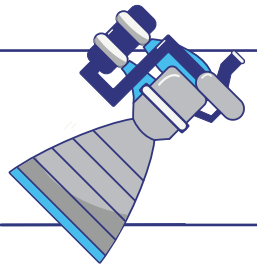
SPACEFLIGHT

Bringing nuclear quality and standards to system simulation.

FLOWNEX® SIMULATION ENVIRONMENT



Flownex® SE determines pressure drop and heat transfer of interconnected components of an integrated system in steady state and transient.

TYPICAL USES

DESIGN

- System component sizing
- System thermodynamics and performance
- Heat transfer interfaces and limiting temperatures
- Control system philosophy

ANALYSIS

- Fast transient simulations
- Analysis of system response
- Oxygen and fuel rate requirement
- Material temperature evaluation
- Point of failure root cause analysis

OPTIMISATION

- Piping geometry and configuration
- Oxygen to fuel ratio
- Cooling strategies
- Insulation material
- Nozzle geometry

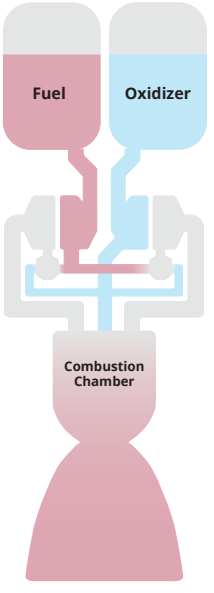
WATCH HERE

WEBINAR

Coming Soon

CLOSED CYCLES

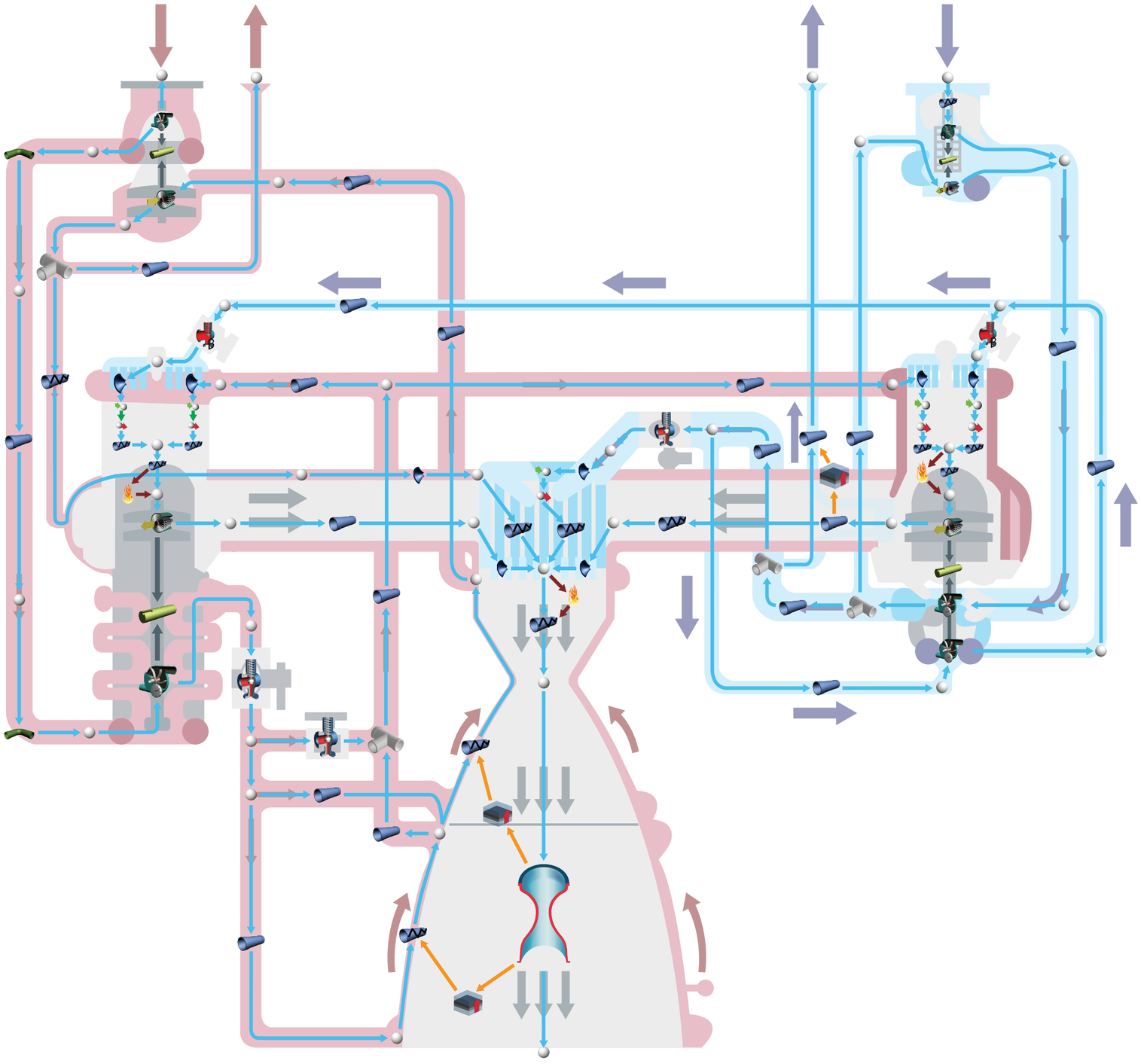
- Fuel rich pre-burners
- Dual shaft configurations
- Re-use pre-burner off-gasses for higher efficiency
- Design for clean combustion products
- Avoid potential component damage



BLUE ORIGIN

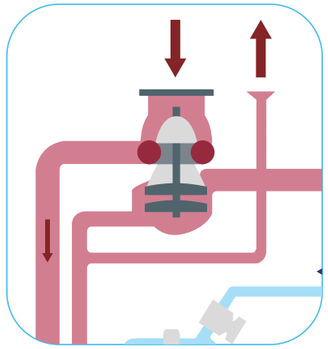
Flownex® is developed within an ISO 9001:2015 quality management system and is ASME NQA-1 compliant.

THE RS-25 LIQUID-FUEL CRYOGENIC ROCKET ENGINE



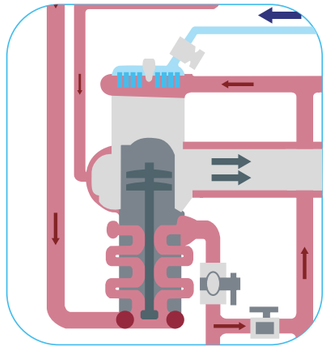
Turbopumps and Fuel Lines

- Model turbo pump configuration
- Power matching capabilities
- Liquid cryogenic fluid properties
- Integrated system response
- Turbine map and pump chart implementation



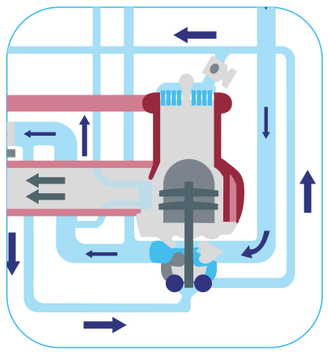
Preburners and Control Valves

- Calculate properties across multiple branches
- Different control valve options
- Complex combustion reaction modelling capabilities
- Include control system response



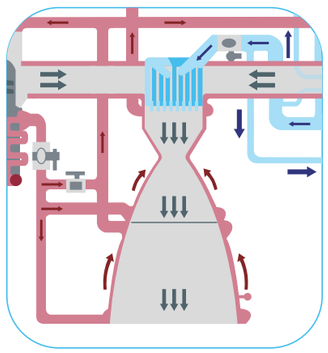
Branched Flow and Heat Exchangers

- Flow distribution with control action
- Multiple turbine and pump components on one shaft
- Heat transfer between flow paths
- Pressure drops in bends, T-junctions, reducers, orifices, etc.



Main Combustion Chamber and Thrust Nozzle

- Main Combustion Chamber mixture, phase changes and heat release
- Nozzle force calculations
- Customise heat transfer geometry
- Material temperature limits
- Pipe stress analysis



LIQUID FUELLED ROCKETS

- Turbo-pump sizing
- Power matching of pump and turbine
- Convective & radiation heat transfer
- Combustion process modelling
- Thrust calculation using nozzle
- Control system integration
- Transient system behaviour
- Flight mission simulation

THERMAL MANAGEMENT SYSTEMS

- Waste heat rejection
- Closed-loop cooling circuit design
- Advanced fluids library
- Pump requirements
- Primary and secondary loss calculation
- Radiator sizing

COMPLETE SYSTEM INTEGRATION

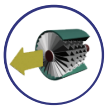
- Overall efficiency calculation
- Effect of single component on system performance
- Testing of different configurations and concepts

HYDRAULIC SYSTEMS

- Calculate pressure drop characteristics
- Flow and heat transfer response to system changes
- Predict pressure loss due to leakages
- Pipe stress analysis with CAESAR II and ROHR2

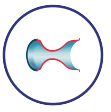
SPECIALISED COMPONENTS

- **Turbine**
  Detailed turbine modelling with turbine maps and choking



- **CEA Adiabatic Flame**
  Combustion process modelling and detailed combustion product calculations

- **Exit Thrust Nozzle**
  Subsonic and supersonic flow with gasses and super-heated fluids



- **Composite Heat Transfer**
  Convection, conduction and radiation, heat transfer to and from solid structures

- **Restrictor with Discharge Coefficient**
  Represents a throttling process, used for fuel and oxygen injectors

- **ANSI Control Valve**
  Control flow rates for gasses, liquids and two-phase fluids

ANSYS CO-SIMULATION

- Direct coupling with Mechanical/CFX/Fluent
- Complex three-dimensional conduction
- Complex three-dimensional flow
- Reduce solving times through integration with one-dimensional flow networks

FLOWNEX® SIMULATION ENVIRONMENT Ansys

ANSYS COUPLING AND WORKBENCH INTEGRATION