

Experimental Aircraft Association

Chapter 55

October 2003

Hameed Noor

**Meetings are the 2nd Saturday of each Month at the Hangar,
Mason Jewett Field, Breakfast at 0800, Meeting at 0930.**

**Pres: Mike Arntz 694-4601 Vice Pres: Gary Long 676-3867 Treas: Gregg Cornell 351-1338
Sec: Drew Seguin 332-2601 Editor: Warren Miller 393-9385**

Climb and Maintain Flight Level 55

On September 13th we flew 35 more Young Eagles. These were kids that we could not fly July 13th. Mary Schwanderer flew another 12. This brings the total for September to 47. Total for this season thus far is 409. Total for our chapter is currently at 1531. From 2001-2003 we have flown 934 alone. Renee Arntz as the Young Eagles Coordinator in one year's time has flown more than any previous coordinator, for a total of 710.

I still need two members to act as the nomination committee for the up coming election of chapter officers. Up for grabs are the positions of President, Vice President, Treasurer and Secretary. So if you want to take part in the direction of this chapter, now is the time to step up and be recognized. Nominations will run from November's meeting up to just prior to the election on December 14th.

The Christmas dinner is at Vevay Township Hall on the second Saturday, December 14th, 2003. Social hour will start at 6:00 P.M. and dinner 7:00 P.M.

It will be your own this year. We will let you know how much the dinner will be at the November meeting. Bob Smith has volunteered to be the chairperson for the dinner. Any one who would like to help let Bob know.

I have not heard from this months team of a program as of yet. We have been getting pretty lax about the programs lately, so we need to decide if we want to continue with the programs or not. If you leave it up the next person it ain't going to happen, the other guy never comes thru.

See you at the meeting. Remember when you go flying take a chapter member with you.

Mike Arntz

TEAMS

October Team

Howard Gostnell
Jim Hendrickson
James Smith
Ken Vandebelt

Chuck Hacker
Lloyd Brown
Tyson Dekorse
Vicki Vandebelt

November Team

Gary Nesbit
Tom Schroeder
Kurt Curtiss
Bill Landucci

Joe Pirch
Leo Holmes
Steve Kent
Ron Filtz

EAA Board of Directors Meeting

Board of Directors Meeting – September 10, 2003

The meeting was called to order at 7:00 on September 10, 2003. → Attendees were President Mike Arntz, Vice President Gary Long, Secretary Drew Seguin, Renee Arntz, Doug Koons, Ernie Lutz, and Bill Purosky → The Treasurer's report was presented by Renee Arntz and approved → The Minutes of the August meeting were approved → Young Eagles: There is a Young Eagles rally set for Saturday, 9/13 from eleven to three. It is an un-advertised rally to pick up some of the kids that were turned away on July 12. We will have another rally for the same purpose on September 20. → We still do not have a volunteer for Web Editor. Mike will try to get a volunteer at the Chapter meeting. → We are having problems with the Hangar door. It was decided to look into the cost of replacing it. Drew Seguin will do the research. → Stan Chubb has agreed to handle the gutters for the building. There was discussion on having a contractor paint the hangar. No resolution. → A motion was made and carried to replace the hangar door lock with a keyless access lock. This is due to the number of people who know where the key is and our inability to control who has access. →

A suggestion was made to enlarge the bathroom. It was decided not to because of the difficulty in doing so. → There was discussion on whether to go with gas or electric for the new water heater. Electric was the decision for simplicity's sake. The meeting was adjourned at 8:25.

EAA Chapter 55 Business Meeting

Membership Meeting – September 13, 2003

The meeting was called to order at 9:40 → There were 38 members and guests present. → The Treasurer's report was presented by Renee Arntz and approved. → The secretary's report was approved → Young Eagles: See above. We have flown 363 Young Eagles to date, including the 231 we flew on 7/12. This brings the Chapter lifetime total to 1453. → There was discussion about things to do to improve the Hangar since we have the funds to do so. These include a new Hangar door, painting, gutters, and a hot water heater. No conclusions were made. → Bob Smith volunteered to coordinate the Christmas dinner for the Chapter. He will need help so contact him if you are available to contribute. → There will be elections in December for Chapter 55 officers. We need volunteers for the election committee. Contact Mike Arntz. → Linda LeBaron of Photo Concepts donated a nice framed picture of the B-17 to the Chapter. Don Chubb, a new member donated \$376.49 to the chapter. These were the proceeds from closing the account of the now defunct MSU Soaring Club. Thank You. → Jim Palmer is renting both sides of the Builder's hangar. → The meeting was adjourned at 10:07 →

Notes from Cape Juby

By Terry L. Lutz, Chapter 55 Flight Advisor

Once in a millennium, and once in a lifetime, the pathways of our lives lead to an intersection of richness and passion that defines the human spirit. Many events in history have changed our lives in ways the average person can only imagine. The invention of the airplane was the defining event of the 20th century, and we are fortunate as pilots to find ourselves free and in the sky to imagine the possibilities of flight.

This *Centennial of Flight Edition* will chronicle current events in aerospace flight testing, and the historic aviation events that have occurred in the century between today and that windswept day at Kitty Hawk, December 17th, 1903. It will be told through the eyes and the minds of the people that made history, as they presented their stories at the 47th Annual Symposium of the Society of Experimental Test Pilots, held September 24-27 in Los Angeles.

I will begin with the technical papers that represent the milestones of flight in the past year. Some outstanding work was accomplished by very capable test pilots, who were supported by engineering teams with all the passion for flight that we feel in the sport aviation community. Some of the programs you may not have heard of, but each one will reveal itself as something new, and something special. So put away the

sandpaper and bucking bar, toss a log on the fire, and *hang on tight*, because you'll have sweaty palms when this story is over.

Eurofighter. The Eurofighter is a follow-on aircraft for the Tornado fighters currently being flown by the air forces of Germany, England, and Italy. It is a twin-engine, delta wing aircraft with canard surfaces for additional pitch control. Test pilots reported a significant pitch-up as the airplane decelerated from supersonic to subsonic. It was a 3g spike, so if you were decelerating through Mach 1 at 5g, the g would rapidly increase to 8g. This could lead to over-g of the airframe and for that matter, the pilot. The fix was to install predictive software so if an increase in angle of attack is sensed, an elevator input will limit the pitch-up. The over-g spike is now 0.5g to 1.0g. Interestingly, we used to demonstrate the same characteristic to test pilot students in the F-4. We would start from Mach 1.2, reset power from afterburner to military, and start a 3g turn. When the Phantom came back through Mach 1, we'd get a 1g spike. Although the Eurofighter has limited the problem, there is more work to do.

From the beginning, Eurofighter was designed to have "carefree" maneuver capability throughout the flight envelope, without the fear of loss of control. However, the airplane has enough power and pitch authority to reach extremely low airspeed at high pitch attitude. The possibility for loss of control is present, so how do you avoid it? A consortium of companies, led by EADS, which is a parent company of Airbus, is developing Eurofighter. The modern FBW transports produced by Airbus contain features which prevent stalls and loss of control, so the experience and influence were there to develop a similar system for Eurofighter. They have designed in an Automatic Low Speed Recovery System. If a low speed warning occurs and the pilot does not react within 3 seconds, thrust advances automatically to military power, the speedbrakes retract, and the airplane begins a recovery maneuver as a function of airspeed and pitch attitude. This could be a roll to 90 degrees of bank, or a roll to inverted to take advantage of the lift vector for recovery. While the system has proven effective in flight test, it is unsettling to think that a fighter pilot may become predictable during a dogfight at slow speed while the automatic recovery system does its thing.

F-22 Raptor USAF has begun testing the M61A1 20 mm gatling gun in the F-22. This presents quite a challenge because the airplane has been designed for stealth, so it can't have an external gun muzzle. A fast acting door must open as the gun spins up and fires. The first problem was the door, which had to be reinforced to accept the opening loads and air loads that were encountered. Next, there were problems of recoil, explosive gun gas, and rounds limiting. Ground tests were conducted at the Gun Butt at Edwards AFB, which is a sheltered sand pit. Because the boresight of the gun is slightly elevated to account for bullet drop in flight, the F-22 had to be elevated on the main gear to get the bullets into the sand pit. Posters of Saddam Hussein and Osama Bin Laden took a beating during these tests!

A lot of things happen when the gun is fired. The door opens, the gun spins up, rounds are chambered and fired, the rounds limiter stops chambering rounds, the gun spins down, and the door closes. Inflight tests identified a problem with high

Hydrogen concentrations in the gun gas, which is dangerous in the gun bay after the door closes, so the vent system was modified accordingly. No targets were engaged during testing because the gunsight algorithm had not yet been installed in the head-up display.

White Knight and SpaceShipOne Business attire for Burt Rutan was a denim shirt as he and test pilot Doug Shane described the design concept for SpaceShipOne and the test results to date. Burt's space vehicle is designed to fly into space and return with significantly lower air loads than the only other airplane to go there, the hypersonic X-15. In contrast to the X-15's energy state of 1000 psf on atmospheric entry, SpaceShipOne will enter at 85 psf. All of the flight characteristics of SpaceShipOne have been demonstrated on White Knight because the cockpit layouts and window design are identical. Burt explained that the windows are laid out so that for each phase of flight, the horizon line appears in a specific set of windows. So for boost, re-entry, glide, and landing, the pilot has the proper view of the horizon.

On one of the early captive flights, White Knight was landing with SpaceShipOne attached below. Mike Melville was in the spacecraft, and the video we watched was shot from one of the booms on the White Knight. It clearly showed that while Brian Binnie in White Knight was doing the landing, Mike Melville was also moving *his* controls in SpaceShipOne. After the landing, Mike said over the interphone, "Nice landing, Brian!" As you can imagine, there is lots of competition among friends.

Burt and Doug described video of the first glide flights of the spacecraft. They had a lot of cameras on both airplanes, and you could see the release mechanism as it unlatched, and the reaction in the spacecraft. Looking over Mike Melville's left shoulder, we could see his checklist fly up from his kneeboard and go out of sight right at release! The first flight went great, and we could see the gear come down from the chase camera. It is spring loaded down, and comes out very quickly. Once safely on the runway and stopped, the entire chase team, as viewed from the aft-looking camera on SpaceShipOne, flew over at "low altitude". First the White Knight, then a Beech Starship (one of the few remaining), and finally a Beech Duchess. Climbing out of the airplane, Mike was dowsed with water from buckets. This was hilariously funny, because on the way to Mike, the guy with the bucket said "A little for Burt" and put a tiny bit of water on Burt's pants, THEN he let Mike have it. On the second glide flight, they unlocked the wings and put them in the feather position. Mike described control as weak in pitch, but good in roll with considerable buffet. He locked the wings again and did a stall, which came at 70 knots, then made a normal landing.

On the third glide flight, which was ballasted for aft cg, Mike did an approach to stall, and at 85 knots, SpaceShipOne pitched up, departed controlled flight, rolled inverted, and continued a rolling/yawing motion for several seconds. Mike tried a lot of different control positions, then someone on the ground noted from telemetry that the roll trim was fully deflected (roll trim is very powerful in this airplane). Mike centered the trim, used rudder to bring the nose back down, and the spacecraft recovered. To make the flight more interesting, they had put slender doors over the main gear, and the drag was higher than

predicted. Mike was 200' high at high key as he began his approach to Mojave, and landed a scant 500' down the runway. Had he not been high, he could very well have landed short.

Burt said that the glide ratio of Space Ship I is 7.0 clean (about the same as a Cessna 172), 4.8 gear down, and 0.6 in feather mode. The cabin is designed with redundant structure, and as Burt described it, the airplane itself is the pilot's pressure suit. The key to success in the design is that every test they fly is with space qualified hardware. They have more work to do, because the worst case abort scenario puts the cg even further aft than on the third flight, and at a higher gross weight. Burt and Doug's presentation was outstanding, and they were later presented with award for best technical paper.

They are also a fun bunch of people. Scaled Composites had a booth in the display area, and ran a continuous loop video of the first flight of SpaceShipOne. Across the way, another company was handing out balsa wood gliders. With idle, but very creative hands, Doug Shane put the wing and tail in backwards, taped the fin to the nose, and moved the weight aft. This created the most elegant and best flying canard glider ever built. Note the glider in the center of attached picture.

F/A-18A/B High AOA Software Testing Imagine putting up the first slide in your presentation and it shows 18 black F-18 silhouettes at the bottom, much like the enemy would paint on his airplane if he had shot you down. But these airplanes represented older operational F-18s, lost in accidents due to loss of control from which the pilot could not recover. They showed video of two F-18 accidents and described the "falling leaf" spin characteristic that is very difficult to recover from. In one instance, the pilot recovered at 5000' over terrain of 4200'. In the other case, the pilot was forced to eject. The worst case configuration was the two-seat model with centerline fuel tank, which is typically used in air-to-air training.

The Navy found that the key to preventing loss of control and entering a spin is control of sideslip, or beta. By modifying the flight control software to use all the control capability to limit beta, fleet pilots can now climb vertically, and at 50 kts airspeed do a full stick deflection roll without fear of departing controlled flight. The airplane does a very controllable roll, and the pilot can start and stop the roll at will. This is a tremendous improvement in the combat capability of the older F-18s.

MV-22 Vortex Ring State Testing Boeing test pilot Tom MacDonald recently completed over 100 flights in the MV-22 Osprey to find out more about the boundary for vortex ring state. VRS occurs when the MV-22 is descending at approximately the same vertical velocity as the rotor downwash. This causes the rotor tip vortices to organize into a strong vortex ring, much like a smoke ring, only with much more energy. If the MV-22 descends into the vortex ring, rapid and dramatic loss of control occurs, and the airplane rolls inverted.

Tom was given the task of defining the vortex ring state boundary in terms of airspeed and sink rate. This included duplicating the departure maneuver that caused the accident in Marana, AZ. Then, he had to intentionally depart the MV-22 and define a recovery technique should MV-22 pilots ever get into a VRS departure. The video was chilling, and for his

professional efforts under intense pressure from the Marines, from Congress, and from his employer, Tom received the Ivan Kincheloe Award for the most outstanding flight test work over the past year.

X-31 Vector Program For those of you unfamiliar with the X-31, it is a small single-engine research airplane with a highly swept delta wing, canards, and 3 large paddles that deploy into the exhaust plume for thrust vectoring. The X-31 has demonstrated stable flight at extreme angles of attack, using the canards and thrust vectoring. The X-31 test team recently demonstrated a concept called ESTOL, for Extremely Short Takeoff and Landing. The first time I saw the video, I must have blinked just prior to the airplane touching down, because I just did not believe what I saw. The airplane flew final approach at 40 degrees angle of attack, which reduced the approach speed by 60 knots. But at that angle of attack, the airplane would strike the tail before main gear touchdown, not to mention that the pilot can't see the runway!

Remember the movie "Space Cowboys" where Clint Eastwood is bringing the Shuttle in, except he is waaay too fast? So he pulls the nose up sharply and just before touchdown lowers it again? That is exactly what the X-31 can do. The actual derotation and touchdown occurs in less than 2 seconds, which is simply amazing. The key to accomplishing this is to define the flight path the airplane must follow to an accuracy of around one inch. This is done with differential GPS techniques, and the landing is executed automatically. While the test pilot could take over and easily go-around, he could not manually save the landing. Brave guys, those X-31 test pilots.

That wraps up the technical papers, so now on to our luncheon speaker, Dr. Bertrand Piccard. Dr. Piccard, along with Brian Jones, organized the first non-stop around the world balloon flight. Actually, it took three tries to make it, and he learned a great deal about balloons, life, and other people. Much of what he told us applies to the world of sport aviation. Dr. Piccard holds a degree in psychiatric medicine. He is also from a family of explorers and adventurers. He was the European hang glider aerobatic champion before turning his interest to ballooning (I didn't think you could do aerobatics in a hang glider!).

After winning the first ever Trans-Atlantic balloon race in 1992, Dr. Piccard turned his thoughts to flying around the world in a balloon. But he realized that it would take more than just drawing a line on the globe, waiting for a favorable wind, and taking off (he tried that twice). "With a balloon, you have performance and efficiency with no control". He learned that you must deal with nature with humility, and not try to control it. He also learned a lot about people. "Bring people as different as possible together and 1+1=3". Dr. Piccard went to China to speak to them directly about overflying their country. The Chinese said that it was the first time anyone hoping to fly around the world in a balloon had actually visited them, and listened to their concerns. The Chinese allowed the overflight, but only partially, because the flight was restricted to an area south of a specific latitude.

On the third attempt, they took off from their base in Switzerland, and instead of heading southeast, the winds took them southwest to northern Egypt. They picked up a section of

the tropical jetstream that took them across southern Asia, and well south of the restricted area of China. They crossed the Pacific and as they prepared to cross the Atlantic, they realized that they were dangerously low on fuel. Winds were favorable for an Atlantic crossing at about 28,000 feet, but the U.S. controllers would not allow it because of airline traffic across the pond at that altitude. Dr. Piccard's team contacted Eurocontrol and asked them to intervene. Eurocontrol called their U.S. counterparts and explained that they had routed all the European traffic below 28,000 feet, couldn't they do the same? Finally, Eurocontrol pointed out that if they didn't allow the crossing, the balloon would run out of fuel in their airspace, and the U.S. would then be in charge of the search and rescue!

With clearance to cross at 28,000 feet, they began to climb, and the winds took an expected turn to the east. They were headed toward the Sahara Desert instead of Europe. The Breitling Orbiter III landed in the desert of Egypt with just 80 lbs (1%) of the 8,000 lbs of propane they had carried for the trip. In all, Piccard and Jones set 7 world records, including longest distance, 45,700 km (28,400 sm), and longest duration, 19 days, 21 hours, 47 minutes.

As a preview, Part 2 of this Centennial of Flight Edition will provide an unparalleled look at the people and events of the past century of aviation, from the Wright brothers, to the Skunk Works, and then to the U.S. Space program. Until then, fly safe, and as always, don't forget to lend a hand to your fellow pilot if they need it.

