The USAF currently uses AM Ti-6Al-4V titanium to substitute for conventional high strength aluminum alloys. Advances in aluminum materials and AM processes however may now be able to produce high strength sustainment parts. Selected teams will provide hexagonal blanks and artifacts of novel, additively manufactured, high strength aluminum for analysis. High strength aluminum materials will be required by the USAF to address sustainment of traditionally manufactured 7075 and 7050 aluminum parts, and will open the door to additional part families.

The goal of this technical challenge is to identify and demonstrate new aluminum materials that will further the AM industry. The Material Hurdles technical challenge is designed to demonstrate material properties and provide potential solutions for the USAF.
QUALIFICATIONS FOR CONTESTANT TEAMS

- Teams must register online and submit a one-page description to be considered for challenge. Technical data sheets, etc. may also be attached to aid in selection.
- Submissions will be limited to one registration per company or organization.
- A maximum of 15 teams will be selected for participation. Those showing the highest likelihood of success based on materials experience and presented technical approach will be chosen. Effort will be made to judge entries against similar sized organizations to prevent unfair advantage.
- Teams will be notified no later than 07.22.2020 that they will or will not be participating in the Material Hurdles technical challenge.
- Selected teams must be willing to produce the required specimens in a timely manner in order to participate.

RULES FOR EVENT

All teams must submit a one-page description of the material used, its benefits, the manufacturing method(s) including AM equipment utilized, heat treatment, and any pricing information the team is willing to provide.

Aluminum tensile specimens

- Teams will supply a minimum of 10 tensile blanks additively manufactured according to the provided drawing. Tensile blanks will be additively manufactured exclusively from the aluminum alloy of choice, and heat treated as desired. Tensile blanks will be vertical (Z) with build orientation identified, and provided in the as-printed surface condition. The blanks will be machined into ASTM E8 tensile specimens and tested.

Aluminum artifacts

- Teams will supply a minimum of 3 artifacts additively manufactured according to the provided model. Artifacts will be additively manufactured exclusively from the aluminum alloy of choice, and heat treated as desired. Artifacts will be vertical (Z) with build orientation identified, and provided in the as-printed surface condition. The artifacts will be used to evaluate buildability, surface roughness, porosity, and compressive yield strength.
Aluminum cube

- Teams will supply one (1) 20 mm cube additively manufactured exclusively from the aluminum alloy of choice, and heat treated as desired. The cube will have the build orientation identified, and provided in the as-printed surface condition. The cube will be used to evaluate microstructure.

Each team will provide the following as previously described:
- 10x aluminum tensile blanks
- 3x aluminum artifacts
- 1x aluminum 20 mm cube
- Video(s) describing material, manufacturing methods and benefits to the USAF. Videos will be compiled and edited to create content for the AMO Virtual event.

Application process opens
06.22

Application process closed
07.24

Teams selected and notified
07.29

Virtual Kick-off meeting with teams*
07.31

Teams work through challenge requirements
07.31-08.19

Final date for teams to submit tensile blanks, artifacts, and cube
08.19

Testing of tensile specimens
08.20-09.09

Judges will analyze results
10.07

Winner will be announced during Advanced Manufacturing Olympics
10.19-10.23

* Denote required attendance by all registered participants
Teams will be ranked, and awarded, based upon the following criteria by an impartial panel of judges.

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Explanation</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tensile performance</td>
<td>Yield strength, Ultimate Strength, and % Elongation will be evaluated</td>
<td>30%</td>
</tr>
<tr>
<td>Artifact with as-printed surface finish</td>
<td>Buildability, surface roughness, and porosity will be evaluated, along with compressive yield test</td>
<td>30%</td>
</tr>
<tr>
<td>Cube evaluation</td>
<td>Porosity and microstructure evaluation</td>
<td>20%</td>
</tr>
<tr>
<td>Judges’ discretion</td>
<td>Novel material, manufacturing, etc.</td>
<td>20%</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

**AWARDS**
- First place $100,000
- Second place $50,000
- Third place $40,000
- All teams will be recognized by the Air Force