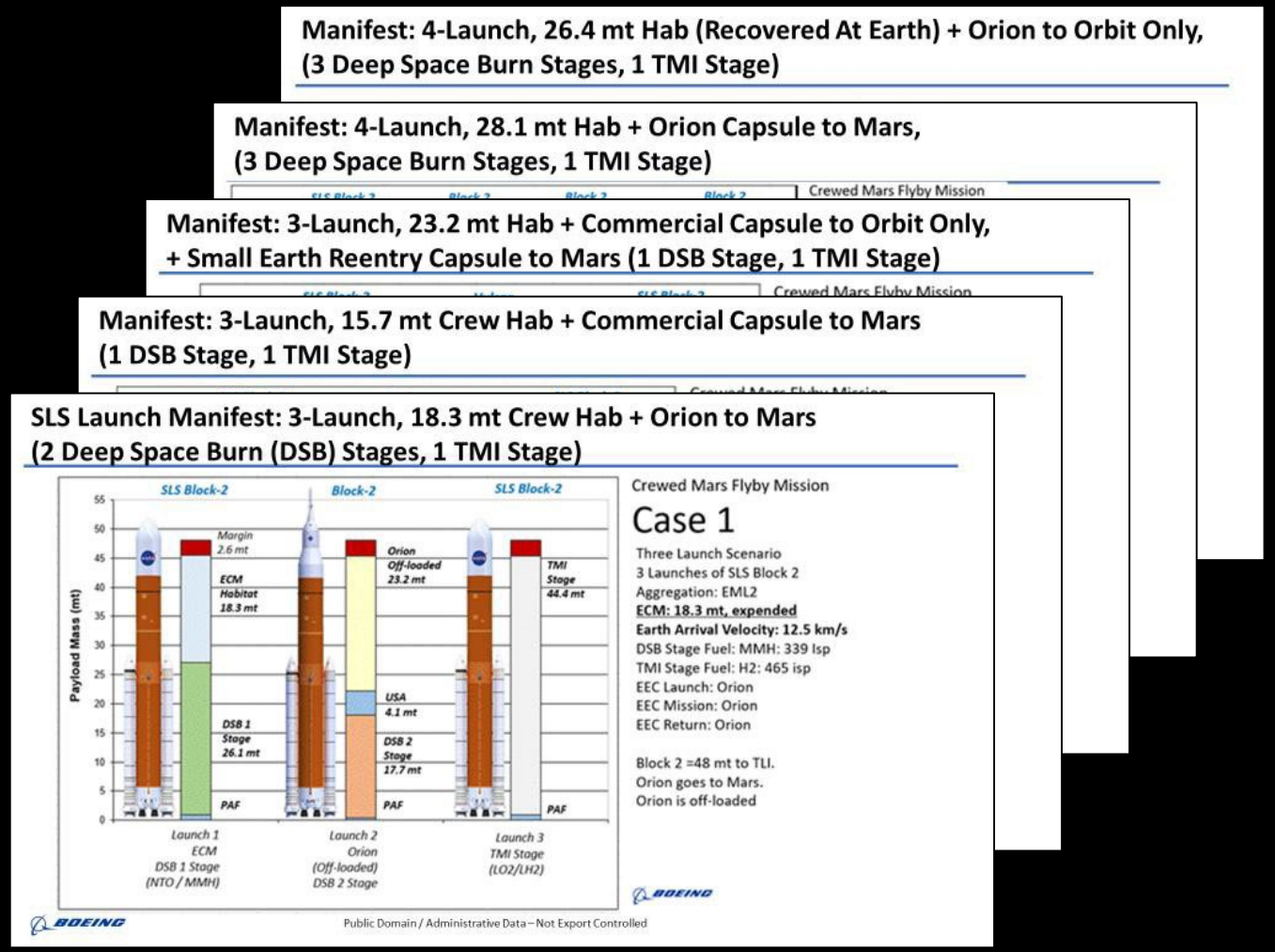
Boeing Study of Mars 2033 Human Flyby Mission

- A 2033 Mars Flyby mission allows for a free return trajectory with no propulsive maneuver required at Mars to affect a return to Earth.
- This greatly reduces the energy requirements for the transfer stages and allows for lighter stages and fewer launches than which would be required for a stopover mission.
- Four elements are required:
  - Crew habitat
  - Earth entry capsule
  - in-space stage
  - Earth departure stage.



BOEING

Tradeable Mission Variables

- Number and type of launch vehicles
- Aggregation orbit for Earth departure
- Habitat and Return Vehicle mass
- Earth return via an Earth Entry Capsule or recapture of the crew habitat
- Magnitude of Deep Space Burn DSB burn
  - Earth entry speed and Thermal Protection System
- Propulsion/fuel type for transfer stages
- Number of crew

BOEING

Advantages of a Flyby Mission

- 2033 is a favorable, low dV cost opportunity due to planetary alignment and mechanics.
- Flybys are dramatically cheaper in prop than stopover missions.
- A Flyby mission is consistent with Apollo approach – a steady buildup and test of capabilities.
- A Flyby mission is the first step to a surface landing.