UK Race to Space

Final arrangements, safety briefing and risk assessment for hot fire testing during the Race to Space competition (3-7th July 2023)

Airborne engineering, Protolaunch and European Astrotech. Westcott.

The UK Race to Space event is committed to ensuring the health, safety and welfare of all attendees, in so far as is reasonably practicable, by fully complying with all statutory health and safety requirements and by positive action to prevent injury and ill health and promote safe working practices.

It is important to note that each individual has a legal obligation to take reasonable care for his or her own health and for the safety of others who may be affected by his or her acts or omissions.

The document is intended to be read along with the accompanying safety information provided by Airborne Engineering and Protolaunch, dependant on the location for that team's test firing.

Planned activities:

- Students will be visiting Westcott to attempt to hot-fire their hybrid/liquid rocket engines that they have developed as part of the Race to Space competition
- Students will be using hand tools in Building 4000 to assemble and prepare their rocket engines
- Students will be using hand tools (spanners etc) at the test sites to prepare their engines for hot firing. They will be supervised at all times when at the test sites.
- The hot-firing itself will be controlled and carried out by the rocketry experts, with the students observing from a safe distance
- Students will be covered by Catapult's insurance while at Building 4000 and the Innovation Centre, and Airborne, Protolaunch and EAL's insurance when on their sites

Schedule:

	(B = biprop, H = hybrid)	**Protolaunch**	**Airborne**	**EAL** (provisional, please check)
Monday 3rd July	**Morning**	Cambridge (B)	Sheffield (B)	-
	Afternoon	Cambridge (B)	Sheffield (B)	-
Tuesday 4th July	**Morning**	South Wales (H)	Southampton (B)	Edinburgh
	Afternoon	South Wales (H)	Southampton (B)	Edinburgh
Wednesday 5th July	**Morning**	Cranfield (H)	Leeds (B)	Edinburgh
	Afternoon	Cranfield (H)	Leeds (B)	Kingston
Thursday 6th July	**Morning**	Glasgow (H)	Kingston (H)	Bath
	Afternoon	Glasgow (H)	Bath (H)	-
Friday 7th July	**Morning**	*Symposium*	*Symposium*	*Symposium*
	Afternoon	*Symposium*	*Symposium*	*Symposium*

Teams testing at Protolaunch and Airborne should have already been in contact with them directly to discuss propellants and any specific setup and mounting requirements. Make sure to bring all required fasteners to mount your engine.

EAL are able to offer the use of their test bays for fit tests etc during the week.

It is highly recommended that *Kingston* and *Bath* make use of EAL in the days before their test to reduce set up time needed on the Thursday at Airborne, as this is likely to become a pinch point.

Documentation:

All teams' final documentation should now have been uploaded to the ***drive***. Organisers should have access to this, let Alistair know if not. It will be the test site's decision on the day whether they are happy for the engine to be fired.

Travel to and arrival at Westcott:

- The Race to Space testing week is taking place at Westcott Venture Park, High St, Westcott, Aylesbury HP18 0PH (***link***)
- All teams should report to the gatehouse on arrival (towards the bottom on this ***map***)

- The gatehouse will direct teams to Building 4000 (also on the map as '4000') where a safety briefing will be given at **0900** at the start of each day by Charlie Muir.
- Teams will then be escorted to and from the test and preparation locations.
- **Do NOT walk or drive to the test sites without being escorted by a member of Protolaunch/Airborne/EAL/organiser staff.**
- With tests going on over multiple days we do not want people inadvertently trying to access the sites in the middle of a test.
- Teams should not stray from the activity locations – Airborne, European Astrotech, Protolaunch, Building 4000 and the Innovation centre.
- The Westcott site runs combined motorised and pedestrian traffic and care should be taken when crossing the site between buildings.
- There will be no access to any other site within the Westcott complex other than specified above.

Key points:

- Only six team members will be permitted to attend the hot firings at the test sites unless otherwise agreed.
- The test sites are complex locations, and **all team members MUST read the corresponding safety information provided by Airborne Engineering and Protolaunch** (sent out with this document), dependant on the location for that team's test firing.
- Each team must email Protolaunch/Airborne with the names of students attending, and confirming that each have read the safety documents
- Only the use of hand tools will be permitted by students during the competition and each team should prepare their own risk assessment related to these activities.
- A specific safety briefing will be provided for visitors watching or partaking in rocket firing activities at each site. Safety information about firings will be presented by the Firing Officer. Visitors must listen carefully to what they say and follow any directions given.

PPE:

- Teams should being their own PPE (safety glasses, ear defenders, safety boots etc as appropriate)

Warning flags:

A warning flag system is in place on the Westcott firing sites. The flags have the following meanings:

- Red flag only: propellant on site
- Yellow flag only: pressure testing being conducted
- Red and Yellow flag: rocket firings being conducted

Sirens:

- Sirens will sound before rocket firings take place. Upon hearing the siren you should move to the control room bunkers immediately as instructed by site staff.

Weather:

- Be aware that the test sites are largely outdoors. Please dress appropriately for the weather and have sunscreen available if necessary.

Should any accident, injury or near miss occur, this MUST be immediately reported to the organisers.

Organiser Contact Details:

- *Alistair John: 07429 473337*
- *Charlie Muir: 07910 734045*
- *Charles Simpson: 07894 268378*

Airborne

- *Adam Greig: 07904 113882*
- *James Macfarlane: 07966 132064.*

Protolaunch

- *Jack Coghen-Brewster: 07515 949996*
- *Matt Escott: 07955 528 218*

EAL

- *Jonathan Heirons: 07309713507*

- *Security Office (Gatehouse): 01296 651870.*

Risk Assessment

Hazard category and hazard	Who might be harmed and how?	What is already in place?	What further controls/actions are required?	Timescales for further actions to be completed	Person/body responsible
Rocket engine hot firings	Visitors could be seriously injured by hot rocket engine exhaust or by the debris caused by an engine exploding	A specific safety briefing will be provided for visitors watching or partaking in rocket firing activities. Visitors will watch rocket engine firings from a safe distance or from behind protective shielding A flag system is used on site to ensure visitors are aware that engine firings are taking place Test site staff will make the decision as to whether an engine is able to be test fired Test site staff will have full control of the firing	none	N/A	N/A
Cat 3: Hazardous substances The test sites stock a wide range of hazardous substances that could cause severe damage to persons. Ongoing projects could lead to the	Visitors could be harmed if they enter a restricted area where the hazardous substances are kept and interact with any such substance. Refer to specific COSHH assessment for details on specific	All potentially hazardous equipment and operations will be taking place in secure test bays or lab environments and away from areas visitors will be situated. Visitors will be made aware of restricted areas they do not have access to. Visitors will be accompanied by a member of staff at all times while on site. Restricted areas are always locked when not in use.	none	N/A	N/A

release of controlled or uncontrolled hazardous liquids or vapour.	implications of different substances.	Staff working in restricted areas will enforce restrictions if visitors gain access. Staff will ensure that deliveries or internal transporting of hazardous substances will be kept at a safe distance from visitors at all times and will be secured as soon as possible. Secure chemical stores are used to store chemicals when not actively in use. All test site staff are first aid trained. COSHH assessments have been completed for the control of hazardous substances. The test site test bays are very well ventilated and allow potentially dangerous fumes to leave rapidly. All pressurised gas cylinders are routinely checked to ensure conformance to safety standards.			
Cat 4: Slips and trips Uneven, wet or muddy floor can lead to slips or trips when walking around site. Obstacles on the floor can lead to trips and falls.	This hazard applies to all visitors on areas of site. Slips and trips could lead to various physical bodily injuries.	Visitors should walk sensibly around the site and not run/jog under any circumstances. Staff will do utmost to point out potential slip or trip hazards when walking around site. The test sites will ensure that all areas are tidy and free from obstacles where possible. All water spillages to be mopped up and dried immediately.	none	N/A	N/A

Liquid spillages can lead to slips and falls.		There will be several First-Aid trained staff on site.			
Cat 5: Work equipment and machinery The test sites have several potentially hazardous pieces of equipment being used around the site. Pressurised systems are to be used. Various tools will be used.	This hazard applies to all visitors on site, particularly in the test bays. Heavy equipment could fall and trap/pinch body parts. Gas inhalation could cause damage. Over-pressurisation can result in ruptures, leaks or equipment failure. Misuse of pressurised equipment can lead to sudden pressure release. System failures can lead to leaks or pressure releases. Misuse of tools can lead to injury.	All equipment used is regulated, calibrated, and conforms to all safety checks to minimise any potential malfunction. All potentially hazardous equipment and operations will be taking place in secure test bays or lab environments and away from areas where visitors will be situated. Heavy equipment is secured in place. Experienced supervision will be given at all times to ensure that the equipment is being used safely and in accordance with set procedures. A supervisor will ensure proper set down and make safe procedures are carried out when appropriate. A supervisor to provide demonstration of tool usage and to ensure proper control and form is carried out at all times. Visitors are instructed by safety briefing documents that they must not handle any work equipment or machinery.	none	N/A	N/A
Cat 6: Fire	This hazard applies to all visitors.	Fire doors are installed in all indoor areas.	none	N/A	N/A

Fire breakout on test site premises during visit.	Fire can cause all range of burns. Inhaled smoke can lead to respiratory problems. Sever harm and death is a very real risk in the case of a fire. Flammable/explosive substances in AIRBORNE premises could lead to further spread of the fire and/or explosions around the site.	All necessary types of fire extinguisher are on hand at various points on site. A safe fire assembly point will be highlighted to all visitors on arrival. In the event of a fire, staff will escort all visitors to the assembly point. The fire department will be called and their advice will be applied. Flammable and explosive substances are contained in a secure chemical store which should prevent fire from reaching them.			
Cat 7: Electricity There are electrical points throughout the site and electrical devices will be in operation throughout the day.	This hazard applies to all visitors. Harm could include shock, electrical burns, and death.	All devices are regularly PAT tested to ensure safe working order. All devices are inspected before use to ensure no visible damage to device or wiring.	none	N/A	N/A
Cat 1: Substance abuse The test sites hold various substances	This hazard applies to all visitors. Harm could lead to intoxication, addiction, poison, death etc.	All potentially hazardous equipment and operations will be taking place in secure test bays or lab environments and away from areas visitors will be situated.	none	N/A	N/A

that could be abused.	Refer to specific COSHH assessment for details on specific implications of different substances.	Visitors will be made aware of restricted areas they do not have access to. Visitors will be accompanied by a member of staff at all times while on site. Restricted areas are always locked when not in use. Staff working in restricted areas will enforce restrictions if visitors gain access. Staff will ensure that deliveries or internal transporting of hazardous substances will be kept at a safe distance from visitors at all times and will be secured as soon as possible. Secure chemical stores are used to store chemicals when not actively in use. All test site staff are first aid trained. COSHH assessments have been completed for the control of hazardous substances.			
Cat 4: Movement of people and vehicles Vehicles entering and leaving car park Staff and visitors walking around site	Moving vehicles could cause physical body damage if collisions occur. People could accidentally collide with each other if unaware of surroundings.	Staff and visitors will be asked to pay full attention to their surrounds when walking around the site. I.e., they should not be looking at phones or documents while on foot. Visitors will be informed of the speed limits around the Venture Park (30 MPH) and on site (10MPH).	none	N/A	N/