

# **Civil Space Shortfalls**

Austin Link, Co-Founder Starfish Space





## Austin Link





Stanford B.S. Physics



Lockheed Martin Systems Engineer



Blue Origin Simulation Engineer



Purdue M.S. Aerospace



Starfish Space Co-Founder

Physics, Simulation and Modeling, Space System Architecture

### Starfish Space





#### **Resume:**

- Startup in Tukwila, Washington, founded October 2019
- Affordable satellite servicing with the Otter:
  dispose of dead satellites
  extend GEO sat lifetimes
- 70 full-time employees
- Otter Pup demo satellite currently in space



- Three Otter missions announced:









Manta articulating boom for efficient, precise thruster pointing



**Nautilus** docking mechanism with flexible end effectors for capture of unprepared surfaces

CEPHALOPOD autonomous guidance and control for EP-only rendezvous & docking

CETACEAN relative navigation using computer vision and modular sensor inputs

**ESPA-Class Bus** Modified off-the-shelf bus for flight heritage &

rapid production

**Electric Propulsion** Fully EP architecture

makes Otter highly efficient

while relatively small

**Propellant Packaging** Maximizing ΔV to perform multiple missions with a single vehicle

Austin Link



## NASA is Incredible

No other organization in the world can explore and inspire like NASA













### Why do space missions fail?



#### **Type A: Failed System**

- Hardware/software/operations unable to perform the mission
- "Traditional" failure
- Finite cost of failure



#### **Type B: Failed Cost/Schedule**

- System so expensive/slow that overall cost outweighs the benefit
- Non-obvious failure mode
- Unlimited potential cost



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## Why do space missions fail?



#### Type A: Failed System

- Hardware/software/operations unable to perform the mission
- "Traditional" failure
- Finite cost of failure
- Covered by Shortfall Ranking

More common failure mode? **Type B: Failed Cost/Schedule** System so expensive/slow that overall cost outweighs the benefit - Non-obvious failure mode - Unlimited potential cost

- Not covered by Shortfall Ranking

Cost/schedule failures are very common in space, and unaddressed by the Shortfall Ranking

## Do Cost and Schedule Count?



## What is a shortfall?

A shortfall is a technology area requiring further development to meet future exploration, science, and other mission needs. The term "gap" is widely used across NASA and the aerospace industry and implies both ends of the problem – the current state of the art and the technology needed – are known. In the case of shortfalls, we may only know where we are today.

#### Technology Area

Cost and schedule are deeply and inevitably interwoven with system design and technology deployment.

#### Exploration, science, and other mission needs











### Proposal:

Considering program timeline and cost failures in the Shortfall Rankings would **tremendously benefit STMD Objectives** 



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