

## Development of a Warm-Gas Butane System for Microsatellite Propulsion



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# Overview

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- Conceptual Design
- Analysis and Detailed Design
- Component Selection and Mechanical Configuration
- Current Testing
- Demonstration
- Future Work

# Conceptual Design Process

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Lifetime

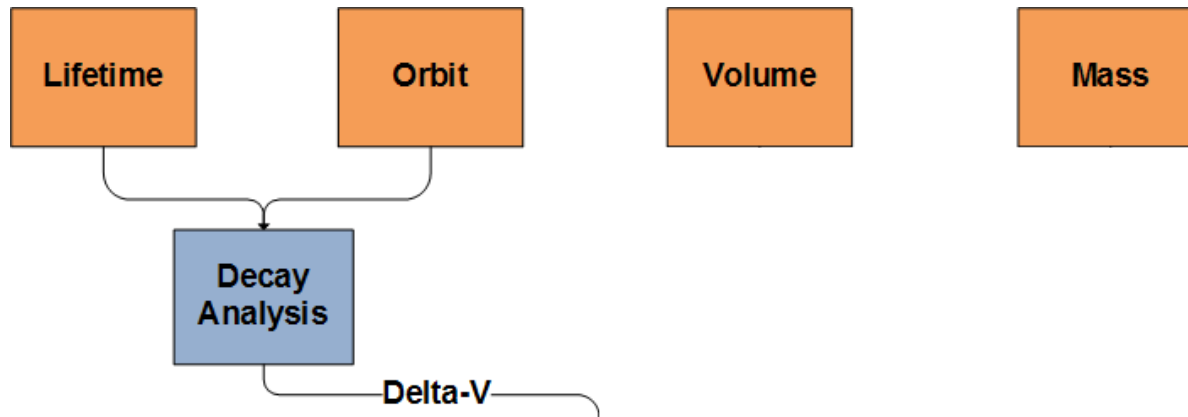
Orbit

Volume

Mass

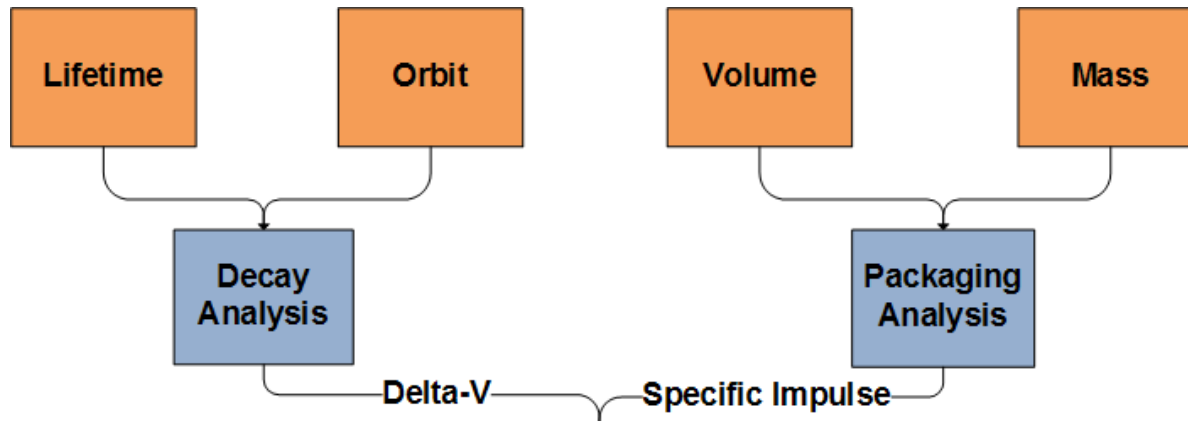
# Conceptual Design Process

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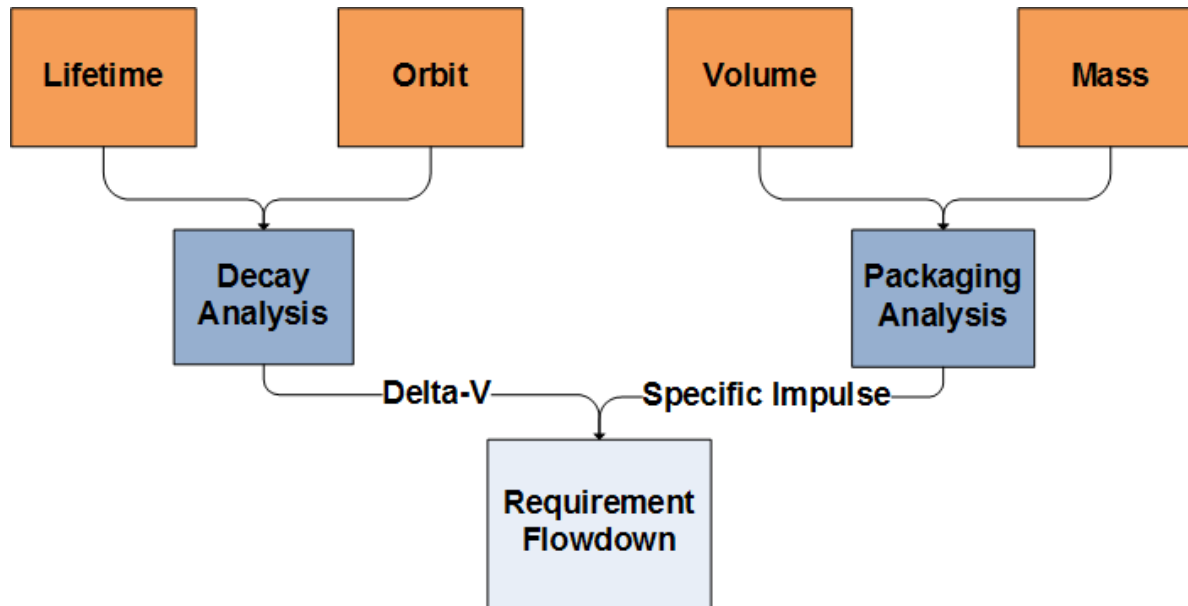
# Conceptual Design Process

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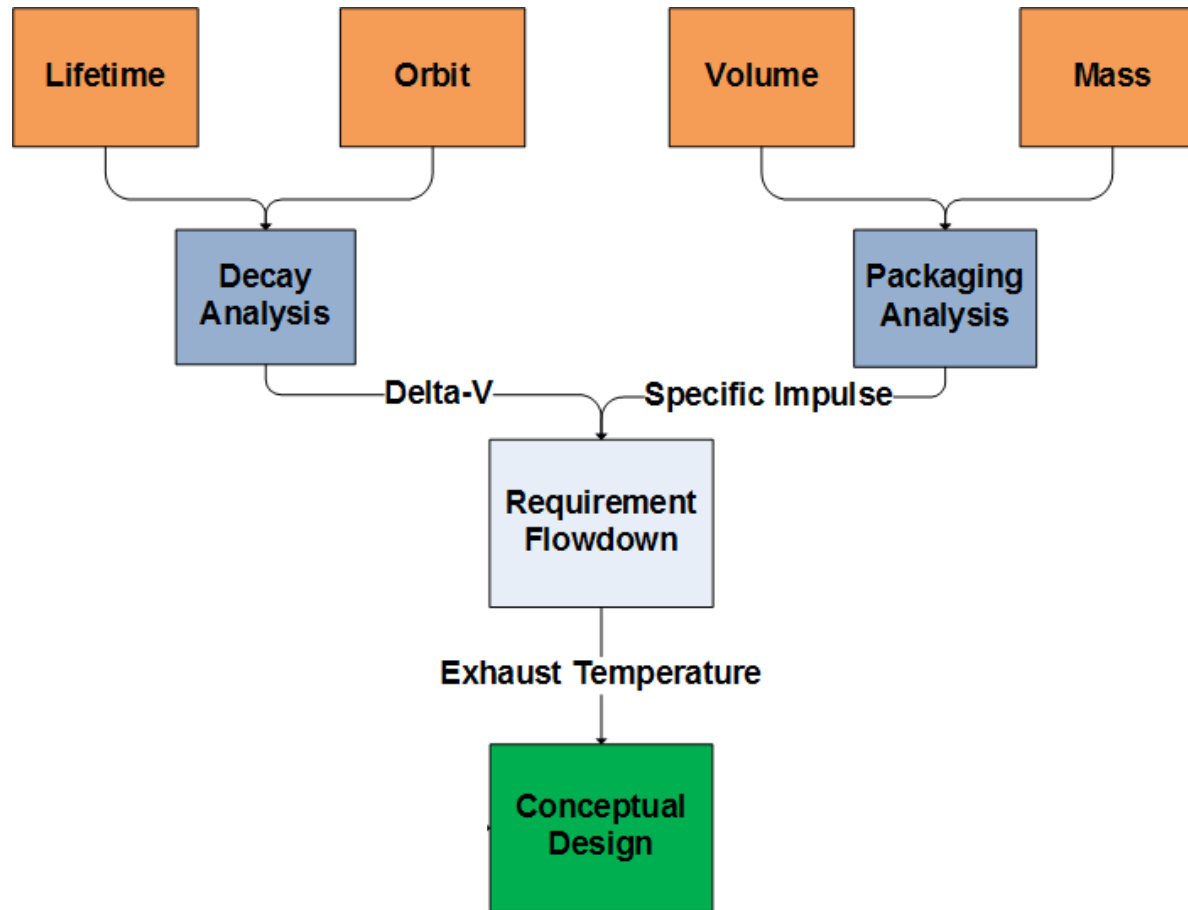
# Conceptual Design Process

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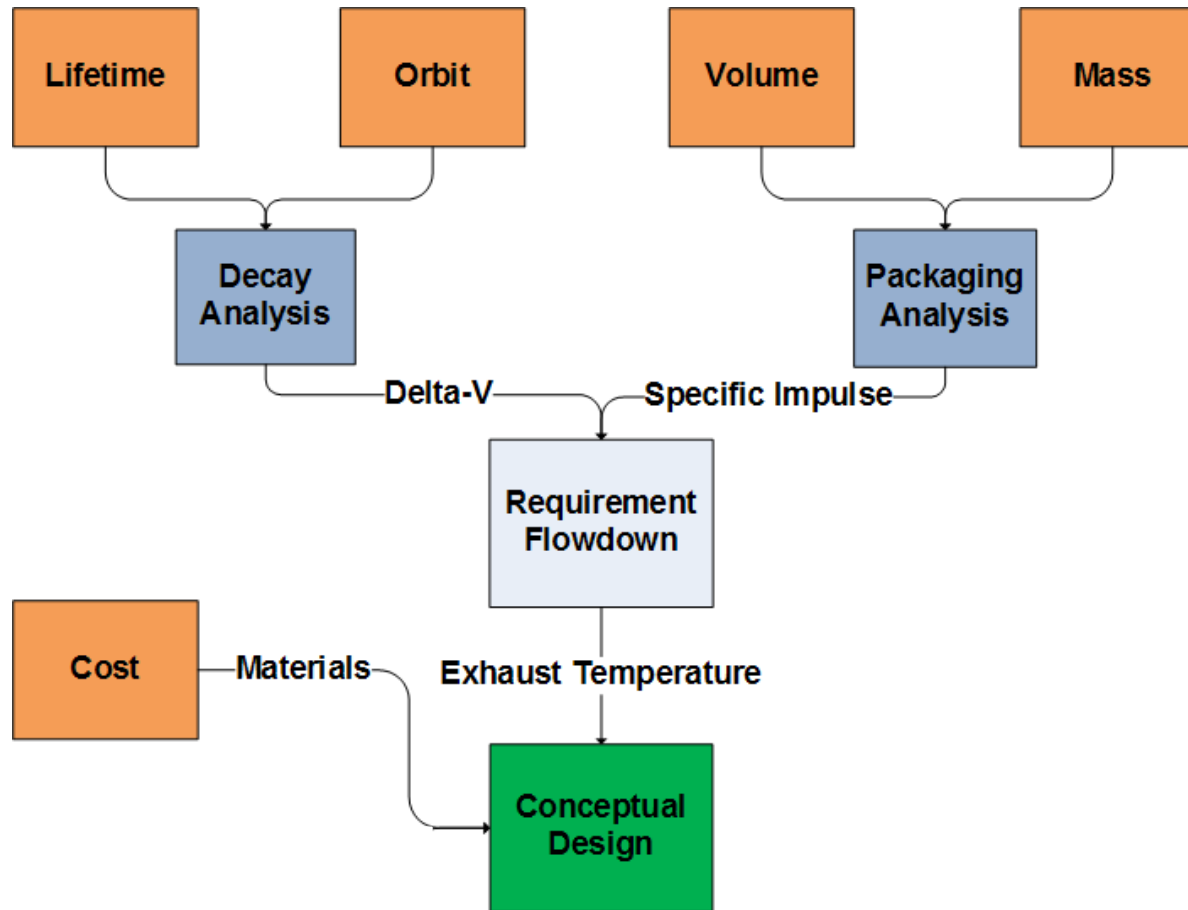
# Conceptual Design Process

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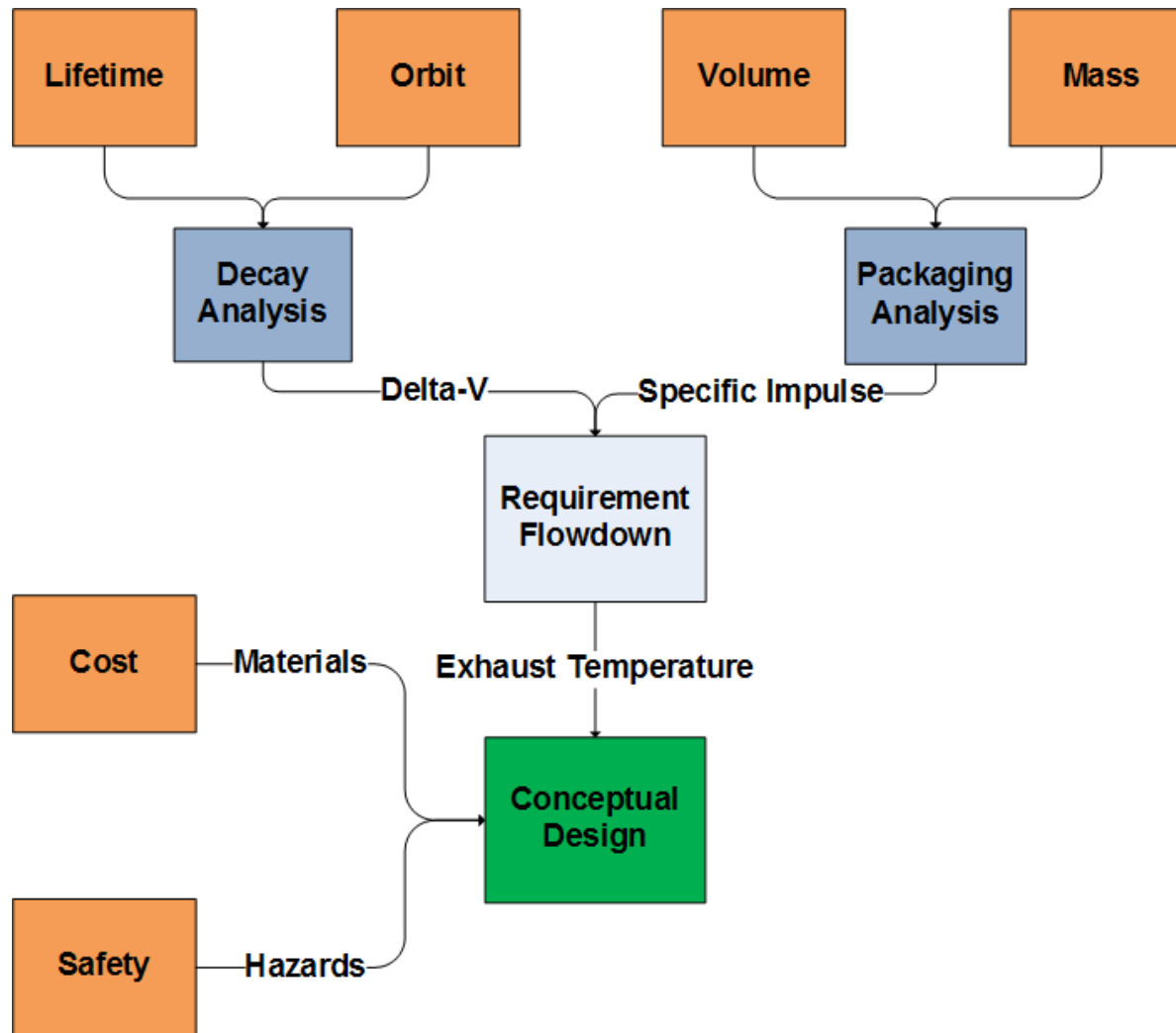
# Conceptual Design Process

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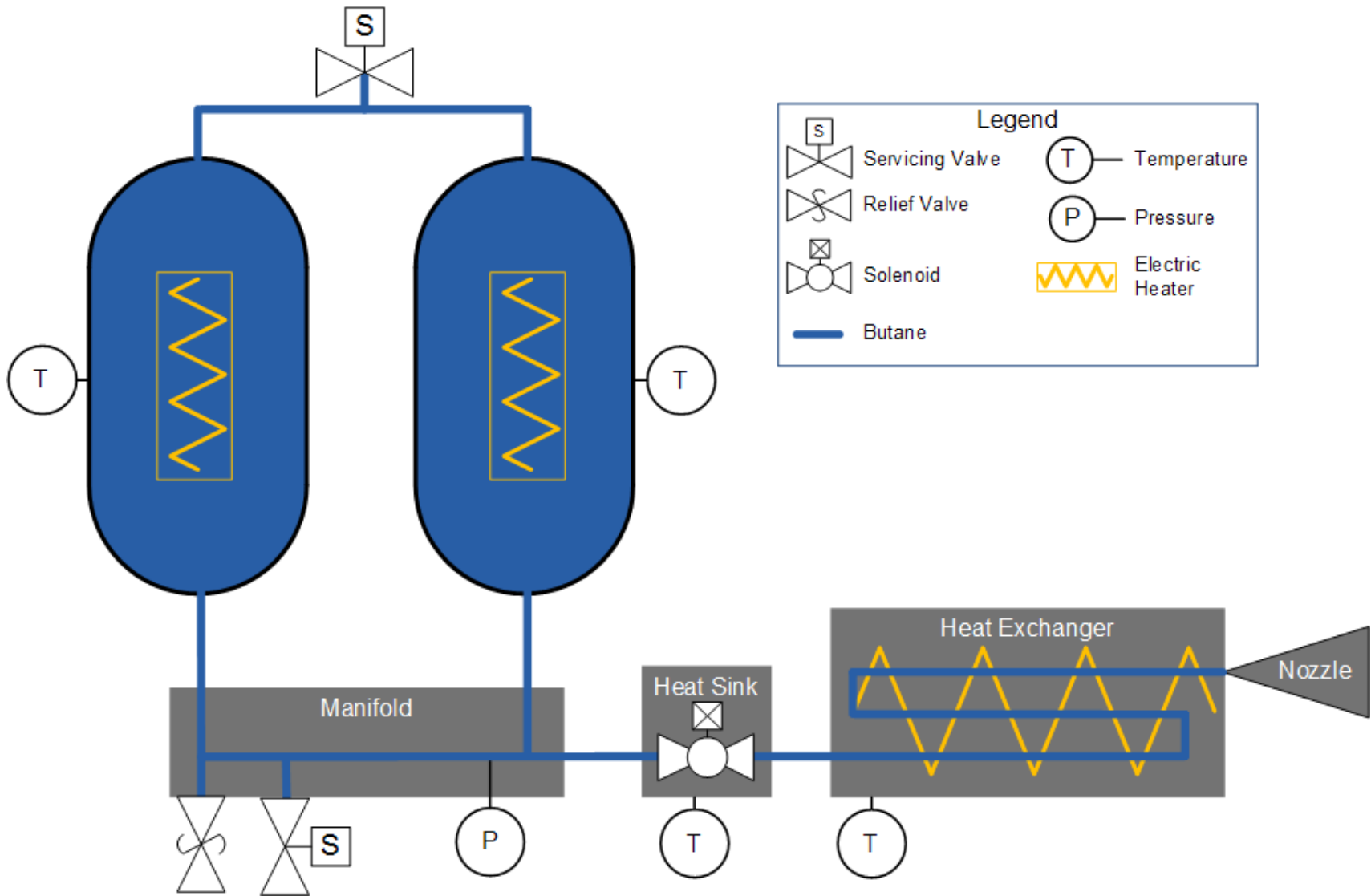




# Conceptual Design Process

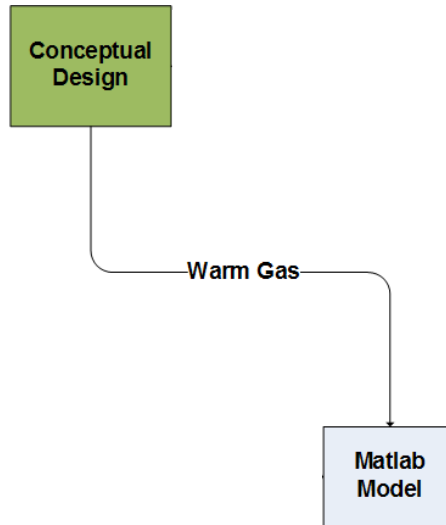


# Conceptual Design



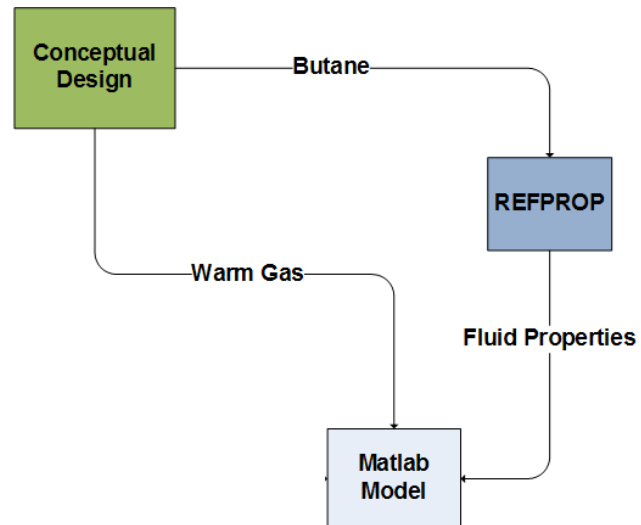
# Analysis and Detailed Design

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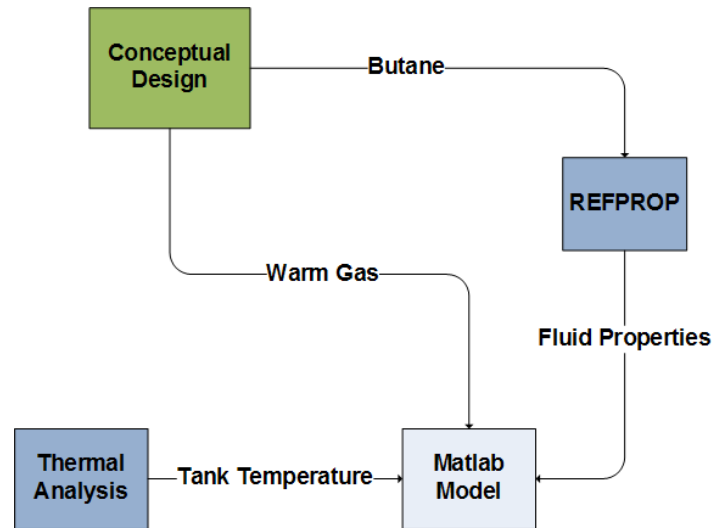
# Analysis and Detailed Design

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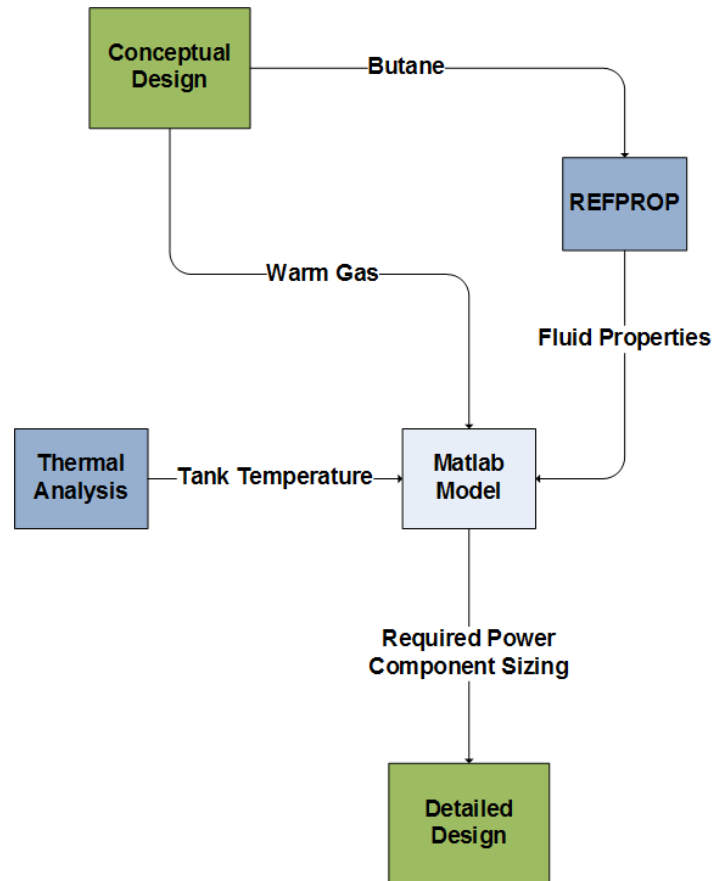
# Analysis and Detailed Design

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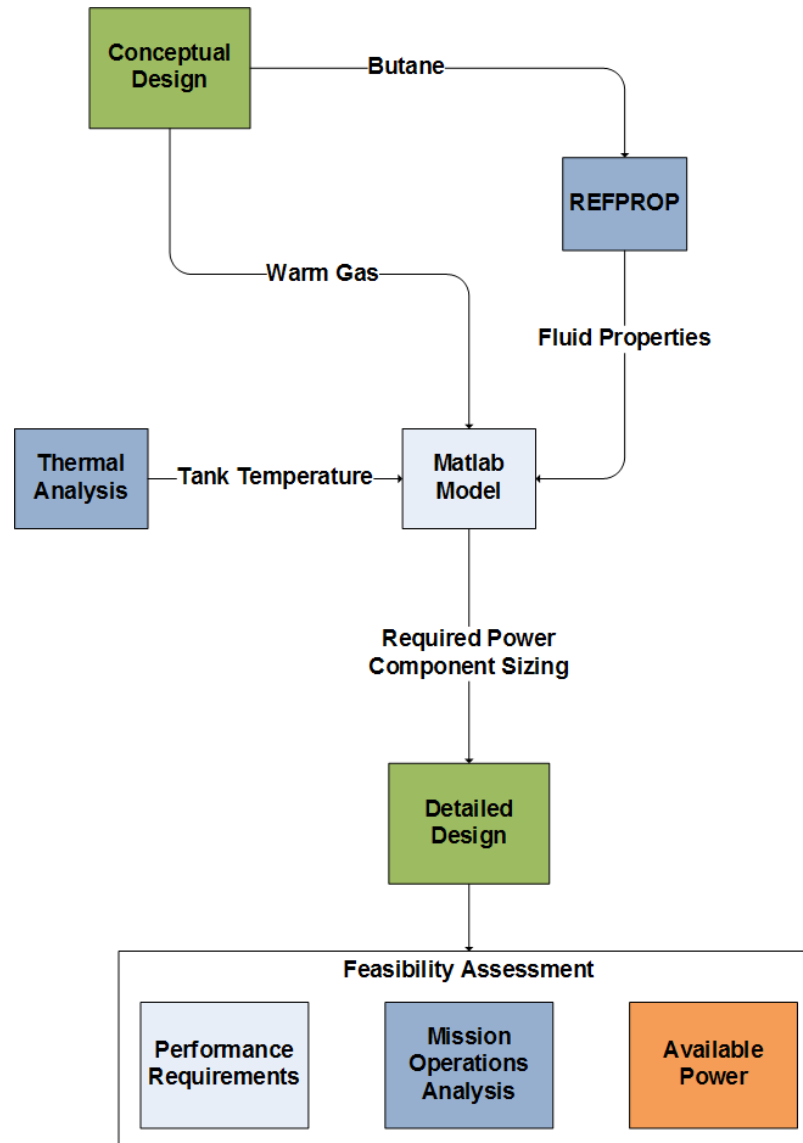


# Analysis and Detailed Design

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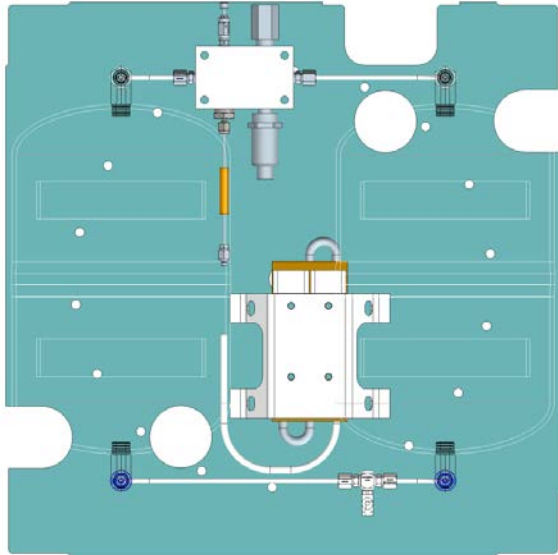
# Analysis and Detailed Design



# Mechanical Configuration

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- Focus on COTS components
  - Tanks, plumbing, heating elements, valves, sensors, nozzle
- Straightforward machining
  - HEX and Manifold are aluminum boxes
- Minimal complex manufacturing
  - Titanium bracket





# Heat Exchanger Detail

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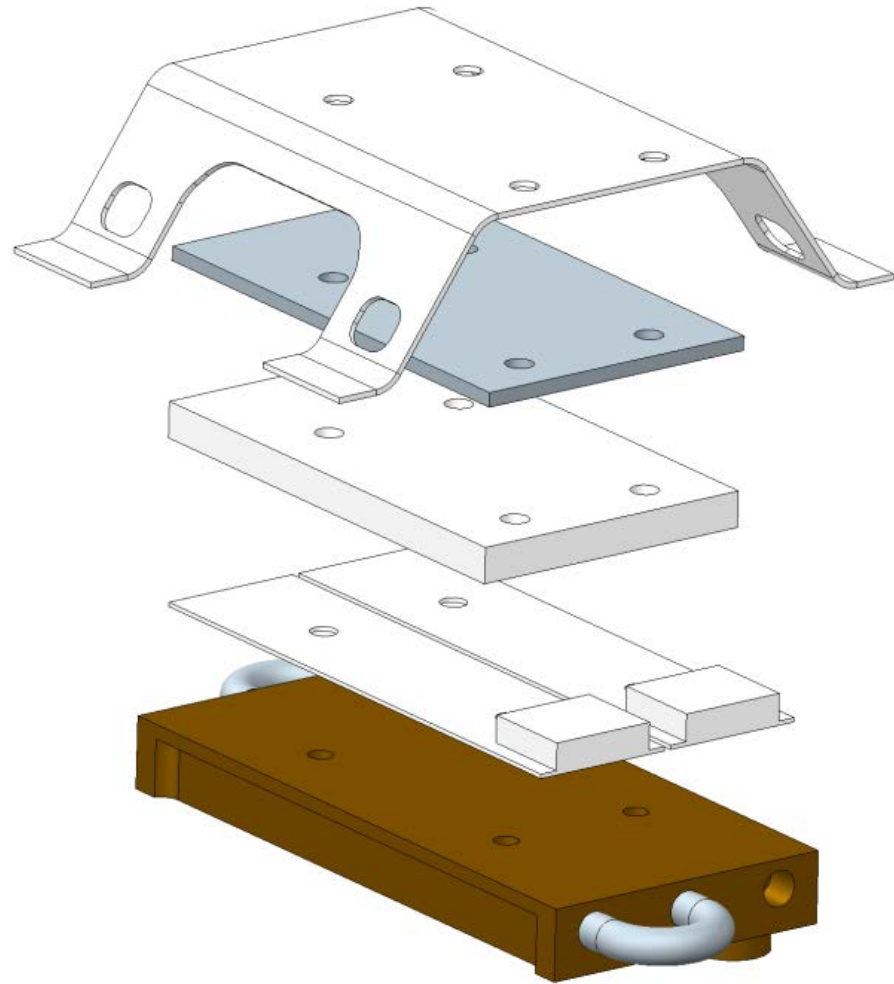
Titanium Mounting Bracket

Stainless Steel Plate

Alumina Insulation

Ceramic Heaters

Machined Aluminum Block



# Test Platform



# Demonstration

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