

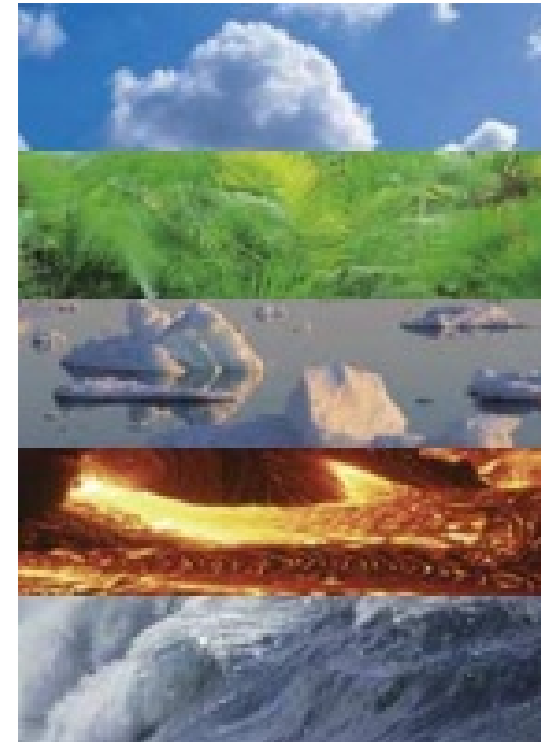
Proving the Concept

Justin Byrne
Head of Future Programs EADS
Astrium Ltd

Centre for EO Instrumentation

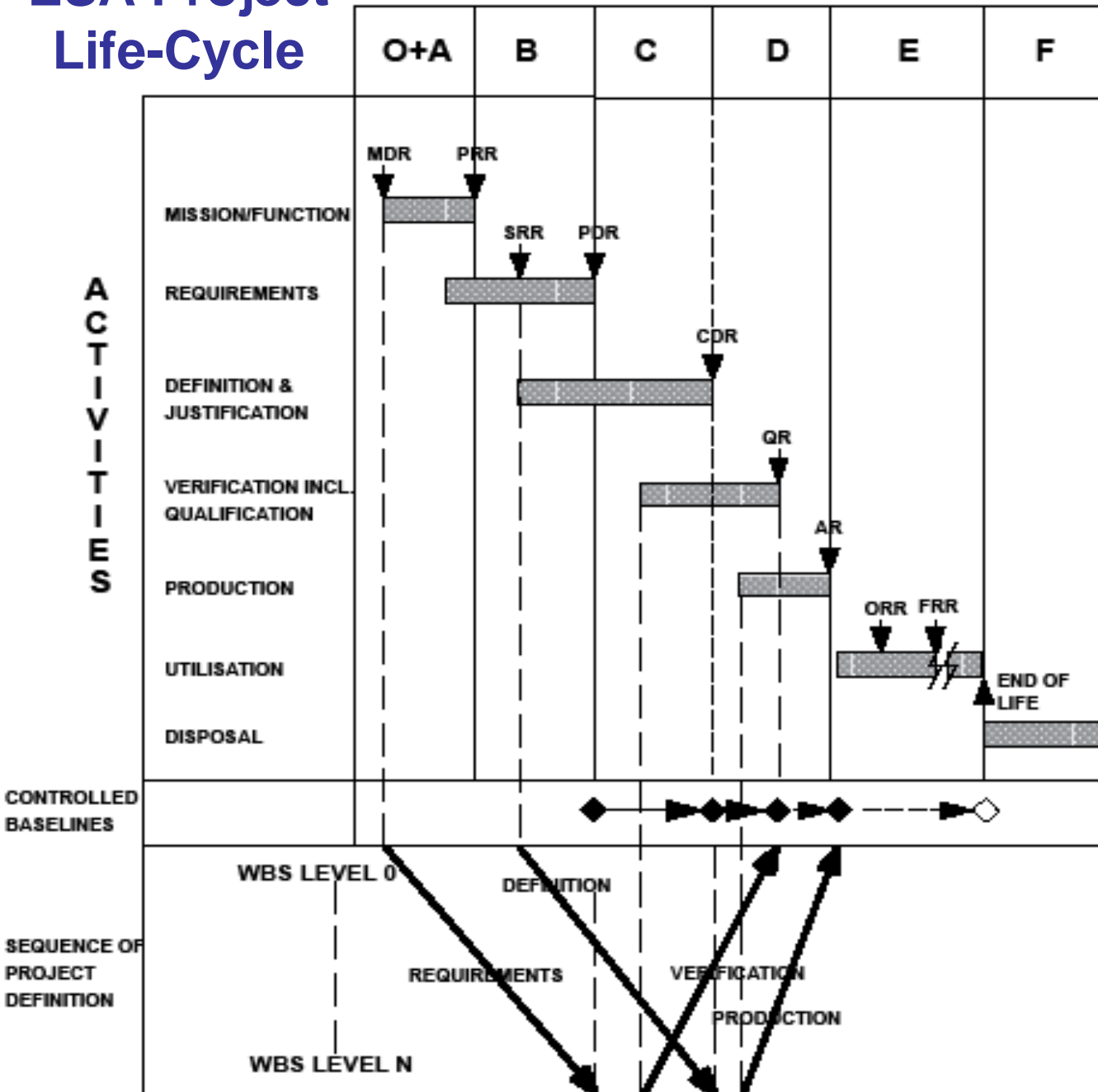
Contents

- ESA Project Life-Cycle
- Pre Phase & Phase A
- Instrument Development
- Understanding the build phase
- Phase BCD assessment
- AIT, launch & Operations / Phase EF



ESA Project Life-Cycle

PHASES



ESA Space Project Management Project Phasing and Planning (ECSS-M-30)



- AR = Acceptance Review
- CDR = Critical Design Review
- FRR = Flight Readiness Review
- MDR = Mission Definition Review
- ORR = Operational Readiness Review
- PDR = Preliminary Design Review
- PRR = Preliminary Requirements Review
- QR = Qualification Review
- SRR = System Requirements Review
- WBS = Work Breakdown Structure

Phase 0: Mission Analysis / Needs Identification

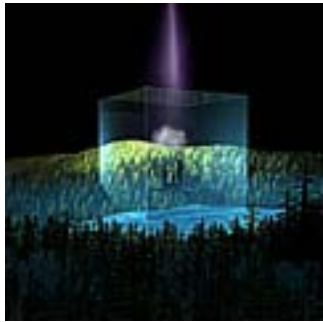
Phase A: Feasibility

- Identification, characterisation & feasibility of mission
- System trade-off / mission baseline selection
- Assessment of launcher, orbit & operational constraints
- Evaluation / definition of system concepts, payload, instruments & platform
- Programmatic assessment (schedule / cost / risks)
- Identification of critical development activities
- Preliminary functional specifications / development plans
- Typical contract – 1-3 FTE, 0.5-1Meuro, 6-12months duration



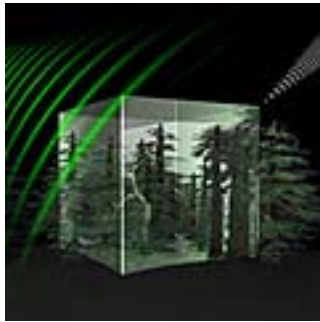
TRAQ

(Air quality and long range transport of air pollutants)



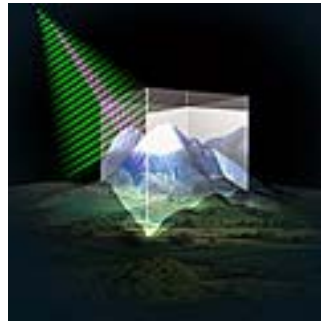
A-Scope

(Advanced Space Carbon & Climate Observation of Planet Earth)



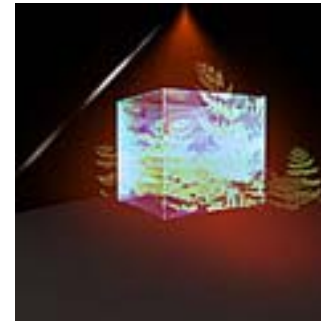
Biomass

(Forest Biomass measurements)



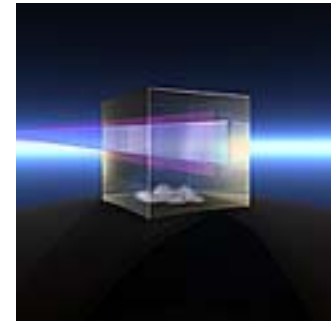
CoreH2O

(Snow, ice & water cycle measurements)



FLEX

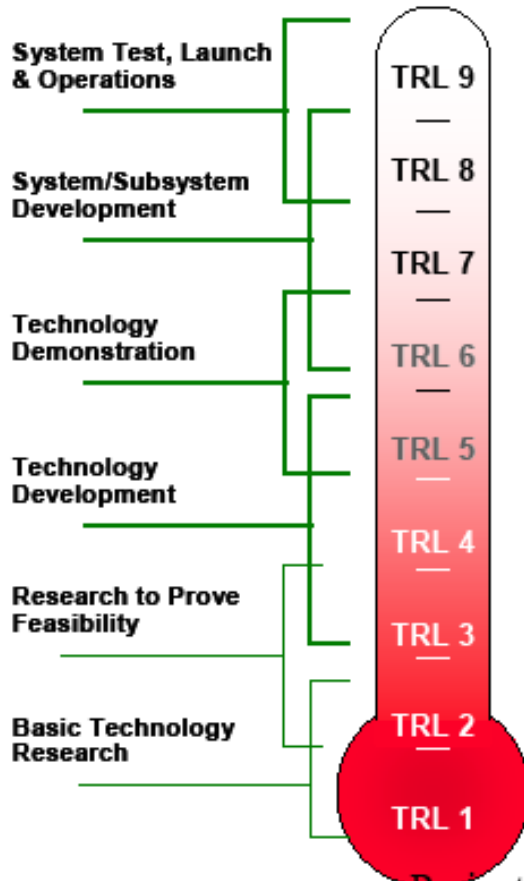
(Global photosynthesis through measurement of fluorescence)



Premier

(Atmospheric processes related trace gases, radiation, chemistry and climate)

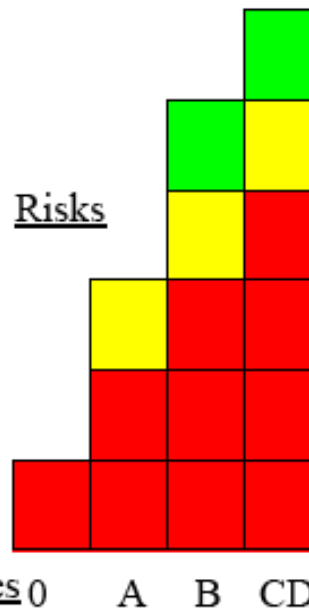
TRL - philosophy



Technology is with access to space one of the enabling activities of ESA

The requirements on technology are increasing, performance, reliability, etc so as to make impact on science and provide services

Failure to have technology at the right readiness level at each project phase is a major source of risks for schedule delays and cost overruns



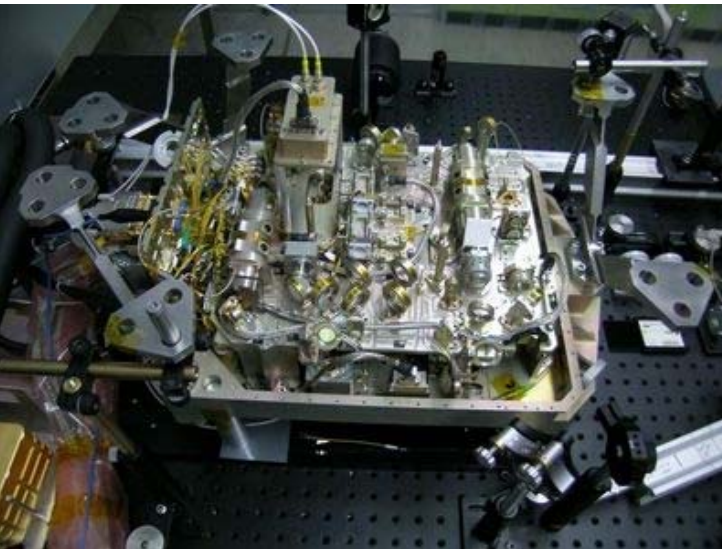
Technology development shall be sufficiently and timely supported

Instrument Technology Development Program

- Objective is to raise instrument TRL maturity to an acceptable level (5/6) in order to enter a BCD program
- Activities include detector / transmitter / component developments through to complete instrument proof of concept
- Example – Aladin pre-development activities on Laser diodes and head / proof of concept



MHS - Microwave Humidity Sounder on Metop



Aladin
Lidar Instrument
for Aeolus

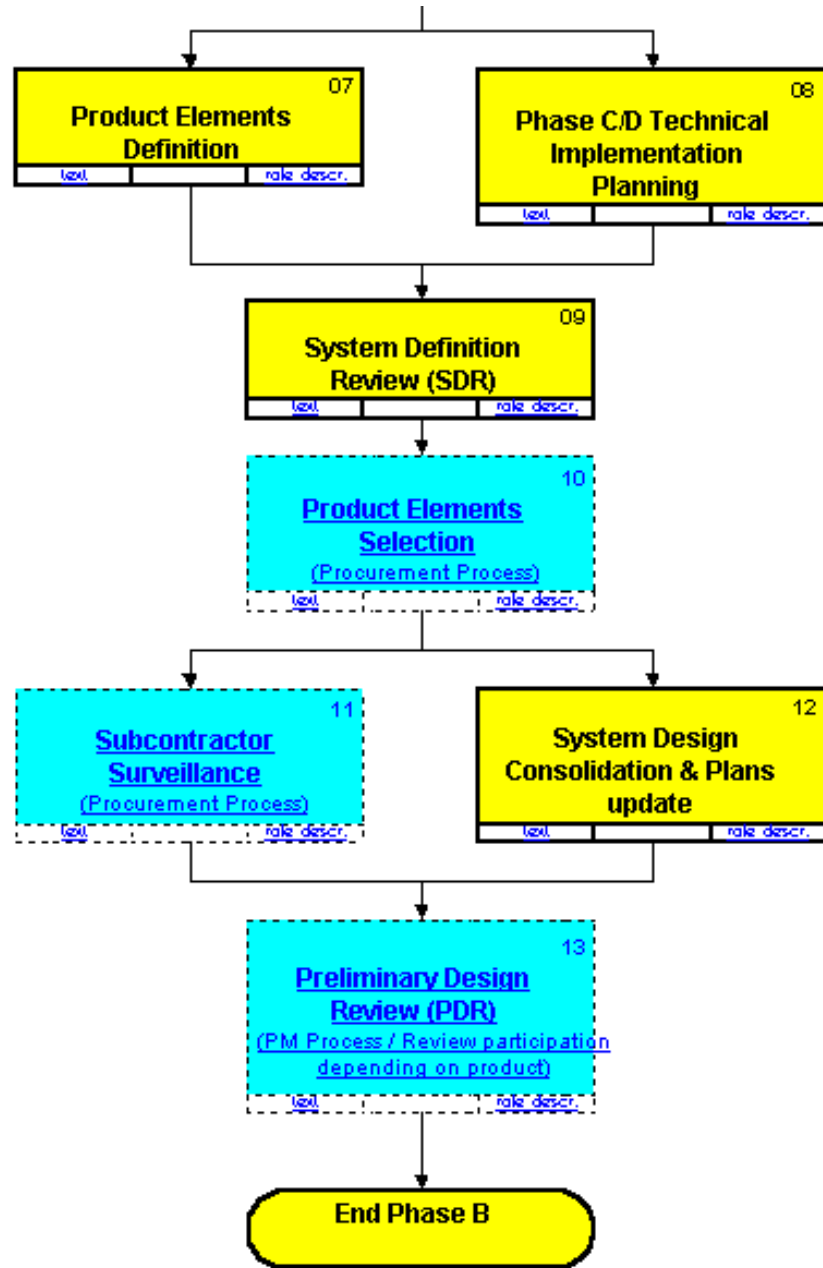
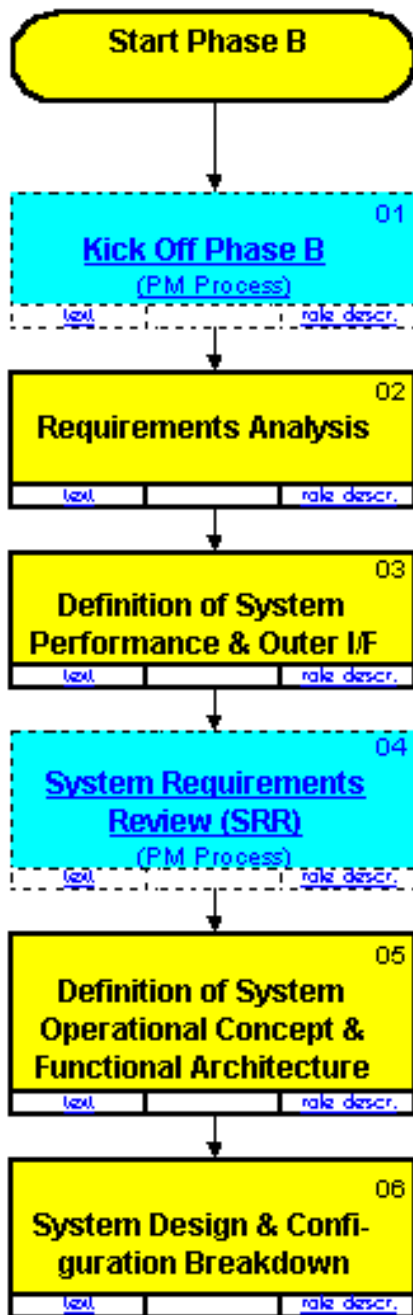
Phase B: Preliminary Definition (Project and Product)

- Define a complete and coherent mission architecture & system design
- Finalise the System Requirements (SRR), flow-down, define the product tree and product specifications.
- Detailed definition of programmatics (cost, schedule & risk), industrial structure and development / verification planning.
- Supplier / LLI selection & KO (Best Practise)
- Geo-return management
- Preliminary Design Review (PDR) to proved coherent system – product design / achieve performance requirements / programmatics
- Typical contract – 10-20 FTE, 10-20Meuro, 12-18 months duration

Sentinel 1 GMES C-Band Radar Mission

Date 3rd June 08



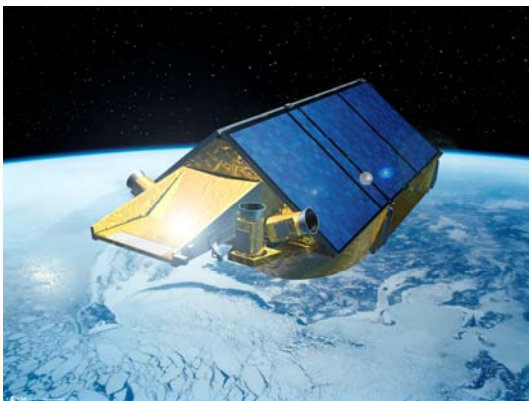


Phase CD: Detailed definition, production and verification

- Finalise the detailed definition of the products and their interfaces
- Define the detailed qualification and verification activities
- Complete all of the equipment / s/w design reviews and confirm manufacturability of the products
- Integration, test, qualification / verification of equipments, s/w through to spacecraft AIT
- Typical contract – 30-40 FTE, 100-250Meuro, 24-36 months duration



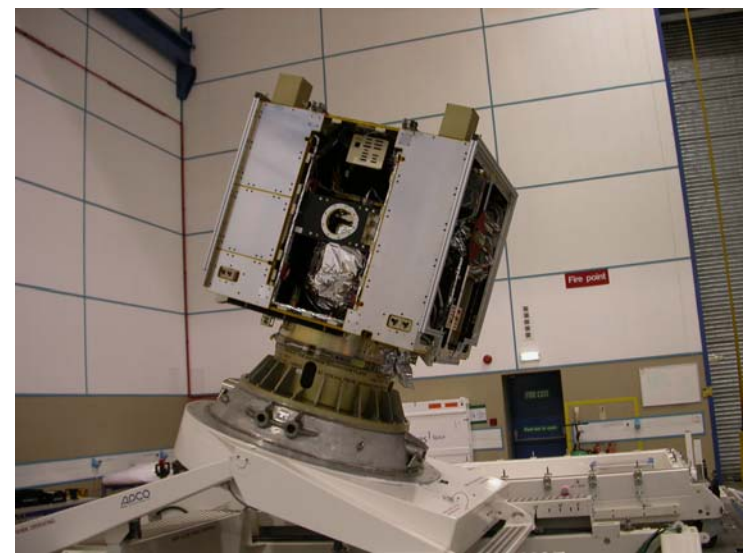
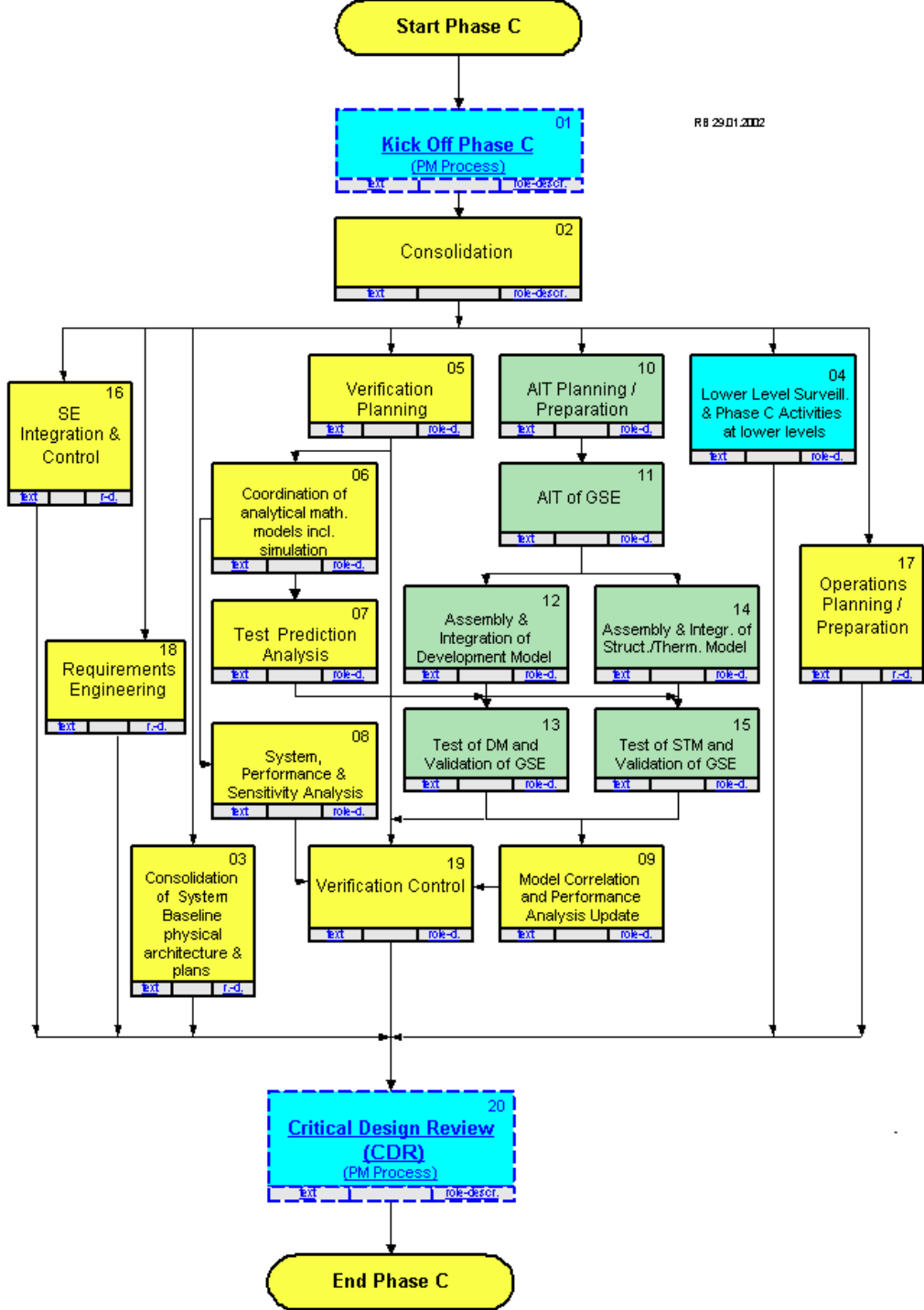
**Aeolus
Wind Mission**

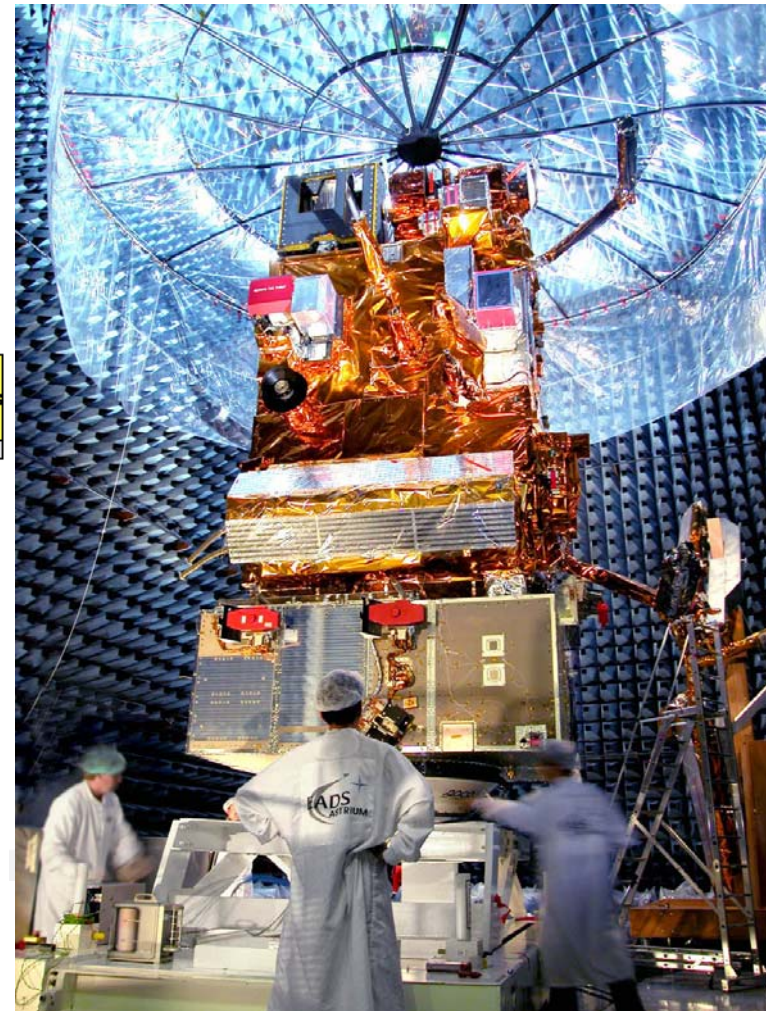
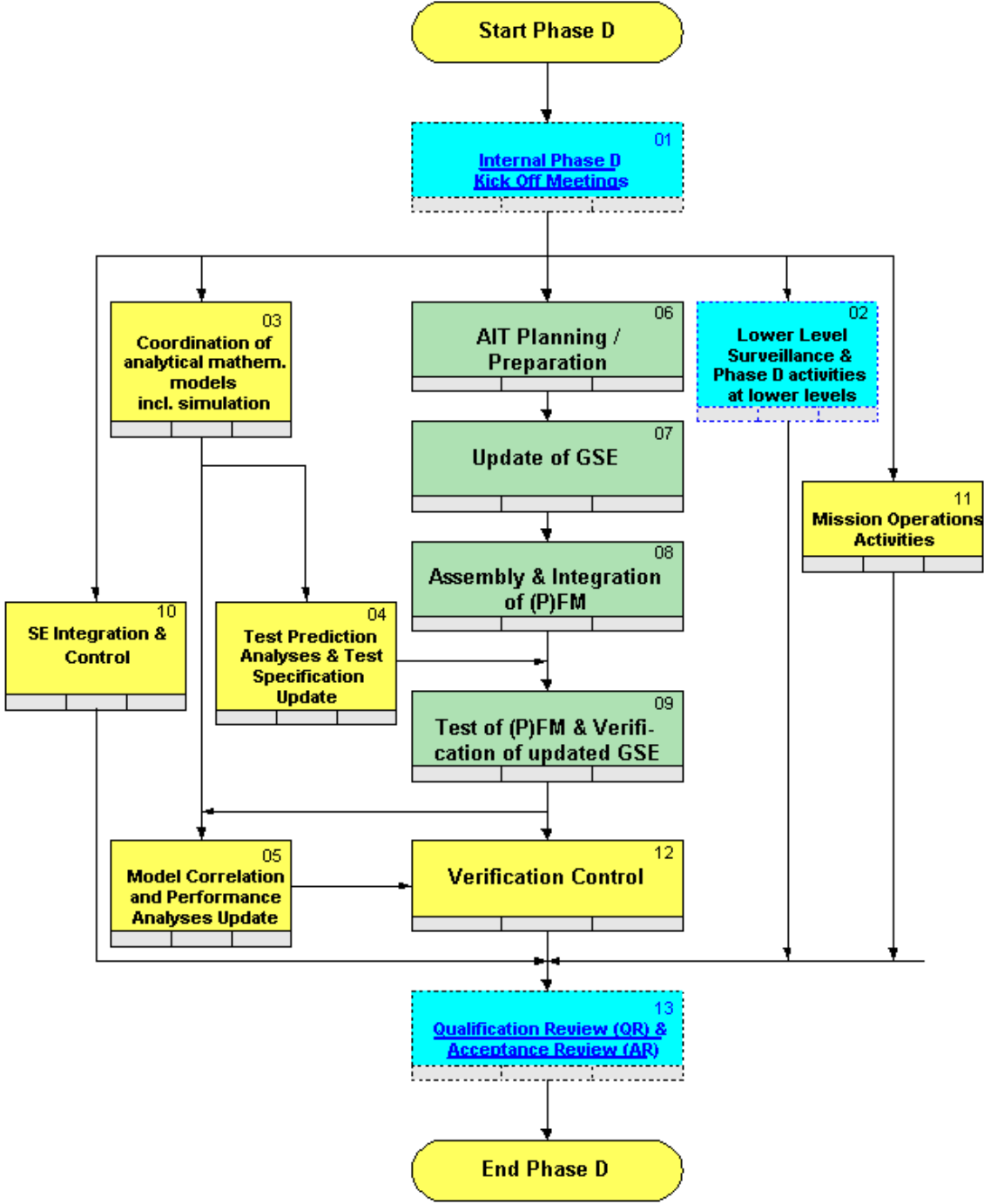


**Cryosat 2
Ice Mission**

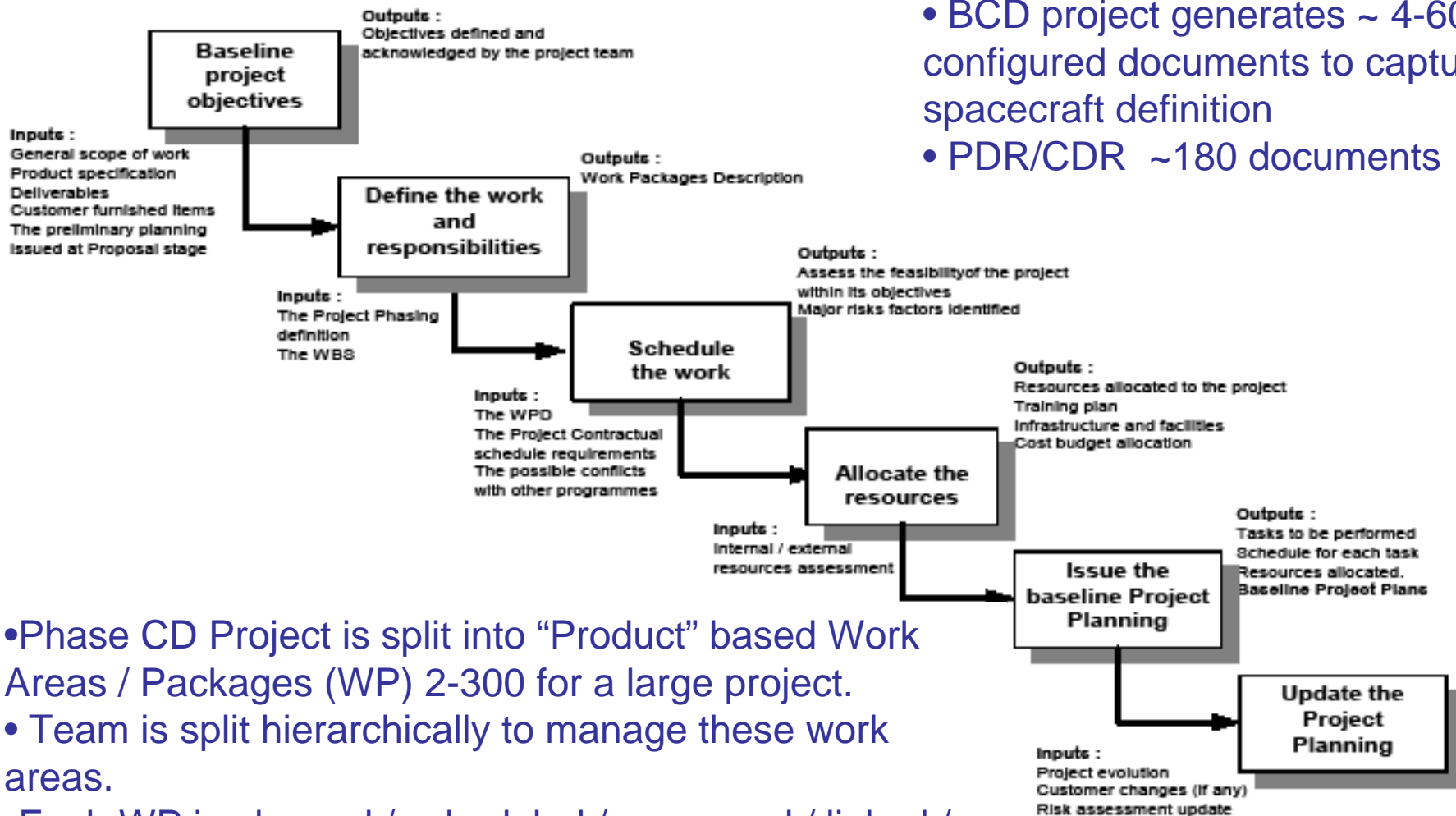


**SWARM
Magnetic Field**





Phase CD Planning



- BCD project generates ~ 4-6000 configured documents to capture spacecraft definition
- PDR/CDR ~180 documents

- Phase CD Project is split into “Product” based Work Areas / Packages (WP) 2-300 for a large project.
- Team is split hierarchically to manage these work areas.
- Each WP is planned / scheduled / resourced / linked / risk assessed in detail. 4-6000 schedule lines
- Plan defines schedule, cost, resources & risk – monthly update process

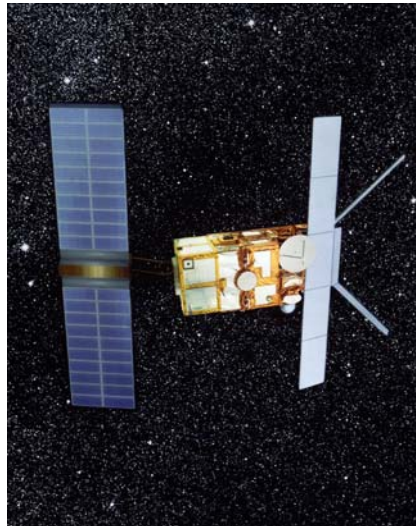
Phase E/F: Utilisation and Disposal

- Confirm spacecraft ready for launch, ground segment ready for operations
- Launch campaign, Flight Readiness Review (FRR), launch & LEOP
- Operations
- In-orbit performance assessment
- Disposal / grave-yarding

Metop A
Polar Orbiter - Metrology
Launched Oct 06



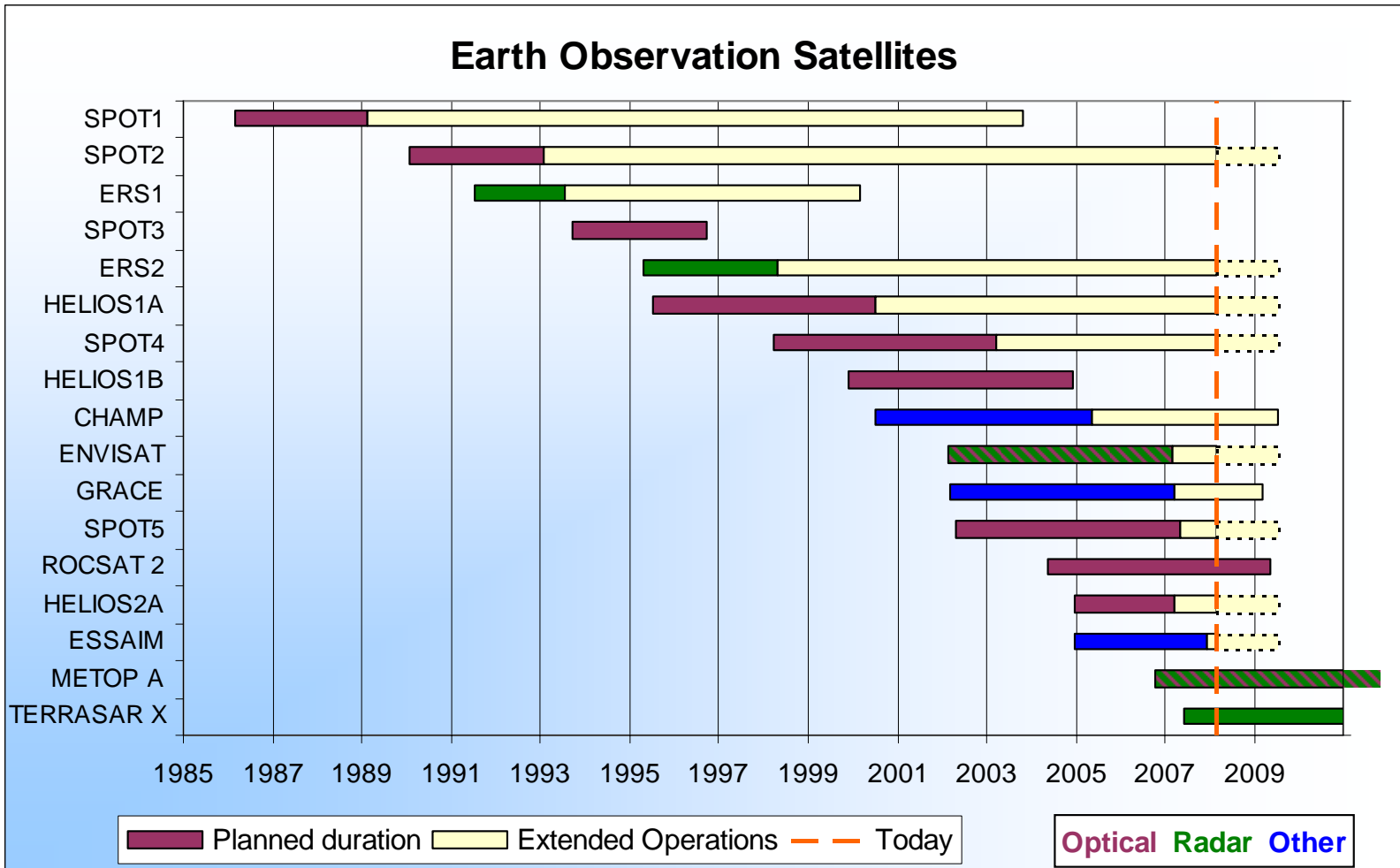
ERS-2
Launched Apr 95



GOCE
Gravity Field & Steady State
Ocean Circulation Explorer
Launch Q3 08



Envisat
Launched 02



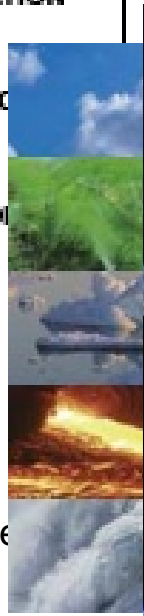
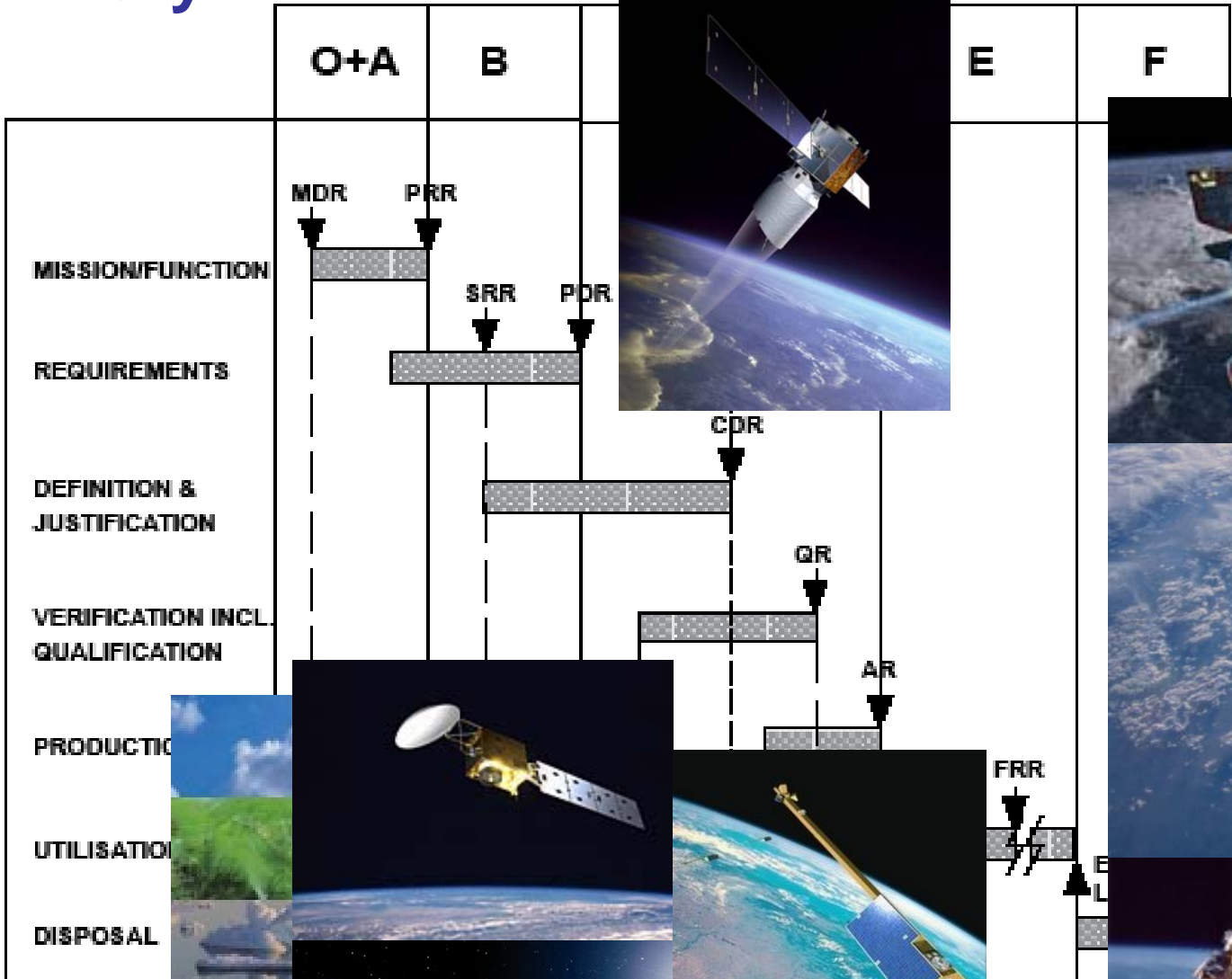
Earth Observation Satellites - 123 years accumulated in orbit
 Prime contractor of 17 satellites

Date 3rd June 08

Summary

PHASES

ACTIVITIES



Date 3rd June



ESA project life-cycle ~10-20 years

Astrium UK currently have > 500 engineers working on all of these phases for ESA EO, Science & Navigation

Projects

Questions ??

