



# Kepler's Orbits

## Round

1

### Ablative Heat Shield

In this round delegates are challenged to design and construct a heat shield capable of redirecting hot air flow away from a designated payload region while allowing the opposing surface to absorb higher temperatures. Delegates must apply the principles of airflow manipulation, heat transfer and geometric shaping to minimise heat conduction towards the protected area. Delegates will complete their prototypes before placing them in the testing station, where temperatures at both ends will be measured to determine the shield's effectiveness at maintaining the payload below the specified threshold. Performance will be evaluated based on the shield's ability to keep the payload region below a specific thermal threshold. This round evaluates structural design, thermal performance, and the ability to use limited materials intelligently unrealistic engineering constraints. Delegation capacity for this round is limited to two delegates.

2

### Aeronautical Anomaly

In this round, delegates take up the role of aerospace investigation teams analysing a simulated aircraft or spacecraft incident. Each delegation will receive a set of blueprints and simplified geometric models representing aircrafts with partial control-surface failures, structural asymmetries, or subsystem irregularities. Delegates are required to evaluate the aerodynamic impact of these faults and develop technically sound solutions to maintain stability through alternative control inputs, compensation techniques or structural modifications. Using the

provided dataset, teams must determine the most probable root cause of the failure, the round relies on knowledge of the designated aircraft, and analytical reasoning. Each team will submit a concise written or oral case-analysis report outlining their findings and technical justifications.

### 3

#### **Applied Propulsion Design:**

The third round requires delegates to design and construct a fully functional model rocket alongside a digital version of the same rocket built in a simulation interface. Delegates will test their designs under realistic flight conditions by running simulations that analyze aerodynamics, thrust, mass distribution, centre of gravity and overall stability. Participants will then build a physical replica of their rocket using a specified set of materials and compare its real world performance with simulated predictions. The round tests understanding of flight dynamics, the accuracy of modelling, and the ability to translate a theoretical design into a reliable and stable physical rocket. Three delegates are allowed per team in this round

***Note: The information in this document is subject to changes.***