A flick of the hand and an aircraft dives into a life threatening spin. It is unrecoverable. It could be fatal. Luckily it is only a model in Langley's 20-Foot Vertical Spin Tunnel, that continues to undergo upgrades that will make it the largest and most productive spin tunnel in the world.

The $1.9 million three-phase refurbishment project that began last April will replace or refurbish the tunnels primary components. “The tunnel will be back in action in April and we’re anxious to catch up on our backlog,” said Raymond D. Whipple, spin research group leader in the Flight Dynamics Branch, Flight Applications Division. “When all the work is completed we’ll have the best spin tunnel there is.”

Phases of the project that are complete include:
- The rotary balance system, including a new control panel, which examines aerodynamic forces under rotating conditions. It is one of the three main phases of the project.
- Replacement of the net used to catch free-spinning models. The new net is strung flat across the bottom of the tunnel, which is vertical. The old net hung in a bowl shape from the sides of the tunnel, that “messed up the airflow,” said Whipple.
- The tunnels walls have been padded to protect models from damage. “These models often cost us $100,000, so this was an important addition,” said Whipple.
- The honeycomb at the bottom of the tunnel was moved up several feet to improve airflow.
- An automated video-tracking system replaced a hand-operated system. “Now we can operate with fewer people,” said Whipple.

The two other main phases still in progress are:
- The motor upgrade. Original from when the tunnel was built in 1941, it will have modern, solid-state technology and its horsepower boosted to 700 from the current 400.
- Fan replacement. The three-blade, fixed pitch wood fan will be replaced with a five-blade, variable-pitch composite fan and all the associated controls that go with it. This upgrade is intended to provide the important ability to change the speed of the airflow.

Spin tunnel data is vital because it develops life-saving aircraft spin recovery methods. It is on the list of Critical National Facilities. “With the tunnel data we can design better aircraft by knowing spin characteristics,” said Whipple. Nearly every U.S. fighter, light bomber, attack plane and trainer has been tested in Langley’s spin tunnel. Future work will include tumbling research, X-31 support, testing of the F-18 E-F models, and F-22 models. Future and existing aircraft models are tested in the tunnel. “We can test anything that is going to fly,” said Whipple.

**HOW A SPIN TUNNEL WORKS**

Air is drawn upward through the test section by a fan at the top. After passing through the fan, the air circulates through turning vanes that direct it into an annular return passage and back up the test section.

Models are hand-launched from the control room. A flick of the hand imparts spin; the model’s fall is offset by up-rushing air. Model surfaces are driven by
tiny electric servo-actuators, which are activated by radio signals to initiate spin recovery.
Looking Up

Photo by Carol Petrachenko

The state personnel launch system, is one of several designs being considered by NASA Shuttle. Human factors studies, using Langley volunteers as subjects, have been issues since seating arrangements, habitability, ingress and egress, equipment handling operations, and to determine visibility requirements during docking and volunteers, wearing non-pressureized flight suits and helmets, were put through a test in both horizontal and vertical modes.

Spin Tunnel to Undergo $1.9 Million Improvement
Work will Replace Fan, Upgrade Motor

Langley’s 20-Foot Vertical Spin Tunnel will undergo a five-month, $1.9 million renovation beginning in April. The three-phase project will replace or refurbish the tunnel’s primary components.

“It’s a major upgrade to the facility and is, by several orders of magnitude, the largest upgrade we’ve ever had,” said Raymond D. Whipple, spin research group leader in the Flight Dynamics Branch, Flight Applications Division. “When completed, we’ll have the best spin tunnel in the world.”

The three main phases of the project are:

- **Motor upgrade.** The motor, original from when the tunnel was built in 1941, will be refurbished with modern, solid-state technology and its horsepower boosted to 700 from the current 400.

- **Fan replacement.** The three-blade, fixed-pitch wood fan will be replaced with a five-blade, variable-pitch composite fan and all the associated controls that go with it,” Whipple said. “Our ability to change the speed of the airflow in the tunnel is very important and this upgrade is intended to do that.”

- **Balance system replaced.** The rotary balance system, which examines aerodynamic forces under rotating conditions, will be replaced. “We’re going to completely replace the rotary balance system,” Whipple said. “The equipment was beyond use and very old.”

Other improvements include replacing the net used to catch free-spinning models. The net hangs in a bowl shape from the sides of the tunnel, which is vertical.

The configuration “messes up the airflow,” Whipple said. The new net will be strung flat across the bottom of the tunnel. In addition, the tunnel’s walls will be padded to protect models from damage. And, the honeycomb at the bottom of the tunnel will be moved up several feet to improve airflow.

Tunnel shutdown is scheduled for April 1. But replacement of the video-tracking system has begun. An automated video-tracking system will replace a hand-operated system.

**How a Spin Tunnel Works**

Air is drawn upward through the test section by a fan at the top. After passing through the fan, the air circulates through turning vanes that direct it down into an annular return passage and back up the test section.

Models are hand-launched from the control room. A flick of the hand imparts spin; the model’s fall is offset by up-rushing air. Model surfaces are driven by tiny electric servo-actuators, which are activated electromagnetically to initiate spin recovery.

Nearly every U.S. fighter, light bomber, attack plane and trainer has been tested in Langley’s spin tunnel. Current work includes tumbling research, X-31 support, and testing of the F-16 C and D models.

New on the Menu: Cafeteria Offering Domino’s Pizza on 7-Week Trial Basis

Employees with a craving for The pizza, which comes from

Lectures sponsored by the Virginia Air and Space Center, the Daily Press and NASA.

In the afternoon lecture, Oberg will discuss the Buran program, comparing it to the NASA shuttle design, and will predict its future. Early manned atmospheric tests and the shuttle cosmonaut cadre will be addressed. The Soviet training and flight activities tell a lot about future Russian shuttle mission plans. Many of the orbits have died tragically.