Integrate RCS, OMS, and MPS

Space Propulsion Technology
Assessment Workshop

April 2001

Current Baseline
Integrate RCS, OMS, and MPS

- Separate RCS, OMS, and MPS Systems
- Different propellants for MPS versus RCS and OMS systems
- See “Integrate RCS and OMS” for RCS and OMS baseline
- MPS
    - High thrust oxygen/hydrogen or oxygen/HC main engines
    - One ox and one fuel tank
    - Autogenous pressurization of ox and fuel tanks
    - No connection to RCS or OMS systems

Goal
Integrate RCS, OMS, and MPS

- Desired gains
    - Only one ox and one fuel tank
        - Save as many as five ox and five fuel tanks
    - No separate pressurization systems
        - Save as many as five GHe and two GN2 tanks and seven pressurization feed systems
    - Two less major feed systems to develop
- Drawbacks
    - Some longer feed system lines
    - Some increased valve redundancy per feed line
        - Overall, fewer valves
    - If gas/gas OMS or RCS, then increased volume and weight of individual OMS or RCS feed lines
        - Overall volune and weight probably less than unintegrated system

Potential Solutions
Integrate RCS, OMS, and MPS

- Use same propellants for RCS and OMS as used by MPS

- Use one fuel and one ox accumulator to feed all RCS and OMS engines
    - Accumulator filled from MPS
    - Accumulator adds safety and functional redundancy
        - Size for deorbit with RCS
    - Can fill accumulator as part of start sequence

- Or accept lower specific impulse tank head pressure fed operation
    - May still be better specific impulse than current propellants
    - OMS engine will be large at such a low chamber pressure
    - May need screen or other propellant acquisition device for predictability

Technology to Implement Solutions (TRLs)
Integrate RCS, OMS, and MPS

- Ox/hydrogen or ox/HC OMS engines (4/5)
    - Gas/Gas
    - Gas/Liquid
    - Liquid/Liquid
- Ox/hydrogen or ox/HC RCS thrusters (4/5)
    - Gas/Gas
    - Gas/Liquid
    - Liquid/Liquid
- Blowdown accumulator OMS/RCS operations (4/5)
    - Filling from MPS
- Possibly propellant acquisition device (4/5)
- Combustion and ignition (4/5)
    - Impulse Bit
    - Ignition
    - Control system integration

Cost to Mature Technology
Integrate RCS, OMS, and MPS