The Airflow Update®

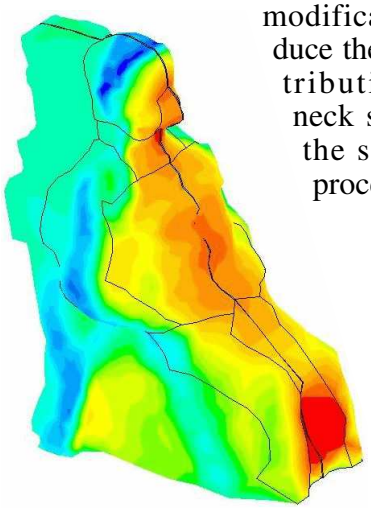
AIRFLOW SCIENCES CORPORATION

Fall 2003

CFD Modeling of Fighter Helmet

Airflow Sciences recently was contracted to perform a Computational Fluid Dynamics (CFD) study of the flow around a fighter pilot during a high speed (700 m.p.h.) ejection. During this event, the pilot is subjected to extreme forces both from the rocket propelled ejection seat as well as the sudden blast of freestream air as he/she exits the protected cockpit area. This study focused on the lift and drag forces on the head and helmet that directly affect the stress on the pilot's neck. The geometry of the pilot, flight gear, and ejection seat was quite complicated by necessity. ASC utilized 3-D scanning equipment on a fully geared mannequin to build an accurate model for the CFD study. A flow model was then built around the pilot and the appropriate free stream velocity conditions were applied. The analysis revealed the forces on various parts of the helmet giving our client valuable insights for future helmet design. Additional investigations could include design modifications to reduce the forces contributing to pilot neck strain during the seat ejection process.

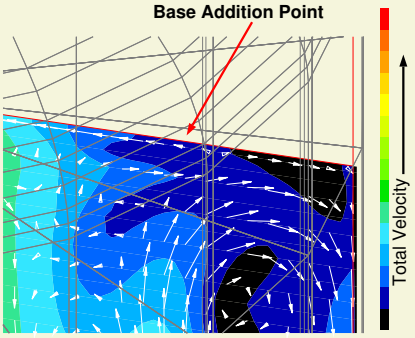
Fighter Pilot Setup for Physical Testing



Pressure Contours on the Pilot

CFD Evaluates Mixing Systems

The May 1 issue of Genetic Engineering News magazine included a BioProcess Tutorial co-authored by ASC's **Andrew Banka, P.E.** and **James Paul, P.E.** The topic of the article is the use of CFD simulations to evaluate and improve the mixing within biotech reactors. Base tracking tests are used for full-scale validation of the simulation results, which raises an important numerical accuracy issue. To request a copy, please contact Andy at *abanka@airflowsciences.com*



From the Editor

*Continuing his quest for world domination, Technical Director **Andrew Banka, P.E.** has recently become a co-owner of Airflow Sciences Corporation, joining **Bob Nelson** and **Rob Mudry, P.E.** Way to go, Andy!*

*Congratulations are also extended to **Dr. Paul Harris**, an Arizona boy who recently married a Maine girl; both are now living in Michigan. We wish you health and prosperity, Paul and Jennifer.*

*The baby boom at Airflow continues yet again with Theresa being welcomed into this world by proud dad **Bruce Devlin**. (You know, there are easier ways to get your name included in this section!)*

If you have any flow, heat transfer, mixing, combustion, or mass transfer issues you're dealing with, feel free to give us a call at (734) 525-0300.

Edited by Kevin Linfield, P.E.

3D Probe Data Acquisition System

Airflow Sciences Corporation has recently developed a data acquisition system and software tailored to performing duct and stack volumetric flow measurements according to EPA Method 2F. The heart of the 3D-DAS™ system is a rugged, industrial computer and a 16 channel, 16-bit data acquisition board. A touch screen and wireless remote transmitter interface simplifies testing procedures.

The 3DDAS™ uses our 3DPROBE™ program to more accurately and efficiently perform 3D duct velocity traverses. The program includes complete test configuration information, data recording and reduction, report generation, and error checking. 3DPROBE™ is fully compliant with EPA Methods 2, 2F, 2G, and 2H.

Uses

- Stack/RATA testing
- Fan outlet ducts
- Mill inlet ducts
- General ductwork/piping
- Fully compliant with: EPA Method 2, 2F, 2G and 2H.

Features

- Industrial NEMA 4/12 rated computer
- High accuracy (0.25%) pressure transducers
- Operation range: 40°F to 130°F ambient
- 30 minute on-board battery backup

Options/Accessories

- Atmospheric pressure transducer
- Low range pressure transducer set
- Cold weather operation
- Heavy duty 3D probe tube bundle
- Purge pump
- 3DDAS™ inclinometer
- Yaw angle laser pointer & protractor

ASC's 3DDAS™ Unit

3DDAS™ in Action

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Airflow Events

We've participated in seven conferences since our last newsletter.

We hope to see you at future trade shows including:

- AACC (Oct 1, Portland, OR)
- EPRI SCR Workshop (Nov 18-20, Indianapolis, IN)
- Power-Gen 2003 (Dec 9-11, Las Vegas, NV)
- NOx Round Table & Expo (Jan 26-27, Akron OH)
- **Your Office**: Looking to host a seminar on modeling, fluid flows, or heat transfer?

We make house calls!

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