

Lauren Cope
Engineering Matters, Inc.
Medfield, MA Office

**“Some exciting new results ...
concerning the haptic stick developed
by Engineering Matters, Inc.”**

Dear Lauren Cope:

I would like to update you with some exciting new results in our Laboratory concerning the haptic stick developed by Engineering Matters Inc. We are presently running human subjects in a task related to controlling unmanned air vehicles. The subjects are involved with a position-tracking scenario and we allow time delays to occur in the simulation. Time delays are one of the most difficult things to deal with and are a consequence of real world situations involving unmanned air vehicles as well as in other situations in which remote assets have to be controlled by an operator located at a safe venue. Typically, when a pilot has to deal with time delays more than 0.4 seconds, the aircraft may go into a PIO (pilot induced oscillation) and lose control of the aircraft resulting in a crash. With the new haptic stick developed by Engineering



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of interaction is due to the extremely high power (1 horsepower) and high bandwidth (80 Hz) which can enable the stick to overcome human limitations. Prior haptic sticks have never had the power or fidelity to accomplish this goal of being more powerful and responsive than the human operator.

Matters Inc., however, we now have human subjects safely tracking simulated UAVs with time delays of 0.5 seconds and more. We expect to be running simulations of 1.0 second or more of time delay without loss of control. Our force reflection algorithm implemented on the haptic stick involves a power management system that prevents instabilities. The main reason why, now, we can now perform this quality

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The new haptic stick developed by Engineering Matters Inc. represents a new technology which enables human interfaces to now handle time delay situations over 0.5 seconds of latency without

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instabilities. This is a new and exciting technology that will enable improved control over teleoperation situations. We continue to run subjects, every day, to see how far we can push this new technology to gain advantage for the operator who has to control assets from a remote location.

We are very excited about this new innovation in technology brought about by the hardware developed by Engineering Matters Inc. We feel this will significantly help the US Air Force develop improved human machine interface systems that can be used in a wide range of applications including unmanned air vehicle systems.

Sincerely,
Dr. D. W. Repperger
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