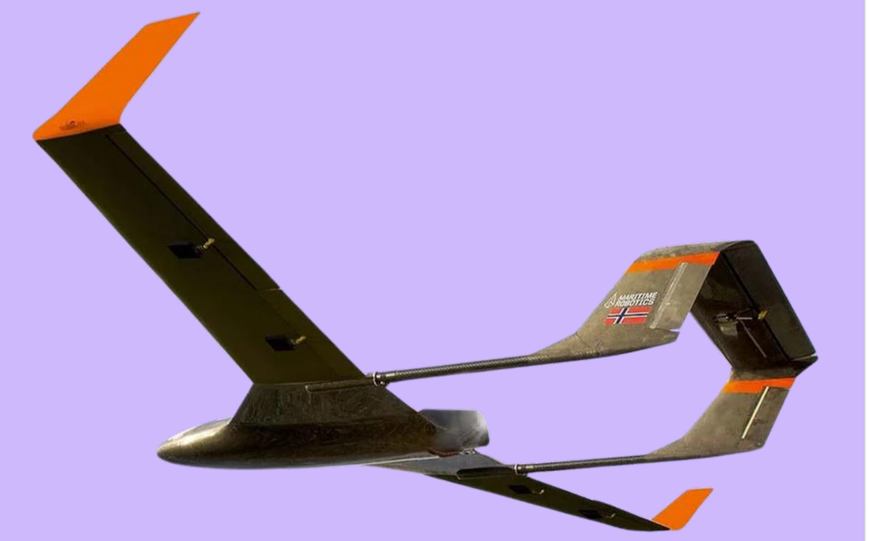
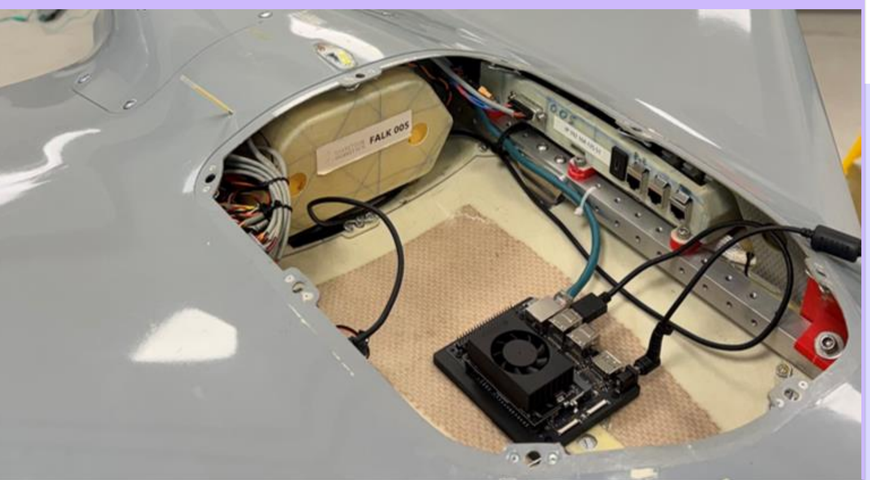
University of South-Eastern Norway

Digital Twin and Systems Integration for a Fixed-Wing Unmanned Aircraft System

Contribution to a Multi-Vehicle Simulation Platform





Purpose and aim

The Falk PX-31 is a 23 kg surveillance drone used by Maritime Robotics to monitor Norwegian coastal waters. Testing it in every possible mission scenario is costly and risky — a realistic computer simulation solves this. This thesis adds the Falk as the fixed-wing branch to an existing multi-vehicle simulation platform, building a physics-based digital twin connected to the drone's real flight controller software and validating it against real flights.

Results and important findings

Three levels of simulation realism were implemented and compared on real flight controller hardware: pure software simulation (SITL), simulation with the real hardware board, and a custom hardware-in-the-loop setup where the real flight controller processes real sensor data from the simulator. The system was validated against operational surveillance flights, establishing how closely the simulation matches real-world behaviour.

ROS2 GAZEBO ARDUPILOT MAVLINK

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