



1<sup>st</sup> bilateral DLR-CSA WORKSHOP on  
On-Orbit Servicing of Space Infrastructure Elements  
via Automation & Robotics Technologies

25-26 November 2002  
DLR, Cologne Area, Germany



## Progress Meeting 1 - 25 Nov 2002



## Breakout Group Reports

Joerg Kreisel & Andy Shaw & Alex Ellery & Marshall Kaplan

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## Breakout Groups

- BG 1: The “Whigs”
  - Big Picture ...
  - Captain: Joerg Kreisel
- BG 2: The “Suits”
  - Stakeholders & Market
  - Captain: Andy Shaw
- BG 3: The “Boffins”
  - Servicer & Target
  - Captain: Alex Ellery
- BG 4: The “Navvies”
  - Mission Architecture & Logistics
  - Captain: Marshall Kaplan



Who?

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## Breakout Group Approach

- BG Session 1: “**Validation**” **WHAT?**
  - Why No OOS yet?
  - Status & Vision!
- BG Session 2: “**Justification**” **WHY?**
  - Routes & Reasoning
- BG Session 3: “**Trade-Offs**” **HOW?**
  - Measures & Options
  - Pros & Cons
- BG Session 4: “**Streamlining**” **WHO & WHEN?**
  - Actions Items & Timeline
  - **DEFINING A “WAY” FORWARD 4 ALL STAKEHOLDERS!**

**50+ Brains ⇒ 1 “WAY”!?**

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## Breakout Groups Session 1 & 2

- BG Session 1: “Validation”
  - **Why No OOS Yet?**
  - Input to the other BGs **Really?**
  - Questions to the other BGs
- BG Session 2: “Justification”
  - Discussion of other BG Inputs **Right Answers & Consensus?**
  - Definition of a “**Vision**” per BG
- BG Captains: “Progress Reporting”

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## BG 1 : “The Whigs”

Agencies  
Industry  
Regulators

- BG Session 1: “Validation”
  - No OOS Because:
    - **Benefits Not Evident**
    - **Other Space Priorities**
    - **Missing Link: Not All OOS-Related Pieces/Elements in Place**
    - **Inappropriate Cultural Approach & Attitude on Both Industry & Agency Level**

**Agreement or More?**

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## BG 1 : “The Whigs”

- BG Session 1: “Validation”
  - Questions to :
    - **“Suits”**
      - Market Demand
      - Implementation
      - Value of Debris Removal/Orbital Clean-Up
      - Costs of Service
    - **“Boffins”**
      - Delta Cost for Serviceable Satellite (Co-Operative Design)
    - **“Navvies”**
      - Availability of All Technologies/Systems/Elements
      - Costs of Missions

**Answers?**

**More?**

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## BG 1 : “The Whigs”

- BG Session 2: “Justification”
  - Vision:
    - **“Realization of a Fully-Fledged Economic Orbit Infrastructure Based on OOS”**
    - “Observation” by 2005
    - “Motion” by 2010
    - “Manipulation” by 2015
  - On-Orbit Assembly by 2020
  - ISS Role: e.g 4 Demonstration

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## BG 2: “Suits”

- BG Session 1: “Validation”
  - No OOS Because:
    - **No Clear Definition of OOS**
  - Status:
    - **Now: ISS-Related & GEO Telco Life Extension Only**
    - **Future: Whole Mission Scenario & Co-Operative Design**
  - Assets:
    - **Huge Technology Investment**
    - **GEO Prime Targets**
  - Lacks:
    - **Launch Costs & Economics of**
    - **Serviceable Constellations**

OOS Service Providers  
Customers  
Sat Mems  
Agencies

Agreement or More?

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## BG 2 : “The Suits”

- BG Session 1: “Validation”

More?

- Questions to :

- **“Whigs”**
  - Debris Removal
  - Constellation Economics
  - Launch Costs
- **“Boffins”**
  - Economy of Scale
  - Launch Costs
- **“Navvies”**
  - Launch Costs

Answers?

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## BG 2: “Suits”

- BG Session 2: “Justification”

- Vision:

- **“Realistic Evolutionary Approach to OOS”**
  - Near-Term “Motion” Services
  - No “Observation” Services
  - Incremental Development Based on Customer Demand
  - Explore the Role OOS as an Enabling Technology

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## BG 3: “Boffins”

Space A&R

- BG Session 1: “Validation”
  - No OOS Because:
    - **Technology Chicken & Egg**
    - **Co-Operative Design Need**
  - Status:
    - **Ready for Demonstrator**
  - Assets:
    - **For Co-Operative Design Few Technological Issues**
    - **Most Technology in Place**
  - Lacks:
    - **No Standardization**
    - **No End-to-end Technology Demonstrator**

Agreement or More?

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## BG 3: “The Boffins”

More?

- BG Session 1: “Validation”
  - Questions to :
    - **“Whigs”**
      - Agency Cooperation & Support
      - Legislation for Satellite Disposal
    - **“Suits”**
      - Funding Demonstration
      - Market Demand: Science vs. GEO
    - **“Navvies”**
      - Demonstrator Based on Micro Sat Technology

Answers?

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## BG 3: “Boffins”

- BG Session 2: “Justification”
  - Vision:
    - **“OOS Increasing Flexibility of Space Missions & Enabling for Future Space Exploration”**
    - If It’s Broke, We Fix It!
    - If It’s Empty We Fill It
    - If It’s Dead, We Eat It
  - **Servicing Technology Developments for Non-Co-Operative Targets Only = The Only Way Forward Now!**

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## BG 4: “Navvies”

- BG Session 1: “Validation”
  - No OOS Because:
    - **Missing Ground Support Infrastructure**
    - **Launch Costs**
    - **Communications: Bandwidth & Latency**
  - Status:
    - **Launch Cost Secondary Consideration**
  - Assets:
    - **Low-Cost Russian Launchers**
    - **Secondary Payload Volumes**

**Mission Architects  
System Engineers**

**Agreement or More?**

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## BG 4: “The Navvies”

- BG Session 1: “Validation”

More?

- Questions to :

- “Whigs”

- Legal & Political: ITAR & National Policies
- Security: National Assets
- Environmental Impact: Debris

- “Suits”

- Institutional Inertia: Cultural Change
- Finance: Investor’s Perception
- Market Demand

Answers?

- “Boffins”

- Mission Development: Limitations on Orbits & Protocols

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## BG 4: “Navvies”

- BG Session 2: “Justification”

- Vision:

- “Full Launch & Ground Infrastructure”

- Low-Cost Space Access
- Integrated Simulation Facilities
- Full Mission Planning

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# Integration of BGs Day 1 ???

