2nd Generation Turbomachinery Technology Demonstrator

Space Transportation Technology Workshop or Section Title:

- **Background**
  - **Short schedule for Prototype Engine would not permit incorporation of new turbomachinery technology**
  - **Needed time to mature technology to TRL 4**
  - **Demonstrator Turbopump required to advance technology from TRL 4 to TRL 5/6 in time for insertion into FSD**
- **Approach** (All work in parallel with Prototype Engine)
  - **Define requirements**
  - **Perform concept definition**
  - **Down select most promising technology for demonstrator, TRL 4**
  - **Design turbopump demonstrator, fabricate hardware, and assemble TP**
  - **Perform hot fire testing, Turbomachinery Technology TRL 6**
- **Deliverables**
  - **Representative turbopump, which incorporates advanced turbomachinery technology, ready for hot fire tested**
  - **Hot fire test results of turbomachinery technology**
  - **Turbomachinery technology advanced to TRL 6, ready for FSD**

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- **State of the Art**
  - **IPD Turbopumps, LOX and LH2, with Hydrostatic bearings**
- **Need**
  - **A turbopump demonstrator is needed to advance the development of Gen 2 turbomachinery technology**
- **Relationship to 2nd Generation Goals**
  - **Technology for LOX and LH2 turbomachinery will address cost, reduced weight and improved reliability**
  - **A partial list of potential technologies**
    - Lighter weight housing materials
    - Enhanced inducer and impeller performance
    - Enhance rotordynamic stability seal
    - Enhanced turbine performance
  - **Turbomachinery technology is cross-cutting among the proposed engine concepts.**

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Gen 2 Turbomachinery Technology Demonstrator

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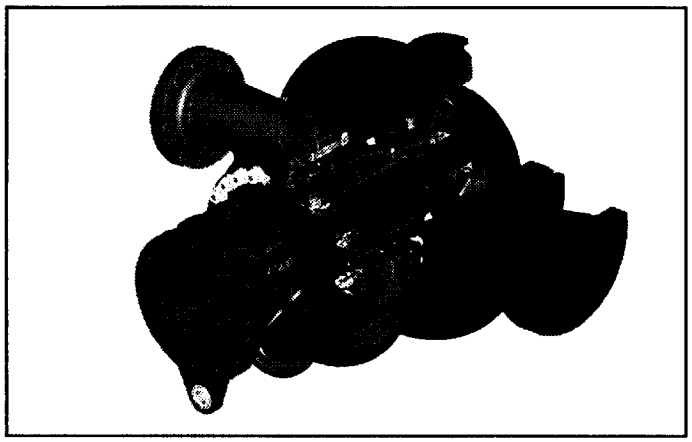
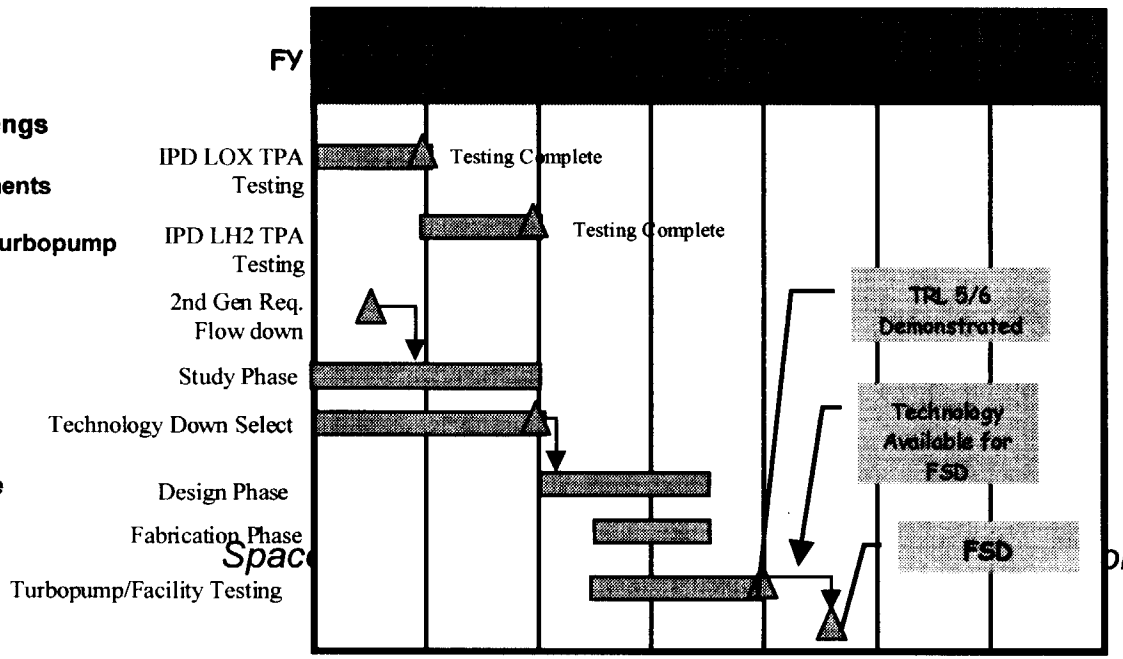


- **Products**
  - **Incorporate Gen 2 turbomachinery technology into a turbopump demonstrator(s)**
  - **Advance turbomachinery technology to TRL5/6, available for FSD**
- **Benefits**
  - **Demonstrate turbomachinery technology which addresses improved pump performance, turbine performance, seals, materials, and bearings which address engine T/W, decreased costs and improved reliability.**
- **Customers**
  - **Industry Partners, DOD, and NASA**
  - **Technology is cross-cutting among the proposed engine concepts**

- **Current State of the Art**
  - **IPD Turbopumps with hydrostatic bearings**
- **Approach**
  - **Define the engine/turbomachinery requirements**
  - **Assess technology needs**
  - **Develop technology for incorporation into turbopump**
  - **Demonstrate technology in turbopump**
- **Performance Metrics**
  - **Reduce Turbomachinery weight**
  - **Improved Turbine Performance**
  - **Reliability Enhancement**
- **Risks**
  - **Testing IPD turbopump**
  - **Maturing necessary technology in time**



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