National Training Aircraft Symposium (NTAS)   2020 - Perspectives: A Vision into the Future of Aviation

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Examination of the Impact of Various Training Approaches on Different UAS Operator Populations

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Drone Uses

Drone Uses Include:

- Film and Entertainment
- Industrial
- Environmental Purposes
- Construction
- Real Estate

- Emergency Services
- Search and Rescue
- Incident Imaging
- Flooding inspection

FAA Forecasts 2019

Drone industry by 2021 expected to grow to

- 1.6 million drones for commercial use
- 3.5 million drones for recreational use

FAA Forecasts Growth (2017)

FAA. (2019). *FAA aerospace fiscal years 2019-2039*. Federal Aviation Administration. Retrieved from
https://www.faa.gov/data_research/aviation/aerospace_forecasts/media/FY2019-39_FAA_Aerospace_Forecast.pdf
FAA forecasts continued growth in air travel. (2017). Retrieved from https://www.faa.gov/news/updates/?newsId=87746&cid=TW502

Importance of Training

- The FAA is currently focused on training regulations and operating standards
  - Currently there is no requirement for flight training to operate drones recreationally or commercially

- Those looking to utilize drones in industry must learn on their own or utilize commercial vendors to train operators
  - However after a short 10-hour training course, practice opportunities are slim, due to regulatory and fiscal limitations related to live flight.
- What are effective and engaging training methods for UAS?

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Study Goals

- Evaluate the effect of training task on engagement

- Determine which training tasks are best for recreational versus commercial operators

- Explore the influencing factors of engagement based on operator type

Task

- Participants completed 3 training tasks
  - Video: Watching UAS videos while following along with controller in hand
  - Simulation: Obstacle courses completed in RealFlight 7.5
  - Live: Flying similar obstacle courses with a sUAS in a high bay

Video

Simulation

Live
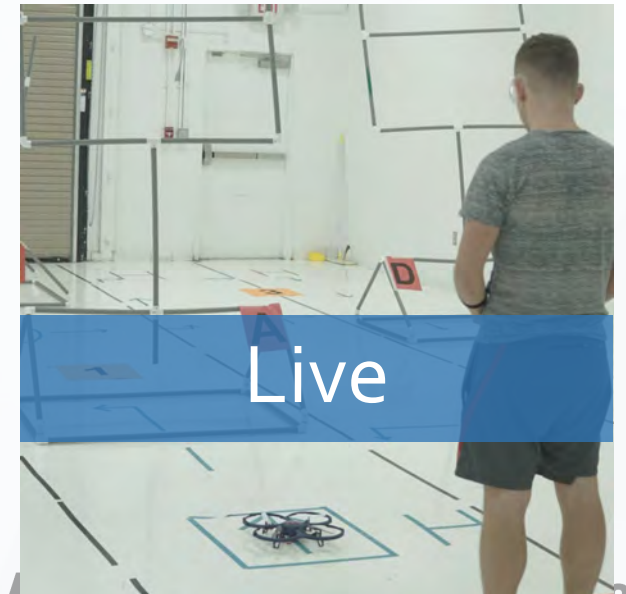
Methods

- 49 people participated in the study
  - 33 undergraduate students enrolled in UAS applications course
  - 8 general college students with UAS interest
  - 8 first responders with UAS experience

- Measures
  - Outcome Measures: Flow Short Scale & Performance
    - Engagement – A state of deep concentration, control, with loss of awareness and time.
    - Performance – 10 points per completed trial
  - Qualifying Measures: Intrinsic Motivation Inventory
    - Interest – Pleasure and interest when completing the task
    - Importance (Value) – Perception of value and usefulness of the task
   - Competence – Perception of effectiveness in completing the task

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Results

- Sim and Live training was significantly more engaging than video
  - F(1,46)=13.03, p = .001

- UAS students and general college students had similar engagement levels throughout

- First responders slightly different (not statistically significant)

- To evaluate differences
  - We merged UAS students and College Students to represent recreational UAS Operators
 - First Responders represented Commercial UAS Operators

Engagement by Task

UAS Students — College Students — First Responders
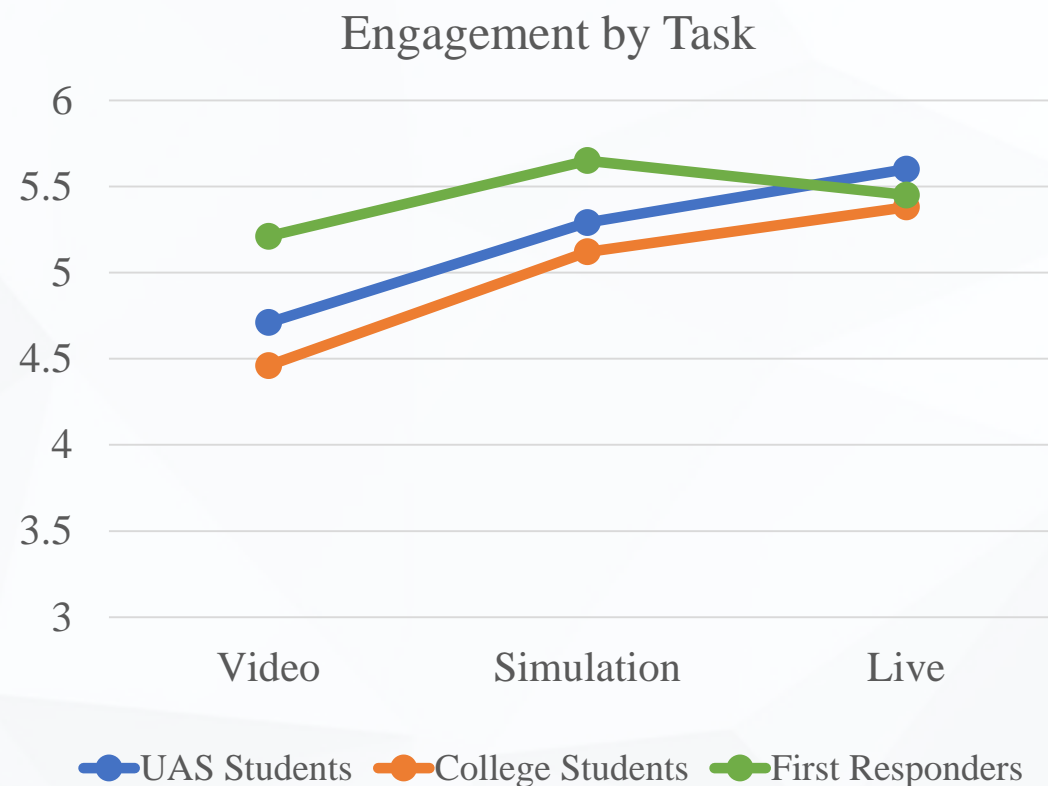
Performance

- Significant interaction between operator type and task
  - $F=(1,47)=8.2$, $p=.006$
- Commercial operators had significantly worse performance
  - $p<=.004$
- Commercial operators mentioned only having experience with self-leveling/auto-hovering drones
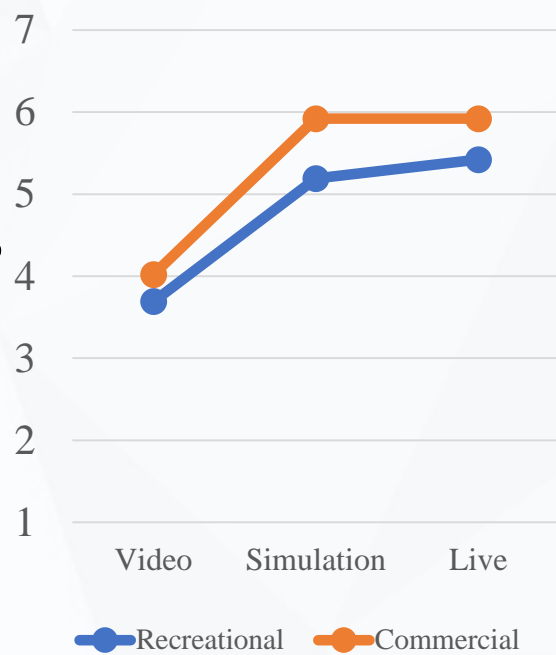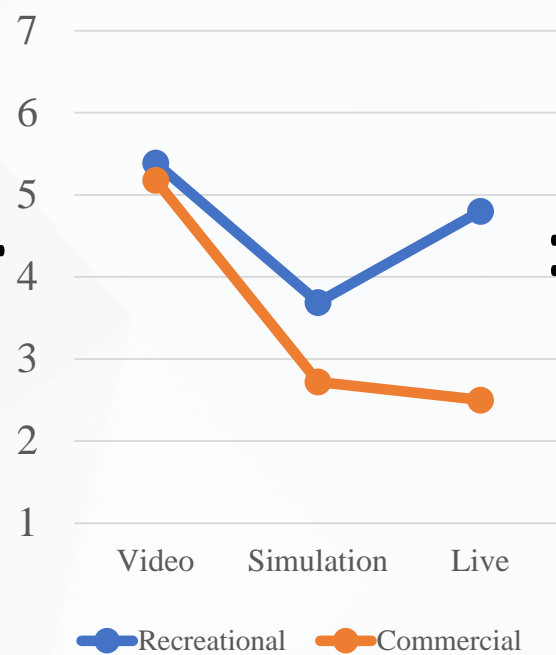
Task Performance
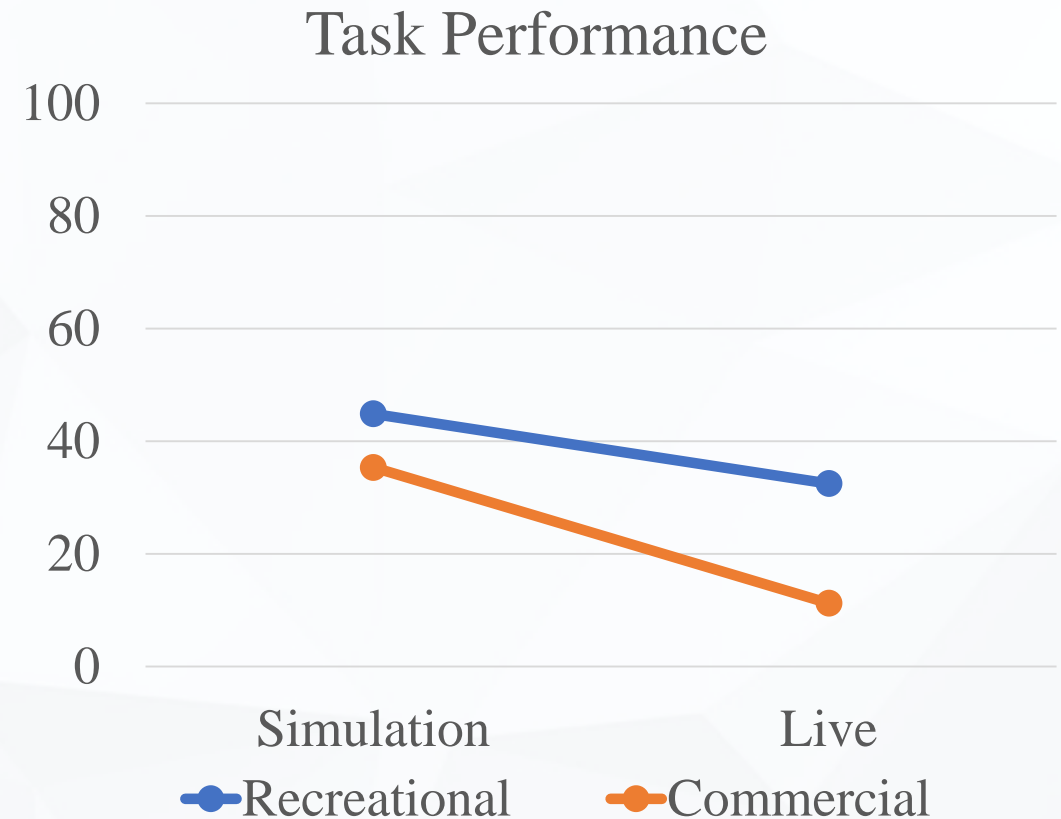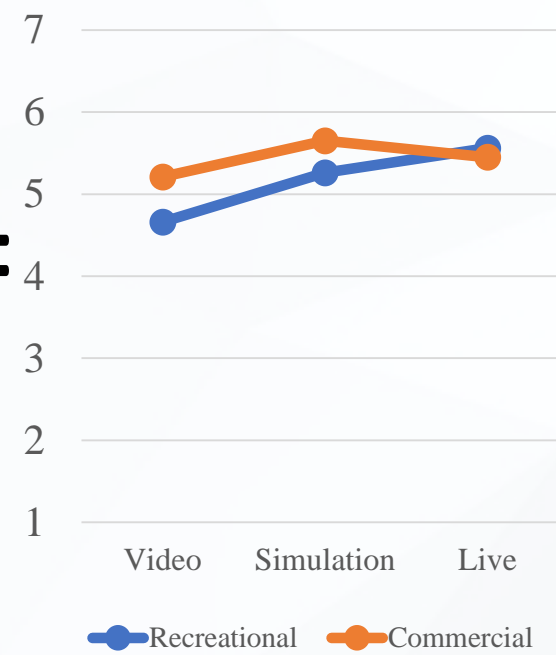
Results

Interest by Task
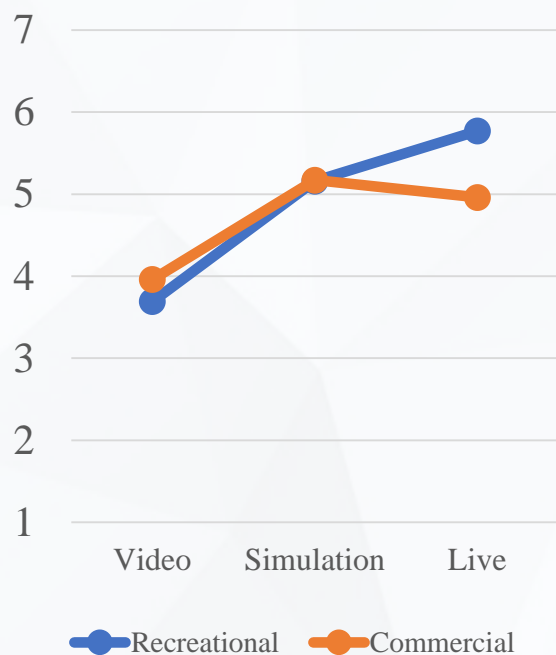
Importance by Task

Competence by Task

Engagement by Task

Interaction of task and operator type
F=(1.68,79.05)=3.15, *p* = .057

No significant interactions or main effects

Main effect of operator type
F(1,47)=6.68, *p* =.013
Interaction of task and operator type
F=(2,94)=7.49, *p*=.001
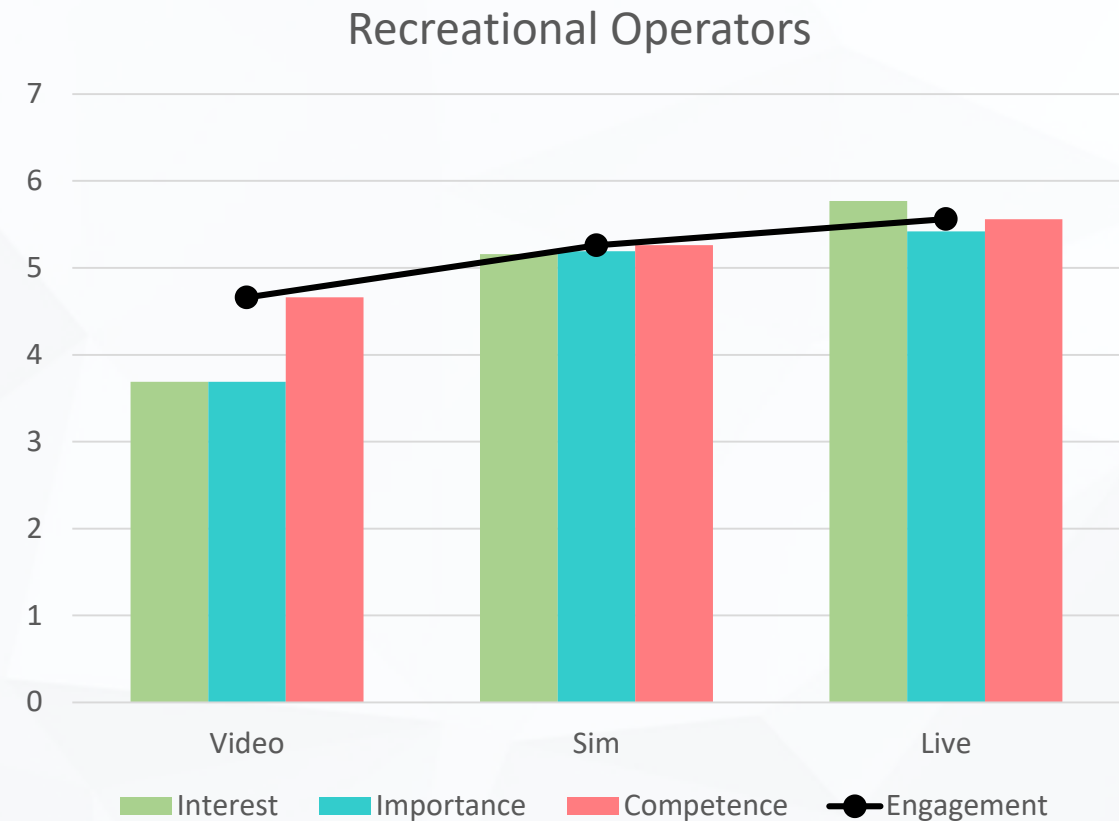
Main effect of task
F=(1.7, 81.74)=6.20, *p*<.005

Recreational UAS Operator Results

- Slightly lower engagement in video condition than commercial operators
  - Likely due to lower interest and importance related to task
- Increased engagement in sim
  - Likely due to improved interest and importance and sustained competence
- Highest engagement in live
  - Likely due to improved interest and importance and sustained competence

Recreational Operators

Legend: Interest, Importance, Competence, Engagement

Categories: Video, Sim, Live

Commercial UAS Operator Results

- Slightly higher engagement in video compared to recreational
  - Likely due to higher interest and importance related to task
- Increased engagement in sim
  - Likely due to improved interest and importance. Slightly less increase compared to recreational likely due to lower competence.
- Decreased engagement in live
  - Likely due to lower competence

Commercial Operators

Legend: Interest, Importance, Competence, Engagement

Categories: Video, Sim, Live

Y-axis: 0 to 7
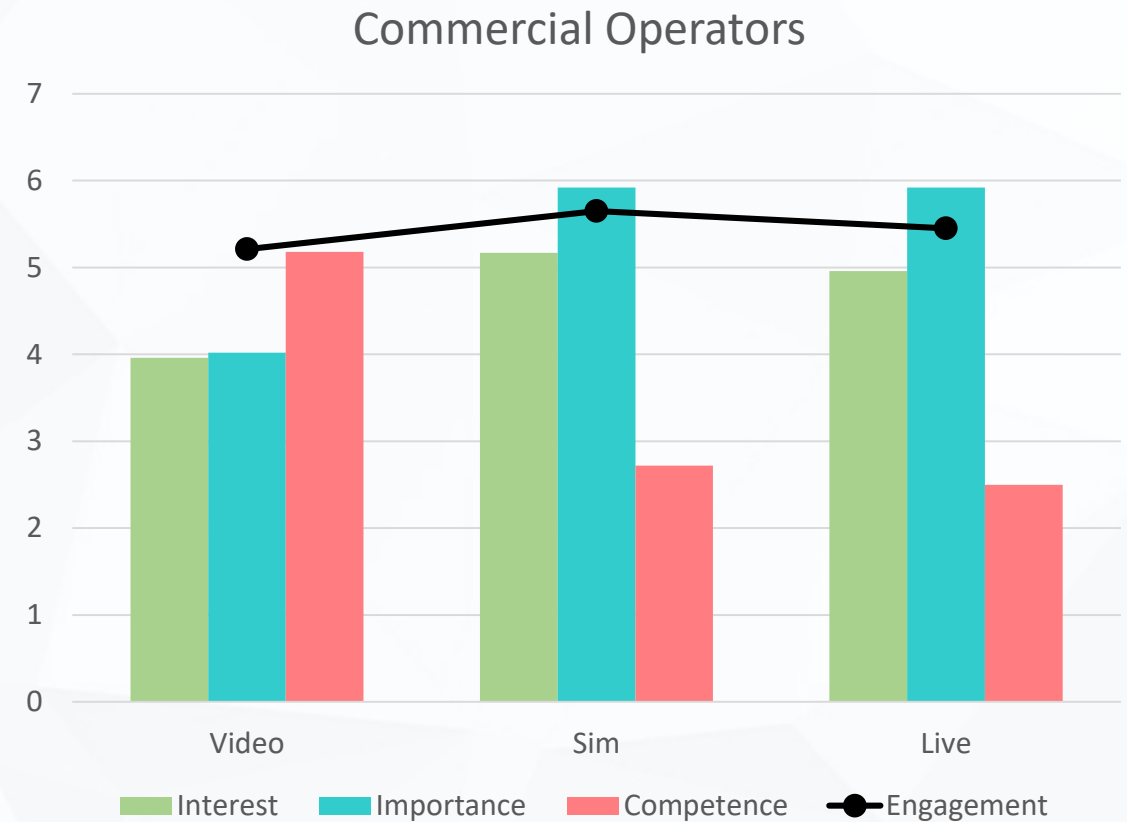
What does this mean for UAS Training?

- Issue: Competence can decrease engagement during training
  - Mitigation: Allow operators to move at their own pace

- Issue: Many commercial operators lack the resources and approval for UAS live training in regulated areas
  - Mitigation: Commercial operators commented that they valued the chance to practice in simulation and live environments

- Issue: Commercial operators did not have experience with non- self-leveling or auto-hovering UAS. Likely this impacted competence and ultimately trainee engagement
  - Mitigation: Match training equipment to real-world equipment

Takeaways for Training

Utilize simulated training, which can be equally as engaging, to increase accessibility and reduce training costs

Training is not one size fits all – offer different paces and environments

Ensure training fosters interest and is designed to be viewed as important to operational needs

Future Research

Evaluate more immersive learning technology such as AR/VR with more applied learning tasks

Explore more individual and task factors that influence learner engagement and outcomes

Evaluate the transfer of training to operational performance

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Questions?

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