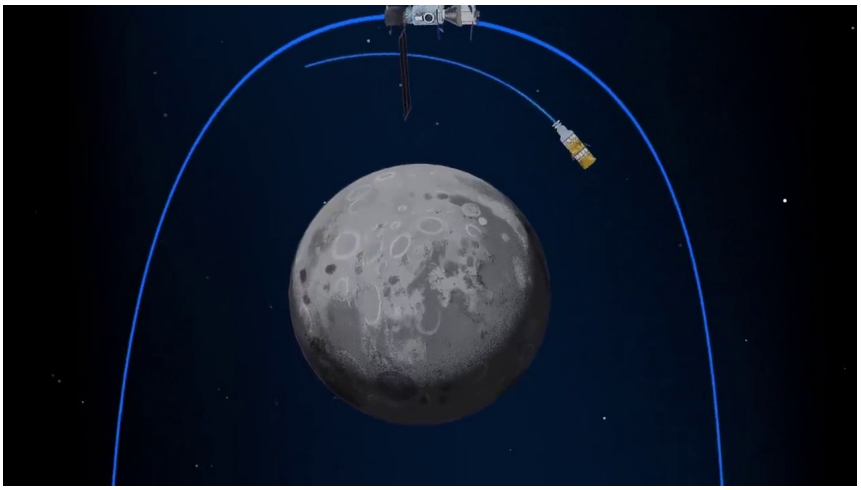

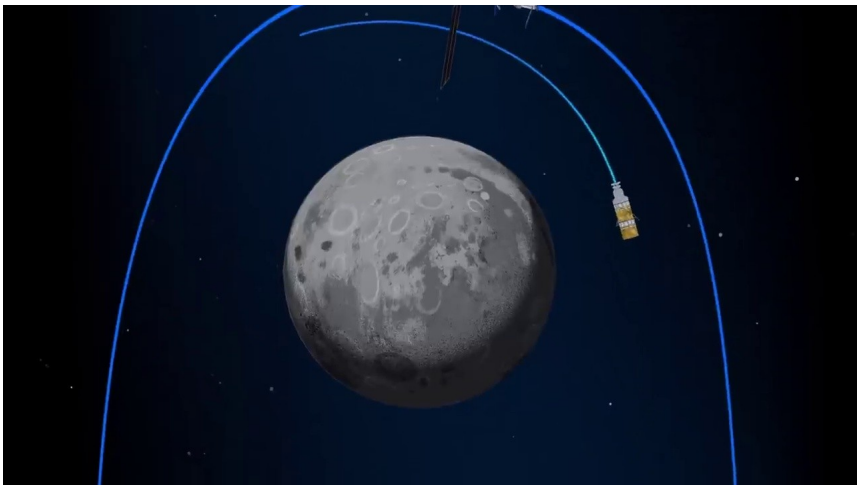

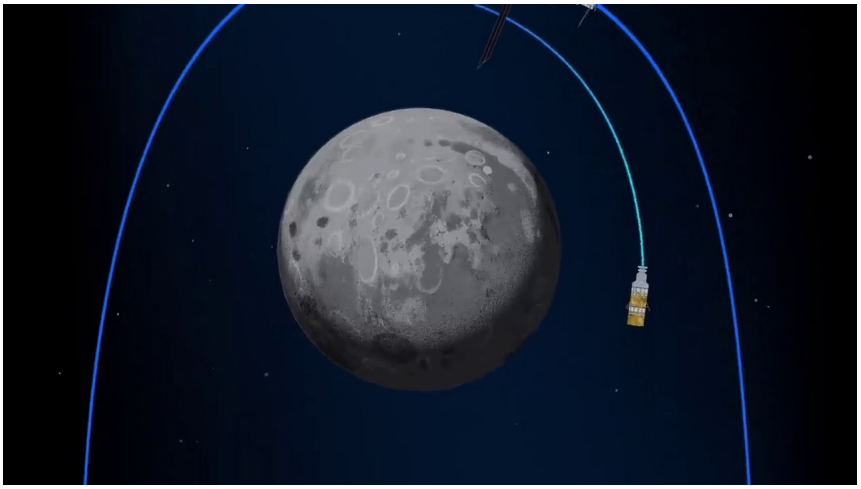

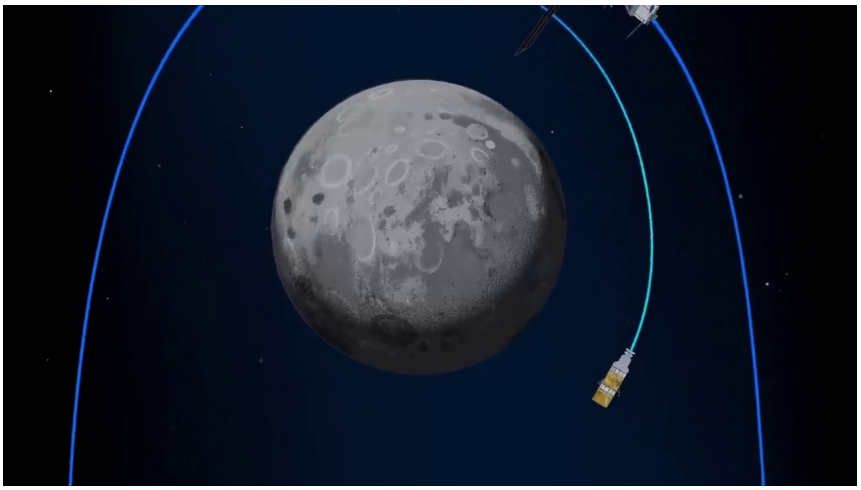

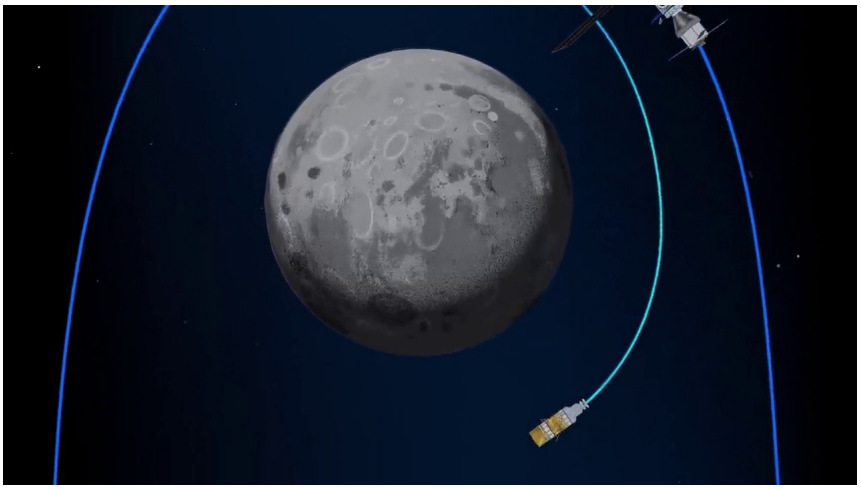

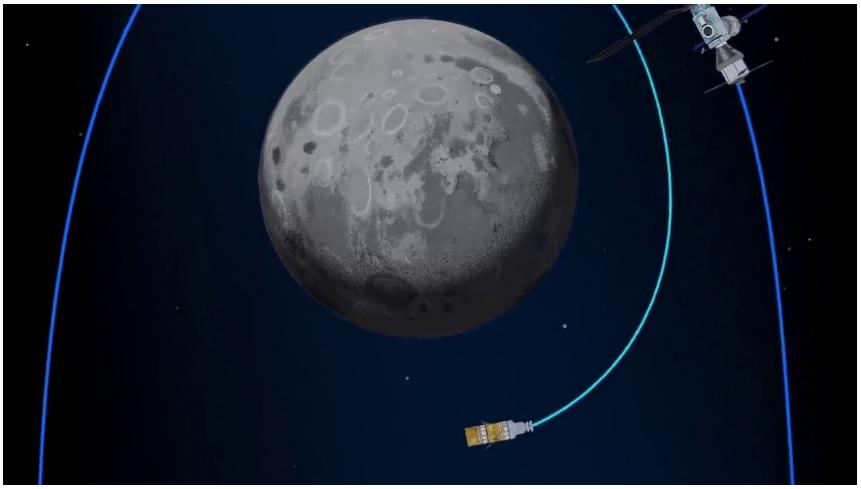

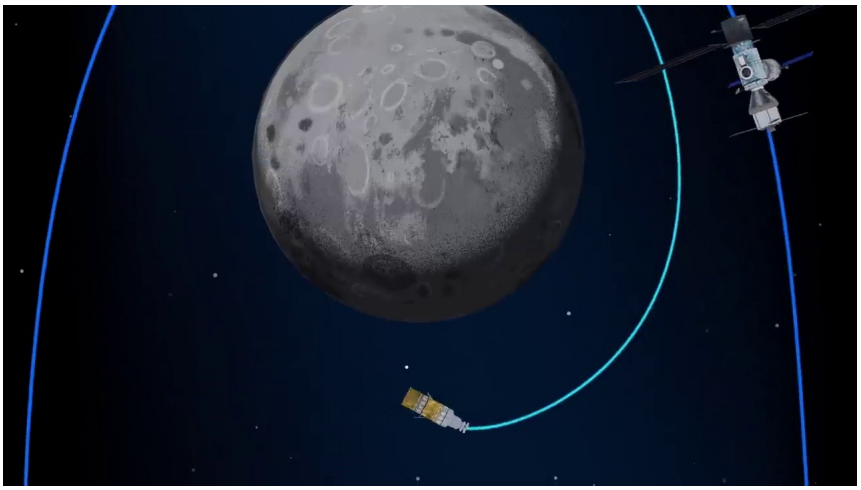

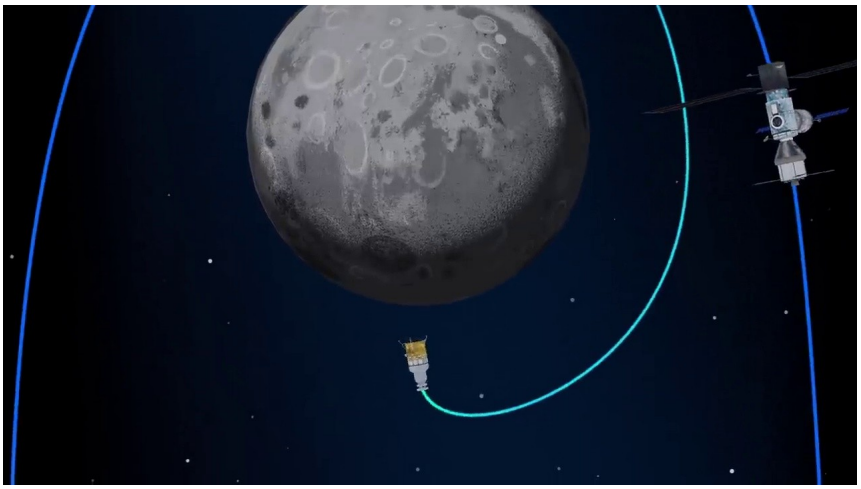

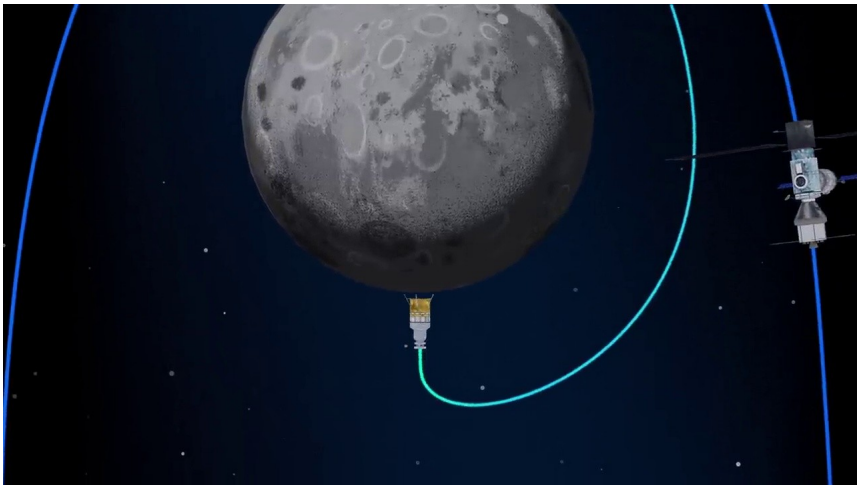

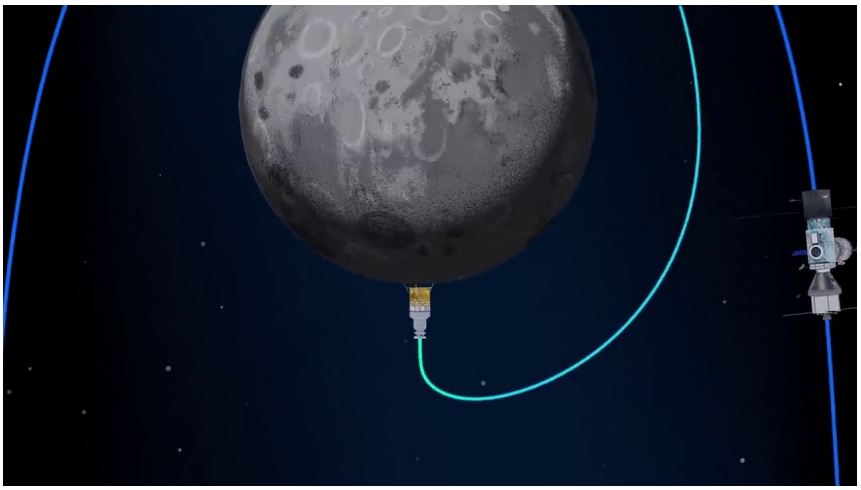

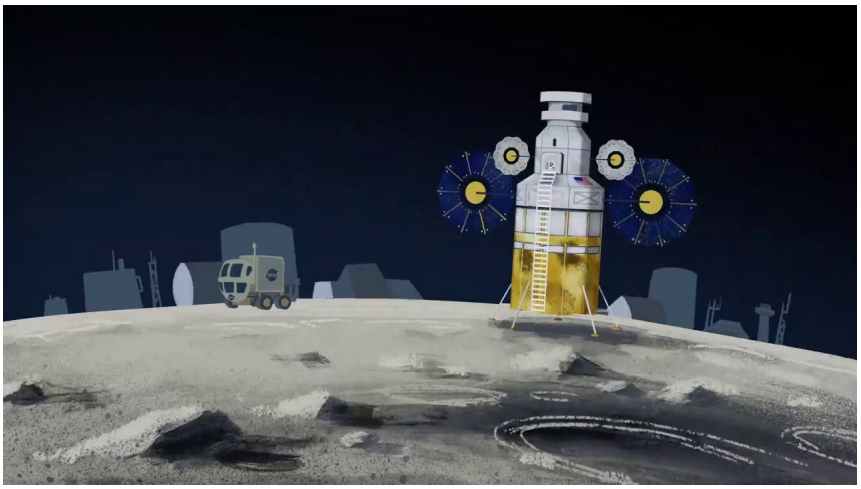

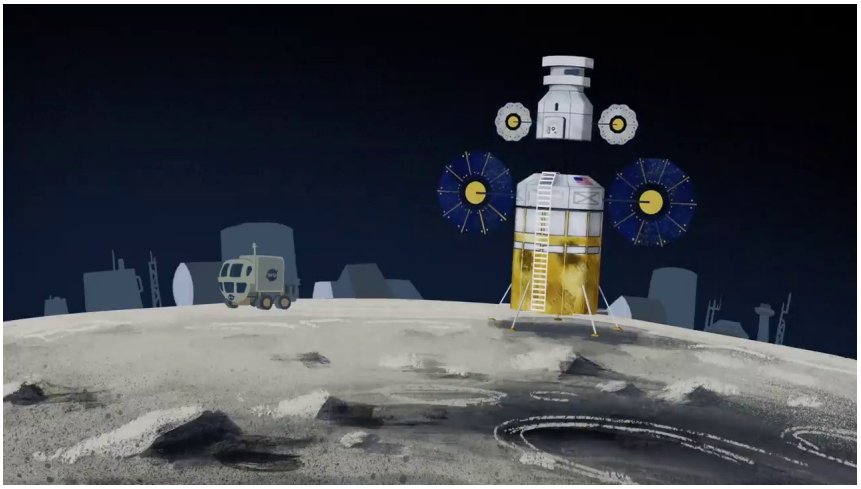

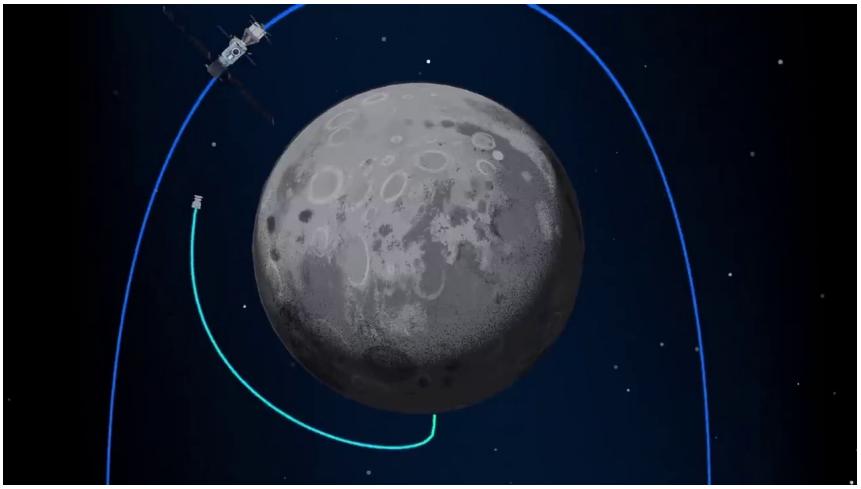

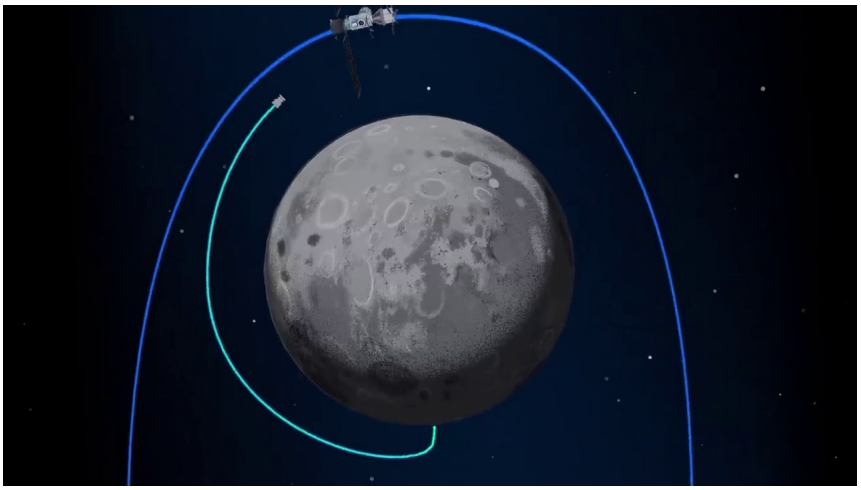

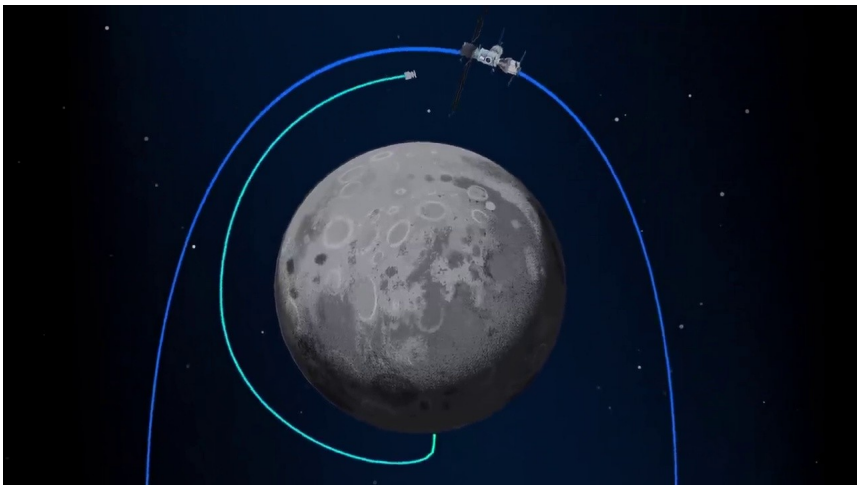

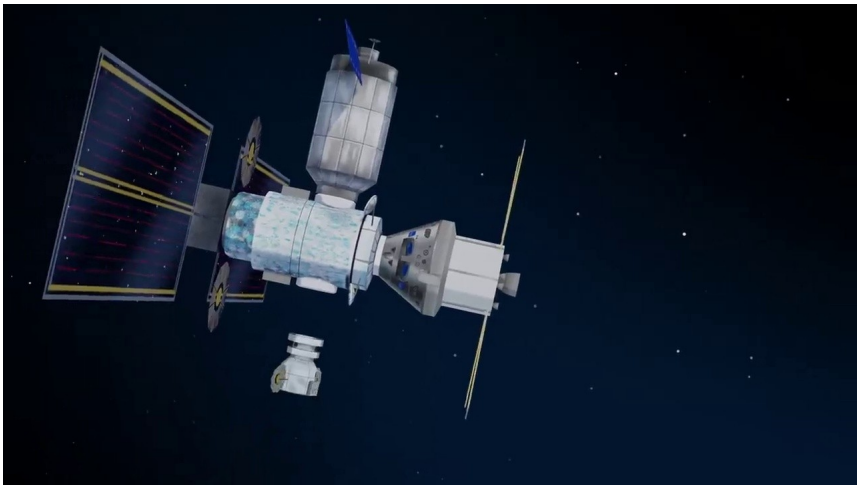

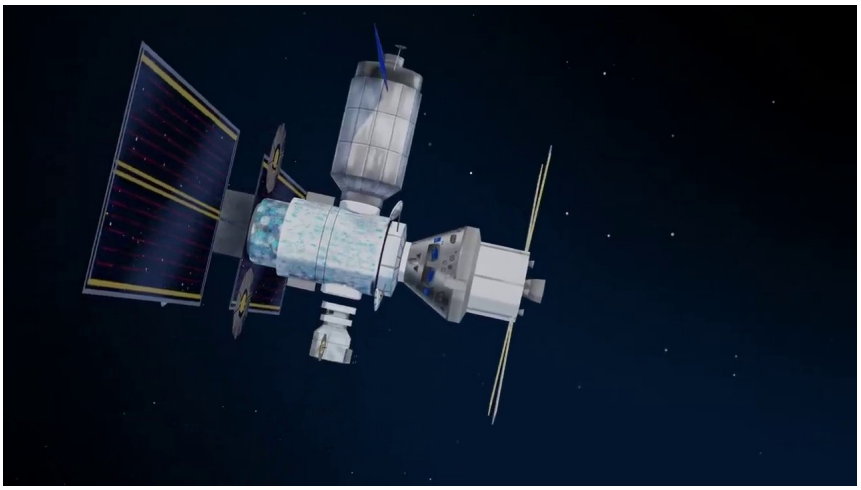

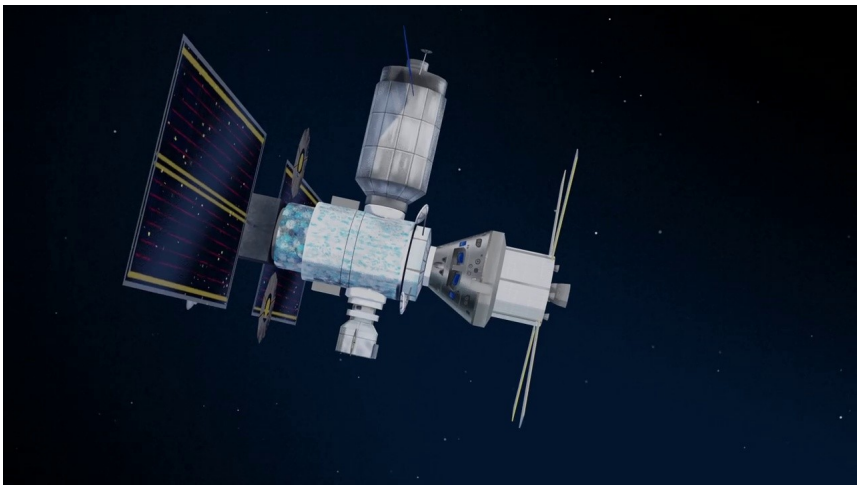

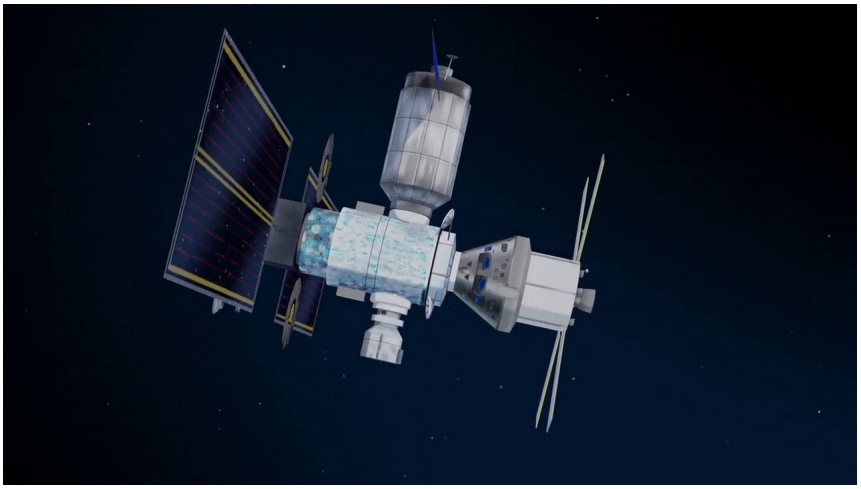

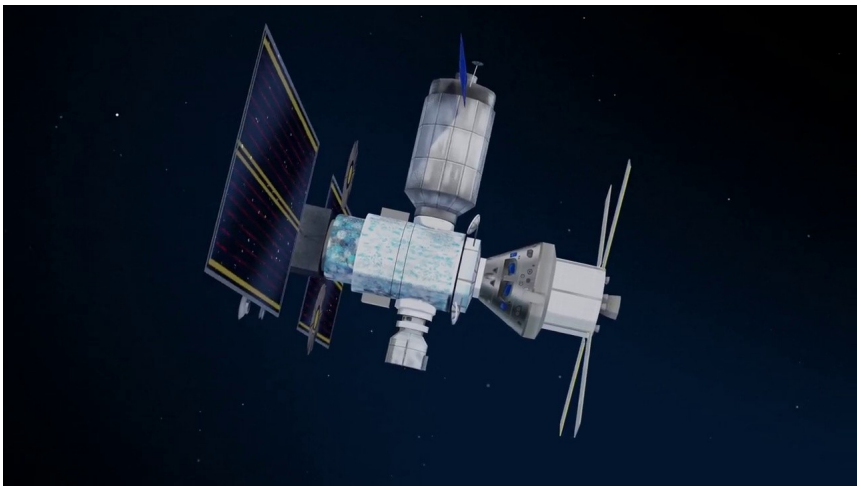

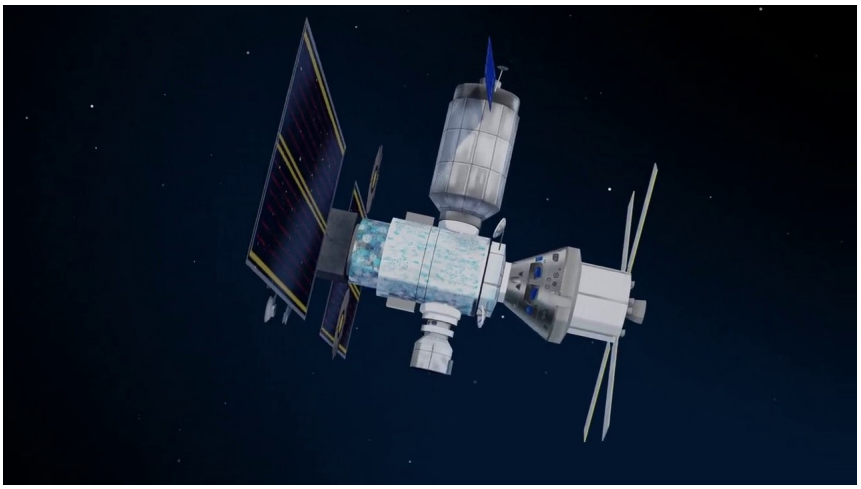


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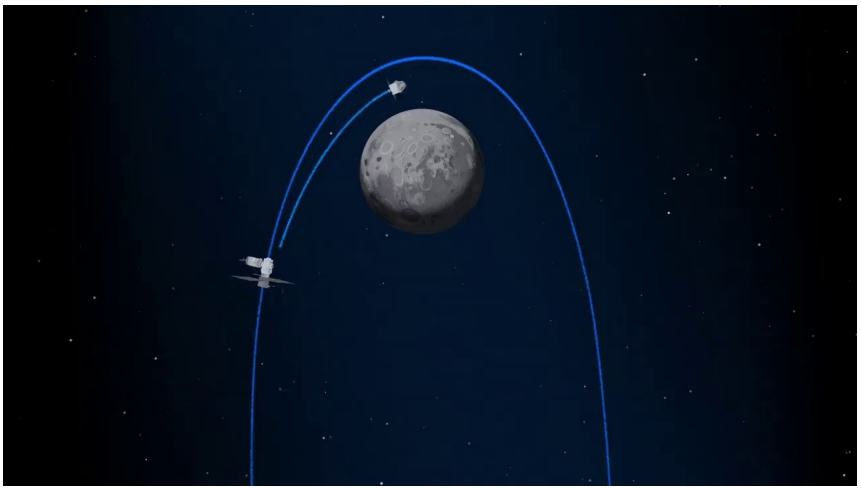

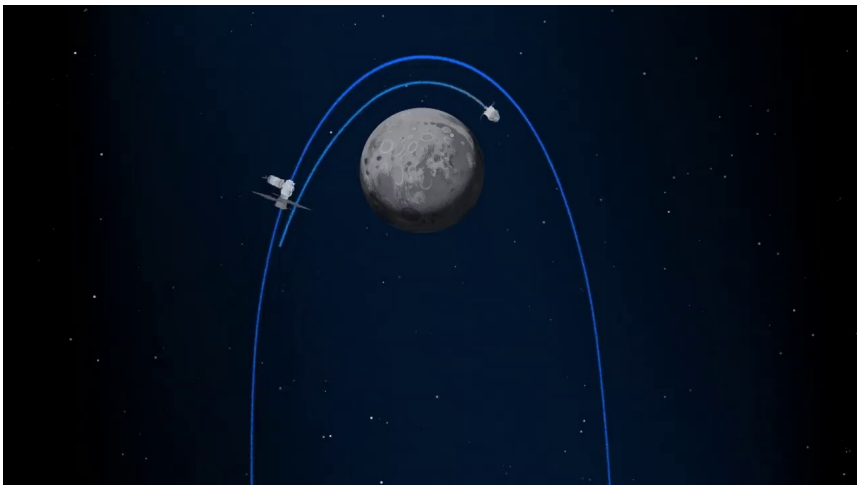

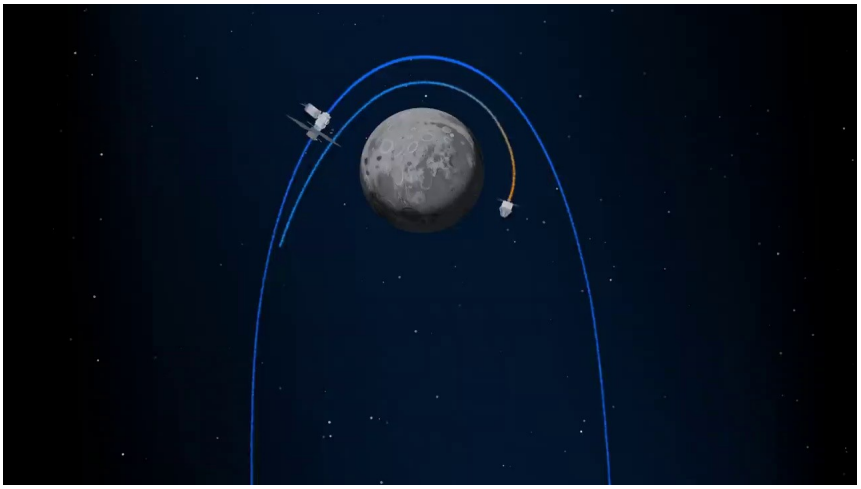

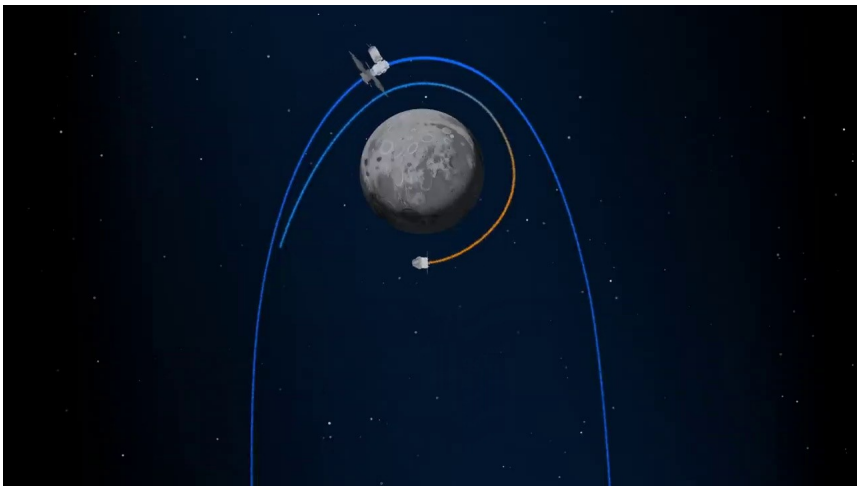

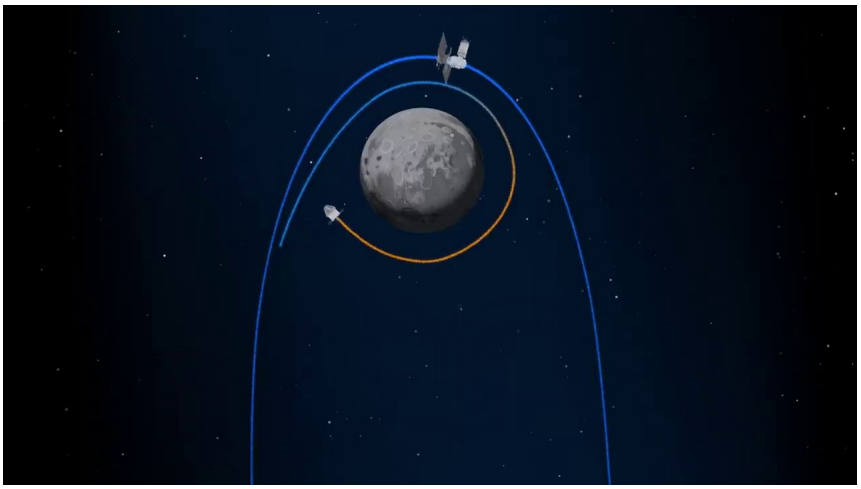

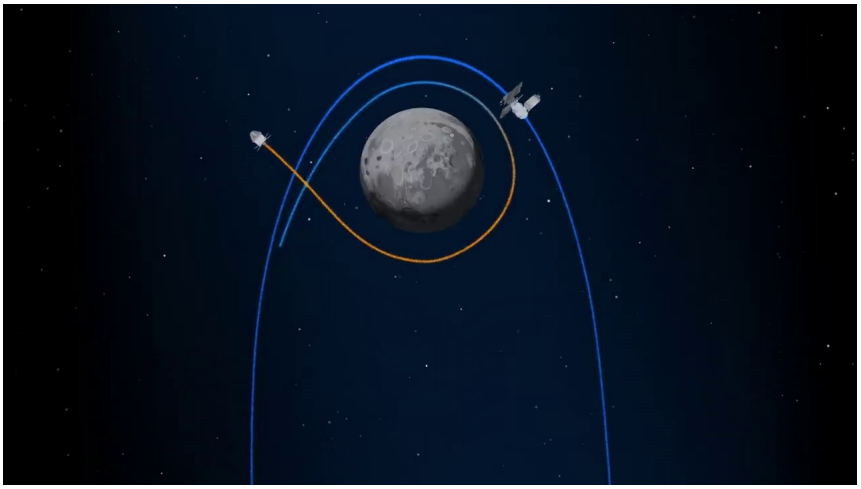

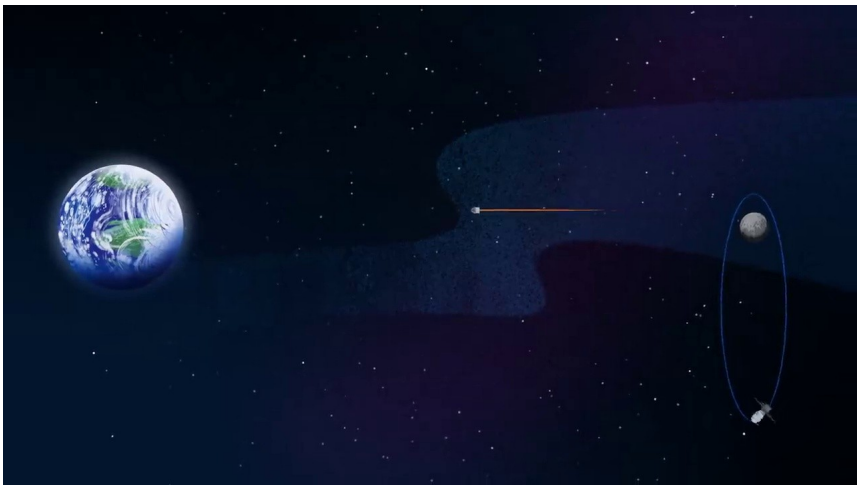

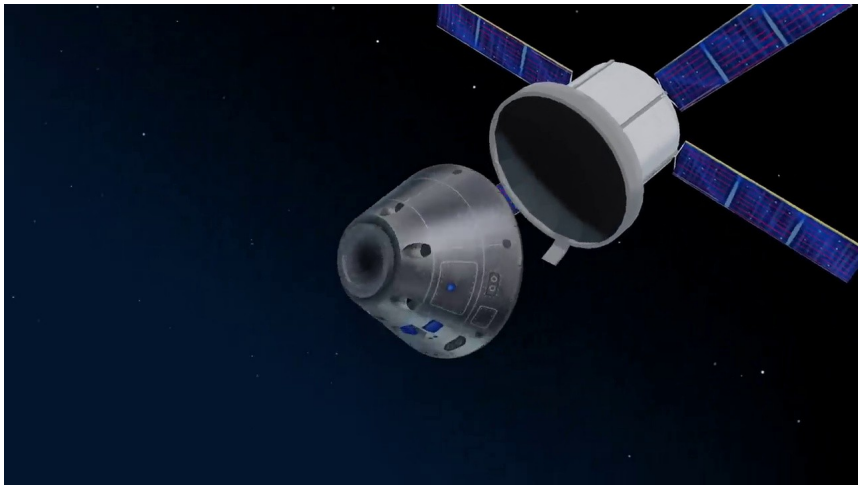

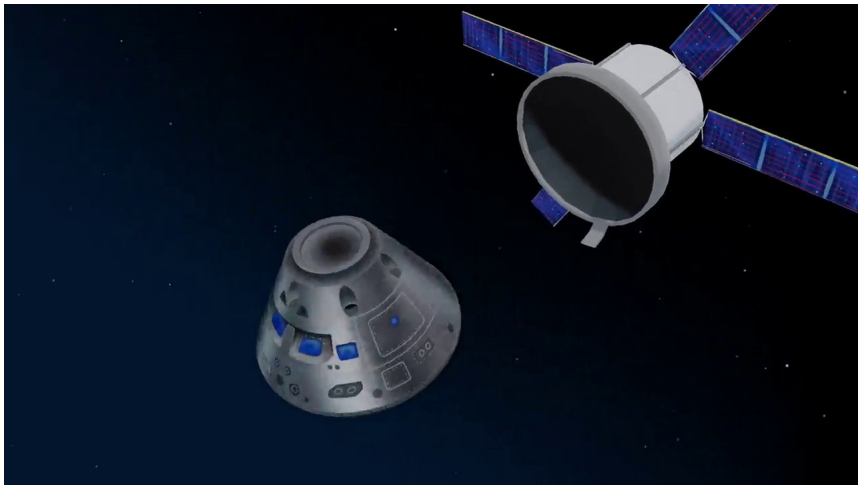

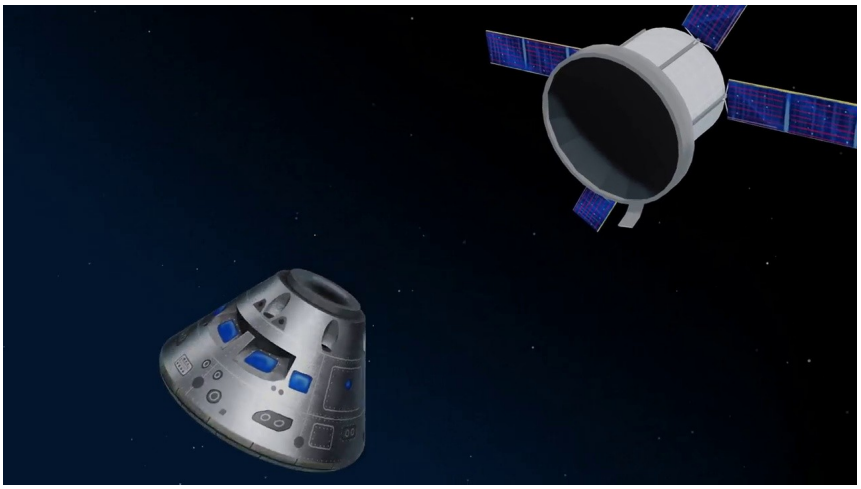

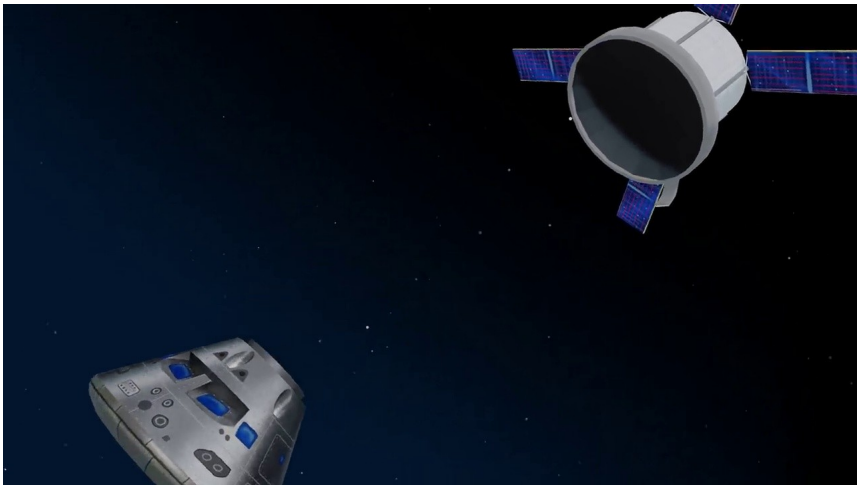

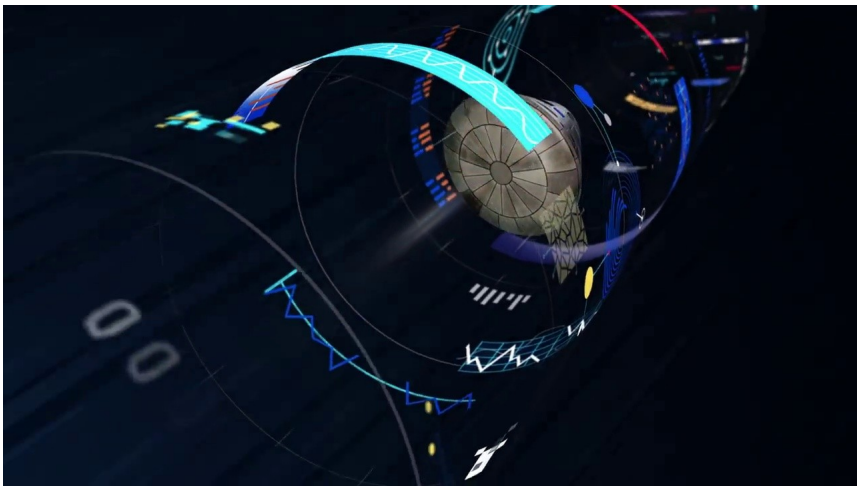

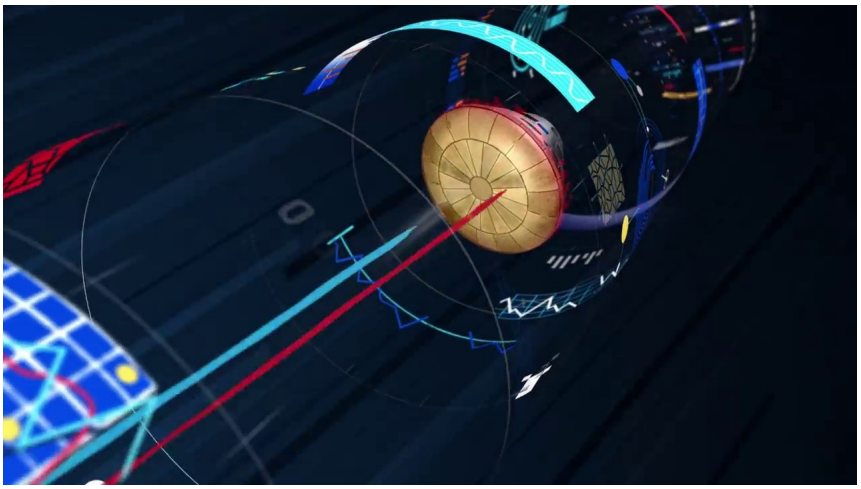

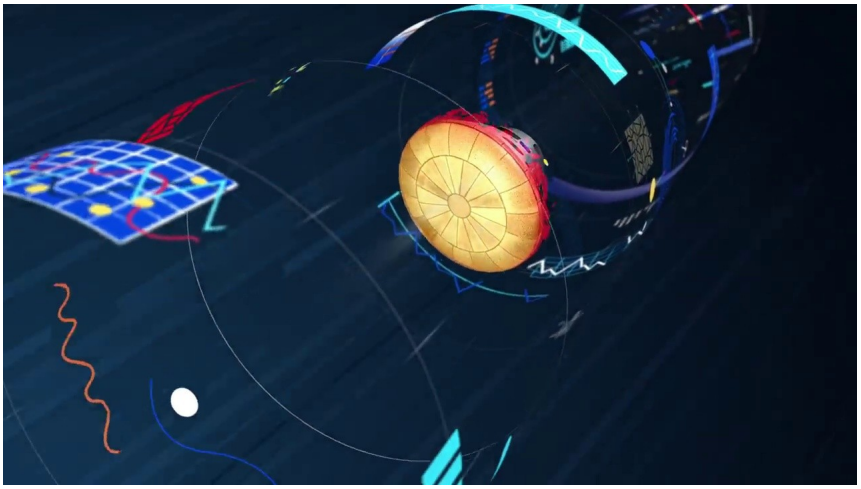

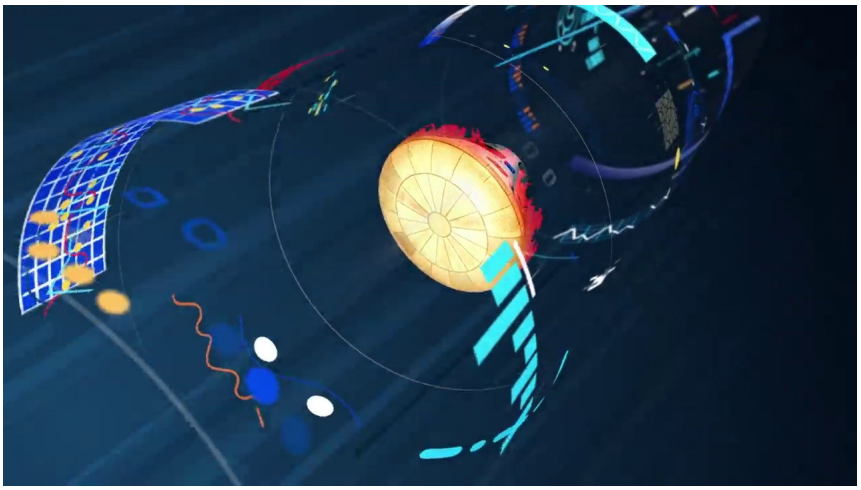

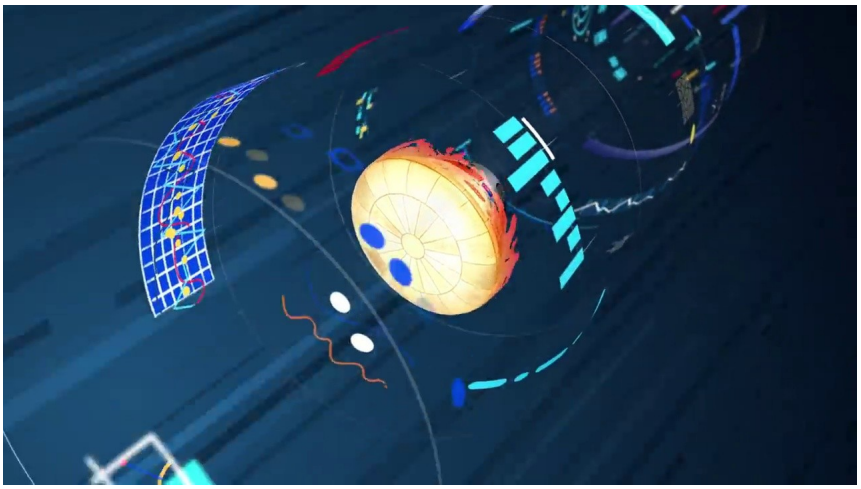

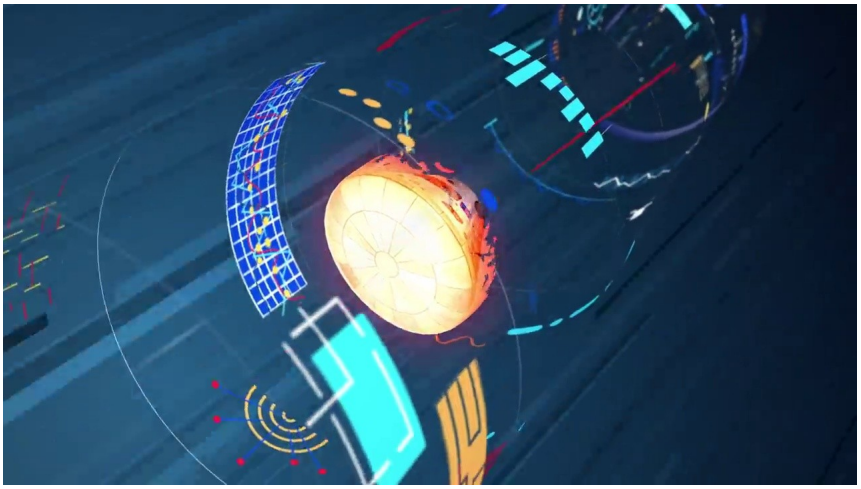

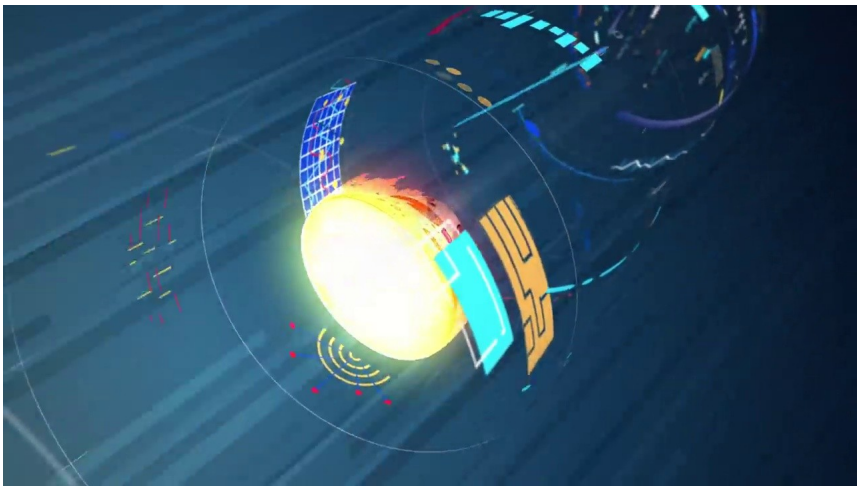

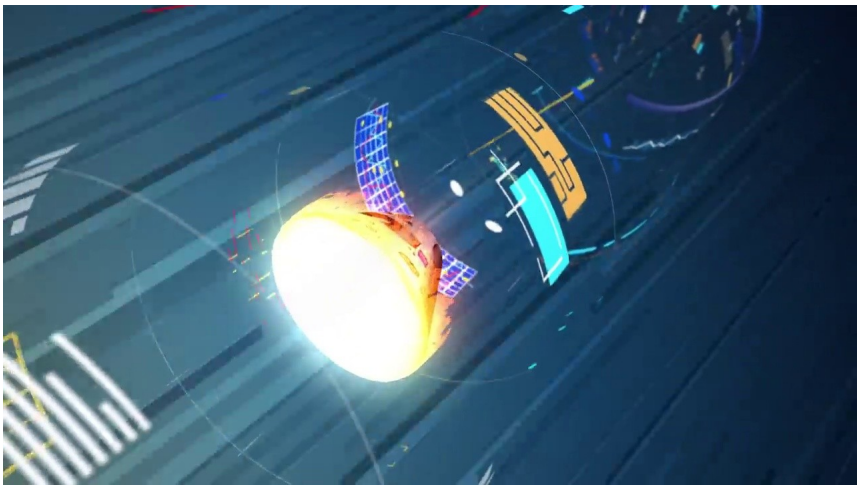

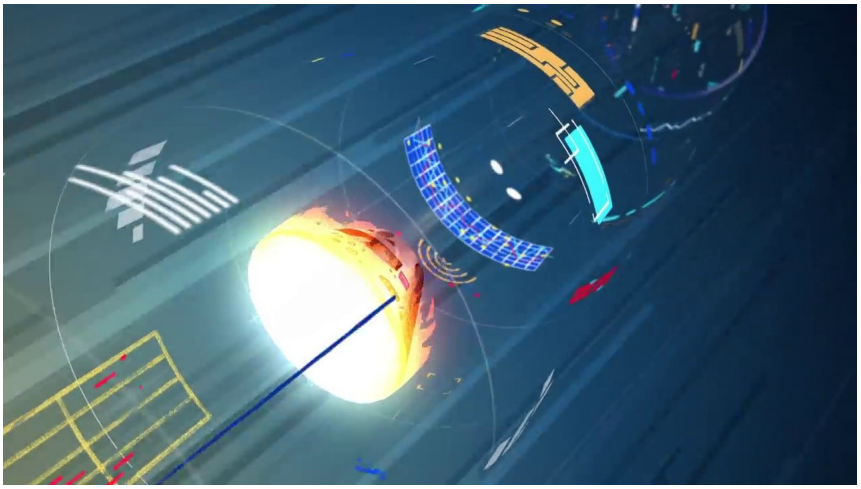

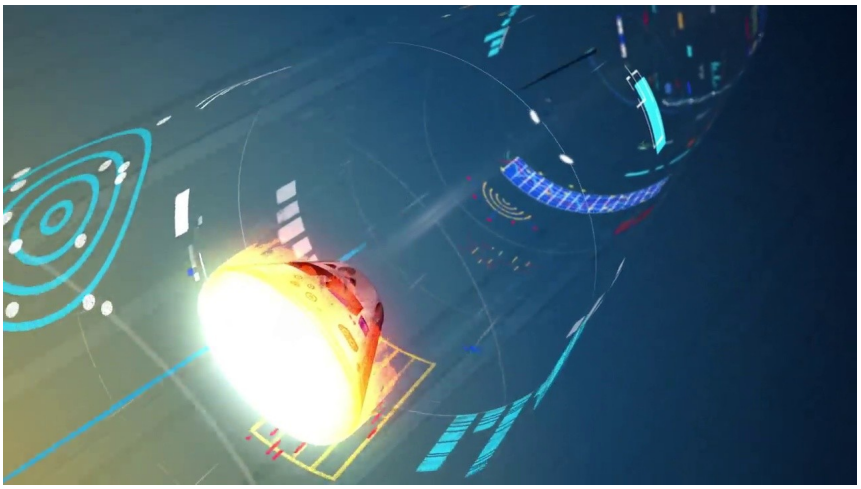

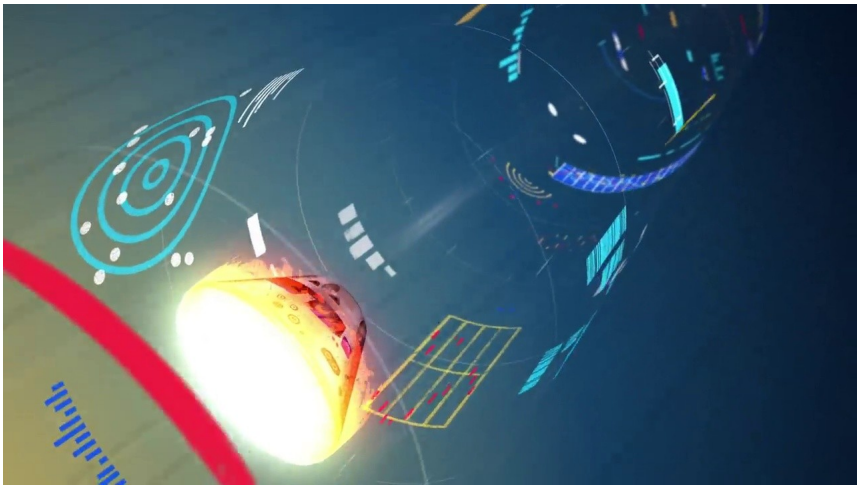

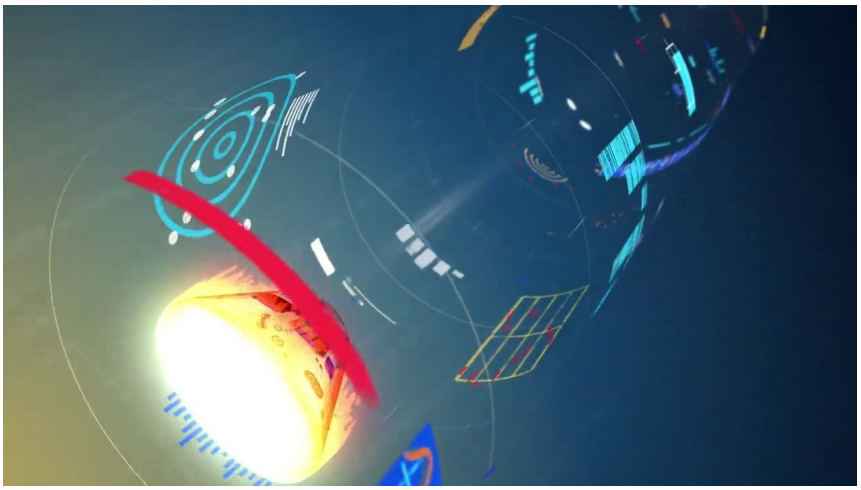


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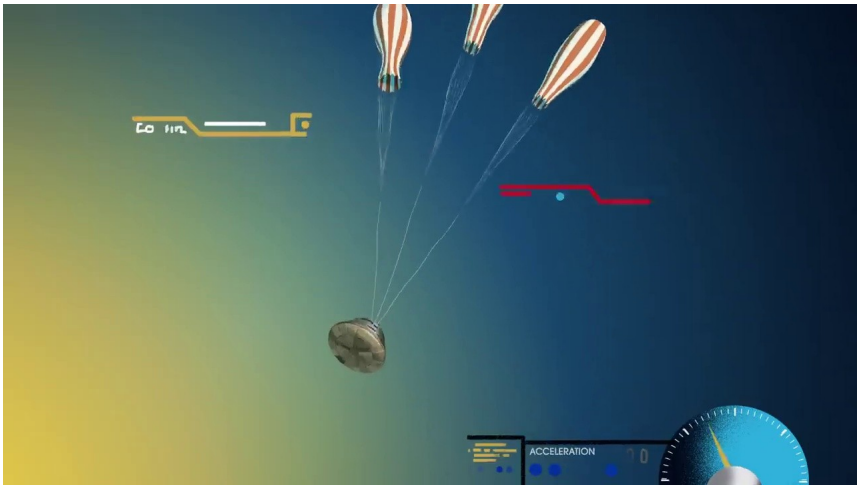
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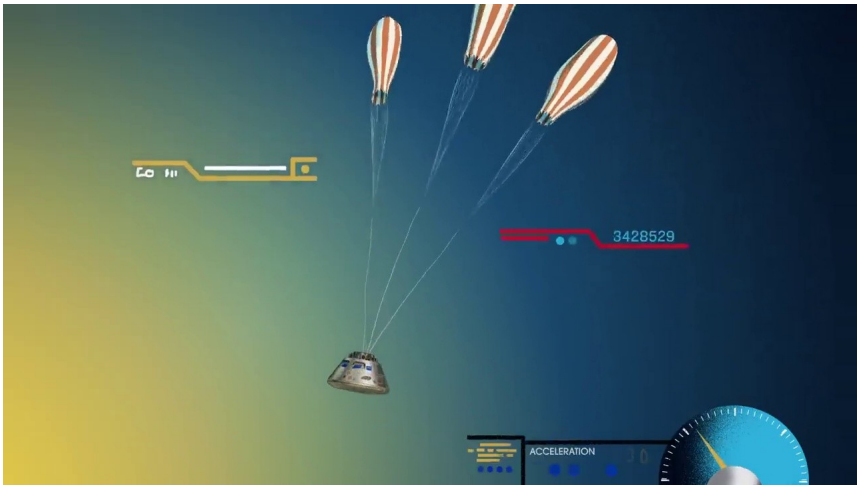
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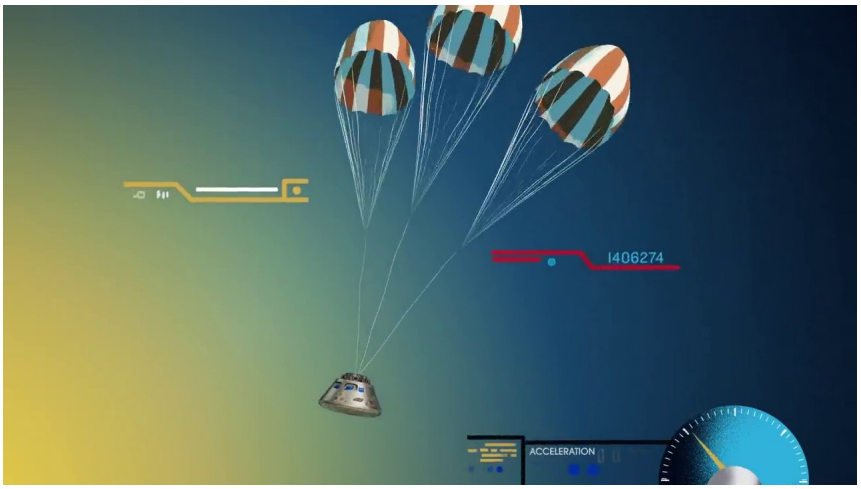
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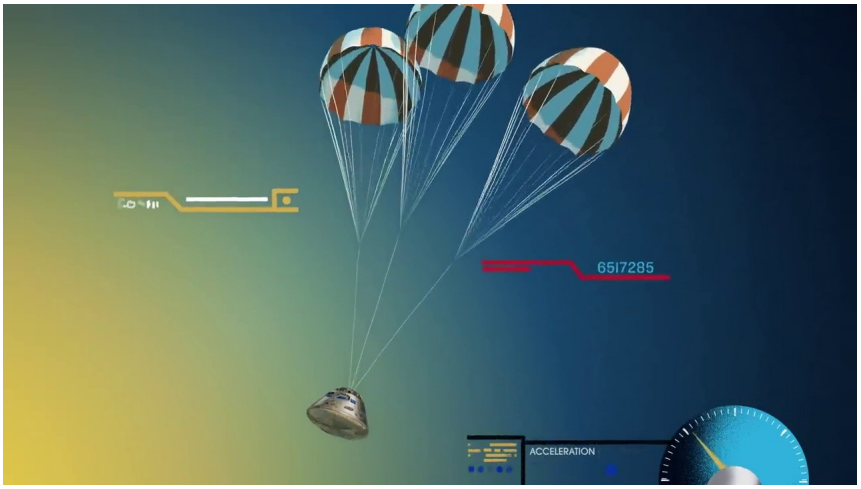
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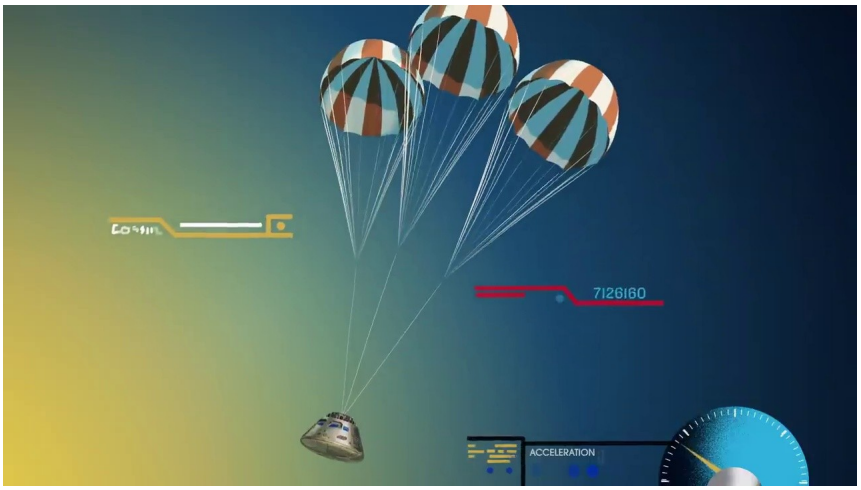
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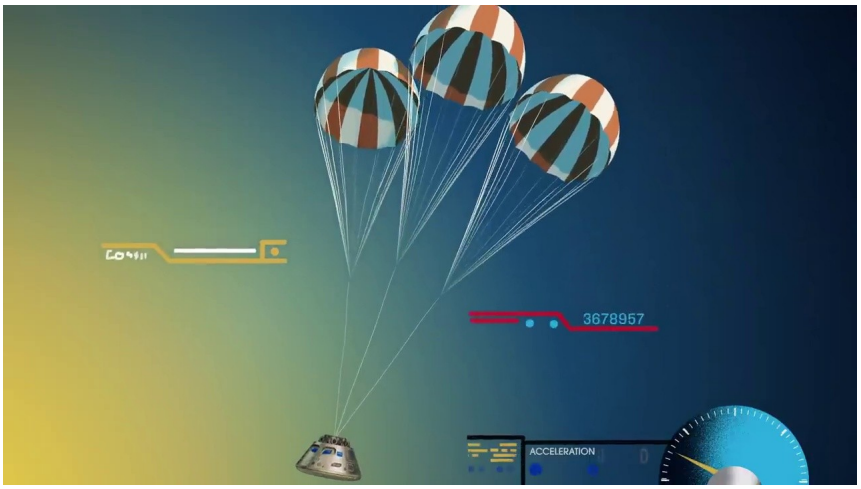
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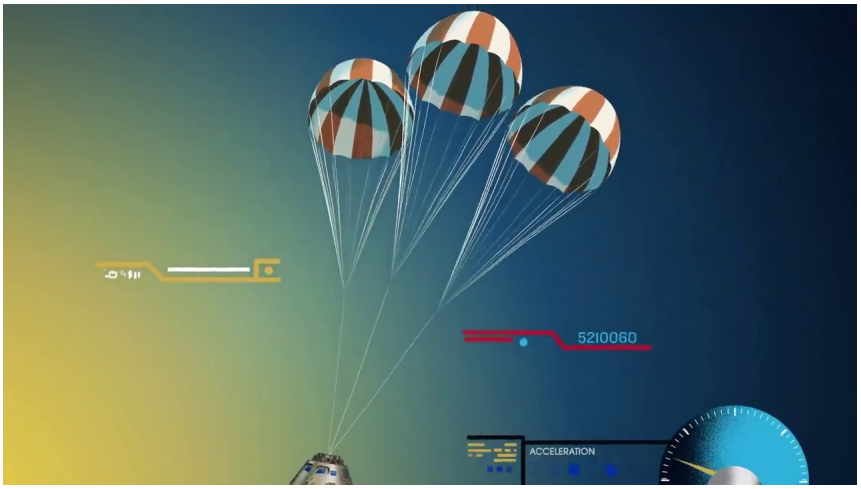
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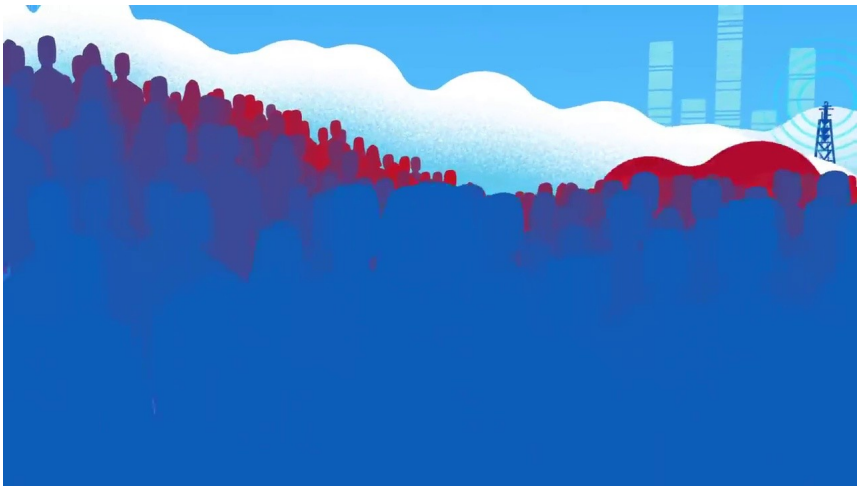

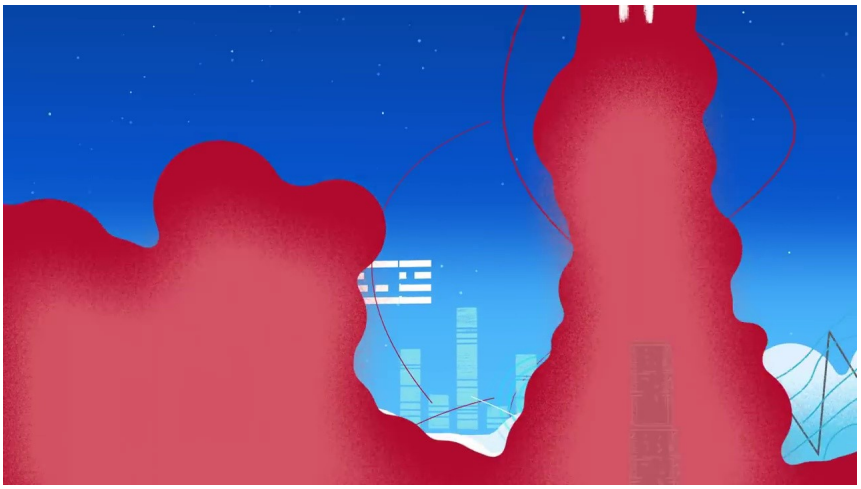

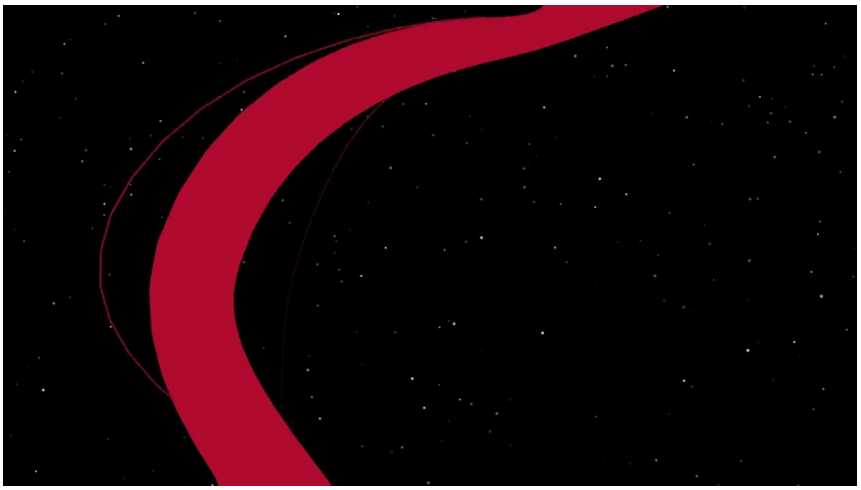

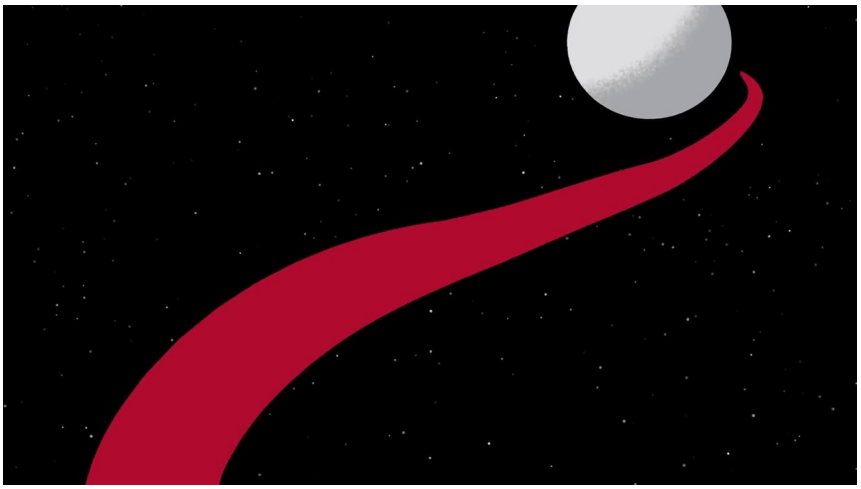

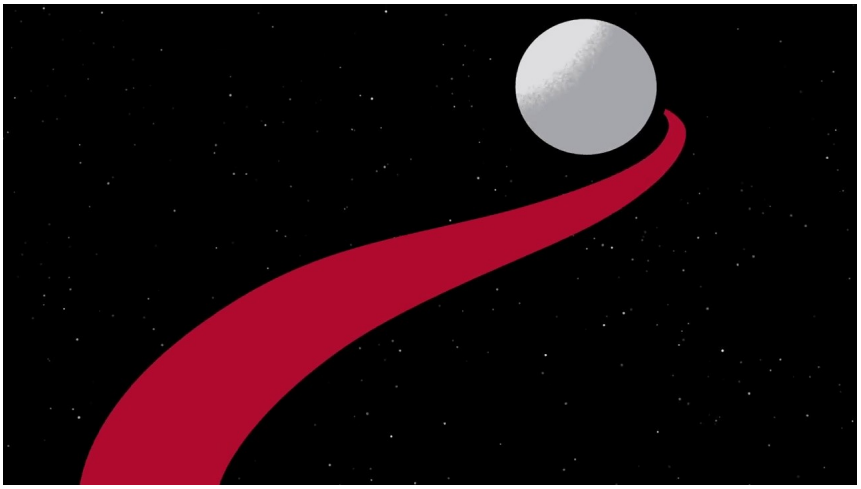

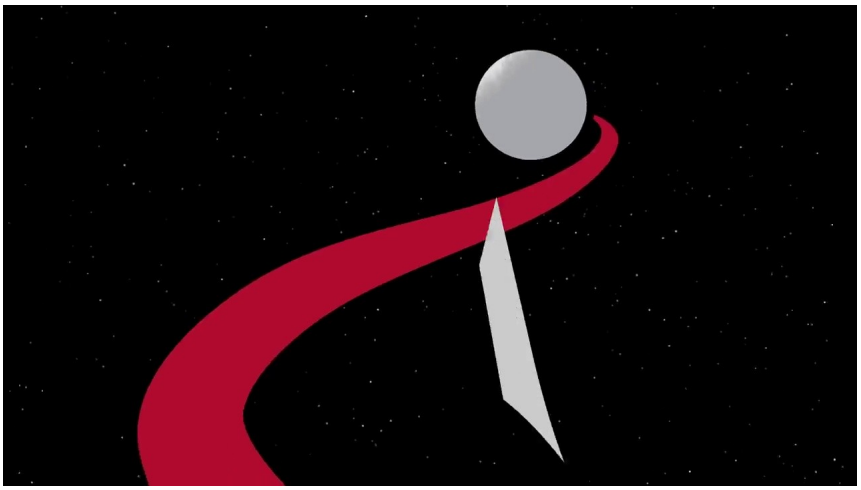


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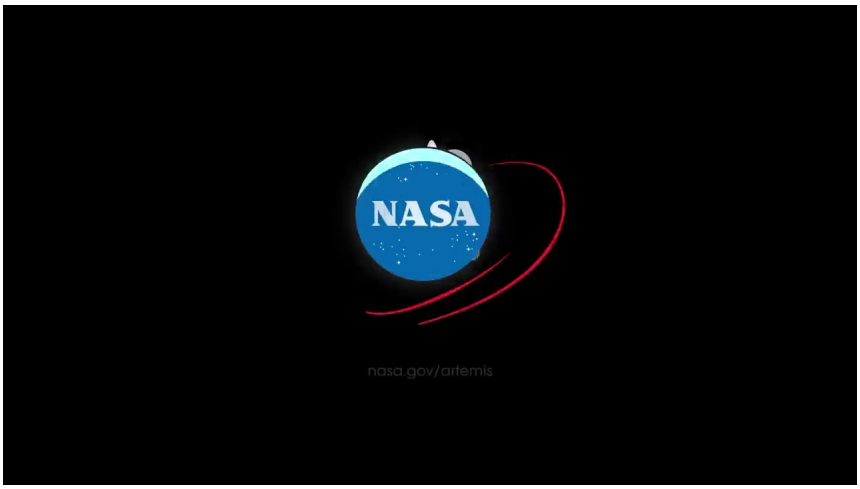
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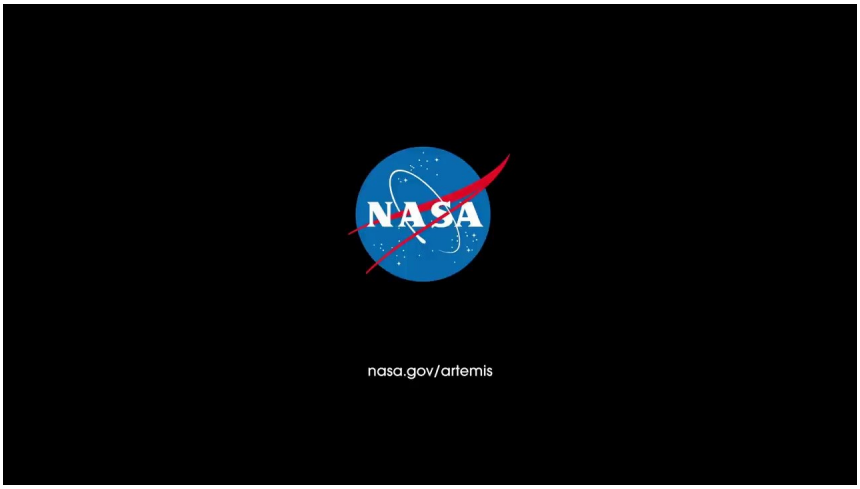
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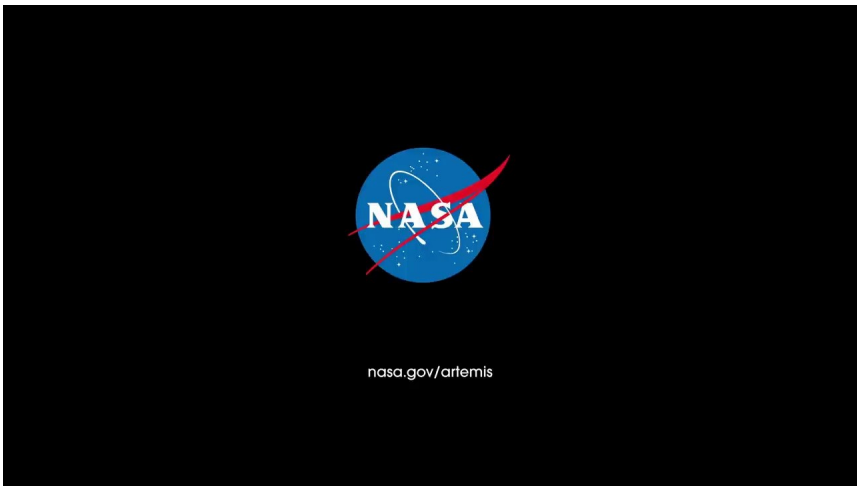
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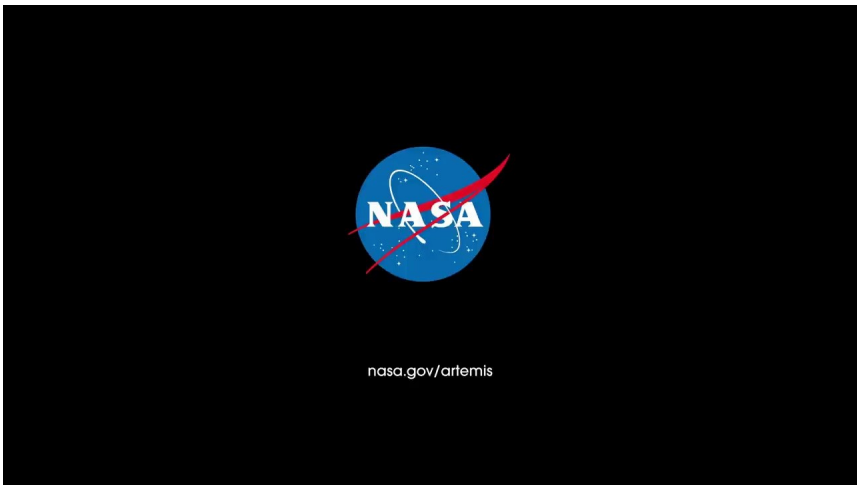

How We Are Going to the Moon

Between 1968 and 1972 America launched nine human missions to the moon, six of which successfully touched down, allowing 12 men to walk on the lunar surface. NASA's next chapter of lunar exploration called Artemis has the task of not just going to the moon to create a long term human presence on and around it, but also to prepare for ever more complex human missions to Mars. In short everything we must be able to do here. We must first do here. So what will an Artemis mission look like? Everything is designed and tested with our most important element in mind the astronauts. This is their deep space human rated spacecraft called Orion, built in three parts the crew module where up to four astronauts will live and work throughout the flight. The service module with life support systems for the crew and its own engine and fuel reserves and to launch abort system with engines capable of pulling the crew module to safety during launch. Should anything go wrong. To accomplish the task of launching our crew and heavy payloads, NASA is building the space launch system comprising of a cargo hold and exploration upper stage, a massive core stage and two extended solid rocket boosters altogether. This is the world's most powerful rocket and it exceeds the legendary Saturn five of the Apollo era in numerous ways. Sitting on the launch pad, the entire rocket, fully fueled, weighs just over 6 million pounds, 5.2 million of which is just the fuel. Once ignited, there was no stopping what comes next. All four RS 25 engines and the two solid rocket boosters come to life thundering our crew upwards. Two minutes after ignition, the solid rocket boosters are spent and released eight minutes after launch. The core stage is depleted and separated. The upper stage fires briefly placing Orion into a parking orbit around the earth. Here the crew reconfigure the spacecraft and check systems to confirm everything is ready for deep space travel. With a go from mission control, the crew reignites the exploration upper stage engines to leave Earth entirely. The exact timing of this maneuver is critical to reach a speed that can escape Earth's gravitational pull, but also put Orion on a course that will intersect the moon days later. Once this burn is complete,

the upper stage of the SLS is jettisoned and the crew aboard Orion coast for several days to work all that awaits them at the moon. Approaching the moon, we see the fundamental differences between Artemis and Apollo. Instead of requiring arriving to serve as an expendable lunar command module or to carry a constrained lunar lander. The Artemis missions will take advantage of a different approach. Prestaging. Everything needed for lunar missions will be positioned in advance by commercial and international partners. This includes rovers, science experiments and human rights systems on the surface, but it also includes a dedicated lunar station in orbit around the moon called gateway here at the station we can prestage a robust lunar lander and establish a strong communications relay. Designed with open standards, the Gateway can be expanded as new missions and partnerships develop. Allowing multiple human missions on the moon at the same time and enabling ongoing science to be conducted even between human missions. The Gateway is also capable of adjusting its orbit to allow access to every part of the moon, something the Apollo missions could not do. But the real key in this approach is placing Gateway in a unique halo orbit to perfect the maneuvers needed for MARS missions. And with the growing list of commercial and international opportunities, gateway is the ideal hub between Earth and all that lies beyond returning to our crew. As they approach Gateway, the Orion must match the elliptical orbit of the station in order to successfully dock. Once onboard preselected crew members transferred to the lunar lander while those assigned to Gateway remain on station. The Lunar Lander system itself is built for three unique steps. Descending from the halo orbit of Gateway down to a low lunar orbit. Descending from low lunar orbit to the surface. And once the lunar mission is complete, launching from the surface of the moon and is sending all the way back to the orbiting gateway. Once back aboard the Orion spacecraft undocked from Gateway, the crew fire their engine wants to break out of the halo orbit and once again to sling the spacecraft around the moon, placing it on a multi day trajectory back towards Earth. As they near the end of this journey, the service module is released and the crew module is oriented heat shield, first. Entering Earth's atmosphere at 25,000 MPH, the friction of air slows Orion considerably, while also subjecting it to temperatures of 5000 degrees. With the Orion, now at just 300 MPH, a series of parachutes uniquely tested and produced for this moment are deployed. Decelerating the craft to just 20 mph for splashdown. With each successful mission, Artemis ushers in the next wave of men and women to explore our moon and prove that together we're ready to go beyond.