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DEMO IN THE DESERT: High Altitude Platforms for Mobile Robotic Telesurgery (HAPs/MRT)

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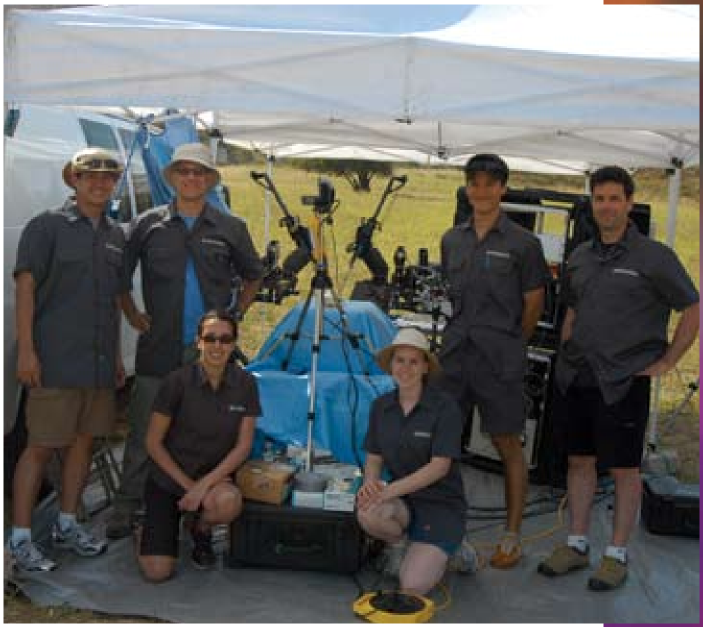
A large effort over the last four years in the UW EE BioRobotics Lab (BRL) focused on developing the RAVEN surgical robot system. The RAVEN will serve as a platform for development in the area of robot assisted surgery (See EEK2006, page 16). While, the challenge of teleoperated surgical intervention is not trivial, other groups have successfully demonstrated it on a number of occasions. The next step in telesurgery is to take the surgical robot to the patient, and the need for mobile healthcare is most urgently illustrated in combat casualties. Taking surgical robots to the wounded will reduce the time from injury to treatment, ultimately saving the lives of critically injured soldiers.

In June 2006, a team of students from BRL headed south in two UW vehicles. About 2000km away, the destination: the desert of Simi Valley, California. It was the first experimental deployment of the RAVEN into an isolated and extreme environment, and the culmination of months of preparation and coordination between the University of Cincinnati, AeroVironment (Simi Valley, CA), HaiVision (Montreal, Canada) and BRL.

Most research systems are developed in a lab for use in the lab environment. Surgical equipment is typically developed to operate in hospitals or other "clean" environments. Deployment into a desert environment adds new design requirements to the system. Environmental concerns include heat, wind, dust and noisy power from generators. Transportation concerns include shock absorption, packaging and packing.

Each day over a three day span, a different location was designated for deployment; each morning a plan was devised for setting up, which took into account the projected afternoon wind patterns. The surgical manipulators were set up in one tent, with the surgeons and master control console set up in a second tent about 100m away. The surgeon's commands were sent to the manipulators via a wireless digital datalink placed onboard an unmanned aerial vehicle (UAV) provided by AeroVironment. Video was compressed by a HaiVision hardware codec was relayed from the surgery site to the surgeon's console via the wireless datalink. The experimental protocol involved touching ten landmarks and tracing out a circle with the left hand, right hand and both hands. Two surgeons from the University of Cincinnati performed the five-task protocol.

Overall, a successful demonstration of remote surgery in an extreme environment through a wireless datalink onboard a UAV was accomplished.EE



THE FIELD TEAM WITH THE DEPLOYED SYSTEM. LEFT TO RIGHT: MITCH LUM, PROFESSOR BLAKE HANNAFORD, HAWKEYE KING, PROFESSOR JACOB ROSEN. FRONT: GINA DONLIN AND DIANA FRIEDMAN.

STUDENT TEAM MEMBERS: *Graduate Students Diana Friedman (ME), Hawkeye King (EE), Ganesh Sankarayanaran (EE); Undergrad Student Gina Donlin (EE)* **FACULTY ADVISORS:** *Professors Blake Hannaford and Jacob Rosen* **COLLABORATORS:** *Brett Harnett, Charles Doarn, Timothy Broderick (University of Cincinnati), AeroVironment, HaiVision* **RESEARCH AREA:** *Controls and Robotics* **GRANT/FUNDING SOURCE:** *The HAPs/MRT project has been supported by the US Army, Medical Research and Material Command grant number W81XWH-05-2-0080*