



WARR Space Elevator

European Space Elevator Challenge 2016

Handbook Summary

VESTNER
AUFZÜGE
ELEVATING PEOPLE

WARR e.V.
Wissenschaftliche
Arbeitsgemeinschaft
für Raketentechnik
und Raumfahrt

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1. General Information

The challenge is to design and build a climber structure in compliance with predetermined requirements, keeping in mind the idea of a real space elevator.

1.1. Levels

- For the 2016 challenge we decided to allow participants with a lower scientific or technical background to compete in a second level with lower requirements (Beginners' Level).
- We suggest for university teams to aim for participating in the Advanced Level and for high school teams to participate in the Beginners' Level.

1.2. Rope/Tether

- Rope properties:
 - Diameter: 10 or 11 mm
 - Material: Aramid sheath, polyamid core
- Tether properties:
 - Width: 30 to 40 mm
 - Thickness: 2 mm
 - Material: Aramid

1.3. Important dates

1. Team registration until **April 30th**
2. Rough climber concept until **June 30th**
3. Video of the working climber until **August 31st**
4. Competition week from **September 12th to 16th**

Further information can be found in the more detailed handbook at <http://euspec.warr.de/downloads>.

2. Beginners' Level

2.1. The participation includes:

1. A short presentation about the climber.
2. The drive of the climber.

2.2. Drive

- The climber has to drive up 20 m vertically on a round rope or flat tether.
- The climber has to operate fully autonomously during the drive.
- The climber has to be mounted on the rope/tether without disassembly of the latter.
- The climber does not have to carry a payload.

2.3. Climber dimensions & materials

- The dimensions of the climber must not exceed 0.5 m x 0.5 m x 1 m.
- The climber must not weigh more than 10 kg.
- The climber structure can be made from any material, including LEGO® or fischertechnik®, but also steel, aluminium or carbon fiber.

2.4. Power

- The climber has to be powered by pre-charged batteries only.

2.5. Safety

- The climber has to fulfill basic safety requirements for protection of operators.
- The climber will be deemed safe or unsafe to drive by EUSPEC technical staff.

2.6. Scoring

- The score will be determined by the jury as a combination of speed, weight and construction quality of the climber.

2.7. Prizes

- There will be prizes for the best three teams. The winning team will also get the opportunity to drive on the 100 m rope/tether.

3. Advanced Level

3.1. The participation includes:

1. The submission of a paper about the development process of the climber.
2. A short presentation about the climber.
3. The drive of the climber.

3.2. Drive

- The climber has to drive up and down 100 m vertically on a round rope or flat tether.
- The climber has to operate fully autonomously during the drive.
- The climber has to be mounted on the rope/tether without disassembly of the latter.

3.3. Climber dimensions & materials

- The dimensions of the climber (including payload) must not exceed 1 m x 1 m x 2 m.
- The climber (including payload) must not weigh more than 20 kg.
- The climber structure should be made from proper engineering materials.

3.4. Power

- The climber should mainly be powered by pre-charged batteries.
- Additional power sources and energy recuperation are permitted but not required.

3.5. Payload

- Standardized payload cubes (10 x 10 x 10 cm) are provided by EUSPEC organizers.
- Each cube weighs approximately 1.1 kg.
- The payload must not be required for the functional capability of the climber.

3.6. Safety

- The climber has to fulfill certain safety requirements like engineering standards and design specifications to prevent water ingress and for protection of operators.
- The payload cubes have to be attached safely to the climber structure.
- The climber will be deemed safe or unsafe to drive by EUSPEC technical staff.

3.7. Scoring

$$Score = \left(\frac{m_{payload}}{m_{total}} \right) \cdot 100 + \left(\frac{E_{potential}}{E_{consumed}} \right) \cdot 200$$

- A measurement board to record power consumption will be attached to the climber by EUSPEC technical staff for which appropriate connectors have to be provided.

3.8. Prizes

- There will be prizes for the best three teams and special awards for technology, speed and safety.