Autonomous Flying Platforms for Atmospheric and Earth Surface Observations (APAESO)

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Project Website: http://eewrc.cyi.ac.cy/APAESO/APAESO

Purpose

→ To carry out at high spatial resolution Atmospheric and Earth-surface observations in the Mediterranean:

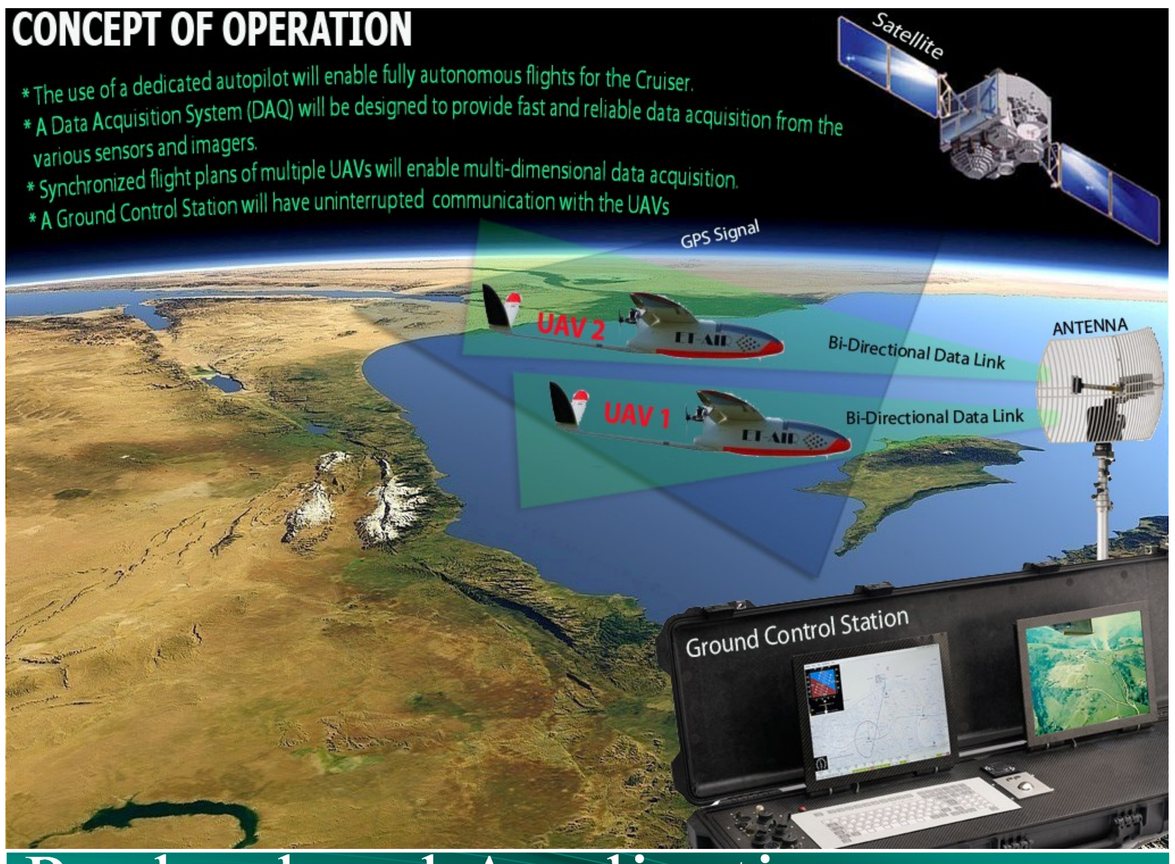
- **Physical, Chemical and Radiative atmospheric properties**
- **Physical, chemical, and optical properties of aerosols**
- **Atmospheric Dynamics**
- **Surface Morphology**
- **Vegetation and Land use patterns**
- **Archaeological Site Reconnaissance**
- **Contaminant detection**
- **Ocean Surface properties (biology, waves, currents)**

Design Characteristics

APAESO UAV: The Cruiser [1-2]

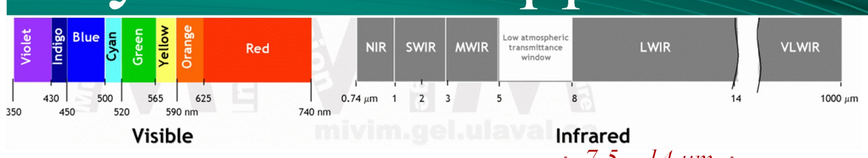
- Medium size Unmanned Aerial Vehicle (UAV)
- Made in Slovakia by ET-Air
- Wingspan: 3.8m
- Altitude: 5 km
- Maximum take-off weight: 30kg
- Payload 15kg including fuel
- Engine: Zenoah 62cc (two-stroke gasoline)
- Fuel Capacity: 10 L

The Cruiser [1-2]



Payload and Applications (Examples)

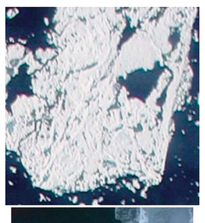
1. Imaging



400-1000 nm Multispectral Cameras [8-11]

380-750 nm Visible Cameras[3-6]

7.5 – 14 μm Infrared Cameras[13-15]



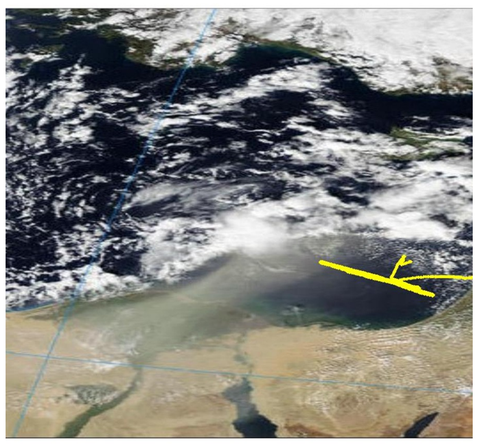
Sauran Medieval Archaeological Complex in South Kazakhstan [7]

(a) Multispectral imagery collected by the MCA-6 camera at 0.15-m spatial resolution and six spectral bands with 10-nm FWHM. (b) Spectra extracted from different image targets in the 400–800-nm spectral region. [12]

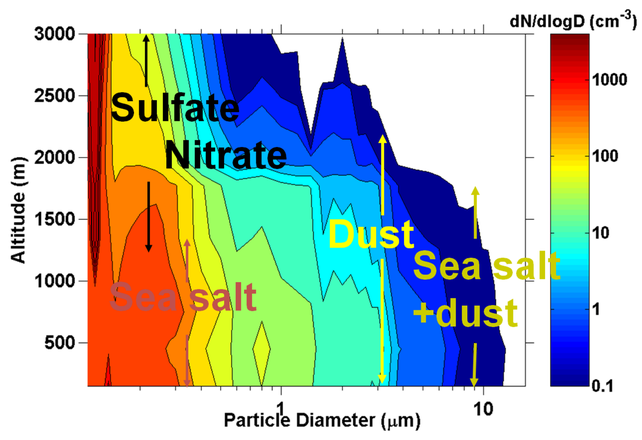
Airborne mid-infrared image of a portion of an agricultural research farm: 1) citrus trees, 2) dry fallow land, 3) irrigated land, and 4) water body [16]

(*Top*) Summer sea-ice conditions showing melt ponds on the surface of a multiyear floe recorded from an aircraft altitude of 1500 m. (*Bottom*) Nilas, new, and young ice in a refreezing lead observed from an altitude of 200 m. [17]

2. Aerosol and Cloud measurements



MODIS image of dust storm above the Eastern Mediterranean on 28 Jan 2003. The yellow line shows track of King-Air research airplane equipped with aerosol measuring probes.[18]

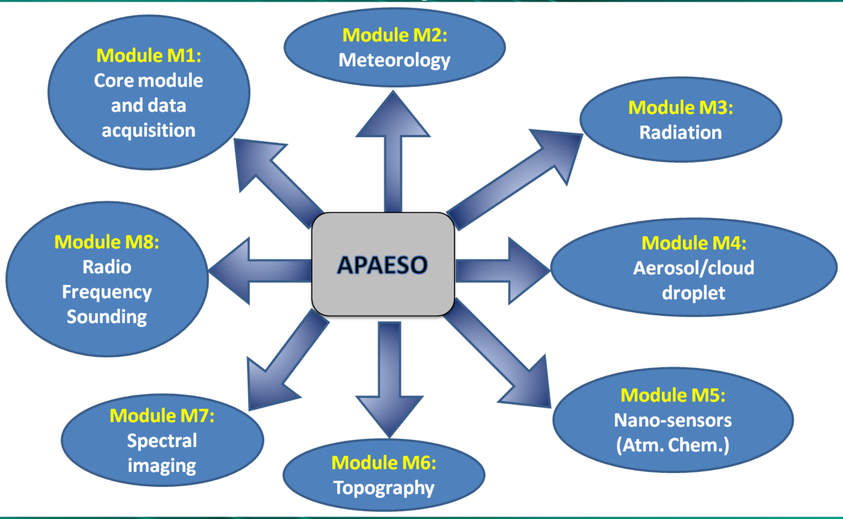


Vertical profile of aerosol size distribution measured by Optical Particle Counters during the dust storm and their chemical composition. Large concentrations of mineral dust aerosols mixed with sea salt were observed up to 2000 m ASL. [18]

Application name	Objectives (examples)	Instruments/ measurements
Meteorological measurements	Boundary Layer studies,	T, RH, P
Remote sensing - Earth surface observations	land and ocean surface properties, vegetation and land-use properties, archeological studies	RH, P, T, PAR radiometer, Hyperspectral camera, IR imaging , Vis imaging
Aerosol & Cloud measurements	Aerosol-Cloud Interactions	RH, P, T, Cloud Droplet Probe, Optical Particle Counter
Aerosol and Radiation measurements	Aerosol direct & indirect effects on climate	RH, P, T, Optical Particle Counter, Albedometer
Aerosol sampling	Ice Nuclei and Cloud Condensation Nuclei sampling	RH, P, T, Aerosol inlet, IN sampler, impactors

Modularity

Sensors, Imagers and DAQ system will be designed in a modular fashion in order to allow easy interchangeability between modules (M1-M8) for the different missions and applications.



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