**Update on Super Heavy/Starship Design**

On September 1, 2020, Elon Musk provided an update on Super Heavy/Starship design progress. He said that Super Heavy would now have 28 Raptor engines, a reduction from the prevously-announced 31. The design now used an outer ring of 20 fixed Raptors, each producing 250 tonnes thrust. An inner set of eight lower-thrust, throttleable Raptors would be used control acceleration during ascent and to descend and land the stage at the end of its missions.   
  
Together, the 28 Raptors would produce about 6,680 tonnes of liftoff thrust. Musk stated that plans called for the outer Raptors to see thrust increased up to 300 tonnes eventually, allowing total liftoff thrust to increase to about 7,500 tonnes for a 1.5 thrust to weight ratio. The overall picture presented by Musk was that the company intended to substantially increase the thrust of its still-in-development CH4/LOX Raptor engine as a means of reducing engine count on the giant Super Heavy booster. SpaceX had found that fixed throttle Raptors can operate at higher thrust than variable-throttle engines. This had forced it toward development of two sea-level Raptor variants.   
  
Musk also stated that prototype Super Heavy vehicles would use fewer Raptors - only two at first - during early tests from Boca Chica. Eventually, the fully-engined Super Heavy would produce so much thrust, noise, and ground vibration that it would have to launch from, and land on, floating platforms off shore.   
  
Finally, Musk said that prototype Starship flights would progress to use of three Raptors for higher altitude flights. These 9 x 50 meter versions would include nose cones and airfoils for the first time. Orbital versions to be launched atop Super Heavy would ultimately use six Raptors and would be equipped with a reentry heat shield. Super Heavy and Starship together would stand about 120 meters tall.

**Vehicle Configurations**

|  | **LEO Payload (metric tons)** |  |  | **Configuration** | **Dimensions (meters)** | **Liftoff  Mass (metric tons)** | **Liftoff Thrust (metric tons)** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| BFR 2016 | ~300 t | t | t | 2 Stage Fully Recoverable | 12 x 122 m | 10,478 t | 13,154 t |
| Super Heavy/Starship 2017 | ~100 t | t | t | 2 Stage Fully Recoverable | 9 x 106 m | 4,400 t | 6,305 t |
| Super Heavy/Starship 2019 | ~100 t | t | t | 2 Stage Fully Recoverable | 9 x 118 m | ~3,900-5,000 t | 4,800 t to 6,200 t |

**Vehicle Components**

| **Super Heavy Stage 1 (2017)** | **Starship  Stage 2 -(2017)** | **Super Heavy Stage 1 (2019)** | **Starship  Stage 2 -(2019)** |
| --- | --- | --- | --- |
| 9 m | 9 m | 9 m | 9 m |
| 58 m | 48 m | 68 m | 50 m |
| ~120 t (est) | 85 t | ~300 t (est) | 200 t (120 t goal) |
| ~2,525 t (est) | 1,100 t | ~2,525 t (est) (~3,300 t goal) | 1,200 t |
| 3,065 t | 1,335 t | 3,065-3,500 t | 1,400 t |
| Raptor | Raptor | Raptor | Raptor |
| SpaceX | SpaceX | SpaceX | SpaceX |
| CH4 | CH4 | CH4 | CH4 |
| LOX | LOX | LOX | LOX |
| 6,305 t | 1,220 t | 4,800-6,200 t | 1,200 t |
| t | 1,314 t | t | 1,300 t |
| 330 s | 330 s | 330 s | 330 s |
| 356 s | 356/375 s | 356 s | 356/375 s |
| s | s | s | s |
| 31 | 6 | 24-31 | 6 |
| - | - | - | - |

**Super Heavy/Starship Flight History**

Date Vehicle No. Payload Mass Site Orbit (kmxkmxdeg)

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NN/NN/NN AAAAA NNN AAA NN AA AA

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**LIST BY STAGE 1 SERIAL NUMBER**

X = Expended

OL = Ocean Landing

DRL = Down Range Platform Landing

LZ1 = Landing Zone 1 Landing

-X = Failed Landing

-S = Successful Landing (Scrapped)

-D = Successful Landing (Saved for Display)

-M = Successful Landing (Mothballed)

STA = Structural Test Article

QTA = Qualification Test Article

References

Draft Environmental Impact Statement, SpaceX Texas Launch Site, Vol 1&2, April 2013  
SpaceX web site www.spacex.com  
Elon Musk Twitter feed