BACKGROUND
The TARGET project encompassed the development, from concept to realisation, of a full-scale autonomous ground “target” vehicle.

The TARGET vehicle was designed to provide a safe unmanned moving ground target for an Unmanned Aerial Vehicle (UAV) project undertaken by Thales Australia.

Key project objective: to develop a ground target vehicle system capable of switching between normal human driving, remote control and autonomous control modes of operation.

AUTONOMOUS GUIDANCE CONTROL
High-level multi-variable control responsible for autonomously guiding the vehicle along a desired waypoint-defined path.

Uses strategic path-tracking algorithms to produce appropriate steering angle and speed commands based on the actual measured vehicle position and heading, and the desired vehicle position and speed described in the path waypoints.

GRAPHICAL USER INTERFACE
Designed specially for the control of the TARGET. Mode switching is controlled from the GUI and Waypoints can be defined by the user to create a path.

The Base Station will calculate a smooth path from the user defined waypoints.

ON-BOARD COMPUTER SYSTEM
Controls the vehicle in its four modes of operation, performs fault monitoring, and integrates all of the vehicle’s systems together. The four modes of operation are:

1. Remote Control (RC) Mode
2. Autonomous Mode
3. Manual Mode
4. Failure Mode

Failure mode automatically brings the vehicle safely to a stop, and is activated when the program detects a fault in the system.

STATE MEASUREMENT & ESTIMATION
Fuses various sensor data into improved estimates of the vehicle position, heading speed using an Extended Kalman Filter.

These sensors include:
- Global Positioning System (GPS) Unit
- Inertial Measurement Unit (IMU)
- Hall-Effect Sensor (located on the drive shaft)
- Potentiometer (located on the steering column)

SAFETY
Extensive measures were taken to ensure the valued safety of the project team and the vehicle itself.

Some of these measures include:
- Various Failure Modes
- Redundant processor in case of main processor failure
- Mechanical and Electronic Emergency Stops
- Roll Prevention

Motion Execution Control
Receives steering and speed commands from the handheld remote controller and the Autonomous Guidance Controller.

Ensures that the vehicle follows these steering and speed commands rapidly and effectively by sending signals to the vehicle’s actuators.