MISRlite - Multi-angle IR Stereo radiometer using uncooled microbolometer arrays for global winds from the ESA-EUMETSAT tandem EPS platforms

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Programme Aims

- **To test if room-temperature IR sensors can be used for cloud imaging**
- **Fly a demonstration experiment on a aeroplane to perform stereo imaging of example cloud types**
- **Carry out system study of a MISRlite space instrument**

Why do we need Space Winds from MISRlite

- **Atmospheric Motion Vectors (AMVs) from GEO & LEO-LEO Cloud Motion Vectors have poor height accuracy and have a poor impact on current NWP forecasts (IWW12)**
- **Winds not well resolved, especially in the zone from 50-75º**
- **Wind determines mesoscale dynamics and weather evolution**
- **Wind determines tropical circulation**
- **Over the ocean where storms develop and sparse 3D meteorological observations are present; reduces errors in NWP forecasts over the ocean**
- **Circulation component in the climate system & Prime WMO requirement**
- **Need to complement the Line-of-Sight ADM-AEOLUS***

Science Objectives

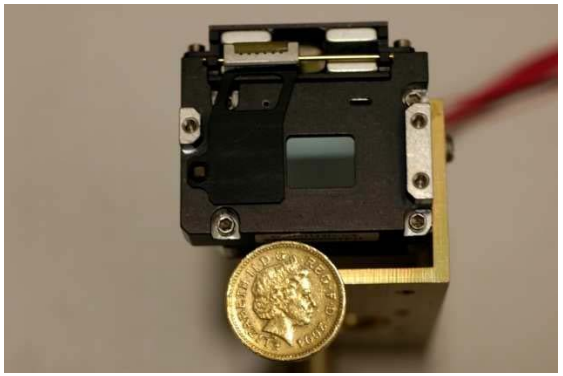
- **Detect global warming signature in cloud top-height climatologies**
- **Develop deeper understanding of severe weather systems (e.g. fronts, line convection, hurricanes) from cloud-top height winds**
- **Develop better understanding of boundary layer cloud formation and their role in global cooling**
- **Winds are second highest priority product for all NPW forecasts (1st is T-P)**

CFARR (Chilbolton Facility for Radar Research)

Prior Art for the development of an airborne prototype

Fisheye ferro-electric camera with FPGA installed at Chilbolton operating every 30 seconds 24/7/365

Compact camera unit with FPGA and new ULIS microbolometer camera cores

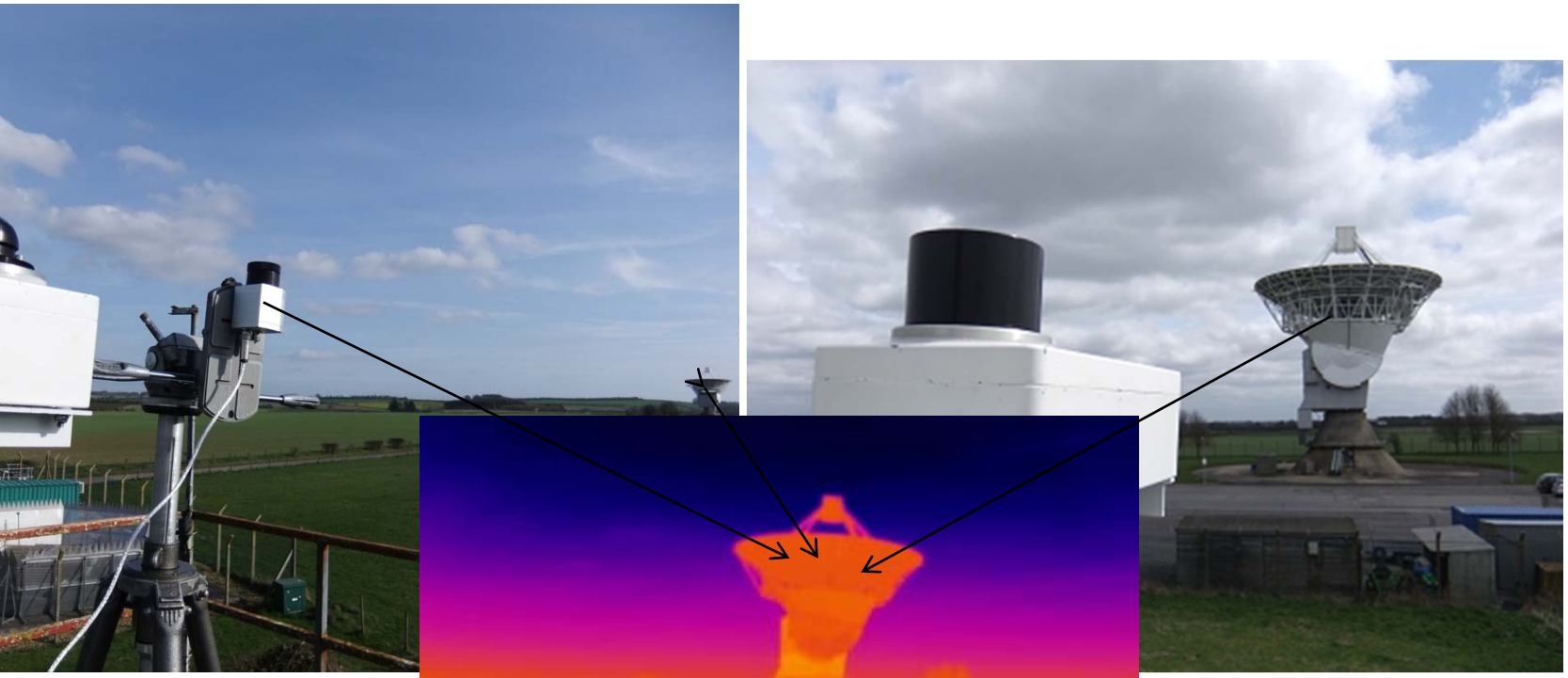


CFARR field deployment to gather suitable data for analysis tests

- **CFARR have two science pods exactly 500m apart, on the roof of which TIR cameras with fisheye lenses can be mounted**
- **Recently deployed Opgal TIR cores in weatherproof enclosures to gather stereo fisheye lens imagery of cloud-base**
- **Mounted to point at zenith and allow us to compare digital output from FPGA microbolometers cf previous ferro-electric sensors**
- **Ground-based set of stereo data will be used to develop camera processing software to convert stereo-matched output to heights**
- **Critical to obtain geometric calibration of both cameras. This was achieved at MSSL using a heated target approach**

TIR Camera calibration at MSSL

New Optris TIR core example frame to be employed in flight campaign



Parafield Airport, Adelaide

ptris Camera

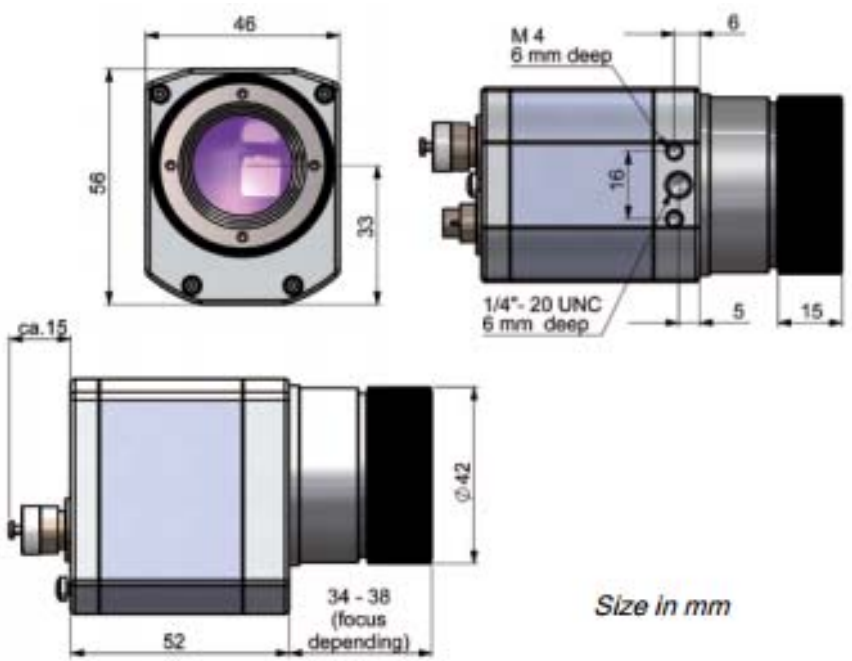
ncooled amorphous icon bolometer array

2 x 288, 25µm pixels

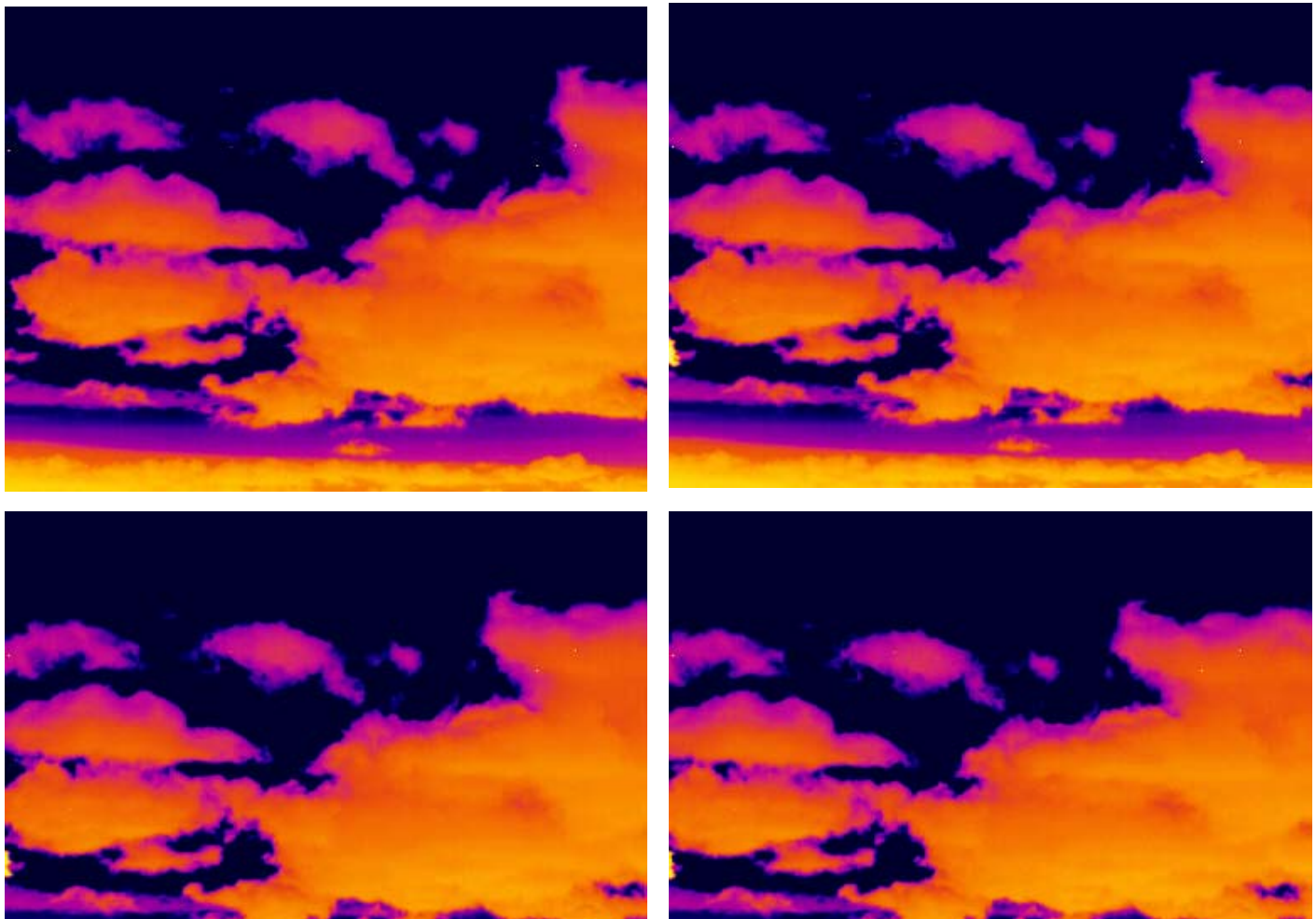
pectral range: 7.5 to µm

rame rate: 80 Hz

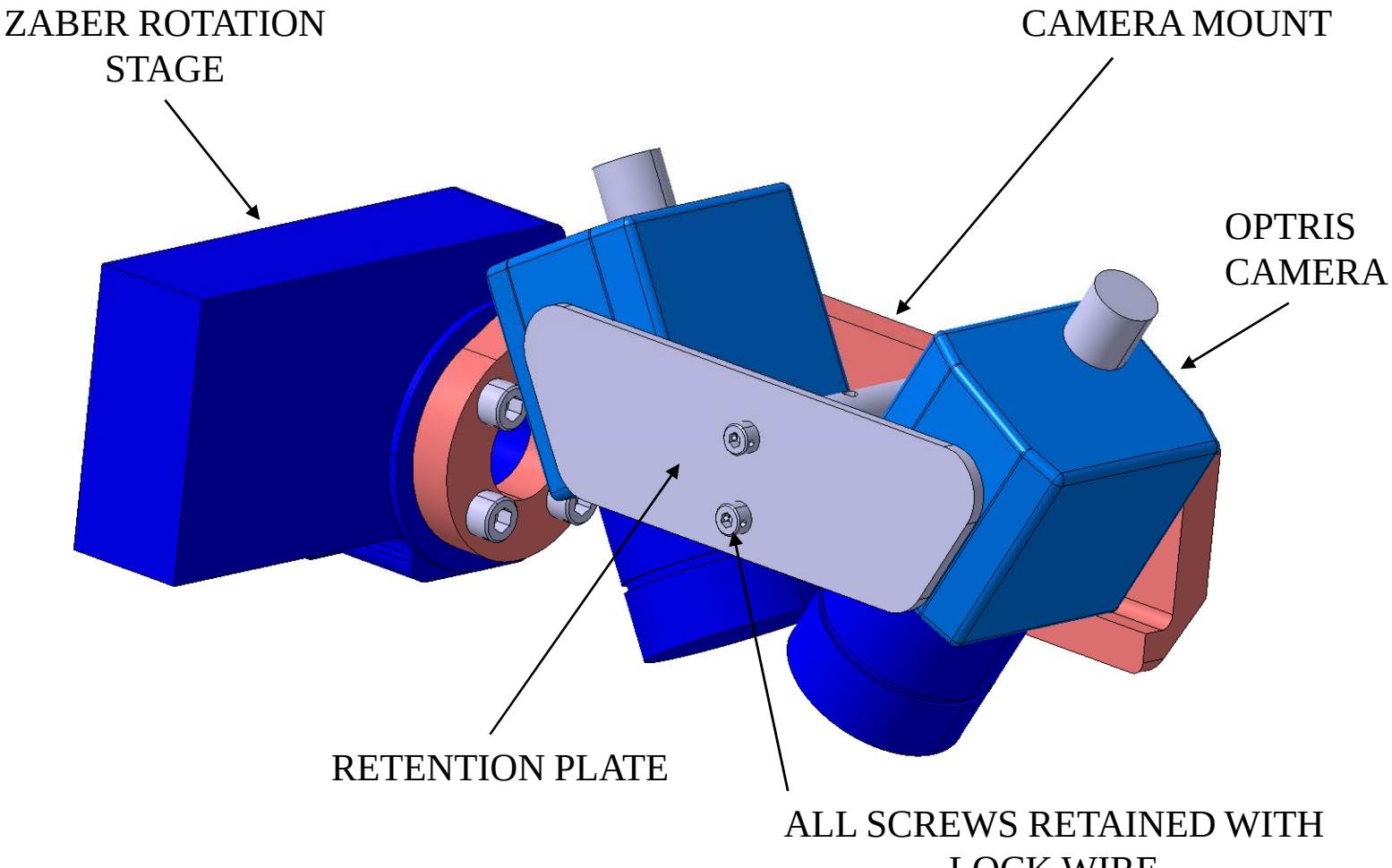
eld of view: 50x50deg

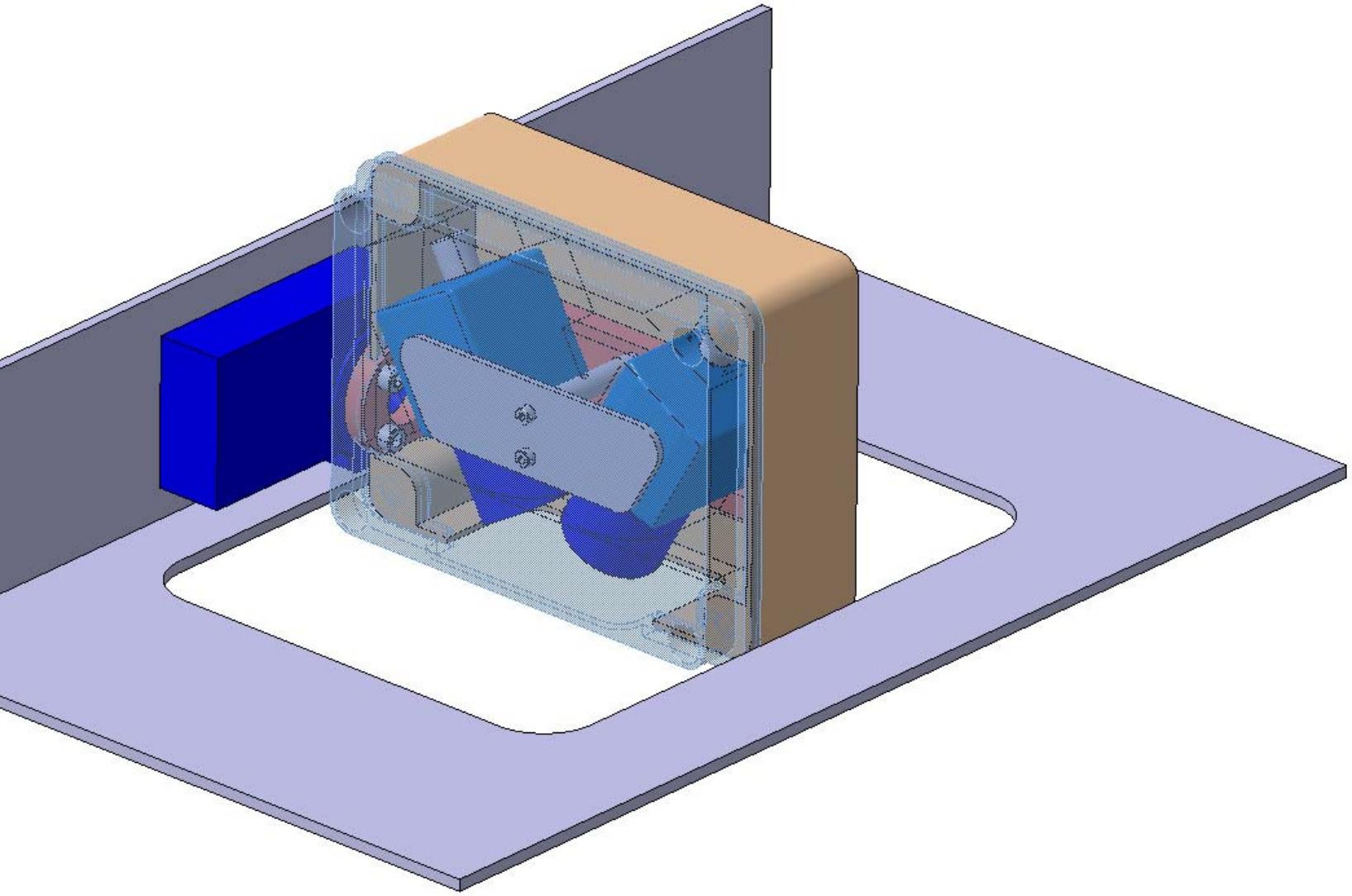


otris Cloud Images



Camera Mount






ECO-Dimona HK36 TTC
Airborne Research Australia
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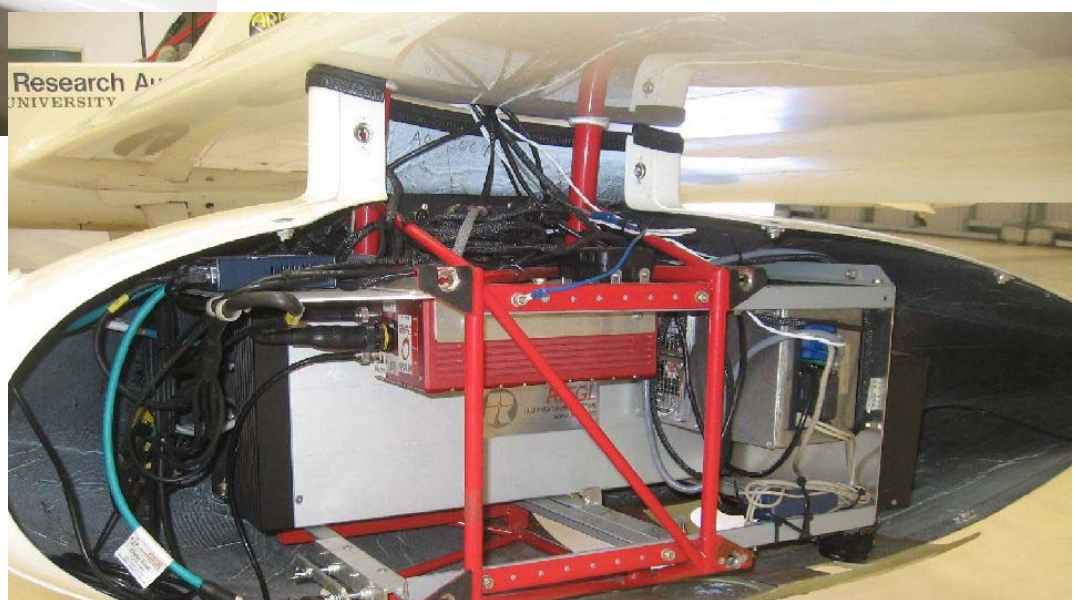
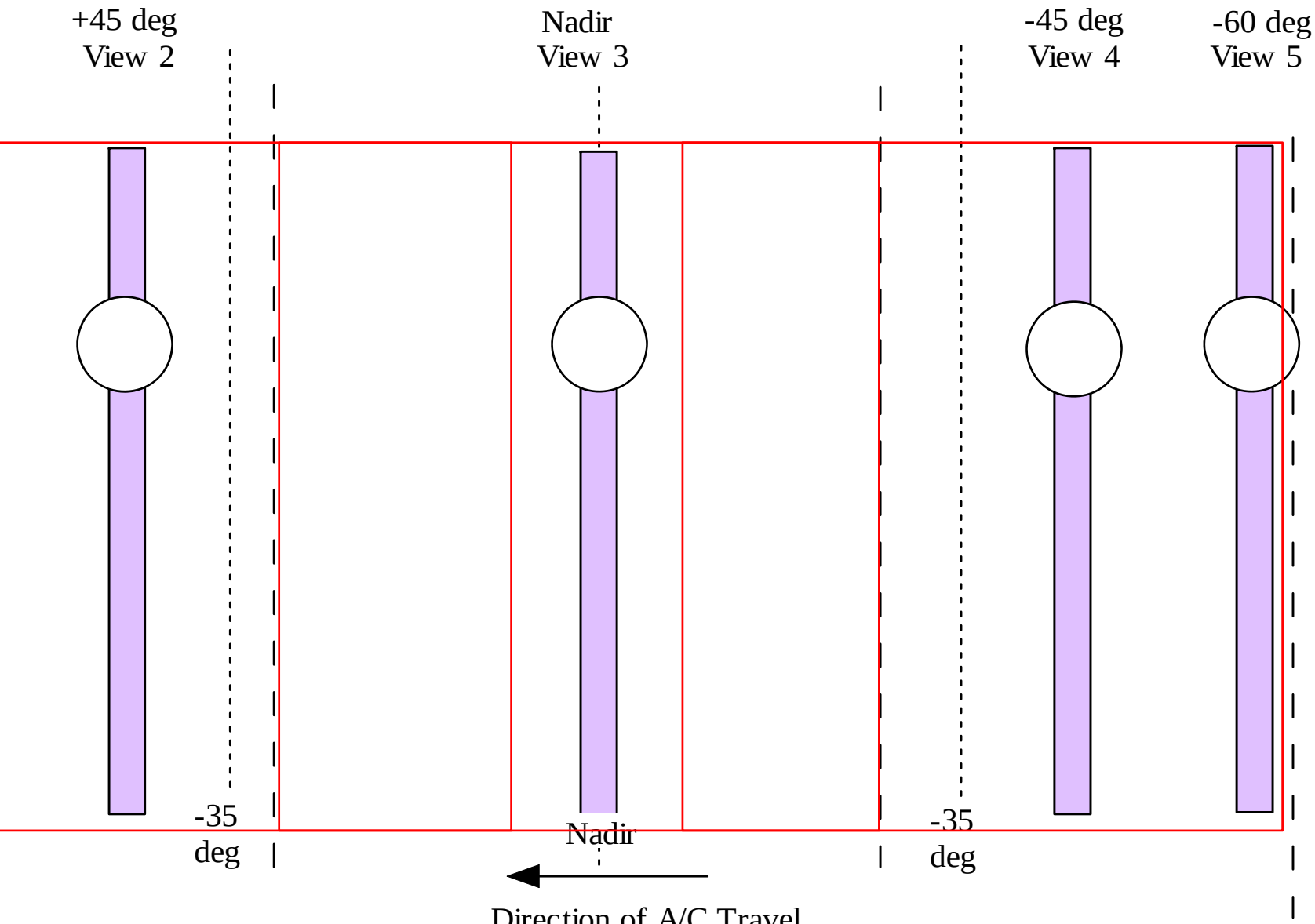
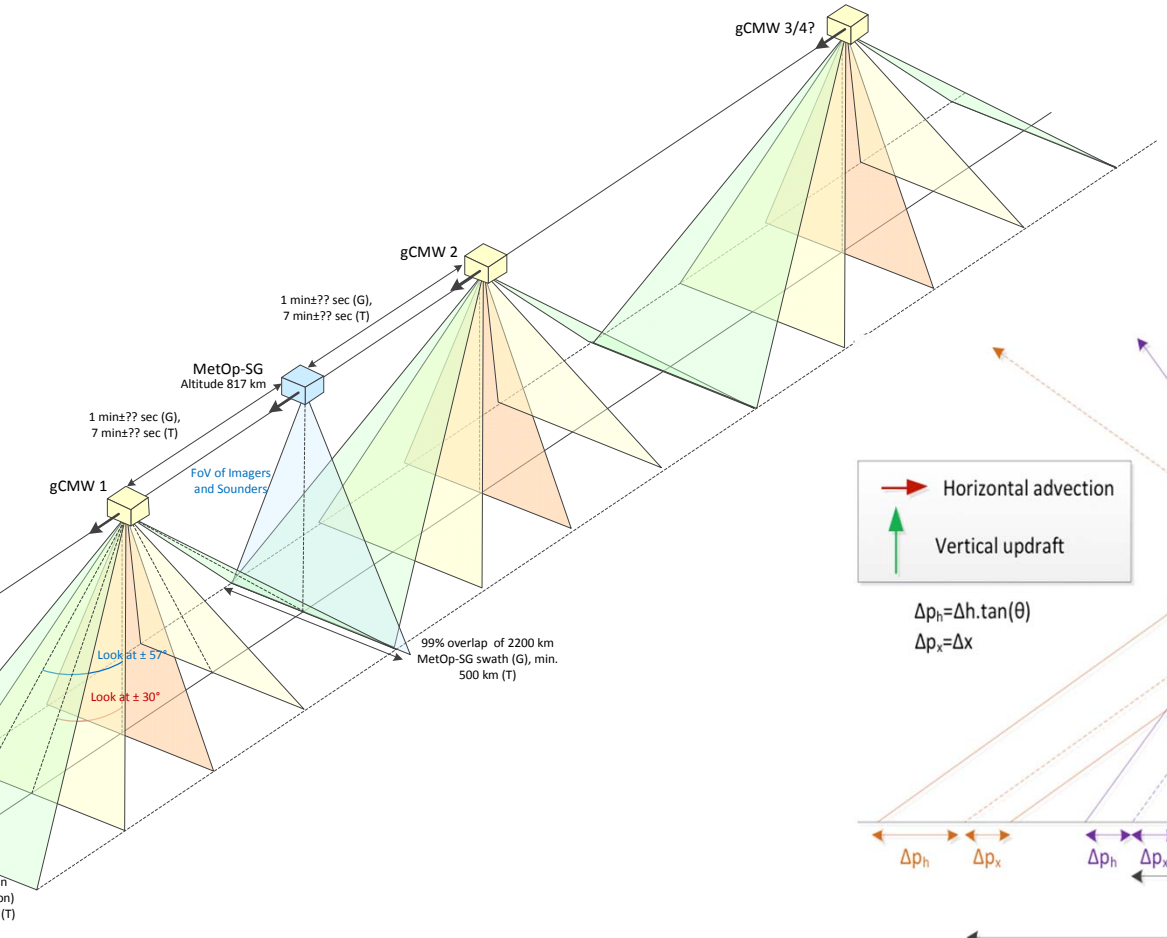
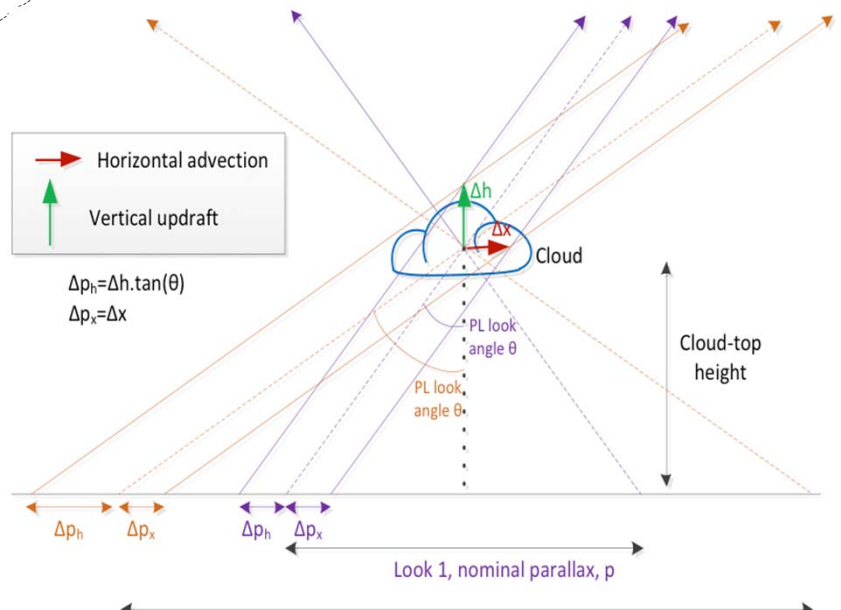



+45 deg
View 2
Nadir
View 3
-45 deg
View 4
-60 deg
View 5
-35
deg
Nadir
-35
deg
Direction of A/C Travel

ometric Cloud Motion Winds from a llite convoy : a proposal for MetOp-SG





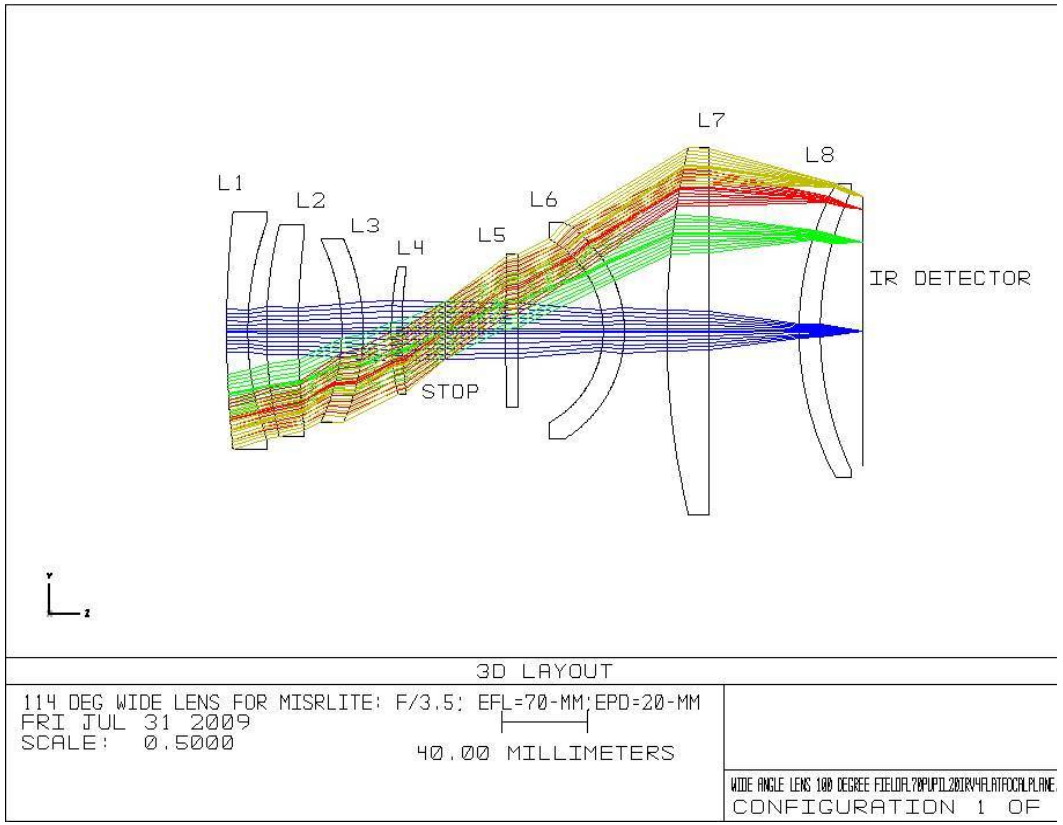
ptical configuration - MISRlite

ngle telescope

ide-field

ncooled detectors

ultiple/large tectors of selected hnology



ummary

- **Uncooled IR detection technologies identified for imaging of clouds from orbit**
- **Demonstration instrument built for aircraft use**
- **Field tests currently underway**