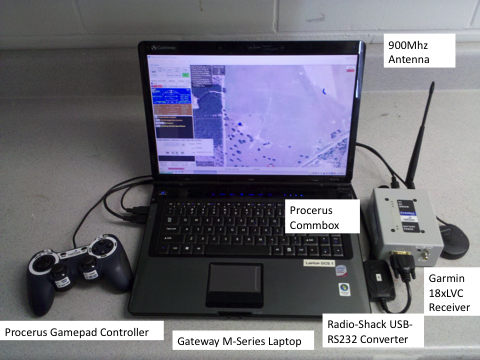
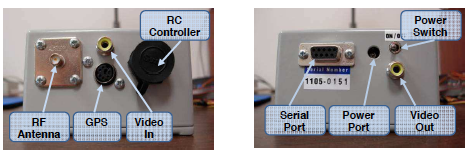
The Ground Control System is a completely off-the-shelf solution through major computer hardware and software vendors coupled with hardware and software provided though Procerus Technologies, the makers of the Autopilot on the NOVA.



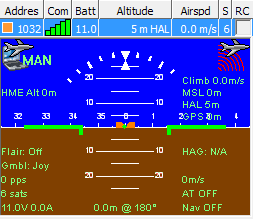
The Computer is a Gateway M-Series SA-1 Laptop, running Windows XP S.P. 3. This is strictly a flight control computer, and is only ever used for flight planning and operations. The ground control software is Procerus Technologies Virtual Cockpit (VC) Version 2.6, built solely for controlling the Procerus Kestrel series of Autopilots.

The ground control station communicates to the UAS through the use of a Commbox, manufactured by Procerus Technologies. The Commbox uses the same make and model of radio modem found on the NOVA; a one-watt Microhard Nano n920. This modem operates in the un-licensed 902-928 MHz range of the ISM band, and no further FCC clearance or license is required to operate. A Digi antenna is connected to the Commbox to accomplish this. The Commbox communicates to the Ground Station Laptop (GSL) through a Radio-shack USB-RS232 converter. The Ground Control System is capable of self-position reporting through an integrated Garmin 18xLVC GPS receiver which communicates through the Commbox. This information is then relayed to the GSL to be reported on VC.



(Image Courtesy of Procerus Technologies)

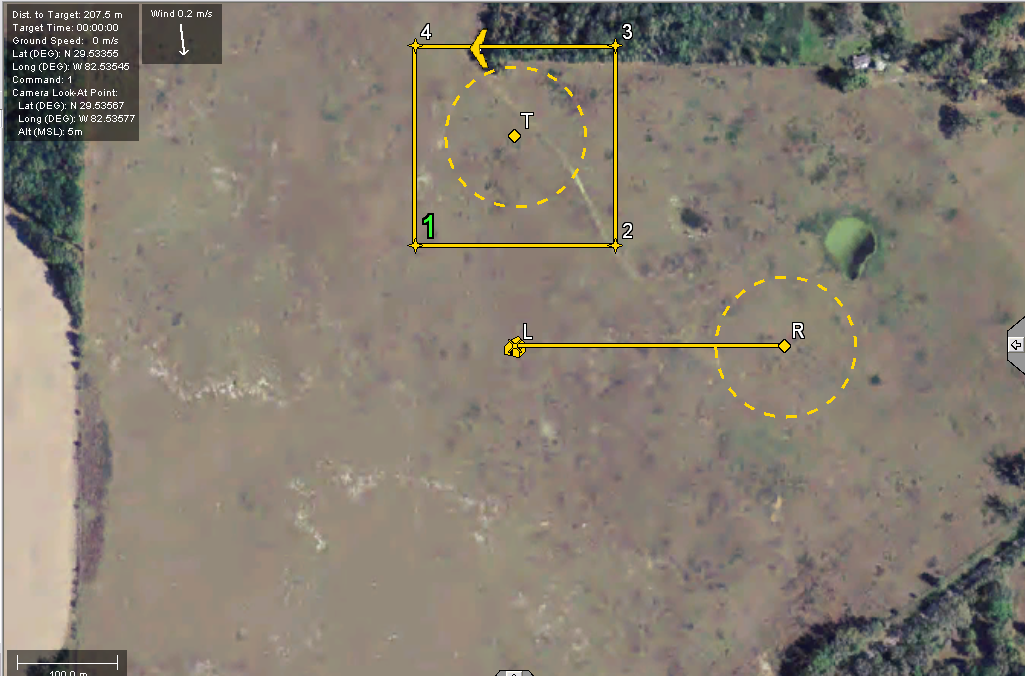
The Virtual Cockpit software is a complete control package from low-level autopilot programming to high-level UAS Operation. All of the tools and information for the PIC to fly the UAV are presented directly in an easy-to-understand format. All pilot-sensitive information is located in the upper left hand corner, including Airspeed, Altitude, Virtual Horizon, Location and Distance to home, Battery information, and information about UAV Position and waypoints.



Action buttons are located directly above this, and give high-level commands to the UAS .



To the right is a 2-d top-down geo-referenced map of the flight location. The map can either lock on to the UAS and follow (Moving Map), or the PIC has the ability to pan around the map without locking on the UAS. The map will always show UAS position, Ground Station Position, Home, rally, and landing position for quick reference. When waypoints are loaded, they will also appear.



For the purposes of the NOVA, the software is used for flight planning, UAS control and flight monitoring. The software walks the PIC through a preflight checklist of our design, and will alert the PIC to any problems prior to take-off. During flight it is the sole responsibility of the PIC to monitor the UAS from the ground station, and direct the flight in normal operation through the selection of TAKEOFF, NAV, and LAND modes. For an uneventful flight, this is the only input the PIC should provide. In the even of a problem (manned aircraft encroachment, problem with the UAS), the PIC can select HOME, RALLY, or LAND modes and manually override the programmed altitude and airspeeds. If more control is required, the PIC can select MANUAL or ALTITUDE mode and control the UAS through auto-pilot assisted flight with the Procerus Gamepad Controller. If even further control is required, the PIC can switch to Pilot-in-control mode. In this mode, through the use of a R/C transmitter and trainer cable into the Commbox (not pictured) the PIC has direct throttle and actuator control, bypassing the autopilot.