

Oct 2003

ALSTOM

Current Product Developments & Web Support System

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Introduction

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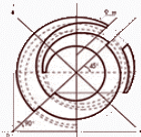
Presentation in two-parts,

Current product developments



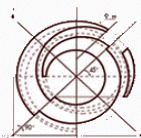
New web support system

- Presentation Structure-



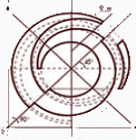
- Large number of developments underway
- Developments at different levels of maturity
- Present current developments
 - Detail depends upon maturity
- Scope for further suggestions to be included
 - Henri will present new web support system
 - Use it to suggest enhancements to the tools

- Introduction -



- FHTS Solver Enhancements
- New Elements
- Fluid property definition
- Groups, Events & Phases
- ESARAD Modelling Enhancements
- ESARAD Visualisation Development
- ThermXL developments
- Further Developments

- Development Items-



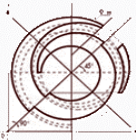
Solver Developments

Two-phase quasi-transient solver

- FGENFI extended to handle quasi-transient
 - P & W assumed steady state
- Selected as an option via QTRSOL (=YES || **NO**)
- Need for pressure boundary removed
 - Assumes fixed fluid mass within loop
 - Mass initialised at start of each time step
- Significant speed improvements seen

- FGENDA made obsolete

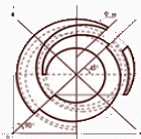
- Two-Phase Solver Extended -



Solver Developments

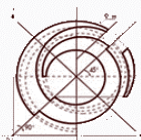
- Single-phase transient humidity solution
 - flntf, flntts and flmths being extended to handle wet air
 - Hydraulic steady state assumed (P & W)
 - Water-vapour inertia term to be included

- Fluid Loop Modelling Capability -



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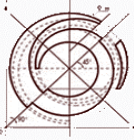
- Development Items-



Functionality Enhancements

- **Provision of new elements.**
 - Flexible pipe model
 - PID Controller
 - Peltier device
- **Requirements taken directly from user requests**
 - Close collaboration with CNES

- New \$ELEMENTS -

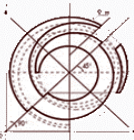


Presentation Contents

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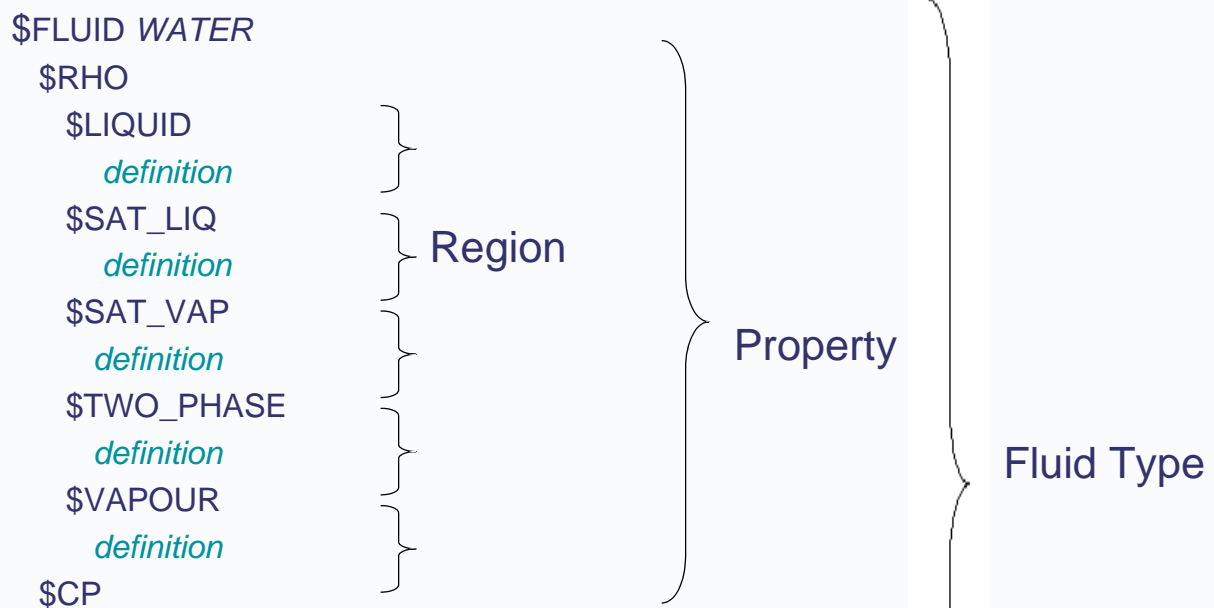
- Development Items -



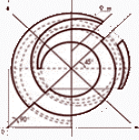
ESATAN Developments

ALSTOM

Open architecture for fluid property definitions



- fdf File Format -



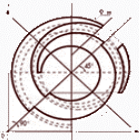
Functionality Enhancements

- Definition can take the form of,
 - a constant
 - interpolation (1D, 2D or fixed interval)
 - procedure (FORTRAN + reserved variables PROPL, ...)

- No difference between system and user properties
- Easy to add new or modify system properties

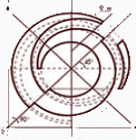
- Similar approach proposed for def'n of htc's
- Additional condensation correlations provided

- Fluid Property Definition File -



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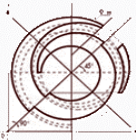


Functionality Enhancements

- Ability to define & refer to a group of nodes.
 - Average group data
 - Group min & max temperature
 - Heat flux between groups
 - Group data output
- Events & Phases
 - Simplify modelling control logic

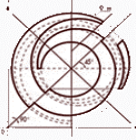
IF(*Event*) THEN
do something

- Groups, Events & Phases -



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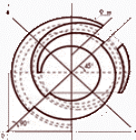
- Development Items-



Functionality Enhancements

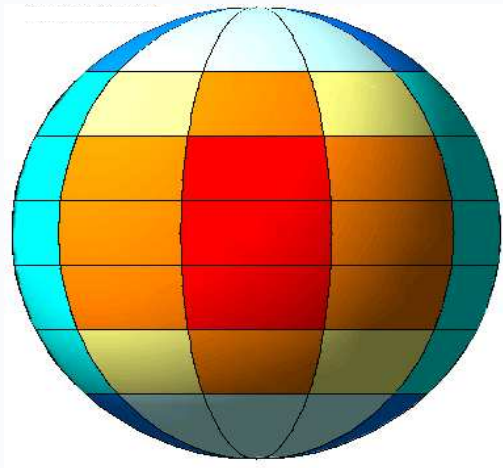
- Developments to meet BepiColombo project requirements
 - Planet temperature map (Alpha release now available to the project)
 - Removing assumption of parallel sun rays
- General implementation

- BepiColombo Requirements -



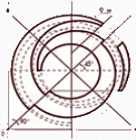
Functionality Enhancements

- Planet temperature map
 - Used in planet flux calculation



- Matrix of temperature
 - T vs longitude/latitude
- Calculate map.

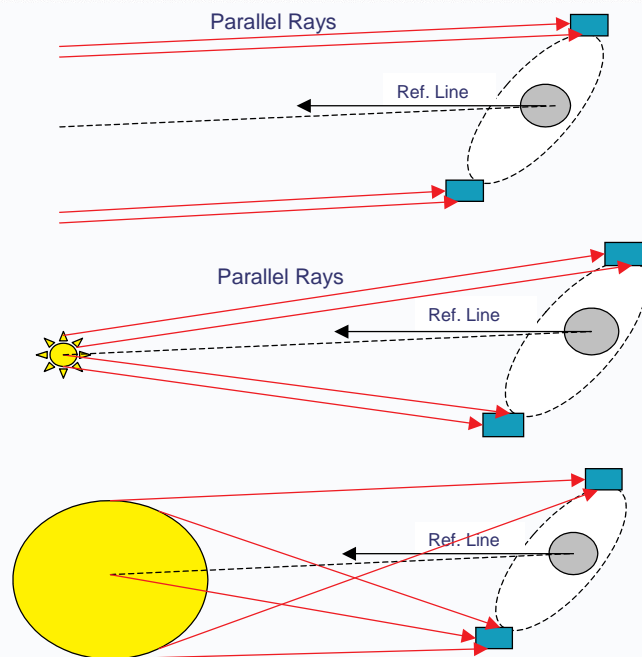
- Radiative Case: Temperature Map -



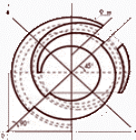
Rays from sun at infinite distance

Rays from sun at finite distance

Rays from finite sun at finite distance



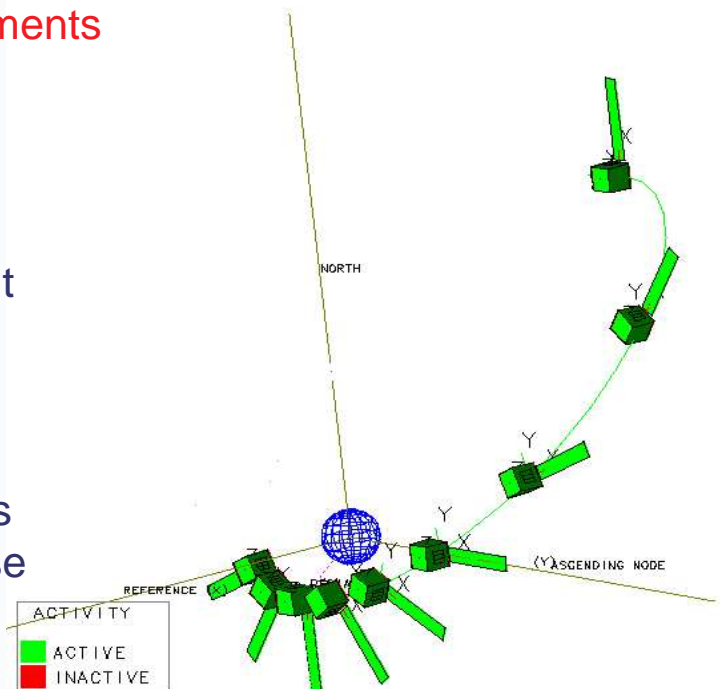
- Radiative Case: Solar Rays -



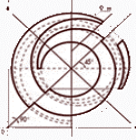
Functionality Enhancements

Orbital Arcs Development

- Orbit segment defined
- Additional options for orbit definition
- Associate orbit segment to radiative case
- An analysis case contains one or more radiative case

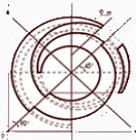


- Radiative Case: Orbital Arc -



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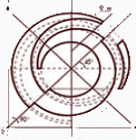
- Development Items-



Functionality Enhancements

- **3D graphics using OpenGL**
 - No third-party licence restrictions
 - Also available on Linux
 - Makes use of hardware graphics accelerator
 - Performance improvements
 - Offers much more powerful graphics capability
 - Functionality enhancements to be defined
- **Tell us what you would like to see**

- Visualisation: OpenGL -

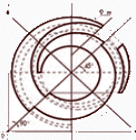


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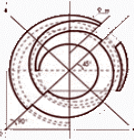


ThermXL Developments

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- Two development programmes underway
- First phase nearing completion
 - Additional modelling capability
 - Flexible interpolation function
 - Sensitivity analysis capability
 - Solver performance
- Further developments under definition

- ThermXL Development -



Selected parameters

Selected output parameters

Output

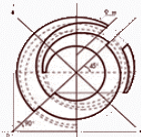
Input Parameters	Radiator Area	Linear Conductors	Radiative Conductors	Internal Dissipation	RSS User Sum
- var %	-10.0%	10.0%	-10.0%	-15.0%	
+ var %	10.0%	10.0%	10.0%	15.0%	
Nominal	2.40E-01	1.00E+01	1.00E+01	1.00E+01	
- var	2.16E-01	9.00E+01	9.00E+01	8.50E+01	
+ var	2.64E-01	1.10E+00	1.10E+00	1.15E+01	
Electronics					
- var %	34.3%	6.9%	50.2%	-58.7%	
+ var %	-29.6%	-5.6%	-44.1%	55.2%	
Nominal	14.838	14.838	14.838	14.838	
- var	5.094	1.023	7.443	-8.716	12.584
+ var	-4.387	-0.629	-6.547	8.190	11.396
Dout/Din (°C/deg)	0.474	0.093	0.699	0.654	
- var %	50.0%	5.0%	73.1%	-78.8%	
+ var %	-43.1%	-4.0%	-64.3%	73.6%	
Nominal	10.180	10.180	10.180	10.180	
- var	5.093	0.505	7.443	-8.019	12.078
+ var	-4.388	-0.406	-6.548	7.491	10.862
Dout/Din (°C/deg)	0.474	0.046	0.700	0.617	
- var %	44.3%	5.7%	64.7%	-71.4%	
+ var %	-38.1%	-4.6%	-56.9%	66.6%	
Nominal	11.595	11.595	11.595	11.595	
- var	5.094	0.653	7.443	-8.216	12.218
+ var	-4.387	-0.526	-6.548	7.690	11.024
Dout/Din (°C/deg)	0.474	0.069	0.700	0.630	
- var %	54.6%	4.4%	79.8%	-84.6%	
+ var %	-47.0%	-3.5%	-70.2%	79.0%	
Nominal	9.328	9.328	9.328	9.328	

- ThermXL: Sensitivity Analysis -



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- Further development underway
 - Usability of ESATAN a key area
 - User survey and direct contact being made
 - Results feeding into current and long terms strategy
 - During 2 days I will be listening to what you want from the products
-
- Henri to present new web support system

- Further Developments -

The ALSTOM logo, featuring the word "ALSTOM" in a bold, blue, sans-serif font. The letter "O" is replaced by a red circle with a white center, and a red arc is positioned above the "O".

www.alstom.com