AOE DEPARTMENT SAFETY REVIEW FORM FOR
EXPERIMENTAL RIGS

In the context of this form 'rig' refers to any potentially hazardous piece of equipment whose safe operation requires more detailed instructions and procedures than can be included in the Experimental Workspace Safety Review form for the area in which the rig is housed. Examples include a wind tunnel, laser system, high pressure tank, material testing machine, rotating system.

Before any such rig in the Department of Aerospace and Ocean Engineering is brought into operation, and **at least once per year** thereafter, a copy of this form must be completed, signed and submitted by the responsible faculty/staff member (usually the principal investigator). When an existing rig undergoes modifications which could affect its safety, a new copy of this form must been submitted by the responsible faculty/staff member at that time, and before it is operated again.

Completed forms should be submitted to the AOE Assistant Department Head for Facilities (Michael Philen) and should also be made available to other faculty/staff with relevant expertise, or with direct involvement in the rig or space where it is housed. Any advice resulting from this interaction should be copied to the Assistant Department Head, as well as being transmitted back to the responsible faculty/staff member. Once the responsible faculty/staff member is satisfied that all safety concerns have been met the final version of the form should be signed and submitted and a copy displayed in a prominent position on or adjacent to the rig and on the department safety website. The responsible faculty/staff member may then authorize its operation. Under no circumstances may a rig be operated without a completed, current copy of this form prominently displayed.

Date of form 8/15/24 ..... Form expires (no more than 1 year after form date): 8/15/25 .....

Name of Rig Open Jet Wind Tunnel .....

Workspace where rig is located VTSS room 158, Experimental Aeroacoustics Lab .....
Include room, building and name given to the space on the EHS training website.

Faculty/staff member responsible for the rig and its safety Nathan Alexander/ William J Devenport .....

Office Address 608/660 McBryde .. Phone 1-1152/1-4456 .. Email alexande@vt.edu/devenport@vt.edu ....

1. An evaluation of the above rig has been performed and the following safety risks have been identified (append details where necessary):

- **Risk of injury from obstruction of flow path or tunnel exhaust. Air is driven through the wind tunnel using a fan located at its upstream end. Substantial obstruction of the flow path or exhaust could raise the pressure upstream of the obstruction that may cause segments of the wind tunnel walls to pull out of their mounts. Objects then falling into the flow path could then strike a person standing downstream.**
- **Risk of injury at tunnel inlet due to ingestion of debris. A metal screen is located at the fan inlet to catch debris from entering the fan. If this is damaged or the debris is smaller than the mesh spacing, debris could hit the fan blades and become a projectile causing injury.**
- **Risk of physical injury from the external and internal tunnel structure, attachments and probes. Many parts of the facility and its attachments have sharp projecting edges or points. Walking into or otherwise striking these (such as by tripping on cables) when in or around the tunnel has the potential to cause injury.**
- **Risk of fan failure. As with all systems employing fans there is a small risk of fan blade failure. Failure of fan blades could result in physical injury from flying debris.**
- **Risk of injury inside the anechoic chamber in which outside assistance may be hard to obtain due to the acoustic nature of the tunnel.**

2. The following actions have been taken to minimize those risks (append details where necessary):

The risks described above have been minimized by developing and ensuring adherence to safe operating rules and procedures. These are described in attachment 1.

3. A safe operating procedure has been developed (attach the procedure to this form). This includes protective equipment to be worn, whether users may operate the rig alone and, if necessary, precautions to be taken by others working in the same laboratory. The procedure is in a form suitable for posting on the rig.

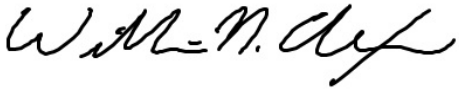
See attachment 1

4. Check one and include a list: ☐ *The rig may only be operated by the following individuals.*
☒ *The rig may only be operated under the supervision of the following individuals.*
(List individuals here)

1. **William Nathan Alexander, Assistant Professor, AOE Department, Virginia Tech**
2. **William Devenport, Professor, AOE Department, Virginia Tech**
3. **Aurelien Borgoltz, Research Associate Professor, AOE Department, Virginia Tech**
4. **Nanya Intaratep, Research Assistant Professor, AOE Department, Virginia Tech**
5. **Szu-Fu Huang, Shishir Damani, Humza Butt, Shreyas Chaware, Charles Galluscio, Agata Grzyb, Celin Rawther, Eric Totten, Bhavika Sharma, Gerrit Vander Wiel, Charlie Van Horn, ThanhLong Duong, Graduate Research Assistants, AOE Department, Virginia Tech**

5. The above individuals are all registered on the EHS training website at https://secure.hosting.vt.edu/www.ehss.vt.edu/training/training_report.php and have taken all appropriate safety training courses. Their training is current and is recorded on the EHS website, under the above workspace name. The appropriate safety courses are (list here):

Personal Protective Equipment (PPE) Awareness
HAZCOM RTK
Electrical Awareness
Lockout/Tagout Awareness
Portable Fire Extinguishers
Ladder Safety



Signature of faculty/staff member
responsible for workspace and its safety ..... Date 8/15/24 .....

ATTACHMENT 1
VIRGINIA TECH OPEN JET FACILITY

This document describes procedures for users of the Virginia Tech Open Jet Facility. All authorized users must read this form before beginning work in the wind tunnel. Safety in the wind tunnel is taken very seriously. This document outlines some identified hazards and procedures that, when followed, my help to reduce risk of injury or damage. Ultimately, however, you the user bear the primary responsibility for your own safety and the safety of others around you.

CONTACT INFORMATION

Nathan Alexander, alexande@vt.edu, 231 1152 (Lab co-Director)
William J. Devenport, devenport@vt.edu, 231 4456 (Lab co-Director)

IDENTIFIED SAFETY RISKS

1. Risk of injury from obstruction of flow path or tunnel exhaust. Air is driven through the wind tunnel using a fan located at its upstream end. Substantial obstruction of the flow path or exhaust could raise the pressure upstream of the obstruction that may cause segments of the wind tunnel walls to pull out of their mounts. Objects then falling into the flow path could then strike a person standing downstream.
2. Risk of injury at tunnel inlet due to ingestion of debris. A metal screen is located at the fan inlet to catch debris from entering the fan. If this is damaged or the debris is smaller than the mesh spacing, debris could hit the fan blades and become a projectile causing injury.
3. Risk of physical injury from the external and internal tunnel structure, attachments and probes. Many parts of the facility and its attachments have sharp projecting edges or points. Walking into or otherwise striking these (such as by tripping on cables) when in or around the tunnel has the potential to cause injury.
4. Risk of fan failure. As with all systems employing fans there is a small risk of fan blade failure. Failure of fan blades could result in physical injury from flying debris.
5. Risk of injury inside the anechoic chamber in which outside assistance may be hard to obtain due to the acoustic nature of the tunnel.

PROCEDURES FOR OPERATING AND WORKING WITH THE OPEN JET FACILITY

1. Use caution working in, on, or around the open jet facility. Wind-tunnel users should make sure all cables are arranged neatly to avoid tripping hazards when possible.
2. Before turning on the wind carefully inspect the flow path to ensure the wind tunnel walls, and all items in the flow path are securely fastened.
3. The wind tunnel operates using a wall mounted VFD. The breaker for this VFD is located on the back wall of the lab which can be used to stop the fan in case of emergency. Make sure all personnel in the lab are aware of the location of the stop buttons (and the need to press them in case of emergency) before starting the fan.
4. Under no circumstances may the fan be left running unless at least one approved wind tunnel operator is present in the lab.
5. While the fan is in operation listen for any rattling sounds that could indicate problems with its blades and watch the settling chamber for any sign of imminent failure. Immediately shut down the system and report the problem to the lab director if you feel there may be a problem.
6. All users must inspect the area in front of the fan inlet and the fan inlet itself before starting the facility. The area in front of the fan should be free of light debris that could be lifted into the fan inlet. The wire screen at the fan inlet must be intact without any sign of damage.