

Flight Control Navigation Unit at Work in Unmanned Reconnaissance Aircraft

Teledyne Ryan Aeronautical (San Diego) has taken delivery of two development and three flight units of Vista Controls Integrated Mission Management Computers (IMMC). The IMMCs will provide the IMMC for the Global Hawk air vehicle, the cornerstone of its Tier II Plus unmanned aerial reconnaissance program. Teledyne Ryan will take delivery of three more units over the next three months.

The IMMC, a derivative of Vista's Flight Control Navigation Unit (FCNU), performs the aircraft's flight control and navigation function. There are two IMMCs per air frame.

Vista's FCNU features an open architecture VMEbus format and integrates a GPS (global positioning system) receiver, IMU (inertial measurement unit) interface, and control and instrumentation I/O into a single package. An integrated navigation solution is computed using GPS, a strapdown IMU and an air data system. The GPS receiver function is implemented using a multichannel, L1, L2 P(Y) code and C/A code capable receiver with RTCM-104 differential capability. The GPS and inertial navigation solutions are then coupled using a centralized Kalman Filter which aids the code tracking loop of the GPS receiver. The resulting GPS/INS navigation information is made available on the bus for other vehicle management functions.

Coupling the GPS and INS subsystems provides improved accuracy and stability, increased reliability, jamming immunity, and higher dynamic operation over the complete military operational environment. Data from other avionics sensors can also be used to aid the navigation solution. Vehicle attitude data is also available via an optional 1553 bus

interface for use in ballistic computations and similar applications.

The IMMC hosts the UAV flight control and vehicle management software and communicates with other vehicle subsystems via a MIL-STD-1553B data

The unit is integrated with a solid state inertial measurement unit to provide all the basic inertial navigation system data; position, velocity, time, attitude, heading, angular rate and acceleration. By integrating the GPS receiver and the inertial

navigation system, Vista engineers achieve higher performance with minimum size, weight and cost. The FCNU can also share inertial sensor data with other vehicle systems, which eliminates costly redundant sensors.

As a member of Vista's SCORE series of high performance RISC-based embedded controllers, the FCNU is based upon Vista's application-proven SCOREmaster controller. Vista's SCORE series of products is intended for ruggedized and full MIL-SPEC/MIL-TEMP applications that demand reliability and maximum performance. SCORE products are employed in a wide

range of military and aerospace applications including avionics, vetronics and tactical communications and control.

The Tier II Plus program is administered by the Defense Advanced Research Projects Agency for the Defense Airborne Reconnaissance Office and is developing and building the high altitude long endurance UAV for real-time reconnaissance and battlefield surveillance. The vehicle has 41 hours of endurance and can operate at 65,000 feet. It is able to produce real-time imagery that can be sent directly to the battlefield commander. Under full operating conditions, the UAV will have both line-of-sight and satellite communication with its ground stations which will communicate with both theater and national exploitation systems.



Teledyne Ryan Aeronautical's 'Global Hawk' unmanned aerial vehicle utilizes rugged VME COTS components from VITA member company Vista Controls Corporation.

link, Ethernet, RS-422 and RS-232 serial data links, ARINC-429 interface and a variety of analog and discrete I/O to perform flight control and management of the vehicle subsystems.

The IMMC is designed to meet the rigorous environmental conditions demanded by the mission profile and is a prime application of rugged commercial off the shelf (COTS) technology, tailored for the military environment.

Vista's FCNU was designed to meet the emerging need for low-cost, open architecture, integrated GPS/INS hardware for navigation, guidance and flight control. The FCNU incorporates a VMEbus Precise Position Service (PPS) or Standard Position Service (SPS) GPS receiver and a full complement of VMEbus processor and I/O components.