

NORCE Drones and Autonomous TROMSØ • systems Research • BARDU

Real-time autonomous monitoring using unmanned aircraft systems (UAS)

BODØ

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Drone Research Themes









Operational Platforms

Instruments and algorithms

Control, navigation and communication

- Platforms, navigation and controll, autonomy, weatherization, safe operations, airworthiness, seaworthiness.
- Sensor systems, algorithm development, real time data distribution, analytics.
- Middleware for payload control, control of communication, indexing and dissemination of data

Flying Drone Platforms









CW Scout (Bungee catapult) x 3

- MTOW: 11kg (2 kg payload)
- Wingspan 3 meter
- Twin electric (56 Ah Li-ion, 4S)
- Cruise speed: 22 m/s
- Pixhawk, 433Mhz, 5.8Ghz and 4G
- 3 hours



CW Roamer (Pneumatic catapult) x 5

- MTOW: 35kg (10 kg payload)
- Wingspan 3.8 meter
- 62 cc 2-stroke gas
- Cruise speed: 27 m/s
- Micropilot autopilot
- Iridium, 433Mhz, 5.8GHz and 4G
- 5 hours





CryoCopter x 2 - 2.5 kg payload in 15 minutes - Pixhawk, 433Mhz, 5.8Ghz, 4G





- CW Explorer (Catapult) x 2 - MTOW: 65kg (20 kg payload) - Wingspan 5.2 meter - 110 cc 2-stroke gas - Cruise speed: 30 m/s
- Piccolo autopilot





Surface Drone Platforms





Operational support systems for autonomous systems



Built on challenges facing UAS operations in remote and harsh environments (Arctic, Antarctic, Greenland, North Sea, ...)

- Unstable and intermittent communication systems
- Limited bandwidth/data reduction
- Distribution of data to stakeholders in real-time
- Temporal and spatial data prioritization
- Need for interaction with end users



Is the future intelligent self optimizing autonomous forecasting, monitoring and surveillance systems?



If so, we need a real-time feedback system



N 🔅 R C E



Critical System Software and Hardware components



Middleware - Cryocore

- Controls all onboard processes and hardware through services.
- Communication
- Sensors

ChainDB

- Stores data and provide data to Nlive
- Stores sensor configurations

Cryocase

- Ground station communication and metadata Nlive and Enlighten-web
- Ground control station, planning, analytics and collaborative tools

Easylce Realtime Onboard Processing



Drone System Software Onboard processing and Chain database



RGB image

Thermal image

Ice floe detection

N C R C E

All data processed onboard and indexed in local database Optimized to work over "fragile" communication links Data is synchronized with priority

- User requests (Areas, objects), metadata, images
- Works with video (Nlive demo)
- Within frame synchronization between all users



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A system of model driven autonomous platforms capable of collecting, analyze and distribute data in near real time, allow for optimizing cost benefit of the system

To enable such a system one depends an adapted middleware that ensure real-time flow of critical data for system decision making.

Powerful onboard computing capability crucial to reducing bandwidth requierments

Allow for efficient distribution and interaction with stakeholders increase learning