



living planet BONN 23-27 May 2022

TAKING THE PULSE OF OUR PLANET FROM SPACE









The TRUTHS Ground Segment

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TRUTHS Ground Segment Context

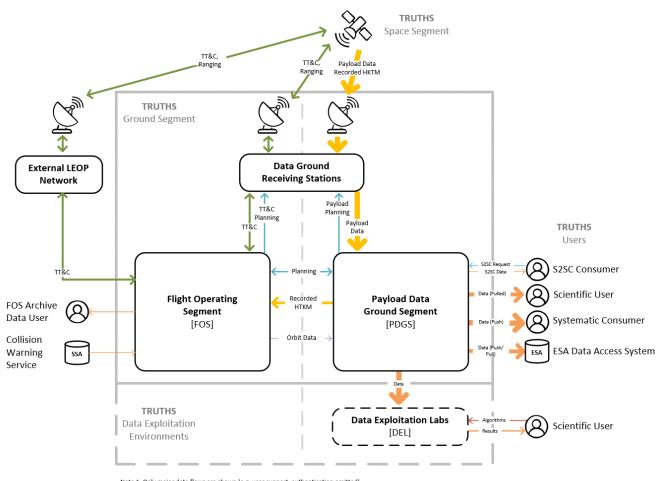


Recalling:

- LEOP/Early Commissioning @ ESOC
- Routine FOS in UK
- 1 polar station baselined for data transfer (e.g. Svalbard), second (e.g. Inuvik) for robustness
- PDGS in UK + data access at ESRIN with ESA Open Data Access Policy

Main interesting TRUTHS specific interactions:

- Mission Planning
- LEOP
- Processing, Data Dissemination and Exploitation
- Data Provenance



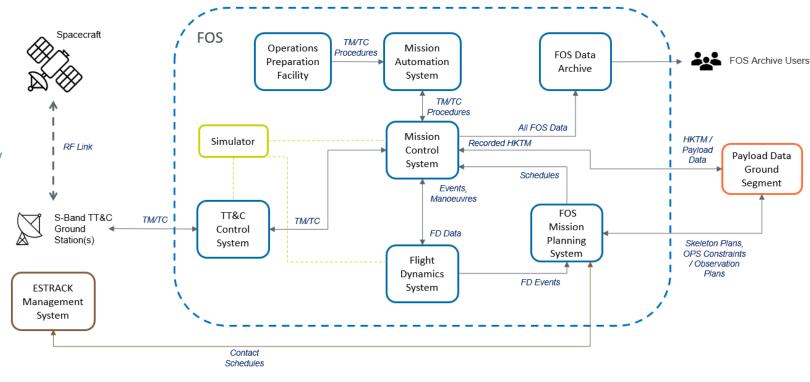
Note 1. Only major data flows are shown (e.g. user support, authentication omitted).

Note 2. The DGRS have a FOS aspect (TT&C) and Payload Data aspect (X-Band Acquisition).
These functions do not need to be co-located with each other, or with the FOS or PDGS.

Flight Operations Segment (1/3)



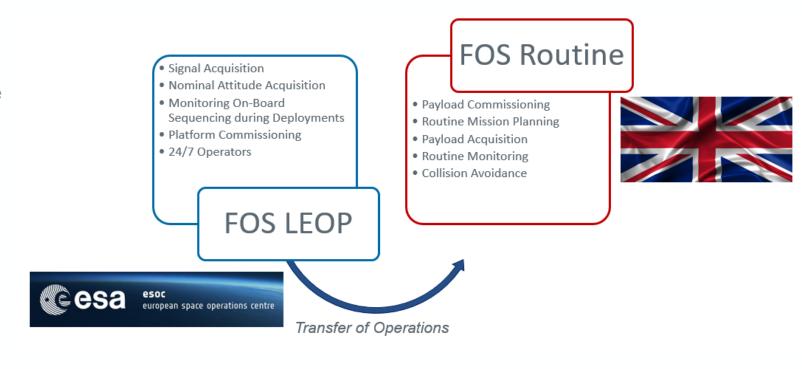
- Platform & Payload Monitoring & Control
- Archiving HKTM
- On-Board Activities Planning
- On-Ground Activities Planning
- Mission Planning Implementation (prepared by PDGS)
- Attitude & Orbit Determination & Prediction
- Collision Avoidance Manoeuvres
- Validating OBSW Updates
- Updating OBSW



Flight Operations Segment (2/3)



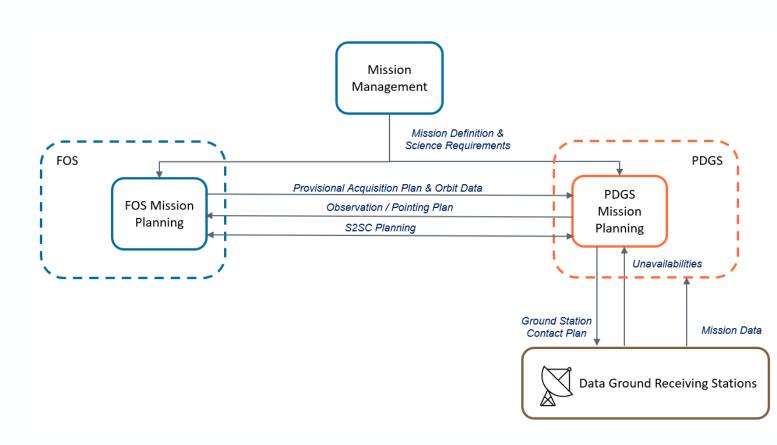
- FOS LEOP will be in ESOC
 - LEOP and Platform Commissioning
- FOS Routine will be in UK
 - Payload Commissioning and Routine
 Operations
- Operations Handover:
 - Procedures / Training / Tools
- Active Manoeuvring needed to fulfil
 Observation Requirements
- Stringent Requirements on Observation timing and pointing



Flight Operations Segment (3/3)



- Mission-Planning iterated between FOS & PDGS
- FOS will dictate the cadence of that planning process
- Key Processes Automated
- FOS will monitor plan execution and report to PDGS

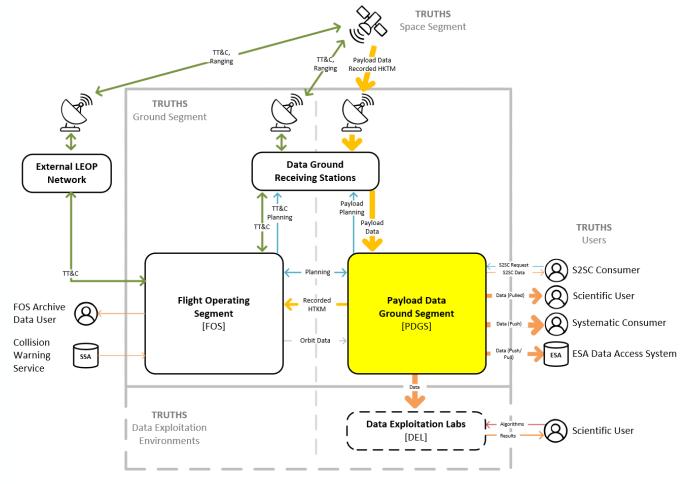


Payload Data Ground Segment: Functions



PDGS Functions:

- Data Reception
- Data Processing
- Data Archiving
- Data Access & On Demand Processing
- Calibration
- Instrument Monitoring and Product Quality Control
- Performance Monitoring
- Payload Mission Planning
- User Support



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Payload Data Ground Segment: Data and Sizing



L1B HIS product contains radiance, reflectance, uncertainty information per pixel.

L1C HIS product splits this data into a set of predefined scenes (specific WRS TBD).

Leads to quite large amounts of data – possibly too large for direct online access.

+ Desire of science team to allow users to select spectral / spatial regridding of this L1B product prior to download – e.g. to match their application's needs.

L₁B

Radiance at Pixel	Uncertainty at Pixel (Random, Structure, Systematic)	~1000 frequencies		
Reflectance at Pixel	Uncertainty at Pixel (Random, Structure, Systematic)	~1000 frequencies		
Instrument Information per Pixel		~1000 frequencies		
Geolocation, Geometry (viewing angles), Quality Flags per Pixel				

One Baseline

Item	Per Day	Per Month	Per Year	End Year 5
Level 0	0.94 TB	28.73 TB	0.34 PB	1.72 PB
Level 1A	4.77 TB	145.17 TB	1.74 PB	8.71 PB
Level 1B	38.54 TB	1.17 PB	14.05 PB	70.38 PB
Level 1C	50.10 TB	1.52 PB	18.30 PB	91.49 PB
Total	94.4 TB	2.8 PB	34.43 PB	172.30 PB

Two Baselines, Level 1B/1C only

Item	Per Day	Per Month	Per Year	End Year 5
Level 0	0.94 TB	28.73 TB	0.34 PB	1.72 PB
Level 1A	4.77 TB	145.17 TB	1.74 PB	8.71 PB
Level 1B	77.08 TB	2.34 PB	14.05 PB	140.76 PB
Level 1C	100.20 TB	3.04 PB	18.30 PB	183.00 PB
Total	183.00 TB	5.55 PB	66.78 PB	334.17 PB

Payload Data Ground Segment: Provenance



As a source of Truth, provenance is an essential requirement.

Traceability

What was used to create a given product?

Integrity

Has this data been corrupted?

Authenticity

Is this what was originally generated?



Typically, metadata.

This is a standard requirement for EO missions



Typically, checksums.

This is a standard requirement for EO missions



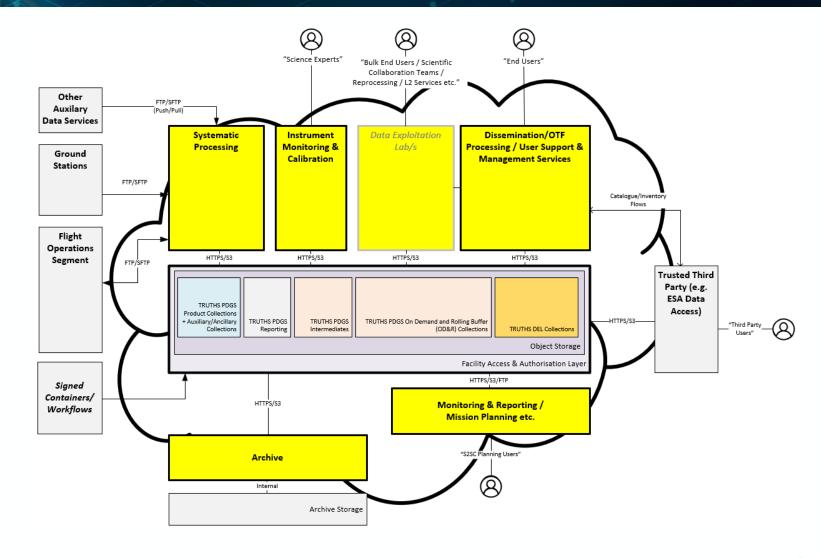
Typically, "trust in the source"

But now we usually retrieve data from secondary locations – DIAS, AWS, GEE etc. Consider digital signature?

Payload Data Ground Segment: Provisional Design



- Co-locate as much as possible.
- Avoid unnecessary data transfers – transfer metadata.
- Share processing resources, in a controlled way.
- Generate old and reprocessed
 L1B/L1C and tailored products
 then sign for authenticity— on demand.
- Data Exploitation as first class citizen of PDGS



Thank you for listening



We're happy to take questions at the end of the session or afterwards!

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