

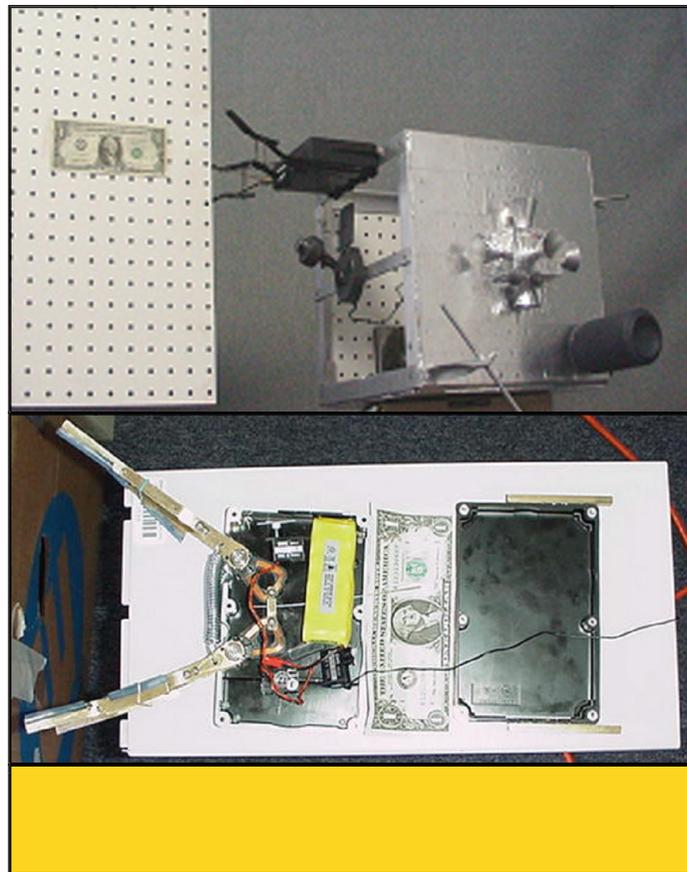


# Air Force Research Laboratory | AFRL

*Science and Technology for Tomorrow's Air and Space Force*

## **Success Story**

### **SPACE COUNTERMEASURES HANDS-ON PROGRAM DESIGNS DOCKING NANOSATELLITE IN SIX WEEKS**



Tasked to prove the feasibility of on-orbit satellite servicing using only off-the-shelf parts, a Space Vehicles Directorate countermeasures hands-on program team set about designing its own satellite completely from scratch, using only government surplus and hobby shop materials.



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### **Accomplishment**

A four-person team, with no prior satellite design experience, developed a satellite that could gently dock with an on-orbit vehicle and transfer a small payload to it. No commercially available satellite possessed all the capabilities required, so the team began with a one-cubic-foot frame and attached only the absolute minimum systems necessary for the emission.

A simple video camera would provide attitude reference and visual docking capability. A standard remote-controlled airplane transmitter used by hobbyists would control the camera, thrusters, and the payload transfer. The only modifications would include an ultra-high frequency booster to uplink the control commands and an S-band downlink to convey the video signals to the ground pilot.

Mission power requirements were kept so low that one battery powered all the systems, eliminating the need for solar cells. The team could start up old computer hard drives to provide attitude stabilization for the short period required. Complete system costs, including the satellite and all its systems, payload, and ground stations, could be less than \$100,000. The team briefed the concept to the Air Force Scientific Advisory Board, who was highly impressed with the accomplishments and ingenuity of this *ad hoc* team of amateurs.

### **Background**

All on-orbit satellites eventually lose their mission capability due to expenditure of maneuver fuel or system failures. This mission helps to demonstrate that it may be feasible to dramatically extend a satellite's life span by providing on-orbit servicing. The potential savings in satellite replacement costs can reach billions of dollars in just a few years.

### **Additional information**

To receive more information about this or other activities in the Air Force Research Laboratory, contact TECH CONNECT, AFRL/XPTC, (800) 203-6451 and you will be directed to the appropriate laboratory expert. (02-VS-01)

Space Vehicles  
Emerging Technologies