

sUAS/ RPAS Training

Competency-based Training and Assessment



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EMBRY-RIDDLE
Aeronautical University™
FLORIDA | ARIZONA | WORLDWIDE

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Intent

- Started with UsX-related research and education options
 - Regulations/certification requirements between manned-unmanned vary drastically
 - Needs of field
 - Application of UAS
 - Educational programs
- Indications from field -> need for:
 - Consistent, flexible training, exceeding Part 107 requirements
 - Observe, learn, practice, apply, and refine critical Knowledge, Skills, and Abilities (KSA)s
 - Real-world settings and scenarios (“learn through doing”)
 - Multiple applications, sUAS types, and support tools
- Gain Part 107 RPC-> practical application/experience-> advanced concepts and best practices

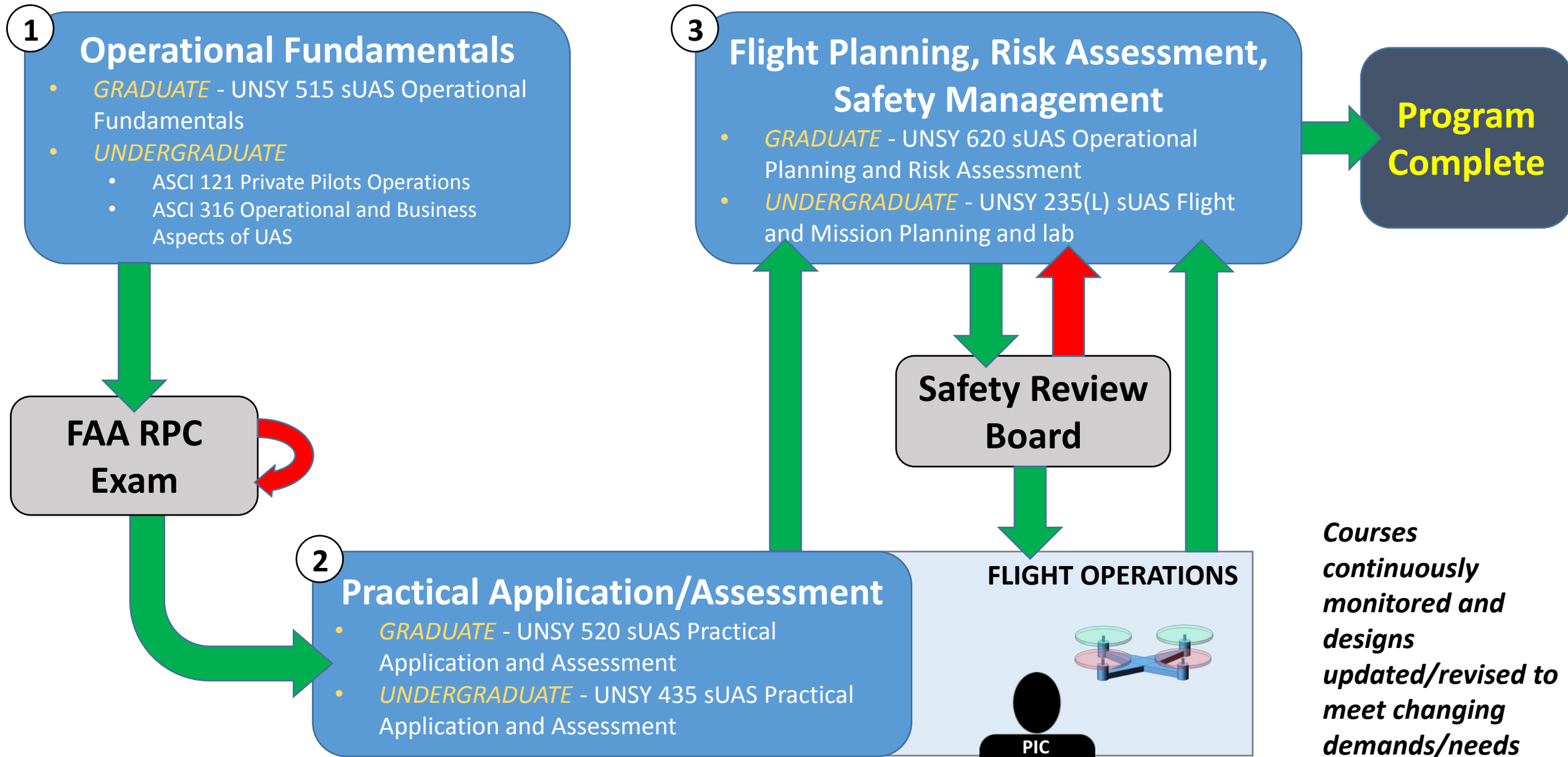


UAS/RPAS Training Design

- Hybrid educational approach
- Derive KSAs, relative to roles
 - Crewmembers and support-roles
 - Safely, effectively, and efficiently operate sUAS in NAS -> best practices/ airmanship
 - Develop Learning Outcomes->Objectives->Activities-> Assessment
- Identify consistent/reliable/appropriate tools; solicit industry feedback/guidance
- Introduce students to variety of platforms/tasks->Achieve Mastery
 - Multirotor and fixed-wing sUAS
 - Flight operation experience
 - Incremental exposure, progression, and assessment with instructor-guided feedback and practice

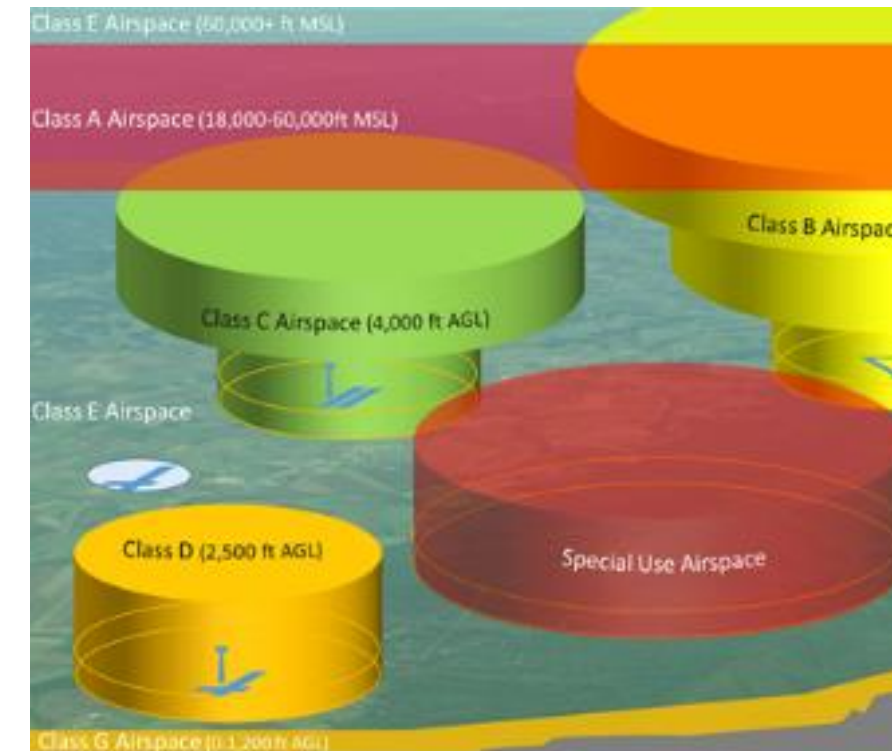


UAS/ RPAS Training Design



UAS/ RPAS Training Design

- *sUAS Operational Fundamentals (Ground School)*
 - Demonstrate appropriate acquisition of knowledge
 - Prepare for FAA Part 107 RPC examination
 - Attain understanding of key factors supporting productive, purposeful, responsible, and legal operation
- KSA-derived LOs
 - Attainment/retention/recall of required aeronautical knowledge necessary to operate sUAS in NAS
 - Interpret examples of regulatory compliant operations
 - Evaluate operational scenarios and conditions
 - Analyze specific practices supporting launch to recovery
 - Formulate regulatory compliant operational strategies
 - Proficiency of operational certification knowledge



UAS/ RPAS Training Design

- *sUAS Practical Application/Assessment (Flight)*
 - Establish/improve unmanned airmanship skills
 - Incremental -> instructor-guided feedback and practice
 - Attain further comprehension of key factors supporting productive, purposeful, responsible, and legal operation
- KSA-derived LOs
 - Employ basic->advanced maneuvers, best practices, and unmanned airmanship skills
 - Practice assigned flight training activities to achieve improved proficiency
 - Assess operational conditions
 - Perform each crew member role
 - Demonstrate legal/regulatory compliance and proficiency
 - Apply fundamental operational KSAs
 - Identify, capture, and analyze quantitative metrics
 - Present results from actual operation



UAS/RPAS Training Design

Practical Application/Assessment

SIMULATED FLIGHT OPERATIONS

Basic Mvrs/Ctls

- Square pattern
- Circular pattern
- Nose-out/lateral/in/translational

Advanced Mvrs/Ctls

- Figure-eight
- Yaw-in-line
- App-specific
- Nose-out/ lateral/ in/translational

FPV

Instructor Checks

- RPC/registration
- Flight Training Area
- Knowledge

Proficiency Assessment

- Altitude control
- Horizontal control
- Heading control
- Control manipulation
- Procedural compliance
- Safety considerations
- Knowledge
- Areas requiring further focus/ practice

LIVE FLIGHT OPERATIONS

Basic Mvrs/Ctls

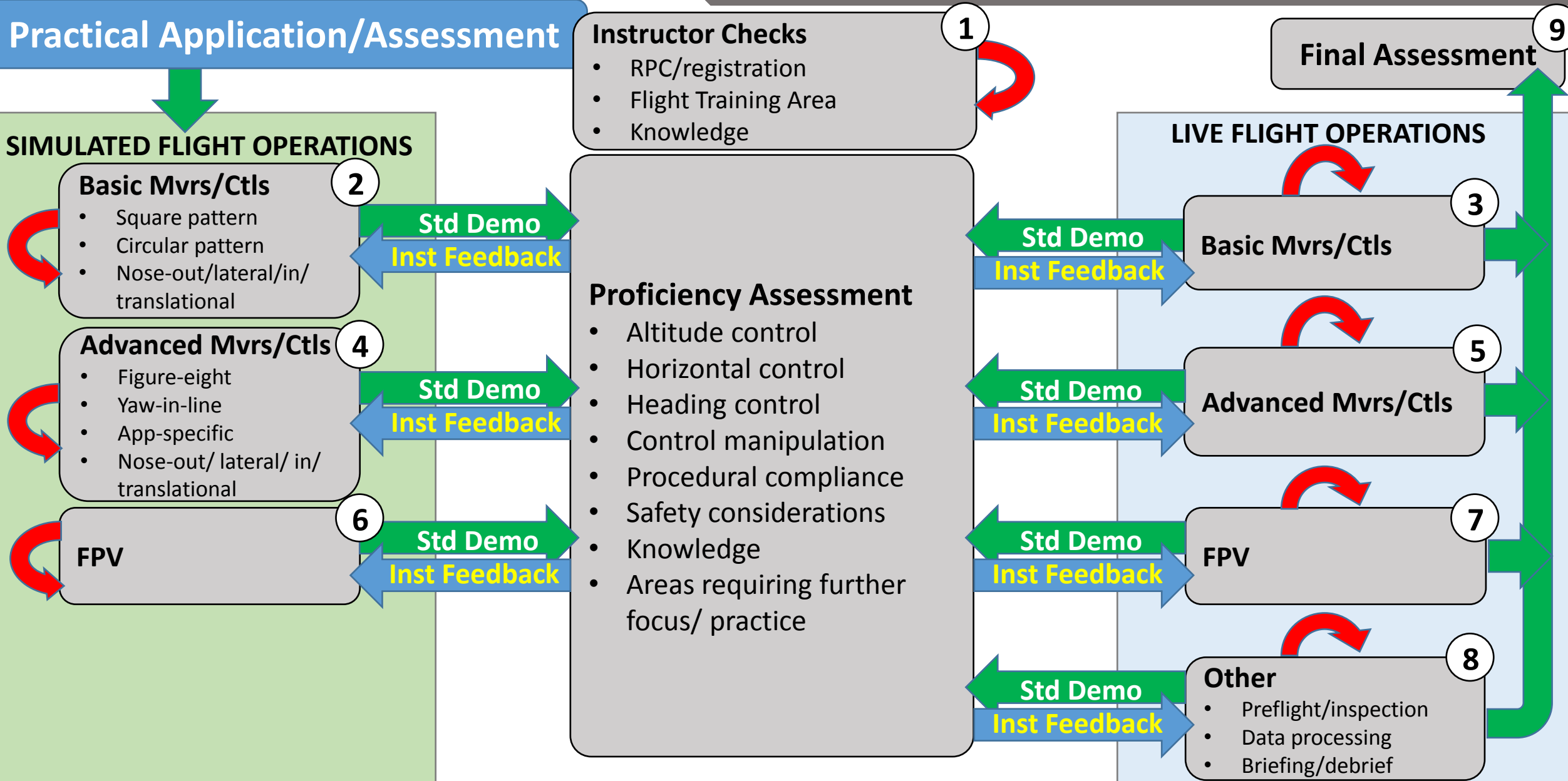
Advanced Mvrs/Ctls

FPV

Other

- Preflight/inspection
- Data processing
- Briefing/debrief

Final Assessment



UAS/RPAS Training Design

- *Operational Planning/Safety Management*
 - Build on previously attained KSAs-> gain further operational exposure/experience
 - Master comprehension of key factors supporting productive, purposeful, responsible, and legal operation
 - Extends well beyond training to real-world operations
- KSAs-derived LOs
 - Formulate viable use->address real-world problem->create feasible operational concept
 - Critically evaluate proposed plans to improve viability, safety, effectiveness, and regulatory compliance
 - Execute detailed analysis of factors affecting performance
 - Develop/defend/test /implement operational plan
 - Classify and report critical observations/metrics from operation
 - Produce after action review briefing detailing results



Support Tools

- Simulation
 - *Aerial Robotics Virtual Lab (AVRL)*
 - *RealFlight 7.5*
- sUAS Toolkit
 - Parrot Bebop2 FPV with SkyController (small multirotor)
 - Smartdevice and apps
 - Records Binder
 - Tools/Equipment
- Additional sUAS Platforms
 - Parrot Disco (fixed-wing)
 - DJI Inspire (larger multirotor)
- Learning Management System (LMS)
- Applicable Texts
 - FAA [Pilot's Handbook of Aeronautical Knowledge](#)
 - ASA [sUAS Guide: Exploring Designs, Operations, Regulations, and Economics](#)
 - ASA [Remote Pilot Test Prep](#)



Observations and Challenges

- Need to quickly adapt/revise materials
- Anyone can legally fly sUAS without any experience
 - Significant differences in training between manned aircraft and sUAS
 - Knowledge exam only->no practical experience required
 - RPC instructor does not need certification as an instructor
- Experience/skills of manned pilots versus non-pilots
 - Non-pilots able to adapt quickly -> lack understanding of regulations, best practices, safety culture
 - Alternatively, experienced manned pilots present inverse
- Overcoming “*I already know all this*” mindset
 - Room to grow->learn new methods
 - Exposure to new concepts/techniques/requirements
 - Civil/commercial (Part 107) differs drastically from recreational and DOD
- Translation from online to real-world settings requires forethought and consideration
 - Appropriate training site selection
 - Rigorous instructor assessment/feedback -> gate to prevent unprepared operation
 - Students already Part 107 certified-> no legal recourse to advancing, independently