



Surface SPECTRE Mk 4

The SPECTRE remote control autopilot for surface craft (RCAS) was the remote control system on the first boat approved for unmanned operation in UK coastal waters by the UK Maritime Coastguard Agency.

Based on the proven SPECTRE autopilot board, it is available as a turnkey system suitable for a wide range of Unmanned Surface Vehicles (USVs). The SPECTRE Mk4 unit has interfaces for navigation sensors via NMEA0183 and NMEA 2000, and with engine and throttle controls. The system may be configured to control a craft with single or twin engines, props or waterjets, via a standard electronic throttle actuator and hydraulic steering pump, and is designed to be easily reconfigurable to meet the needs of a variety of craft.

The SPECTRE autopilot board provides:

- Advanced self-tuning autopilot control modes, including heading, track and hover / dynamic positioning.
- Remote controlled operation.
- Fully autonomous operation.
- Collision avoidance.
- Autonomous with capability for operator intervention.
- Covert mode—zero command link transmissions.
- Proprietary stable and secure communications protocol (available as DLL for third party control software) or NMEA type interface.
- Engine monitoring.
- Ignition control (remote start/stop).
- Control of auxiliary systems (PTZ camera, transponders etc) including gyrostabilisation control for IR/visible camera systems.
- Multiple serial connections: 5 for the MicroSPECTRE, 10 for SPECTRE 2.
- Analogue and digital inputs and outputs.
- Control of power for external devices with intelligent power monitoring and overload tripping.
- Single or twin engine control, including single or twin waterjets.
- Docking joystick—direct control of the boat via a dedicated radio modem—makes it safer to bring the boat into dock.
- Control over Iridium satellite based communications link.
- Compatible with our Datalogger that can log from serial ports, analogue inputs, and digital inputs measuring state or pulses.

Typical applications are vehicles up to 15 metres in length, at speeds ranging from less than 1 kt to over 50 kts. Performance is limited primarily by the ability of the vehicles's own navigational sensors to operate correctly at high speeds, and the performance of the vehicle itself.

The application shown here is a target-towing RHIB operated by QinetiQ.

To facilitate the operation of unmanned vehicles, SPECTRE processor has the ability to communicate, using a remote control protocol, across a radio link or some other remote signalling system. The SPECTRE system provides the additional circuitry for controlling the hydraulic steering pumps and electronic throttle, as well as the navigational sensor suite and the ignition and starter circuitry. Remote control of additional channels, for example cameras, is provided. Safety cut-outs and fail-safe operation are included.

High speed operations:

SPECTRE is equipped with advanced sensor datafusion and adaptive autopilot algorithms which aid stability at high speed. Agile craft such as RHIBs have a tendency to begin "snaking" when the autopilot is engaged at high speed, especially when following waypoints. SPECTRE's advanced adaptive algorithms are able to overcome these issues, resulting in a straight track with no significant oscillation.

Potential applications include:

- Surveillance: the autopilot controls the vessel to follow a pre-defined track within the survey area, while payload instruments are employed, for instance, side-scan sonar, visual / infrared imagery. The SPECTRE autopilot autonomously navigates the craft, while the command link is used to communicate with the payload sensors or the autopilot may be pre-programmed to switch on instruments at specific waypoints. The system provides command and control channels for remote control and monitoring the payload.
- Remote controlled mine-hunting: the SPECTRE autopilot is ideally suited to control the vessel at low speeds and in hover manoeuvres while payload instruments are deployed. A special mode can control the vehicle to stay on a fixed station relative to the host ship and can be used to scan the area ahead of a warship under way.
- Target and target towing: the autopilot can be fitted either to the target itself or to a towing vessel. The proven SPECTRE technology can control a light craft at towing speeds, and the compass stabilisation technology allows the autopilot to maintain heading even in significant sea states.

