

Report on TFAWS 2001

12th Thermal and Fluids Analysis Workshop
NASA Marshall Space Flight Center / Univ. of Alabama
Huntsville, AL, USA, September 10-14, 2001
<http://tfaws01.msfc.nasa.gov>
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Format

- 5 days - 196 registered attendees
- 13 half-day Paper Sessions (mostly 2 tracks in parallel)
 - Spacecraft and Vehicle Fluid Systems Design, Analysis and Test
 - Spacecraft and Vehicle Thermal Systems Design, Analysis and Test
 - Interdisciplinary Analysis and Integration
 - Propulsion and Launch Vehicle Thermal Systems Design, Analysis and Test
- 4 Keynote addresses
- Product Overview Lectures / Short Courses
- Hands-On Computer Classes
 - 4 classrooms equipped with 40 PCs or SGI workstations each

POLs, Short & Hands-On Courses

- CFD Tools
 - CFDRC: CFD-Fastran, CFD-ACE+, CFD-GEOM, CFD-VIEW, MDICE
 - NASA: Corsair, Gridgen
 - ???: FIELDVIEW
- Spacecraft / instrument thermal control and thermo-hydraulics
 - Cullimore & Ring: Thermal Desktop/RadCAD, FloCAD, SINDA/FLUINT
 - Harvard Thermal: Thermal Analysis System (TAS)
 - Maya / SDRC: I-DEAS/TMG and FEMAP/TMG
 - NASA-MSFC: Generalized Fluid System Simulation Program (GFSSP)
 - Network Analysis: SINDA/G, SINDA/ATM (FEMAP), THERMICA
 - Space Design: TSS, SINDA/FLUINT 3.0

Papers

- “Usual” mix of overviews, case studies, specialist subjects
- Highlights (personal selection)
 - Inovative application of optical fiber to measure (radiation) temperature
 - ThermPlot Excel-based postprocessor for SINDA and ESATAN
Freeware by Swales (Hume Peabody)
- Good response to ESA Thermal Model Data Exchange using Open Standards “evangelist” paper
 - Maya will start STEP-TAS interface implementation in TMG
 - MSC/Patran now has a beta-version STEP-TAS interface

General Trends - Tools

- Increase in interest for thermal control and CFD
 - Large programs: NASA's 2nd Gen Reusable Launch Vehicle (RLV)
- Back to basics: improvements of basic algorithms
 - new sparse matrix solvers
 - enhancements for ray-tracing
- Connect to CAD and structural FEA
 - increase scalability of tools for very large models
- Engineering analysis process integration / speed-up
 - multi-disciplinary and multi-physics analysis
 - concurrent engineering
 - computer aided workflow & configuration control

Specific tool developments

- Use of Conjugate Gradient sparse matrix solvers
 - SINDA/G and TMG claim significant solve speed increase
- Advanced oct-cell algorithm in TSS to speed up ray-tracing
 - For large models (several thousand surfaces) need to go to 12 levels deep
- Thermal Desktop focus on “CAD-like” GUI modelling
 - Some users like this: model building speed, quick results
 - Other users dislike it: difficult to know/verify/control/rerun model
- MS-Office (Excel, Visio) toolkit for SINDA/G
- FEMAP/TMG sister product to I-DEAS/TMG

Conclusions

- Well organised, very practical workshop
- Very interesting detailed hands-on courses
 - At beginner, routine, advanced user levels
- Open atmosphere - even between competing tool developers
- Renewed interest in thermal control and CFD
- Trend: integration of thermal analysis into engineering process
 - Ingest CAD / FEA models
 - Analysis with large set of surfaces
- Renewed activity in thermal tools development

Intro to ThermPlot

- Tool developed by Hume Peabody of Swales Aerospace, USA
- Used successfully on METOP Phase C/D analysis
 - Swales is responsible for the US instruments on METOP
- Freeware - download from www.swales.com after registration
- Can read files from standard output routines of SINDA/G, SINDA/FLUINT, ESATAN
- ESATAN interface can be considered a beta release
 - No formal validation performed (yet)
- Need to use quite high spec PC: 128+MB RAM, 500+MHz