Success in life

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BE AWESOME PILOT

By ANJAY KUMAR

Pilot means --- person who operates the flying controls of an aircraft.If you ever want to become a pilot, then definitely remember this book once. In this book, I will tell you how to become a pilot, what to do, what to read to become a pilot, you will have to take science or you will have to take PCM in science, meaning physics, chemistry and mathematics, first of all you will have to pay full attention to Physics, you will have to study completely or work hard, only then you will be able to study physics or you will do practical in physics. Second of all you will have to pay full attention to chemistry, you will have to study completely or work hard, only then you will be able to study physics or you will do practical in chemistry. Third of all you will have to pay full attention to maths, you will have to study completely or work hard, only then you will be able to study maths.

(PHYSICS)

Physics is the natural science of matter, involving the study of matter, its fundamental constituents, its motion and behavior through space and time, and the related entities of energy and force.

Who is father of physics?

Isaac Newton: The Father of Modern Physics

Sir Isaac Newton, associated with Cambridge University as a physicist and mathematician, became famous after propounding three laws of motion that established a connection between objects and motion.

What is the 3 types of physics ?

Here are all branches of Physics: Classical Physics. Modern Physics. Nuclear Physics.

What is the full form of physics?

A science that deals with matter and energy and their interactions:the physical processes and phenomena of a particular system.

Who first started physics?

Galileo Galilei | The founder of modern physics | New Scientist.

Who founded physics first?

Well, the answer is a bit complex. Sir Isaac Newton is known as one of the fathers of Physics while Albert Einstein and Galileo Galilei are the fathers of Modern Physics. Sir Isaac Newton established the three Laws of Motion and thus, earned the title of the Father of Physics.What is the old name of physics?

The word "physics" comes from the Latin physica (“study of nature”), which itself is a borrowing of the Greek φυσική (phusikḗ “natural science”), a term derived from φύσις (phúsis “origin, nature, property”).

What is the father of physics in India ?

Homi J. Bhabha

Born : 30 October 1909 (bombay)

Died : 24 January 1966 (Mont Blans)

What are the 4 pillars of physics?

These four basic forces are known as fundamental because they alone are responsible for all observations of forces in nature. The four fundamental forces are gravity, electromagnetism, weak nuclear force, and strong nuclear force.

What is the oldest branch of physics?

Classical Physics is the oldest branch of Physics.

What is physics theory?

Overview. A physical theory is a model of physical events. It is judged by the extent to which its predictions agree with empirical observations. The quality of a physical theory is also judged on its ability to make new predictions which can be verified by new observations.

Why physics is called King of science?

“Physics is the king of all sciences as it helps us understand the way nature works. It is at the centre of science,“ he said.

Is physics full of math?

While physicists rely heavily on math for calculations in their work, they don’t work towards a fundamental understanding of abstract mathematical ideas in the way that mathematicians do. Physicists “want answers, and the way they get answers is by doing computations,” says mathematician Tony Pantev.Is BSC physics tough or easy?

Learning something can be sometimes difficult but if you find the easiet way to do then it will become the most interesting thing you ever learn , talking about B.S.c physics then if you have interest in this field and have cleared all your basics in physics then you will not find it difficult to study if not then …

How old is physics?

He wrote the first work which refers to that line of study as “Physics” – in the 4th century BCE, Aristotle founded the system known as Aristotelian physics.

Who is father of Modern Physics?

The Fathers of Modern Physics are Galileo Galilei, Sir Isaac Newton, and Albert Einstein. They have received the title due to their outstanding achievements in the field of physics.

Who is the mother of physics name?

- Marie Curie

Marie Curie

Is considered to this day, to be the Mother of Modern Physics. In 1898, together with her husband Pierre, she discovered the elements of polonium and radio for which she received a first Nobel Prize in Physics in 1903.

Who is the father of atom?

John Dalton

Thus, John Dalton known as father of atoms and atomic theory.

Which is hardest in physics?

Quantum mechanics is deemed the hardest part of physics.

(CHEMISTRY)

Chemistry is the scientific study of the properties and behavior of matter. It is a physical science under natural sciences that covers the elements that make up matter to the compounds made of atoms, …

What is a simple definition of chemistry?

1. : a science that deals with the composition, structure, and properties of substances and of the transformations that they undergo. 2. A. : the composition and chemical properties of a substance.In a more formal sense, chemistry is traditionally divided into five major subdisciplines: organic chemistry, biochemistry, inorganic chemistry, analytical chemistry, and physical chemistry.

What is the full form of chemistry?

Chemistry is a subject that deals with the study of matter, its properties, composition, and behavior. The word "Chemistry" is derived from the word "alchemy" which means the study of the transformation of matter. Full Form of CHEMISTRY. The full form of CHEMISTRY is Chemical Science.

Why is it called chemistry?

The term chemistry is said to derive from the Greek word "khemeia", which means "cast together." It is the atomic-level science of matter. Chemistry is the study of matter, including what it is made of, its characteristics, and how it changes.

What are the 7 types of chemistry?

Areas of Chemistry

Analytical Chemistry.

Biological/Biochemistry.

Chemical Engineering.

Inorganic Chemistry.

Organic Chemistry.

Physical Chemistry.

Who is the father of organic chemistry?

Friedrich Wöhler

Friedrich Wöhler is known as the father of organic chemistry. He was a German chemist and was the first person to isolate many numbers of elements. Wohler initially worked mainly on topics of inorganic chemistry and he was the first to obtain Beryllium and Yttrium in their pure form.

What are the 4 basics of chemistry?

Chemistry Basics – Atoms, Molecules, Elements, Compounds, and Mixtures.

Why study chemistry?

Because it is so fundamental to our world, chemistry plays a role in everyone's lives and touches almost every aspect of our existence in some way. Chemistry is essential for meeting our basic needs of food, clothing, shelter, health, energy, and clean air, water, and soil.

Who named chemistry?

The word chemistry is said to have roots in either ancient Egypt or Greece. Science historian Howard Markel discusses the word's origin, and the modern naming of the field of chemistry by British natural philosopher and alchemist Robert Boyle in his 1661 treatise, The Skeptical Chymist.

Who invented chemistry?

Antoine-Laurent de Lavoisier is considered the "Father of Modern Chemistry".

NEET Chemistry is divided into three sections, namely, Physical, Organic and Inorganic Chemistry. Compared to Biology and Physics, Chemistry is considered to be the most scoring section.

Main branches of chemistry

Organic chemistry: Organic chemistry studies carbon-containing compounds.

Inorganic chemistry: Inorganic chemistry focuses on compounds such as metals and minerals.

Physical chemistry: Physical chemistry incorporates physics into chemistry.

What are the 8 branches of chemistry?

Organic Chemistry.

Inorganic Chemistry.

Physical Chemistry.

Analytical Chemistry.

Stereochemistry.

Biochemistry.

Geochemistry.

Forensic Chemistry.

Who is first chemistry?

Along with Lavoisier, Boyle, and Dalton, Berzelius is known as the father of modern chemistry. In 1828 he compiled a table of relative atomic weights, where oxygen was used as a standard, with its weight set at 100, and which included all of the elements known at the time.

What is the old name of chemistry?

Alchemy

The word chemistry derives from the word alchemy, which is found in various forms in European languages. Alchemy derives from the Arabic word kimiya (كيمياء) or al-kīmiyāʾ (الكيمياء).

How old is chemistry?

Many chemists believe chemistry became a proper science in the eighteenth century. The investigation of air by Antoine Lavoisier (France), the discovery of oxygen by Joseph Priestly (England), and the new scientific language of chemistry, all played a part.

Where is chemistry used?

Chemistry is used in daily life for numerous tasks, including eating safe foods, boiling water to kill bacteria, using antibacterial soap, and more. As you can see, there are many applications of chemistry in daily life; you likely just don't recognize them.

Who is the father of inorganic?

Alfred Werner

Alfred Werner is considered as the father of inorganic chemistry.

Who is the father of Indian chemistry?

Acharya Prafulla Chandra Ray

Who was Acharya Prafulla Chandra Ray? Known as “Father of Indian Chemistry”, Prafulla Chandra Ray (1861-1944) was a well-known Indian scientist and teacher and one of the first “modern” Indian chemical researchers.

Who is the father of all chemicals?

Antoine-Laurent de Lavoisier

Therefore, Antoine-Laurent de Lavoisier was known as the father of chemistry.

Who is the heart of chemistry?

At the heart of chemistry are substances — elements or compounds— which have adefinite composition which is expressed by a chemical formula.

Is an atom a chemical?

An atom is a particle of matter that uniquely defines a chemical element. An atom consists of a central nucleus that is surrounded by one or more negatively charged electrons. The nucleus is positively charged and contains one or more relatively heavy particles known as protons and neutrons.

What is 5 chemistry?

The five main branches are organic chemistry, inorganic chemistry, analytical chemistry, physical chemistry, and biochemistry.

Why is chemistry hard?

Chemistry Involves A Lot of Math!

In an actual math class, word problems are sometimes the most difficult problems for students to tackle. Considering chemistry is like an endless stream of word problems, it’s no surprise that a chemistry course can seem to be exceedingly challenging.

Why is chemistry Favourite?

Chemistry is a subject which brings people together from all around the world. You may have had various life experiences and grown up in different cultures, but the Chemistry you learn about is the same. Creativity is extremely important in Chemistry.

Why is chemistry the best?

Chemistry sometimes is called the “central science” because it connects other sciences to each other, such as biology, physics, geology, and environmental science. Here are some of the best reasons to study chemistry. Chemistry helps you to understand the world around you. Why do leaves change color in the fall?

Who is king of chemistry?

Sulphuric acid

Hence, Sulphuric acid (H 2 SO 4) is known as king of chemicals.

Who is known as father of scientist?

Albert Einstein called Galileo the “father of modern science.” Galileo Galilei was born on February 15, 1564, in Pisa, Italy but lived in Florence, Italy for most of his childhood.

Where did chemistry started?

Egypt

Even though the word “chemistry” comes from Egypt, it seems that people all over the world were experimenting with chemicals as early as the 5^{th} century BC. Early alchemists in China mostly wanted to find “the elixir of life,” a potion that could cure all diseases and keep people from dying.

Who won the first Nobel Prize in chemistry?

Jacobus Henricus van ‘t Hoff

The first Nobel Prize in Chemistry was awarded in 1901 to Jacobus Henricus van ‘t Hoff, of the Netherlands, “for his discovery of the laws of chemical dynamics and osmotic pressure in solutions”.

Is chemistry used In MBBS?

It is important to study organic chemistry in MBBS as it is the related formation of carbon compounds. This study will be required during the MBBS. It is the basic science related to medicine behind the understanding of carbon-related compounds. That’s the reason behind its importance.

(Mathematics)

Mathematics is the science and study of quality, structure, space, and change. Mathematicians seek out patterns, formulate new conjectures, and establish truth by rigorous deduction from appropriately chosen axioms and definitions.

Is It math or maths?

Math is the preferred term in the United States and Canada. Maths is the preferred term in the United Kingdom, Ireland, Australia, and other English-speaking places. There’s no real logical explanation as to why math became preferred in some places while maths was elsewhere.

Is maths difficult for girl?

Girls tend to be more affected by ‘maths anxiety’ than boys, according to a study which shows that teachers and parents may inadvertently play a role in a child developing the fear of numbers.

While mathematics is often considered a hard subject, not all difficulties with the subject result from cognitive difficulties.

How can I learn in math?

The nine strategies included in this guide are:

Make a study schedule.

Maintain a mathematics notebook.

Read your textbook prior to class.

Do textbook examples.

Write the mathematical procedures.

Re-visit previously-studied concepts.

Summarize concepts and procedures.

Re-read prior to a quiz or test.

Who is maths father of math?

Archimedes

Archimedes is known as the Father of Mathematics. Mathematics is one of the ancient sciences developed in time immemorial.

Is maths easy or hard?

Is Maths difficult to learn? Maths is the easiest subject to learn if you practise it regularly with full efficacy. Thought concepts may take time to fit into your mind, but all the concepts are easy to understand, and everyone can understand.

Should I study maths?

Studying maths helps us find patterns and structure in our lives. Practically, maths helps us put a price on things, create graphics , build websites, build skyscrapers and generally understand how things work or predict how they might change over time and under different conditions.

Is math difficult?

It’s no surprise that mathematics is often considered to be one of the most challenging subjects for students. Recent surveys report that 37% of teens aged 13-17 found math to be harder than other subjects – the highest ranked overall.

What age is best at math?

The ability to do basic arithmetic peaks at age 50.

But the next time you try to split up a check, keep this in mind: your ability to do basic subtraction and division doesn’t reach its apex until your 50^{th} birthday. In other words, “there may not be an age where you’re the best at everything,” Hartshorne said.

What is best age for math?

Early Elementary Math

Between the ages of 5 and 7, your child will start working on simple addition and subtraction problems and basic fractions. Money and time will suddenly have concrete meanings. Counting by ones transitions into skip counting by twos, tens and fives.

Is math or physics harder?

Why is Physics harder than Math? Answer: Physics demands problem-solving skills that can be developed only with practice. It also involves theoretical concepts, mathematical calculations and laboratory experiments that adds to the challenging concepts.

How to enjoy maths?

Here’s how.

Talk to the teacher(s) …

Incorporate math into daily activities. …

Play games. …

Explain that errors are inevitable. …

Challenge kids who say they hate math. …

Try manipulatives. …

Search social media. …

Explore NCTM resources.

How can I master my maths?

How to Study Math

1 Do your homework, but don’t stop there.

2 Read your textbook actively.

3 Spend a few minutes studying each day.

4 Show your work on every problem.

5 Give extra attention to word problems.

6 Check your work once you’re finished.

7 Refresh your memory by going through older problems.

Is 1234 good luck?

In terms of spiritual significance, when you see the number 1234 you should take it as a positive sign. Spiritually this is a sign from your guardian angels that good luck and personal growth and even a spiritual awakening are going to be on your side in all the endevors you are stoking right now.

What is 1 called?

1 (one, also called unit and unity) is a number. A numerical digit is used to represent that number in numerals. The number 1 is called a unique number due to the following reasons: It is neither a prime nor a composite number. It has only one factor, that is, the number itself.

Does 1234 mean I love you?

1234 meaning for love

If you are in a relationship and keep seeing 1234, Michaela tells mbg it may indicate that your relationship is leveling up in some way, shape, or form.

Who found zero?

Brahmagupta

Brahmagupta, an astronomer and mathematician from India used zero in mathematical operations like addition and subtraction. Aryabhatta introduced zero in 5th century and Brahmagupta introduced zero in calculations in around 628 BC.

Who named mathematics?

The study of mathematics as a “demonstrative discipline” began in the 6th century BC with the Pythagoreans, who coined the term “mathematics” from the ancient Greek μάθημα (mathema), meaning “subject of instruction”.

Who is father of algebra?

Muhammad ibn Musa al-Khwarizmi

Muhammad ibn Musa al-Khwarizmi was a 9th-century Muslim mathematician and astronomer. He is known as the “father of algebra”, a word derived from the title of his book, Kitab al-Jabr. His pioneering work offered practical answers for land distribution, rules on inheritance and distributing salaries.

Is BCA full of Maths?

Ans. Mathematics is one of the most important BCA course subjects. You will study topics like Limits and Continuity, Differentiation, Statistics, Probability, etc.

Is math good for future?

Combining mathematics with other specialist subjects such as economics, statistics, computer science, applied mathematics, engineering, and mathematical sciences can greatly improve job prospects. Engineers with good mathematical skills can find employment in chemical engineering and electronic engineering.

Why math is better?

Math helps us have better problem-solving skills.

Math helps us think analytically and have better reasoning abilities. Analytical thinking refers to the ability to think critically about the world around us. Reasoning is our ability to think logically about a situation.

Can I be good at math?

Studies show everyone can learn math with a little work. Some people do have an inborn talent for math. This can help them gain an advantage early on, and they may learn more quickly in elementary school. However, most studies indicate hard work can improve your math skills just as much as a natural inclination.

Is It easy to get 100 in maths?

Getting 100 marks in mathematics in Class 10 is a great achievement and can be challenging, but with dedication and hard work, it is definitely achievable.

Which math is easier?

Statistics courses can be more manageable for some students because the material is less theoretical and more applied than more complicated math courses such as differential equations. Finite Math: Finite math refers to a variety of math courses that do not involve calculus.

Why can't I do maths?

Dyscalculia is a learning disorder that affects a person's ability to do math. Much like dyslexia disrupts areas of the brain related to reading, dyscalculia affects brain areas that handle math- and number-related skills and understanding.

What is a good brain age?

Your vocabulary skills are sharpest around age 67. Scores on multiple-choice vocabulary tests show that most people reach their peak vocabulary abilities in their late 60s or early 70s.

Pilot Information

An aircraft pilot or aviator Is a person who controls the flight of an aircraft by operating its directional flight controls. Some other aircrew members, such as navigators or flight engineers, are also considered aviators because they are involved in operating the aircraft's navigation and engine systems.

The Pilot Is in the aviation industry and can control an aircraft to convey passengers or goods from one location to another. They are working for commercial airlines, agencies, or authority. Pilots are independent or work for a discrete to bestow private conveyance in small aircraft or private jets.

What is the work of a pilot?

Operate and control aircraft along planned routes and during takeoffs and landings. Monitor engines, fuel consumption, and other aircraft systems during flight. Respond to changing conditions, such as weather events and emergencies (for example, a mechanical malfunction)

What is in a pilot?

A pilot episode is essentially a test run of a TV series concept—but often, it also acts as the series premiere if the show makes it to air.

Why are pilots important?

Pilots are responsible for the operation of the aircraft, the safety of the passengers and crew members, and all flight decisions once in the air. Their primary concern, however, is the safety of the plane and passengers.

What is called pilot?

A pilot is a person who is trained to fly an aircraft. He spent seventeen years as an airline pilot. … fighter pilots of the British Royal Air Force. Synonyms: airman, captain, flyer [old-fashioned], aviator More Synonyms of pilot.

Why is called a pilot?

PILOT MEANING IN SHOWS

Some suggest that it comes from 'pilot light,' as in, the first episode is the spark that grows into a larger flame that is the series. Others suggest that the term comes from the idea of the first episode serving as the figurative pilot of a boat or plane that guides the rest of the series.

What is a sentence for pilot?

He spent seventeen years as an airline pilot.

What is the pilot of an Aeroplane?

An aircraft pilot or aviator is a person who controls the flight of an aircraft by operating its directional flight controls. Some other aircrew members, such as navigators or flight engineers, are also considered aviators because they are involved in operating the aircraft's navigation and engine systems.

What is student pilot in India?

SPL is issued to a pilot in training, and is a pre-requisite for the student to fly alone in the aircraft, or solo and people who dreamt of flying but couldn't pursue their dream due to any reason can do hobby flying with student pilot license.

How do you introduce a pilot speech?

Ladies and gentlemen, good morning / afternoon / evening. Welcome on board (flight reference). This is Captain / Co-pilot (your name) speaking and I have some information about our flight. Our flight time today will be (flight duration) and our estimated time of arrival in (destination) is (ETA)local time.

What do pilots study?

Prospective employers will prefer that you secure a degree in a discipline that is directly related to piloting aircraft. Therefore, BA and BS degrees in fields like aviation, aeronautical science, and aerospace engineering can land you directly into flight training programs that lead to rewarding careers.

Is a pilot job good?

Conclusion. In conclusion, being a commercial pilot is an excellent career choice with several benefits, including the opportunity to travel the world, unique work environment, job satisfaction, handsome salaries and perks, and more.

What is a pilot salary?

Pilot Salaries in India

The average salary for Pilot is ₹7,32,715 per month in the India. The average additional cash compensation for a Pilot in the India is ₹5,66,119, with a range from ₹93,989 - ₹15,83,849. Salaries estimates are based on 62 salaries submitted anonymously to Glassdoor by Pilot employees in India.

What are 3 things pilots do?

The pilot’s responsibilities include transporting passengers and cargo, determining the safest routes, analyzing flight plans and weather conditions, calculating fuel, and inspecting operation systems and navigation equipment.

Why is pilot job interesting?

One of the main advantages of being a pilot is the ability to constantly learn something new everyday and to challenge yourself. With so many flights departing airports every single day, no two flights are ever the same - even when you're a pilot.

Is pilot good for future?

If you are prepared to spend the time and money required on the many hours of flight training, becoming a pilot can be a positive investment in your future. Understanding the benefits of becoming a pilot can help you feel prepared and make an informed decision about whether it may be the right career move for you.

Is pilot life good?

The life of an Airline Pilot is indeed very high standard and luxurious. Their ROSTER is set monthly by the Airline company and they have to follow the schedule firmly.

Where do pilots work?

Pilots work in many different industries, flying aircraft to various destinations. Flying private planes means working in small airports, while commercial pilots work in larger airports. Agricultural pilots may primarily work on farms and other crop sites.

Is pilot study hard?

However, becoming a pilot is as realistic as any other profession. The idea of flying an airbus seems quite difficult as a proposition and so we think of much less challenging professions. We can all agree that no profession is easy nor difficult but when it comes to flying, it's not for everyone.

Is pilot a good job for female?

Yes, aircraft pilot is a growing in-demand career option for girls in India. You can be a pilot with Indian Air Force (IAF) giving NDA exam after class 12^{th} or can become a commercial aircraft pilot. The career path for IAF pilot would be very different from a commercial pilot.

Is pilot exam tough?

Alongside the difficulty of the posed questions, the short time limits mean candidates must perform under intense pressure – another skill that is important for pilots. Part of the reason why pilot aptitude tests are so hard is because they effectively decide whether a candidate is suitable for training.

Which age is best for pilot?

What is the best age to become pilot?

Student Pilot License – at least 16 years old.

Private Pilot License – at least 17 years old.

Commercial Pilot License – at least 18 years old.

Airline Transport License (ATPL) – at least 23 years old.

Is pilot a government job?

In the aviation industry, an airline pilot is someone who operates aircraft to transport passengers or goods from one location to another. Commercial airlines, corporations, or governments hire aviators. An airline pilot can be self-employed or work for an individual.

Which pilot field is best?

Prospective employers will prefer that you secure a degree in a discipline that is directly related to piloting aircraft. Therefore, BA and BS degrees in fields like aviation, aeronautical science, and aerospace engineering can land you directly into flight training programs that lead to rewarding careers.

What is the qualification for pilot?

Pilot Course Eligibility Criteria

The candidate must be at least 17 years old to begin training. One must have a minimum of 50% in their 10+2, which may vary depending on the institute. One must have completed MPC subjects (Mathematics, Physics, and Chemistry) as well as English at an intermediate level.

How do I become a pilot?

Becoming an airline pilot involves earning a bachelor’s degree in aviation or a related field from an FAA-approved institution, acquiring a commercial pilot’s license and instrument and multi-engine ratings, logging flight hours and gaining an airline transport pilot certification.

Do pilots get job easily?

To get a pilot job is not difficult for a candidate who has completed a Commercial Pilot License (CPL) course from top institutes that provide placement in well-established companies and the best training programs.

How many subjects are in a pilot study?

During the theoretical training, you will receive instruction in 13 subjects and sit through 13 exams. The subjects are delivered in three blocks and following each theory block, you will sit for the official CAA exams in the subjects delivered.

Is pilot math easy?

If you are thinking about becoming a pilot, the maths component might be scary. Fortunately, there is no need to be concerned. All pilots, whether professional or recreational, generally only need to use a few basic maths skills – they are addition, subtraction, division and multiplication.

How long is a pilot study?

Commercial Pilot Licence (CPL)

Students typically take 18 to 24 months for private school CPL training. An equivalent university degree takes three to four years. To qualify for the CPL exam, students need 200 flight hours for qualification.

Do pilots make good money?

The Bureau of Labor Statistics reported the median U.S. pilot salary at $211,790 in 2022. This means 50% of pilots earn more than this, and 50% earn less. However, there are pilots working for major airlines making more than $700,000 per year.

How can I become a pilot after 12^{th}?

In order to know how to become a Pilot after 12^{th}, aspirants need to pursue UG-level Aviation courses in B.Sc Aviation, B. Tech Aeronautical Engineering or equivalent. Students wanting to know how to become a Pilot after Graduation can pursue PG-level courses like MSc Aviation, M.E/M.

Are pilot studies good?

By conducting a pilot study, researchers will be better prepared to face the challenges that might arise in the larger study. They will be more confident with the instruments they will use for data collection. Multiple pilot studies may be needed in some studies, and qualitative and/or quantitative methods may be used.

Are pilot studies good?

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Can a fail student become pilot?

Failing in 11th or 12th grade does not necessarily disqualify someone from becoming a commercial pilot. While a good educational background is generally preferred and can be advantageous for a career in aviation, it is not the sole determining factor for becoming a pilot.

Is pilot a safe job?

Piloting an aircraft is one of the most dangerous occupations in the world and requires an immense amount of skill, knowledge, and dedication.

What is the salary of a pilot girl?

Pilot Salary in India Based on Experience

Experience	Average annual Salary (INR)
0 – 5 years	12 – 15 lakh
6 – 10 years	17.67 – 24.91 lakh
11 – 15 years	37 lakh and above
16 – 20 years	63 lakh and above

Why is pilot job interesting?

One of the main advantages of being a pilot is the ability to constantly learn something new everyday and to challenge yourself. With so many flights departing airports every single day, no two flights are ever the same - even when you're a pilot.

Is pilot a stressful job?

An airline pilot can be an extremely stressful job due to the workload, responsibilities and safety of the thousands of passengers they transport around the world. Chronic levels of stress can negatively impact one’s health, job performance and cognitive functioning.

What is the age limit for pilot girls?

Unmarried male and female candidates between ages 20 and 24 years are eligible to appear in the

AFCAT exam. The upper age limit for candidates with a valid Commercial Pilot License (issued by DGCA) is 26 years.

Can a 5ft girl be a pilot?

There are no specific height restrictions for pilots under FAA rules. Flight schools and commercial airlines accept pilots for training as long as they are physically able to reach the controls and obtain a full rudder deflection in the aircraft they will operate.

What are pilot questions?

Pilot questions are questions that the SOA is testing out to determine the difficulty of them for future exams. They don't tell you which questions are pilot questions nor do they tell you how many pilot questions are on your exam. Pilot question DO NOT count toward your final score.

Can I become pilot without exam?

To get into this training program, the candidate has to clear a pilot entrance exam after 12th in India. Apart from that, you have to also clear interviews, and medical tests held as per the institution you opt to get in the training programs.

How to crack pilot exam?

To prepare for the Commercial Pilot License (CPL) exam, a pilot must first complete a training course that covers all the relevant topics. This course should include the basics of aviation and aircraft operations, as well as the knowledge and skills required to safely operate an aircraft.

Do pilots love their job?

For many, working as a pilot is an exciting career choice. You may enjoy working as a pilot if you enjoy flying and traveling, but there are also some elements of this profession that may not be suitable for everyone.

Do pilots get free hotels?

The airline handles and pays for accommodations for crewmembers when they are on a trip. Many pilots do not live where they are based and choose to commute. Generally, if pilots need to travel and stay away from home when they are not on a trip, they are responsible for their own accommodations.

What are the disadvantages of pilot?

What are disadvantages of being a pilot?

Long and sometimes unpredictable hours. Pilots work different numbers of hours depending on several factors. …

Training. You need a lot of training to be a pilot. …

Flight school and training can be expensive. …

Stress of the job.

What is the last age of pilot?

ICAO stipulates the maximum age for commercial pilots to be 65 years, after which the Licence is not renewed. Most countries including DGCA India follow the recommendation.

Can I become pilot after 21?

Airline transport pilot licence (ATPL)

Candidates can apply for an ATPL only if they have a CPL and a Class I medical fitness certificate from a DGCA-approved practitioner. The minimum age for an ATPL licence is 21. Prerequisites include 1,500 hours of flying experience, with at least 150 hours in the last year.

How many pilots in a flight?

The Federal Aviation Administration (FAA) requires two pilots at all times for most aircraft that exceed 12,500 pounds. Other factors, such as flight length may also demand more than one pilot. One of the biggest reasons two pilots are required for commercial flights and private jets is safety.

Do pilots get free flights?

If a seat is available, they will receive a seat assignment and fly for free. The fuller the flight, the closer to boarding time this will occur – standby passengers often are the last to board.

Which is the No 1 pilot college in India?

India’s Top Flying Schools and Fees Structure

Institute	Fees
Indira Gandhi Rashtriya Uran Akademi (IGRUA)	INR 45L – Full CPL
Madhya Pradesh Flying Club (MPFC)	INR 8.5L – Per Year
National Flying Training Institute (NFTI)	INR 34.6L – Full CPL
Ahmedabad Aviation & Aeronautics Ltd. (AAA)	INR 24.6L – Full CPL.

What is pilot syllabus?

The syllabus for an airline pilot preparation class will vary depending on the type of airline and the specific requirements of the pilot. Generally, the syllabus will include topics such as federal aviation regulations, aircraft systems, navigation, aerodynamics, human factors, and meteorology.

What is the normal age for pilot?

The FAA sets the minimum age for commercial pilots at 18. According to information compiled by GAMA for its 2019 Databook, the average age for commercial pilots was 45.9.

How can a 15 year old become pilot?

It is possible to receive a Student Pilot License (or SPL) at 16 years of age. However, an aspiring pilot must be at least 17 years of age to be eligible to start training as a pilot in India. At 18, a Private Pilot License (PPL) can be attained which allows the pilot to fly solo, passengers as well as cargo.

What is the cost of becoming a pilot?

25 lakhs, depending on the type of aircraft and the number of hours of experience required. After the cost of the student pilot license, ground school, flight training, and medical and interview fees, the total cost of becoming an airline pilot in India can range from Rs. 12 lakhs to Rs. 35 lakhs.

Pilot Foods Related Information.

What kind of food do pilots eat?

These meals consist of sandwiches, salads, a selection of hot meals (breakfast, lunch or dinner, with veggie and meat options) plus snacks including fruit, nuts, crisps and chocolate.”

What is the basic information of pilot?

An aircraft pilot or aviator is a person who controls the flight of an aircraft by operating its directional flight controls. Some other aircrew members, such as navigators or flight engineers, are also considered aviators because they are involved in operating the aircraft’s navigation and engine systems.

Why do pilots eat different meals?

Many airlines require different meals for members of the flight crew in the belief that it mitigates risk of food-borne illness, but it is a choice made by each operator. Why do pilots eat different meals?

Many airlines require different meals for members of the flight crew in the belief that it mitigates risk of food-borne illness, but it is a choice made by each operator.

How do pilots eat healthy?

A balanced diet should focus on fresh fruits and vegetables, whole grains, and lean proteins. Whether you’re at home having dinner with your family or grabbing a bite at a layover restaurant, consider eating one or more of the following nine “superfoods” at mealtime or when you’re ready for a snack.

What do airplane pilots eat?

The pilots usually eat after the passengers have had their meal service. There is always crew food in the trolley area if a particular crew member’s body clock demands food at unusual times, Anderson says, and there is often a tray of snacks, salads, and sandwiches on the flight deck when the pilots arrive.

Can pilots eat the same food?

“If both pilots request the same meal, the cabin crew must bring this to the attention of the captain who will approve or deny the request.” So if there is a particularly eye-catching curry on the menu, and neither pilot can face the alternative, they may still eat the same meal.

Do pilots eat airplane food?

Offerings and responses may differ

So, pilots often bring their own food on board. Regardless, flight attendants can heat the food in the oven for them so that they can still enjoy a hot meal while in the air. Moreover, those on shorter routes often bring snacks on the aircraft to maintain their energy levels.

Can pilots be vegetarian?

There are some rules, like pilots have to eat a different meal (to prevent both getting incapacitated due to food poisoning), and we sometimes wait until all passengers are served in the hope to get a leftover meal from business or first class. Yes pilots can be Vegan.

Can pilots eat onion?

There is no official aviation regulation or guideline that prohibits pilots from consuming onions or garlic before flying.

Who served food in Aeroplane?

Meals are usually prepared on the ground in catering facilities close to the airport, and are then transported to the aircraft and placed in refrigerators for flight attendants to heat and serve on board.

Is plane food healthy?

Airplane food — just like food on the ground — can become contaminated in several ways, including exposure to dirty water, incorrect handling or cooking, and more.

Do pilots eat free?

Most decent airlines provide a meal for their crew. There are exceptions, most notably Ryanair in Europe, where pilots even have to pay for the water they drink. Almost all airlines in the world provide a meal though. I've worked in four different airlines and I never had to worry about getting food on board.

How do fighter pilots eat?

The straw fits into the pilots' pressurized helmets, which, along with their suits, have to stay on the whole time they're in the air—so no using hands or utensils. The straws are connected to tiny aluminum tubes, and each tube filters food amounting to 150 to 300 calories.

Can pilot eat while flying?

DO PILOTS EAT IN THE COCKPIT? Yes, pilots can and do eat in the cockpit during a flight, however, pilots in the cockpit do not eat at the same time and take it in turns to enjoy their food whilst the others are in control of the plane.

Do airplanes have free food?

Free dinner

“The major international airlines still provide hot meals to those in the main cabin—and generally, these meals are also served with free beer and wine to those of age,” he notes. While you may not necessarily get your favorite meal, you’ll always receive a salad, main course and dessert.

Do airplanes have food?

Regarding food, complimentary snacks aren’t provided on flights under 800 miles, but passengers can bring their own. Flights over 500 miles offer additional items like snack boxes for purchase, and flights 1500 miles or longer have Bistro on Board items available.

Can pilots drink and fly?

Specifically, the Federal Aviation Administration rulebook states that a pilot may not use alcohol within 8 hours of a flight and cannot have a blood alcohol content above 0.04%.

Is plane food free?

Ans: This depends on the carrier you choose. Some airlines offer free meals while others don’t. It also depends on the class you travel to. In most cases, premium classes will offer free meals.

How do you buy food in flight?

To buy snacks and drinks on board, you’ll need to save a form of payment before your flight. You can do this easily using the United app or using PayPal (only for registered PayPal users on select flights).

Is food free In first flight?

You will be able to get free web check-in, free seat selection and a Complimentary Meal (includes one sandwich and one beverage) on board.

What to drink on a plane?

It should come as no surprise that the healthiest thing to drink on a plane is water, which also happens to be the healthiest thing to drink on land. Inside an airplane cabin, the air is extremely dry, putting you at heightened risk of dehydration. That can lead to nausea, headaches, and other unpleasant outcomes.

Can you take drinks on a plane?

Water and other non-alcoholic drinks

That means that the maximum amount of each liquid you bring on board has to be 3.4 ounces or 100 milliliters and all your liquids/gels must fit in one quart size bag. Having said that, it might be a better idea to buy a drink after you pass the security checkpoint.

Is food free In Air India?

We offer complimentary refreshments or meals onboard all our flights. Talk about a nation that prides itself in having nature’s bounty, the earliest civilizations, a rich and varied cultural heritage, a glorious past… and you can expect the perpetuations of a great legacy. That's India.

Do you get food on all flights?

On short-haul and medium-haul flights, you can expect snacks and small hot meals, while on long-haul flights you'll get a full, hot menu.

Which airlines provide food in India?

Most full-service airlines in India provide free meals on domestic routes. These include Air India, Vistara, and Jet Airways (currently not operational). Some low-cost carriers such as IndiGo and SpiceJet also offer complimentary meals on select routes.

Is airplane water clean?

Water from aircraft tanks can contain harmful bacteria, but it's not the most likely cause of GI upset while traveling.

Why is water not allowed in planes?

The directive was put in place by the Transportation Security Admistration (TSA) in2006. TSA agents and passengers are expected to followthe"3-1-1" rule for liquids. The reason for not allowing liquid is that terrorists could bring liquid explosives or components to make explosive through water bottles.

What snacks can I take on a plane?

TSA-approved snacks and meals

Sliced veggies with a (smaller than 3.4 ounce) container of hummus.

Protein bars.

Dried fruits and nuts.

DIY charcuterie box (with hard, not creamy, cheeses)

Muffins and pastries.

Beef or mushroom jerky.

Popcorn.

Whole wheat crackers.

Physics most important chapter for pilots.

Statics and dynamics. Laws of linear and circular motion. Work, energy & power. Machines.

Ohm's Law, Turn Radius, Law of Moments, Point of Equal Time, Point of No Return, Departure formula and the Lift formula are just some examples of what you will face during the training. Airlines have different mathematics and physics tests in order to select & assess people quickly during their selections.

What subject is most important for a pilot?

For pilot training course, candidates must have qualified 10+2 in science stream with a minimum score of 50 per cent marks. Mathematics and Physics are the mandatory subjects for candidates who want to have a flying career.

Is physics helpful for pilots?

An understanding of Physics is crucial to appreciate how aircraft fly, how to manoeuvre an aircraft at low and high speed, and how air masses and weather work.

What area of science is most important to a pilot?

Without a basic understanding of science, it will be very difficult to understand the basics of flight as they are all about the balancing of forces (which is physics). Fuel management, air density and atmospherics are easier with a knowledge of physics and chemistry and navigation makes use of physics and mathematics.

Can I be a pilot if I’m bad at physics?

The math and physics you need to know are part of your pilot training and will be explained to you in a manner that makes sense. You do not have to know Quantum Physics to become a pilot. The math and physics required to be a pilot is very, very basic.

Is pilot study easy or tough?

It is hard work as well an expensive training. The career of a pilot will involve lot of travel. There are plenty of colleges in India who impart this training. There are more than 200 Aviation Colleges in India imparting various kind of trainings related to aviation including pilot training courses.

Physics is useful.

Physics provides quantitative and analytic skills needed for analyzing data and solving problems in the sciences, engineering and medicine, as well as in economics, finance, management, law and public policy.

What is physics important for?

Physics is the cornerstone of the other natural sciences (chemistry, geology, biology, astronomy) and is essential to understanding our modern technological society. At the heart of physics is a combination of experiment, observation and the analysis of phenomena using mathematical and computational tools.

Aviation Performance Solutions LLC presents ...

Pilot Training Manual

- Upset Recovery Training
- Stall/Spin Awareness and Recovery Training
- Instrument Recovery Training
- Integrated Workbook

Chief Editor
Clarke "Otter" McNeace
ATP / CFI / CFII / MEI

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Third Edition 2007

APS Emergency Maneuver Training
A Division of Aviation Performance Solutions, LLC
www.apstraining.com
Mesa, Arizona USA

COURSE INTRODUCTION

As the President of Aviation Performance Solutions, I would like to thank you for your decision to participate in our specialized courses of training. In preparation for your APS program, we have provided this training manual as a reference to be used at your discretion. For your convenience and future reference, we have also included a Notes section in the back of this booklet for you to jot down your thoughts during your visit. Please enjoy your stay with us and take a moment to review the resources we have brought together to provide this training...

Our Commitment
Our team is committed to providing the highest quality upset recovery training, aerobatics instruction, spin recovery and instrument recovery training available in the industry at the best value for your training dollar.

APS Emergency Maneuver Training ensures our clients are in the hands of highly trained and experienced professional aviators. Our staff excels in quality customer service and, in addition to providing world-class training in leading-edge equipment, we put the customer second only to flight safety. Moreover, we ensure our training services are being delivered in strict adherence to the industry's highest performance standards. Our business philosophy integrates quality training amidst an easy-going and enjoyable atmosphere.

Instructors
Each one of our instructor pilot's professional flight experience spans a highly specialized spectrum of aviation that uniquely qualifies them as the ideal training providers. All have extensive experience in general aviation, aerobatic maneuvering, military flight instruction, and all have experience flying technologically advanced aircraft in commercial and/or transport category flight operations.

As a testament to our dedication to the quality of our instructor staff, the APS President and Chief Flight Instructor is one of only eleven NAFI Master CFIs in the United States to receive "aerobatic" accreditation out of a field of over 90,000 CFIs and nearly 500 Master CFIs nationwide.

Facilities
All APS training courses are headquartered in our modern corporate hangar/office facility centrally located at the Williams Gateway Airport in Mesa, Arizona. Arguably, Arizona boasts the nation's most consistently favorable VFR weather conditions supporting everyone's need for reliable course scheduling.

The Industry Standard
These key assets of personnel and infrastructure combined with our 10-years of business experience have helped us establish the industry standard. We've been constantly refining upset recovery training techniques common to all categories of fixed wing aircraft and this has helped to make APS an unparalleled training resource to the aviation community.

In addition to all training being in compliance with the FAA Upset Recovery Training Aid Revision 1, APS Emergency Maneuver Training (to our knowledge) is the only Part 141 Flight School certified upset recovery, spin and instrument recovery training course provider in the nation.

Training Aircraft
APS Training exclusively employs the German-built Extra 300L. In addition to being the world's highest performance certified aerobatic aircraft, the Extra 300L is one of the safest, most structurally sound aircraft available and is ideally suited for upset recovery and advanced aerobatics training. This aircraft is fully aerobatic, equipped with multiple-view digital video systems and certified by the FAA to a +/- 10 G envelope for your team's safety.

Despite the Extra's superior performance and capabilities, all maneuver-based and scenario-based training exercises are taught in a manner that ensures each student is trained to apply recovery techniques within the performance envelope of their specific aircraft.

Training Objectives
Our upset recovery and emergency maneuver training courses teach every participant to recover from any possible in-flight upset or flight envelope excursion. Most importantly, APS training programs are focused on promoting "Recognition and Avoidance" through flight training integrated with a thorough theoretical understanding of the aerodynamics involved with each potential flight condition. To accomplish this, we do immerse pilots into the world of unusual attitude and uncommon flight envelope conditions while instilling participants with effective recognition, avoidance and recovery capabilities.

Graduates can expect the development of:

- Increased awareness of all upset scenarios
- Early recognition and avoidance skills through practical experience and understanding
- Decisive recovery techniques
- Leadership skills and judgment in high pressure, time critical flight environments
- Enhanced multi-crew cockpit management skills during an upset
- Improved safety of flight

A Final Word
Thank you for joining our team for the next few days. We look forward to sharing our training with you. We're confident you will learn skills and develop insights during your course that will last a lifetime.

With sincere appreciation,

Paul BJ Ransbury, President
Master Flight Instructor
APS Emergency Maneuver Training

TABLE OF CONTENTS

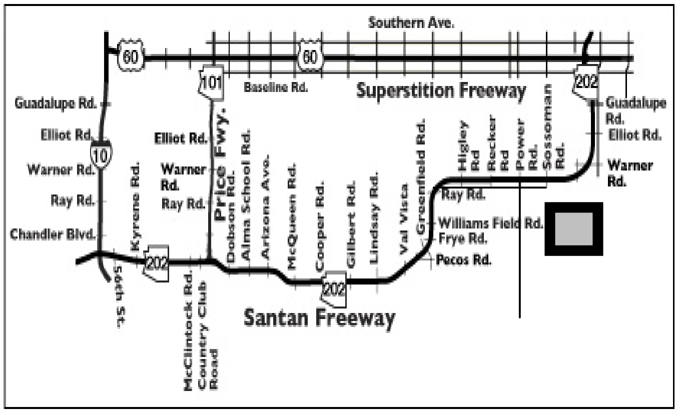
HANDOUTS and INSERTS:

On arrival at APS Emergency Maneuver Training, you will receive:

- Mission Exercise Summaries
- Instrument Recovery Training Supplement
- Various Articles Applicable to Your Selected Course of Training as Determined by Your Course Instructor(s)

CHAPTER 1: GENERAL INFORMATION

101 FACILITY LOCATION



Please visit our website for more detailed maps:
http://www.apstraining.com/fci_directions.htm

Williams Gateway Airport, home and headquarters for APS Emergency Maneuver Training, is located in the Phoenix metropolitan area in southeast Mesa, Arizona.

From US Highway 60: exit at Power Road – Exit 188 (DO NOT TAKE THE SOSSAMAN ROAD EXIT FROM US 60). Merge onto and proceed south on Power Road approximately 4.5 miles to the intersection of Power Road and E Ray Road. Turn left on E Ray Road. Ray Road will veer sharply to the right after approximately ¼ mile and the road becomes South Sossaman Road.

From the San Tan Freeway Loop 202 – exit onto Power Road – Exit 36. Proceed south on Power Road for ½ mile to the intersection of Power Road and E. Ray Road. Turn left on E Ray Road. Ray Road will veer sharply to the right after approximately ¼ mile and the road becomes South Sossaman Road.

Once on Sossaman Road you will have a reasonable view of the runways on the left and a golf course on the right as you proceed toward the main section of the airport. APS Emergency Maneuver Training facility is the 5th building on the left side of the road – bldg #5865, a brand new 25,000 square foot 2-story complex, located just beyond the Williams Gateway Airport Administration office. The building facade features a frontal view of two aircraft in formation.

APS Emergency Maneuver Training
5865 S. Sossaman Road.
Mesa, Arizona 85212
Toll-free: 866-359-4273
Tel: 480-279-1881

102 INSTRUCTOR PILOTS

Paul "BJ" Ransbury, President
Aerobatic, Upset Recovery & Spin Training Instructor
Instructor Qualifications:
NAFI Master CFI-Aerobatic
Part 141 Chief Flight Instructor
Certified Flight Instructor (CFI) | Multi-Engine Instructor (MEI)
Instrument Instructor Airplane (CFII) | Advanced Ground Instructor (AGI)
FITS: Cirrus Standardized Instructor (CSI) SR22/20
Military - Bombardier Flying Instruction Techniques Course Graduate
Military - Fighter Weapons Instructor Course Graduate
Professional Pilot Experience and Certifications:
Airline Transport Pilots License, Single/Multi-Engine IFR (US & CAN)
Airlines: A320 Airbus
Tailwheel / Complex / High-Performance Certified
2500+ hours Extra 300L Experience
Memberships: NBAA, AOPA, TBMOPA, MMOPA, EAA, IAC, NAFI, ICAS
Military Fighter Pilot Experience:
12 Yrs CAF: F/A-18 Hornet Fighter Pilot
Fighter Electronic Warfare and Advanced Radar Graduate
416 Tactical Fighter Squadron | 425 Tactical Fighter Squadron
Air Show Qualifications:
ICAS Certified Air Show Performer - Solo/Formation Aerobatics
Education:
BSc Honors Mathematics & Physics Degree | Royal Military College of Canada
Pursuing MBA - University of Phoenix

Clarke "Otter" McNeace
Aerobatic, Upset Recovery & Spin Training Instructor
Director of Flight Training / Check Pilot
Part 141 Assistant Chief Flight Instructor
Certified Flight Instructor (CFI) / Advanced Ground Instructor (AGI)
Multi-Engine Instructor (MEI) / Instrument Instructor Airplane (CFII/MEII)
11,000+ Flight Hours
U.S. Navy: 8 yrs active duty
F/A-18 Hornet Instructor | Fighter Weapons Instructor
Strike Phase Instructor | Landing Signal Officer (LSO) with Training Qual
36 combat missions: Desert Storm/ Southern Watch
300 carrier-arrested landings:
USS Midway, USS Independence, USS Nimitz,
USS America, USS Lexington
Airline Transport Pilot - 10 years | Airline Captain, B-737 - 5 years
Tailwheel, Complex, Sailplane endorsements
B.S. Computer Science, University of Kansas

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20 Years USAF: Lt. Col, F-16, A-10 Fighter Pilot
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308th Fighter Squadron Commander, Luke AFB, AZ
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Instructor Course Graduate - F16, A10, AT37
28 Combat Missions DESERT SHIELD / STORM | 1990-1991 (F-16)
356th Tactical Fighter Squadron (A-10)
24th Comp/Tac Air Support Squadron (A/OA-37)
4th Fighter Squadron, Hill AFB, UT (F-16)
421st Fighter Squadron, Hill AFB, UT (F-16)
310th Fighter Squadron (F-16 Ops Officer)
309th Fighter Squadron (F-16 Commander)
Airline Transport Pilots License, BE-400, MU-300
USDA Interagency USDI | Single Engine Air Tanker Firefighting Pilot
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"Stormin' " Norman Rennspies
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Instructor Course Graduate - F16, A10
USAF Fighter Weapons School Graduate
Combat Vet DESERT SHIELD / STORM / SOUTHERN WATCH
1990-1998 (A-10,F-16)
25th Tactical Fighter Squadron (A-10) Suwon Korea
92nd Tactical Fighter Squadron (A-10) RAF Bentwaters
356th Fighter Squadron (A-10) Myrtle Beach, SC.
94 Training Squadron (TG-7A) USAF Academy, Co.
68th Fighter Squadron (F-16) Moody, GA.
61st Fighter Squadron (F-16) Luke AFB, AZ.
56th Training Squadron (F16 Chief Academic Instructor) Luke AFB, AZ
Peace Vector IV (F16 Commander) Gianaclis AB, Egypt
Airline Transport Pilots License
Airlines: Boeing 737, Airbus A320/319/321
B.S. General Engineering, USAF Academy, Co.
M.S. Management, Troy State University, European Region

Bill 'Muff' Moffat
Aerobatic, Upset Recovery & Spin Training Instructor
Canadian Air Force: 15 yrs active duty - F/A-18 Hornet Instructor
Fighter Electronic Warfare and Advanced Radar Instructor
Wing Tactical Evaluation Pilot
Canadian Air Force F/A-18 Demonstration Pilot
United States Navy F/A-18 Instructor Pilot | Carrier Qualified
Theatre of Duty: Kosovo
Airline Transport Pilot | Airlines:B-737, K&S Aviation 737 Instructor Pilot
Tailwheel, Complex, Sailplane endorsements
B. Comm, Dalhousie University

103 TRAINING AIRCRAFT

Your safety is our top priority. The APS fleet of German-built Extra 300Ls are a perfect fit to our training programs. Although we teach our course to the performance and capabilities of your specific aircraft, the Extra is certified to +/- 10Gs, has no prohibited maneuvers and boasts a max gross climb rate in excess of 3200 fpm, making it one of the safest and most capable aircraft in the sky.

As an added benefit, each aircraft is equipped with a multi-view digital video and audio system that records the entire flight for use as a teaching tool after the flight and as a keepsake to review or to show your family and friends.

As the world's most successful unlimited category aerobatic aircraft, the two-seat Extra 300L remains unrivalled in its class. Its proven performance in international aerobatic competition, combined with its docile handling and dependable stability, translate into a comfortable cross-country touring machine. For pure power, handling and performance, nothing matches this aircraft.

Specifications

Length..22.83'
Height..8.6'
Span..25.25'
Engine..Textron Lycoming AEIO540L1B5, 300 HP fuel injected
Propeller..MT Constant Speed Propeller, 3 blade standard
Inverted Oil System..Christen Industries
Fuel
Total Fuel Capacity..45.1 gallons
Useable Fuel - Standard Tanks..44.6 gallons
Total Fuel Capacity - Long Range Tanks..55.1 gallons
Useable Fuel - Long Range Tanks..54.5 gallons
Airspeeds
Never Exceed Speed (Vne)..220 kts
Maneuvering Speed (Va)..158 kts
Stall Speed @ 1800 lbs..55 kts
Stall Speed @ 2095 lbs..60 kts

Take-Off Performance: Standard Day @ Sea Level @ Gross Weight
Ground Run..653'
Total: Clear 50 foot obstacle..1789'
Performance
Maximum demonstrated @ 90° crosswind component..15 kts
Maximum Rate of Climb at Sea Level..3200 fpm
Service Ceiling..16,000 feet
Max Range Standard Tanks @ 8000 and 170 kts TAS415 nm plus 45 minute reserve @ 45% power
Long Range Tanks @ 8000 feet and 170 kts TAS ... 510 nm plus 45 minute reserve @ 45% power
Weight and Balance
Standard Empty Weight..1440 lbs
Gross Weight..2095 lbs
Maximum Useful Load..655 lbs

CHAPTER 2: REGULATIONS & SAFTEY

201 REGULATIONS

1) In the FARs, aerobatic flight is described as "maneuvers intentionally performed by an aircraft, involving an abrupt change in its altitude, an abnormal attitude, or an abnormal variation in speed."
2) Part 91 of the Federal Aviation Regulations outlines specific items pertaining to aerobatic and formation flight. APS Emergency Maneuver Training operates in accordance with its FAA Certificate of Waiver or Authorization (FAA Form 7711-1) to ensure compliance with FARs 91.111, 91.303 and 91.307

FAR 91.303 - Aerobatic Flight

No person may operate an aircraft in aerobatic flight -

(a) Over any congested area of a city, town, or settlement;

(b) Over an open air assembly of persons;

(c) Within the lateral boundaries of Class B, Class C, Class D, or Class E airspace designated for an airport;

(d) Within 4 nautical miles of the centerline of any Federal airway;

(e) Below an altitude of 1,500 feet above the surface; or

(f) When flight visibility is less than 3 statute miles.

FAR 91.307 – Parachutes and Parachuting

(c) Unless each occupant of the aircraft is wearing an approved parachute, no pilot of a civil aircraft carrying any person (other than a crewmember) may execute any intentional maneuver that exceeds –

(1) A bank of 60 degrees relative to the horizon; or
(2) A nose-up or nose-down attitude of 30 degrees relative to the horizon.

202 FLIGHT PREPARATION

PREFLIGHT

1) Preflight inspection and control of ALL LOOSE ARTICLES cannot be over-emphasized.
2) Personal Preparation in the Cockpit
   a) Straps tight
   b) Headset secure
   c) Full rudder deflection easily achieved – even under negative G
      (knees should be bent at no more than a 120 degree angle with full rudder deflection sitting on the ground after strap-in)
   d) Confirm full-range of control column and rudder deflection available

INFLIGHT

1) Prior to every aerobatic maneuver, or sequence of maneuvers, the pilot in command will ensure that the airspace is clear of traffic and that a Pre-Stall-Spin-Aerobatic (PSSA) check is carried out. This check will consist of:
   a) **PSSA (Pre-Stall-Spin-Aerobatic) Check**
      i) Altitude
      ii) Area
      iii) Loose Articles
      iv) Temperatures and Pressures
      v) Fuel & Engine Parameters
      vi) Clearing turns appropriate to the maneuver (in order of preference):
         (1) 2 X 90 degree level turns or wing-over (Lazy Eight-like) maneuvers in opposite directions
         (2) 180 degree turn

2) It is the instructor's responsibility to ensure that each student is aware of all safety factors related to aerobatic flight. Although this document covers the key elements of each maneuver, every pilot must be ready to "centralize the controls and analyze" any peculiar situation whenever the maneuver or sequence of maneuvers becomes unfamiliar. Botched maneuver recovery techniques will be taught throughout the course.

CHAPTER 3: RELEVANT THEORY OF FLIGHT

Unlike the Wright brothers and pilots of early days, the modern pilot has the burden of dealing with a complex web of structured airspace, burdening regulations, and sophisticated equipment. Much of a pilot's training today is committed to managing these complex areas that can be a tremendous distraction. As a student pilot (we are all "students" of aviation, no matter your experience) we must give due consideration to developing skills to safely handle our aircraft in any adverse flight condition. *With Loss-of-Control in flight being one of the leading causes of fatal aviation accidents worldwide*, it is important that we not dismiss stall-awareness and upset recovery training as trivial.

Statistics demonstrate that the scenarios presented in the APS courses of training can threaten your safety, if not your very life, and could happen on any given day. Let's start the preparation through academic study. We will be applying each of the concepts presented in this chapter in a manner that clearly explains their application to recovering an aircraft. Understanding pertinent principles of flight pertaining to emergency maneuver training enables us to appreciate the effect of airflow on stability and control at varying speeds, angles of attack and flight attitudes.

301 GENERAL TERMINOLOGY [1]

1) An airplane is in *upright flight* whenever the pitch or bank angle is within 90° of its upright, wings-level attitude relative to the horizon.
2) An airplane is in *inverted flight* whenever the pitch or bank angle is exceeds 90° from an upright, wings-level attitude relative to the horizon. NOTE: Just because an aircraft is inverted, does not mean it is experiencing negative G's or a negative angle of attack.
3) *Coordinated flight* occurs whenever the pilot is proactively canceling the adverse yaw effects associated with power (engine / propeller effects), aileron inputs, and airplane rigging. We would experience *uncoordinated flight* otherwise.
4) *Relative wind* is the net wind presented to a lifting surface such as the main wing of an airplane. For our purposes, relative wind could be made up of several components: the wind resulting from the forward progress of the airplane through the air, the wind resulting from yawing or side-slipping.
5) *Angle of Attack (AOA)* refers to the angle formed between the chordline of a given wing, airfoil, or any other lifting surface, and the net relative wind. In positive G flight, the wing has a positive angle of attack and the Lift vector points through the top surface of the wing. In negative G flight, the wing has a *negative angle of attack* and the Lift vector points through the bottom surface of the wing.
6) *Adverse Yaw* is the yaw associated with deflected aileron inputs. A downward deflected aileron in normal flight produces more lift; hence, it also produces more drag. This added drag attempts to yaw the airplane's nose in the direction of the raised wing.

7) *Critical Angle of Attack* refers to the AOA representing the maximum coefficient of lift of a wing, airfoil, or other lifting surface. Every wing has at least two critical angles of attack: one positive, one negative. The positive critical angle of attack in a light airplane typically occurs in the range of ten to twenty degrees AOA. Critical values can be in excess of +35 AOA in modern fighter aircraft.
8) *A spiral* is nothing more than a turn during which the altimeter changes. An airplane in a spiral is not stalled.
9) *A graveyard spiral* usually occurs during IMC or marginal VMC flight. The resulting accident is often fatal and is typically driven by false or conflicting information from the visual and vestibular systems.
10) *G-load* or *Load factor* is the ratio of the total air load acting on the airplane to the gross weight of the airplane. For example, a load factor of 3 means that the total load on an airplane's structure is three times its gross weight. Load factor is usually expressed in terms of "G's" – that is, a load factor of 3 may be spoken of as 3 G's.
11) *Torque Components* (left turning tendency of aircraft with right-turning propellers) is made up of four elements that cause or produce a twisting or rotating motion around at least one of the airplane's three axes. These four elements are:
    a) *P-factor* (Asymmetric loading of the propeller)
    b) *Gyroscopic Effect* from gyroscopic precession of the propeller
    c) *Slipstream* (corkscrew effect of the slipstream)
    d) *Torque* from engine turning the propeller
12) *Induced Drag* is the drag created as a direct result of the lift created. Unlike parasite drag, induced drag is a direct function of angle of attack. As angle of attack is increased, induced drag increases exponentially.
13) *Parasite Drag or Form Drag* is the drag created from the skin friction and disruption of the streamline flow over the aircraft. It is a function of airspeed. As airspeed increases, parasite drag increases exponentially.
14) *Mush* can occur during low speed/high drag flight, with the airplane operating well on the back side of the power curve. The airplane is not stalled here; however, it is descending at a high sink rate toward the ground in spite of the application of additional power. A low, slow, dragged-in approach to landing often precipitates a mush accident. In swept wing aircraft, a similar aerodynamic condition can occur in the region referred to as Speed Divergence.
15) *Departure,* in the context of stalls and spins, means that the airplane has crossed the line from unstalled flight into stalled flight. Sometimes called a "departure from controlled flight."
16) *Stall* describes the turbulent separation of otherwise smooth airflow over the main wing, the horizontal stabilizer, the propeller blade, or any other lifting surface on the airplane. Unless otherwise specified, *stall* here normally refers to airflow separation from the main wing. Furthermore, the *Stall* - the intentional maneuver that pilots practice - is assumed to occur while maintaining coordinated flight throughout unless indicated otherwise.

17) *Upright Stall* refers to a stall encountered while under positive G loading, wherein the wing is stalled at its positive critical angle of attack, regardless of the airplane's attitude

18) An *Accelerated Stall* occurs anytime critical angle of attack is exceeded while experiencing G-loads greater than +1.0 in upright flight, or greater than –1.0 in inverted flight. Stalls encountered while turning, for example, are accelerated stalls. Thus, an aircraft can stall at any airspeed provided that sufficient G (or acceleration) is applied up to Va without overstressing the aircraft. To determine the airspeed that this will occur, simply multiply the square root of the load factor (or G) by the basic stalling speed of the aircraft. NOTE: Increased G-load equals and increase in stall speed. Conversely, decreased G-loading means a decrease in stall speed.

19) *Stall strips, stall fences, vortex generators, washout, wing twist, leading edge cuff, leading edge droop, modified outboard leading edge (MOLE), slots, slats,* et al., are design elements used to elicit specific slow flight and stall behavior in an airplane.

20) *Stall Buffet* occurs as turbulent airflow separates from the main wing and impinges on the empennage and tail surfaces. Keep in mind that there are several wing designs, such as the swept wing, where boundary layer separation typically occurs at or near the wing tips precluding impingement on the aircraft's empennage and tail surfaces.

21) *Stall Break* typically refers to the sudden change in pitch attitude as an airplane enters stalled flight. A properly loaded light airplane is designed to pitch to a lower angle of attack at the stall break. For swept wing aircraft, this does not necessarily hold true because of the effect a wing tip stall can have on the movement of the center of pressure. In a swept wing aircraft (for example), the aircraft can exhibit a nose-up moment to a higher AOA at the stall necessitating the integration of stall safety devices such as stall shakers and stick pushers to force intentional flight operations away from the region of stalled flight.

22) *Roll-off* (a.k.a. *wing drop)* describes an airplane's inherent tendency to roll at the stall. Roll-off often signals the transition to a spin.

23) *Positive roll damping* is the roll-stabilizing effect of an aircraft in normal flight. During normal flight, as an airplane rolls, the combination of forward motion *and* rolling motion results in the net relative wind meeting the down-going wing at a slightly higher angle of attack. Similarly, the net relative wind on the up-going wing strikes it at a slightly lower angle of attack. In normal flight, this results in the down-going wing having a slightly higher coefficient of lift and the up-going wing a slightly lower coefficient of lift, which tends to roll the aircraft back to level flight.

24) *Negative roll damping* is the roll de-stabilizing effect of an aircraft in stalled flight. During stalled flight, as an airplane rolls, the combination of forward motion *and* rolling motion results in the net relative wind meeting the down-going wing at a slightly higher angle of attack. Similarly, the net relative wind on the up-going wing strikes it at a slightly lower angle of attack. In stalled flight, this results in the down-going wing having a slightly lower coefficient of lift and the up-going wing a slightly higher coefficient of lift that tends to

contribute to the roll of the aircraft in the same direction. The down-going wing also produces higher drag than the up-going wing, which contributes to yaw in the same direction as the roll and can eventually contribute to the perpetuation of a spin yaw is prolonged.

25) *Post-stall gyration (PSG)* is usually used in the context of jet aircraft. PSG describes the uncontrolled motion about any or all of the flight axes immediately following a departure from controlled flight, but prior to the incipient spin phase. The uncontrolled motion of an aircraft experiencing PSG can be violent and disorienting; moreover, PSG might not follow a recognizable pattern.
26) *Deep stall* is a stabilized flight mode occurring at angle of attack on the order of 30 degrees or greater – well above the wing's critical angle of attack. Swept wing aircraft, T-tail aircraft, and aircraft loaded beyond their aft centers of gravity limits can be prone to deep stalls.
27) *A Falling Leaf (*a.k.a. *oscillation stall* or *rudder stall)* is a spin prevention exercise designed to improve a pilot's yaw awareness and footwork. The maneuver is typically entered from an intentional wings-level stall with idle power or low power. Once in stall buffet, the pilot quickly works the rudder pedals to prevent the stalled airplane from departing into a spin.
28) *Spin* aptly describes the maneuver, during which the airplane descends vertically along a tight, helical flight path while at stalled angles of attack. Smoke trailing behind a spinning airplane would etch a corkscrew in the sky. An airplane must be stalled and yawed in order to spin. Although rotation occurs around all three flight axes simultaneously, it's the combined yawing and rolling motion that give the spin its classic look.
29) *Tailspin* is a colloquial term for a spin and was used in the early years of powered flight.
30) *Autorotation* describes the self-propelling nature of a fully developed spin. The aerodynamics of stalled flight fuel autorotation through a process called "negative roll damping". Normal Flight, on the other hand, favors positive damping in roll and adverse yaw, both of which oppose the rotary motion of a spin. These different characteristics explain why spins are associated with stalled angles of attack, even though the stall itself does not generate the spin.
31) *Coupling* refers to a disturbance along one flight axis that induces a change along another axis. Yawing an airplane, for example, not only rotates the airplane about the yaw axis, but it also generates a secondary roll about the roll axis. Yaw / roll coupling is the aerodynamic factor that drives a spin.
32) *Inertia* refers to the resistance of various components of an airplane to changes in its flight path.
33) A spinning airplane rotates around its *spin axis.* The inclination of this axis and its location depend on the spin phase and on the type of spin encountered. As a typical light airplane falls into a normal spin, the spin axis rotates from horizontal to vertical (or nearly so). *Spin radius* is the distance between the airplane's spin axis and its center of gravity. The spin radius typically shrinks as the airplane progresses from the incipient spin departure into a developed spin.

34) *Upright spin* refers to a spin encountered while under a positive G loading, wherein the wing is stalled beyond its positive critical angle of attack, regardless of the airplane's attitude.
35) *Inverted spin* refers to a spin encountered while under a negative G loading, wherein the wing is stalled beyond its negative critical angle of attack, regardless of the airplane's attitude.
36) *Spin direction* is the direction the airplane is yawing relative to the pilot during a spin. Also referred to as "direction of rotation."
37) *Normal spin* refers to a spin entered with the controls applied and maintained in the following manner: power idle; ailerons neutral; rudder fully applied in the direction of rotation; elevator fully against the aft stop at or near the airplane's wings-level, +1.0 G stall speed, or against the forward stop at or near the airplane's wings-level, -1.0 G stall speed.
38) *Aggravated spin* and *abnormal spin* refer to spins wherein the controls are not positioned and/or maintained as described for the normal spin.
39) *Pro-spin* refers to airplane design elements and control inputs that contribute to spinning.
40) *Anti-spin* refers to design elements and control inputs that resist or counter spinning.
41) *Unrecoverable spin* and *inertially locked-in spin* refer to spins where the pro-spin forces and moments exceed the ability of anti-spin controls to stop the rotation. An airplane in an unrecoverable spin will continue to spin regardless of the recovery actions taken by the pilot-even if correct spin recovery actions are applied and held. Most airplanes, including a number of aerobatic/spin-approved airplanes, may have unrecoverable spin potential under certain circumstances.
42) The *incipient spin phase* is a transitional phase during which the airplane progresses from an uncoordinated (i.e. yawed) stall to pure autorotation. Incipient spins are typically pilot-driven, as pro-spin forces alone are weak and unable to sustain the rotation. Many intentional spins and competition aerobatic spins are performed in the incipient phase.
43) The *developed spin phase* represents a state of equilibrium between aerodynamic and inertial force moments acting upon the airplane. The spin is driven aerodynamically; hence the term a*utorotation.* If the controls are released, they will tend to float in spin configuration of their own accord as rotation continues.
44) The *recovery phase* is a transitional phase during which anti-spin forces and moments are at work to overcome pro-spin aerodynamics. Here, the nose attitude typically steepens. The rate of rotation may very well increase momentarily during the recovery phase.
45) In aircraft with a right turning propeller, the pilot can induce a *flat accelerated spin* by adding power and by applying aileron opposite to the direction of roll and by moving the elevator off its control stop (e.g., add power, right aileron, forward elevator during a normal upright spin to the left; add power, right aileron, aft elevator during a normal inverted spin to the right).
46) *Graveyard spin* typically refers to a fatal spin accident sequence wherein the pilot successfully recovers from the primary spin, but then reenters a secondary spin. The graveyard spin is typically driven by false or conflicting vestibulo-ocular (ear-eye) information.

47) *NASA Standard, normal recovery controls, standard spin recovery and normal spin recovery* all refer to the following specific recovery actions:

a) Power – off

b) Ailerons –neutral

c) Rudder – full opposite to the direction of yaw

d) Elevator – positive movement through neutral

Hold these inputs until rotation stops, then;

e) Rudder –neutral

f) Elevator –recover to straight and level

48) *Beggs method or Beggs/Muller* refer to the following spin recovery actions prescribed by aerobatic pilot and instructor Gene Beggs:

a) Power off.

b) Remove your hand from the stick.

c) Apply full opposite rudder until rotation stops.

d) Neutralize rudder and recover to level flight.

NOTE: This emergency spin recovery method may be effective and may be appropriate ONLY in a limited number of high performance aerobatic airplanes.

Reference:
[1]Portions excerpted with permission from: Rich Stowell, *The Light Airplane Pilot's Guide to Stall/Spin Awareness*; Rich Stowell Consulting, Ventura, CA, 2007.

CHAPTER 4: FACTORS AFFECTING DISORIENTATION

401 EFFECTS OF ACCELERATION FORCES (G-FORCES)

Positive-G

If an aircraft is accelerated in the pitching plane by increasing the angle of attack of the wings, it will move in a curved path and be subject to increased loading. This increased loading is measured in factors of "G" and is felt by the pilot as an apparent increase in weight. In straight-and-level flight a pilot experiences 1G but when he/she moves the stick back to enter a climb, loop, or banks the aircraft into a level steep turn, the pilot will experience a force greater than 1G. For example, in a 60-degree bank turn at a constant altitude, the pilot will experience 2G's and feel twice as heavy (G-factor, or load factor, of 2). If a pilot pulls 4G's in a maneuver, he will feel four times heavier (G-factor of 4).

High positive G has the following effects:

a) The blood becomes 'heavier' and tends to drain from the head and eyes to the abdomen and lower parts of the body.
b) The heart is displaced downwards by its 'increased weight,' thus increasing the distance it has to pump the 'heavier' blood to the brain and eyes.
c) Greater muscular effort is required to raise the limbs and hold the head upright.

As a result of (a) and (b), the eyes and brain could become starved for oxygen resulting in 'grey-out' followed quickly by 'black-out', and then, if the g-loading is sustained, g-induced loss of consciousness (G-LOC).

Your instructor will give you special training on how to combat these forces and show you how to work effectively in this environment. Awareness is the key to G-force management. Blackout and loss of consciousness are extremely rare and will be actively avoided during your flight training. Your instructor has thousands of hours of training in the high-G environment and will always be in the aircraft to ensure your complete safety.

<u>**NOTE**</u>: Your training will emphasize the flight envelope (i.e. limit load or G-limit) of the aircraft you typically fly. Depending upon your specific aircraft, the range of g-loading targeted for your training at APS will vary from between 2.5 G to 3.8 G. In some cases, utility and aerobatic category pilots may be requested to implement recoveries utilizing up to 4.4 G and 6.0 G respectively. To be clear: we will not be going out and pulling 8 G's just because we can. This serves no practical purpose and is of no value whatsoever in being competent in emergency maneuver training.

Grey-out is blurred vision under positive g-load accelerations; blackout is a dulling of the senses and seemingly blackish loss of vision under sustained positive g-load accelerations; loss of consciousness is characterized by a total lack of awareness or physical capability and can take up to several tens of seconds to regain sufficient awareness to effectively recover after the g-load situation is returned normal.

Due to the latent period before the symptoms of g-affects occur, it is possible to tolerate high 'G' for short periods. Illness, hunger, fatigue, lack of oxygen and the common 'hang-over' decreases tolerance. Tolerance varies with individuals, but the average pilot will black-out between 3.5 and 6G's after five seconds, 'graying-out' at about 1G less, and losing consciousness at about 1G over. During periods of grey-out or blackout, normal vision will return as soon as the high G-forces are reduced.

***Important note**: Tests have shown that under rapid G-increases of 1G/sec or greater, or when applying positive-G immediately after a maneuver involving negative-G, a pilot may lose consciousness without experiencing blackout, and that recovery may take up to thirty seconds. A lot can happen in that time. This is called the *"Push – Pull Effect"* and your instructor will be monitoring the flight to ensure that rapid G-onset is minimized. Smooth, positive control of the aircraft is the key reducing exposure to the "push-pull effect".

To help reduce the effects of positive-G, the "Anti-G Straining Maneuver" should be practiced and used whenever you are under g-loading above normal levels. It involves tightening the legs and abdominal muscles and 'bearing down' which is accomplished by trying to exhale but not allowing air to escape. This creates extra tension on the abdominal muscles and constricts the veins and arteries to minimize the amount of blood that pools in the lower body. The pilot should inhale … wait three seconds … exhale approximately 20% of lung capacity over a 1 second interval and then immediately inhale to repeat the sequence. The muscle contraction of the extremities and abdomen should be sustained throughout the G exposure.

Negative-G

When the pilot feels the G-forces acting in the reverse direction to normal (as in sustained inverted flight, an outside loop or an inverted spin), this is known as negative-G. Excess blood is forced into the head and 'red-out' occurs at about –4G to –5G. Unlike positive G's, there is no known straining maneuver that can be accomplished to counter the effects of negative G. You will be spending very little time in negative G flight. It is not the purpose of this training to teach you how to fly at negative G (or even zero G).

402 SPATIAL DISORIENTATION

The body uses three integrated sensory systems working together to determine orientation and movement in space. First, the eye is by far the largest source of information. Second, the Somatosensory System refers to the sensation of position, movement, and tension perceived through the nerves, muscles, and tendons. This is the "Seat of the pants" part of our flying. The third sensory system is the Vestibular System that is a very sensitive motion sensing system located in the inner ears. It reports head position, orientation, and movement in three-dimensional space.

During your training, getting back to the basics of flying the attitude and envelope of the aircraft will be of primary importance. Using your eyes to avoid extreme flight conditions and, if encountered, using them to regain control is also an important skill that must be learned and practiced. Statistically, ninety percent of the Loss of Control In Flight (LCIF) accidents happen in visual meteorological conditions (VMC). It's no accident that much of your training will be in VMC. Flying can sometimes cause your three sensory systems to supply conflicting information to the brain, which can lead to disorientation. During flight in VMC, the eyes are the major orientation source and usually prevail over false sensations from other sensory systems. When these visual cues are taken away, as they are in instrument meteorological conditions (IMC), false sensations can cause a pilot to quickly become disoriented.

Your training will focus on teaching you where to look, scan, and focus your eyes through the varied phases of flight in VMC. Those of you staying for the Instrument Recovery Training (IRT) will learn how to use your instruments in IMC for recognition, avoidance and recovery from extreme flight attitudes.

The vestibular system's primary purpose is to enhance vision.   The second purpose, in the absence of vision, is to provide perception of position and motion. On the ground, the vestibular system provides reasonably accurate perception of position and motion. In flight, however, the vestibular system may not provide accurate assessment of orientation. In both the left and right inner ear, three semicircular canals are positioned at approximate right angles to each other. Each canal is filled with fluid and has a section full of fine hairs. Acceleration of the inner ear in any direction causes the tiny hairs to deflect, which in turn stimulates nerve impulses, sending messages to the brain. The vestibular nerve transmits the impulses from the utricle, saccule, and semicircular canals (Figure 2) to the brain to interpret motion.

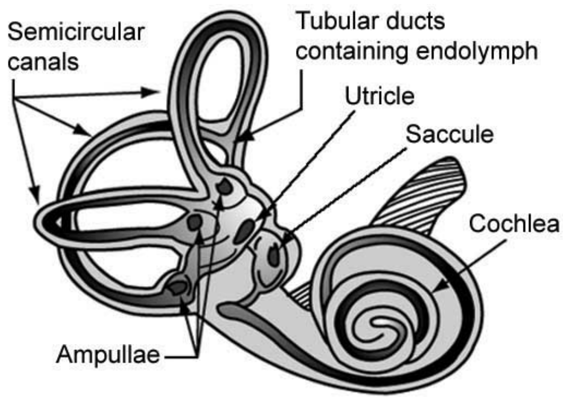


Figure 2: The Vestibular System - semicircular canals and otolith organs

Your training will concentrate on learning "when" and "if" to trust your vestibular system in order to detect an unsafe safe flight condition and effect a safe recovery, if needed.

The somatosensory system sends signals from the skin, joints, and muscles to the brain that are interpreted in relation to the earth's gravitational pull. These signals determine posture. Inputs from each movement update the body's position to the brain on a constant basis. "Seat-of-the-pants" flying is largely dependent upon these signals. The body cannot distinguish between acceleration forces due to gravity and those resulting from maneuvering the aircraft, which can lead to sensory illusions and false impressions of the airplane's orientation and movement.

As we know, some early pilots believed they could determine which way was up or down by analyzing which portions of their bodies were subject to the greatest amount of pressure. We now understand that the seat-of-the-pants "sense" is completely unreliable as an attitude indicator. However, when used in conjunction with visual references, "seat of the pants", is critically important as we learn how to use it effectively to determine angle of attack and g-loading- but not flight attitude. This will be clearly explained during the course of your training and you will apply this knowledge in several practical situations.

403 CAUSES OF SPATIAL DISORIENTATION (SD)

There are a number of conditions and factors that will increase the potential for SD. Some of these are physiological in nature (human factors) while others are external factors related to the environment in which the pilot must fly. Awareness by the pilot is required to reduce the risks associated with these factors.

Personal Factors. Mental stress, fatigue, hypoxia, various medicines, G-stress, temperature stresses, and emotional problems can reduce a pilot's ability to resist SD. A pilot who is proficient at accomplishing and prioritizing tasks with an efficient visual and instrument crosscheck and is mentally alert as well as physically and emotionally qualified to fly, will have significantly less difficulty maintaining orientation.

Workload. A pilot's proficiency is decreased when he/she is busy manipulating cockpit controls, anxious, mentally stressed, or fatigued. This leads to increased susceptibility to SD.

Inexperience. Inexperienced pilots are particularly susceptible to SD. A pilot who must still search for switches, knobs, and controls in the cockpit has less time to concentrate on visual references and instruments and may be distracted during a critical phase of flight. It is essential for an effective crosscheck to be developed early and established for all phases of flight to help reduce susceptibility to SD.

As we all know, every pilot is susceptible to SD. One would hope that the difference between an inexperienced pilot and experienced pilot is that the experienced pilot would recognize SD sooner and immediately establish priorities to reduce its affects. Denying the existence of SD by inexperienced pilots has been a major contributing factor to countless LCIF accidents.

Proficiency. Total flying time does not protect an experienced pilot from SD. More important is current proficiency and the amount of flying time in the last 30 days. Aircraft mishaps due to SD generally involve a pilot who has had limited flying experience in the past one month period. Vulnerability to SD is high for the first few flights following a significant break in flying.

Instrument Time. Pilots with less instrument time are more susceptible to SD than more instrument experienced pilots.

Phases of Flight. Although distraction, channelized attention, and task saturation are not the same as SD, they contribute to it by keeping the pilot from maintaining an effective visual or instrument crosscheck. SD incidents have occurred in all phases of flight, in all kinds of weather but are particularly prevalent during the takeoff and landing phases of flight. Aircraft acceleration, speed, trim requirements, rates of climb or descent, and rates of turns are all undergoing frequent changes. The pilot flying on instruments may pass into and out of VMC and IMC. At night, ground lights can add to the confusion. Radio channel changes and transponder changes may be directed during critical phases of flight close to the ground. Unexpected changes in climb out or approach clearances may increase workload and interrupt an efficient crosscheck. An unexpected requirement to make a missed approach or a circling approach at night in IMC at a strange field is particularly demanding. All of these factors and more can significantly increase the potential for SD.

402 PREVENTION OF SPATIAL DISORIENTATION MISHAPS

Recognize the Problem. If a pilot begins to feel disoriented, the key is to recognize the problem early and take immediate corrective actions before aircraft control is compromised.

Reestablish Visual Dominance. The pilot must reestablish accurate visual dominance. To do this, either *look outside if visual references* are adequate or keep the head in the cockpit, defer all nonessential cockpit chores and concentrate solely on *flying basic instruments*.

Resolve Sensory Conflict. If action is not taken early, the pilot may not be able to resolve sensory conflict.

Transfer Aircraft Control. If the pilot experiences SD to a degree that interferes with maintaining aircraft control, then consider relinquishing control to a second crewmember (if qualified) or, if available and capable, consideration should be given to using the autopilot to control the aircraft if the flight attitude is not severe.

403 MINIMIZING MOTION SICKNESS

During your training at APS, it's possible for the student to experience motion sickness. Besides being uncomfortable, it limits your ability to learn. At APS we have tailored our courses in consideration of the fact that some students will experience some form of motion sickness during the course. Syllabus rides are organized so that all objectives can be easily accomplished within the five-ride program, even with an average occurrence of motion sickness.

CAUSES OF MOTION SICKNESS

Apart from physical disorientation, a feeling of nausea may be brought on by:

a) Apprehension of the unknown
b) Apprehension of the sensation of feeling nauseous
c) Apprehension of making an error

WHAT TO DO ABOUT IT

First of all, do not worry about getting airsick. Even very experienced pilots can become nauseous in an unusual flight environment. Our instructors have been trained in alleviating factors that can contribute to motion sickness and will take action to help relieve any symptoms.

A positive, can-do attitude goes a long way toward ensuring your ability to obtain maximum training benefits during your training flights. Focusing on the objectives and procedures prior to and during each flight will help you prevent apprehension and motion sickness. Climb into the aircraft eager to tackle the fun-filled challenge ahead. With your understanding instructor behind you, just make the firm decision to overcome any perceived barriers and focus your mind on the task at hand.

The following is a list of things to consider before the flight to help prevent motion sickness:

a) Ensure you are well rested and hydrated.
b) Eat a light meal an hour or two before the flight.
c) With a doctor's permission, consider taking Dramamine about an hour prior to the flight if you have serious concerns related to nausea.
d) With a doctor's permission, consider obtaining a motion sickness "patch".

The following is a list of things to consider airborne to prevent and alleviate motion sickness:

e) Ensure your air vents are wide open and directed toward your face.
f) Take slow, deep breaths.
g) Keep your eyes outside the cockpit focusing on the horizon.
h) Ask your instructor for a break.
i) Ask to take control of the aircraft and just fly an easy, smooth flight path.
j) Focus on the task at hand. Force your mind to think of something else besides your stomach.
k) Ask questions. Make comments. Be pro-active in your training; *do not allow yourself to become passive.*

l) If sickness becomes inevitable, do not be afraid to use the provided airsick bag. This is rare but it does happen on occasion. You will feel much better once you have released that menacing feeling.

EMERGENCY MANEUVER TRAINING

CHAPTER 5: EMERGENCY MANEUVER EXERCISE GUIDE

THE "SAY & DO" TECHNIQUE

During your training, you will be required to memorize and recite the recovery procedure appropriate to the flight condition you are faced with (there are only two procedures). You will be expected to say the recovery step (i.e. "Push") and then consciously make the appropriate control input for that step. Before further control inputs are made, you will say the next step in the recovery (i.e. "Power") and then consciously make the appropriate control input. You should not give us a running narrative of what you are doing on the recovery (i.e. "I am now relaxing the backpressure…" or "Okay, here I go…hmmm...I'm pushing the throttle forward"). Giving us a running narrative only serves to slow you down during the recovery. Nor should you remain silent while performing the recovery procedure.

Please do not accept the attitude that you cannot talk and fly at the same time. If you fly airplanes and talk to ATC, then you already have the necessary cognitive abilities needed to successfully accomplish this aspect of training.

The speed of your recovery is NOT the primary concern while learning these procedures. ACCURACY of each step and the SEQUENTIAL application of the recovery steps are the top priorities. Blending of control inputs or allowing your control inputs to get ahead of your mouth will be discouraged. Once you can successfully "Say & Do" each of the recovery steps, then and only then will the speed or efficiency of the recovery be emphasized. The accuracy of the recovery will always take precedence over the speed of the recovery.

WHY IS THIS IMPORTANT?

Recovering from stalls and spins requires the pilot to make control inputs that are contrary to the normal reflexes. A few common reflexive actions observed during stall and spin training include the following:

- Freezing on the controls
- Holding the breath
- Involuntary swearing and sweating
- Continuing to hold the elevator control aft because of a dramatic, nose-down flight attitude
- Inadvertently applying opposite aileron as a wing dips at the stall break, or as the airplane starts to roll into an incipient spin
- Wildly shoving the elevator control forward
- Leaning the body away from the spin direction
- Pressing both legs against the rudder pedals, making it difficult to fully apply the opposite rudder
- Once applied, allowing recovery inputs to drift to other positions before the airplane stops rotating

Interestingly, several of these reflex actions are responsible for causing inadvertent stall and spin departures in the first place. These are not just the reactions of low-time pilots during their first encounters with stalls and spins, but also of experienced pilots - even highly trained test pilots - who have become confused or excited during exposure to stall/spin scenarios.

Simply put; stall and spin recovery actions are counterintuitive. Hence, they must be learned well enough to supplant reflexive actions. In the early stages of stall/spin training, the mind must consciously direct the body to make the appropriate inputs. Only repeated and structured practice, paying close attention to the physical details, can reduce the amount of mental effort needed to make the body react with the appropriate inputs in a crisis. This is no different from any other mechanical skill requiring a complex and precise set of body movements. In an airplane, though, the difference literally could be life or death.

Think of these procedures as red boldface emergency checklist procedures. If you had an engine fire, you would do the immediate action items first and in order. You would not start at step #10 then go to step #2 and so forth. That would potentially aggravate the situation or, at the least, not put out the fire completely. A checklist, by design, is to be done in sequence. This is the only way the pilot can ensure that a task is accomplished.

Not only is saying the step beneficial for directing proper control inputs but it is sound Crew Resource Management (CRM) procedure. Your fellow crewmember can be kept "in the loop" of what you are trying to accomplish during the recovery.

This may seem strict or "very picky" to some. No so, it is simply uncompromising and has demonstrated to yield the most effective results and to maximize skill retention. Not only is your life potentially at risk but also the lives of your passengers. We have many years and thousands of hours of instructing pilots with vast amounts of NASA/NTSB reports to back our teaching methods. It is simply a matter of attitude. If you come with a positive attitude and open mind, you will gain the maximum benefit from this course and have fun doing it. Remember, a true professional aviator knows aviation is about life-long learning.

PSSA✓ : PRE-STALL / SPIN AEROBATIC CHECK

1) Prior to every aerobatic maneuver or sequence of maneuvers, the pilot in command will ensure that the airspace is clear of traffic and that a Pre-Stall-Spin-Aerobatic (PSSA) check is carried out. This check will consist of:
   a) **PSSA (Pre-Stall-Spin-Aerobatic) Check**
      i) Altitude
      ii) Area
      iii) Loose Articles
      iv) Temperatures and Pressures
      v) Fuel & Engine Parameters
      vi) Clearing turns appropriate to the maneuver (in order of preference):
         (1) 2 X 90 degree level turns or 2 X 90 degree wing-over (Lazy Eight-like) maneuvers
         (2) 180 degree turn

2) It is the instructor's responsibility to ensure that each student is aware of all safety factors related to aerobatic flight. Although this document covers the key elements of each maneuver, every pilot must be ready to "centralize the controls and analyze" any peculiar situation whenever the maneuver or sequence of maneuvers becomes unfamiliar. Botched maneuver recovery techniques will be taught throughout the course.

EXERCISE #1: HANDLING / ATTITUDES / STEEP TURNS

OBJECTIVE: Familiarization with basic flight characteristics and control forces of the Extra 300L.

WHY? This is the first step in the building block approach of the EMT Syllabus. Becoming acquainted with the control stick (as opposed to a yoke) and its associated control forces will allow for more accurate control inputs during maneuvers.

NOTE: It must be understood that even though the control forces are considerably lighter than most aircraft, there will be no flight characteristics or procedures introduced that will be unique to the Extra 300L.

WHAT IS IT? You will fly level turns using 30/45/60° angle of bank (AOB). Climbs and descents using various power settings will also be flown.

KNOWLEDGE TEST Does a 60° AOB level turn at 100 kts require the same G-loading as a 500 kt level turn at 60° AOB?

From the perspective of the pilot sitting in the aircraft:

- What type of movement is roll?
- What type of movement is yaw?
- What type of movement is pitch?

HOW

- PSSA

- ✈ Establish level flight at 120 kts with power stabilized.
- ✈ **Coordinated Turns:** Roll into 30° AOB turns while maintaining altitude. Identify the role of ailerons, elevator and rudder during turns. Emphasize coordination of aileron and rudder when changing the bank angle. Crosscheck resulting performance with the instruments.
- ✈ **Steep Turns:** Use pitch, power and bank corrections to maintain altitude and constant airspeed with bank angle set at 45 - 60 degrees. Note the relationship between bank angle and rate of turn. Also note the G-loading required to maintain level flight with varied AOB.

RECOVERY

- ✈ As you return to level flight, note the decreased G-loading compared to turning in flight.

COMMON ERRORS

- Failing to add rudder when rolling the aircraft. (coordinated turn)
- Failing to release/coordinate rudder pressure when AOB is established.
- Failing to maintain the flight attitude relative to the horizon (backpressure) during the steep turns.
- Failing to add power during the steep turn to compensate for increased drag.
- Failing to coordinate rudder pressure in response to torque effects during slow flight.

EXERCISE #2: DUTCH ROLLS

OBJECTIVE: Demonstrate the importance of coordinated rudder and aileron inputs in common turning maneuvers.

WHY? Coordinated control inputs can help avoid many unusual flight situations that could progress to dangerous flight attitudes or loss-of-control flight conditions.

WHAT IS IT? The Dutch Roll is a two-part flight demonstration. The first part demonstrates the effect of aileron inputs on yaw *without* the use of rudder. The second part demonstrates the effect of aileron inputs *with* the use of coordinated rudder.

KNOWLEDGE TEST

- What is adverse yaw? In what common handling exercises, do you expect to have to correct for it?
- Is there adverse yaw once the angle of bank has been established and ailerons neutralized in medium bank turns (20 – 45° AOB)?
- Why is a rudder correction required as the airspeed reduces on prop aircraft?
- Does rudder correct for each of; gyroscopic effect, slip stream, and P-factor on prop aircraft?

HOW PERFORMED:

- PSSA
- **Dutch Roll**: from a cruise attitude and about 80 kts, pick a visual reference point straight over the nose of the aircraft on the horizon (the instructor will discuss this point of reference during the briefing).
- Part 1: While holding (locking) the rudders in the neutral position, using only aileron input, roll aircraft from side to side (approximately +/- 30 degrees of bank) at a moderate rate. Note the side-to-side movement of the nose as the roll is generated. Note when the aircraft rolls right, the nose yaws left and vice versa. Also note the substantial swings of the ball. This adverse yaw is generated by induced drag differential between the ailerons.
- Part 2: Once again, roll the aircraft using aileron from side-to-side at a moderate rate but use rudder inputs to now keep the nose pointed

straight ahead at the ground reference point. If rudder is coordinated properly, the nose will only rotate about the longitudinal axis of the aircraft. Yaw will be nonexistent. Note the lagging effect of the ball.

COMMON ERRORS:

- Rolling too quickly
- Part 2: Failing to apply coordinating rudder effectively as aileron is applied

EXERCISE #3: ZOOM MANEUVER

OBJECTIVE; Demonstrate controllability at airspeeds less than the 1G stall speed.

WHY? Although there is a specified 1G stall speed for every aircraft (~60 knots in the Extra 300L), any aircraft is capable of flying controllably below the 1G stall speed without exceeding critical angle of attack (AOA).

Stall speed is a function of AOA and an aircraft can stall at any speed if critical AOA is exceeded. A critical action step in Stall Recovery involves immediately reducing the angle of attack. If we carry this to a logical conclusion, we should be able to fly below the 1G stall speed without stalling if we are constantly commanding less than critical AOA at any airspeed or flight attitude.

WHAT IS IT? The zoom maneuver is an altitude-gaining maneuver where the nose of the aircraft is pitched very nose-high and then gently unloaded to demonstrate controllability at airspeeds less than the 1-G stall speed.

KNOWLEDGE TEST

- Is the Coefficient of Lift a function of airspeed or angle of attack?
- Does Coefficient of Drag increase or decrease with increasing angle of attack?
- Is pulling G's (example, 60° AOB level turn at 2 G's) while sustaining level flight an indication of increased angle of attack?

HOW

- PSSA
- **Zoom Maneuver**: start at approximately 120 kts and full power.
- Pitch the nose 70 degrees nose-high.
- At 70 kts, gently relax back pressure to a attain a light positive G and nose the aircraft over. Continue to feed forward pressure on the control stick to feel light in the seat which equates to approximately + ¼ to ½ G's. Note the airspeed will continue to drop well below the 1 G stall speed of 60 kts (40 kts or less is not unusual).
- Be careful not to push too hard or you will go to zero or negative G and be pushed out of your seat.

- ✈ While continuing the unload the nose of the aircraft back to the horizon, gently roll the aircraft back and forth using aileron to about 15° AOB each direction to demonstrate the positive stability of aircraft control. As the nose of the aircraft pitches down below the horizon, allow the airspeed to increase above the 1G stall speed (60+ knots) and gently effect recovery to level flight.

COMMON ERRORS:

- ✈ Not maintaining a positive push on the elevator to hold light "G" until the nose is below the horizon and airspeed is increasing above 60 kts.

EXERCISE #4: SLOW SPEED MANEUVERING

OBJECTIVE: Gain awareness of the characteristics of slow flight and how to effectively control altitude, airspeed and yaw in this regime.

WHY? Many portions of normal flight in the traffic pattern or recoveries from an emergency or unusual attitude may involve slow flight.

WHAT IS IT? Slow flight is defined as "flight in the speed range from just below 1-G maximum endurance speed to just above the 1-G stall speed." It can be encountered in all flight attitudes. Planned or inadvertent entry into 'slow flight' is one indication of an imminent stall.

KNOWLEDGE TEST

- When can slow flight be encountered?
- Are we close to critical angle of attack during slow flight?

HOW - PSSA

- Pull the power to idle and allow the aircraft to decelerate to 70 kts while holding altitude.
- Approaching 70 kts, set power to stabilize at 70 kts. Keep in mind the aircraft is in the region of reverse command and will require higher power settings to sustain slower airspeeds while holding a constant altitude.
- Use pitch to control airspeed and vary power as necessary to hold altitude.
- Scan outside to focus on flying the aircraft attitude while referencing the airspeed indicator and altimeter.
- Note the diminishing response of flight controls, increased sustained angle of attack and change of aircraft noise. Also, note the increased right rudder pressure needed to center the ball due to P-factor and slipstream.
- After straight and level flight, practice gentle turns, climbs and descents by adding or subtracting power while using pitch to control airspeed.

RECOVERY

- Increase power while reducing angle of attack to re-establish cruise.

COMMON ERRORS

- Failing to scan outside and not using the aircraft attitude/pitch for airspeed control.
- Failing to add right rudder pressure due to increased torque effects.

EXERCISE #5: UNACCELERATED STALLS

OBJECTIVE: Recognize an imminent unaccelerated (1G) stall, the stall itself and then use the correct recovery to regain aircraft control and minimize altitude loss.

WHY? Effective recognition and expeditious recovery from a stall reduces the chances of the aircraft entering a spin, developing an adverse flight attitude or generating an aggravated stall.

WHAT IS IT? An aircraft is in a stall when flown at an angle of attack greater than the critical angle of attack. This flight condition results in a loss of effective lift, roll stability, and an increase in drag.

KNOWLEDGE TEST

- Which flight control directly influences angle of attack?
- What are the stall characteristics of the following wing designs? Consider; stall progression, aileron effectiveness and handling characteristics.
  a. Rectangular Wing
  b. Moderately Tapered Wing
  c. Swept Wing
- When does an aircraft experience negative roll damping?
- Should ailerons be used in a Stall Recovery? If so, when?

HOW PSSA

Power Off Stall

- With power at idle, allow the airspeed to decelerate while maintaining altitude.
- Simulating we are distracted, focus your eyes outside the cockpit on the developing flight attitude while continuing to feed back pressure until the aircraft stalls.
- Execute a Stall Recovery (below) when directed by the instructor.

Power On Stall

- The instructor will set about 20” MP on the engine.
- Bring the nose up to about 20° in a climbing turn (feet on the horizon). While simulating being distracted, the airspeed will begin

to decay. At a constant 20° nose up flight attitude with airspeed decreasing, the AOA will be increasing.

- Hold this attitude and bank angle until the stall. Note, the aircraft may roll one direction or the other at the stall.
- Execute a Stall Recovery (below) when directed by the instructor.

STALL RECOVERY

- Stall recovery is a Say & Do technique. You will first say the step (ie. **PUSH**) and then move the flight controls as appropriate for the step before moving on to the next step. Here is the recovery:
- **PUSH**: Say, **"Push":** Release back pressure on the elevator to allow the aircraft to unload and seek a lower angle of attack.
- **POWER**: Then say, **"Power":** Smoothly but aggressively add full power (usually). Increased power will help drive the aircraft away from the stall and preserve altitude irrespective of nose position. Exceptions exist where power should be set to idle and these will be discussed in ground training.
- **RUDDER**: Then say, **"Rudder":** While referencing outside the cockpit VMC or the attitude indicator IMC, use rudder to <u>coordinate</u> the aircraft. Do NOT reference the ball as it is completely unreliable. Use your senses to determine the existence of yaw. If the aircraft is still rolling then "pop" opposite rudder to stop the roll. You are not to attempt to roll the aircraft using the rudder. The primary purpose of rudder is to cancel yaw. Rudder will be used to cancel yaw during all recoveries.
- **ROLL**: Then say, **"Roll":** Now is the time to use coordinated ailerons and rudder to expeditiously roll the aircraft to a level flight attitude. You should not pull back on the elevator until the wings are within 30° of level flight.
- **CLIMB**: Then say, **"Climb":** If the airspeed is still below V_A, you should smoothly but aggressively pull just short of stall (in and out of the horn, shaker, or stall light) to maximize lift thus minimize altitude loss in the dive recovery. If the airspeed is greater than V_A, smoothly but aggressively pull to the limit load of the aircraft and consider a power reduction to idle. You should initially set a Vy pitch attitude (~10° nose up in the Extra 300) and then confirm positive rate on the altimeter or VSI.

COMMON ERRORS

- Using ailerons at the stall break to attempt to correct generated roll.
- Adding too much forward pressure (dumping the nose) at the stall break.
- At the stall break, releasing the backpressure but immediately reapplying backpressure resulting in possible secondary stall (pumping the stick).
- Failing to apply full power.
- Looking at the ball and chasing it with rudder application.
- Trying to level the wings with rudder vice ailerons.
- On the "Climb" step, failing to set the Vy attitude and confirming a positive rate of climb.

EXERCISE #6: FALLING LEAF (RUDDER STALL EXERCISE)

OBJECTIVE: To demonstrate the dynamic instability of an aircraft in stalled flight and the proper use of rudder to cancel yaw.

WHY? Demonstrating the unstable nature of stalled flight due to negative roll damping will emphasize the critical importance of avoiding stalled flight and expediting a thorough recovery should a stall be encountered.

WHAT IS IT? The Falling Leaf is a very dynamic exercise where the aircraft is held in a full stall with idle power. The rudder is used correct any developed yaw. The aircraft will be losing altitude during this maneuver.

KNOWLEDGE TEST

- What aerodynamic factor causes negative roll damping?
- Is the aircraft positively or negatively roll damped in a stall?
- Are ailerons effective in a stall? If so, when? Why or why not?
- What is the most effective flight control for reducing angle of attack?
- Can an aircraft be stalled in any flight attitude? How about inverted?

HOW - PSSA

- From level flight, set idle power and allow the aircraft to decelerate to a normal wings-level power-off stall. Approaching the stall, begin "running" on the pedals to get your feet moving. Your goal will be to aggressively cancel any yaw/roll that is developed in the exercise. Essentially, you will be acting as a manual yaw damper.
- At the stall, pull and hold the control stick full aft with neutral ailerons and keep the ailerons neutral throughout the maneuver until recovery. The Instructor will help hold the stick back. This will ensure the aircraft remains in a stalled condition throughout the exercise.
- Now, use all available rudder to cancel yaw. If the aircraft rolls right then full left rudder will be needed to stop the roll. Because of negative roll damping, once the roll begins, opposite rudder is needed to stop the roll. Note the marked instability of the aircraft in this stalled condition. This is due to *negative roll damping*. Also, take note of

- the pitch oscillations. Continue this "rudder dance" until the Instructor terminates the exercise by stating, "recover".

- When instructed, aggressively (but not excessively) reduce angle of attack with forward elevator movement. This will reduce the angle of attack and recover the aircraft from the stall.
  Note the immediate stability of the aircraft as it regains normal AOA (i.e. $<AOA_{critical}$)
- The result will be a nose down attitude, possible over-banked, but in normal (unstalled) flight. Notice the immediate roll stability due to positive roll damping in normal flight. Continue with the remainder of the Stall Recovery.

COMMON ERRORS

- While in stalled flight, holding the rudder in one direction too long.
- Not using sufficient rudder to stop the rolling moment.
- Applying the rudder in the wrong direction

EMERGENCY MANEUVER TRAINING

EXERCISE #7: THE AILERON ROLL

AEROBATICS: All aerobatics taught during APS Emergency Maneuver Training courses (URT/EMT/IRT) are used as tools to develop skills to recover an aircraft from adverse flight conditions. In these specialized courses of training, we are not attempting to teach how to fly perfect aerobatic maneuvers, give significant emphasis to the ideal shape of the maneuver nor do we express measurable concern to maintaining specific lines. The instructor will state the correlation to emergency maneuver training for each aerobatic maneuver exercise. Certain aerobatic maneuvers give pilots exposure, awareness and skill-development opportunities that cannot be efficiently developed in any other way. Note: If you are participating in an aerobatics-specific course at APS, we will provide exact detailing of the "how to" of competition-standard aerobatic maneuvering during your ground training complemented by other published references.

OBJECTIVE: To learn to roll an aircraft in an effective manner to re-orient the lift vector while minimizing altitude loss.

WHY? The aileron roll exposes the pilot to all possible angle of bank attitudes in a single maneuver. Over-banked situations, such as those caused by wake turbulence, can lead to tremendous altitude loss if the aircraft is not rolled upright effectively.

WHAT IS IT? An aileron roll is an aerobatic maneuver in which the aircraft is rolled 360 degrees around its longitudinal axis as illustrated below. This maneuver is accomplished by use of coordinated ailerons and rudder while keeping AOA low and positive.

KNOWLEDGE TEST What is the most effective flight control to roll an aircraft in normal flight?

Why do we need to reduce angle of attack before rolling when over-banked?

How do you know if you have pushed (unloaded) enough before rolling?

How long do you hold the push?

HOW

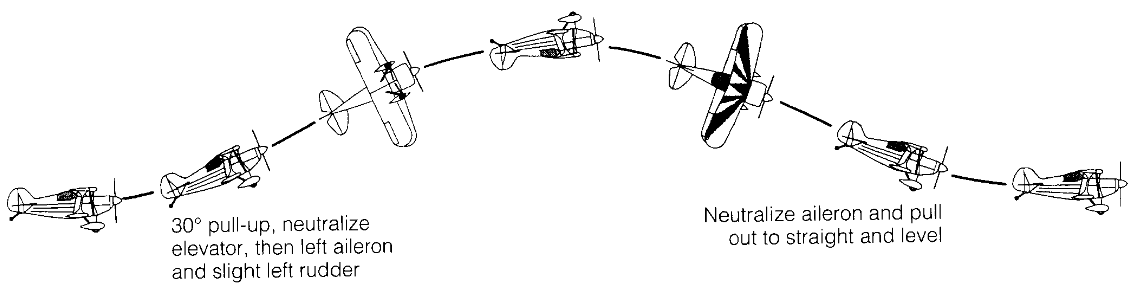
- PSSA
- ✈ Establish cruise speed of 120 kts with power stabilized.
- ✈ Pull nose up about 20°(feet on the horizon).
- ✈ Say "Push", then push slightly until you feel light in the seat. This ensures a decreased AOA.
- ✈ Say "Roll", then use coordinated aileron and rudder to roll the aircraft in one direction while holding the slight push. Look straight ahead at distant horizon.
- ✈ Watch the world go around.
- ✈ When the wings are back to level flight, stop the roll.
- ✈ Now apply backpressure to return the nose to level flight.

COMMON ERRORS

- ✈ Failing to push slightly before beginning the roll.
- ✈ Failing to hold the slight push throughout the roll.

- Over-pushing through the inverted flight attitude
- Pulling when approaching the inverted flight attitude

Fig. A-11 The Aileron Roll.



20-degree pull-up, then slight push of elevator, then left aileron and slight left rudder

Neutralize aileron when wings are level and pull out

EMERGENCY MANEUVER TRAINING

EXERCISE #8: THE INSIDE LOOP

AEROBATICS: All aerobatics taught during APS Emergency Maneuver Training courses (URT/EMT/IRT) are used as tools to develop skills to recover an aircraft from adverse flight conditions. In these specialized courses of training, we are NOT attempting to teach how to fly perfect aerobatic maneuvers, give significant emphasis to the ideal shape of the maneuver nor do we express measurable concern to maintaining specific lines. The instructor will state the correlation to emergency maneuver training for each aerobatic maneuver exercise. Certain aerobatic maneuvers give pilots exposure, awareness and skill-development opportunities that cannot be efficiently developed in any other way. Note: If you are participating in an aerobatics-specific course at APS, we will provide exact detailing of the "how to" of competition-standard aerobatic maneuvering during your ground training complemented by other published references.

OBJECTIVE

To learn proper G-loading and angle of attack control through changing speed conditions.

WHY?

This maneuver exposes the pilot to all possible pitch attitudes and teaches the pilot how to recognize the maximum structural load-loading of their aircraft. The pilot will continue to develop 3-dimensional awareness while practicing dive recovery techniques during the last ½ of the maneuver.

WHAT IS IT?

From an upright level flight condition, the Inside Loop is a 360 degree turn in the vertical plane of motion with the elevator being the primary flight control.

KNOWLEDGE TEST

- ✈ If you increase the G-loading of an aircraft, does the angle of attack increase?
- ✈ Can you pull as many G's as you want at any speed?
- ✈ How many G's are available at maneuvering speed (V_a)?
- ✈ What is your aircraft's maneuvering speed (V_a)?
- ✈ What is the limit load of your aircraft? Why?
- ✈ Can you stall the aircraft when operating above maneuvering speed?

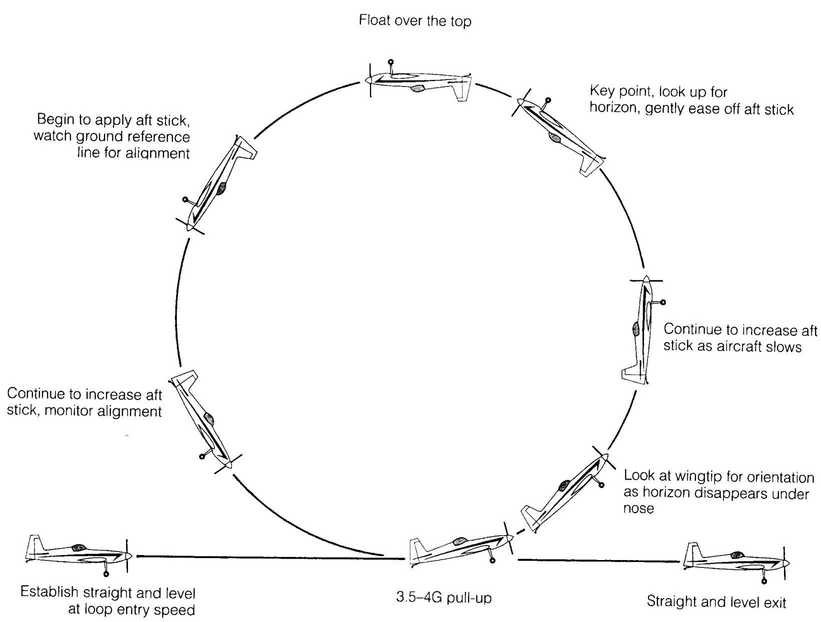
HOW

- PSSA

- ✈ Set full power and 160 kts in level flight.
- ✈ Smoothly apply backpressure until you feel the G-loading your instructor has requested (typically this will be the limit load of your aircraft). From his G-meter, the instructor will announce the G-loading throughout the maneuver.

- ✈ Continue adjusting backpressure to hold the target G-loading until the horizon goes out of sight. Now look right or left at the wing in relation to the horizon in order to keep situational awareness throughout the loop.

- As airspeed bleeds off and your available G-loading decreases, adjust your pull to maintain a constant pitch rate over the top of the loop. Additional right rudder pressure will be necessary due to increased torque effects.
- Approximately 30-45° prior to reaching the wings-level inverted flight attitude begin looking forward over the nose to find the horizon.
- Continue adjusting backpressure to maintain a constant pitch rate.
- On the backside of the loop (i.e. nose pointing at the ground), airspeed will begin to increase rapidly. Adjust backpressure to once again pull the requested G's as the maneuver is completed and the aircraft is returned to level flight.



COMMON ERRORS

- Failing to reference the horizon throughout the maneuver to maintain orientation.
- Failing to keep backpressure on the elevator as the aircraft becomes inverted (over the top of the loop).
- Failing to adjust the back pressure (pull) to the simulated limit load of the client's aircraft as airspeed accelerates above Va on the backside of the loop (dive recovery)

EXERCISE #9: INVERTED FLIGHT

AEROBATICS: All aerobatics taught during APS Emergency Maneuver Training courses (URT/EMT/IRT) are used as tools to develop skills to recover an aircraft from adverse flight conditions. In these specialized courses of training, we are NOT attempting to teach how to fly perfect aerobatic maneuvers, give significant emphasis to the ideal shape of the maneuver nor do we express measurable concern to maintaining specific lines. The instructor will state the correlation to emergency maneuver training for each aerobatic maneuver exercise. Certain aerobatic maneuvers give pilots exposure, awareness and skill-development opportunities that cannot be efficiently developed in any other way. Note: If you are participating in an aerobatics-specific course at APS, we will provide exact detailing of the "how to" of competition-standard aerobatic maneuvering during your ground training complemented by other published references.

OBJECTIVE: Used as a practical method of "de-programming" a pilot's common reaction of "pulling to bring the nose up" when presented with an over-bank or inverted flight condition.

WHY? Situations such as wake turbulence encounters or cross-controlled stalls can quickly lead to inverted flight situations with little or no warning. It is vitally important to have awareness of how to maintain aircraft control and situational awareness while recovering to level flight.
NOTE: It is not our intention to teach you how to maintain negative G's while in inverted flight in your aircraft. This is only an exercise in *eliminating* a common instinctual reaction (ie. pulling) that could have disastrous results.

WHAT IS IT? Sustained flight upside down, while holding altitude and keeping the aircraft under complete control.

KNOWLEDGE TEST

- If you pull back on the elevator while inverted, what will that action do to the dive angle?
- If you push on the elevator such that you rise out of your seat against your harness, what have you done to the angle of attack?
- Are most aircraft designed to fly with sustained zero or negative G's?

HOW

- PSSA
- Establish cruise speed of 120 kts with power stabilized.
- Pull nose up about 20°(feet on the horizon).

- Then push slightly until you feel light in the seat.
- Then use coordinated aileron and rudder to roll the aircraft in one direction while holding the slight push.
- As the aircraft approaches 90° AOB, begin pushing even harder to hold the nose above the horizon. Stop your roll when you have achieved wings-level inverted flight. You will be in your straps hanging from your hips under negative 1-G.
- After stabilizing and holding altitude, use aileron to roll upright while continuing to hold forward pressure. When the aircraft passes through 90° AOB, begin to apply back pressure to resume positive G's in upright level flight.

COMMON ERRORS

- Failing to push slightly before beginning the roll.
- Failing to hold the slight push throughout the roll.
- Failing to push even harder (feeling of coming out of your seat) as the angle of bank passes 90° on its way to inverted.
- Failing to hold the push once inverted. The nose should remain above the horizon.

EXERCISE #10: NEGATIVE ROLL DAMPING EXERCISE

OBJECTIVE: Introduce the stability differences of positive roll damping verses negative roll damping in their respective flight conditions.

WHY? It is important to understand that normal flight (unstalled) provides positive (good) stability in the roll axis. However, stalled flight (AOA > Critical) provides a negative (deteriorating) stability in the roll axis that can lead to extreme flight attitudes or conditions.

WHAT IS IT? This is a two-part demonstration. The first part demonstrates positive roll damping while in normal flight (unstalled). The second part demonstrates negative roll damping while in continuous stalled flight.

KNOWLEDGE TEST

- If a yawing moment is applied to an aircraft, which wing (up-going or down-going) has the greater angle of attack local angle of attack?
- If a wing has a greater angle of attack than the other wing, does it have a corresponding increase in lift in normal flight? In stalled flight?
- While in normal flight, if an aircraft begins to roll because of aileron input or yaw, will the aircraft continue to roll if the aileron input or yaw is removed?
- While in stalled flight, if an aircraft begins to roll because of aileron input or yaw, will the aircraft continue to roll if the aileron input or yaw is removed?
- Is aileron effect reversed in stalled flight?
- Should we use ailerons to control roll in a stalled flight condition?

HOW - PSSA

- <u>Part One</u>: Establish stabilized normal flight. Any speed above the stall is acceptable.
- Apply momentary aileron input (a hit-and-release on the stick in either direction) to begin an aircraft roll.
- Once the roll has started, quickly release the aileron input allowing the ailerons to neutralize on their own. Note the aircraft ceases to roll. This is due to *positive roll damping*.
- Repeat the exercise using a short and brisk application of rudder and note the results.

- Part Two: At idle power, decelerate the aircraft for a level power-off stall.
- At stall, pull and hold the control stick full aft which keeps the aircraft in a continuous stalled flight condition.
- Press and hold full rudder in either direction. The aircraft will begin to roll due to the generated yaw.
- After aircraft starts to roll, neutralize the rudders.
  NOTE: the aircraft continues to roll due to negative roll damping.
- After another 90 - 180° of roll, completely relax the backpressure on the stick allowing the aircraft to break the stall. NOTE: the aircraft immediately stops rolling due to positive roll damping in normal (unstalled) flight regardless of flight attitude.
- Now use ailerons to level the wings (if not already) and pull out of the dive.

COMMON ERRORS

- Failing to hold the elevator fully aft.
- Giving up while in the maneuver.

EMERGENCY MANEUVER TRAINING

EXERCISE #11: SKIDDED TURN STALLS

OBJECTIVE: Perform proper recognition, avoidance and recovery techniques from skidded turn stalls. Observe characteristics of skidded turn stalls and their effects.

WHY? It is important to understand that there is no practical benefit to doing a skidded turn. The potential altitude loss could be disastrous if an aircraft is stalled during the skid. The key ingredients for spin entry are contained in a skidded turn stall.

WHAT IS IT? An uncoordinated maneuver where there is excess yaw in the direction of the turn. This is normally pilot-induced. The most common phase of flight for this error is when turning base to final and a runway overshoot is developing. If the pilot refuses to increase his angle of bank or decides against initiating a go-around, he will typically try to increase his turn rate by adding inside rudder. (See discussion of uncoordinated turns.) NOTE: *A skidding turn can always be recognized by the movement of the ball drifting off center toward the high wing in a steady-state unstalled turn*.

KNOWLEDGE TEST

- ✈ What is the primary purpose of the rudder?
- ✈ Does a skidded turn help us to turn quicker?
- ✈ Is there any aerodynamic benefit to a skidding turn?
- ✈ How do you know if you are in a skidded flight condition?
- ✈ Is there much warning of a stall in a skidded turn?
- ✈ Will the aircraft roll in a skidded turn stall? If yes, which way?
- ✈ If the aircraft rolls in this stalled condition, will it keep rolling? Why?
- ✈ Will there be much altitude lost in a skidded turn stall?

HOW - PSSA

- ✈ Starting at 80 kts and idle power, establish a 30° AOB coordinated turn while holding altitude.

- Simulate letting the aircraft overshoot the runway centerline and feed additional rudder in the direction of the turn to tighten the turn while keeping bank and pitch angle constant.
- Rudder input will tend to slice the nose even lower and we will respond with a stick back input to keep the nose up, putting the aircraft closer to critical AOA.
- Rudder input will also induce the outer wing to travel faster, generating more lift, and therefore, rolling the aircraft further into the turn. We will compensate by feeding in opposite aileron to maintain bank angle.
- In compensation for the applied rudder, we have entered a cross-controlled flight condition and increased angle of attack.
- The resulting lack of turn performance will cause the aircraft to continue to overshoot the runway. Typically, the normal pilot reaction is to do more of everything by increasing all control inputs, starting with more inside rudder and associated cross-control inputs (inappropriate), to attempt to make the final turn work.
- As backpressure is increased further, a sudden stall will ultimately induce a rolling moment causing the aircraft to roll toward the inside (low) wing. When the roll is detected, immediately initiate a Stall Recovery as outlined below.

RECOVERY

- Normal Stall Recovery (See Exercise #5)
  - Push
  - Power
  - Rudder
  - Roll
  - Climb

NOTE: Altitude loss during a skidded turn Stall Recovery can be greater than 600’ depending on the type of aircraft and the amount of uncoordinated rudder used in generating the stall.

COMMON ERRORS

- At the stall, using ailerons to try to stop the roll during the “Push” step.

- During the “Push” step, applying too much forward pressure resulting in a “dump” of the nose and excessive loss of altitude.
- During the “Rudder” step, looking at and chasing the ball.
- If the aircraft is inverted while doing the “Roll” step, rather than rolling first upright, the typical instinctual pull will result in tremendous altitude loss.

See Exercise 14: Split-S

EXERCISE #12: SLIPPING TURN STALLS

OBJECTIVE Perform a proper entry into a slip. Practice proper recognition, avoidance, and recovery from slipping stalls. Observe characteristics of slipping turn stalls and forward slipping stalls and their effects.

WHY? The slipping turn is a useful maneuver for losing altitude quickly, particularly if high on the landing approach. Also, the slipping turn can be useful when coping with in-flight control failures such as split flaps, jammed ailerons or a jammed rudder. The potential altitude loss could be catastrophic if an aircraft is stalled during the slip. *The key ingredients for spin entry are potentially contained in a slipping turn stall despite that fact that, aerodynamically speaking, slipping flight is inherently stall resistant.*

WHAT IS IT? A slipping turn is an uncoordinated turn due to excess yaw opposite to the direction of the turn. The inside wing points toward the ground while the deflected rudder points skyward, opposite to the direction of the turn. NOTE*: A slipping condition is recognized by the ball drifting out of center toward the **LOW** wing in steady-state unstalled flight.*

KNOWLEDGE TEST

- ✈ Is a slip a valid piloting technique?
- ✈ In a forward slip, where do you expect the ball to be in relation to your wings?
- ✈ Why do we add airspeed on final approach to compensate for crosswinds and/or gust factor? (Think of control inputs for crosswind landings)
- ✈ If we stalled the aircraft in a slip, would the aircraft roll? If yes, which way? Are there exceptions?
- ✈ If the aircraft rolls in this condition, would it keep rolling? Why?

HOW - PSSA

Forward Slips

- ✈ We will simulate a crosswind landing approach with the aircraft being high on final. At idle power and about 80 kts, begin by lowering a wing about 10-20°. Then add opposite rudder. Now check that the ball has drifted to the low wing. The amount of rudder you apply will determine how much angle of bank you will need to keep the aircraft tracking straight ahead. Allow the nose to drop slightly in order to preserve airspeed.

- **Forward Slip to a Stall:** Now we will simulate getting distracted and losing track of airspeed / nose attitude. We will bring the nose up to the horizon and allow the airspeed to bleed off. As airspeed bleeds off, continue to feed in backpressure on the elevator. Airframe buffeting will begin as the critical angle of attack is approached. When the aircraft stalls, it will roll away from the ball and in the direction of the applied rudder. When the roll is detected, immediately initiate a Stall Recovery as outlined below.
  NOTE: During your training, notice how much more cross-control input is required in a slip to get the aircraft to stall as compared to a skidded stall.

Slipping Turns

- We will simulate an idle-power turn to final while being too high on the approach. At idle power and in a coordinated 30° AOB, apply opposite rudder (high rudder) from the direction of turn. The ball should now drift to the lower wing. Continue to apply aileron pressure to hold the 30° AOB. The nose will need to be lowered in order to preserve airspeed.
- **Slipping Turn to a stall:** Now we will simulate getting distracted and losing track of airspeed / nose attitude. We will bring the nose up to the horizon and allow the airspeed to bleed off. As the airspeed bleeds off, continue to feed in backpressure on the elevator. Airframe buffeting will begin as the critical angle of attack is approached. As backpressure is increased, a stall will finally induce a rolling moment causing the aircraft to roll toward the outside (high) wing. When the roll is detected, immediately initiate a Stall Recovery as outlined below.

RECOVERY - Normal Stall Recovery (See Exercise #5)

- Push
- Power
- Rudder
- Roll
- Climb

COMMON ERRORS

- Not holding assigned flight attitude or altitude resulting in prolonged entry.
- Allowing the flight attitude to vary dramatically.

EMERGENCY MANEUVER TRAINING

EXERCISE #13: SPIRAL DIVES

OBJECTIVE Recognize conditions associated with a spiral dive and apply the correct recovery action.

WHY? A spiral dive can lead to severe altitude loss and if not recovered properly. An improper recovery can possibly lead to a steeper angle of bank and aircraft structural damage/ failure during the recovery. The ability to quickly identify the situation and recover properly is an important tool for all pilots.

WHAT IS IT? A spiral dive is a steep angle of bank turn with the aircraft in an excessive nose-low attitude resulting in increasing airspeed and possibly G-forces. They are normally entered as a result of a poorly executed turn, or through inattention to flight parameters while in steep turns or during Stall Recovery.

KNOWLEDGE TEST

- ✈ If in a level turn, must the G-loading be increased if the angle of bank is increased? Why?
- ✈ If in a steep turn (AOB > 45°), does the angle of bank tend to increase on its own? How does that affect the vertical component of the lift vector?
- ✈ In general, if we are increasing G-loading, are we increasing angle of attack?
- ✈ In a high speed descending turn, is it possible we will not have enough G availability to bring the nose up?
- ✈ To the pilot, can a spiral dive look similar to a spin?

HOW **-** PSSA

- ✈ Establish a 60° AOB level turn (2 G's) at 120 kts with the power stabilized.
- ✈ We will now simulate getting distracted and being unaware of an increasing the bank angle beyond 60°. Without applying more backpressure, the nose will begin to fall.
- ✈ After the bank angle has increased to as much as 75° and the airspeed has increased, we will simulate that we now recognize the descending turn and will apply more backpressure increasing the

load to 3 G's. This will be ineffective for bringing the nose back to the horizon and tremendous altitude loss will ensue.

- Recover as outlined below.

RECOVERY (Follow Say & Do Technique)

- **"Push"** - Push the elevator so that you reduce the G-loading (light in the seat). This also reduces the angle of attack.
- **"Power"** - Reduce (close throttle). With the nose below the horizon, airspeed is probably increasing and therefore, power is not needed, as it will only serve to increase our altitude lost.
- **"Rudder"** – Ensure yaw is canceled and the aircraft in coordinated flight
- **"Roll"** – Using coordinated aileron and rudder; roll the aircraft to level flight.
- **"Climb"** Recover out of the dive by pulling to the load limit of the aircraft if above Va.

COMMON ERRORS

- Failing to push enough to reduce the G-load (light in your seat) before rolling wings level.
- Failing to reduce the power to idle.
- Premature backpressure on the elevator before achieving wings level.

EXERCISE #14: SPLIT-S (½ ROLL & PULL-THROUGH)

AEROBATICS: All aerobatics taught during APS Emergency Maneuver Training courses (URT/EMT/IRT) are used as tools to develop skills to recover an aircraft from adverse flight conditions. In these specialized courses of training, we are NOT attempting to teach how to fly perfect aerobatic maneuvers, give significant emphasis to the ideal shape of the maneuver nor do we express measurable concern to maintaining specific lines. The instructor will state the correlation to emergency maneuver training for each aerobatic maneuver exercise. Certain aerobatic maneuvers give pilots exposure, awareness and skill-development opportunities that cannot be efficiently developed in any other way. Note: If you are participating in an aerobatics-specific course at APS, we will provide exact detailing of the "how to" of competition-standard aerobatic maneuvering during your ground training complemented by other published references.

OBJECTIVE

To recognize the effect and consequences of pulling back on the elevator when presented with an inverted or extreme over-bank flight condition.

WHAT IS IT?

The Split S is a maneuver in which the aircraft is rolled to the inverted position and then pulled through as in the last half of a loop. The result is a loss of altitude, a gain in airspeed, and a 180-degree change of direction.

WHY?

Performing the Split-S is an excellent demonstration of how ***not*** to recover from an over-banked aggravated stall or nose-low unusual attitude situation. Excessive altitude loss occurs if a Split-S recovery is used as instead of the recommended recovery techniques taught at APS

KNOWLEDGE TEST

- ✈ If presented with inverted flight, does applying backpressure on the elevator increase the dive angle?
- ✈ Will power increase or decrease your altitude lost during a Split-S? Why?

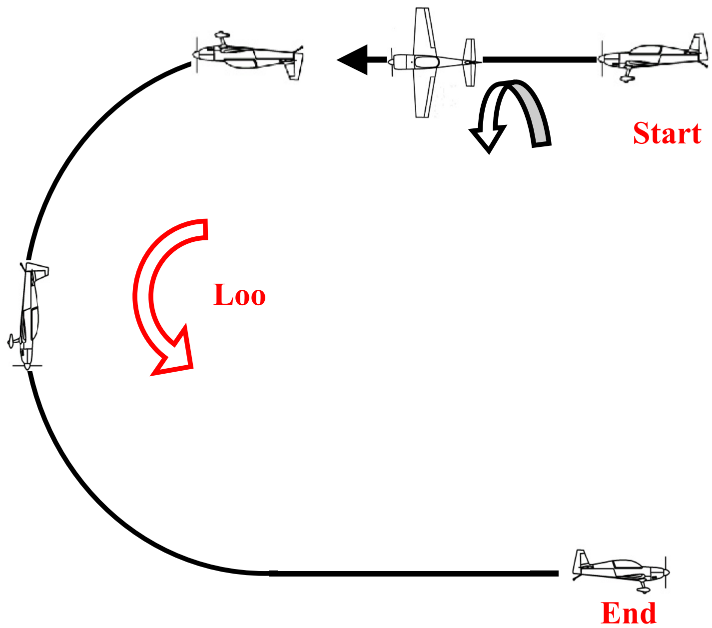
HOW

- PSSA
- ✈ Maximum Entry speed - 100 kts
- ✈ Attitude - 20 degrees nose up; power – midrange.
- ✈ Roll aircraft to the wings level inverted position and then immediately apply smooth but aggressive backpressure. As the aircraft begins a downward trajectory, the airspeed will increase rapidly. When speed has increased above Va, the elevator pressure should be applied to ensure the aircraft is turning at a g-loading equal the limit load of the simulated aircraft.
- ✈ Continue the backpressure until the aircraft has achieved level flight in the opposite direction.

COMMON ERRORS

- ✈ Applying too much backpressure too early and pulling the aircraft into an accelerated stall.
- ✈ Applying too much backpressure and pulling more G's than briefed.

The Split 'S' Maneuver



EXERCISE #15: THE CUBAN 8

AEROBATICS: All aerobatics taught during APS Emergency Maneuver Training courses (URT/EMT/IRT) are used as tools to develop skills to recover an aircraft from adverse flight conditions. In these specialized courses of training, we are NOT attempting to teach how to fly perfect aerobatic maneuvers, give significant emphasis to the ideal shape of the maneuver nor do we express measurable concern to maintaining specific lines. The instructor will state the correlation to emergency maneuver training for each aerobatic maneuver exercise. Certain aerobatic maneuvers give pilots exposure, awareness and skill-development opportunities that cannot be efficiently developed in any other way. Note: If you are participating in an aerobatics-specific course at APS, we will provide exact detailing of the "how to" of competition-standard aerobatic maneuvering during your ground training complemented by other published references.

OBJECTIVE

To get exposed to extreme aircraft attitudes and practice components of the techniques used in unusual attitude recoveries.

WHY?

Aerobatics help to develop a pilot's situational awareness. Performing the Cuban 8 is a great exercise to practice maintaining orientation in various attitudes in addition to continuing to develop both g-awareness and dive recovery techniques. Particular to this maneuver, we focus attention on the nose-low (45 degrees) inverted flight attitude and the application of properly coordinated control inputs to recover the aircraft. The skills developed in this aerobatic maneuver are directly applicable to both stall recovery and unusual attitude recovery proficiencies.

WHAT IS IT?

The Cuban 8 is a combination of two partial loops with an aileron roll to the upright flight attitude from the inverted 45-degree nose-low position. The ½ rolls (2 in the maneuver) occur after passing the inverted wings level position over the top of each looping maneuver. The resulting flight path essentially traces a sideways 8 through the air. Thus the name "Cuban Eight".

KNOWLEDGE TEST

- When faced with an extreme nose high attitude (only blue sky is visible out forward windscreen), where should the pilot look to regain situational awareness?
- When faced with an extreme nose low attitude (only ground is visible out forward windscreen), where should the pilot look to determine the direction of the nearest horizon?

HOW

\- PSSA

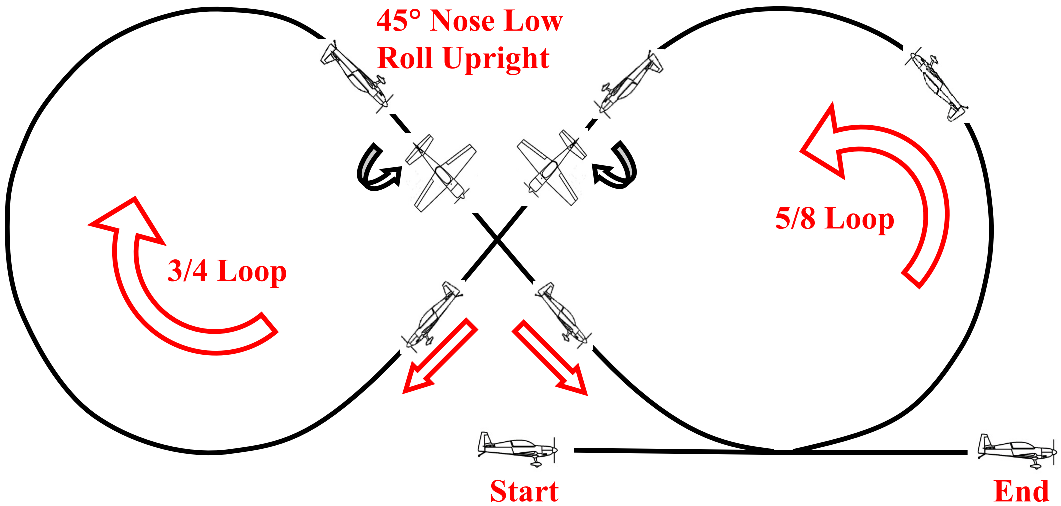
- Establish 160 kts level flight with full power.

- Smoothly apply backpressure until the pre-briefed G-load is achieved. Strive to keep a wings-level pull. As the horizon disappears well below the nose, shift your scan to the right or left to view the wings in relation to the horizon and take note of the pitch rate. As airspeed decreases, continue to apply backpressure while striving to hold the same pitch rate. G-load will decrease over the top of the loop and control inputs will be varied by the pilot to continue to sustain a constant pitch rate.
- Reference the wing in relation to the horizon. When the nose is approximately 45° nose-low in an inverted flight attitude, apply just enough forward stick pressure, while stating and applying "Push – Power – Rudder", to feel light in the seat and then, state "Roll" while you roll the aircraft upright using coordinate aileron and rudder while holding the slight forward pressure.
- Allow the aircraft to accelerate to approximately 140 kts while 45° nose down in preparation for an immediate entry into another cuban eight exercise.
- Once 140 kts is achieved, state "Climb" and begin applying backpressure to establish the prebriefed G-load.
- THIS IS EXCELLENT RECOVERY PRACTICE: SAY & DO
- Continue as described above to accomplish another cuban eight exercise without delay.
- Recover to level flight after completing the second 45° nose-down roll to upright or as directed by the instructor.

COMMON ERRORS

- Faulty pull up: too many G's or not enough.
- Failing to shift your view to the right or left wingtips prior to reaching the vertical nose-up attitude during the first ¼ turn of the cuban eight entry.
- Failing to maintain the backpressure to hold a constant pitch rate once the G-load is established.
- Failing to push to feel light in the seat before rolling upright from the inverted 45° nose down position.
- Over pushing in the recovery to a zero or negative-g flight condition

Fig. A-1: Cuban 8



EXERCISE #16: POWER OFF APPROACH TO LANDING

OBJECTIVE To effectively fly a forced engine-out approach.

WHY? It is a constant requirement to maintain proficiency in power off approach situations. Most aircraft POHs do not present recommended flight profiles for engine-out situations for multi-engine aircraft yet complete power loss on both single-engine and multi-engine aircraft is still prevalent today.

WHAT IS IT? An emergency procedure in which the aircraft is flown at the proper glide speed, an appropriate landing spot is chosen and, using situational awareness and appropriate aircraft control, the aircraft is landed safely.

KNOWLEDGE TEST

- ✈ What are some possible scenarios that could result in losing your engine(s)?
- ✈ Do you know what your V_{bg} (Best Glide Speed) is for your aircraft?
- ✈ At V_{bg}, will your glide ratio remain the same irrespective of your weight?
- ✈ What is the power-off approach profile recommended by the FAA?
- ✈ If engine failure occurs after takeoff, how much altitude is needed to glide back to the departure runway?
- ✈ With enough altitude on departure, will you then always have the option of returning to the airport if presented with a complete loss of power?

HOW - PSSA

- ✈ Engine failure will be simulated by setting idle power.
- ✈ V_{bg} is 85-90 kts.
- ✈ An overhead 360° pattern will be emphasized.

RECOVERY

Speed

- ✈ Adjust pitch attitude to obtain and maintain V_{bg} (Best Glide Speed)
- ✈ If slower than best glide speed at any point in the profile, the pilot must be willing to sacrifice some of the remaining altitude to achieve best glide speed…this is the top priority!

Look for a Spot

- Pick a landing site that is well within glide range.
- If on approach or departure, view the airport as **one** landing site, but not necessarily **the only** landing site.
- Altitude permitting, fly directly to the landing sight for an overhead approach or fly to directly intercept some point on the overhead approach profile.

Set-up

- There may not be ample time to configure the aircraft totally for a forced landing. However, by performing additional tasks as time permits, we enhance the probability of post-crash survival or possibly restarting the engine. Do not do these additional tasks at the expense of aircraft control. *Maintain aircraft control first*, ensure the aircraft is adhering to the proper forced landing profile then, and only then, perform additional tasks situation-permitting.

COMMON ERRORS

- Stalling the aircraft
- Making turns too steep (i.e. greater than 45° AOB).
- Failing to obtain and maintain V_{bg} after engine(s) failure.
- Failing to perform coordinated turns.
- Attempting to stretch the glide (i.e. slow below V_{bg}) on final approach.
- Failing to know the minimum altitude required to perform an overhead 360° power-off pattern at best glide speed in the pilot's specific aircraft type.
- Failing to know the minimum altitude required to complete a turn back to the departure airfield during an engine failure after takeoff.

EXERCISE #17: UNUSUAL ATTITUDE RECOVERIES

OBJECTIVE Recognize and safely recover from a wide variety of unusual attitudes.

WHY? Unusual attitudes can happen in any flight regime. Time and altitude available for recovery can be critical. Situational awareness, recognition of unusual attitudes and the proper execution of the recovery techniques are key to safely recovering the aircraft.

WHAT IS IT? An unusual attitude is any flight attitude that occurs inadvertently. It may result from turbulence, inattention, disorientation, aborted aerobatics, uncoordinated stalls or a host of other possible scenarios that could result in an unfamiliar flight attitude.

KNOWLEDGE TEST

- What is the relationship between bank angle and the lift vector?
- Irrespective of the aircraft's attitude, if the pilot feels positive G's (pressed into his seat), does he have a positive angle of attack on the aircraft?
- If a pilot applies backpressure while in an over-banked or inverted flight attitude, what effect is there on the dive angle of the aircraft?
- If a pilot applies a slight forward pressure while in an over-banked or inverted flight attitude, what effect is there on the dive angle?
- What is the most effective flight control to roll an aircraft while in unstalled flight?
- What are the dangers of uncoordinated (particularly rudder) control inputs if used to recover from unusual attitudes nose-high or nose-low in high or low speed flight?

HOW - PSSA

- The instructor (with you riding the controls) will place the aircraft in various unusual attitudes nose high and nose low with various bank angles, speeds, and power settings. When appropriate, the instructor will tell you to recover.
- Wake Turbulence Encounters: Although we think of wake turbulence encounters typically happening in the vicinity of airports, wake turbulence encounters can happen anywhere, whether from a

passing heavy aircraft at 17,000 feet or from mountain wave turbulence and so on. During the course, the instructor will present you with simulated wake turbulence encounters and ask you to recover. The recovery is Push-Power-Rudder-Roll-Climb.

RECOVERY

- In all recoveries, if the flight attitude is not immediately recognized, centralize the controls and analyze the situation. The combined observation of airspeed and altitude can reliably determine whether the aircraft is in a nose-high or nose-low flight attitude.
- Disconnect the Auto-Pilot (if equipped)

Nose Low

- If airspeed is increasing and altitude is decreasing, the aircraft is in a nose-low attitude.
- To prevent an excessive airspeed build-up and a corresponding excessive loss of altitude:
  - **"Push"** – Add slight forward pressure to the elevator to effectively unload (light in your seat) the aircraft. This will minimize dive angle (especially when over-banked), increase aileron effectiveness, and prevent asymmetrical G-loads that can damage the aircraft.
  - **"Power"** – Pull the throttle to idle. Power will only contribute to increased airspeed, which dramatically increases our altitude loss especially if accelerating above maneuver speed. NOTE: This is not a Stall Recovery that demands increased power to minimize altitude loss.
  - **"Rudder"** – Confirm yaw has been canceled and in coordinated flight
  - **"Roll"** – Using full ailerons and *coordinated* rudder while maintaining the above push, aggressively roll the wings level (orients lift vector skyward). The Roll should be towards the nearest horizon (shortest distance). If the horizon is not visible (i.e. inverted and nose-low with a "face full of dirt"), scan left and right out the windscreen to look for blue sky or, if IMC, reference the attitude indicator. If blue sky is seen out the right side then roll right and vice versa. If blue sky is not seen then aggressively roll any direction and the sky will come into view. Do not apply backpressure while rolling; you must maintain the forward pressure until the wings are within 30° of level.

- **"Climb"** – Once the wings are level, recover out of the dive by smoothly, but aggressively, applying backpressure to bring the nose back to the horizon. If above maneuvering speed, pull to the limit load of the aircraft at idle power. If below maneuvering speed, pull to an angle of attack just short of the stall warning to maximize lift resulting in a minimization of altitude loss in the dive.
- When the aircraft is established in the climb, return to the desired configuration and power setting.

Nose High

- A nose-high attitude can be recognized by a lack of horizon reference, a decreasing airspeed with the altitude increasing.

To recover:

- **"Push"** – Add slight forward pressure to the elevator to effectively unload (light in your seat) the aircraft. This reduces AOA that in turn lowers the stall speed effectively increasing the normal flight envelope of the aircraft. The unload also allows the nose to more quickly fall toward the horizon. Do not push to zero or negative G-load.
- **"Power"** – Apply full power. Power preserves airspeed and assists in retaining more controllability of the aircraft.
- **"Rudder"** – Confirm yaw has been canceled and in coordinated flight
- **"Roll"** – Using ailerons and *coordinated* rudder, roll towards the nearest horizon to a maximum of 45-60° AOB. Rolling towards the nearest horizon reduces the vertical component of lift and allows the nose to slice more rapidly toward the horizon which preserves both airspeed and controllability. In nose-high unusual attitudes with bank angles less than 90 degrees, roll the aircraft as required to obtain 45-60° AOB. For nose-high unusual attitudes with greater than 90 degrees of bank (over-banked), bank angle should be reduced to again achieve 45-60° AOB.
- **"Climb"** – As the nose crosses the horizon, roll wings level while maintaining your push and check that your airspeed is above 1-G stall speed. If slow (below the 1-G stall speed), allow the airspeed to build by letting the nose of the aircraft fall slightly below the horizon while sustaining the unload prior to recovering the aircraft to level or climbing flight.

- When the aircraft is in level flight, reduce power to maintain normal cruise airspeed.

WAKE TURBULENCE RECOVERY

- **"Push"** – Irrespective of a nose high or nose low flight attitude, apply slight forward pressure to unload (light in the seat) the aircraft.
- **"Power" -** As Required. Increasing or decreasing power depends on altitude, attitude, configuration and airspeed trend. At altitude with nose low, power would probably come back. Near the ground and slow, e.g. low and slow (even with the nose down) – full power may be required.
- **"Rudder"** – Confirm yaw has been canceled and in coordinated flight
- **"Roll"** – Using full ailerons and coordinated rudder while maintaining the above push, aggressively roll the wings to continue with either the nose-high or nose-low unusual attitude recoveries explained above.
- **"Climb"** – When the aircraft is in level flight or climbing, return to desired configuration and power setting.

COMMON ERRORS

- Adding power when nose low and airspeed building.
- Failing to add full power with nose high and airspeed decreasing.
- Failing to apply forward pressure for a "light in the seat" feeling.
- Pushing too much causing zero or negative G.
- During a nose-low recovery, failing to hold the push until the wings are level.
- During a nose-high recovery, failing to hold the push until the nose is below the horizon with the airspeed accelerating above 1-G

EXERCISE #18: THE HAMMERHEAD

AEROBATICS: All aerobatics taught during APS Emergency Maneuver Training courses (URT/EMT/IRT) are used as tools to develop skills to recover an aircraft from adverse flight conditions. In these specialized courses of training, we are NOT attempting to teach how to fly perfect aerobatic maneuvers, give significant emphasis to the ideal shape of the maneuver nor do we express measurable concern to maintaining specific lines. The instructor will state the correlation to emergency maneuver training for each aerobatic maneuver exercise. Certain aerobatic maneuvers give pilots exposure, awareness and skill-development opportunities that cannot be efficiently developed in any other way. Note: If you are participating in an aerobatics-specific course at APS, we will provide exact detailing of the "how to" of competition-standard aerobatic maneuvering during your ground training complemented by other published references.

OBJECTIVE

To get exposed to extreme aircraft attitudes and practice the techniques used in upset recovery and spin recovery.

WHY?

Develops confidence in aircraft control at airspeeds well below the 1-G stall speed. It demonstrates that even though there is continuous yaw below stall speed, the aircraft will not enter a spin as angle of attack will be maintained below critical at all times during the maneuver. It also allows practice in the use of rudder control to cancel yaw in preparation for spin recovery as well as affording the opportunity practice dive recovery techniques.

WHAT IS IT?

From straight-and-level flight, the aircraft is brought into a vertical climb and held in that position until almost zero airspeed. Full left rudder is then applied and the aircraft yaws, or cartwheels, 180 degrees until pointed vertically downwards and enters a vertical dive. On recovery, the aircraft will be heading in the opposite direction of entry heading

.

KNOWLEDGE TEST

- What is the AOA when the aircraft is in the vertical (i.e. going straight up)?
- Where should you be looking during the hammerhead (i.e. left, right, or forward) to hold yourself in the vertical?
- Is slight forward pressure required to hold the aircraft in the vertical?
- When well below stall speed and full rudder is applied, why does the aircraft not enter a spin?

HOW

\- PSSA

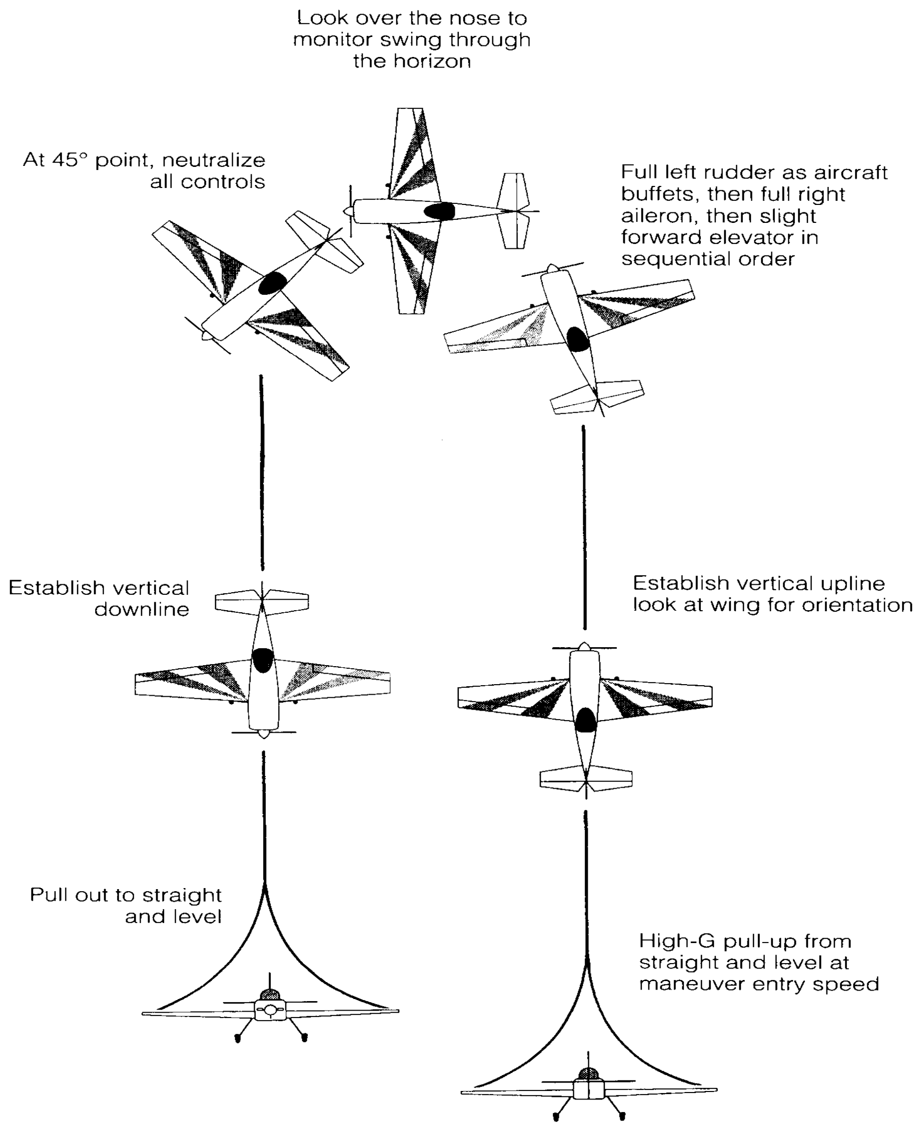
- Establish 160 kts level flight with full power.
- Smoothly apply backpressure until the prebriefed G-load is achieved. Strive to keep a wings-level pull. As the horizon disappears well below the nose, shift your scan to the left to view the wings in relation to the horizon.
- Continue your pull until the fuselage of the aircraft is perpendicular to the horizon. Apply elevator pressure as required to

- freeze the vertical attitude of the aircraft while continuously referencing the horizon off the left wing of the aircraft. Using peripheral vision, continue to scan the wing orientation in relation to the horizon and adjusting elevator and rudder pressure to hold the attitude within parameters defined by your instructor.
- Just after the aircraft begins to buffet (and before it starts to torque roll), apply full left rudder and hold. The nose will slice downward toward earth. Immediately following the kick of the rudder pedal, slight right aileron and forward elevator movement may be required to maintain the proper flight attitude as the aircraft rotates from straight up, to straight down.
- When the nose of the aircraft is approaching the straight down position, apply full opposite rudder to cancel yaw to stop the nose in the vertical. When established in the vertical down attitude, neutralize the rudder.
- When the airspeed accelerates to approximately 1.5 Vs (90 kts), apply smooth but aggressive backpressure to bring the nose back to the horizon (level flight). Be careful not to over-pull the aircraft into a secondary stall. When above your simulated maneuvering speed, be careful not to pull the aircraft beyond the prebriefed G-load. Use the seat of your pants to determine the proper G-load.

COMMON ERRORS

- Failing to shift your scan to the wing as you pull to the vertical up position.
- Holding the backpressure too long as the aircraft approaches the vertical up position.
- Applying too much forward pressure after achieving vertical.
- Failing to apply FULL rudder to initiate the kick over the top.
- Failing to neutralize the rudder when the nose is pointing straight down.

The Hammerhead Maneuver



EMERGENCY MANEUVER TRAINING

EXERCISE #19: IMMELMAN (THE ROLL-OFF-THE-TOP)

AEROBATICS: All aerobatics taught during APS Emergency Maneuver Training courses (URT/EMT/IRT) are used as tools to develop skills to recover an aircraft from adverse flight conditions. In these specialized courses of training, we are NOT attempting to teach how to fly perfect aerobatic maneuvers, give significant emphasis to the ideal shape of the maneuver nor do we express measurable concern to maintaining specific lines. The instructor will state the correlation to emergency maneuver training for each aerobatic maneuver exercise. Certain aerobatic maneuvers give pilots exposure, awareness and skill-development opportunities that cannot be efficiently developed in any other way. Note: If you are participating in an aerobatics-specific course at APS, we will provide exact detailing of the "how to" of competition-standard aerobatic maneuvering during your ground training complemented by other published references.

OBJECTIVE

To learn proper G-loading and angle of attack control through changing speed conditions. Skills for stall and unusual attitude recovery are also enhanced.

WHY?

This maneuver continues to develop the unloaded roll technique, which is fundamental to effective unusual attitude recoveries, especially in slow-speed flight conditions. Additional skill development continues in the recognition and application of the limit-load of your specific aircraft as well as 3-dimensional flight attitude awareness.

WHAT IS IT?

An Immelman consists of the first half of a loop, followed by a half-roll back to level flight. The result is a significant gain in altitude (approximately 1000' – varies with airspeed and g-loading at entry) with a 180-degree change of direction, as shown in Fig. I.

KNOWLEDGE TEST

- Is it possible to stall an aircraft while inverted?
- Does pulling back on the elevator while inverted increase your dive angle?
- What is the most efficient flight control to roll an aircraft in unstalled flight while at very slow airspeed?

HOW

\- PSSA

- Establish full power and 160 kts in level flight.
- Smoothly apply backpressure until you feel the G-loading your instructor has requested. From his G-meter, he will relay the G-loading as you pull into the ½ loop entry.
- Execute the ½ loop following the same techniques as described in Exercise 8: The Inside Loop.
- Continue adjusting your backpressure to hold the assigned G-loading until the horizon goes out of sight. Now look right or left at the wing in relation to the horizon in order to keep situational awareness throughout the initial pull. Take note of, and maintain, the pitch rate throughout the ½ loop portion of the maneuver.
- As the airspeed decreases, your G-loading will decrease as you continue to feed in backpressure to hold a constant pitch rate.
- Approximately 45 degrees prior to achieving inverted flight over the top of the ½ loop, shift your scan forward to the approaching horizon over the nose. When the cowling touches the horizon, apply slight

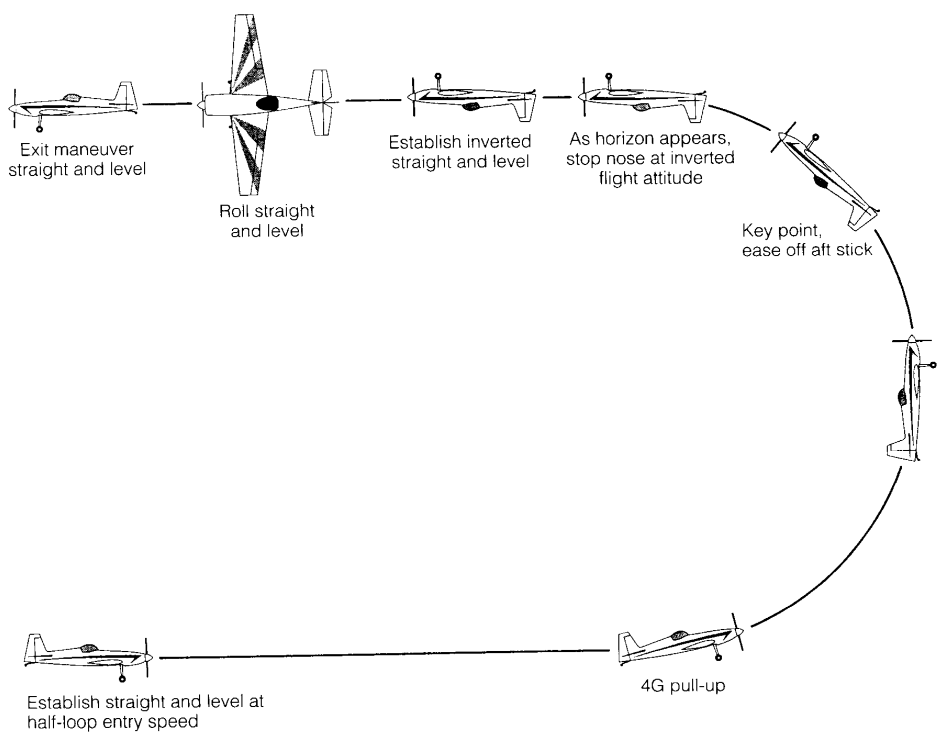
forward pressure (light in the seat) and then using coordinated aileron and rudder, roll upright.

- Unlike a competition-standard immelman, you are not trying to maintain level flight on the recovery nor are you trying to fly a constant radius loop. The technique being developed is the proper unloaded roll technique critical to effective slow-speed unusual attitude recovery and skill development.

COMMON ERRORS

- Not achieving the assigned G-load on the initial pull.
- Not shifting your scan left or right to view the wing in relation to the horizon to maintain orientation.
- Not maintaining backpressure as the aircraft passes through the vertical.
- Applying too much forward pressure causing zero or negative G's on the roll to upright.
- Rolling and pulling during the roll to upright causing an over-banked stall while attempting to recovery the aircraft.

The Immelman



EXERCISE #20: SIMULATED CONTROL LOSS

(AILERON / ELEVATOR / RUDDER / FLAP FAILURE)

OBJECTIVE Recognize and apply safe recovery techniques to retain aircraft control during from various control failures and/or structural damage scenarios.

WHY? Control failures are very rare but are often manageable if corrective action is taken before the aircraft enters an unusual attitude. In addition to control failures, structural integrity issues can arise due to such occurrences as; bird strikes, icing, hail damage and so on. Pilots should understand various techniques for safe recovery of the aircraft when confronted with unexpected adverse handling characteristics and/or aircraft structural integrity issues.

WHAT IS IT? A control failure is the inability of a particular surface to perform normal operation. This can be manifested through conditions such as simple control jams or become more complex when a bird strike breaches the structural integrity of the aircraft and various flight controls. Ground instruction and in-flight scenario-based exercises will revolve around maintaining aircraft control, analyzing the situation, and taking appropriate actions to safely return the aircraft to an airport. Appropriate actions include developing a strategy for *performing a controllability check* whenever aircraft control or structural integrity is in question. In addition to analyzing the runway environment for best landing runway and direction of landing, the pilot will also determine a minimum controllable airspeed at a safe altitude prior to attempting to land. These considerations are usually not included in aircraft POH.

KNOWLEDGE TEST

- ✈ With a jammed rudder, what flight control can be used to control the track of the aircraft?
- ✈ With a jammed rudder or aileron, what type of flight condition will likely occur when maintaining track? (Slip or Skid)
- ✈ How do you tell the difference between a Slip and a Skid in steady-state (constant pitch and bank) unstalled flight?
- ✈ With a jammed rudder or aileron, which way (toward or away from the ball) should you turn the aircraft?
- ✈ With a free-floating elevator, what pitch controls are available?

- Can the **Push-Power-Rudder-Roll-Climb** Strategy for unusual attitude recoveries help in the control failure and/or structural damage scenario?
- Why Is flying the ATTITUDE of the aircraft very important in these control failure scenarios?

HOW -PSSA

- The following control failures will be investigated:
  - Aileron
  - Split-flap
  - Rudder
  - Elevator

RECOVERY

Aileron Failure

- **PUSH –** Apply forward pressure (light in the seat) to decrease AOA and increase airspeed (if desired).
- **POWER** – Increasing or decreasing power may be wise to achieve greater rudder effectiveness (aircraft dependent). If in a high torque prop aircraft and the aileron is jammed in a left roll (assuming a right-turn prop), consideration should be given to decreasing power to reduce aggravating torque effects.
- **RUDDER –** If aircraft is rolling, use available opposite rudder to counter the roll and level the aircraft to a manageable flight attitude to maintain track. If aircraft is not rolling, use rudder to initiate turns when needed.
  - Power can be used in twin-engine aircraft to help control bank
  - Aircraft will be in controlled slip when safely turning or maintaining track. All turns should be made in the direction of the ball (low wing).
- **ROLL** – Ailerons not functional. Secondary roll through rudder application must be used.
- **CLIMB** – attempt to get the aircraft climbing until complete control has been confirmed.
- Do a controllability check at altitude.
- For landing, use a normal flight attitude. If a crosswind exists on approach, the crosswind component should be on the ball side (low wing side) during approach.

Rudder Failure

- **PUSH –** Apply forward pressure (light in the seat) to decrease AOA, increase airspeed and increase aileron effectiveness. The pilot must be willing to sacrifice altitude to regain control.
- **POWER** – Increasing power may be wise to gain airspeed for greater aileron effectiveness. If in a high torque prop aircraft and rudder is jammed in left roll, consider reducing power to minimize torque effects.
- **RUDDER** – not functional
- **ROLL** – If aircraft is rolling, use all available opposite aileron to counter the roll and level the aircraft. If aircraft is not rolling, use aileron to initiate turns when needed.
  - Power can be used in twin-engine aircraft to help control bank
  - Aircraft will be in controlled slip. All turns should be made using ailerons in the direction of the ball (the low wing).
- **CLIMB** – attempt to get the aircraft climbing until complete control has been confirmed
- Do controllability check at altitude.
- If rudder is jammed in a neutral position, avoid maximum performance climbs. Make smooth power changes and controlled aileron inputs. Restrict to your flight attitude to less than 30 degrees of bank and 10-15 degrees of pitch if at all possible.
- For landing, use a normal attitude. If a crosswind exists on approach, the crosswind component should be placed on the ball side (low wing side) for approach and landing.

Elevator Failure

- **POWER** – Control of the pitch attitude must be maintained through the use of; power, elevator trim and center of gravity positioning (ie. shifting baggage/passengers)
  - If in a Nose-Up attitude, reduce power to lower the nose and consider using gyroscopic properties to control the nose position (in a prop aircraft)
  - If in a Nose-Down attitude, add power and consider using gyroscopic properties to control the nose position (in a prop aircraft)

Flap Failure

- If flaps fail to deploy, use a no-flap landing technique
- If flaps fail to retract (i.e. during a go-around) then smoothly add power while pitching for airspeed. If no retraction, fly pattern below Vfe and carry out an approach and landing for that specific flap configuration.
- If a split flap occurs during extension then discontinue any further flap selection and consider retracting the flaps (refer to POH). If the split flap condition persists, the net effect is the same as depressing an aileron, which could lead to an over-banked attitude, aggravated stall or spin if uncorrected. The aircraft will roll away from low flap but yaw towards it. If the split flap leads to an uncontrollable roll, use the **Push-Power-Rudder-Roll-Climb** technique and counter the roll and yaw with aileron and rudder. The pilot must be willing to sacrifice altitude in order to gain airspeed for better aileron/rudder effectiveness. Once under control, climb and carry out a controllability check at a safe altitude. Consider increasing approach speed to the flapless approach speeds or even faster, if the uncoordinated flight condition is considerable.

COMMON ERRORS

- Failing to unload (push) the aircraft while trying to regain control because of an instinctual unwillingness to lose altitude.
- Failing to vary airspeed for greater flight control effectiveness.
- Failing to add power to maintain or increase airspeed.
- Failing to adjust nose attitude to stop altitude loss once aircraft is under control.

EMERGENCY MANEUVER TRAINING

EXERCISE #21: INCIPIENT SPIN RECOVERIES

OBJECTIVE

Recognize aerodynamic factors developing in an incipient spin and take appropriate actions to effectively recover in a timely manner to avert a develop spin.

WHY?

Spins can be entered from any flight regime and any flight attitude. Being aware of and recognizing the control inputs required to enter a spin will help you avoid inadvertent spin entry parameters. It is important to understand the different phases of a stall leading to a spin in order to apply proper recovery control inputs. In this exercise, we concentrate on the ability to stop the spin in the incipient phase before it fully develops.

WHAT IS IT?

An incipient spin is the result of an uncoordinated (aggravated) stall, with each wing having a different amount of lift and drag yet both beyond the critical angle of attack. It is a maneuver in which the aircraft starts its departure from upright flight and seeks an ever-increasing decent angle along a tight, helical flight path while at stalled angles of attack. You will recover in the incipient phase (less than one rotation).

KNOWLEDGE TEST

- What are the stages of a spin?
- Is an incipient spin more like a stall or a spin? Why?
- What type of recovery (stall or spin recovery) do we use in the incipient spin phase?
- If we don't know what recovery to use but the stalled flight condition is generating significant yawing and rolling, which recovery should we select?
- What are the two aerodynamic factors required for an aircraft to spin?
- During an incipient spin, what is the "Rule of Thumb" for deciding which recovery procedure (stall or spin) to use?
- Will a NASA Standard Spin Recovery (P.A.R.E.) effectively work in an incipient spin?

HOW - PSSA

- Most entries will be from the slipping turn stalls or skidded turn stalls (see Exercise #11 & 12 for entry parameters).
  - Additional Spin Entries:
    - Power-off descent
    - Climbing maneuvers with and without turns
    - High 'G' flight conditions
    - Power-on entries
- When the aircraft stalls, the instructor will help you hold the pro-spin controls. This simulates "freezing" on the controls after the stall.
- After the aircraft rolls ½ to ¾ of a revolution (incipient spin), the instructor will have you initiate the recovery (see below).

RECOVERY **Stall Recovery** (See Exercise #5)

- **Push**
- **Power***
- **Rudder**
- **Roll**
- **Climb**

* Power selection considerations will be discussed during ground training

COMMON ERRORS

- Not moving the elevator far enough forward in the "Push" step.
- Failing to neutralize the ailerons during the "Push" step.
- Failing to properly apply opposite rudder if the aircraft is still rolling during the "Rudder" step.
- Doing "rolling pulls" during the "Roll" step.

EMERGENCY MANEUVER TRAINING

EXERCISE #22: FULLY-DEVELOPED SPIN RECOVERIES

OBJECTIVE

Build confidence by performing multiple rotation spins, spin recoveries procedures and safely recovering the aircraft. Practice procedural discipline and develop all-attitude awareness.

WHY?

Statistically, 28% of stall/spin accidents are fatal. Since the knowledge and skill of the pilot should always match the airplane, the ability to properly recognize and avoid a spin, while appreciating how a spin develops, will make any pilot a safer pilot. The ability to recover from a fully developed spin is a critically important awareness exercise to the overall stall/spin education process.

WHAT IS IT?

A spin is the result of a prolonged uncoordinated stall, with each stalled wing having a different amount of lift and drag (negative roll damping) while being subjected to continuous yaw. It is a maneuver in which the aircraft descends vertically along a tight, helical flight path while at stalled angles of attack.

KNOWLEDGE TEST

- What are the stages of a spin?
- What are the two aerodynamic factors required for an aircraft to spin?
- What are three methods to determine which recovery rudder to use?
- How should you hold your head and where should you look during a spin recovery?
- Is negative roll damping a driving force in an aircraft spin?
- Should we ever push the elevator BEFORE applying opposite rudder?
- Canceling yaw is top priority in a spin recovery. (True or False)
- Will the aircraft be pointing close to straight down (vertical) after the spin rotation has been stopped from a 3-turn spin?

HOW

- PSSA

- Most upright spin entries will be from a power-off stall (see exercise #5). Just prior to the stall (65-70 kts), push and hold full left or right rudder immediately followed by full aft stick.
- Hold these full control deflection inputs for the entire duration of desired number of turns until recovery is initiated by the instructor stating “Recover”.

- Typical altitude loss is about 350 - 500 feet per turn in the Extra 300L and most small general aviation aircraft.
- Note instrument indications.
- At the direction of the instructor, recover using the NASA Standard Spin Recovery procedure below (P.A.R.E.)

Additional Spin Entries:

- Skidded turn
- Slipping turn or straight ahead slipping stalls
- Power-off descent
- Climbing maneuvers with and without turns
- High ‘G’ flight conditions
- Power-on entries

RECOVERY **<u>NASA Standard Spin Recovery: P.A.R.E. Recovery</u>**

- **“Power” –** Reduce power to idle.
- **“Ailerons” –** Neutralize the ailerons (select flaps up). Do not allow ailerons to be deflected in either direction.
- **“Rudder” –** Determine the direction of the spin and then push <u>full</u> rudder opposite the rotation of the spin and hold until rotation stops.
- **“Elevator” –** Immediately following the completion of pushing full opposite rudder to full control deflection, push the elevator through neutral. Some aircraft may required full-forward elevator to effectively reduce angle of attack sufficiently to recover from an upright spin.

Hold these inputs until rotation stops, then immediately:

- **“Rudder”** – Neutralize the rudder (very important, holding opposite rudder deflected during recovery increases the risk of entering a spin in the opposite direction.
- **“Elevator” –** Since the nose is now pointing straight down, airspeed will build rapidly. Smoothly but aggressively pull right to the prebriefed G-load to effectively bring the nose back to the horizon.

Note: While recovering from the dive, any disorientation and sensation of continued spinning can be reduced by fixing your eyes on an external reference point (i.e. horizon). Ensure you establish visual dominance in the recovery while suppressing vestibular illusions.

COMMON ERRORS

- Not holding full rudder and elevator deflection until recovery is initiated.
- Moving the elevator inappropriately while neutralizing the ailerons.
- Failing to push enough forward elevator during the first “Elevator” step.
- Failing to apply *full* opposite rudder during the first “Rudder” step.
- Failing to neutralize the rudder after spin rotation stops.

EXERCISE #23: AGGRAVATED & INVERTED SPIN MODES

(FLAT / STEEP / ACCELERATED / INVERTED)

OBJECTIVE Introduce aggravated spin modes and understand the associated control inputs affecting them.

WHY? Otherwise recoverable aircraft can quickly become unrecoverable if inappropriate power and/or flight control inputs are applied during spin recovery. You will experience how various *inappropriate* control inputs will aggravate a spin. Maximizing the probability of recovery certainly hinges on applying *appropriate* recovery inputs in the proper sequence.

WHAT IS IT? An aggravated spin is a spin that deepens or becomes more difficult to recover due to inappropriate power and/or flight control inputs contrary to the NASA Standard Spin Recovery procedure.

KNOWLEDGE TEST

- In general, will increased power help or hinder spin recovery?
- Can inappropriate aileron input cause an increased spin rotation? How about premature elevator application?
- Should we ever push the elevator BEFORE applying opposite rudder?
- If we apply the incorrect recovery rudder for the P.A.R.E., what should we do?
- Is an inverted spin much more disorienting than an upright spin?
- How should you hold your head and where should you look if in an inverted spin? What's different about the recovery, if anything?

HOW - PSSA

- Most spin entries will be from a power-off stall (see exercise #5); however, the instructor will demonstrate numerous possible ways of entering an aggravated or inverted spin.
- Once in the spin, the instructor will demonstrate numerous control inputs that will aggravate the spin.
- Typical altitude loss is about 350 - 500 feet per turn in the Extra 300L.
- Note instrument indications.
- At the direction of the instructor, recover using the procedure below (P.A.R.E.)

Demonstrations

- Power Effect – Right Spin, add throttle – note the change as the spin becomes faster / steeper. In a left spin, add power and note how the spin flattens.
- Aileron Effect – add in-spin aileron – note the change as spin becomes faster, more nose low with more roll
- Add out-spin aileron – note the reduced roll component and accelerated yaw component
- Elevator Effect – add forward elevator with and without aileron – note changes as spin becomes faster, flatter or steeper

RECOVERY

NASA Standard Spin Recovery: P.A.R.E. Recovery

"Power" – Reduce power to idle.

"Ailerons" – Neutralize the ailerons (select flaps up). Do not allow ailerons to be deflected in either direction.

"Rudder" – Determine direction of the spin and then push full rudder opposite the rotation of the spin and hold until rotation stops.

"Elevator" – Immediately following the completion of pushing full opposite rudder to full control deflection, then:

UPRIGHT SPIN: Push elevator *forward* through neutral

INVERTED SPIN: Pull elevator *aft* through neutral

Some aircraft may required full elevator deflection to effectively reduce angle of attack sufficiently to recover (if recoverable).

Hold these inputs until rotation stops, then immediately:

"Rudder" – Neutralize the rudder (very important, holding opposite rudder deflected during recovery increases the risk of entering a spin in the opposite direction.

"Elevator" – Since the nose is now pointing straight down (true whether recovering from an upright or inverted spin), airspeed will build rapidly. Smoothly but aggressively pull to the prebriefed G-load to effectively bring the nose back to the horizon.

Note: While recovering from the dive, any disorientation and sensation of continued spinning can be reduced by fixing your eyes on an external reference point (i.e. horizon). Ensure you establish visual dominance in the recovery while suppressing vestibular illusions.

COMMON ERRORS

- Mental freezing on the controls. Pilot must force proper recovery action by mechanically implementing the recovery using the Say & Do technique.
- Failing to push enough forward elevator (upright spin) or pull enough aft elevator (inverted spin) during the first “Elevator” step.
- During an inverted spin, looking up. (This can be disorienting)

EMERGENCY MANEUVER TRAINING

EXERCISE #24: INADVERTENT SPIN RECOVERIES

OBJECTIVE

Recognize and recover from spins entered from stalled unusual attitudes commonly referred to as "botched maneuvers".

WHY?

The unusual attitude and stall recovery demands timely and appropriate control inputs in order to affect a safe and efficient recovery. If, however, late or inappropriate control inputs are made, an inadvertent spin is possible.

WHAT IS IT?

A spin may be entered in many varied ways; all of which have common contributing factors. A spin entry requires continuous stall and continuous yaw. Any failed unusual attitude or stall recovery that results in the aircraft remaining in an aggravated (yaw) stall condition will drive the aircraft through the incipient spin phase and into the fully developed spin phase.

KNOWLEDGE TEST

- ✈ What are the two aerodynamic requirements to spin an aircraft?
- ✈ Is it possible to stall an aircraft from an unusual attitude?
- ✈ Is it possible to stall an aircraft while inverted?
- ✈ Is it possible to enter another spin while recovering from a spin?
- ✈ If a spin is entered from an unusual attitude stall, is it possible that the spin will be aggravated (i.e. flat, accelerated, inverted)

HOW

- PSSA

- ✈ The instructor will place the aircraft into a spin from an extreme flight condition and call "Recover"
- ✈ The student will call out each input as he/she recovers the aircraft

Suggested Unusual Attitude Entries:

- ✈ Left climbing turn, right spin (over-the-top) at 70 kts.
- ✈ Loop, left spin as nose passes through horizon on the back
- ✈ Left turn at 80-90, right snap roll
- ✈ Immelman via left roll, into spin immediately

- ✈ Left hammerhead to upright flat spin
- ✈ Right hammerhead to inverted flat spin

RECOVERY **<u>NASA Standard Spin Recovery: P.A.R.E. Recovery</u>**

"Power" – Reduce power to idle.

"Ailerons" – Neutralize the ailerons (select flaps up). Do not allow ailerons to be deflected in either direction.

"Rudder" – Determine direction of the spin and then push <u>full</u> rudder opposite the rotation of the spin and hold until rotation stops.

"Elevator" – Immediately following the completion of pushing full opposite rudder to full control deflection, then:

UPRIGHT SPIN: Push elevator *<u>forward</u>* through neutral

INVERTED SPIN: Pull elevator *<u>aft</u>* through neutral

Some aircraft may required full elevator deflection to effectively reduce angle of attack sufficiently to recover.

Hold these inputs until rotation stops, then immediately:

"Rudder" – Neutralize the rudder (very important, holding opposite rudder deflected during recovery increases the risk of entering a spin in the opposite direction).

"Elevator" – Since the nose is now pointing straight down (whether recovering from a developed upright or inverted spin), airspeed will build rapidly. Smoothly but aggressively pull to the prebriefed G-load to effectively bring the nose back to the horizon.

<u>Note</u>: While recovering from the dive, any disorientation and sensation of continued spinning can be reduced by fixing your eyes on an external reference point (i.e. horizon). Ensure you establish visual dominance in the recovery while suppressing vestibular illusions.

COMMON ERRORS

- ✈ Rapid "flailing" of the controls in a panic attempt to maintain/regain control of the aircraft. Commonly this only aggravates spin entry and significantly delays recovery
- ✈ Mental freezing on the controls. Pilot must force proper recovery action by mechanically implementing the Say & Do technique.

CHAPTER 6: NOTES

Upset Recovery Training: Mission 1 (URT 1 or QUAL 1)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