

THE OVERGRID GRAPHICAL USER INTERFACE IN CHIMERA GRID TOOLS

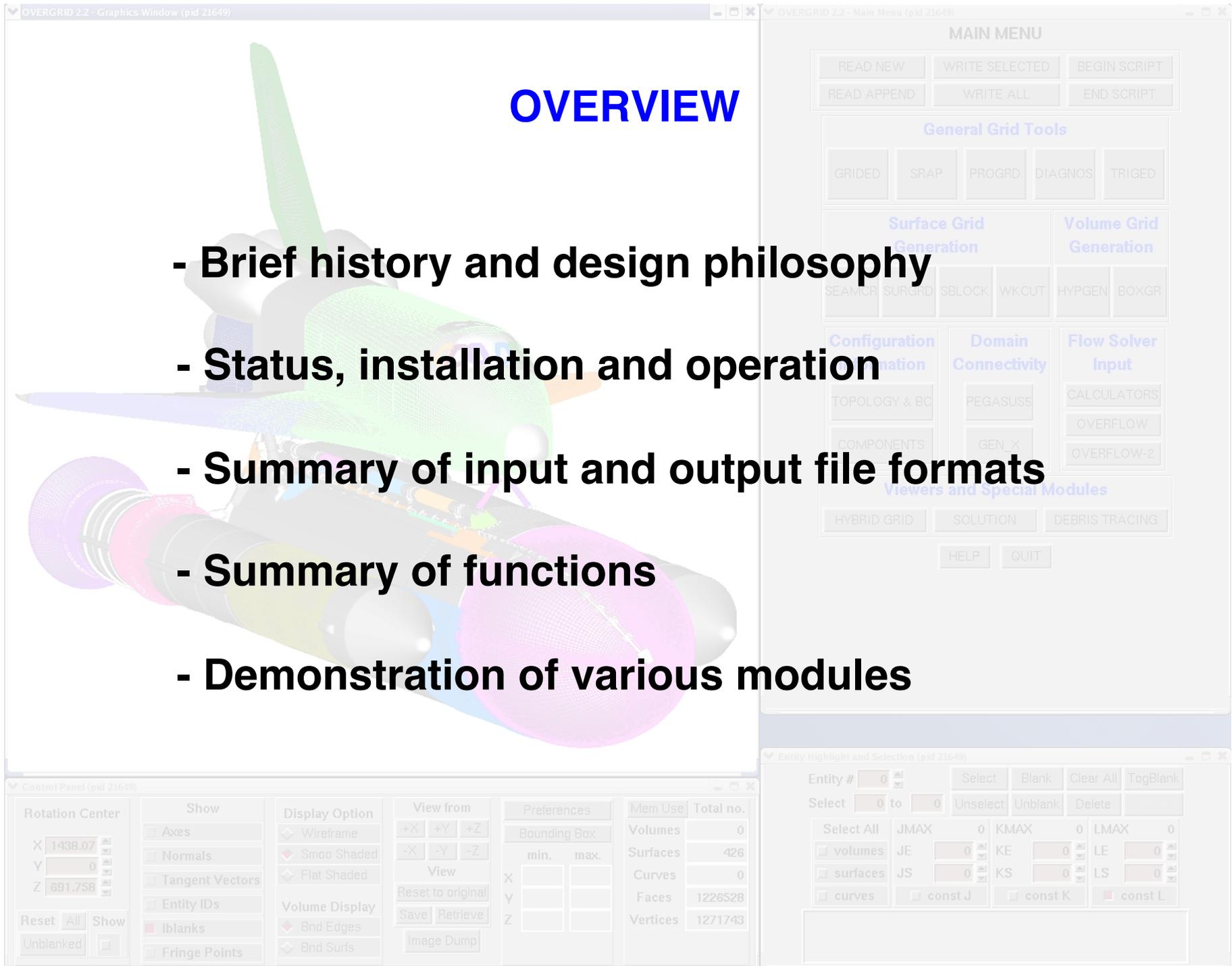
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**Applied Modeling and Simulation Branch
NAS Division**

AMS Seminar Series, May 13, 2014

OVERVIEW

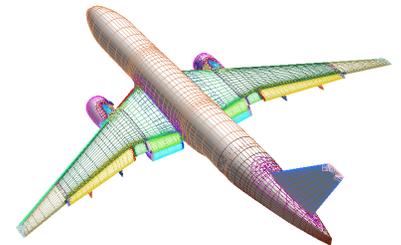
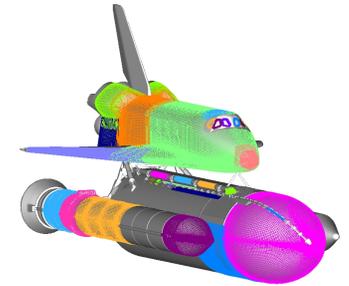
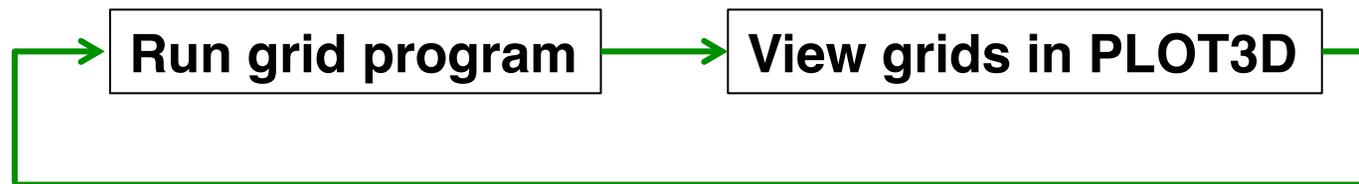
- Brief history and design philosophy
- Status, installation and operation
- Summary of input and output file formats
- Summary of functions
- Demonstration of various modules



BRIEF HISTORY

Early 1990s

- Lack of GUI-based grid tool for overset grid generation
- About a dozen independent grid utilities
- Typical process:

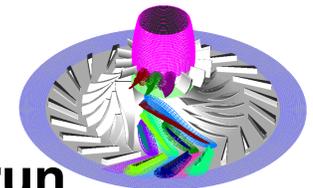


Around 1997

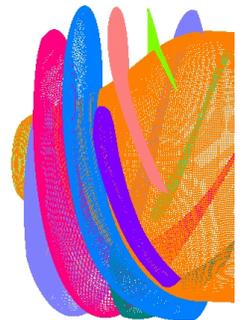
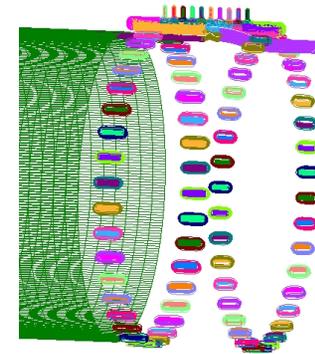
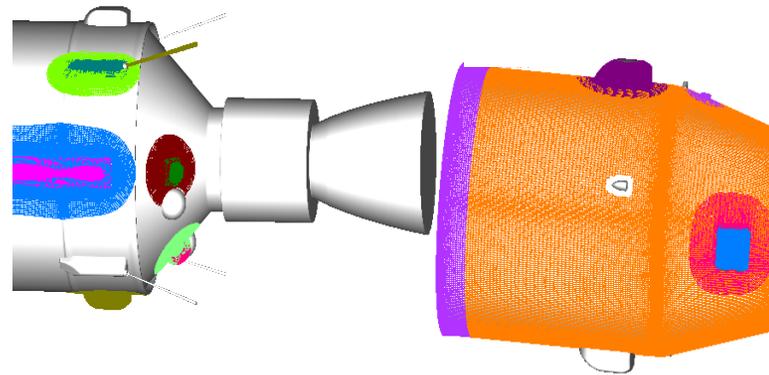
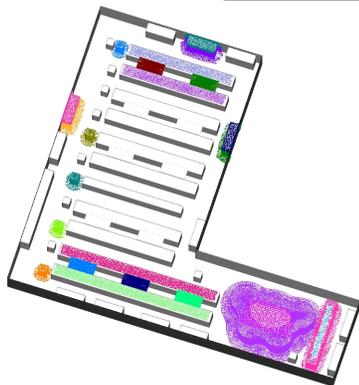
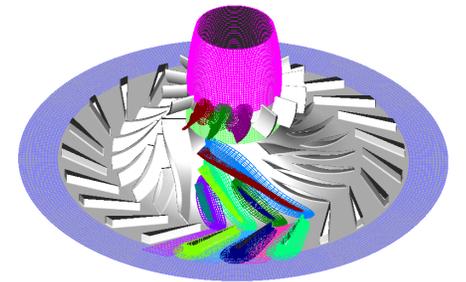
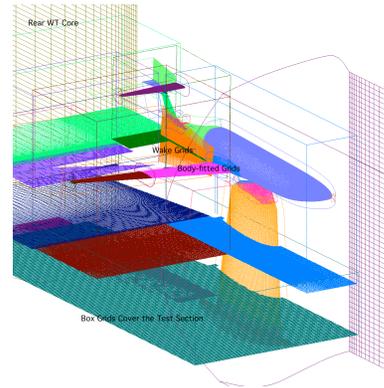
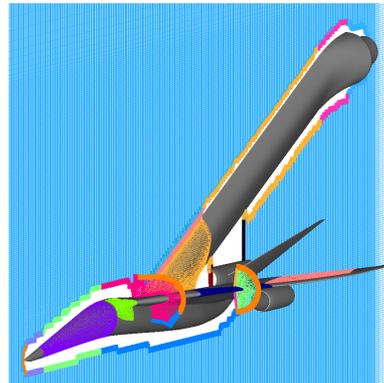
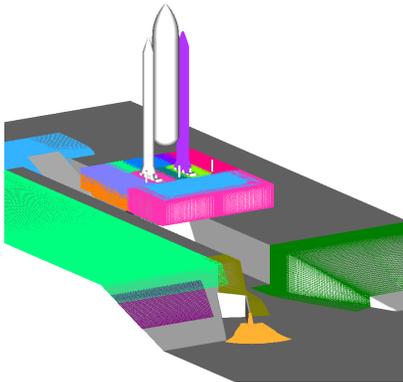
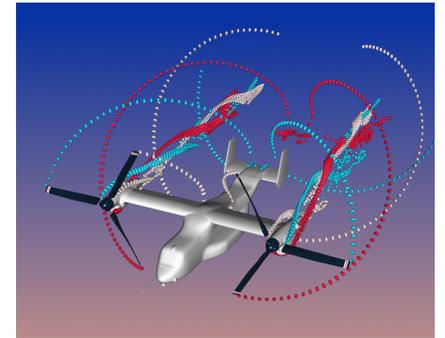
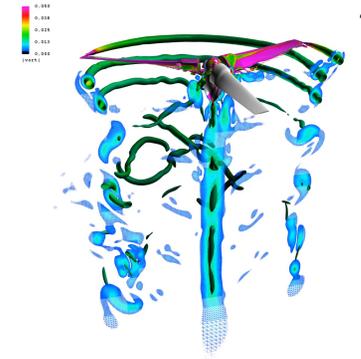
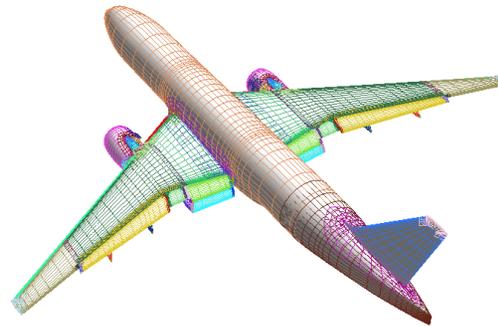
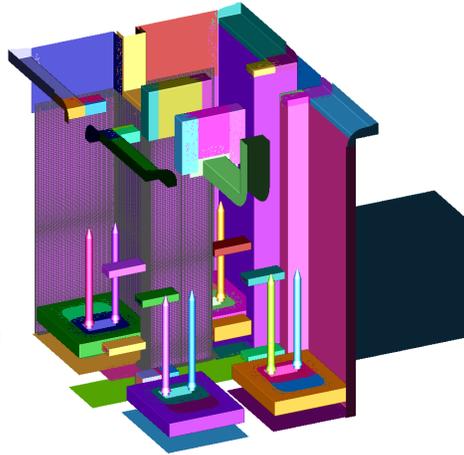
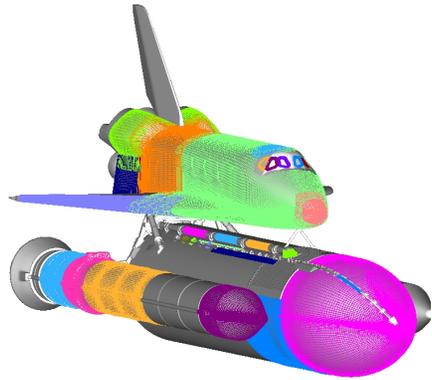
- DoD High Performance Computing Modernization Program CHSSI CFD-4 Project began funding development of OVERGRID
- Initial objectives
 - Access grid editing utilities, hyperbolic surface and volume grid generation tools, and view grids in one interface

Late 1990's – present

- Perform most pre-processing tasks prior to flow solver run
- Perform basic flow visualization



SAMPLE APPLICATIONS



DESIGN PHILOSOPHY

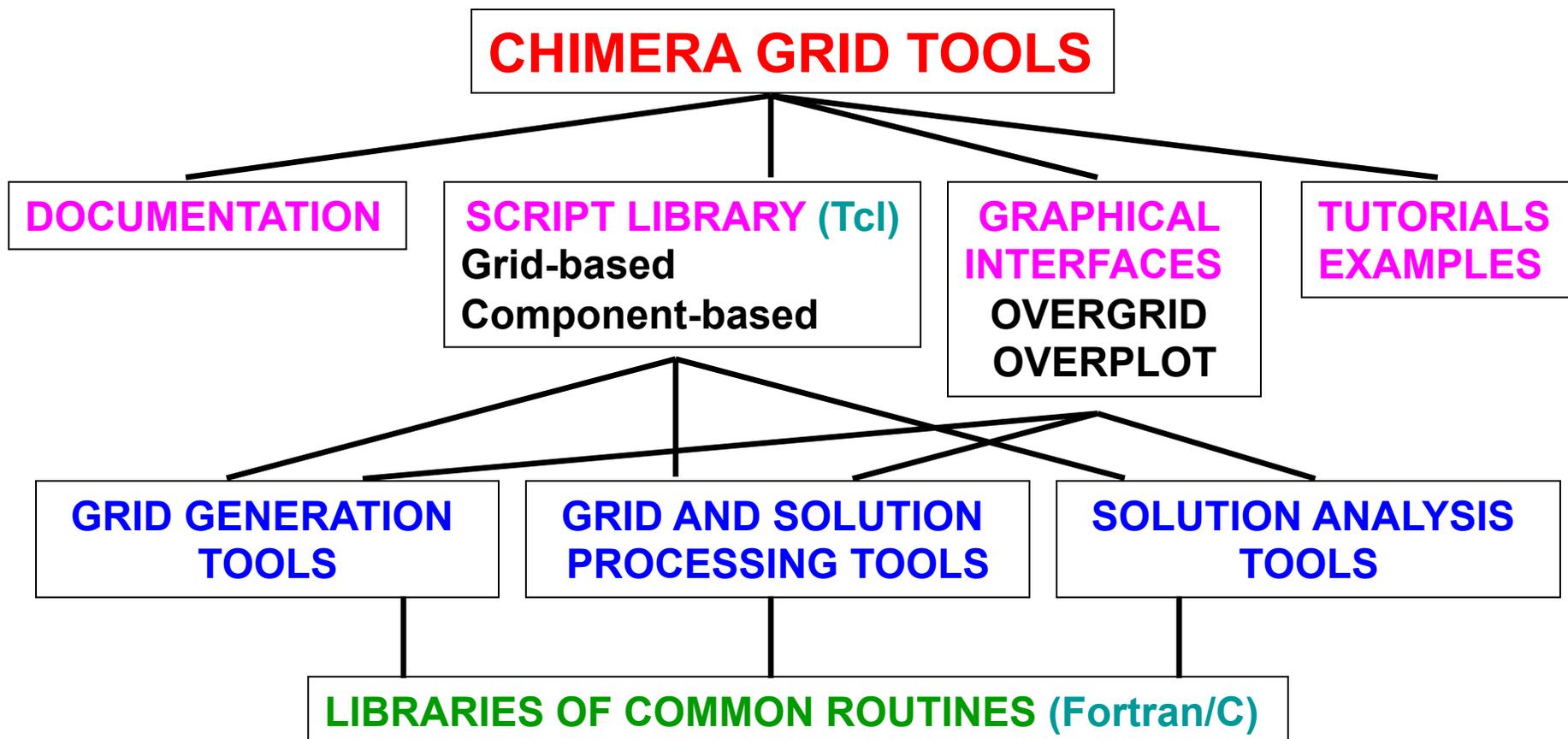
“ Be able to visualize geometry, grids, solutions; and perform pre- and post-processing tasks with the minimal number of mouse clicks and user inputs”

- **Auto file attributes detection**
- **Default viewing surfaces and colors**
- **Developers are also intense users with deep understanding of entire CFD analysis process**
- **Improvements driven by users as well as developers**
 - **bug reports**
 - **features suggestions**
- **Develop features that make life easier for the user (not necessarily easier for the developers)**

CHIMERA GRID TOOLS MODULES HIERARCHY

Authors: W. M. Chan, S. E. Rogers, S. A. Pandya, D. L. Kao,
S. M. Nash, P. G. Buning, R. L. Meakin, D. A. Boger

Software tool set for pre-processing, and post-processing of overset
grid computations



CURRENT STATUS

Last official release

- CGT 2.1, OVERGRID 2.3, April, 2010
- Availability: U.S. citizens/permanent residents working for U.S. government, industry, academia within the U.S.
- Software Usage Agreement
- Webpage:
<http://www.nas.nasa.gov/~wchan/cgt/doc/man.html>
- Supported platforms: Linux, Unix, Mac-OS-X
- Executables available for Windows-XP (unsupported)

Latest unofficial intermediate release

- OVERGRID 2.3s, April, 2014
- For internal use only

INSTALLATION AND OPERATION

Requirements

- Fortran compiler (ifort, pgf90, gfortran 4.4+)
- C compiler (gcc, icc, pgcc)
- Tcl/Tk 8.5.8 or earlier (CGT version 2.1)
 - 8.6.1 or earlier (latest internal version)**
- Best to download source from SourceForge and install yourself (Linux and Mac)
(`untar -> cd unix dir ->configure -> make`)
- OpenGL and X11 libraries

Operation

Command line prompt >

- `overgrid` (bring up file browser)
- `overgrid filenames` (display grids from files)
- `overgrid -2 filenames` (send display to screen 2)
- `overgrid -dp filenames` (force dp mode for formatted files)

SUMMARY OF INPUT AND OUTPUT FILE FORMATS

Input File Formats

Native CAD via CAPRI - Pro-E, OpenCASCADE, Catia V5, Parasolid, SolidWorks, UniGraphics (.prt, .asm, .sldprt, etc.)

Common exchange formats via CAPRI – **STEP** (.step, .stp, .STEP, .STP)

Unstructured surface triangulations

- **CART3D TRI** (.tri, .triq), **FAST** (.fst),
CART3D TRIX, **UCD** (.ucd), **STL** (.stl, .STL)

Structured grids/solutions - **PLOT3D** (grid, solution, **function**)
OVERFLOW (solution)

Domain connectivity files - **X-rays**

Donor stencils (INTOUT, XINTOUT)

Strand and Cartesian grids - (.sac)

Output File Formats

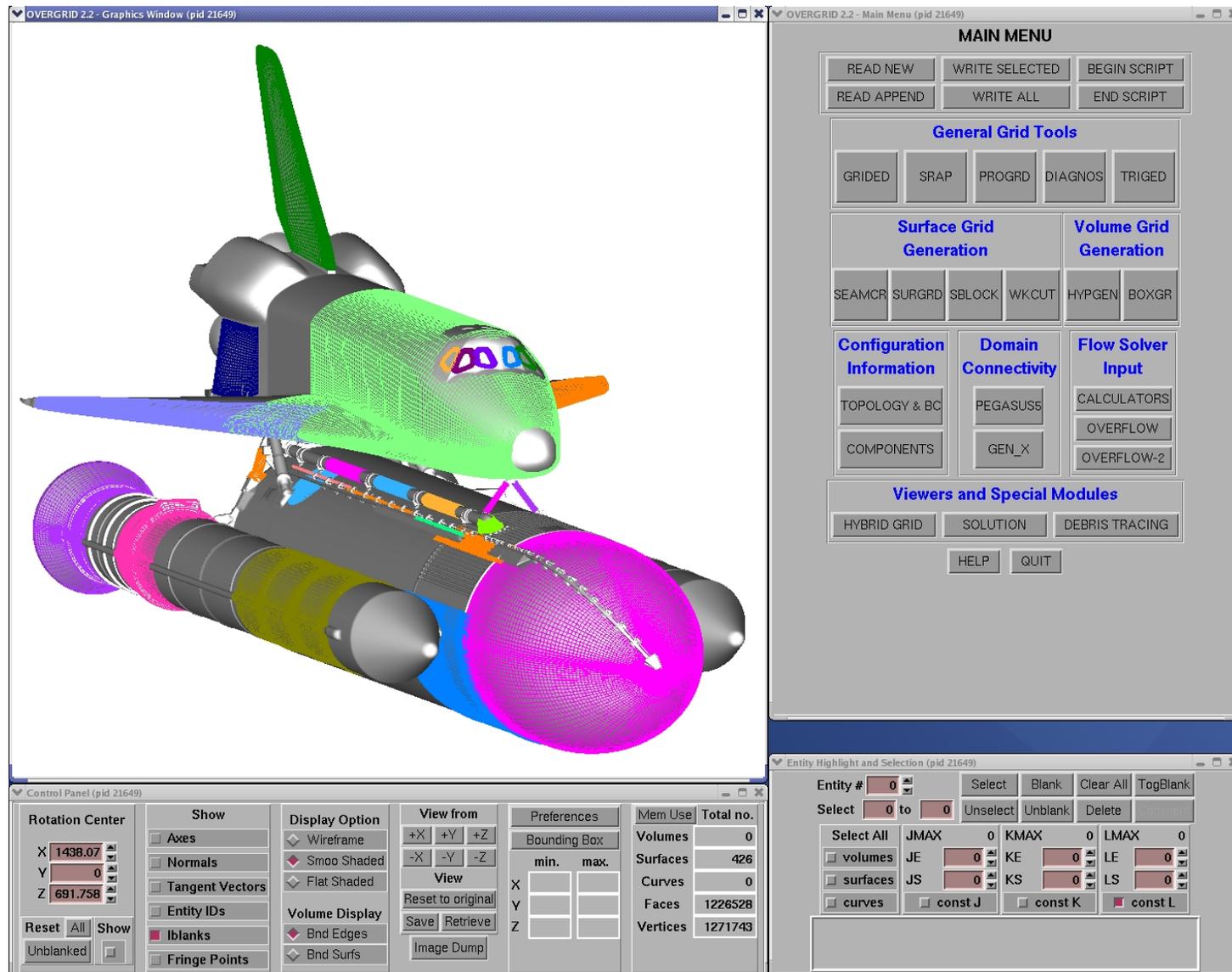
Structured grids – **PLOT3D**

Unstructured surface triangulations – **CART3D** (.tri)

SUMMARY OF FUNCTIONS

- **Visualization and processing of geometry and grids (overset structured grids, unstructured surface triangulations)**
- **Grid generation (hyperbolic, algebraic, Cartesian)**
- **Hole-cutting pre-processing (X-rays generation)**
- **Grid quality and domain connectivity diagnostics**
- **Flow solution input preparation (boundary conditions, numerical methods, freestream conditions, prescribed and 6-DOF dynamics)**
- **Flow solution visualization**
- **Prescribed and 6-DOF dynamics animation**
- **Debris trajectory inputs preparation**
- **Strand grid visualization**

OVERGRID GUI DEMO



*** OVERGRID tutorial available as part of CGT release ***