

THE FINAL FRONTIER: 3D PRINTING AND SPACE EXPLORATION

2023

3D PRINTING APPLICATIONS IN SPACE



Rockets

Additive manufacturing is enabling the creation of rockets that are entirely or partially 3D printed, revolutionizing the space industry.



Radio Antennae

In 2022, the National Radio Astronomy Observatory and Optisys collaborated on the metal 3D printing of orthomode transducers (OMT), which form part of electromagnetic devices.



Extraterrestrial Construction

Additive manufacturing is currently being used to attempt to make constructions that would be suitable for the lunar surface.



Satellites

Satellites can be manufactured entirely with 3D printing, for example by Australian firm Fleet Space.



ISS

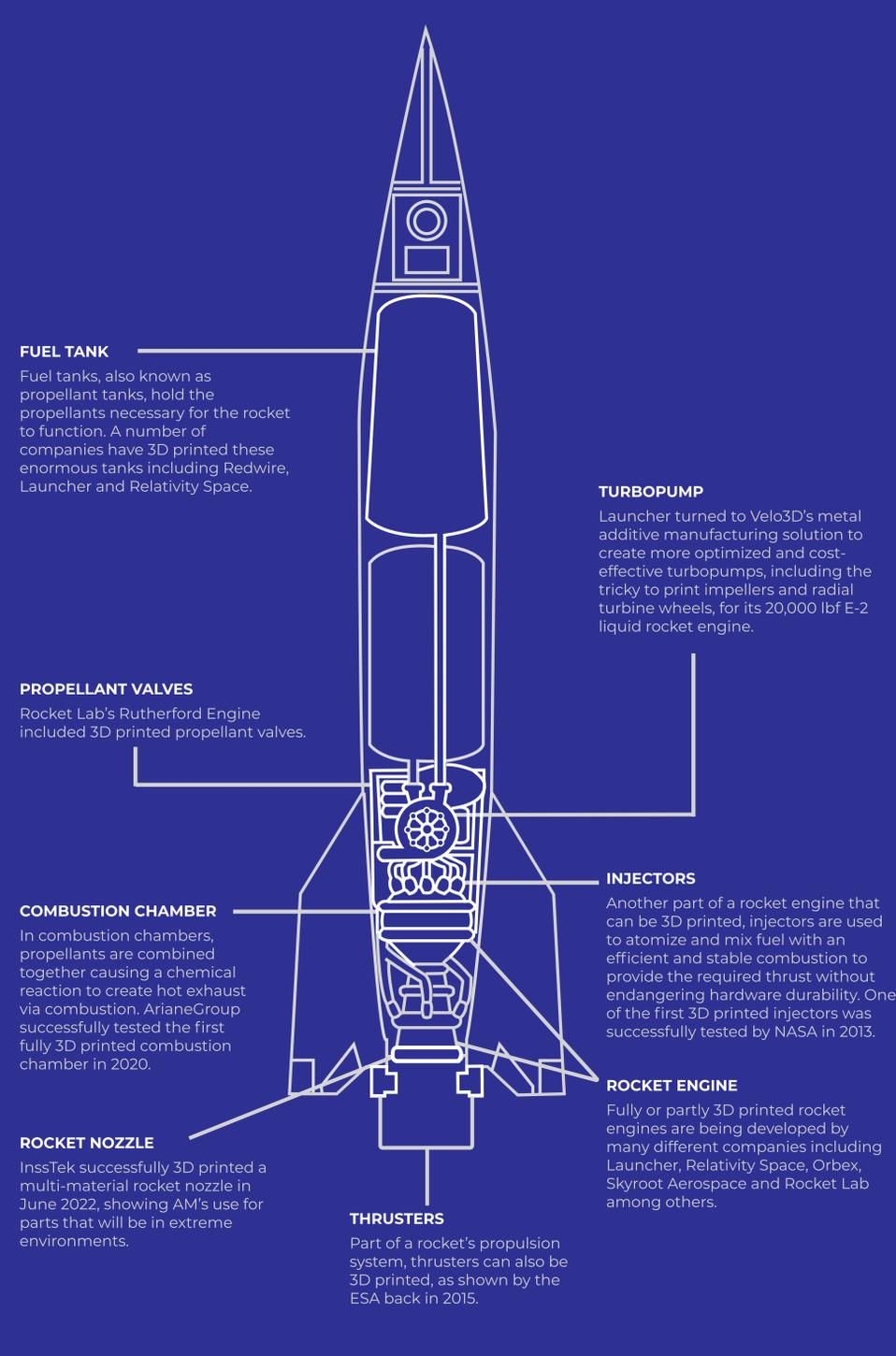
On the International Space Station, testing is being undertaken to see the viability of 3D printing (including for spare parts!) and bioprinting in space.



Spacesuits

NASA is funding a project to create custom spacesuits for astronauts.

3D PRINTED PARTS IN ROCKETS



KEY FACTS & FIGURES ON ADDITIVE MANUFACTURING IN SPACE

100 FEWER PARTS
are in Relativity's Space Terran 1 rocket thanks to AM.
(RELATIVITY SPACE)

7 YEARS
was how long it took in total, from conception to end, for the Terran 1 to be ready for flight.
(RELATIVITY SPACE)

2030
is when we could already have a fully 3D printed 'Moon Village' according to the ESA.
(ESA)

\$2.1B
is the expected market value of AM in the Private Space Industry by 2026
(SMARTTECH)

72% MORE EFFICIENCY
is possible in Launcher's 3D printed E-2 turbo pump thanks to its streamlined design.
(LAUNCHER)

LESS THAN 60 DAYS
is the number of days it takes to fully complete Terran 1, from materials all the way to flight.
(RELATIVITY SPACE)

TIMELINE

- 1994** ● DMLS, a key technology in aerospace additive manufacturing and one of the first metal 3D printing processes, is invented by EOS.
- 2010** ● Made In Space, one of the first companies dedicated to 3D printing in space, is founded.
- 2013** ● NASA funded a prototype 3D printer to print pizza (and other meals) for astronauts.
- MAY **2014** ● SpaceX unveiled the Dragon V2 space capsule, whose launch escape system includes the SuperDraco engine chamber, printed using DMLS.
- SEPT. **2014** ● NASA's ISM (In space manufacturing) project sent the first 3D printer to the space station to test 3D printing in Zero G.
- 2020** ● NASA's Perseverance rover, which landed on Mars on Feb. 18, 2021, carried 11 metal 3D printed parts.
- 2021** ● 17 companies, including SpaceX and winners of the NASA 3D Printed Habitat Challenge, were selected by NASA to co-develop lunar technologies.
- 2022** ● Uganda launched a satellite carrying a 3D bioprinter; NASA launched Artemis 1 which included rocket engine parts made using L-PBF.
- 2024** ● Relativity Space's 3D-printed rocket, the Terran 1, is set to launch from Cape Canaveral in Florida in the beginning of the year.