

Out of **this world**



from the main hangar floor, any lingering uncertainty that a visitor might have about the nature of this operation is completely dispelled. This is a busy, serious, and definitely militarylike flight department.

That was my impression during a visit when I got to see how the space agency uses a variety of airplanes to support the manned space program. Hosting my visit was astronaut Steve Nagel, a veteran of four space shuttle missions: one as pilot, two as mission commander, and one as a mission specialist. Retired from the active astronaut corps, Nagel's business card now simply reads "Research Pilot," a title that only hints at all of his responsibilities. Besides flying, he helps to manage a flight department that includes 23 full-time pilots, 12 to 15 flight engineers, and 40 total aircraft divided among seven unique types.

"We operate about 10,000 flight hours a year," Nagel explained as we made our way across the hangar floor, crammed with aircraft undergoing various inspections and scheduled main-

Initial astronaut-candidate flight training takes place in the T-38N Talons.



tenance. "And each of our pilots is current on two to four different aircraft types." According to Nagel, this makes for an interesting and never-dull workday. That would be a hard point to argue, considering that the aircraft types include the sleek T-38N supersonic trainer, the aerodynamically absurd Super Guppy, and the shuttle Training Aircraft, a highly modified Gulfstream II used by astronauts to practice Shuttle approaches and land-

ings. In fact, you'd be hard-pressed to find another flight department that operates such a collection of special-purpose aircraft.

The T-38N Talon. According to NASA, AOD directly supports the Space Shuttle Program. "Directly supports" has broad meaning in such a complex program, and the makeup of the fleet underscores this complexity. Among its many charges, the department is responsible for initial astronaut-candi-

AOPAstronauts! The highest-flying AOPA members

AOPA's membership includes all kinds of pilots, from the brand-spanking-new student to the grizzled "been there, done that, flew the box it came in" hundred-mission type. If there's a single trait that marks an AOPA member apart from everyone else, it's a passion for flying. It shouldn't be too much of a surprise then that a highly accomplished subgroup of AOPA members has followed this passion to what some might call the ultimate flying job—NASA's astronaut corps.

Of the approximately 180 active-duty NASA astronauts, a fair number are general aviation pilots and AOPA members too. On a recent visit to Houston's NASA Johnson Space Center (JSC), I had a chance to speak with eight who, despite their exciting day jobs, are still thrilled about a subject the rest of us can relate to—GA flying.

Shannon Lucid AOPA 283741

A veteran of five space flights, Shannon Lucid holds the U.S. record for space-flight endurance on the Russian Space Station Mir—more than 188 days—and the record for most flight hours in space by a woman—5,354. We could list all her other accomplishments and awards, but that would mean cutting down another hundred acres of trees. Suffice it to say that she is a very talented lady.

Lucid was just 5 years old, flying aboard a Douglas DC-3 somewhere in China (she was born in Shanghai) when she decided to become a pilot. She recalls spotting a runway out the window and being "just amazed that



someone could land there. I wanted to be able to do that too."

She got her wish when she earned her private certificate 42 years ago on Valentine's Day, 1963. "I then spent the rest of my life looking for ways to afford to fly."

She bought her first airplane, a Piper Clipper, before she owned a car. She took her three children flying by the time each was 1 week old. Family vacations were always small-airplane adventures, including trips from their home in Oklahoma as far afield as Alaska and South America. No longer an airplane owner, nowadays the commercial-, instrument-, and multiengine-rated Lucid rents airplanes when the urge to fly strikes.

How did she end up an astronaut? "In grade school I was interested in science fiction and exploring, and I figured space would still be worth exploring when I was old enough." She figured right.

Stephen K. Robinson AOPA 1232720

By the time you read this, Stephen K. Robinson will have made NASA and AOPA proud as a mission specialist aboard STS-114, the space shuttle's first return to flight mission following the *Columbia* re-entry tragedy. A veteran of two previous space missions, Robinson's diverse interests include music (he plays lead guitar for Max Q, a rock 'n' roll band) and, of course, aviation.

As a teenager, Robinson would bike 60 miles round trip to take glider lessons (unbeknown to his parents), and later built and flew his own gliders. An aeronautical engineering major in college, he



Each Space Shuttle pilot trains in a Gulfstream II Shuttle Training Aircraft (STA) (right). The G-II cockpit, with the left seat set up as it would be in the shuttle. (below).



date flight training and ongoing flight currency requirements in the T-38N Talon trainer.

That by itself is a big job for the instructor pilots within AOD. Nearly 180 astronauts currently fly the fleet of 31 T-38N aircraft. About 40 of these are shuttle pilots, while most of the rest are mission specialists. A smaller subgroup is made up of International Space Station flight engineers.

All of the shuttle pilots come from tactical military aviation backgrounds, with tenures at Air Force or Navy test pilot school pretty much standard résumé fare. Maintaining currency in high-performance jet aircraft such as the T-38N would seem a natural job requirement for this group. Mission specialists, on the other hand, don't actually pilot the shuttle. They may or may not have any aviation background at all when they enter the astronaut corps, yet they're required to check out in the Talon as part of their job description. Considering all their other training responsibilities, this naturally begs the question, "Why?"



Vagabond that he has flown all over the country.

Despite a demanding training schedule for STS-114, he tries to find time to fly half a day each week. He lives in a flying community that's just eight miles away from his "dream job." His Vagabond has been known to grace the T-38 flight line at Ellington Field when that commute seems just a little too long for him to bear by car.

Leroy Chiao AOPA 913187

I caught up with Leroy Chiao by telephone, or I should say he caught up with me, as he appeared over Houston's horizon aboard the International Space Station, where he served as commander and NASA science officer of Expedition-10. His fourth time into space, this one was a six-month mission that launched from the Baikonur Cosmodrome in Kazakhstan on October 13, 2004.

Chiao didn't come from a flying family, but nevertheless he devel-



began working on his private certificate during a summer internship with Cessna Aircraft in Wichita. He's a self-proclaimed classic-taildragger kind of guy. He owns a 1939 Taylorcraft along with a 1948 Piper PA-15

oped an early fascination with flight. He recalls reading a book in kindergarten about test pilots that inspired his interest in aviation. That led to building model airplanes, designing his own gliders, and finally getting his private certificate while in graduate school. And that led to becoming an astronaut, another childhood interest that seemed to intersect naturally with flying.

Chiao is an instrument-rated pilot with more than 2,000 hours logged in a variety of aircraft. He too lives at a residential airpark not far from JSC, and he owns a Grumman Tiger. A typical GA flight for him nowadays is an hour or so of local VFR flying when he can find the time. He and his wife have flown the Tiger to California and Georgia to visit with family.

David A. Wolf

A medical doctor by profession, David A. Wolf grew up in Indiana as part of an extended flying family, and was around airplanes for as far back as he can remember. His family owned a range of different aircraft types over the years, including Boeing Stearmans, Pitts, North American Navions, Beechcraft Bonanzas, and others. "My family has always flown aerobatic airplanes since before I was born," says Wolf, who currently owns a Christen Eagle that he flies competitively at intermediate-level aerobatic events. A stickler for details, he loves nothing better than to be working on, around, or in an airplane.

Wolf continues to serve as a U.S. Air Force senior flight surgeon in the Air National Guard, and has logged more than 2,000



According to Nagel, the reasons are straightforward. The kinds of skills needed to master the high-performance T-38N are exactly the same kinds needed to succeed as an astronaut—teamwork, attention to detail, and the ability to function well in a fast-moving, complex environment. Much of an astronaut's training takes place in simulated environments or in classrooms. Flying the Talon, on the other hand, provides a chance to hone similar kinds of skills in a dynamic environment where decisions have real-world consequences. Several mission specialists I spoke with during my visit echoed this sentiment. Even though they don't get to solo the T-38N as do the shuttle pilots, they all agreed that flying the Talon helps them to better handle their other astronaut duties.

The Shuttle Training Aircraft. Besides maintaining flying proficiency in the T-38N, shuttle pilots also spend a lot of time flying the Gulfstream II Shuttle Training Aircraft (STA) used to practice shuttle approach and landing proce-

The Super Guppy—so named for its wide fuselage and cavernous cargo hold—is now used to transport oversized structures that otherwise could not be moved by air.



dures, from 35,000 feet all the way down to a simulated landing just above the runway (see "Shuttle Training Aircraft: Flying the Ultimate Sim," March 1997 *Pilot*). NASA's flight department operates four STAs. Every shuttle pilot makes hundreds of practice approaches in these aircraft (and in the shuttle simulator) before ever having a turn at the real shuttle (see "No Go-Around," April 1999 *Pilot*). The STA's left-side pilot station is configured like the pilot position aboard the Shuttle,

complete with rotational hand controller and cockpit flight control instrumentation. The right side is equipped with standard Gulfstream II control yoke and instrumentation, and it is where the instructor pilot sits during a training mission. A flight engineer stationed in the stripped-down passenger cabin monitors the specialized computers and other equipment needed to make the STA mimic the space shuttle during its final approach and landing phase.

AOPAstronauts!

hours of flight time in T-38s and various GA aircraft. He traces his earliest interest in becoming an astronaut to Ed White's pioneering spacewalk during the Gemini 4 mission. It's only natural then that Wolf ended up holding his current title of chief of the Astronaut Office Extravehicular Activity Branch, in charge of development, test, and operational support of spacewalks.

A veteran of 143 days in space during three missions (including four spacewalks), he says there are many characteristics shared by pilots and astronauts. They include the ability to react appropriately in a tough situation, and good intuition. "Intuition is important—knowing when something isn't right."

Garrett E. Reisman AOPA 1118411

It was 7:30 on a Friday night in Star City, Russia, when I reached Garrett E. Reisman by telephone, where it seemed I had interrupted him doing his laundry. Yet to fly in space, Reisman was accepted by NASA in 1998 and is training as a mission specialist. Born in New Jersey, Reisman always wanted to be an astronaut and a pilot, and today he is both. He's a CFI and owns a Grumman Tiger, which he shares with his wife, a private pilot. They regularly fly together when he's at home in Houston.

"[Flying] the T-38 is a dream come true for me—so far it's been one of the best parts of the job," he says. "I've discovered these things called Mach number, flight levels, and aerobatics." He says the airplane has done a lot to improve his GA flying skills, and the instructor pilots he



flies with (mission specialists always fly with an instructor pilot) are, in his words, "the best at what they do. It's a privilege to fly with them."

Following the February 1, 2003, loss of the space shuttle *Columbia*, Reisman acted as a liaison between NASA's astronaut community and the family of Israeli astronaut Col. Ilan Ramon, who died in the accident. He got to know Ramon's teenage son Asaf, who shortly after his father's death announced he wanted to become a pilot like his father. Reisman and his 1998 astronaut classmates decided to sponsor Asaf's flying lessons, with Reisman serving as his CFI. One of Reisman's proudest moments was watching his young student solo in a Cessna 150.

Edward Tsang Lu AOPA 834654

Another astronaut whose childhood fascination with aviation and space colored his career path, Edward Tsang Lu is a veteran of three space missions. He feels passionately about the need to protect our rights to fly in the United States. "We don't want to become like Europe with all its restrictions to GA flying. If we lose the ability to explore by aircraft, we've lost a lot."

He bought a Van's Aircraft RV-4 when he moved to Houston to join NASA in 1994 and has since put more than 400 hours on the aircraft. He's a commercial pilot with instrument and multiengine ratings, enjoys aerobatic flying, and has accumulated more than 1,200 hours of total flight time.

According to Lu, airfields stand out quite well from space, big ones visible with the naked



Nagel's experience piloting the real shuttle confers him with unimpeachable credentials as an STA instructor. During a typical training mission he puts shuttle pilots through their paces, watching carefully as they fly a dozen or more practice approaches. These are essentially 18- to 20-degree dives with descent rates of about 14,000 fpm. The maneuver is flown at 300 knots with the STA's gear down and its twin engines operating in re-

verse thrust at high power settings. Once they master the basic profile, shuttle pilots practice abnormal approach scenarios in which different systems or components are failed. As a safety measure, each high-speed approach ends with a simulated landing and actual go-around, since the approach speeds are much higher than normal Gulfstream II landing speeds.

The Super Guppy. At the other end of the scale from the sleek Talons and

sophisticated STAs is the Super Guppy, one of the few aircraft to which the advice to "keep the pointy end in front" doesn't apply. It is a hybrid created around the fuselage of a Boeing B-377/C-97 with major modifications to wings, engines, flight controls, landing gear, and most notably, the fuselage width. NASA uses its lone remaining example to transport oversize structures that otherwise couldn't be transported by air. In recent years the space agency has used it to carry large assemblies headed to the International Space Station.

Walking through its cavernous cargo hold (the ceiling reaches 25 feet, 6 inches above the cargo-hold floor at its highest point), I felt like I was wandering the floor of a Home Depot instead of touring an airplane. One reaches the cockpit by climbing a ladder from the cargo-hold floor. According to Larry Glenn, one of its pilots, the Super Guppy flies better than one would expect from its ugly-duckling appearance. It does require careful attention during crosswind takeoffs and land-



The zoom climb of 350 knots at a 45-degree nose-high angle earned NASA's KC-135A its nickname, the "Vomit Comet."

eye, small ones requiring binoculars. "I used to love to spot airfields that I'd landed at. It's interesting to see with your own eyes that the U.S. has a large number of airports. In some other countries they're not nearly as commonplace."

Nicholas J.M. Patrick AOPA 953427

Born in the United Kingdom in 1964, Nicholas J.M. Patrick became a U.S. citizen in 1994. Long before that, though, Apollo 11 had inspired his interest in space exploration and flying. As a 10-year-old he built models of the Apollo Lunar Excursion Module instrument panel, and at age 16 he took glider lessons and soloed.

While attending university in the U.K. he began powered flight lessons, and when he moved to the United States he earned his private certificate and instrument ratings. He later learned to fly helicopters, and added a seaplane rating too. When he showed up on NASA's doorstep as part of the astronaut class of 1998, he had already logged a respectable 1,300 hours in more than 20 different aircraft types.



None of his flight experiences, however, had prepared him to fly the T-38. As he recalls it, "On my introductory flight we went supersonic over the Gulf of Mexico. I could read the altimeter and the airspeed indicator, but not both at once." With more than 450 hours of T-38 time now under his belt, he's a bit more comfortable in the jet. "It's never boring, and it definitely has helped make me a better general aviation pilot by improving my scan."

Patrick is a part owner in a Bonanza and has been assigned as a mission specialist to STS-116, an International Space Station assembly flight.

Mark L. Polansky AOPA 829320

Mark L. Polansky caught the space bug early in life, growing up fascinated by the early Mercury, Gemini, and Apollo missions. He knew very little about aviation, but when he met Apollo astronaut Capt. Gene Cernan, he was inspired to join the ROTC at Purdue University. It was while undertaking 25 hours of ROTC flight training in light aircraft that, he says, "I fell in love with flying." Soon afterward (in 1979) he joined AOPA.

After completing Air Force pilot training, he began flying tactical aircraft such as the F-15 and F-5E. Eventually he landed a coveted slot at the USAF Test Pilot School at Edwards Air Force Base, California. "Even though I was mostly flying fighters, I really never stopped reading about GA flying." When he graduated with distinction from test pilot school in 1987, he bought a 1967 Mooney M20E, which he still flies today. (It shares a hangar with astronaut Ed Lu's RV-4.) He has flown it extensively around the country with his wife, including a trip to Alaska.

According to Polansky, his GA flying is extremely relaxing, but he nevertheless approaches it with the same discipline and professionalism that he applies to his work as an astronaut.

Polansky was pilot of STS-98 in 2001, and is assigned to the pilot slot on STS-116, a mission he'll share with fellow AOPA member Nicholas Patrick. —VC



ings, though, because of all that surface area. Engine-out practice can be a physical, sore-muscle-inducing affair requiring buckets full of rudder.

The Vomit Comet. NASA's well-known KC-135A "Vomit Comet," used for many years to conduct reduced- and zero-gravity research, has just been retired. It's being replaced by a C-9, the Navy version of the Douglas DC-9, which is currently undergoing refurbishment. When the aircraft enters service later this year, it will pick up where the KC-135 left off in the Johnson Space Center's Reduced Gravity Program.

A typical Vomit Comet mission entails flying a series of 30 to 50 parabolic arcs that produce weightless or reduced-gravity conditions for 18 to 25 seconds each. The pilot begins each maneuver with a zoom climb, starting at 350 knots and pulling up into a 45-degree nose-high attitude. This is followed by a push-over of as much as 45 degrees nose low. Depending on the exact profile flown, researchers riding in the back can experience lunar, Martian, or zero gravity (or any other G level less than 1 G).

Incidentally, the KC-135 on a pylon that greets visitors to JSC is the original "Vomit Comet," retired in 1995 after flying more than 58,000 parabolas.

The WB-57F. NASA also operates two WB-57F aircraft, which are highly modified B-57 aircraft used for high-altitude research missions. These early 1960s-vintage aircraft have a 2,500-mile range and 6.5-hour endurance. Their pilots wear spacesuits during flights that can reach altitudes in excess of 65,000 feet.

According to Program Manager Andrew Roberts, the

WB-57F aircraft were equipped with high-definition, long-range television cameras to detect damage on the space shuttle.

WB-57F has very low vibration, which makes it an ideal candidate for carrying various optical payloads. With the return to flight of the shuttle, the WB-57F takes advantage of this characteristic in a new role: monitoring the condition of the shuttle's exterior following launch to look for possible damage like that which led to the *Columbia* disaster. For this mission, the aircraft was equipped with high-definition, long-range television cameras that detected such damage.

The Shuttle Carrier Aircraft. Of all the unusual aircraft that NASA operates in support of the space shuttle, the two Shuttle Carrier Aircraft (SCA) are perhaps responsible for the most double takes from casual observers on the ground, at least when either aircraft is transporting one of the shuttles. An SCA was used most recently to move the *Discovery* from its alternate landing site at Edwards Air Force Base back to Florida following the shuttle program's return to flight operations in August.

The SCA are highly modified Boeing 747-100-series transports with beefed-up support struts protruding from the top of the fuselage. A shuttle can be mated atop these for transport. Two additional vertical stabilizers were added, and other major structural and systems modifications were made as well.

Unlike its commercial counter-



part, each SCA is limited to just 250 knots, with or without a shuttle attached. When carrying a shuttle, SCA cruise at 15,000 feet or below, and the extra drag reduces their range to just 1,000 miles.

Gulfstream II Executive Transports. The most ordinary of all the aircraft flown by NASA are the several Gulfstream IIs it uses as any other corporate flight department might—for transporting personnel. During the first day of my visit, Nagel left to pilot a round-trip executive transport mission to Kennedy Space Center in Florida, carrying several NASA managers to a meeting. Such flights are pretty commonplace for NASA's AOD pilots, and it isn't unusual for a pilot to instruct in the T-38N in the morning, then change hats to corporate pilot for a Gulfstream II flight later that day.

Besides offering a chance to fly some truly unusual aircraft, being a pilot for NASA can be your ticket to space. Astronaut and AOPA member Mark Polansky had gone through the highly competitive application process to be an astronaut twice with no luck before deciding to apply for a pilot position in flight operations instead. Once employed in NASA's flight department he applied one

i Links to additional information about NASA may be found on AOPA Online (www.aopa.org/pilot/links.shtml).

more time for astronaut training at the urging of a fellow pilot. Lo and behold, the third time was the charm, and Polansky, since transferred to the astronaut corps, is now slated to command a future shuttle mission.

AOPA

Vincent Czaplyski holds ATP and CFI certificates. He flies as a Boeing 757/767 captain for a major U.S. airline.