

On-Orbit Servicing (OOS) Issues & Commercial Implications

Presentation 05

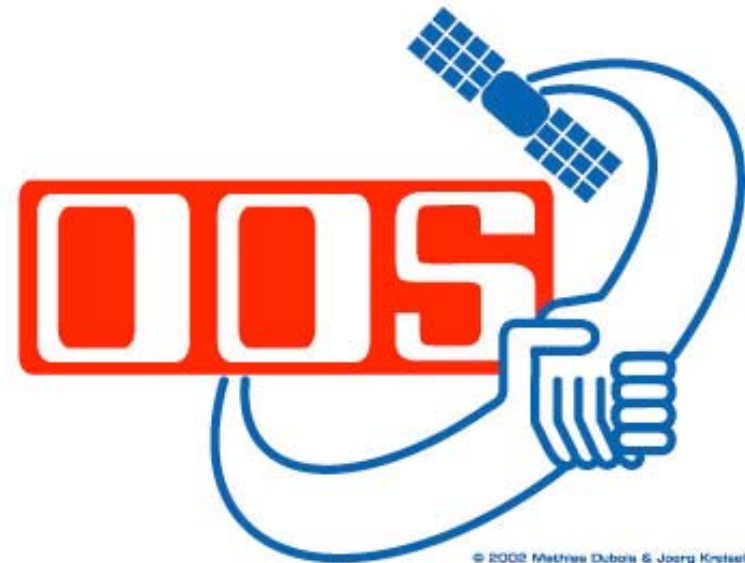
Session IAA3.1

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JKIC - Germany



Status Quo?

- OOS Activities for Decades: But Not as “OOS”!
- 30+ Projects Worldwide = 1000+ Man Years p.a.
- No Commercial OOS Yet (“ORC” on the Move)
- Space A&R Technology in Place
- **OOS Business Drivers NOT Yet Understood!**
- Potential OOS Market 1.000 MEUR p.a.
- **Co-Operative Satellite Design**
- **Too Early to Judge on OOS!**
- Changes to Culture & Mindset
- Paradigm Shift

Multi-Level
Complexity!

“S2S” Business!

Does It Matter?

Satellite Population

(500+ kg, non-military)

- Orbit
- Type of Satellite
- Type of Operator
- Life Cycle

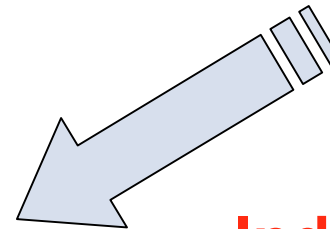
App 650 p.a.



Satellite Failures

- Cause
 - Technical
 - Other (Impact)
- Occurrence (Life Cycle)
- Probability
- Propagation!

App 100 p.a.



Individual Case!

Impact on Operator (Threat)

(Mission: Business Case vs. Project)

- Total Loss
- Partial Loss

Value of Correction?

Alternatives

State of the Satellite

- Tumbling Mode +/-!
- Communication
- Power
- Propellant ...

**Space A&R
Capabilities!**

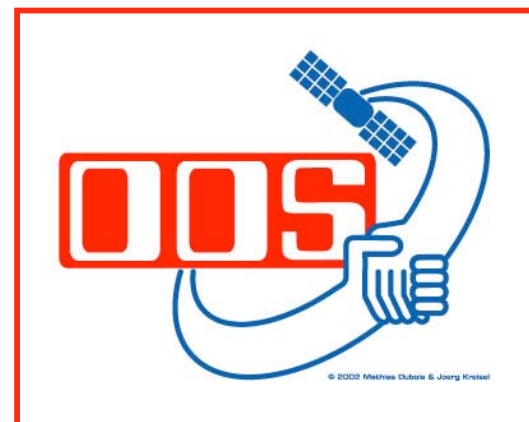
None

+

Non-OOS

- Design (Redundancy)
- Technical (Workarounds, S/W)
- Business Model
 - Spare
 - Switch/Lease
 - New Satellite Launch
 - Insurance Claim

1's-100's MEUR



Service?

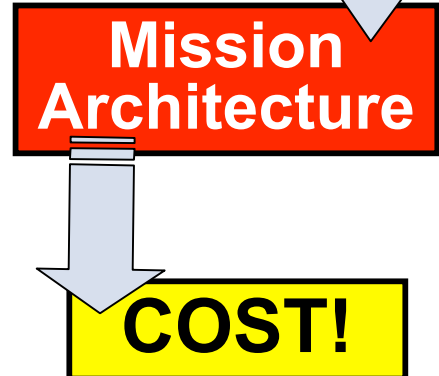
Services



Service Class	Kind of Service	Co-Op. Satellite Design	Supplies
Motion <div style="border: 1px solid black; padding: 2px; display: inline-block;">2010</div>	<ul style="list-style-type: none"> • Re-Orbiting • De-Orbiting • Salvage 	? ? ?	
Manipulation <div style="border: 1px solid black; padding: 2px; display: inline-block;">2015</div>	<ul style="list-style-type: none"> • Maintenance • Repair • Retrofit • Docked Inspection 	+ + + +	+ ? + -
Observation <div style="border: 1px solid black; padding: 2px; display: inline-block;">2005</div>	<ul style="list-style-type: none"> • Remote Inspection 	-	-

Drivers

- Service Needs (No.)
- Frequency
- A&R Task (Service)
- Orbit & Plane
- Responsiveness
 - Scheduled
 - Emergency
- Logistics (Supplies)





Stakeholders

Commercial Satellite Operators	<ul style="list-style-type: none"> • Profit (Revenues!) • Deferred CAPEX 	YES + NO Camps!
Insurance Companies	<ul style="list-style-type: none"> • Risk Reduction • Premium Policy & Market 	
Satellite Manufacturers	<ul style="list-style-type: none"> • Design Feedback • Servicer Production/Economy of Scale • Co-Operative Satellite Design 	Hard Factors <ul style="list-style-type: none"> • Market • Budget/Profit • Cost-Benefit • Structures • Processes • Technology • Demonstration
Space Agencies	<ul style="list-style-type: none"> • Demonstration in Space • Space Infrastructure Development • Commercialization 	
Governments	<ul style="list-style-type: none"> • Knowledge Base • Budget Efficiency & Economic Growth 	
Science Community	<ul style="list-style-type: none"> • Safeguarding Projects 	
Launch Service Providers	<ul style="list-style-type: none"> • No. & Frequency of Launches 	
Space A&R Community	<ul style="list-style-type: none"> • Various 	Soft Factors <ul style="list-style-type: none"> • Culture • Mindset • Psychology
Intl. & Regulatory Bodies	<ul style="list-style-type: none"> • Debris, Orbital Clean-Up, Frequency 	
Suppliers	<ul style="list-style-type: none"> • Innovation & Standardization • Economy of Scale 	



OOS Challenges



Business

- **Potential Market p.a.:**
 - 500-1.000 MEUR/100-150 Services
- **Target Market Segment**
 - Orbit/Plane, Customer, Type of Satellite
 - Multiple vs. Single Servicing (Servicer Design)
 - High vs. Low Value Services
 - Co-Operative Satellite Design
- **Systems Engineering**
 - Mission Architecture/Logistics
 - Servicer Design & A&R
- **Business Engineering**
 - Demonstration & Launching Customer
 - Business Model (Stake & Shareholders)
 - Financial Feasibility (Financing Strategy)

- CAPEX & Cost
- Revenue Model

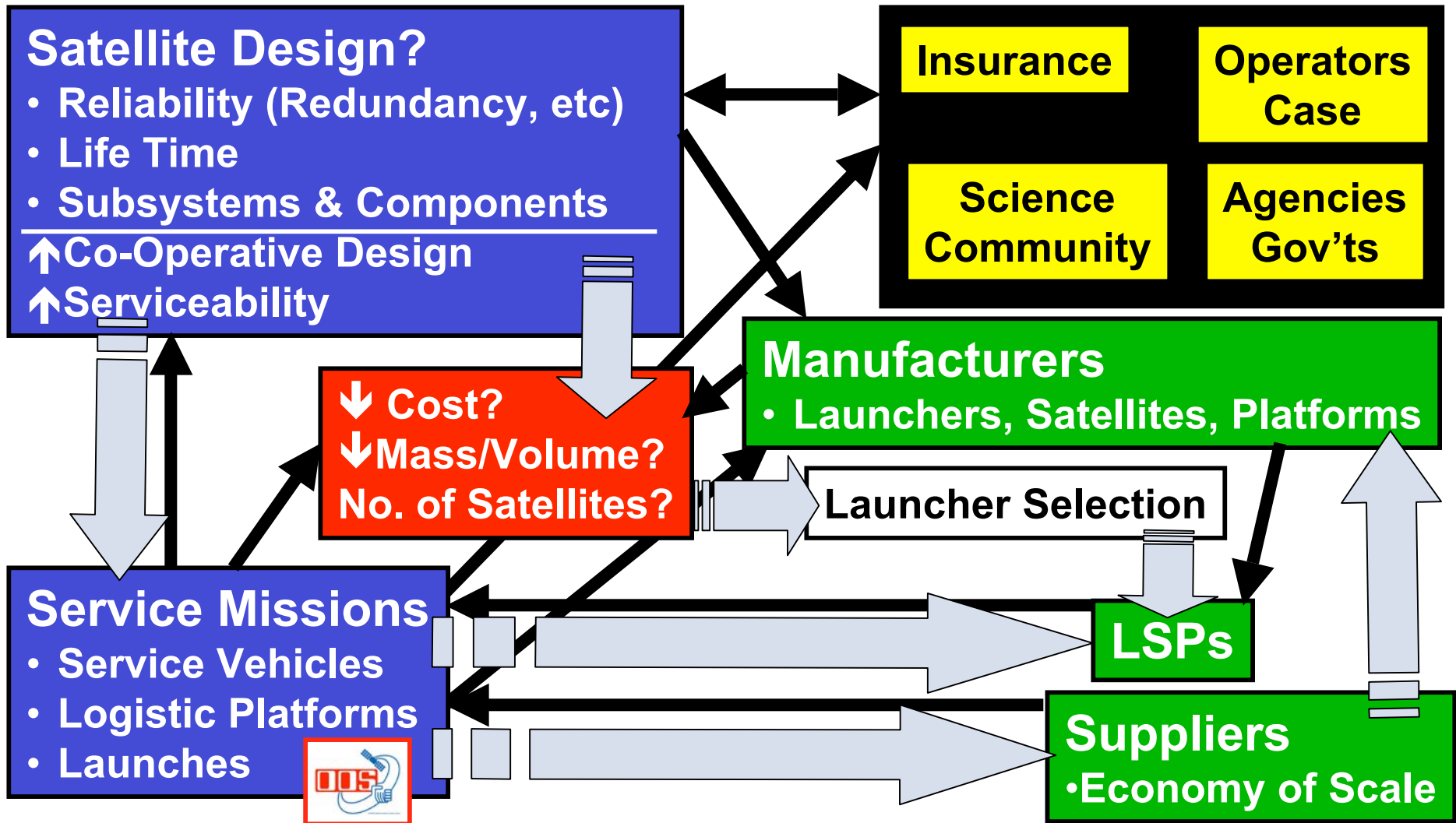
Focus

- **Agencies**
 - Technology
 - **Demonstration**
 - **Non-Technical!**
- **OOS Providers**
 - 1st Movers, ORC
 - **Business Acumen**
- **Space Sector**
 - “OOS” as Topic
 - Awareness
 - **Sound Homework**



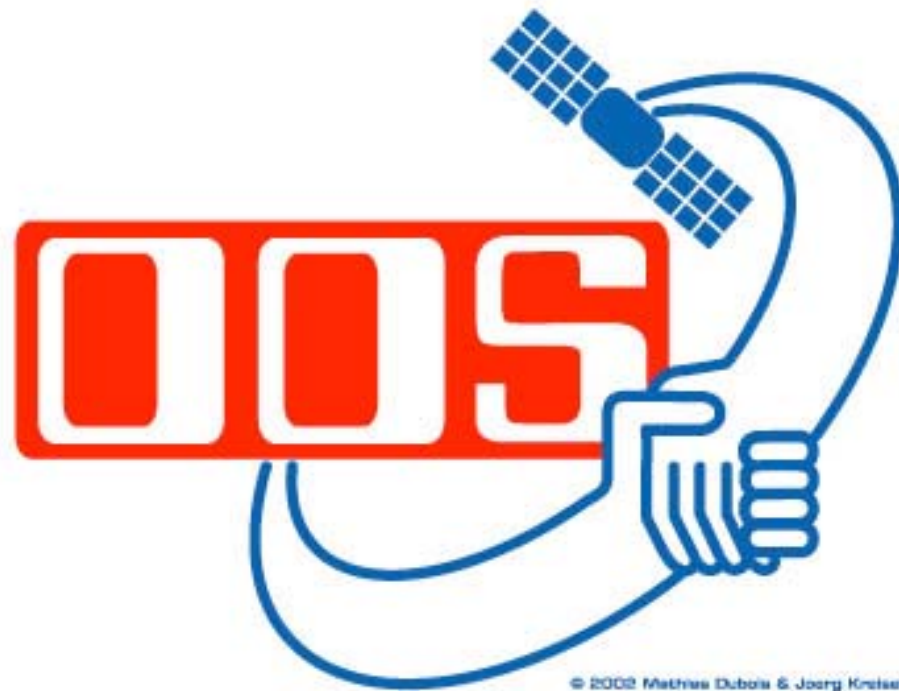


Implication & Opportunities?



Website:

www.on-orbit-servicing.com



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