



Cockpit Commander

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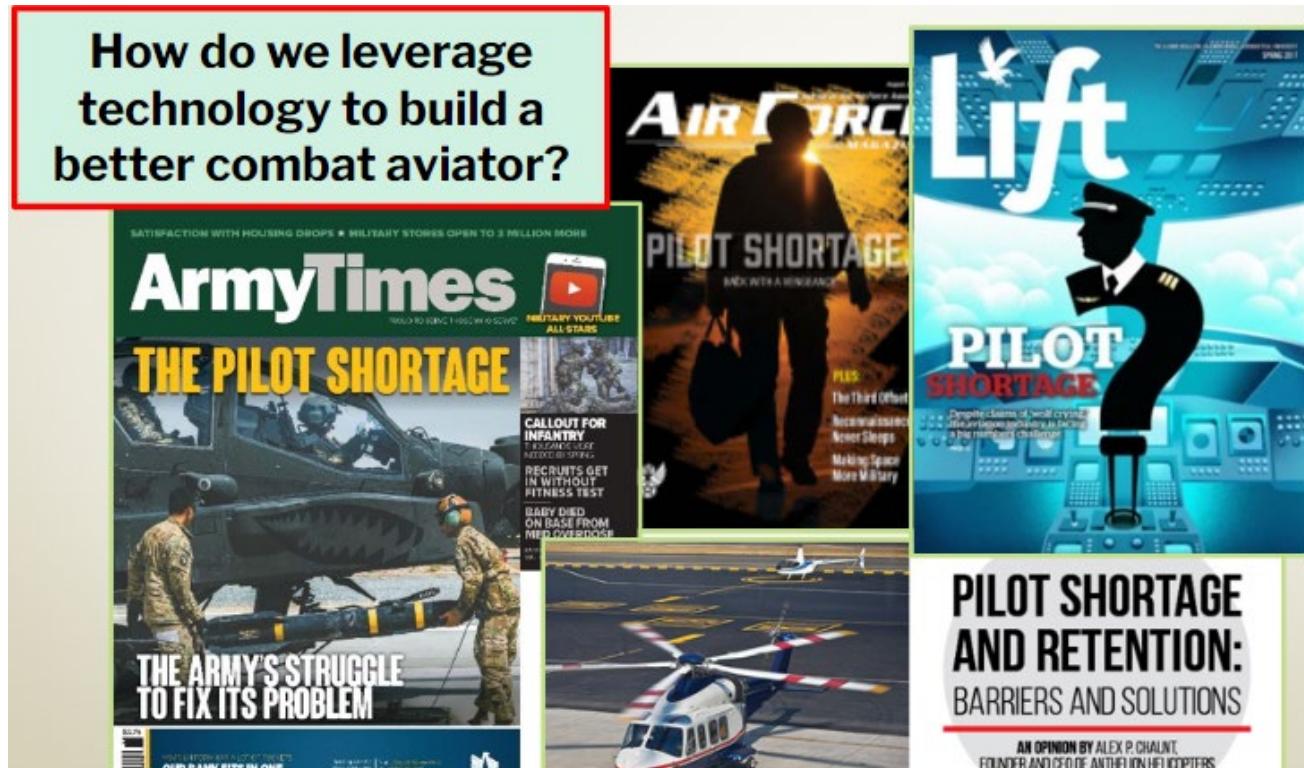


Agenda

- Background
- Research Problem / Hypothesis
- Related Work
- Methods and Design
- Equipment Used and Demo
- Surveys and Grade Sheets
- Questions/Feedback
- References

Background

How do we leverage technology to build a better combat aviator?



- Current training approach remains technologically deficient
- Lack of ability to adjust training
- Device is proven its ability to train flight maneuvers

Research Problem

- Will training in a VR environment provide a more efficient method of flight training in novice pilots?
- What differences will be apparent with the comparison of VR and Powerpoint training.

Hypothesis

- Powerpoint : Will provide more transfer of declarative knowledge than VR.
- VR: Will provide more understanding how to operate the plane rather than a powerpoint.
- A combination of a powerpoint training along with the VR simulation could promote better scores than one or the other.

Related Work (Lit Review)

Gandhi, R. D., & Patel, D. S. (2018).

Virtual Reality –
Opportunities and
Challenges.

Virtual reality adds an extra “layer” of immersion which allows users to have the feeling that they are truly being placed in a new environment

Makransky, G., Terkildsen, T. S., & Mayer, R. E. (2019).

Adding immersive virtual reality to a science lab simulation causes more presence but less learning.

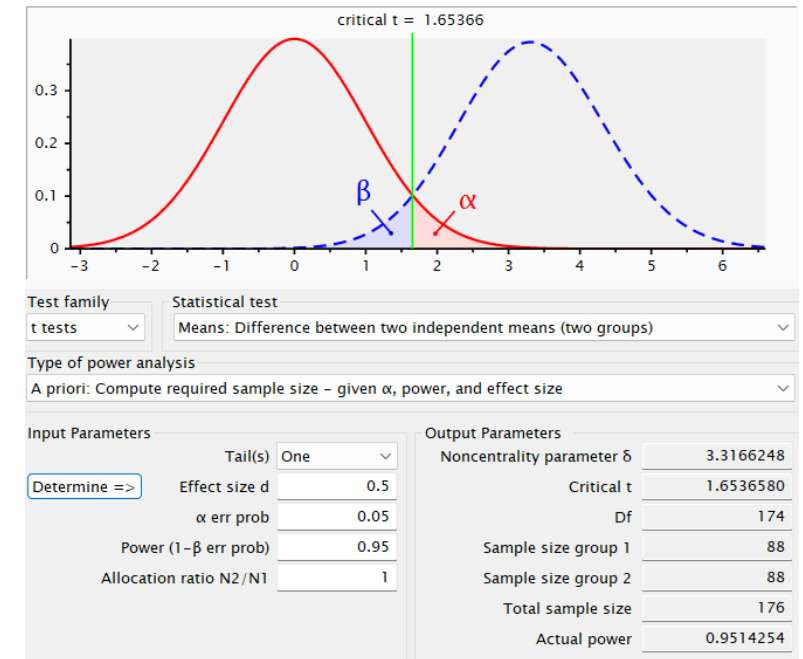
While participants reported being more immersed in the VR environment, it was found that cognitive workload increased while performance on the task decreased when using VR.

Parong, J., & Mayer, R. E. (2018).

Learning science in immersive virtual reality.

Participants who were shown a slideshow scored higher on posttest than VR group, however those participants also reported lower motivation, engagement, and interest in the experiment.

Methods (DOE)



Design of Experiment

Groups:

PPT Only

88 Pre Flight School Students (2 For this Class)

VR Device Only

88 Pre Flight School Students (2 For this Class)

Data Collection:

- Pre-made checklist scored by same IP for all to eliminate bias
- All groups will conduct two iterations of testing flight pattern. Iteration one for familiarization and iteration two for grading.

Conduct Post Test in VR and complete prescribed surveys

Conduct Post Test in VR and complete prescribed surveys

Inclusion and Exclusion Criteria

- Inclusion Criteria:
 - Must be a United States Citizen.
 - Each participant must be 18 - 31 years old.
 - Each participant must have normal or corrected-to-normal vision.
 - No previous history of seizures.
 - Be in good health at time of testing.
- Exclusion Criteria:
 - Not meet the inclusion criteria.

Study Timeline PPT

- Complete informed consent, demographic survey, and Baseline Simulator Sickness Questionnaire (SSQ): 15 minutes
- Conduct Training in PPT: 15 minutes
- Conduct Prepared 3D (P3D) simulated flight exam in VR: 10 minutes
 - Graded by Instructor Pilot
- Complete SSQ #2: 5 minutes
- Debrief: 5 minutes
- **Total Time: 50 minutes**

Study Timeline VR Device

- Complete informed consent, demographic survey, and Baseline Simulator Sickness Questionnaire (SSQ): 15 minutes
- Conduct Training in Prepared 3D (P3D) simulated flight in VR: 15 minutes
- Complete SSQ #2: 5 minutes
- Conduct Prepared 3D (P3D) simulated flight exam in VR: 10 minutes
 - Graded by Instructor Pilot
- Complete SSQ #3: 5 minutes
- Debrief: 5 minutes
- **Total Time: 55 minutes**

Equipment used

- PPT
- Vive Pro
- Helimod
- Surveys
 - Demographic
 - SSQ
 - NASA TLX
- Grade sheet



Device Demo



- Student is provided with picture of topic with illustrations.
- Step by step explanations mirroring VR training provided in text format with correlating picture.
- Still in process of creating training PowerPoint.

Surveys and Grade Sheet

Demographic Survey Questions

Please circle one response for each question.

1. What is your gender?
 - a. Male
 - b. Female
2. What is your rank?
 - a. WO1-CW2
 - b. 2LT-CPT
 - c. Other
3. What is your age?
 - a. 18-24
 - b. 25-34
 - c. 35-44
4. Do you have normal or corrected to normal vision?
 - a. Yes
 - b. No
5. Are you in a good state of health today?
 - a. Yes
 - b. No
6. What is your educational level?
 - a. High School Graduate/GED equivalent
 - b. 2 years of college
 - c. 4 years of college
 - d. Higher level – MS, PhD
7. How often do you play computer games?
 - a. Daily
 - b. Weekly
 - c. Monthly
 - d. Never
8. What is your level of experience with Virtual Reality?
 - a. Novice (Played less than 10 times)
 - b. Intermediate (Played more than 10 times but less than 100)
 - c. Expert (Played more than 100 times)
 - d. None

ID# _____
Date: _____

Date _____ Simulator Sickness Questionnaire Participant _____
SSQ-X

Are you motion sick now? Circle YES or NO

Circle how much each symptom below is affecting you now.
0 = "not at all" 1 = "mild" 2 = "moderate" 3 = "severe"

- | | | | | |
|-----------------------------|---|---|---|---|
| 1. General discomfort | 0 | 1 | 2 | 3 |
| 2. Fatigue | 0 | 1 | 2 | 3 |
| 3. Headache | 0 | 1 | 2 | 3 |
| 4. Eyestrain | 0 | 1 | 2 | 3 |
| 5. Difficulty focusing | 0 | 1 | 2 | 3 |
| 6. Increased salivation | 0 | 1 | 2 | 3 |
| 7. Sweating | 0 | 1 | 2 | 3 |
| 8. Nausea | 0 | 1 | 2 | 3 |
| 9. Difficulty concentrating | 0 | 1 | 2 | 3 |
| 10. Fullness of head | 0 | 1 | 2 | 3 |
| 11. Blurred vision | 0 | 1 | 2 | 3 |
| 12. Dizziness (eyes open) | 0 | 1 | 2 | 3 |
| 13. Dizziness (eyes closed) | 0 | 1 | 2 | 3 |
| 14. Vertigo* | 0 | 1 | 2 | 3 |
| 15. Stomach awareness** | 0 | 1 | 2 | 3 |
| 16. Burping | 0 | 1 | 2 | 3 |

*Vertigo is experienced as loss of orientation with respect to vertical upright
**Stomach awareness is usually used to indicate a feeling of discomfort that is just short of nausea.

NASA Task Load Index

Hart and Staveland's NASA Task Load Index (TLX) method assesses work load on five 7-point scales. Increments of high, medium and low estimates for each point result in 21 gradations on the scales.

Name	Task	Date
Mental Demand How mentally demanding was the task?		
Very Low Very High		
Physical Demand How physically demanding was the task?		
Very Low Very High		
Temporal Demand How hurried or rushed was the pace of the task?		
Very Low Very High		
Performance How successful were you in accomplishing what you were asked to do?		
Perfect Failure		
Effort How hard did you have to work to accomplish your level of performance?		
Very Low Very High		
Frustration How insecure, discouraged, irritated, stressed, and annoyed were you?		
Very Low Very High		

Flight Evaluation Score Sheet

ID# _____
Date: _____

You are currently located on the airfield at a heading of _____.

All preflight and before takeoff checks have been completed and your call sign is Rucker One.

You will only need to communicate with tower and communication will be verbally with no keying of a microphone necessary.

Traffic pattern altitude is 1000' (+/- 100') on the downwind and 800' (+/- 100') on base, winds are calm.

Your task is to complete a Normal VMC take off, remain in the traffic pattern, and complete a VMC approach to the ground. Call ready for takeoff.

After ready for T/O call: Rucker One you are clear for takeoff, remain right closed, call base.

After base call: Rucker One you are clear to land lane _____.

TASK	SATISFACTORY	UNSATISFACTORY
Student Type	VR / PPT	
VMC TAKEOFF		
Maintain takeoff heading ± 10 degrees below 50 feet above ground level (AGL) or until clear of obstacles.		
Maintain desired ground track.		
Maintain aircraft in trim above 50 feet AGL or as appropriate for obstacle clearance or transition to terrain flight.		
VMC FLIGHT MANEUVERS (TRAFFIC PATTERN)		
Turns: Rollout on desired heading ± 10 degrees.		
Climbs/Descents: Stop climb/descent at desired altitude ± 100 feet.		
Enter, operate in, and depart a traffic pattern.		
Comply with all ATC directives.		

Questions/Feedback



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