SHRIKE
Questions and Proposed Responses

1. **Can SHRIKE be considered a "drag sled"?**

   No, but by association it is oftentimes mistaken as such. SHRIKE is a fully autonomous robot capable of measuring surface friction without intervention or intervention by a human operator. Unlike traditional sleds, SHRIKE is designed to overcome common disadvantages of manual friction testing. As the technical differences between the two products places them in different categories, they cannot be considered alike.

2. **How can SHRIKE be considered better than common drag sleds?**

   Common sleds are ultra low-tech devices, normally hand made, without certified, recognized and approved components. They are constructed without standardization as to materials or construction methods and possess no electronic capability. Common sleds cannot measure at a rate considered scientifically acceptable by any standard. They are highly prone to user error and human bias; subject to unwanted loss of stability and often present a very unprofessional appearance.

   SHRIKE is built to very exacting engineering standards while using only industry standard, internationally certified components. The user need only to place it on the test surface and turn it on. The device will connect to its computer controller via Bluetooth and automatically propel itself on the test surface for a pre-programmed distance and velocity at a measurement rate of 100 samples per second. It will sort, arrange, average force data and display the drag. It can also calculate speed.

3. **How fast does it travel and how far?**

   SHRIKE is programmed to optimally measure drag from data clusters of force measurement at a default rate of 100 cps. Every test is 3 seconds long with the first second allowing the device to get up to its designed velocity of 0.15 m/sec. In this manner, at least 2 seconds are assigned for test data accumulation. A standard test travels about 1.2 m.

4. **How is it propelled?**

   The device has 4 planetary geared motors that combine to drive two parallel zinc-0xide tracks. The propulsion is controlled by its computer to be the same for every test.

5. **How long does the battery last?**

   About 4 hours under continuous use. It can be recharged by wall charger although a 12V car charger is included with the unit. A full charge takes about 2 hours.

6. **Does SHRIKE slide on its tracks?**

   No. The tracks only propel the device carriage. A specially designed skid plate is carried underneath the carriage and contacts the test surface directly. Inside the skid plate is positioned the load cell measurement component bringing the contact point to within 1" of the test surface.

7. **Can you describe the skid plate and how it assists in measuring friction?**

   The skid plate was completely re-engineered specifically for this device. The primary automotive rubber contact patch supplied with every unit is permanently affixed and other pads can be placed over this to extend the capability. The skid pad weighs only 3 lbs and carries the electronic load cell that measures force to move the unit along a given surface.

8. **How does SHRIKE adhere to the Coulombe friction model?**

   Much has been discussed about this model and some clarification is needed.

   Coulombe, and earlier Amontons, proposed friction laws several centuries ago. Theories of dry sliding friction of the past several decades are much more applicable. The centuries old friction laws are idealized generalizations of empirical observations by engineers; friction theories are in-depth analyses of physical phenomena by scientists.

   As the Laws of Friction are primarily based on the experimental findings of practical engineers centuries ago, they are expected to be valid only in a small range of experimental conditions. Although the first quantitative theory of friction was due to Coulomb, it can be shown, that it is not a theory of friction at all.

   These are areas that require intensive discussion above and beyond this document.

9. **If you put 2 SHRIKE units side by side on the same surface will the test results be the same?**

   Generally, road surfaces are anything but completely smooth; surface roughness is quite varied. It's not impossible the units will return identical results, but they will most likely be very close. Any difference is due to the test surface, not the unit. SHRIKE is designed to return results within a +/- 0.02 variance.

10. Does the device compute drag by the standard manual method of force/weight?

No. The F/W model is not the only method of measuring drag but it IS the only method available to manual sleds. Accelerometers for example do not directly measure drag but calculate it based on speed/velocity/distance and time. Similarly, SHRIKE determines surface resistance to its pre-programmed movement over time by gathering hundreds of force measurements every second; filters the data and computes drag from measurements received from its load cell, positioned only 0.75" above the surface.

11. How can SHRIKE guarantee the proper pull angle?

The chassis has a cavity on its underside that accommodates the skid plate and load cell. The entire plate will move very slightly during a test to allow it to conform to irregularities in the test surface. Its directional stability is enhanced by two vertical support posts that keep the plate parallel to the surface and perpendicular to the chassis while allowing minimal movement.

12. What if the unit skips or the tracks don't adhere to the surface?

This might happen when testing on extremely hot, pliable or oily surfaces. If the tracks do not engage the surface and provide an even run, the unit will return an error reading. This will also happen if the units engages something like a small rock or a curb that will alter its run. Simply test again.

13. Does it work on ice, mud or snow/slush?

Yes, but use caution. Measuring drag on unstable surfaces is difficult regardless of what you are using. SHRIKE presents a 45 degree cant on its leading skid plate edge to reduce plowing under degraded conditions like mud and snow. Its power alone should overcome common sources of resistance but vigilance is required. Testing has shown some difficulty in movement in thick grass.

14. What is the total unit weight? Is it the same for every unit?

22 lbs or 10 kg. This is the design weight and is the same for every unit unless design customization is requested such as advanced sensors, or some other requirement.

15. Is SHRIKE only available to law enforcement?

No. Shrike is available to civilian and military law enforcement, military units in general, educational institutions and insurance investigators.

16. Is there a military SHRIKE? How is it different?

Yes, there is a SHRIKE model specific to the military. We cannot discuss its capabilities.

17. Are there any options available?

Yes. There are many options for sensors. A digital camera can be fitted, and a robotic arm/hand is available. There are numerous possibilities and anyone requiring a specific addition can contact us to discuss.

18. How does SHRIKE compare to other electronic products like accelerometers?

This is understandably a common question but is very difficult to answer. Accelerometers measure average drag through the function of other variables like speed/velocity, skid distance and time. They do NOT contact the surface as they are usually placed in/on a vehicle. SHRIKE drags its skid plate directly upon the test surface while it is measuring.

SHRIKE is as different from an accelerometer as it is to a common hand drawn drag sled. Similarities or differences in test results can only be attained through dynamic testing and all the problems that action presents. Generally, the two return very close results when properly deployed without interference or bias.

19. Does SHRIKE use some type of scale?

No. It measures force electronically using a load cell or strain gauge.

20. How does SHRIKE assemble and filter the force readings?

During a test, the SHRIKE captures 100 force readings. At the end of the test, the readings are processed by the on-board computer to minimize force fluctuations resulting from road roughness. The result is a repeatable friction value.