

Development of Upset Recovery and Basic Aerobatic Courses for Collegiate Flight Training Programs

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UPRT & Aerobatic Courses for Collegiate Flight Training

Warren Pittorie, PhD • Michaela Satter

Presentation Overview

1. Presenter Introduction
2. Overview of UPRT
3. UPRT vs Aerobatic Training
4. Opportunities & Challenges in Collegiate Environment
5. Where to start?



Presenter Introduction





Overview of UPRT

Upset Prevention & Recovery Training



Precursor to LOC-I: Aircraft Upset

- Upset means **unintentional**
- Pitch attitude
 - $>25^\circ$ nose up
 - $>10^\circ$ nose down
- Bank angle: $>45^\circ$
- Normal parameters, but inappropriate airspeed
- Examples: unintentional slow flight, unusual attitudes, stalls, & spins

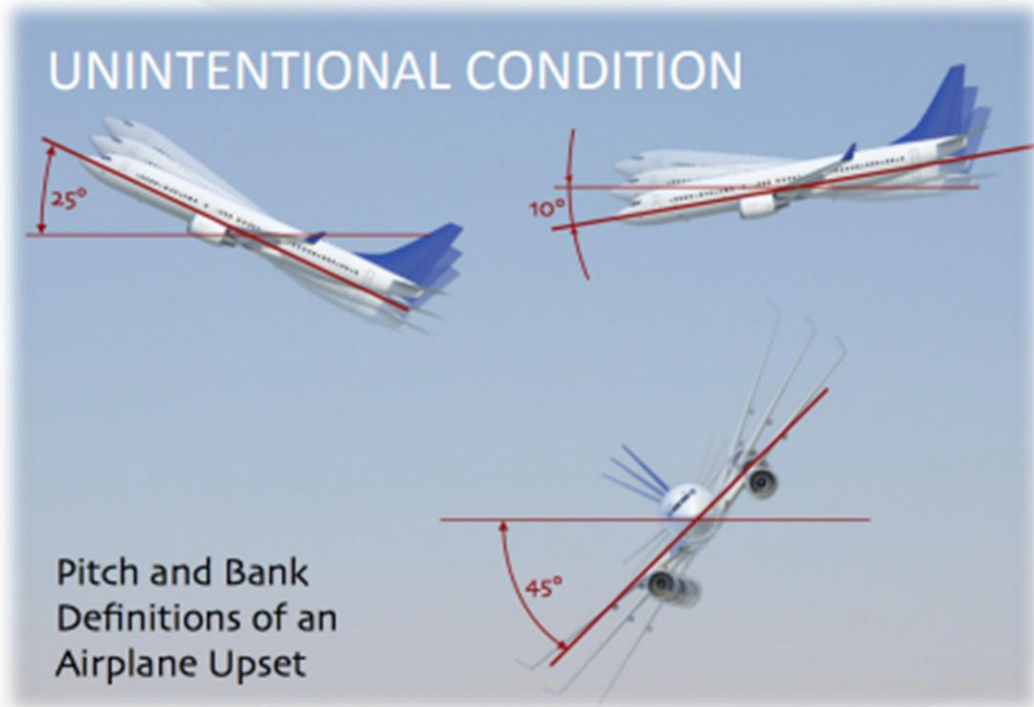


Figure 1: Unintentional Condition (NBAA, n.d.)

Loss of Control-Inflight

- Upset that is not recovered = LOC-I
- Nearly 50% of U.S. fixed-wing GA accidents in the last two decades attributed to LOC-I
- Causes of upsets
 - Pilot-induced
 - Environmental Induced
 - Systems Anomaly-Induced
- Mitigation phases
 - Recovery
 - Prevention
 - Mitigation

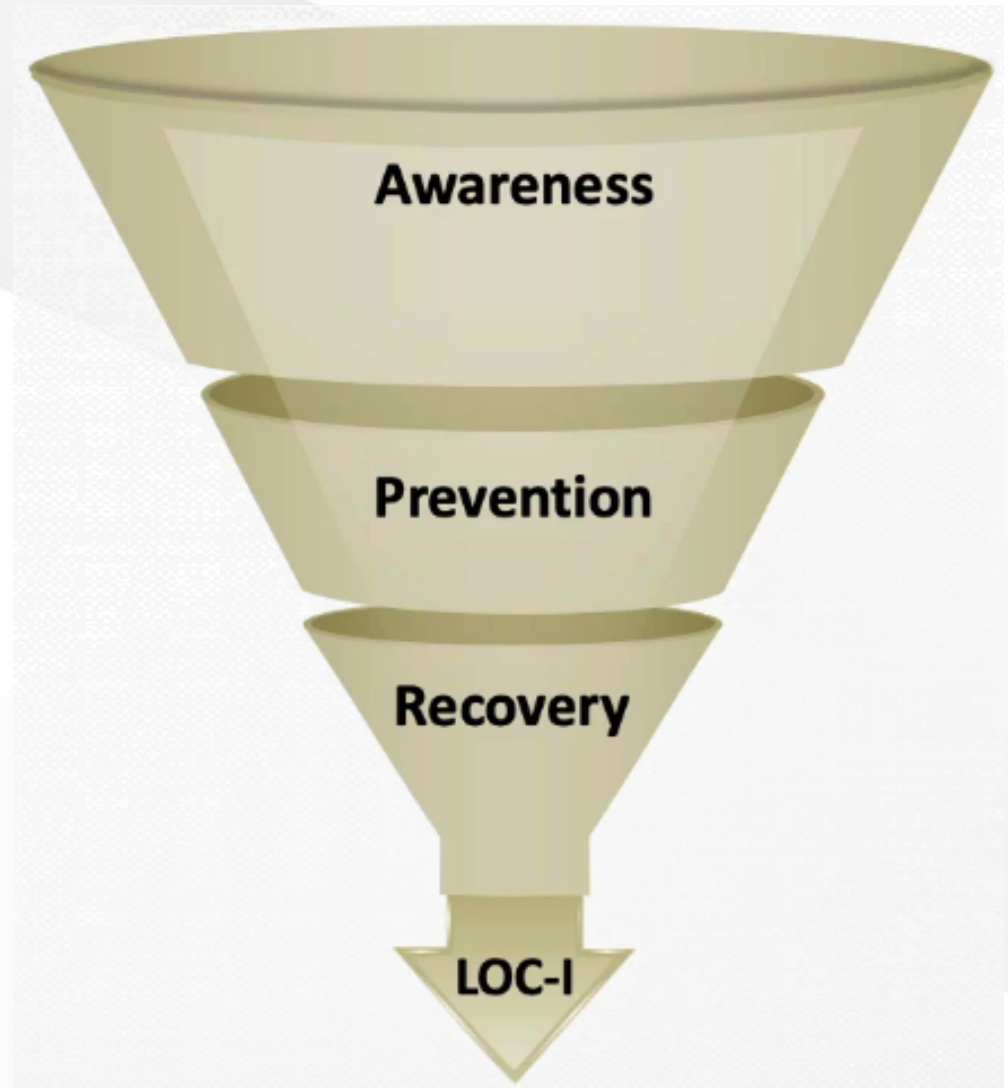


Figure 2: LOC Mitigations and Causes (APS, n.d.)

Elements Missing from Most GA Training

- Full flight envelope unusual attitudes & recovery (*in VMC and IMC**)
- Training beyond minimum requirements in Airmen Certification Standards
 - Scenario-based training: incorporating upsets into normal flight procedures
 - 14 C.F.R. §61.183: **Instructional proficiency** in stall awareness, spin entry, spins, and spin recovery procedures

* = training dependent upon aircraft limitations

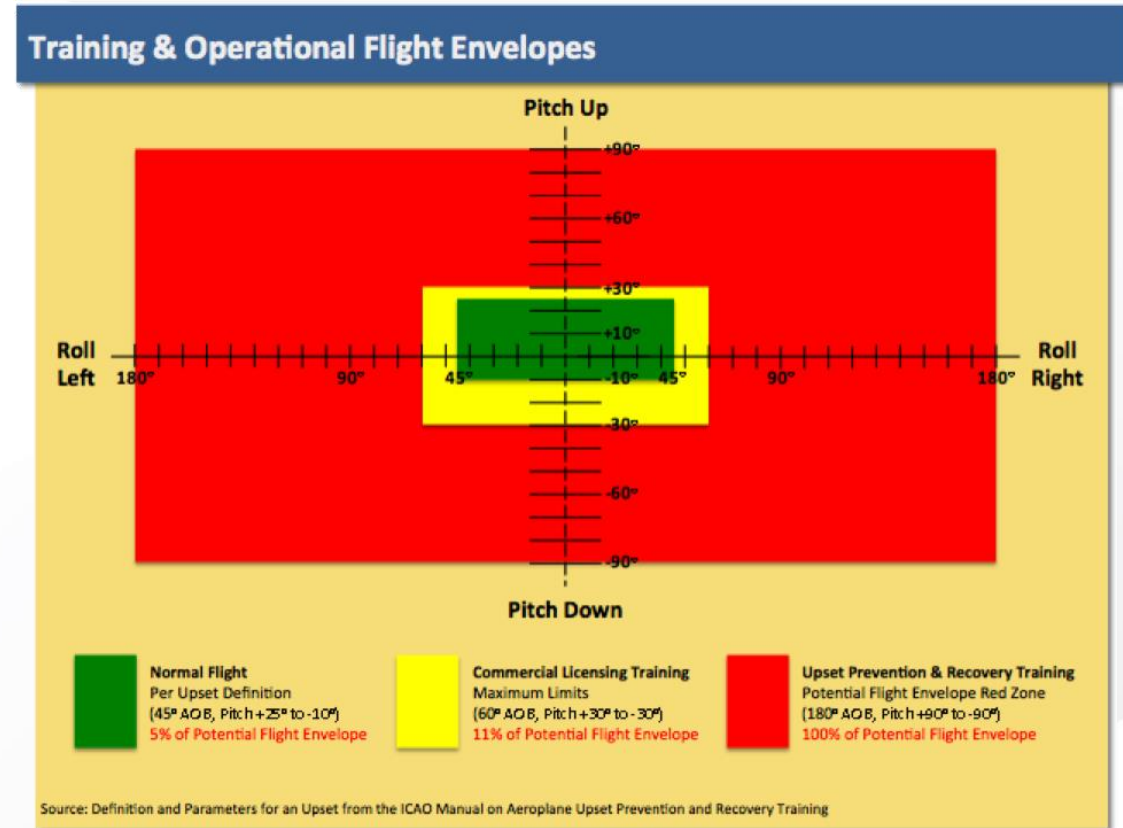


Figure 3: Training and Operational Flight Envelopes (APS, n.d.)

UPRT vs Aerobatic Flight Training Methods

Aspect of Training	UPRT	Aerobatics
Primary Objective	Safe, effective recovery from upset	Precision maneuvering capability
Secondary Objective	Improved manual aircraft handling skills	
Aerobatic Maneuvering	Supporting mode of training	Primary mode of training
Academics	Fundamental component	Supporting role
Training resources utilized	Aircraft, flight simulator (<i>physical & VR</i>)	Aircraft (<i>few exceptions</i>)



Opportunities & Challenges

In the Collegiate Training Environment



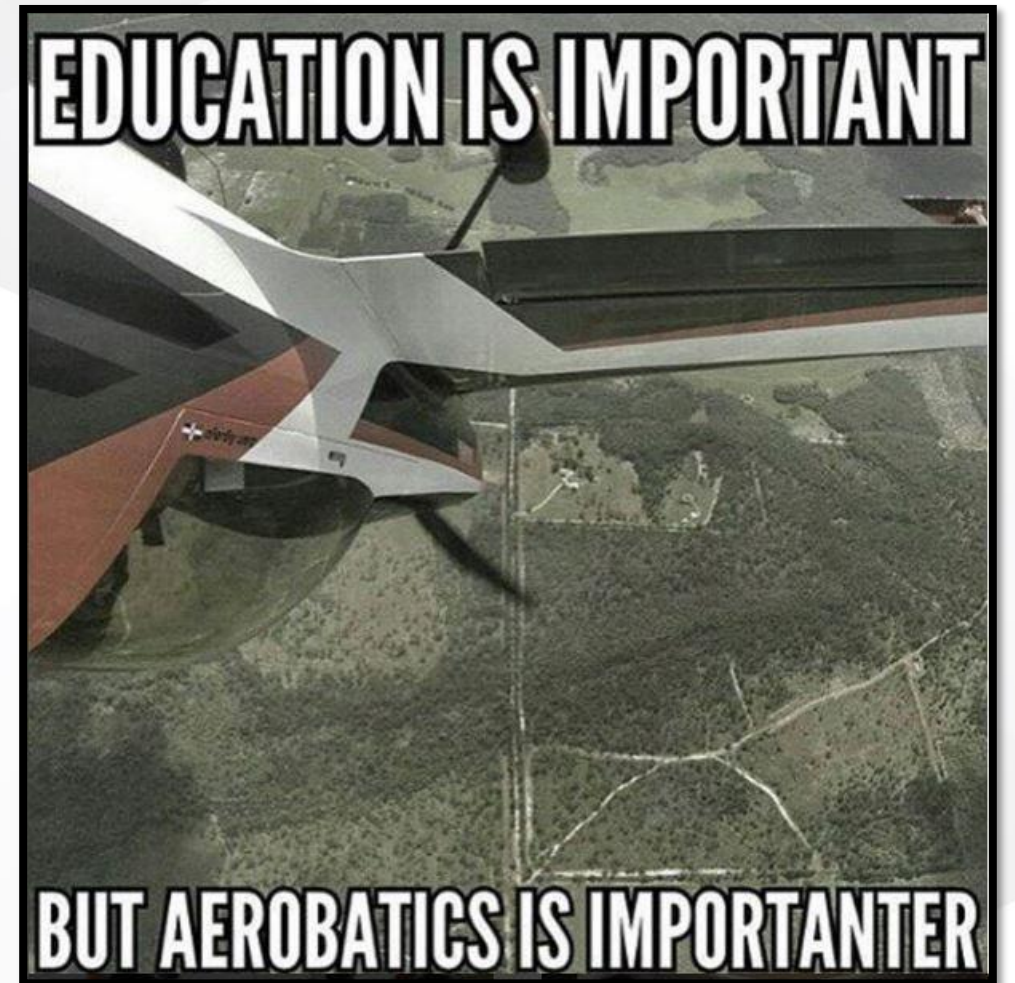
Opportunities

- Existing academic structure for UPRT knowledge: aerodynamics, performance limitations, human factors
- Acquisition of multi-use aircraft: UPRT, aerobatics, & tailwheel
- Development of collegiate flight electives, eligible for R-ATP
- Diversification from other collegiate programs
- Niche training can extend to retail customers



Challenges

- Acquisition of capable aircraft
 - Initial purchasing cost
 - Fixed maintenance costs: higher if using fabric aircraft
- Flight instructor training
 - Proficiency must be beyond that of UPRT or aerobatic student
 - **Possible solution:** outsource training of instructors
- Flight instructor retention
 - Niche flight training dependent on limited number of instructors
 - **Possible solution:** sponsor training in return for additional hours of dual-given





Where to Start?

Publicly-available resources for UPRT & Aerobatic Training



Resources

- Introductory Resources: Airplane Flying Handbook
 - Chapter 5: Maintaining Aircraft Control: Upset Prevention and Recovery Training
 - Chapter 14: Transition to Tailwheel Airplanes
- Regulatory Resources
 - AC 61-67C: Stall and Spin Awareness Training
 - AC 90-23F: Aircraft Wake Turbulence
 - AC 91-61: A Hazard in Aerobatics: Effects of G-Forces on Pilots
 - ICAO Doc 10011: Manual on Aeroplane Upset Prevention and Recovery Training
- Organizational Resource
 - [Guidelines for Pilots Seeking All Attitude Flight Training](#): Provided by the Society of Aviation and Flight Educators (SAFE)
- Providers of UPRT & aerobatic training
 - [International Aerobatic Club](#) (IAC)
 - [LOC-I Training Page](#) through the NBAA

Aircraft Considerations

- Cost
 - Upfront purchasing cost from new or used market
 - Maintenance: complexity of systems, fabric aircraft
- Limitations
 - Useful load
 - Limit load factors
 - Sustained inverted flight capability
 - Maneuverability & stability
- Flexibility
 - Multi-role aircraft (*primary trainer, tailwheel*)
 - Flight instructor initial training



References

- Aviation Performance Solutions. (n.d.). *Training and Operational Flight Envelopes*. Technology in Airline Jet Upset Training. Retrieved October 15, 2022, from <https://apstraining.com/resource/technology-in-airline-jet-upset-training/>.
- Federal Aviation Administration. (2021). *Airplane Flying Handbook* (FAA 8083-3C). U.S. Department of Transportation. Retrieved October 15, 2022.
- Federal Aviation Administration. 14 C.F.R. §61.183 (2022).
- International Civil Aviation Organization. (2014). *Manual on Aeroplane Upset Prevention and Recovery Training* (1st ed.). International Civil Aviation Organization.
- National Business Aviation Association. (n.d.). *Unintentional Condition*. Safety Resource: Loss of Control Inflight. Retrieved October 15, 2022, from <https://nbaa.org/wp-content/uploads/2018/04/2017-loci-safety-overview.pdf>.
- National Transportation Safety Board. (2019). Aviation accident database & synopses. NTSB. https://www.nts.gov/_layouts/ntsb.aviation/index.aspx