Get your science on the Moon
January 2018
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Sean Mahoney, CEO, Masten Space Systems
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Sean Mahoney, CEO, Masten Space Systems
Dr. Clive Neal, Grandpoohbah
Masten Take Aways

1) Talk to Matt Kuhns or myself at this workshop.

2) Two designs available to begin conversation

**XL-1**
- 100 kg to the surface
- Soon

**Xeus**
- 1.5 mt to the surface
- Soon after

3) Masten has been reducing risks to your landing for 14 years and hundreds of landing operations.
Mission Driven Design → Capability Driven Design
Reuse changes the development approach
Increase $n$:
Don’t rely on everything right the first time.
Iterate quickly.
Iterate frequently.
Increase \( n \):
Don’t rely on everything the first time.
Iterate quickly.
Iterate frequently.

Use Flight Opportunities to get hands-on experience for your team and tech before selection and before launch

* or feel free to contract directly, of course
* See Alex from Flight Opportunities (wave)
Save Finger-crossing for the kids soccer game. 
Know it works with Reusable Rocket-powered landers

<table>
<thead>
<tr>
<th>XA-0.1-B-1</th>
<th>XA-0.1-E-1</th>
<th>XA-0.1-E-2</th>
<th>XA-0.1-E-4</th>
<th>XA-0.1-E-5</th>
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<tbody>
<tr>
<td><img src="image1.png" alt="Image" /></td>
<td><img src="image2.png" alt="Image" /></td>
<td><img src="image3.png" alt="Image" /></td>
<td><img src="image4.png" alt="Image" /></td>
<td><img src="image5.png" alt="Image" /></td>
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<tr>
<td>B-class type A vehicle “Xombie” in service since 2009</td>
<td>E-class type A vehicle “Xoie” in service during 2009</td>
<td>E-class type B vehicle “Xaero” in service between 2010 and 2012</td>
<td>E-class type B vehicle “XaeroB” entered test qualification service in 2014</td>
<td>E-class type C vehicle “Xodiac” entered test qualification service in 2015</td>
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5 Reusable Lander Vehicles Demonstrated

400+ Flights · Multiple Flights per Day · Small Team Operation
Robust Lunar Delivery For Customer Payloads

Design supported by NASA Lunar Catalyst Program

Storable non-cryogenic fuels remove thermal roll during transit

Detailed design across all aspects of system
- Leverages Masten technology for engines and controls
- Uses unique proprietary new green/non-toxic propellant
- Enables a wide variety of potential missions

XL-1: Efficient Lunar Lander
XL-1 design Overview

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
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<tbody>
<tr>
<td>Payload Mass</td>
<td>100.0 kg</td>
</tr>
<tr>
<td>Dry Mass</td>
<td>465.0 kg</td>
</tr>
<tr>
<td>GLOM</td>
<td>2,079.0 kg</td>
</tr>
<tr>
<td>Landed Mass</td>
<td>506.3 kg</td>
</tr>
</tbody>
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- Max Height: 2.02 m
- Ground Clearance: 0.45 m
- Lunar Surface: 0 m
- Length: 2.98 m
- Height: 3.56 m
Heavy Lift to Lunar Surface

• Mission kit to land large mass (~1.5 mt)
• Innovative Dual Thrust Axis design
• Proven Masten technology for pinpoint EDL targeting

Dual Thrust-Axis Advantages:
• Crew and cargo closer to surface
• Land on steeper slopes
• Improved operability and reliability
• Higher mass fraction
Masten Space Systems
Lunar Delivery Services

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Cislunar Ecosystem Needs Full Solution

There is a need for connection between large infrastructure and the direct, disparate users.

There is a need in space for end point transportation.

Masten: Space’s Last Mile Company

Applications
- Tourism
- Mining/extraction
- Manufacturing
- Science
- Entertainment
- Settlement

Out of Masten Scope (Infrastructure)

Out of Masten Scope (Customers)

Masten Scope
- Design & Test
- Propulsion Control Systems
- Operations

Blue Origin
- Industry in space

ESA
- Moon Village

ULA
- Cislunar 1000

NASA
- Return to Moon, Journey to Mars

SpaceX
- Mars Vision