

# EcosimPro/PROOSIS SIMULATION TOOLKITS APPLICATIONS

www.ecosimpro.com (4th-March-2026)

## SPACE

### ESPSS (European Space Propulsion System Simulation) from ESA

Toolkit for modelling rocket and satellite propulsion systems

#### Applications

Simulation of ground, spacecraft and launch vehicle propulsion systems under transient and steady conditions

Fluid systems with two-fluid mixtures under gas, liquid and two-phase flow regimes for a wide database of fluids

Studies of water hammer, pressure drop, priming processes, etc. in fluid networks

Hydraulic and pneumatic systems, equipment and combustors, with heat transfer and controls loops coupled together

Fluid networks with advanced devices: heat exchangers, 1D tanks, turbomachinery components, etc.

Transient simulation of liquid, solid and hybrid rocket engines

Advanced components for combustion modelling: injectors, cooling jackets, film cooling combustion chambers, etc.

Simulation of air breathing engines: ramjet and scramjet

Orbital and attitude motion of satellites

Electrical propulsion systems

PEM fuel cell and electrolyzers for propulsion applications

Nuclear propulsion systems

Performance analysis and design of space engines and subsystems

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## THRUST

Toolkit for modelling fluid networks and aerospace propulsion systems

### Applications

Transient simulation of complex fluid systems, power plant cycles and combustion processes

Simulation of ground, spacecraft and launch vehicle propulsion systems under transient and steady conditions

Fluid systems with two-fluid mixtures under gas, liquid and two-phase flow regimes for a wide database of fluids

Simulation of water-hammer, pressure drop, priming processes, etc. in fluid networks

Hydraulic and pneumatic systems, equipment and combustors, with heat transfer and controls loops coupled together

Fluid networks with advanced devices: heat exchangers, 1D tanks, turbomachinery, boilers, actuators, etc.

Special turbomachinery formulation based in BETA-ZETA/MFT maps for gas turbine architectures

Transient simulation of liquid rocket engines

Simulation of air breathing engines: ramjet and scramjet

Electrical propulsion systems

Performance analysis, design and optimization of space engines and subsystems

## ECLSS - Environmental Control and Life Support Systems in manned spacecraft

Modelling of environmental control and life support systems in manned spacecraft.

### Applications

Thermohydraulic analysis of conventional ECLSS systems of air regeneration and conditioning in spacecraft

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Thermohydraulic analysis of venting lines

Sizing or specification of conventional ECLSS equipment pressure regulators, valves, heat exchangers, pumps, fans, etc.

Identification of operational problems in ECLSS systems

Transient analysis of ECLSS system performances for the duration of the mission

Analysis of air humidity, temperature and composition taking into account occupation and crew member activity.

Thermohydraulic analysis of cooling loops in conventional ECLSS systems.

Analysis of the response of the ECLSS systems control system and adjustment of the control loops.

Calculation of pressure drops in ducts and accessories in air loops and cooling loops of ECLSS systems

## AERONAUTICS

### TURBO - Gas Turbines Performance Simulation

Simulation of design, off-design, transient and mission models in gas turbines

#### Applications

On-design analysis of aeronautical or industrial gas turbine systems

Off-Design analysis of aeronautical or industrial gas turbine systems

Gas turbines: model identification

Exporting of gas turbine models as flexible stand-alone black boxes (customer decks)

APU modeling

Coupled simulation of engine and aircraft systems

Gas turbine Multi Design Point with limiters

Off-design simulation with limiters

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Transient simulation of gas turbines

Transient simulation with control system

New aeronautical engine configuration: Open Rotor, Ultra-High Efficiency Gas Turbine, etc.

## ASYST - Aircraft Systems Simulation Toolkit

Simulation of thermo-fluid aeronautical systems

### Applications

Cycle analysis (On- and Off-design) of aircraft thermofluid systems: humid air, liquid and vapor systems

Environmental Control System of an aircraft

Air Cycle Machine based Environmental Control System (ECS)

ECS engine bleed subsystem

Cabin and air distribution subsystem simulation (ECS)

Aircraft hydraulic systems (fuel, oil)

Aircraft vapour systems

Organic Rankine Cycles, combined cycles, heat recovery

Electric machine systems

Aircraft systems thermal management

Control systems for aircraft complete architectures

Coupled simulation of engine and relevant aircraft systems

Innovative architectures based on H2 combustion

Innovative architectures based on hybrid and electric propulsion

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## POWER

### CRYOLIB- CRYOgenic simulation LIBrary

Simulating cryogenic installations and their control systems.

#### Applications

Dynamic simulation of large scale cryogenic systems (refrigerators and cryogenic consumers) and their control.

System design and integration studies of the cryogenic system

Development/optimization and off-line test of control algorithms for these systems

Check of starting/ending sequences and operation of the system as a whole

Virtual commissioning

Operator training in abnormal situations that may occur in cryogenic installations

### TRITIUM- Cryogenic simulation

Simulation of processes involving hydrogen isotopes

#### Applications

Transient analysis of the tritium inventory: concentration of tritium at different process locations

Support of decision-taking for process engineering

Support with deciding on the materials to be used

Analysis of tritium transfer surface phenomena

Dynamic analysis of tritium inventory under conditions of no tritium generation.

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Modeling of different scenarios of pulsed generation of tritium

Simulation of changes in the composition of the process fluid

## PIPELIQ- Steady Hydraulic Simulation

Balances of pressures and mass flows of hydraulic/liquid systems

### Applications

Calculating pressure drops in piping networks

Calculation of hydraulic balances (pressure and mass flow) in hydraulic systems

Support in the sizing and selection of equipment (pumps, valves, pipes, etc.).

Heat balances in non-compressible circuits

Operation and control systems of non-compressible circuits: cooling loops and heat pipes with no phase change.

## PIPELIQTRAN- Transient Hydraulic Simulation

Transient analysis in fluid networks

### Applications

Selection of pumping systems

Dimensioning and location of anti-waterhammer device

Selection of control valves and actuators

Design and adjustment of control loops for non-compressible systems

Analysis of pressure transients and calculation of wave forces in pipelines for support design

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Cooling loops such as the circulating water system of a power plant (nuclear, combined cycle).

Water supply system to a steam generator of a nuclear power plant.

Thermal liquid loops such as the primary circuit of a thermo-solar plant.

## POWER

### THERMAL\_BALANCE- Steady THERMAL BALANCE simulation Toolkit

Steady-state thermal balance studies in power plants

#### Applications

Stead-state energy balances in different operating conditions in power generation plants (Combined Cycles, Nuclear, etc.)

Identification of causes of loss of performance in power plants

Cycle optimization and operating modes

Study of the impact of modifications and anomalies on plant performance

Transient analysis of the heat sink of a nuclear power plant.

Analysis of the operating sequence in steam accumulators of a thermo-solar plant

Dynamic simulation of the plant and plant systems due to changes in operating conditions or environmental conditions

### FLUIDAPRO - Fluids simulation

Model and simulate complex dynamic fluid network in one/two phases (liquid-vapor)

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## Applications

Transient simulation of complex fluid systems, power plant cycles and combustion processes

Simulation of models involving two-fluid mixtures under gas, liquid and two-phase flow regimes for a wide database of working fluids

Simulation of water-hammer, pressure drop, priming processes, etc. in fluid networks

Analysis of hydraulic and pneumatic systems, equipment and combustors, with heat transfer and controls loops coupled together

Modeling of combustors, HX, turbo-machinery, Pumps, Tanks, Boilers, hydraulic and pneumatic actuators, etc.

Performance analysis and optimization of space and aeronautical engines

## H2ENERGY - Hydrogen simulation

Model H2 networks

### Applications

All applications from FluidaPro

Transient simulation of H2 fluid systems

Electrolyzers - H2 generation

Fuel Cells - power generation

Renewable grid management

Optimisation of LCOH

## HVAC - Modelling building HVAC systems

HVAC modelling of buildings

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## Applications

- Create building digital twins for transient HVAC performance simulation.
- Virtually commission HVAC control logic with PLC-in-the-loop testing.
- Size ducts, pipes, and equipment using dynamic fluid-thermal models.
- Assess comfort and air quality: CO<sub>2</sub>, humidity, temperature.
- Optimize energy operation via scenario simulation and predictive control.

## SMART\_GRID - Energy SMART GRID simulation

Energy systems with sources such as wind turbines, solar, battery banks and diesel

## Applications

- Intelligent networks of different sources (e.g. wind, solar, etc.)
- Study how environmental conditions affect renewable energy sources (sun, wind)
- Analysis of different network control configurations
- Network optimization
- Analysis of different network configurations