INSPACE
MISSIONS

Faraday IOD/Early Service Programme

An Ultra-Low Cost Commercial Service Providing Access to Space

FARADAY

Doug Liddle - CEO

www.in-space.co.uk

Company Overview

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- Owners: Doug Liddle and Tony Holt
- Team of 8 (and hiring)
- Company established in August 2015
- >130 years combined experience designing, building, testing, operating and selling space missions

In-Space primary mission is the collaborative development of new space businesses making maximum use of in-orbit demonstration

- ***Leading them from concept to fully funded, operational systems***
- ***Enabling and supporting 3rd party newspace businesses***

- In-Space also provides consultancy to newspace companies, traditional space companies, institutions and government. We have worked for or with over 30 separate organisations since 2015.
- Our model is to create collaborative networks to deliver large scale innovation without the need for large prime involvement.
- In-Space has developed two service offerings:
  - SpaceTime (real-time immersive video from space w/RWD)
  - Faraday IOD/ES

Faraday IOD Service

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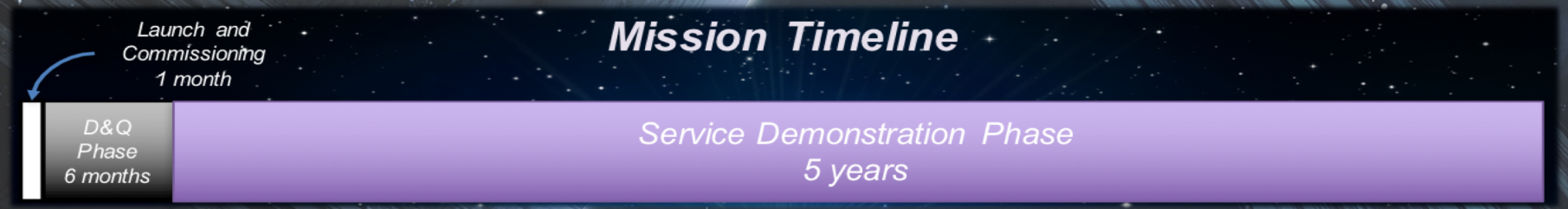
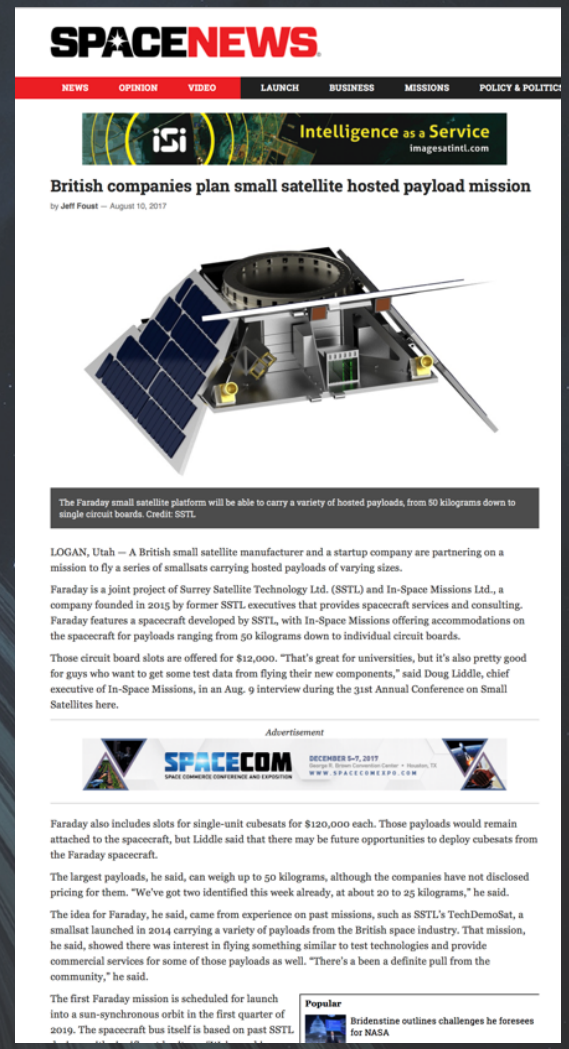
A series of ultra low-cost, hosted payload opportunities for early service and technology demonstration in Low Earth Orbit – the key is multi-manifesting

- 3-5 year missions
- From £5,000 to place a payload in orbit
- Led by In-Space Missions with a range of delivery partners: Bright Ascension, Magna Parva, Printech Circuit Labs, SSTL, GomSpace, ISIS, Kongsberg Satellite Services, SpaceFlight Industries and Rocket Lab



Key principals

- Faraday missions break even 6 months after commissioning – this allows us to offer fair prices to demonstration customers
- Beyond 6 months, service demonstration and 'satellite-zero' activities are based on an SLA model
- Fully commercially funded



SPACENEWS

NEWS OPINION VIDEO LAUNCH BUSINESS MISSIONS POLICY & POLITICS

British companies plan small satellite hosted payload mission

by Jeff Foust — August 10, 2017

The Faraday small satellite platform will be able to carry a variety of hosted payloads, from 50 kilograms down to single circuit boards. Credit: SSTL

LOGAN, Utah — A British small satellite manufacturer and a startup company are partnering on a mission to fly a series of smallsats carrying hosted payloads of varying sizes.

Faraday is a joint project of Surrey Satellite Technology Ltd. (SSTL) and In-Space Missions Ltd., a company founded in 2015 by former SSTL executives that provides spacecraft services and consulting. Faraday features a spacecraft developed by SSTL, with In-Space Missions offering accommodations on the spacecraft for payloads ranging from 50 kilograms down to individual circuit boards.

Those circuit board slots are offered for $12,000. "That's great for universities, but it's also pretty good for guys who want to get some test data from flying their new components," said Doug Liddle, chief executive of In-Space Missions, in an Aug. 9 interview during the 31st Annual Conference on Small Satellites here.

Faraday also includes slots for single-unit cubesats for $120,000 each. Those payloads would remain attached to the spacecraft, but Liddle said that there may be future opportunities to deploy cubesats from the Faraday spacecraft.

The largest payloads, he said, can weigh up to 50 kilograms, although the companies have not disclosed pricing for them. "We've got two identified this week already, at about 20 to 25 kilograms," he said.

The idea for Faraday, he said, came from experience on past missions, such as SSTL's TechDemoSat, a smallsat launched in 2014 carrying a variety of payloads from the British space industry. That mission, he said, showed there was interest in flying something similar to test technologies and provide commercial services for some of those payloads as well. "There's a been a definite pull from the community," he said.

The first Faraday mission is scheduled for launch into a sun-synchronous orbit in the first quarter of 2019. The spacecraft bus itself is based on past SSTL

Popular

Bridenstine outlines challenges he foresees for NASA

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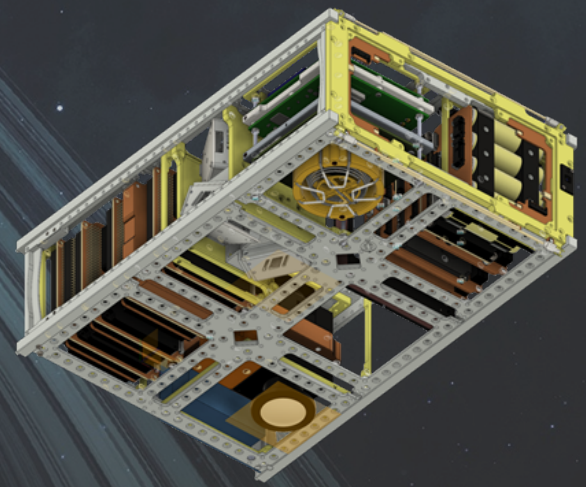
Faraday-1 Mission

- Faraday-1 is 6U CubeSat mission embarking several customer payloads for in orbit demonstration, qualification and early service purposes
- Core avionics from a single manufacturer to accelerate AIT and minimize non-compatibility issues
- Integration at In-Space facilities in Bordon, Hampshire
- GomSpace was down-selected based on being able to:
  - Provide a reliable and robust system with proven flight heritage (ESA GOMX4)
  - Able to meet the performance requirements and have scalability options
  - Able to meet cost and schedule
- Key features:
  - 4.5 kg of payload
  - Accommodation space for multiple antennas
  - Triple deployed solar panels ~12W OAP (45W peak)
  - 3 axis stabilized platform with ground station tracking capability (< 2degrees)
  - S-band payload downlink
  - UHF TT&C
  - Flight software with heritage from Bright Ascension
- **Launch in Q3 2019**



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Faraday-1 Architecture

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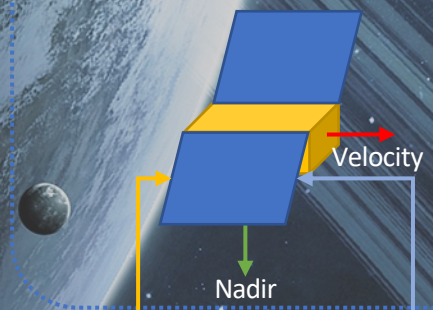
Space Segment

Faraday-1

- 6U Cubesat with multiple hosted payloads using dedicated SDR and antennas
- Platform utilises COTS Cubesat components (GomSpace GOMX4 ESA heritage + others)
- Provides 3 axis stabilised system



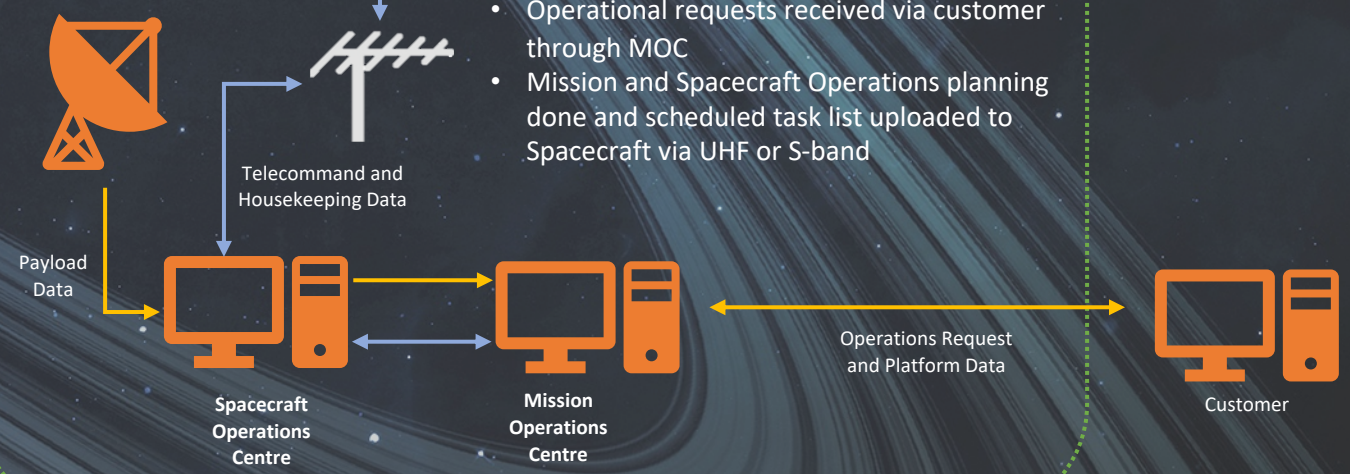
Launch Segment

Electron

- Shared launch
- Sun synchronous orbit with altitude 500 km and LTDN of 1030 (TBC)
- Launch from New Zealand
- Q3 2019

Ground Segment

- MOC/SOC operated by In-Space
- Operational requests received via customer through MOC
- Mission and Spacecraft Operations planning done and scheduled task list uploaded to Spacecraft via UHF or S-band



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Faraday-1 Payloads

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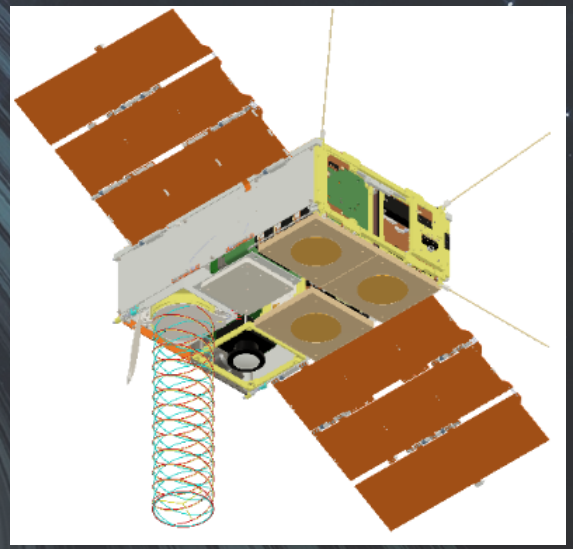
- Payload Customers
  - 2 from large companies with market cap > $2 bn (details under NDA)
  - 3 from start-ups
  - 1 from research organisation
  - 1 from SME serving institutional science market
- Payload Types
  - 2 Passive RF payloads
  - 2 Active RF payloads
  - 1 Ultra wide field optical imaging
  - 1 Passive optical retroreflector
  - 1 Passive internal payload
- Payload Locations
  - 4 UK
  - 1 Mainland Europe
  - 1 Canada
  - 1 Australia



- Extended operations
  - Under contract already from 2 of the 7 customers for exploitation beyond first 6 months
  - In negotiation with a further 2.

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Faraday Future – FD-1

- 3 additional Faradays currently on the drawing board:
- Faraday-1b/c/x, all 6U satellites (as planned but may expand to 8U if needed)
- Schedule:
  - Faraday-1b (Q2) filling fast but some space still available
  - Faraday-1x (Q3) limited space available – nearly full
  - Faraday-1c (Q4) all space available
- Several payloads from repeat customers
- Prices ~£120k/kg - £200k/kg of payload depending on location and views

Faraday Future – FD-2CS

- Faraday-2CS under development
- Much larger, more capable vehicle
- Lower price/kg for payload providers – economies of scale
- First launch in 2021
- Plan to bring price down to <£100k/kg
- Will become workhorse of Faraday programme with FD-1 launches interspersed to meet demand

Summary

- Ultra-low cost fully commercial IOD/Early Service capability
- Makes use of proven hardware and software from partners
- Ticket to fly for 6 months – all inclusive
  - Design support
  - Integration and satellite level EVT
  - Licensing and Regulatory
  - Launch campaign
  - Commissioning + 6 months of operations
- SLA for on-orbit service beyond this – extended service
- Launches every 3-6 months from 2020

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