

## December Meeting

**Topic:** *Competition Aerobatics*

**Speaker:** Hella Comat

**Reporter:** Gord McNulty

A good turnout of about 40 people enjoyed the conclusion of our 2016 speakers' program and the annual Christmas Gift Exchange. CAHS Toronto Chapter President Sheldon Benner welcomed several new faces before our speaker was introduced by Treasurer Brigadier-General (Ret'd) Paul Hayes. Paul, who practiced aerobatics intensely during RCAF pilot training on the Harvard, introduced a master of the discipline in Hella Comat. She graduated in 1972 from McMaster University with an Honours B.A. summa cum laude, then served the Halton Board of Education as a teacher from 1973 to 2004. Hella has a strong background in educational computing. In 1996 she received the Prime Minister's Award for Teaching Excellence in Science, Technology and Mathematics. She was an instructional leader in computers in the classroom at York University in 2001. Since 2005, she has worked as a curriculum writer at Technokids Inc.



Speaker Hella Comat  
*Photo Credit - Neil McGavock*

Hella became actively involved in aviation, not as a career but as a hobby that she takes really seriously. She owns a 1984 Pitts Special S1-T aerobatic biplane and has done remarkably well. She lives in Burlington but flies out of Kitchener-Waterloo airport at Breslau. Hella's impressive achievements include three first-place finishes in the International Aerobatic Club Championship Series (2010 Northeast Region); (2011 MidAmerica Region); (2012 Northeast Region).

Hella began by noting that while relatively few people are interested in flying competition aerobatics, she encourages general aviation pilots to take an aerobatic course. It's really worthwhile to improve skills with training to recover from unusual flight attitudes. Second World War pilots, for example, had to complete a four-turn spin coming out on an actual heading, complete a loop, a roll and a Half Cuban Eight in order to solo. "We have nothing like that anymore, which I think is a real loss," Hella said. Every time she flies, she does one, two or three spins of various kinds. She works at the very slow end of the flight envelope. In fact, she could be flying a vertical manoeuvre where the airspeed is well below the stall speed and she is just hanging on with full power to keep the aircraft flying. "I'd like to think I can get some confidence from feeling what it is like when the airplane is at the edge of control," she said. We hear about accidents where pilots on base-to-final overfly the turn because of wind or whatever. They try to get lined up again. But flying very slowly, they increase their angle of bank, the top wing stalls and they are into a spin situation at low level. Hella suggested the number of such accidents could be reduced with training at unusual attitudes.

In a colourful slide presentation, Hella described how she loves her Pitt Special. The classic biplane developed from a series of small, light, nimble aerobatic biplanes designed by Curtis Pitts of the USA. Pitts Specials have won many aerobatic competitions since the first flight of the prototype in September, 1944. Pitts biplanes dominated world aerobatic championships during the 1960s to the 1980s and even today they remain potent competitors. Curtis Pitts began his design for a single-seat aerobatic biplane in 1943-44. The basic design has been refined continuously since the first flight, with the current Pitts S2 remaining close to the concept of the original design. A notable design feature is the 6.5 degree sweptback upper wing, which enhances stability. This feature certainly highlights and complements the many "AKRO" paint schemes applied to Pitts Specials around the world. The Pitts S-1C was the second Pitts Special constructed



Little Stinker Pitts S-1C showing a brilliant AKRO paint design at NASM, Virginia, USA - Photo Credit - Pilotfriend,.com

by Curtis Pitts and it gained international recognition with aerobatic pilot Betty Skelton. Ms Skelton promptly named it "Little Stinker." The oldest surviving Pitts, it's currently on display at the Smithsonian National Air and Space Museum in Virginia. Hundreds of Pitts Specials have been built around the world from plans, kits and factory manufacture. The current factory manufacturer is Aviat Aircraft Inc. of Afton, Wyoming, producing the S-2C two-seat model.

Hella did most of her training on the two-seat version. While Hella said the Pitts sadly has a bad reputation for being "squirrely" on landing, she noted: "We like to think there are no squirrely airplanes, just squirrely pilots." She described the Pitts as "a great magnifying glass of your skills. What you tell the Pitts to do, it's going to do right away. And it's going to keep doing it until you tell it to do something else." Hella described flying and landing a Pitts as a challenge, but

a gratifying experience recognizing that it was designed for aerobatics as opposed to stability. Her Pitts, with a wing span of 17 feet, four inches, is also a challenge to fit in a hangar with a door that's 16 feet wide. When flying cross-country to and from aerobatic competitions, Hella doesn't like to leave it outside since it is a fabric-covered airplane. She prides herself on how much stuff she can fit into the aircraft for a four- or five-day event. The only baggage area is in the turtle deck, the raised area right behind her head, which holds her backpack and a litre of oil.

Hella acquired the Pitts, a factory-built model, nine years ago. She was navigating with a handheld GPS and a paper map, which is another challenge to handle in the small cockpit of an aircraft that isn't to be flown hands-off. She does a lot of VFR flying, as there isn't any electrical system. She flies with an iPad with the Foreflight app, which has the maps and an ADS-B receiver providing the in-flight weather forecast, an important safety factor. In 2010, the airplane was showing signs of wear and tear, a concern for aerobatic flying when the aircraft is being loaded so heavily. Hella decided to remove all the fabric for a full inspection and sent the aircraft back to Aviat in Wyoming. The return flight was a thrill, taking about three days. Her altimeter showed an altitude of 12,600 feet as she flew from Wyoming above the High Plains north of Colorado. She had never flown in a place where there wasn't any sign of a house, a road, or any human habitation, let alone by herself. It felt like a long period of time, but it was "pretty exciting." Then it was on to Idaho and Midwest America, with wonderful cumulus weather.

Hella is proud of the championships she has won in International Aerobatic Club competition. The IAC, a division of the Experimental Aircraft Association, divides the competitions into six regions in the US. Although she has competed in the southeast, it really is feasible only to compete in the northeast and MidAmerica regions. The process involves sub-competitions from spring to fall. The three best competitors

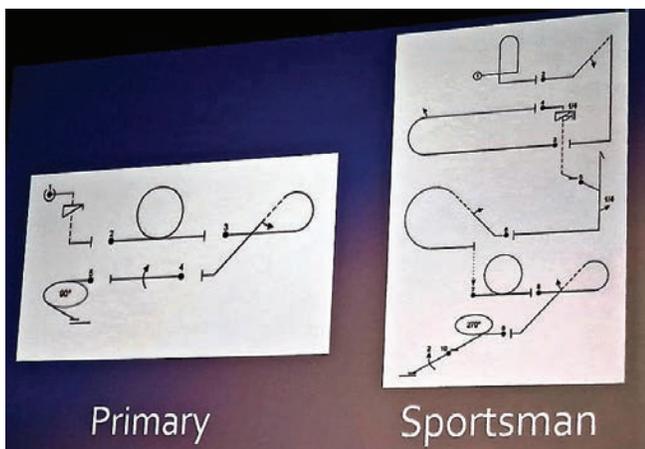


Hella's Pitts Special (C-FWTT) and a fellow competitor

are chosen. Hella noted that in 2010, 60 pilots were in her category, including just one woman. So she justifiably felt good about doing so well in winning the Northeast Region in 2010. Very few Canadian pilots participate; probably only five in Ontario compete regularly. When Hella arrives she's often the person who has come the farthest and is usually the only woman. She would like to see more women involved. At the world level, women compete separately from men, but Hella suggested it's probably time to change that.

Hella explained how competitive aerobatics differs from air show flying. International aerobatics competition has a wonderful safety record, with a history of no fatal accidents, compared to the tragedies that have occurred at air shows. Aerobatics doesn't require high-performance airplanes and can be flown with Cessnas and Piper Cubs at the lower levels. The focus is on precise flying, with exact circular loops and vertical flying with rolls that don't lose altitude. In contrast, air shows are typically flown at low levels --- "the lower the better." Show aircraft are noisy and display smoke, with the aim of creating excitement and an element of danger. There are five levels of aerobatic competition. During a weekend event, pilots must fly three flights. At the two beginner levels, pilots fly their compulsory sequence three times over. Every year, a new sequence comes out. Hella is already practising the 2017 sequence. She competed at the intermediate level when she won the three regional championships. She's now competing at the advanced level and has been for three years. Advanced pilots have to fly the compulsory sequence and a freestyle which they create. Difficult challenges are required, such as hammerheads and loops. The hardest part of the competition in a weekend competition comes on a Saturday night, when pilots are given a sequence of 10 to 15 manoeuvres that they must fly the next day without any practice at all. Pilots go back to their hotel rooms to try to calculate where they will place everything and what speed they will need. There are so many different possible combinations of figures that a lot of their combinations of manoeuvres will never have been flown before. "It's a big challenge and the unknown is usually what determines who wins

that,” Hella said. She has taped the unknown to the instrument panel and highlighted the things that she wants to remember in flight. As Hella said, pilots don’t have a lot of time to look at the sequence card as they are looking outside, watching airspeed, and the attitude of the airplane. She uses yellow lines to mark manoeuvres that she flies with a tailwind, and circles things that she might forget. Often, a pilot will fly the unknown and miss a whole row of figures. Watching a square loop, for example, judges will require it to be perfectly square. It may, however, require a two-point roll at the top --- something that Hella had never done. When a pilot is flying faster, the first part of the square loop takes very little time to do, but then the pilot has very little airspeed to complete the two-point roll and manage the vertical downline. It’s a challenge to complete the elements of the square to the same length when flying at different airspeeds. A ground observer to watch the practice routine is worthwhile for any competing pilot.



Competition Categories and Related Aresti Code Diagrams - Photo Credit - John Bertram



The Aresti Code diagram in Hella’s cockpit

The aerobatic box that pilots compete in is a block of air 1,000 metres long by 1,000 metres wide. The floor of the box depends on the category --- 1,500 feet for the primary and sportsman category, for example. If you go below 1,500 feet as a sportsman, you will receive zero for the whole sequence. The intermediate floor is 1,200 feet; the advanced floor is 700 feet; and the unlimited, which is world level, is 300 feet. The judges sit centre box, back about 200 metres, and have a really good view. At the start of each category, an aircraft will fly the bottom lines to give judges a good visual of where the bottom of the box is. For the pilots, the red on the right has nine markers for the box. There will rarely be a competition with all nine markers, as the box may be on private property or inaccessible. Hella is also a member of the Buffalo Chapter of the IAC, which has a contest at Olean every year. The runway is 4,800 feet long, and pilots are required to stay within three-quarters of the runway. That’s a challenge when flying at 180 miles per hour, or 80 metres per second. That leaves just 10 seconds from one end of the box to the other. Typically, in the middle of the box, you have about five seconds to finish a manoeuvre and get into the next one. If you have a tailwind, it’s less than that. “Staying in the box is a critical thing,” Hella said. The markers look enormous on the ground, but they are not so big from the air.

Hella showed several images from Olean. The aircraft is equipped with a four-pronged sighting device which helps the pilot to sight various manoeuvres. Competitive aerobatics is a sport decided by judges, and Hella compared it to figure skating. At least three judges are necessary. Often, there are five. Each judge has two assistants, a caller and a recorder. The assistant judge is the caller, who has the sequence, and watches the aircraft fly. He tells the judge which manoeuvre is coming. After each, the judge calls a grade by number. The recorder takes it down and give the reason for the mark. The grades are multiplied

by a difficulty factor for each manoeuvre. A hammerhead is 18. If you score a ten on it, you get 180 points. The judging criteria are very strict. If a spin comes out more than 30 degrees off heading, that's a zero. A point or half-point is deducted for every five degrees off heading. For vertical manoeuvres, if you are more than five degrees positive or negative, that's a point off every time. Pilots can lose points very quickly. Boundary judges sit at the corners of the aerobatic box. They have devices with strings attached to help line up the aircraft and the box. They radio back the results and penalty points are assigned for leaving the box. Because of the shortage of volunteers, pilots serve as boundary judges, assistants or recorders. Hella encourages people to attend and/or volunteer at these events. In Ontario, Aerobatics Canada has been rejuvenated in recent years and is always looking for volunteers. Their annual contest is held at Hanover in August. It's not an air show. Insurance coverage doesn't allow it to be advertised, but everyone is welcome. Hella described aerobatics at the unlimited level as "just phenomenal." In her view, watching an unlimited performance flown to demanding combinations of manoeuvres "beats any air show." Check the website [www.aerobaticscanada.org/](http://www.aerobaticscanada.org/) Becoming a judge requires two days' attendance at judges' school. An online exam and an oral exam is involved and you need to judge at least 40 flights. It sounds like a lot, but if 25 pilots are participating it's not that much. A colourful variety of aircraft is typical at these events. In addition to the Pitts Special, other biplanes like the Bucker Jungmann are familiar. While the Bucker is limited to the primary and sportsman category because of limited power, it is still a strong performer. There are contemporary monoplanes like the Sukhoi-26/-29/-31 series, or the Zivko Edge 540, the most common aircraft used in the Red Bull Air Race Series. Hella noted that monoplanes, made of composite materials like carbon fibre, have a much higher G loading and more powerful engines. Other aircraft include the Decathlon, the Christen Eagle and many more. Hella really enjoys meeting people with fascinating backgrounds in aviation.

She described the Aresti Code, the standard document for evaluating and scoring aerobatic manoeuvres in aerobatic competitions worldwide. It was designed by Spanish aviator Colonel Jose' Luis Aresti Aguirre (1919-2003). Each manoeuvre is represented by a line, arrow, geometric shape or number which shows the precise form to be flown. The code classifies manoeuvres into "families" or "groups," such as turns, loops, rolls, spins and horizontal or vertical lines. Solid lines indicate upright or positive G flight while dashed lines indicate inverted or negative G flight. The Aresti diagrammed figures are a form of shorthand, with sketches depicting the methods, directions and the sequence for flying the manoeuvres. Each competing pilot has his or her individual Aresti diagram mounted in the cockpit. The Aresti format has been an excellent method for pilots of all languages and nationalities to clearly understand what is required of him or her.

Hella mentioned that despite all of the intensive pre-flight preparation, once a pilot takes off, "you lose a bit of brainpower. Somehow, things don't work as well. When you go upside down, 50 per cent of that is gone again. There isn't a whole lot to work with once you are in the air." Hence, the need to go over and practice the routine again and again. Hella reiterated the importance of spin training as a valuable safety measure for pilots. Our speaker answered numerous questions. To her credit, she has come a long way since learning to fly on a Cessna 150 and then a 150 Aerobat. Chapter Volunteer Bob Winson thanked Hella and gave her a gift in appreciation of a lively and intriguing insider's guide to the demanding world of competitive aerobatics.



Speaker Hella Comat receiving a gift from the Chapter from Volunteer Bob Winson -  
*Photo Credit - Neil McGavock*