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for Universal Opportunities

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SpaceX Launch Vehicle Program

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SpaceX Launch Vehicle Program

Lee Rosen, Vice President, Customer Ops & Integration

May 24, 2016

SpaceX Overview

- Founded in 2002 to revolutionize space technology, with the ultimate goal of enabling people to live on other planets
- Approximately 5,000 employees and growing
- Over 1.5 million sq ft of offices, manufacturing and production in Hawthorne, Calif.
- Offices in Washington, D.C.; Chantilly, Va.; and Houston, Texas
- Launch sites at Cape Canaveral Air Force Station, Fla., Kennedy Space Center, Fla.; Vandenberg Air Force Base, Calif.; and Brownsville, Texas (2018)
- Test facilities in McGregor, Texas



SpaceX Vehicles



Falcon 9



Falcon Heavy



Dragon

SpaceX Reusable Rocket Philosophy

“If one can figure out how to effectively reuse rockets just like airplanes, the cost of access to space will be reduced by as much as a factor of a hundred. A fully reusable vehicle has never been done before. That really is the fundamental breakthrough needed to revolutionize access to space.”

--Elon Musk

Reusability Benefits

- Improved Reliability
- Greater Flexibility
- Lower Launch Costs

Reusable Booster Components

Merlin Engines



Independent engine gimbaling and throttling for vehicle control

Landing Legs



Four legs made of carbon fiber with an aluminum honeycomb structure

Reaction Control System



Cold-gas thrusters to provide for three-axis stability control

Grid Fins



Four fins in an "X-Wing" configuration to control vehicle roll, pitch, and yaw



Reusable Booster Development Program



2013 - Grasshopper



2014 - Falcon 9 Reusable Development Vehicle



2015 - Falcon 9 Droneship Landing Attempts

The Falcon has landed!



Dec 21, 2015
First Successful Land Landing

April 8, 2016
First Successful Droneship Landing



What's next?



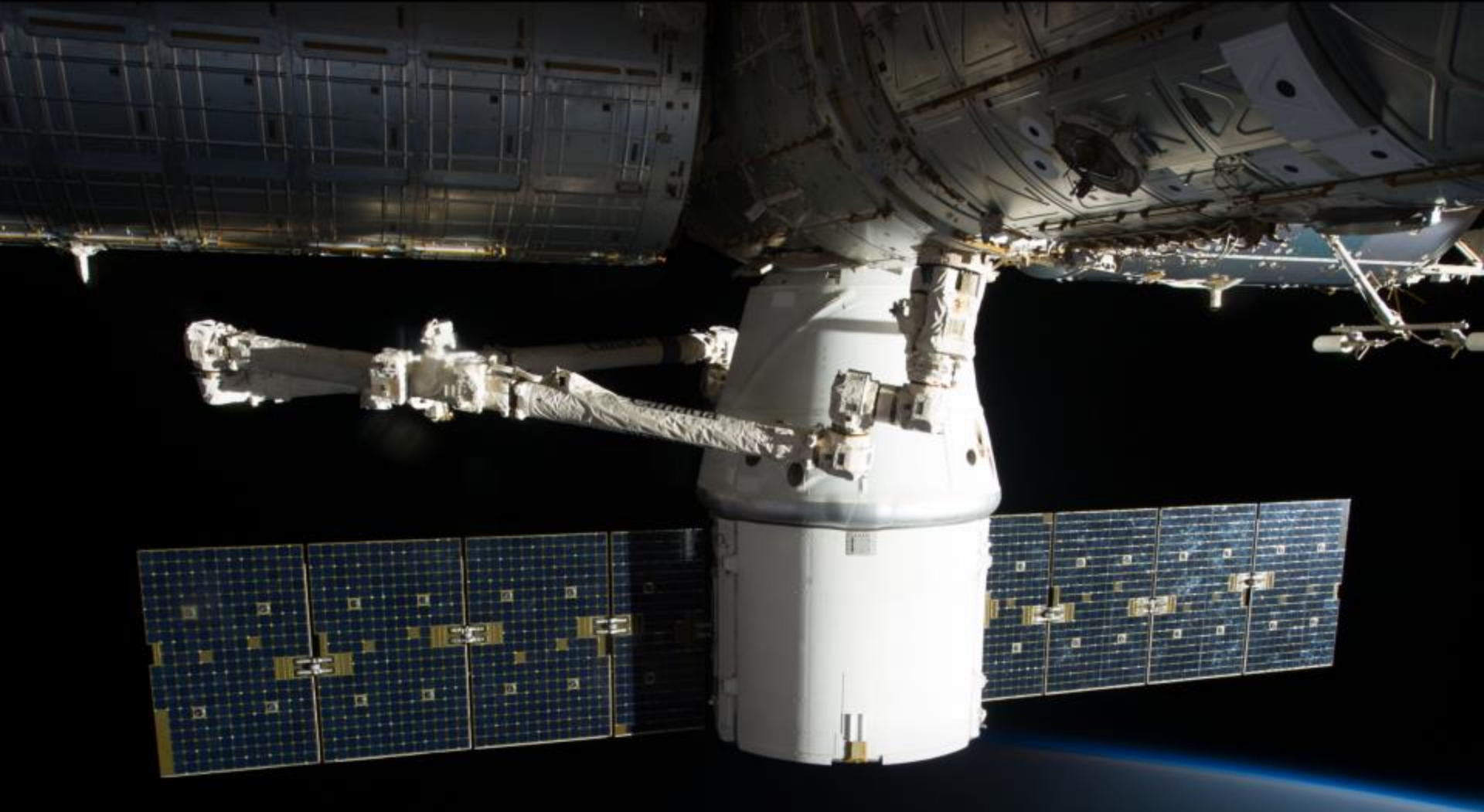
2016 - First Falcon Heavy Launch



2017 - First Commercial Crew Mission



2018 - First Dragon on Mars



Questions?