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
Hans-Peter.de.Koning@esa.int

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)
  - Innovative 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 scaleability 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