

# New era of human spaceflight

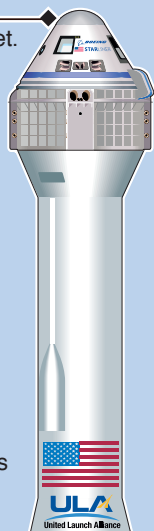
NASA astronauts will blast off from American soil for the first time in almost nine years when the SpaceX Crew Dragon launches atop a Falcon 9 rocket to the International Space Station (ISS). In 2014, NASA allocated \$8.5 billion to SpaceX and Boeing to develop crew capsules

## Boeing CST-100 Starliner

Crew: 7.  
Height: 5.0 metres

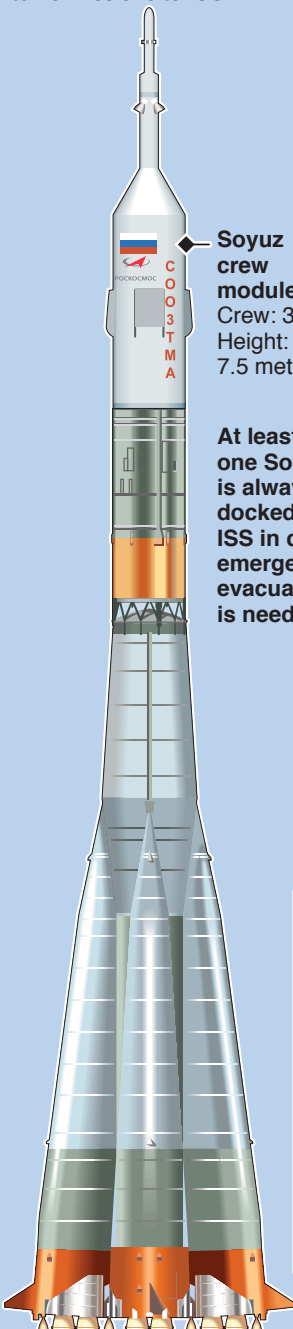


Reusable self-flying capsule, launched by ULA Atlas V rocket. Starliner is designed to fly up to 10 missions to ISS



**Soyuz crew module**  
Crew: 3  
Height: 7.5 metres

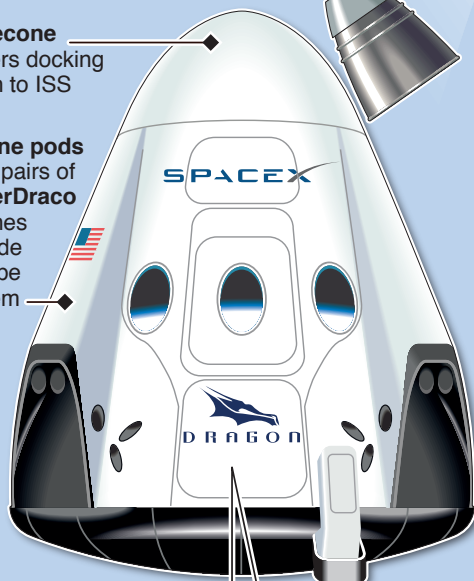
At least one Soyuz is always docked at ISS in case emergency evacuation is needed



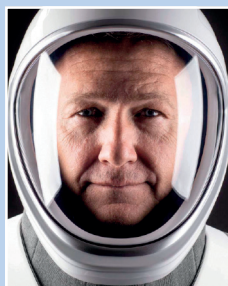
**Merlin 1D Vac engine:** Generates 801kN (81,700kg) of thrust in vacuum

**Nosecone**  
Covers docking hatch to ISS

**Engine pods**  
Four pairs of SuperDraco engines provide escape system



Landing legs



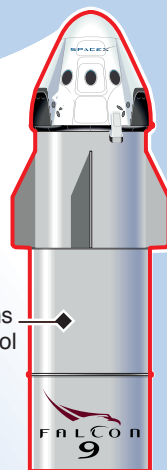
## SpaceX Crew Dragon

Crew: 7. Height: 8.1 metres

**Trunk:** Carries unpressurized cargo. Solar panels cover half of surface. Trunk jettisoned prior to re-entry

**Second stage:** Contains avionics and flight control computers

SpaceX Falcon 9 rocket



Inter-stage adapter



**Soyuz 2-1a launch vehicle**  
Roscosmos' Soyuz has been ferrying crew to ISS since November 2000  
**Cost: Up to \$86m/seat**

**ULA Atlas V rocket**  
Dec 2019: Unmanned test flight of Boeing Starliner fails to reach ISS  
**Cost: \$90m/seat**

**May 27, 2020: Doug Hurley (above left) and Bob Behnken (right)** will be first two NASA astronauts to fly Crew Dragon to ISS

**Falcon 9 reusable first stage:** Nine Merlin 1D engines, each with sea-level thrust of 654kN (66,700kg)  
**Cost: \$58m/seat**