



**DAYTON:  
WHERE JUMPING FROM A  
PERFECTLY GOOD AIRPLANE  
BEGAN!**

Welcome and introduce the speaker team...

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# OVERVIEW

- **BRIEF HISTORY OF PARACHUTES**
- **MUSEUM TOUR**
- **SHOW & TELL**



## EARLY HISTORY- EUROPE



DA VINCI- 1483



FAUSTO VERANZIO- 1617



JACQUES GARNERIN - 1797

One of the earliest appearances of the parachute; Da Vinci sketched a parachute concept in a notebook in 1483. An accompanying note read: "If a man is provided with a length of gummed linen cloth with a length of 12 yards on each side and 12 yards high, he can jump from any great height whatsoever without injury."

Fausto Veranzio designed his own version of a parachute with a frame; possibly influenced by Da Vinci's sketch. He is widely believed to have built it and make a jump with it from a tower in Venice (at the age of over 65).

Jacques Garnerin began experiments with early parachutes based on umbrella-shaped devices and carried out the first frameless parachute descent (in the gondola) with a silk [parachute](#) on 22 October 1797 at [Parc Monceau](#), Paris. Garnerin's first parachute was made of white canvas with a diameter of approximately 23 feet (7 m). The umbrella was closed before he ascended, with a pole running down its center and a rope running through a tube in the pole, which connected it to the balloon. Garnerin rode in a basket attached to the bottom of the parachute; at a height of approximately 3,000 feet (1,000 m) he severed the rope that connected his parachute to the balloon. The balloon continued skyward while Garnerin, with his basket and parachute, fell. The basket swung violently during descent, then bumped and scraped

when it landed, but Garnerin emerged uninjured. Garnerin went on to stage regular tests and demonstrations.

## UNITED STATES- THE FIRST “SMOKE JUMPERS”



© Historic Photo Card  
1374 Eastview Dr.  
Fairborn, Ohio 45324

1910 - Osborn, Ohio U.S.A.  
Double Parachute Jump from balloon  
McGill & Woodall

In the United States, during the last half of the 19<sup>th</sup> and into the early 20<sup>th</sup> century stunt jumpers would put on exhibition jumps from hot air balloons. Typically they would dig a fire trench and inflate the balloon with hot air. They would be suspended with their parachute from the balloon as it ascended and then cut away and descend with the parachute. Sometimes they would have multiple parachutes and do cut-away's and open under another chute to thrill the crowd. These jumpers were sometimes called “smoke jumpers” because of the smoke from the fires that inflated the balloons. The picture shows a double parachute jump with two jumpers from a balloon in Osborne, Ohio in 1910.



## **LIFE SAVING DEVICE WWI**

Up until WWI, parachutes were novelties for stunt exhibitions. During WWI parachutes were first called into wide spread use for saving lives. Primarily for observers in observation balloons over the front lines. When attached by aircraft, the observer could jump from the balloon basket with a static line activated parachute. The parachute was always attached to the basket or in this case the rigging and with a line attached to the jumper, the act of him falling pulled the chute out of its bag. At the time, people thought you could not survive free-fall so parachutes had to be static line operated. Later in the war, German pilots were the first to use parachutes to escape from fixed wing aircraft- but they were static line balloon parachutes adopted for use in the airplane- not ideal.

## McCook FIELD



Near the end of WWI the US Army put together a parachute research group that came under the Engineering Division at McCook Field here in Dayton. Their job was to develop a practical parachute for in-flight escape from fixed wing aircraft. They drafted requirements and tested all the existing parachutes they could but none met their requirements. At the same time they also were working on their own design, based largely on Floyd Smith's concept for a manually operated free-fall parachute. The pilot would wear the chute, climb out and jump away from the airplane, then manually operate the parachute once safely away from the plane. Shown is Floyd Smith wearing the prototype Model A, which was the first practical system for in-flight escape from fixed wing aircraft. The chute was initially live jumped by Leslie Irvin in April of 1919 and was soon standardized and eventually required for use by Army pilots.

## WWII



**BACK**



**SEAT**



**CHEST**

Following the initial development of the free-fall chute, during the 1920's – 1930's refinements were made and three basic styles of emergency bail out parachutes were perfected- back-style, seat-style, and chest-style. The pictures show examples of these types from WWII. Also during WWII, one of the significant milestones in parachutes was achieved with the development of nylon fabric for parachutes to replace silk for personnel parachutes. Rayon fabric was also developed and used on cargo parachutes. This was the start of the use of man-made fabrics for parachutes which allowed higher performance systems to be developed in the years to come.



## THE REAL SMOKE JUMPERS: FIRE FIGHTERS FROM THE SKY



Photo: Leonard Pauls



Photo: Jim Beekman



Photo: Mike McMillan

[www.smokejumpers.com](http://www.smokejumpers.com)

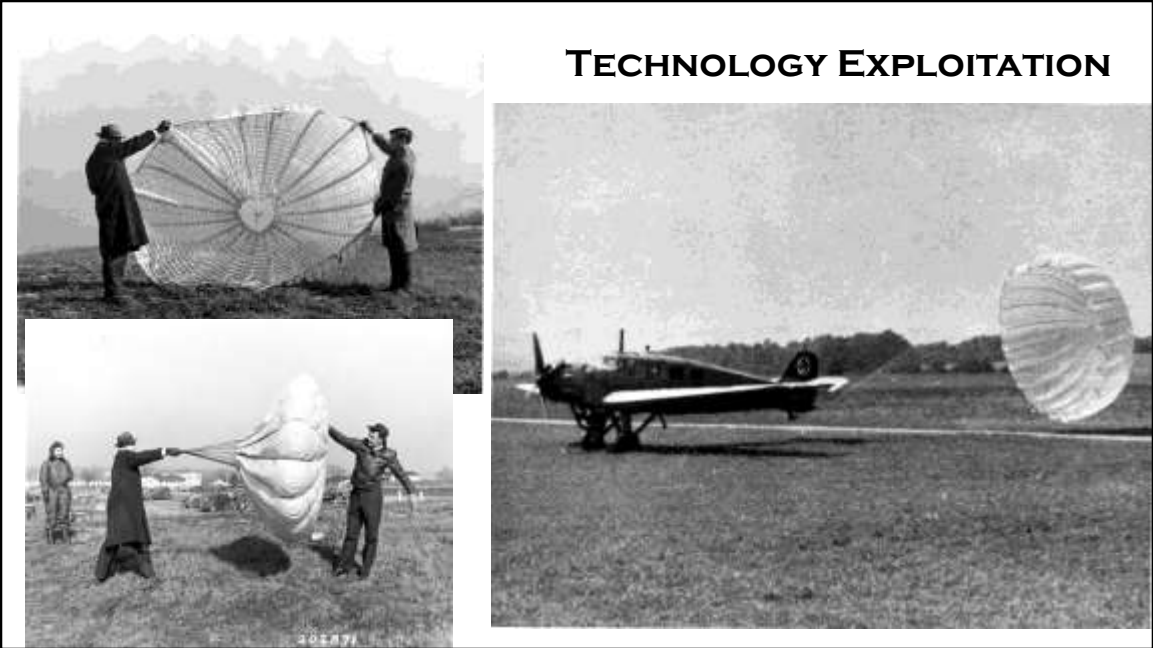
During the late 1930's the concept of dropping fire-fighters into the wilderness to fight forest fires in the western US, what we now know as smoke jumpers, was first considered. The smokejumper program began in 1939 as an experiment in the Pacific Northwest Region, and the first fire jump was made in 1940. Ever since then smoke jumpers have been called upon to jump into otherwise inaccessible areas to put out small fires before they become too large. Traditionally they have used round parachutes and make a lot of their own gear. Within the last year or two they have made the switch to "square" parachutes, gliding canopies similar to what skydivers use. - National smoke jumper association web site- Mike McMillan gallery (square chute), Leonard Pauls gallery- old picture, Jim Beekman gallery (round chute)

## AIRBORNE!



In 1928 the Army Air Corp conducted a demonstration jump of 6 armed parachutists from a Martin Bomber over Kelly Field, TX. The jumpers quickly set up machine guns and were firing within minutes of jumping; but although a successful demonstration, no other progress was made in the US toward an airborne force until WWII. With the US getting closer to involvement in WWII, an Army Major, William Lee who was charged with developing airborne troops for the army, visited the smoke jumpers and used some of the concepts from the smoke jumpers to start training paratroops. Airborne troops had been experimented with by other countries and in particular, Russia and Germany had already developed a force of airborne troops. The US developed parachutes for airborne troops based on training systems that used a main parachute on the back and a reserve parachute in front. The photo on the left shows some jumpers exiting over wright field during WWII and the photo on the left shows a jumper with the with T-5 or T-7 airborne parachute system used during WWII. The first widespread use of airborne troops during WWII made a big impact on the art of warfare.

## TECHNOLOGY EXPLOITATION



At the end of WWII Project Paperclip and similar operations aimed at obtaining German WWII technology, brought advancement in technology to Wright Field. Seven paperclip parachute scientists and engineers came to Wright Field and brought with them new concepts and designs for parachutes, such as the ribbon parachute and the guide surface parachute. One of these scientist, Theo Knacke was co-inventor of the ribbon parachute in 1937, shown in the picture to the right and the top left. This was a parachute with slots in it made from a grid of ribbons which proved ideal for many military and space applications. Another of the scientists, Helmet Heinrich invented the guide surface parachute, shown at the bottom left. Both of these men were eventually internationally know and had a big influence on parachute technology throughout their careers.



## **GOLDEN AGE WPAFB**

After WWII with the advent of the jet and space age, there was a proliferation of parachute applications and systems developed for military and space applications. Many people do not know that Dayton was also a hub of parachute development- from McCook Field to Wright Field. This picture shows the parachute branch at Wright Field in 1960; this whole group was dedicated to parachute development.



These pictures show some of the military applications for parachutes and systems developed during the 1950s-1980s that were managed or developed at Wright-Patt.

## TESTING



In the US another important milestone in parachute technology was the establishment of a national facility for parachute testing. In 1951 the Joint Parachute Test Facility, later known as the National Parachute Test Range, was established at NAS El Centro in southern California. This was a joint Air Force/Navy test facility. The Air Force contingent was the 6511<sup>th</sup> Parachute Test Group (originally the 6502<sup>nd</sup>). One of the unique facilities at El Centro was this whirl tower, which could launch parachute systems for testing, more economically than by dropping them from airplanes. This range eventually closed as the Navy and Air Force consolidated their own testing at China Lake, CA and Edwards AFB, CA. But for about 25 years this was the center for parachute testing in the US.



## HIGHER!

**RALPH BOTTRIELL:  
20,600 FT, 28 JUN 1920**

**RANDOLPH LOVELACE:  
40,200 FT, 24 JUN 1943**

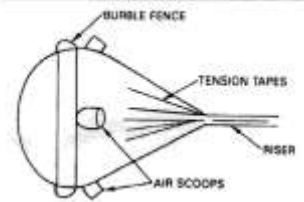
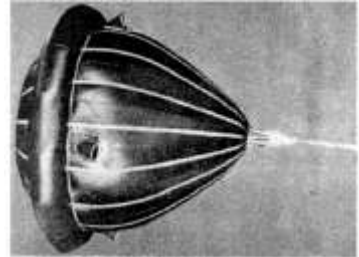
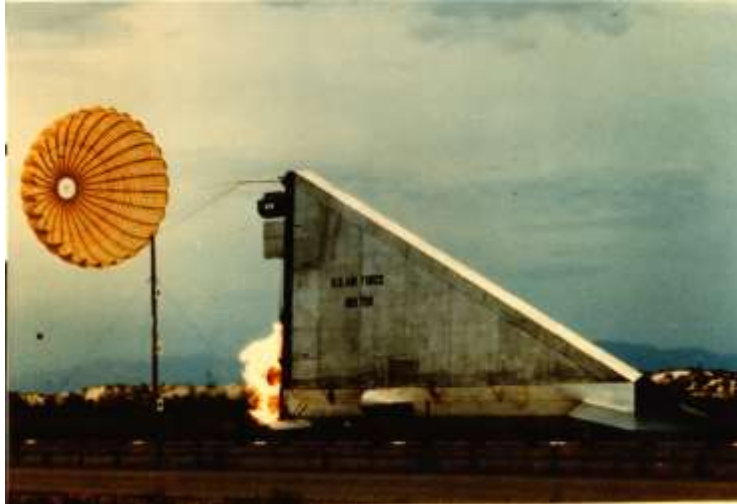
**JOE KITTINGER:  
102,800 FT, 16 AUG 1960**

**FELIX BAUMGARTNER:  
127,852 FT, 14 OCT 2012**

**ALAN EUSTACE:  
135,889 FT, 24 OCT 2014**

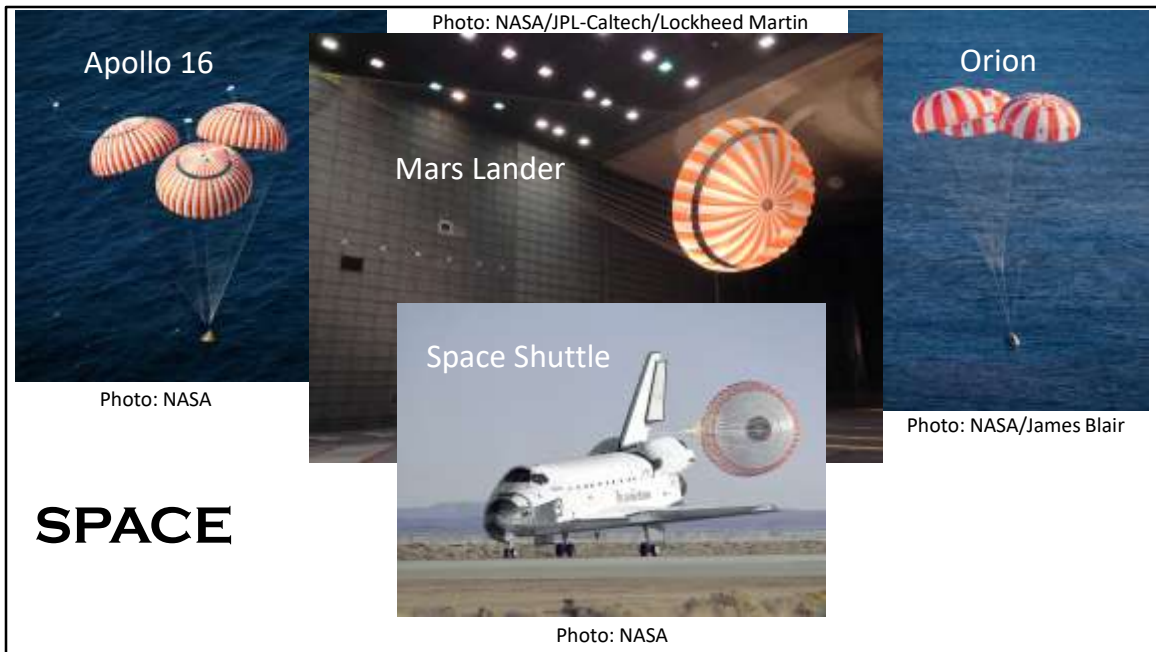
Like all other areas of human endeavor, there is always the push to go farther, or in this case higher, to make a parachute jump. One of the first high altitude jumps was by Sgt Ralph Bottruell at McCook Field in 1920 from an altitude of 20, 600 feet. In 1943 in order to test experimental oxygen equipment, Col Randolph Lovelace jumped from 40,200. In 1960 under Project Excesior, Capt. Joe Kittinger made an all time record altitude jump of 102,800 feet from the edge of space. This record stood for decades until 2012 when Felix Baumgartner, with Kittinger on his team, beat the record with a jump from 127,852 feet. Only 2 years later, Alan Eustace came along and beat that record with a jump from 135,889 feet.

# FASTER!



Besides going higher, researchers pushed the boundaries of speed for parachute use. Using rockets and also rocket sleds, as shown in the picture on the left, engineers tested different designs and materials to withstand high speed deployment and inflation. A ribbon parachute design is shown behind the rocket sled. Ribbon parachutes have been shown to work up to about Mach 3. Right: Balloon parachutes, or ballutes, were designed and tested at conditions of Mach 10 and up to 200,000 feet.





Finally, high performance parachute systems have been developed to support space exploration. From Mercury, Gemini and Apollo to the space shuttle and Mars landers, space exploration could not have been possible without parachutes. On the top left is Apollo 16 getting ready to splash down. Top center is the chute being tested for the InSight Mars landing program, scheduled to launch in May of 2018; in a wind tunnel test at the NASA Ames tunnel, the largest in the world (80 x 120 ft). Bottom center shows the landing deceleration parachute for the space shuttle. And on the left is the new Orion capsule in a test of its parachute system; which will be used in the next manned flights for the US. Caltech/Lockheed Martin, Feb 2015 in NASA Ames wind tunnel, largest in the world.

## JUST FOR FUN!



## GLIDING MODIFICATIONS

In the 1950's some crazy people started thinking about jumping out of airplanes for fun. They started using surplus military round parachutes, but wanted to have some glide capability, so they started modifying the chutes with holes and vents. Typical examples of this are shown here. On the left is a modified round parachute with multiple cut-outs. These cut-outs allow air to vent so the parachute can have some horizontal/forward drive, manipulating the lines can direct the venting air to provide some steering capability. The Army even developed their own versions of round gliding canopies as shown in the 2<sup>nd</sup> from left picture of the MC1 parachute. Second from right is the paracommander parachute that was popular with skydivers. It has multiple vents and skirt extensions to provide as much gliding capability as possible for a round parachute- the drawing on the right gives you an idea of how the airflow through the canopy helps provide drive and steering.

## GLIDING DESIGNS



Eventually, to achieve greater gliding capability, many different new designs appeared that simulated wings to provide better gliding performance. The most successful was the parafoil shown on the left (top and bottom), which became the basis of the modern gliding skydiving parachute used today.

## MODERN SKYDIVING

Misty Blues

Perfectly Good Airplane!

Crazy People!

Parafoils and similar designs are much different than traditional round parachutes. A round parachute is really designed to provide drag, but a parafoil is designed as an inflatable wing to create lift and to be able to glide and maneuver like an airplane. Shown on the right are the Misty Blues all female skydiving team, who have donated equipment to our museum. On the left are just more of those crazy people who like to jump out of perfectly good airplanes.