# SearchWing UAV – Datasheet

Release V4, Date: 10.03.2023

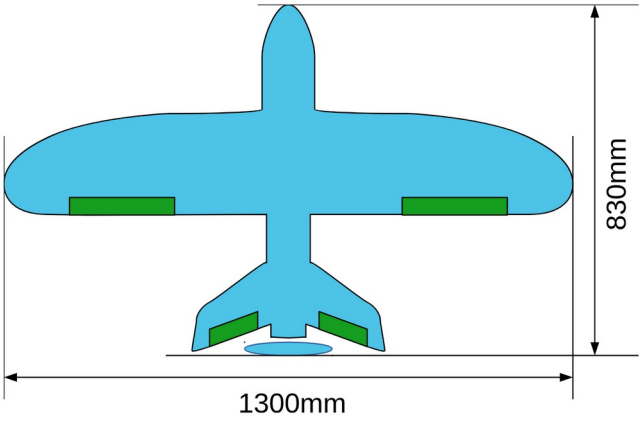
The SearchWing UAV is an unmanned aerial vehicle that searches for boats at sea. The UAV is designed to be operated by the regular crews on the rescue vessels. It takes GPS tagged photos ready for download and analysis after landing.

## Key features

- Range: 80 - 120 km
- Flight time: 1h - 1.5 h
- Max. area covered: 160 km² - 240 km²
- Ground resolution:  ~ 20 cm / pixel @ 550m altitude

## Hardware

- Wingspan: 1300 mm
- Length: 830 mm
- Weight: 2.1 kg
- Max. speed: 100 km/h
- Cruise speed: 60 km/h
- Max. range: 80 km (LiPo) / 120 km (LiIon)
- Max. area covered: 160 km² - 240 km²
- IP rating: IP67 (waterproof)
- Wind resistance: 20 kt
- Sensors
  - Visible light cameras
  - GPS
  - Barometer
  - IMU / Gyrometer
  - Magnetometer
  - Internal humidity
- Telemetry range: 25 km

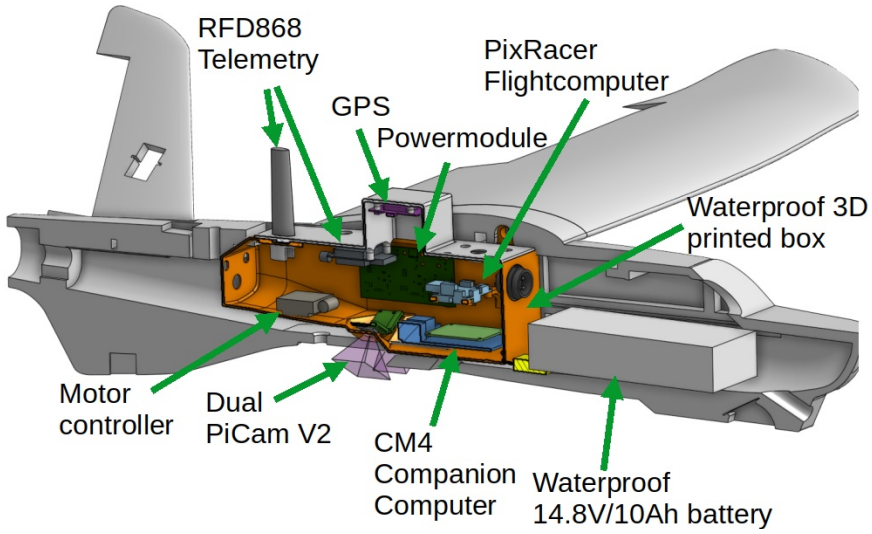



### Battery options

1. Lithium-Polymer
   - 4S 10.000 mAh
   - 80 km range
   - 1.5 h Flight time
2. Lithium-Ion
   - 4S 10.000 mAh
   - 120 km range
   - 2 h Flight time

# Payload

## Overview

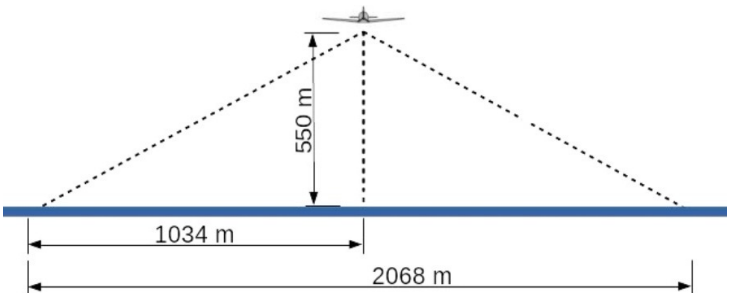



## Dual Raspberry Pi Camera v2

- Sony IMX219 Sensor
- Resolution: 8 Megapixel / 3280 x 2464 Pixel
- Mounted at +30° Roll and -30° Roll
- Horizontal field of view: 62.2°
- Vertical field of view: 48.8°
- Image rate: 1 image / 2 seconds

## Maximum expected coverage in one flight

- At 550m altitude
- Sweep width: ~ 2 km
- Lithium-Polymer battery option: 160 km²
- Lithium-Ion battery option: 240 km²




## Ground resolution

- At 550m altitude
- 20 - 40 cm / pixel

# Groundcontrol station

## Hardware

- ASUS TUF Gaming FX505DV Laptop
- Oukitel RT2 IP67 tablet
- FrSky Taranis X9D+ or Radiomaster TX16S remote
- Ship mounted Antennabox (300mm x 300mm x 180mm)
- 868MHz Barracuda OMB.868.B05F21 telemetry antenna (818mm long)
- 150W Drone battery charging station

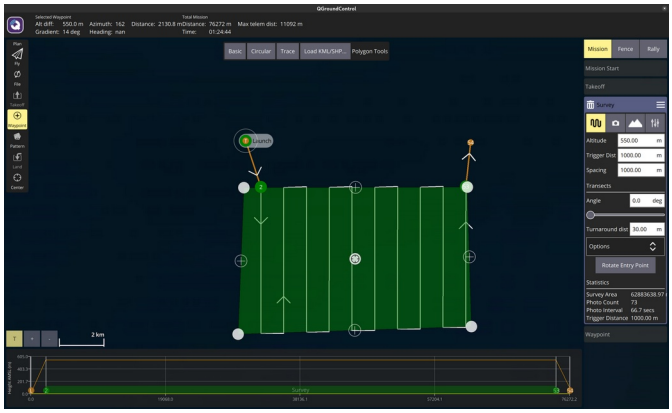
## Required installation onboard

- 230V Power Supply for Laptop, battery charger and image download box
- Telemetry antenna installed outdoor
- Antennabox close to antenna with 24V supply via PoE
- Clean water to rinse the plane from salt water

## Software

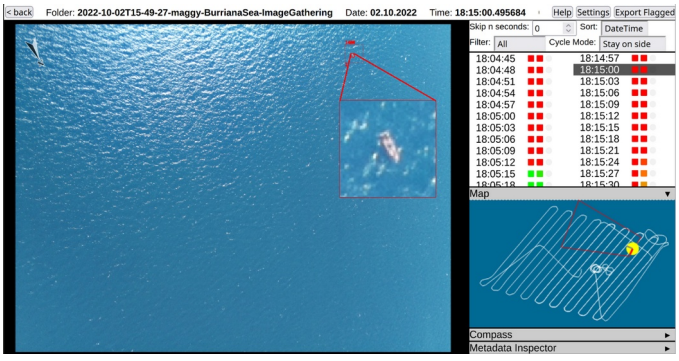
### Flight control tablet

- Running QGroundControl software
  - Mission planing
  - Preflight checks
  - Mission control



### Ground station laptop

- Image Download after landing using WIFI
- Automatic boat detection
  - Deep Learning based & GPU-assisted boat detection
  - Temporal filtering using Kalman filter based Multi-Object-Tracking
- Images & detections visualization software
  - Multi-user capable
  - Accessable from all computers on the ship via browser
  - Visualizes results from automatic boat detection & GPS position




# Transport

- 2 x Aluminium box: 900 mm x 495 mm x 367 mm
- Lithium batteries: dangerous goods, special care

# Standard operating procedures (SOPs)

## Pre-Mission Pilot Training

### *Goal*

Prepare pilots for a mission according to our pilot training handbook

### *Procedure*

1. Before training the pilot does trains plane maneuvers in simulator at home
2. Two days training in Berlin or Augsburg
3. First day theory of flying and operations
4. Second day practical flying

### *Responsibilites and qualification*

**Remote pilot** Executes training as described above.

## Daily preparations preparations

### *Goal*

Having planes ready for daily operation

### *Procedure*

1. Coordinate possible flights in daily meeting
2. Get drone parts from storage
3. Prepare plane and ground control for takeoff.

### *Responsibilites and qualification*

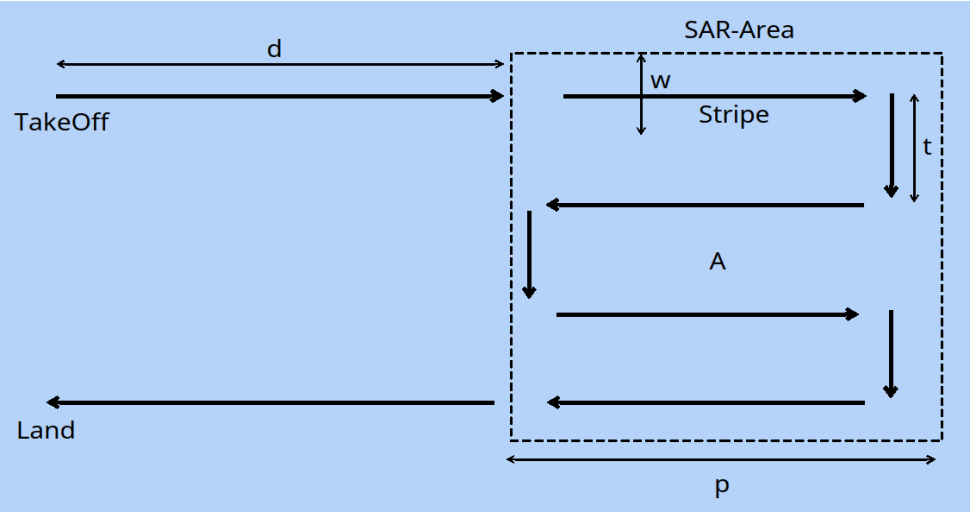
**Remote pilot** prepares UAS.
**Bridge/SAR Ops** acknowledges mission readiness.

## Reconnaissance flight for case reported by sources

### *Goal*

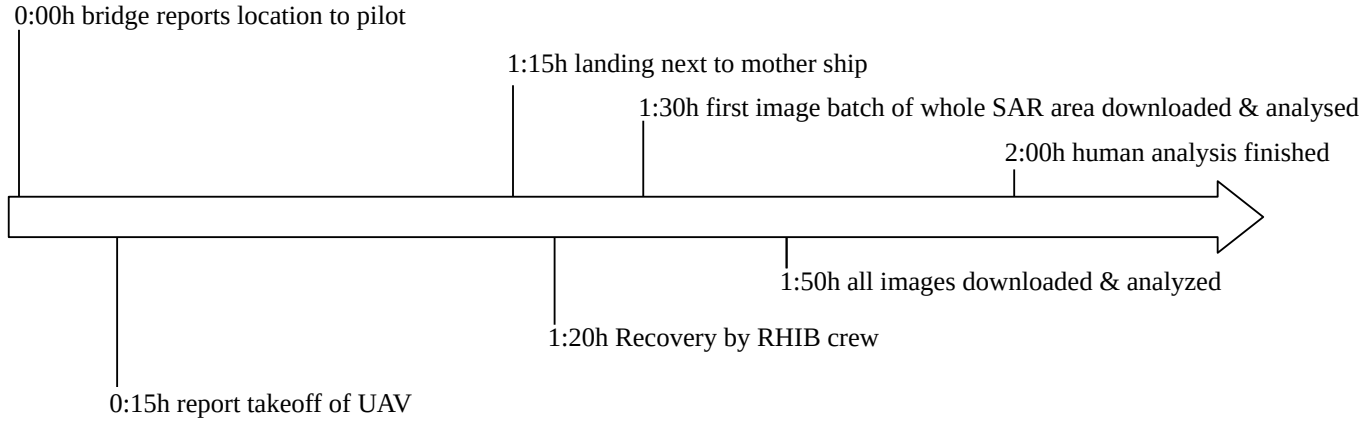
Gather intelligence about a far potential case reported by a source as fast as possible.

### *Typical mission parameters*




d = 30 km = 16.2 nm
w = 2 km = 1.08 nm
p = 4 km = 2.16 nm
A = 16 km² = 4.67 nm²

### *Mission procedure*




### *Responsibilites and qualification*

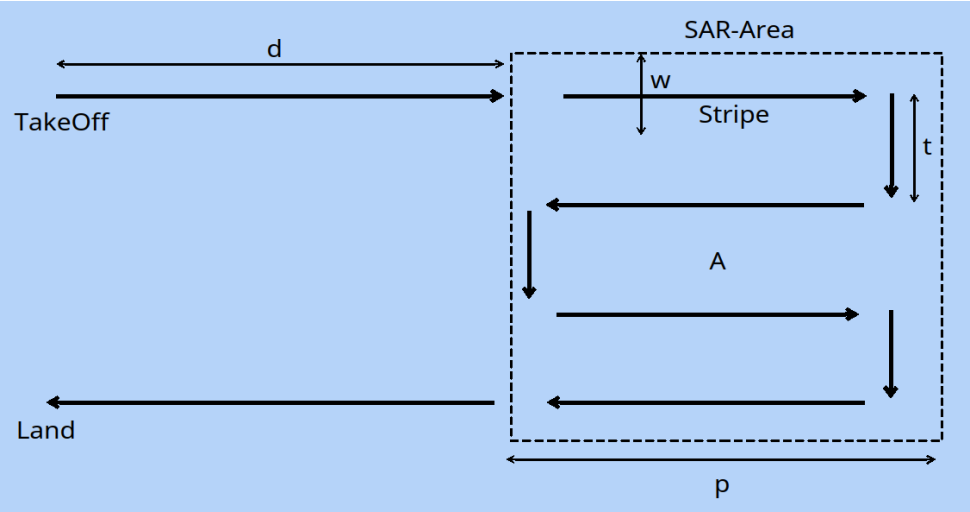
**Bridge/SAR Ops** reports position and coordinates between RHIB crew and pilot.
**Remote pilot** operates UAV/UAS and provides bridge/SAR OPs with intelligence about potential cases. Operates image analysis.
**RHIB crew** recovers UAV from water after touchdown or failed takeoff.

## Search for unknown cases

### *Goal*

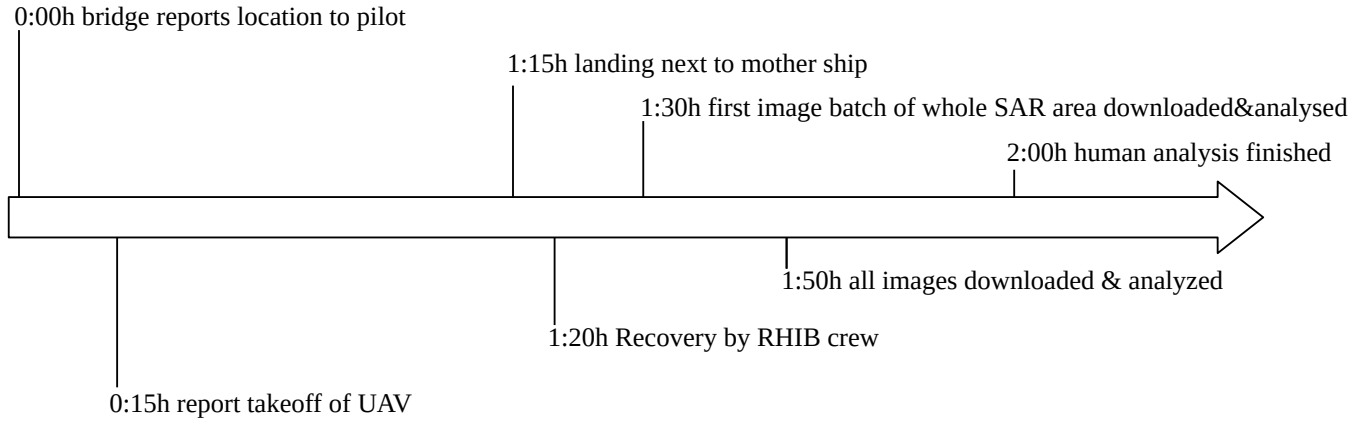
Find cases without prior knowledge about potential cases. Maximize covered area.

### *Typical mission parameters*




d = 7 km = 3.78 nm
w = 2 km = 1.08 nm
p = 9 km = 4.86 nm
A = 81 km² = 23.62 nm²

### *Mission procedure*




### *Responsibilites and qualifications*

**Bridge/SAR Ops** reports search area and coordinates between RHIB crew and pilot.
**Remote Pilot** operates UAV/UAS and provides bridge/SAR OPs with intelligence about potential cases. Operates image analysis.
**RHIB crew** recovers UAV from water after touchdown or failed takeoff.