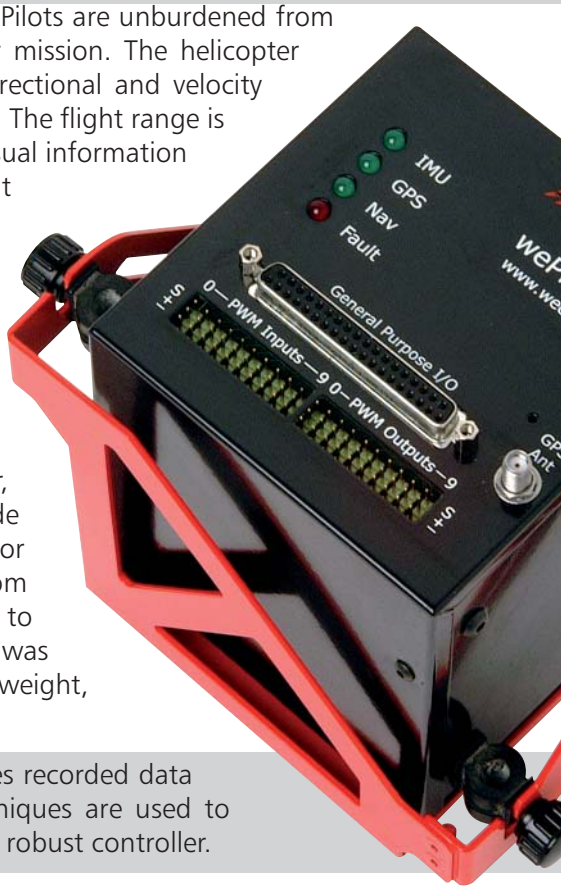
wePilot1000

OVERVIEW

The wePilot1000 is a flight control system for small unmanned helicopters. It is inserted between the RC receiver and the servo actuators. Pilots are unburdened from tedious stabilization tasks and can focus now solely on their mission. The helicopter is steered with the sticks of the RC transmitter expressing directional and velocity information. This allows the reduction of cost for pilot training. The flight range is considerably increased, since the pilot no longer depends on visual information for attitude determination. The wePilot1000 provides excellent assistance to pilots for close-range applications, like aerial photography, video, and filming.



The wePilot1000 consists of a flight control processor with a built-in embedded computer system, a GPS receiver, a full six-degree of freedom inertial measurement unit, a barometer, and an externally connectable magnetometer. The wePilot1000 combines integrated GPS/inertial navigation with robust controller design methodologies and a low-power, high-performance embedded computer. It provides attitude stabilization, velocity control for cruise, and position control for hover. A general purpose I/O interface allows control of custom payload equipment. Optionally a data-link may be added to visualize data on a ground control station. The wePilot1000 was specifically designed for mini helicopters where small size, light weight, and low power consumption are essential requirements.

The adaptation of wePilot1000 for a specific helicopter requires recorded data from a manually piloted flight. Parameter identification techniques are used to extract mathematical models from the data and to synthesize a robust controller.

FEATURES

- Attitude stabilization and velocity control
- Position of RC transmitter sticks interpreted as velocity commands
- Integrated GPS/inertial navigation
- Payload insensitive flight controller
- Built-in data logger and telemetry capability
- Programmable hardware for rapid customization
- Built-in payload interfaces
- Plug-in between remote control receiver and servos
- Built-in vibration isolating suspension

Hardware :

- Embedded computer system
  - Intel XScale PXA255 32-bit RISC Processor
  - 32 MB Flash ROM
  - 64 MB SDRAM
  - Xilinx SpartanXL FPGA
- GPS receiver module
  - Novatel OEMV1 receiver
  - Provides differential GPS (RTCM-SC104) input
  - Position accuracy : 1.8m RMS
  - Acquisition time (cold start) : 40s
- Inertial measurement unit with
  - 3 gyroscopes : ± 100 deg/s
  - 3 accelerometers : ± 10 g
- Piezoresistive pressure sensor :
  - 300 – 1100 mbar

- Interfaces
  - SMA connector for active GPS antenna
  - 10 PWM input channels
  - 10 PWM output channels
  - General purpose I/O interface
    - 6 analog input channels with 12-bit resolution
    - 8 digital I/O channels
    - RS-232/TTL interface for external magnetometer
    - RS-232/TTL interface for external data-link
    - RS-232/TTL interface for external DGPS correction message receiver
    - 1 RS-232 interfaces for custom payload equipment
    - RS-232 interface for host computer
    - 4 LED status signals
- 12 V unregulated power supply
- Power consumption : 450 mA @ 12V

Algorithms :

- Extended Kalman Filter for data fusion of GPS and inertial sensors
- Robust flight controller design based on H_∞ methods
- Bumpless transfer between manual and automatic control
- Waypoint guidance package
- Automatic take-off and landing
- Monitoring of GPS solution, IMU, magnetometer, PWM inputs, and power supply
- Pseudo-autorotation in case of engine power loss

DIMENSIONS AND ENVIRONMENT

- Dimensions (flight control processor) : 120 x 154 x 125 mm (L x W x H)
- Weight : 1020 g
- Operating temperature : 0 °C … 70 °C
- Storage temperature : -20 °C … 125 °C

DESIGN SUPPORT

weControl provides consultancy services as well as hardware and software support for :

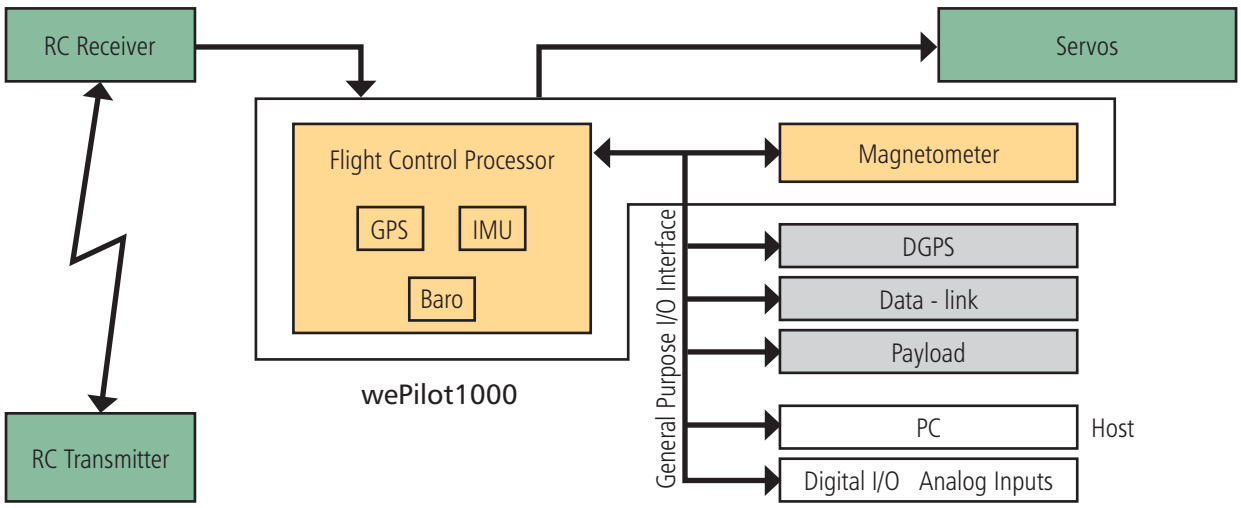
- Custom payload control
- Ground control station
- Sensor integration

ORDERING INFORMATION

wePilot1000 :

Flight control processor, including

- Computer board
- IMU
- GPS receiver with antenna and magnetometer module for external mounting



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