



**KTA 2-27 annual meeting  
automatic grid generator for IMPNS**

Nicolas Hamel  
Richard Lestage

Precision Weapons Section, DRDC Valcartier  
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## Outline

- Work plan update
- Elliptical LaRC body wing tail grid
- Gridgen “Automatic” grid generation for IMPNS
  - *Missile AutoGrid* version 0.2
  - What final version should include
- Plan for the next 12 months



## Work plan to meet KTA 2-27 objectives

Milestone	Completion Date	Status
IMPNS integration with JPPF	Dec 2008	Completed
LaRC Elliptic missile configuration Body-alone -Mesh (Completed) -Run (Completed) -Analysis (to be put in format and include in the report)	March 2008	90 %
LaRC Elliptic missile configuration Body-wing-tail	March 2009	Meshing problem
LaRC Tandem Control missile -Automatic grid generator (version 0.2) -Run -Analysis	September 2010	20 %
Final report	May 2011	15 %



## Grid generation

- Limitation with elliptical LaRC body wing tail configuration
  - Tail region semi-automatic grid generation failed
  - Interaction between wing trailing edge and tail leading edge
- The solution retained was to mesh the geometry interactively.
  - More than 30 hours spent on a mesh
    - This does not align with the KTA objective



## Gridgen “Automatic” grid generation for IMPNS

- Gridgen is the grid generator used at DRDC Valcartier
- The *Glyph* scripting option was used to automate the grid generation
  - TCL language
  - GUI was created, needs update
  - Manipulate input output file



## Requirements

- Create an O-Mesh compatible with IMPNS
  - Optional compatible with Fluent
- Mesh automatically the reference missile
  - LaRC Tandem Control missile
- Geometry input similar to missile DATCOM
- Can be sent in batch
  - Editable ASCII input file



# Missile AutoGrid Glyph GUI

## Version 0.2

**General parameters**

Input parameters:

Overall dimensions: lbody: 39.0005 dbody: 2.6

Domain shape parameters: Domain type: Cone #d\_domain\_base: 60

Grid parameters: #grid pts/d: 20 Leading edge pt density factor: 10 Interblock gap: .0005  Mesh only first section

Display parameters: Body display: Hidden Cross sections display: Hidden Domain display: Hidden Display sections: 4  Enable animations

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**Geometry parameters**

Use finset 1     Use finset 2     Use finset 3     Use finset 4

Nose style:	Finset 1 style:	Finset 2 style:	Finset 3 style:	Finset 4 style:	Base parameters:
Conical	Sharp-edges	Sharp-edges	Sharp-edges	Sharp-edges	Base diameter: 2.6
Inose: 7.8	x_hinge_line: 9.8	x_hinge_line: 37.2	x_hinge_line: 37.2	x_hinge_line: 37.2	Diameter loc: 39
<input type="text" value="0"/>	Alpha list: 0 0 0 0	Alpha list: 0 25 0 -25	Alpha list: 15 15 15 15	Alpha list: 15 15 15 15	
<input type="text" value="0"/>	Phi_offset: 0	Phi_offset: 0	Phi_offset: 0	Phi_offset: 0	
<input type="text" value="0"/>	nFins: 4	nFins: 4	nFins: 4	nFins: 4	
<input type="text" value="0"/>	Dim_a: .572	Dim_a: .572	Dim_a: .572	Dim_a: .572	
	Dim_b: 1.228	Dim_b: 1.228	Dim_b: 1.228	Dim_b: 1.228	
	Dim_c: 1.268	Dim_c: 1.268	Dim_c: 1.268	Dim_c: 1.268	
	Dim_d: .532	Dim_d: .532	Dim_d: .532	Dim_d: .532	
	Thickness: .150	Thickness: .150	Thickness: .150	Thickness: .150	
	Dim_e: 2.249	Dim_e: 2.249	Dim_e: 2.249	Dim_e: 2.249	
	Dim_f: 1.356	Dim_f: 1.356	Dim_f: 1.356	Dim_f: 1.356	
	Dim_g: 3.41	Dim_g: 3.41	Dim_g: 3.41	Dim_g: 3.41	
	Dim_h: 2.878	Dim_h: 2.878	Dim_h: 2.878	Dim_h: 2.878	

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**Output parameters**

Auto-export PLOT3D IMPNS compatible gridfile (\*.grd)     Auto-export Gridgen file (\*.gg)

Export location:  Z:/prive/Glyphs/MissileAutoGrid Release



## Text file input

- Editable with Notepad
- Compatible with Apache Velocity Template Engine
- Useful to launch grid generation in batch mode
- Not self explained

A screenshot of the Notepad++ application window. The title bar reads "Notepad++ - E:\Beta versions\Output.txt". The menu bar includes "File", "Edit", "Search", "View", "Format", "Language", "Settings", "Macro", "Run", and "TextFX". The toolbar contains various icons for file operations and editing. The main text area shows a list of 32 lines, each with a line number on the left and a text string on the right. The strings are: 1 txtlnoseCRIF, 2 7.8CRIF, 3 txtlbodyCRIF, 4 39CRIF, 5 txttbodyCRIF, 6 2.6CRIF, 7 txtdomainparam1CRIF, 8 60CRIF, 9 txtdomainparam2CRIF, 10 2CRIF, 11 txtdomainparam3CRIF, 12 0CRIF, 13 txtnoseparam1CRIF, 14 0CRIF, 15 txtnoseparam2CRIF, 16 0CRIF, 17 txtnoseparam3CRIF, 18 0CRIF, 19 txtnoseparam4CRIF, 20 0CRIF, 21 txtfsparam(1.1)CRIF, 22 9.8CRIF, 23 txtfsparam(1.2)CRIF, 24 15CRIF, 25 15CRIF, 26 15CRIF, 27 15CRIF, 28 txtfsparam(1.3)CRIF, 29 0CRIF, 30 txtfsparam(1.4)CRIF, 31 4CRIF, 32 txtfsparam(1.5)CRIF. The status bar at the bottom shows "nb char : Ln : 1 Col : 1 Sel : 0" and "Dos\Windows ANSI INS".



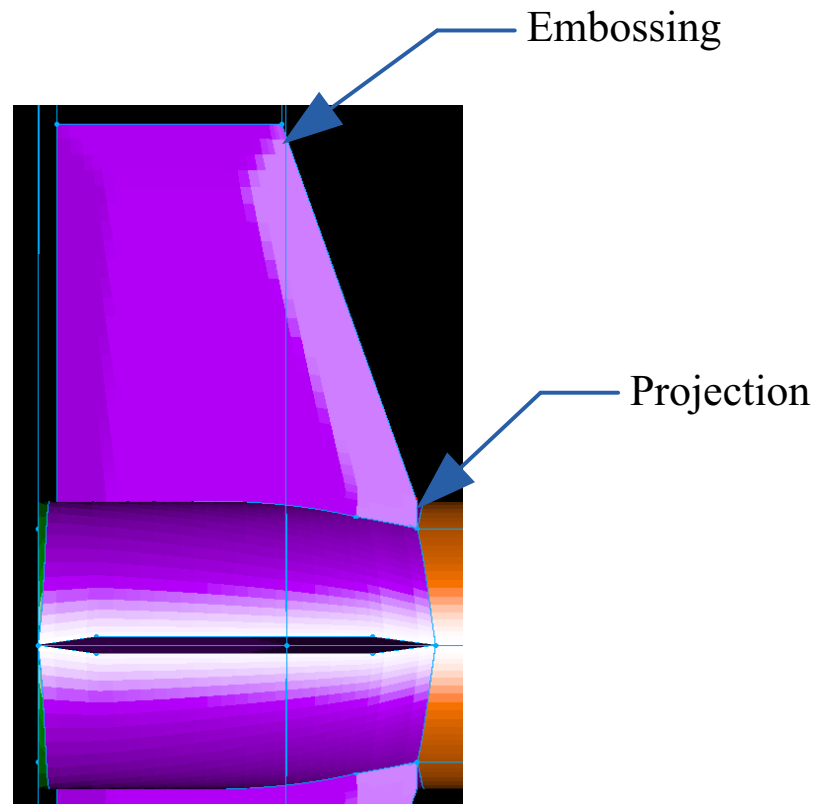


## Some limitations

- Nose style Combobox
  - Determine which nose style to apply to the missile. Currently, only cone and tangent-ogive are implemented.
- Finset
  - Symmetrical planar finset only
  - Phi offset not currently implemented
  - Fins must be physically in contact with the body, the code fills the empty space between the fin base and the body when at angle
  - Embossed wing surface



# Finset Embossing and projection





## Future developments

- Key word, integers and floating point's inputs check
  - Errors handling
- Speed optimization
- More geometries configurations
  - Nose (Haack, power, Karman)
  - Body (Option 2)
  - Fin (asymmetrical, phi offset... )
  - Intake ???
- Directly output IMPNS .grid file



## Plan for the next 12 month

- Complete the LaRC Tandem Control missile calculation
- Continue the development of the *Missile AutoGrid* Glyph
- Include *Missile AutoGrid* in JPPF
- Complete the report