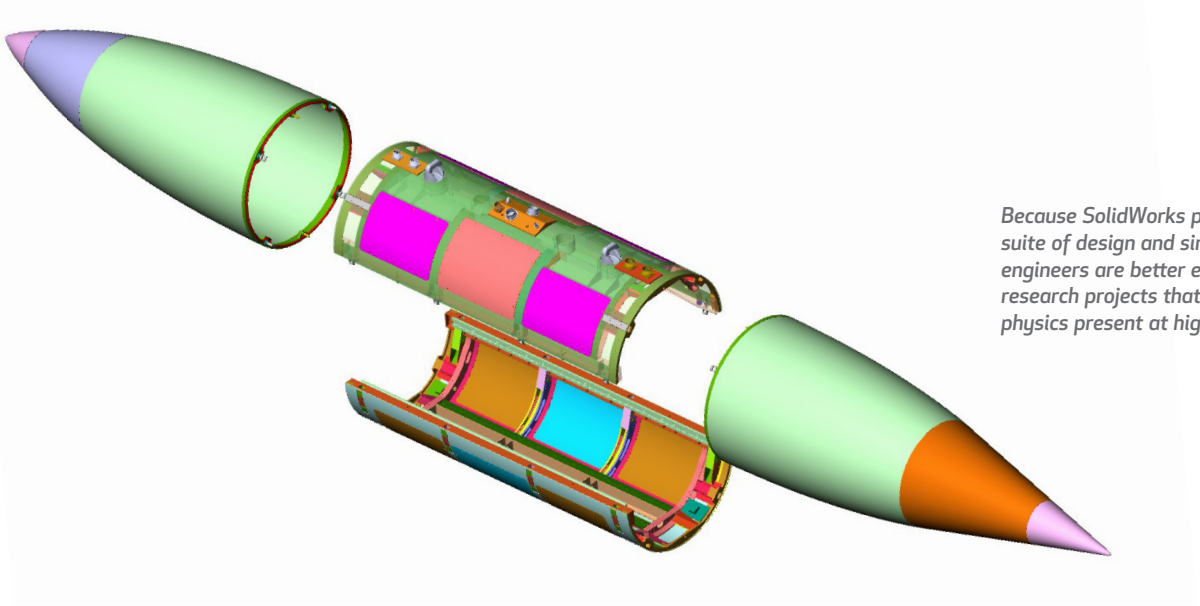
NATIONAL CENTER FOR ATMOSPHERIC RESEARCH

Advancing human understanding of the Earth's atmosphere with SolidWorks



Because SolidWorks provides a complete suite of design and simulation tools, NCAR engineers are better equipped to support research projects that involve the complex physics present at high atmospheric altitudes.

Scientists can learn much about our world by investigating the atmospheric barrier between Earth and space. How fast is the ozone layer deteriorating, and how can we stop it? What are the pollutants in the upper atmosphere, and how do they impact our environment? What's happening with climate change, and can anyone truly predict the weather—especially the formation of dangerous storms like hurricanes?

The National Center for Atmospheric Research (NCAR) was established half a century ago to help scientists find the answers to questions like these by supporting atmospheric research. Operated under the auspices of the University Corporation for Atmospheric Research, a nonprofit organization of more than 70 universities, and funded by the National Science Foundation, NCAR works closely with university scientists in developing atmospheric experiments. Research topics include atmospheric chemistry, climate, cloud physics and storms, weather hazards to aviation, and interactions between the Sun and Earth.

NCAR engineers used AutoCAD® 2D design tools until 1997, when the organization determined that a 3D design platform would make its operations more efficient and effective, according to Steve Rauenbuehler, mechanical engineer in the Design and Fabrication Services Group at NCAR's Earth Observing Laboratory.

"We immediately perceived the value of 3D and convinced management that moving to 3D would enable us to better serve the atmospheric and geoscience research community," Rauenbuehler recalls. "We were looking at Pro/ENGINEER® and Mechanical Desktop® CAD software when a representative of MCAD Technologies, who had come in to show our machinist a CAM package, introduced us to SolidWorks® design software. After that evaluation, we decided to jump into SolidWorks with both feet."

NCAR chose SolidWorks because it is easy to use and provides access to integrated simulation tools, such as SolidWorks Flow Simulation computational fluid dynamics (CFD) software. Since implementing 15 licenses of SolidWorks CAD software, the research group has added SolidWorks Flow Simulation software to simulate the physics involved in high-altitude experiments.

Challenge:

Satisfy the diverse experiment design and support needs of the US atmospheric and Earth science research community in a responsive, cost-effective manner.

Solution:

Implement SolidWorks 3D design and SolidWorks Flow Simulation computational fluid dynamics (CFD) analysis software.

Results:

- Shortened design and machining cycles
- Reduced prototyping requirements
- Improved design communications with researchers
- Supported advanced research into hurricane formation

SOLIDWORKS

"I use SolidWorks for eight hours a day, five days a week," Rauenbuehler says. "The software has proven to be the right choice for a variety of experiment design projects."

Packaging high-altitude instruments

NCAR uses SolidWorks solutions to create the packaging that scientists require to launch their experiments in NCAR aircraft, which range from a balloon gondola to a C130 military aircraft to a converted Gulfstream G5 for high-altitude work. Using SolidWorks software, the research organization has compressed the time required to develop and machine instrument packages.

"Essentially, our work involves repackaging something to ride on one of our airplanes," Rauenbuehler explains. "A researcher will have an instrument that needs to take samples or readings at different altitudes. While the scientists are very focused on the research, we need to concentrate on time and budget limitations. SolidWorks enables us to provide excellent support to the scientific community while saving time and money. Much of what we do would be impossible or impractical without SolidWorks."

Simulating the in-flight environment

NCAR uses SolidWorks Flow Simulation software to simulate design performance during flight, including structures that ride outside the aircraft. For example, on the Giant Nuclei Importer, a long tube sticks out of the side of the aircraft to collect particulate matter in the upper atmosphere. NCAR designers had to ensure that the design could withstand the air flow along the side of the plane.

"We were able to do some analysis in SolidWorks Flow Simulation software to understand how we needed to modify the aerodynamic shape of the plane's exterior," notes Designer Karl Schwenz. "Combined with SolidWorks visualization capabilities, simulation allows us to reduce prototype requirements and communicate more effectively with scientists, because we can literally show them how the design will function without having to build it."

Hurricane diving with the Global Hawk

Perhaps one of NCAR's most important contributions to atmospheric research is the dropsonde, a weather reconnaissance device. Hurricane hunters have used dropsondes—which contain a global positioning satellite (GPS) receiver and pressure, temperature, and humidity sensors—to increase human knowledge regarding hurricane formation. Now NCAR is using SolidWorks to develop specialized dropsondes for use in the National Aeronautics and Space Administration's (NASA's) Global Hawk, a remotely operated jet that the US Air Force uses to perform high-altitude, long-endurance reconnaissance and intelligence missions.

"There are real challenges getting everything to fit within the Global Hawk's small space requirements," notes Aerospace Engineer Cynthia Bradley. "It's like building a ship in a bottle, and SolidWorks has proven to be real handy for designing a system that functions within a tight clearance envelope."

"SOLIDWORKS ENABLES US TO PROVIDE EXCELLENT SUPPORT TO THE SCIENTIFIC COMMUNITY WHILE SAVING TIME AND MONEY. MUCH OF WHAT WE DO WOULD BE IMPOSSIBLE OR IMPRACTICAL WITHOUT SOLIDWORKS."

Steve Rauenbuehler
Mechanical Engineer

SolidWorks solutions help NCAR engineers overcome the physical challenges and space limitations of atmospheric research.

NCAR
NATIONAL CENTER FOR ATMOSPHERIC RESEARCH

National Center for
Atmospheric Research
1850 Table Mesa Drive
Boulder, CO 80305 USA
Phone: +1 303 497 8780
www.ucar.edu
VAR: MCAD Technologies, Inc.,
Boulder, Colorado, USA

Dassault Systèmes
SolidWorks Corp.
300 Baker Avenue
Concord, MA 01742 USA
Phone: 1 800 693 9000
Outside the US: +1 978 371 5011
Email: info@solidworks.com
www.solidworks.com

SOLIDWORKS