
Look Who's Talking Careers

By Robin Bell

Career Area:

Geophysics

Job Title:

Senior Research Professor

The Big Picture - What I do:

As a geophysicist I use remote sensing tools like light and sound to penetrate ice and water and see the landscapes underneath. Studying parts of the world that are invisible to the rest of us has always fascinated me since early in my career as a scientist when I worked on adapting technology developed for use in the oceans, into airborne work. I have used aircraft to study inaccessible regions in ice-covered Antarctica, coordinating eight major Antarctic aerogeophysical expeditions. The most recent Antarctic work I did was with the AGAP project where we imaged an extensive mountain range completely hidden under up to three miles of ice, and identified fascinating structures forming from the ice at the base of the icesheet. (See link -other resources)

What I Like Most About My Job:

Being able to 'see' things that are hidden from view. We are the explorers of 21st century – traveling to places where people have never been before using geophysical tools to take us there...although we do a lot of physical visiting to unusual places as well...like the middle of the Antarctic Ice Sheet!

The Most Unusual Part About My Job:

No one has even physically seen the things that I image in my work. Whether they are mountains buried under the ice, or plumes of refrozen ice folded over deep in the icesheet, or giant sandwaves carved into dunes on the bottom the river under many meters of cloudy water, each of the items we image is a discovery!

What Type of Schooling/Experience is Needed?

Math and Science are the tools of the trade! Physics is a key part of everything I study. We are interested in the energy of how things move, from the water under the ice, to the ice itself, to how we can use energy to do measurements! But aside from schooling scientists need to ask questions! Question the why, the how, build hypothesis and test them out. We learn for asking and testing, and from our successes and our failures – failure force us to rethink and retry.

STEM Careers in Polar Climate

Grades 7-12

Single Class

Photo:



Robin Bell at the South Pole during the AGAP project (see link -other resources)

Education

BA Geology, Middlebury College

MS, PhD, Geology Columbia University

Other Resources

The AGAP project from International Polar Year (2007-2008) was an international Airborne Geophysics Project

<http://www.ldeo.columbia.edu/agap>

Look Who's Talking Careers

By Nick Frearson

Career Area & Job Title:

Engineering,

Senior Engineer/Researcher

The Big Picture - What I do:

Oversee our engineering & software team in the designing and building of very cool sensors for our do airborne geophysics work in the Arctic and Antarctic. This project began with just an idea about a new way to collect remote sensing data! Once we got the 'go-ahead' we had to move quickly to build the team to design and build and the cool sensors, instruments and the software we would need to collect and record the measurements from the ice sheets and sea ice we would fly over. From the sensor design, to shrinking instruments to fit inside a small compartment in the 8.5X2 ft. ice pod, to testing the instruments in extremely cold environments, its my job to make sure it all works!

What I Like Most About My Job:

Going to the coolest places on Earth with my colleagues and standing there in awe looking at, observing and reporting on the massive changes that are going on there.

The Most Unusual Part About My Job:

Working and sleeping in an unheated tent in the middle of the Antarctic Ice Sheet where the outside temperature was -30F i.e. colder than the freezer in your kitchen! We spent about 2 months there as part of the AGAP project – you can read about that: <http://www.ldeo.columbia.edu/agap>

What Type of Schooling/Experience is Needed?

Degree in Engineering and/or Math and Physics is the starting point but just a degree is not enough! To design and build new instruments and think about new ways to make measurements and 'do' science requires a massive desire to understand what makes our Planet tick wand what part we play, if any, in that. So being curious, asking questions, wanting to know more and wanting to try out new ideas is really important!

STEM Careers in Polar Climate

Grades 7-12

Single Class

Photo



Nick Frearson in the field in Antarctica.

Education

Degree in Electronics

Degree in Physics

Northumberland University,
Newcastle-upon-Tyne, England

Look Who's Talking Careers

By Chris Zappa

Career Area:

Oceanography (Air-Sea Interaction)

Job Title:

Senior Research Professor

The Big Picture - What I do:

I study the interaction between the atmosphere and the ocean, specifically the transfer of momentum, heat, mass, upper ocean processes, wind-wave dynamics, and deep-ocean wave breaking. For the IcePod project the interaction will be looking at sea ice and the surrounding ocean water and energy transfer in the ice sheets. We will have two cameras to operate, an infrared camera and a visible wave camera. The infrared will tell us about the intensity of the heat energy that is radiating from the ice we are flying over, important for ice age, condition and stability. The visible wave camera will capture surface images of the ice.

What I Like Most About My Job:

I get to spend a good chunk of time out on the ocean!

The Most Unusual Part About My Job:

Spending time living and working on a really unusual research vessel called FLIP which stands for FLoating Instrument Platform. This 355 ft. long ocean research vessel literally flips to stand on its tail leaving the front 55 ft. of the boat standing straight up out of the water. FLIP is a great research platform since it is really stable and doesn't get knocked around by waves. It looks like a capsized ship! While we are running our ocean research experiments we live on the vessel!

What Type of Schooling/Experience is Needed?

I have a PhD in Physical Oceanography, which involves a strong focus in math and science – especially physics. This job also requires lots of experience with measurement systems, instruments, and field-work!

STEM Careers in Polar Climate

Grades 7-12

Single Class

Photo:

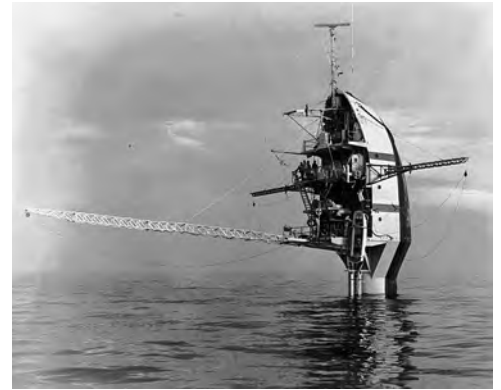


Photo of the Floating Instrument Platform popped up on its tail! People can be seen standing on two of the landings that are parallel to the long boom arm extending over the ocean surface. By the way, the design of this research platform was inspired by a baseball bat!

Education

BA Mechanical Engineering, Columbia University

MS, PhD, Civil & Environmental Engineering/Physical Oceanography, University of Washington

Look Who's Talking Careers By LingLing Dong

STEM Careers in Polar Climate

Grades 7-12

Single Class

Career Area & Job Title:

Computing Science and Geophysics

Data Systems Engineer

The Big Picture - What I do:

I write software for our instruments' data acquisition, science data analysis and display. This is extremely important since a successful field campaign must collect the data and put it into a format the science team can work with. I manage about 10 lab computers by loading the operation system, and configuring them to work. I also design and implement a local network for the computers in the rack so that we can perform data acquisition and communication during the field campaigns. Being able to see the data and while we are in the field is key to our being able to make any needed corrections before it is too late.

What I Like Most About My Job:

I like to develop software that works with instruments; it is interesting and complicated: it involves hardware, Operating Systems (OS), and software knowledge. I also like to deal with scientific data to discover the science rules hidden in the data.

The Most Unusual Part About My Job:

It requires multiple skills in different fields.

What Type of Schooling/Experience is Needed?

Solid Computing science and Geophysics education is a good start. But just completing the courses is not enough. I have definitely put effort into learning the computer administration and network. In addition, this career needs the courage to continue learning and mastering the new theories and rules. It is most important to be creative and to resolve real problems.

Photo



LingLing Dong discusses the data systems program with Scott Brown during project testing.

Education

Degree in Solid Computer Science

Degree in Geophysics

Look Who's Talking Careers By Chris Bertinato

Career Area & Job Title:

Engineering

The Big Picture - What I do:

As a part of the IcePod project engineering group I do whatever is necessary to ensure success of the project. I have worked on the design and implementation of the positioning (location & time) and laser systems, directed environmental testing of the IcePod sensors to be sure that they would operate in extreme conditions, and completed flight test planning for the IcePod test flights in Schenectady, NY and Greenland. When we're flying with the pod, I become a test engineer as well making sure all the equipment is working correctly.

What I Like Most About My Job:

I work with an all around great group - the scientists, engineers, and support team. In the engineering group we all work closely with each other. We pick up tasks in order to get things done, and we all help each other to solve problems and get through the grunt work (sometimes we take things apart over and over to troubleshoot). Working closely also makes it a great place to learn new things and pick up new skills. The type of work that we do is almost exclusively research and development, which just about any engineer can tell you, is a blast. It's a very creative environment where we can try new ideas. We're constantly talking about how to improve upon our old designs. There is never a shortage of problems that need solutions, and that's where the fun is.

The Most Unusual Part About My Job:

We go to some interesting places! To do environmental testing of the IcePod sensors we went to a facility that had, among other pieces of test equipment, a 25-foot long air gun out of which they shoot chickens; the supermarket kind!

What Type of Schooling/Experience is Needed?

The engineers in the group all have formal training in engineering, but the focus varies. We all have a good grasp of physics and mathematics, both of which we use on a day-to-day basis to solve problems. Measuring things from a moving plane requires physics! We also all have some experience in computer programming which we use often. As an aerospace engineer I studied dynamics and control, which typically deals with flight control systems for aircraft and spacecraft, but there are other focuses within aerospace engineering, such as propulsion, materials and aerodynamics. It is not uncommon for aerospace engineering students with a bachelors degree to find a job in the space or aircraft industries, but many students go on to masters and PhD degrees to further focus on a specific area. Graduate school is especially important for developing the skills required for research and development.

STEM Careers in Polar Climate

Grades 7-12

Single Class

Photo



Chris Bertinato at work on the equipment rack for the IcePod installation inside the large LC130 aircraft of the New York Air National Guard.

Education

- Bachelors degree in physics
- Masters degree in aerospace engineering.

Look Who's Talking Careers By Scott Brown

STEM Careers in Polar Climate
Grades 7-12
Single Class

Career Area & Job Title:

Electrical Engineering, *Analytics, Remote Sensing, Image Processing,
*Computer Vision.

*See Big Picture for More Information.

The Big Picture - What I do:

My work focuses on different kinds of imaging collected from both infrared cameras that use the heat given off by an object to create thermal images, and visible wavelength video cameras. Both cameras collect images from 1200 meters (almost 4000 ft!) in the air from a plane moving at ~250 km/hr. I maintain and operate the cameras and aid in purchasing the imaging-related equipment.

Collecting the data is just the beginning of my job! Once we have the images the post-processing begins with Computer Vision and analytics. Computer Vision uses the light reflected back to our eyes from objects to develop algorithms that provide meaning to what we are seeing. This allows us to tell how far away objects are and how they are orientated. I also use analytics (or the discovery of meaningful patterns in the data) to help provide meaning to what we are seeing. The data collected is meaningless without this post processing to generate analysis plots and products. These products are also used for journal publications.

What I Like Most About My Job:

I like problem solving practical issues, travelling, working with electronics and the research-grade equipment.

The Most Unusual Part About My Job:

Travelling to exotic places, such as Diego Garcia – it is an island, NOT a person - (you might need to google it), Greenland, Alaska & the Arctic circle.

What Type of Schooling/Experience is Needed?

Electrical engineering or related degree, usually masters level. My two degrees are bachelors physics and bachelors electrical engineering.

Photo



Scott Brown (l) 'troubleshoots' equipment with Chris Bertinato (r) while on-site at Stratton Air Force Base, Scotia, New York.

Education

Degree in Electrical Engineering

Degree in Physics

Columbia University

Look Who's Talking Careers

By 1Lt Richard Mitchell

STEM Careers in Polar Climate

Grades 7-12

Single Class

Career Area & Job Title:

Pilot, 109th Airlift Wing, New York Air National Guard (NYANG)

The Big Picture - What I do:

The primary mission of the wing is polar airlift and support for the National Science Foundation during Operation RAVEN DEW and Operation DEEP FREEZE. As a pilot I am responsible for mission execution and operation of the C-130 Hercules, which is used to move significant numbers of people and supplies around the world. My position on the crew requires extensive systems, flight characteristics and procedural knowledge to include normal and emergency operations. Each year I am in the Arctic and the Antarctic regions for two to three months total. Knowledge of the polar regions and the effects of weather, high altitude and cold conditions on the impact the aircraft and the crew is important. Every mission has its' own unique focus. With IcePod, we will be incorporating current research into our polar airlift missions to expand our capabilities.

What I Like Most About My Job:

I work with a team of highly motivated professionals. Regardless of the location the entire wing works together to overcome the daily challenges of support, logistics, maintenance and operations to accomplish the mission and safely fly the world's largest plane on skis.

The Most Unusual Part About My Job:

For me, the most unusual part is takeoffs in deep, open snow. To get a heavy C-130 to accelerate in these conditions requires extensive training and special procedures. Occasionally, rockets are attached to the aft of the airplane to provide extra thrust. Pilots have to rely on the entire crew to safely takeoff at very low airspeeds and accelerate only feet off the snow.

What Type of Schooling/Experience is Needed?

A pilot candidate must first graduate from a 4-year university. Basic math and physics are important elements in flying, so a degree in Math, Science, or Engineering is preferred, but not required. Once a candidate is selected, he or she will attend approximately two years of United States Air Force flight training. Operating a C-130 in extreme cold weather climates requires additional training and experience that can only be accomplished in Arctic and Antarctic regions. This means the new pilot will return to the NYANG for another six months to a year of training that is requisite to fly the LC-130.

Photo



1Lt Mitchell standing outside the crew entrance door of the LC130, after a brief fuel stop on his first trip to Kangerlussuaq, Greenland.

Education

- Bachelor and Master of Science in Aerospace Engineering
- Commercial Pilot License

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Look Who's Talking Careers

By 1Lt Joe Shanahan

STEM Careers in Polar Climate

Grades 7-12

Single Class

Career Area & Job Title:

Navigator, New York Air National Guard (NYANG)

The Big Picture - What I do:

As a navigator with the NYANG, I complete an extensive preflight planning process prior to every flight to include the route of flight, fuel planning, and flight record keeping. The route of flight is annotated using geographic coordinates (latitude and longitude) that I enter into the Self Contained Navigational System known as SCNS. While planning a mission we consider the air speed and altitude we will be flying at as well as any special mission requirements. For example, some of the IcePod instruments we use, like the laser altimeter, require us to be at a lower elevation and slower airspeed than we normally fly for cruise. The fuel planning system is a simple formula we use to calculate how much fuel each engine uses per hour added to the minimum required for safety. Once in flight, I use the inertial navigation systems (INS) and radar to guide the plane, checking against the entered waypoints in SCNS and plotting our position on charts. In polar environments, I use a navigational system known as Grid to guide the plane enroute and the aircraft's radar for an instrument approach to a ski landing.

What I Like Most About My Job:

Traveling to remote locations, such as Greenland and Antarctica. Very few people in the world get to go to these locations and it is a privilege. Our mission is unique and we do a job that no one else does.

The Most Unusual Part About My Job:

As a navigator we also track our position using celestial procedures. This requires using a sextant and calculating the position of the sun in the sky to determine our heading and location. We are the only unit that still uses this skill set.

What Type of Schooling/Experience is Needed?

A bachelor's degree is needed to become an officer. After that it can take up to two years to complete aviation training to become an Air Force C-130 navigator. Then after finishing basic C-130 navigator training, it can take another six months to become proficient in the ski qualifications that are unique to LC-130 aircraft.

Photo



1Lt Shanahan at Alert Station, the world's most northern station.

Education

- Bachelor's Degree in History
- Finishing Master's Degree in Education to become certified to teach in NY State

Want More Activities:

www.ldeo.columbia.edu/polareducation

Look Who's Talking Careers MSgt John Bartow

Career Area & Job Title:

Loadmaster, New York Air National Guard (NYANG)

The Big Picture - What I do:

Loadmasters work the “business end” of the LC-130 aircraft. We are responsible for the safe loading, inflight handling and download of cargo and passengers. We supervise loading teams, calculate limitations for large or outsized cargo and monitor aircraft systems inflight. Prior to takeoff, we calculate the aircraft allowable center of gravity to ensure that the airplane is properly balanced for all phases of flight. Loadmasters are airdrop subject matter experts. We employ the aerial delivery system to deliver up to 42,000 pounds of cargo via parachute to remote drop zones where landing may not be feasible due to terrain or ground threats. We also employ “combat offloading” see the short film!

What I Like Most About My Job:

As a member of the aircrew team, I frequently travel to most every corner of the planet. Most aircrew members have visited dozens of countries and all 50 states, supporting everything from humanitarian relief efforts to polar science support to combat operations.

The Most Unusual Part About My Job:

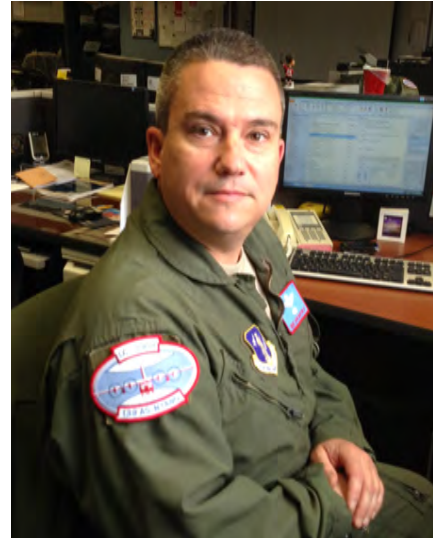
Loading cargo in the most remote regions of the world. There are times where the aircrew may be the only human presence for thousands of miles. Being “alone” on the snow with a job to get done can be challenging and intimidating at times. The aircraft must be positioned in front of the cargo instead of the cargo being positioned behind the aircraft. The loadmaster guides the pilot by looking out the ramp and door and determining the correct position for loading operations. Once aligned, the aircraft is stopped, the equipment inspected and then winched off the snow into the cargo compartment. All this occurs with engines running and at altitudes as high as 12,000 feet above sea level.

What Type of Schooling/Experience is Needed?

Aircrew formal training can last up to 2 years. Many loadmasters are selected from the more seasoned airmen in the USAF. If selected, training begins at Little Rock Air Force Base, Arkansas and lasts almost a year, followed by land, water and arctic survival schools. Finally, after another four months of home station training specific to the LC-130 ski mission, you are ski-mission qualified.

STEM Careers in Polar Climate
Grades 7-12
Single Class

Photo



MSgt Bartow is a key member of the NYANG team. Loadmasters are the rear eyes of the pilot during take off and flight visually inspecting engines and equipment for the flight team. The safe loading, and balance of equipment and passengers for flight and delivery is the loadmaster responsibility.

Education

- The minimum education requirement is a High School Diploma.
- Continuing military education is mandatory. The USAF provides resources for continuing civilian education. Loadmaster formal schooling gives airmen a majority of credits toward a Community College of the Air Force Associate of Science in Aircrew Operations.

Look Who's Talking Careers

TSgt Corey Palmatier

Career Area & Job Title:

Flight Engineer, Aircraft Systems Expert

The Big Picture - What I do:

As a Flight Engineer on the LC-130 aircraft I am primarily concerned with the operation and monitoring of all aircraft systems as well as identifying abnormal conditions and performing in flight trouble shooting techniques. I perform preflight, thru flight, and post flight inspections as well as compute takeoff, climb, cruise, and landing data. Some of the systems I am responsible for operating include the electrical system, fuel system, air conditioning, pressurization system, anti-icing, and the APU (Auxiliary Power Unit). The flight engineer is the systems expert of the airplane with an extensive mechanical and technical knowledge of aircraft systems and performance.

What I Like Most About My Job:

I get the privilege to travel around the world with a great group of people who have become a second family. We operate in some of the world's most beautiful and inhospitable locations presenting very unique challenges and opportunities. On a really good day they let me play with rocket motors for ATO (Assisted Take-Off). ATO rockets provide us the capability to take off when certain snow conditions exist that would otherwise prevent us from getting airborne and having to camp out in a remote location.

The Most Unusual Part About My Job:

There are not many other places where a penguin or seal on the runway can delay a takeoff. Long periods of cold weather, sometimes at high altitude unpressurized can pose certain physiological challenges such as hypoxia. In a way we chase summer following it from hemisphere to hemisphere which leads to long periods of constant daylight due to operating in the Arctic and Antarctic circles (just 6 months until sunset!). We get the chance to interact with some of the world's leading climate scientists and are involved in the transport of ice cores and other valuable scientific cargo.

What Type of Schooling/Experience is Needed?

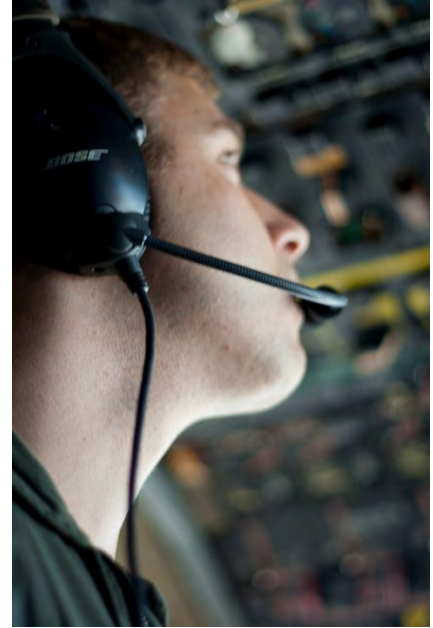
As a bare minimum you need a high school diploma to be able to enlist into the US Air Force as well as being physically fit. It can take between one and two years to complete basic training and the follow on tech schools for your chosen maintenance career before you go back to your unit. Then it takes several years of on the job training to learn and become proficient enough to qualify to retrain into the Flight Engineer career field. It can then take another one and half years to get though all required training before coming back a qualified Flight Engineer. Once back it can take another 6 months learning about the unique systems and mission of the LC-130 before you are fully ski mission qualified.

STEM Careers in Polar Climate

Grades 7-12

Single Class

Photo



TSgt Palmatier operating the overhead panel and monitoring engine systems of the New York Air National Guard's LC-130 aircraft.

Education

- AS Degree in Aircrew Operations / Aircraft Maintenance
- Currently still in school finishing BS focusing in Geology and Paleoclimatology.

Want More Activities:

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