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## National Personal Protective Technology Laboratory

# Computational Fluid Dynamics of Facepiece Leakage

Holiday Inn Select, Pittsburgh South  
Pittsburgh, PA

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# CBRN Respirator Standards

The findings and conclusions in this presentation have not been formally disseminated by the National Institute for Occupational Safety and Health and should not be construed to represent any agency determination or policy.

# Background

- **Objectives**

- To develop a computational fluid dynamics (CFD) simulation of the outward leakage of oxygen around the facepiece of a closed circuit breathing device .
- To experimentally validate the simulation

- **Partners**

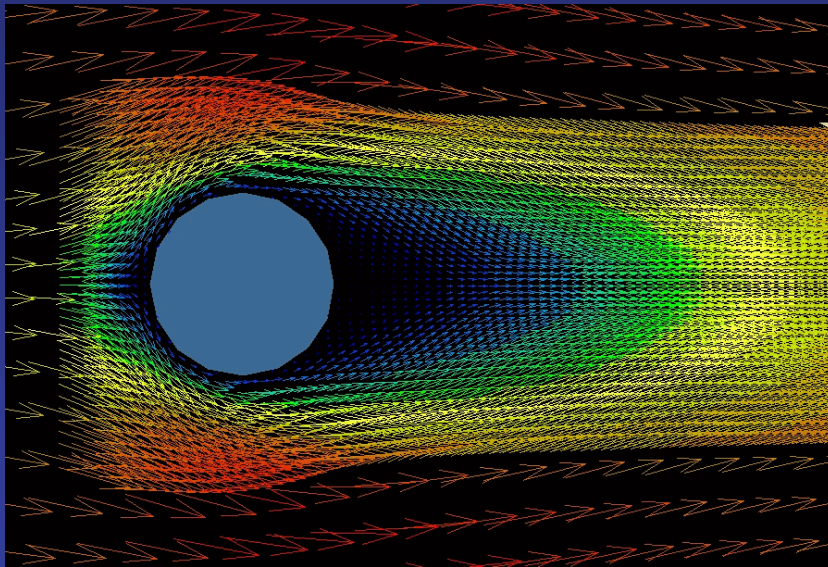
- NIST Buildings and Fire Research Laboratory



- **Timeline**

- Completed before start of FY06

# Computational Fluid Dynamics (CFD)

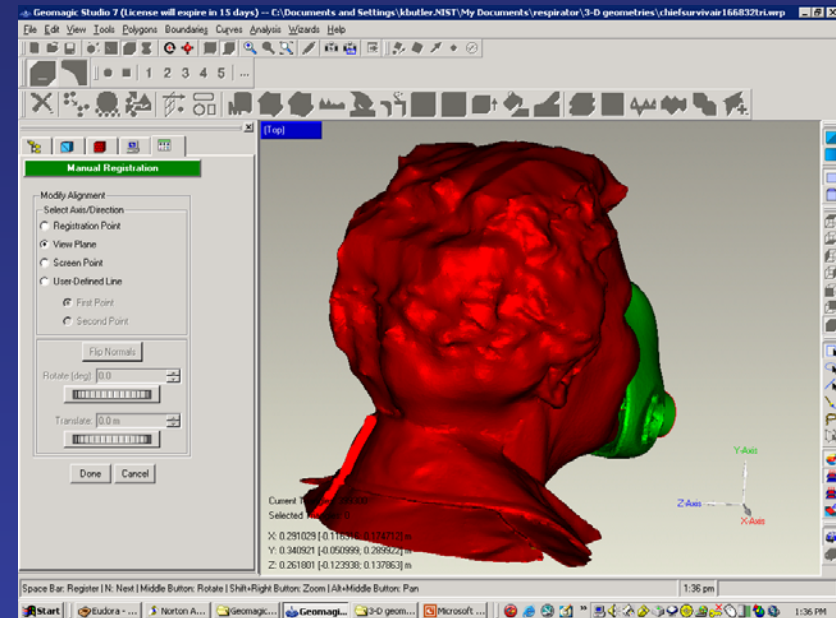
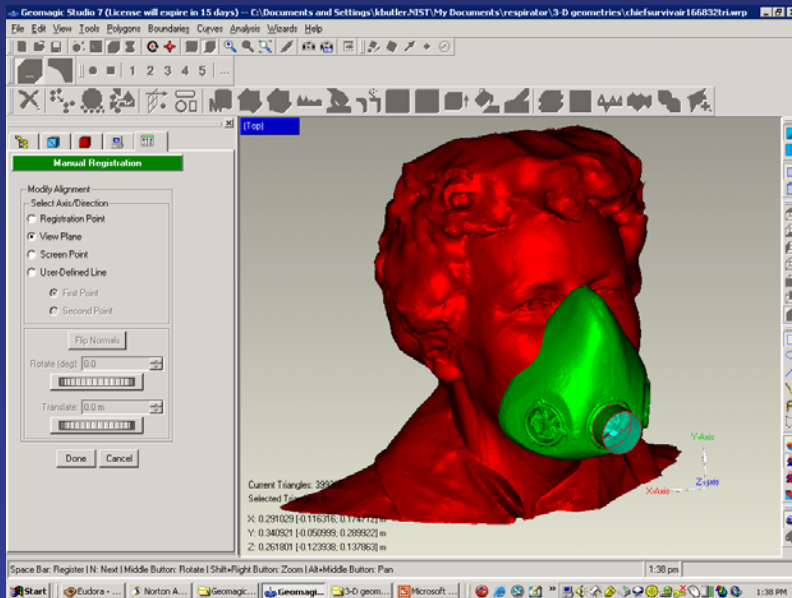


- Computational fluid dynamics (CFD) is the use of computers to analyze problems in fluid flow
- CFD is a means of visualizing and providing enhanced understanding of the resulting solution.
- Modeling and simulations mean nothing, of course, independent of the reality they are supposed to represent. The accuracy of the simulation must be checked, or validated, against experiment

# Protocol

- Actual heads and masks will be scanned into a 3D data set for entry into the CFD software, providing a physical boundary for the problem to be solved.
- Leak geometries representing an imperfect seal will be defined.
- Oxygen concentration fields and flow streamlines will be computed for multiple leak geometries and for both normal and high stress breathing patterns.
- Model results will be compared to planned experimental work.

# Geometrical Modeling



# Quality Partnerships Enhance Worker Safety & Health

Thank you !

