

EVERY PILOT IN CONTROL SOLUTION STANDARD™

The Pinnacle of Optimized
Upset Prevention and Recovery Training (UPRT)



Every Pilot In Control
Solution Standard™



At Aviation Performance Solutions (APS) we are relentlessly committed to our purpose: We Help Pilots Bring Everyone Home Safely. We accomplish this through overcoming every pilot's top fatal threat - Loss of Control In-flight (LOC-I). Simply put, APS's brand promise is Every Pilot Trained - In Control - All The Time.

APS was honored to participate in leadership roles in pivotal international working groups from 2009 through 2014 that ultimately lead to ICAO publishing the ICAO Manual on Airplane Upset Prevention and Recovery Training (UPRT) with a 5-year adoption period. While we were excited to see UPRT officially enter into the global flight training system in recent years, we have been disappointed to see so many of the crucial elements essential to UPRT's ability to effectively mitigate LOC-I left behind. Robust layers of intervention to include airplane upset awareness, recognition, prevention, and recovery, require a paradigm shift in the industry's approach to solving LOC-I that, unfortunately, the aviation training community is either unwilling or unable to take on a large scale.

Fortunately, APS does not quit and does not accept regulatory minimums as a standard of safety, especially when hundreds of lives are needlessly lost to LOC-I year over year worldwide. Sadly, this trend will largely continue until robust UPRT is implemented by training providers committed to saving lives.

The Every Pilot In Control Solution Standard™ (EPIC-S2™) defines the Six Critical UPRT Program Implementation Factors that must be optimized by instructors and training providers to render LOC-I a major fatal threat of the past. Now in our third decade of implementing EPIC-S2-compliant UPRT, APS is stepping up, along with our diverse network of partners, to save lives on a global scale. We hope you join us as one of our many EPIC-S2 UPRT Operators by starting your APS UPRT training today.

Paul 'BJ' Ransbury, CEO
Aviation Performance Solutions



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Table of Contents

INTRODUCTION	2
CRITICAL IMPLEMENTATION FACTORS	4
CRITICAL FACTOR #1: ELITE INSTRUCTORS	5
CRITICAL FACTOR #2: INTEGRATED PROGRAM	7
CRITICAL FACTOR #3: TRAINING INTENSITY	9
CRITICAL FACTOR #4: BEST PRACTICES COMPLIANT	11
CRITICAL FACTOR #5: PURPOSE-BUILT PLATFORMS	12
CRITICAL FACTOR #6: INITIAL & RECURRENT TRAINING	13
COMPLIANCE AND EVALUATION	15

INTRODUCTION



Every Pilot In Control
— Solution Standard System™ —

Over the past 50 years of statistically analyzed accident history in commercial and general aviation, Loss of Control In-flight (LOC-I) has consistently been one of the leading causes of airplane crashes and crash-related fatalities. Over the last decade LOC-I has persisted as the number one cause of fatalities across all sectors of aviation worldwide.

Fatalities by CICTT Aviation Occurrence Categories

Fatal Accidents | Worldwide Commercial Jet Fleet | 2010 through 2019



Figure 1: 10 Year LOC-I Summary (Boeing - Commercial Aviation Safety Team data)

The Problem

Because current civil pilot certification training does not comprehensively address the unique and counterintuitive skills necessary to recognize, prevent and overcome LOC-I, Upset

Prevention and Recovery Training (UPRT) is needed to fill this training gap. However, regulatory guidelines addressing UPRT are high-level, and do not get into specific guidance on the amount, design, integration, quality, and technical learning elements of the training, nor does it specify guidance on how to train and qualify instructors to provide the training. Consequently, UPRT programs can vary greatly in delivery and results.

Improperly conducted UPRT results in ineffective training and often unintentionally generates increased risk to pilots and their passengers throughout their career due to negative training and/or negative transfer



of skill. It is imperative that specific guidelines be adopted in order to ensure safety during training and that skills learned are truly effective in mitigating the risk of LOC-I. The **Every Pilot In Control Solution Standard™ (EPIC-S2™)** sets forth a framework of proven critical factors that result in UPRT that is both safe and successful at teaching pilots to recognize, prevent and if necessary, recover from an unexpected airplane upset.

Purpose

The purpose of this APS EPIC-S2 outline is to provide a detailed explanation of the six key factors that encompass effective Upset Prevention and Recovery Training (UPRT) and have proven to be critical in successful implementation. The result of training which adheres to these standards and practices is a substantial reduction in the risk of LOC-I for pilots receiving such training.

This graphic model (Figure. 1) conceptually represents how these critical factors work together to maximize the efforts of training so that UPRT accomplishes what it is intended to do: create more resilient pilots with enhanced skills. Focused directly at reducing the number one cause of aviation fatalities, there is likely no greater contribution to aviation safety than widespread adoption of this standard in the flight training of pilots across the globe.

CRITICAL IMPLEMENTATION FACTORS

Many of the critical factors related to UPRT success will seem familiar. That is because in most cases they are factors that are taken for granted as necessary for effectiveness in the majority of specialized elements of pilot training.



Figure 2: Every Pilot In Control Solution Standard Model

Unique Domain Considerations

There are two aspects of these essential UPRT factors that require distinct attention in the delivery of UPRT. The first is that, unlike many other areas of pilot training, some of the same identified factors which are applied in other areas of flight training are not followed or adequately addressed.

The second aspect is related to context. How these factors are addressed in the upset domain may differ due to the unique human factors nature that exists outside of the normal flight envelope, and because of the counterintuitive considerations that exist in unexpected and escalating upset events.

Reinforcing Relationship

It is easy to view these critical factors as separate and distinct elements. They are not. The synergistic relationship that exists between these factors when applied comprehensively is what is responsible for the effectiveness of UPRT conducted in accordance with the guidelines of the APS EPIC-S2™ specifications.

CRITICAL FACTOR #1: ELITE INSTRUCTORS

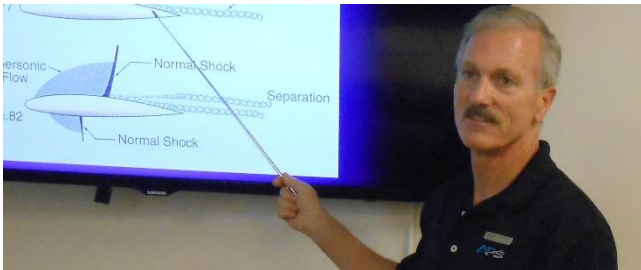


Figure 3: Advanced Instructor Pilot Conducting UPRT

According to the ICAO Manual on Aeroplane Upset Prevention and Recovery Training, "...an essential component in the effective delivery

of UPRT is a properly trained and qualified instructor who possesses sound theoretical and operational knowledge relevant to the UPRT content.” In addressing Training Risk Mitigation the same reference recommends mitigation “by only utilizing qualified UPRT instructors who are able to demonstrate the necessary competencies to deliver the in-flight training.” The EPIC-S2™ model presents the Elite Instructor as the first and most critical component of effective UPRT and offers specific qualification requirements for a UPRT instructor.

Qualified and Standardized UPRT Instructors

A qualified instructor is arguably the single greatest asset to UPRT. Conversely, an unqualified instructor will quickly become the greatest liability to the success of the UPRT initiative. UPRT Instructors must have extensive experience flying in the all-attitude environment; however, elite qualifications and experience are only the beginning. Every qualified UPRT instructor will also have rigorous, UPRT-specific training and experience to properly and safely deliver advanced upset training.

Proper UPRT Instructor Training

Safe and effective delivery of UPRT requires Flight Instructor skills and proficiency beyond the normal flight envelope. As the ICAO Manual on Aeroplane Upset Prevention and Recovery Training puts it: “The UPRT on-aeroplane environment may be beyond that which is experienced during normal training operations. The unpredictable nature of trainee inputs, reactions, and behaviour requires fluency in response to a wide variety of potential situations requiring a time-constrained and accurate response. This specialized expertise cannot be acquired through routine flight operations alone, but demands that instructor training provides the appropriate degree of exposure necessary to develop a comprehensive understanding of the entire UPRT operating environment, as well as the aeroplane’s limitations and capabilities.”

CRITICAL FACTOR #2: INTEGRATED PROGRAM



Figure 4: Integrated Academics, On-aircraft and Simulator Training

The most effective, safe, and long-lasting upset training is accomplished through an integrated combination of industry-approved loss of control academics, proper use of all-attitude airplanes, and expertly integrated advanced flight simulation training devices. Each of these integrated components should adhere to the intent of the ICAO Manual on UPRT and IATA requirements for on-aircraft training and advanced simulator UPRT.

Each of these training elements has unique advantages, but also limitations in addressing the multiple challenges pilots face in an upset. It is the synergistic integration of these factors that solidifies training concepts through a building block approach. The goal is to overlay these various training elements in a manner that maximizes platform advantages and minimizes their limitations. This synergistic integration of mediums achieves improved skill acquisition and retention creating an unparalleled depth and breadth of training which not only teaches pilots how to avoid LOC-I related accidents but also significantly deepens airmanship and manual handling skills.

Laying the Academic Foundation

The order of application of these elements is important. Just as any construction must be built on a solid foundation, academics create the

framework of understanding necessary for applied learning. This is essential in UPRT because current pilot licensing training does not require full understanding of the differences in aircraft behavior or handling characteristics outside of the normal envelope. Without this awareness, pilots perceive events and apply inputs appropriate to the normal aerodynamic envelope where they regularly fly. Unfortunately, many of these normal and natural responses become high risk, or even catastrophic, when applied in the upset domain.

In Actual Flight: Human Factors

One of the recommendations of the FAA's Loss of Control Avoidance and Recovery Training Aviation Rulemaking Committee (LOCART ARC) adopted by ICAO was to provide UPRT-specific training *in actual flight* (emphasis added) at the commercial pilot licensing level, using airplanes capable of performing recommended maneuvers while maintaining acceptable margins of safety.

After careful review this group concluded, and ICAO agreed that academic information alone may not be accessible in the dynamic, complicated, confusing and often chaotic aerodynamic situation confronting pilots in an airplane upset, and not adequately modeled in simulators. For those situations, hands-on practical skill development in actual flight is needed to acquaint pilots with human factors encountered in flight.

Without the perception of risk or threat of physical consequences present in the on-aircraft domain, pilots are unprepared for the utterly different psychological environment they will face in flight. Cognition is slowed and analytical thought is lost. Only what has been ingrained through committed and deliberate practice remains.

The Simulator: Transfer to the Operational Environment

Once these essential skills have been introduced, the simulator can be used to practice newly acquired skills in a crew environment, at altitudes and in weather conditions that would be unsafe in the real world. The transferability of techniques learned in flight can be practiced with the limited visibility, reduced control response, and higher control forces of an operational aircraft.

The Whole Is Greater Than the Sum of the Parts

Overlaying all of these elements of training together, in the right order, in the right amounts to achieve the desired result, integrates these three critical components to create the most comprehensive and effective UPRT possible.

CRITICAL FACTOR #3: TRAINING INTENSITY



Figure 5: Intense On-aircraft UPRT

Research and analysis over the years into the disproportionate rate of LOC-I fatalities has become increasingly focused on essential pilot training elements which can address a seemingly systemic problem in how we prepare pilots to avoid or recover from unexpected airplane upsets. Both the problem and the potential solution increasingly point to the human physiological and psychological response to the stresses present in an unanticipated upset event.

In an unexpected airplane upset, accurate decision-making, resilience and measured reaction times are critical. There are two dimensions to training intensity critical to addressing human factors in an upset in order to create an effective UPRT program.

Flight Frequency over Training Course Duration

The first dimension of training intensity involves the training flight frequency over the duration of the training course. Behavioral studies show that practicing a skill multiple times intensely in a focused, deliberate manner over multiple days develops deeper learning, faster decision-making and precise reaction time with accurate control response under stress. A UPRT program must provide sufficient practice opportunities so that the skills learned remain ingrained and second nature should an unexpected airplane upset happen six months or even a couple of years after the training occurs.

Depth and Frequency of Human Factors Integration

The second dimension of training intensity concerns depth and frequency of human factors integrated into core skill development within each flight. In an unexpected airplane upset, the human factors responses of startle and surprise can undo a pilot's ability to think clearly and respond accurately. Intense on-aircraft training, which puts pilots in upset situations and requires them to repeatedly overcome the associated fear, confusion and uncertainty, allows pilots to become familiar with the maneuvers and overcome the human factors related to operating beyond the extended envelope.

CRITICAL FACTOR #4: BEST PRACTICES COMPLIANT



Figure 6: ICAO Headquarters

Adherence to proven best practices is critical for safety in all sectors of aviation, and no less so for UPRT. These best practices, such as those espoused by the International Air Transport Association (IATA) and Aviation Performance Solutions (APS), ingrain long-lasting, resilient skills that are effective for overcoming LOC-I while avoiding negative training.

Addressing regulatory-defined training content is a bare minimum. UPRT training should be in strict compliance with detailed guidelines set forth by National Aviation Authorities regulating UPRT. Much of the guidance related to UPRT is relatively recent and some is non-regulatory in nature. However, the benefits of research and analysis by industry organizations and working groups clearly and consistently identifies what constitutes effective practices, whether regulated or not.

In addition, a well-constructed UPRT program should adhere to the strictest of safety standards including the incorporation of a rigorous Safety Management System. The EPIC-S2™ standard outlines regulatory guidance and elaborates on the best practices that should be included in every program.

CRITICAL FACTOR #5: PURPOSE-BUILT PLATFORMS



Figure 7: S211 Jet Upset Trainer

On-aircraft training in an all-altitude, aerobatic-capable airplane is essential for pilots to develop advanced manual handling skills, effectively develop a three-dimensional mental model, and overcome critical human factors that often derail successful upset prevention or recovery in a real-world crisis event.

Margin of Safety

Together with expert instructors following a comprehensive training curriculum, safe all-attitude aircraft that are fully recoverable from inadvertent high-G control inputs and spins assure the delivery of a complete program while guaranteeing a margin of safety essential to safe and effective UPRT.

The overarching consideration in the selection of an aircraft for UPRT delivery is the margin of safety provided in the conduct of training. While all aircraft can be utilized in a transferable manner by an appropriately qualified UPRT Instructor, only proper structural and aerodynamic design considerations allow for student exceedances seen in training, and the ability to safely recover from autorotation or other scenarios encountered in training. Important factors such as egress and secure harnessing and parachute accommodation are also critical for a UPRT training aircraft.

Validated Training Envelope

Aircraft are not the only training platform used in integrated UPRT, flight simulators must be considered as well. While fixed-base Flight Simulation Training Devices (FSTDs) and non-enhanced Level D flight simulators can be useful for introducing procedural and CRM elements of UPRT, they require an Instructor properly trained in their limitations. Incorrect or inappropriate use of FSTDs can result in negative training that has been implicated in LOC-I accidents.

CRITICAL FACTOR #6: INITIAL & RECURRENT TRAINING

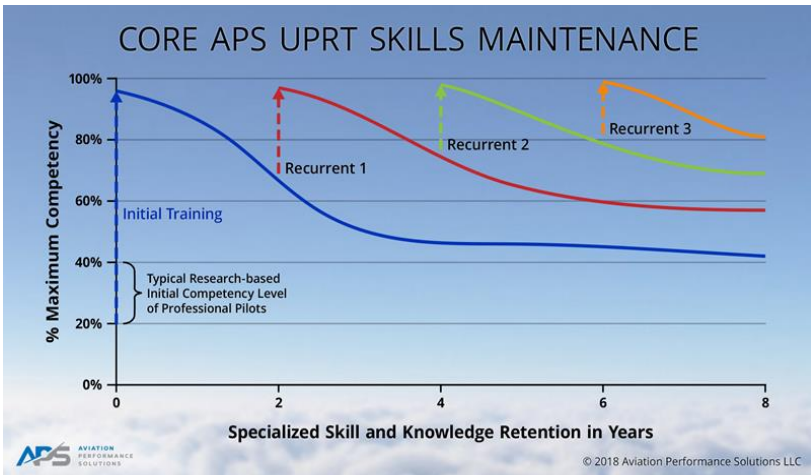


Pilots are well aware of the short-lived nature of perishable skills in piloting. Landing currency, instrument currency, and other consistent reminders that skills that are not used erode with time. If this is true for the skills we use in normal flight operations, it certainly applies to the no less essential, but seldom used skills acquired in UPRT.

Initial UPRT Training

The intensity, density, and integration of the initial UPRT course must establish a long-term, renewable knowledge and skill foundation. If properly introduced, these fundamentals lay the basis for periodic restoration at regular intervals.

Recurrent Training



Like any skill and unique domain of competency, UPRT skills must be revisited and practiced in order to maintain proficiency. Although the vast majority of the benefits of effective UPRT are used on a daily basis by pilots (such as manual flight operations proficiency, enhanced TEM, expanded CRM competence, and Airplane State Awareness), the 'upset recovery' element of these advanced skills are seldom, if ever, used in everyday flying. Therefore, an effective UPRT program must offer a robust recurrent program to allow pilots to refresh cognitive familiarity and afford practice opportunities at least every two years.

COMPLIANCE AND EVALUATION

The EPIC-S2™ Compliance Guide offers a comprehensive checklist of objective compliance parameters in each of the EPIC-S2™ Six Critical UPRT Program Implementation Factors. The guide is available to prospective UPRT providers and operators committed to maximizing their UPRT program's effectiveness. The companion EPIC-S2™ Evaluation Tool provides objective standards to assess compliance to the principles of EPIC-S2™ UPRT.



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“UPRT training, in my opinion, has the greatest safety and cost leverage of any training available. APS has been the industry leader and values a passionate mission to make pilots a safer asset for their company.”

— Steve M., Manager of Standards, Fortune 500 Company

“The knowledge and confidence you receive from [APS] training is second to none. When you return home from your training, you will have the confidence that if you find yourself in your aircraft and put into an unusual situation, you’ll instinctively apply what you’ve learned and turn a bad day into a good one. I would highly recommend APS to anyone who wants to take their aviation skills and safety to the next level. “

— R.B., US Army Pilot

Our airline partnered with APS three years ago to help our team of airline training experts develop an industry-leading, highly-effective Upset Prevention and Recovery Training (UPRT) program. Our UPRT team and I have been completely satisfied with the collaborative work we’ve accomplish over the years with APS for all nine of our fleet-types. APS understands the UPRT needs of Part 121 Air Carriers, FAR 121.423, and the processes, training, and implementation challenges that must be overcome to institute fleet-wide UPRT standardization to the highest level of efficiency, effectiveness, and utility. Helping our airline ensure our pilots bring everyone home safely is what APS offers and delivers. I highly recommend APS as a UPRT partner for any Part 121 operator seeking UPRT solutions to FAR 121.423 and beyond.

— Managing Director of Flight Training, Major U.S. Air Carrier



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