

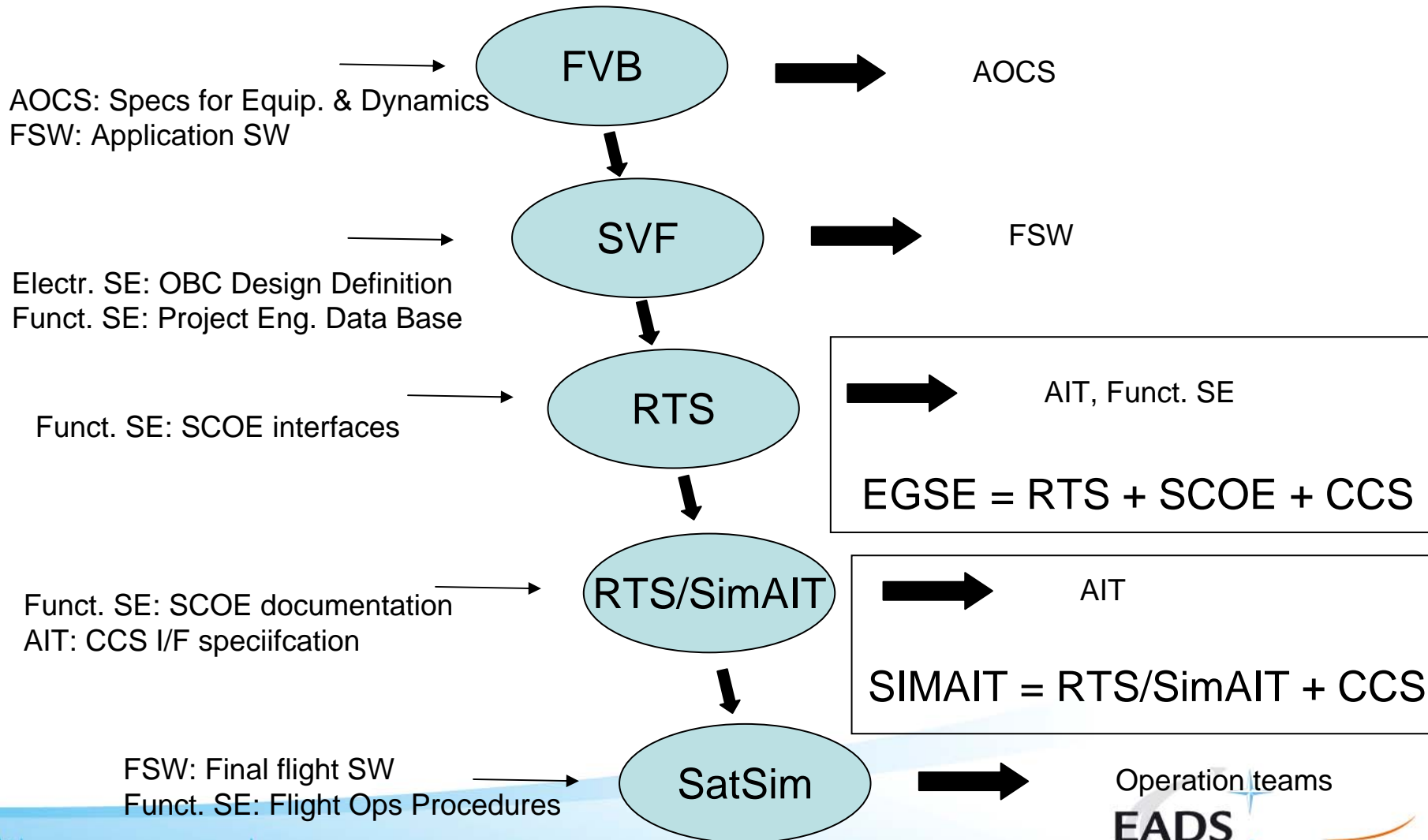
# Astrium SL Position on Reference Architectures for Simulation

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All the space you need



# Simulator devel. and other entities interactions



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# Characteristics of Test Bed Development

- For FVB development and usage: strong coengineering between AOCS and Simulator (e.g. for equipment models and dynamics)
- For SVF development and usage: strong coengineering between FSW and Simulator (e.g. for level of representativity, failure models, productivity features)
- For OBC modelling: strong dependency of OBC design inputs
- For OBC model validation between SVF and STB: strong coengineering between FSW and Simulator
- For design characteristics and TM/TC: strong coengineering for databases between Functional Verification and Simulator

# Characteristics of Test Bed Development

- The simulator development:
  - is by nature close to the critical path of projects
  - Suffering from difficulty of projects to specify as early and as complete as necessary
  - Suffering from frequent changes and additional incremental deliveries
  - Suffering from difficulty of users to specify implicit requirements/expectations
  - Has to support the users integration and usage intensively on site with fast reaction

# Mastering the integrating process & tool chain requires a clear „make“ approach

- Close integration of simulator development activities with avionics & system engineering (i.e. verification ) activities
- Difficulty to subcontract activities due to
  - Necessary modeling fidelity depending of the users (AOCS, FSW, CAIT, Avionics Validation,....) needs and requiring tight co-engineering discussion
  - Evolving equipment design (late specification)
  - Interaction with system deliveries
  - Large number of different user/processes imposing tools and strong reuse
- Simulation supports activities which are often on the critical path – with direct cost impact on others requiring close reactive support
- Commercial export needs

# Definition: RA for S/C system simulator

- Reference architecture identifies 'generic architecture' of a S/C system simulator including
  - Common building blocks
  - Mission specific building blocks
- Interface definition of different building blocks
- Covered building blocks are:
  - S/C element (e.g. equipment) and S/C I/F simulation model
  - Environmental simulation model
  - Physical models
  - Common numeric functionality

# Reference Architecture is to

- Ease re-usability of simulation models
  - Across different simulation infrastructures
  - Between different contracts
  - Between different phases (i.e. phase B/C/D/E)
  - Between different programs
- Should lead to simulation model library as part of the re-usable simulator component items

# Current status @ Astrium SL

- @ Astrium SL currently simulators for approx. 20 S/C projects are under development (thereof 50% ESA projects)
- Typically for the majority of non ESA projects simulators for ground operation are delivered.
- A simulator reference architecture, model exchange and reuse is fully implemented internally via SimTG
- All projects are fully developed inhouse implementing the critical „make“ decision.
- Today and in the near future no single use case is seen where Astrium would directly benefit from reference architectures and model portability standards.



# Conclusion

- No actual/near future benefit for Astrium SL is seen
- Potential benefits for others are recognised, e.g.
  - model delivery from Astrium to ESOC
  - Facilitation of subcontracting of modeling activities (not simulators) compliant with our main tools / infrastructure on a case by case basis
- Astrium is committed to support the cooperation on European space projects between all industries and agencies.
  - Contribution to the definition of reference architectures and model exchange standards
  - Supporting the the development of advanced functionalities by technology based companies as community open source, pending the prime can 'advise/orient' the specification / architecture