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Problem Statement

- Current lab instructions are written for experienced mechanics, not students who may be less familiar with protocols
- Increasing class sizes allow less time for one-on-one instruction



Research Question

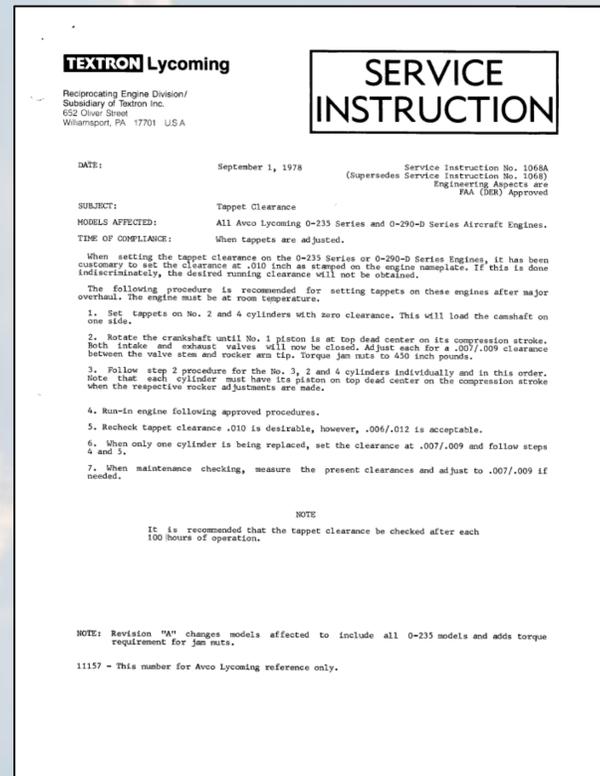
- Will enhanced training tools that include more descriptive text and graphics reduce the likelihood of miscommunication and improve student outcomes in the laboratory project?

Methodology

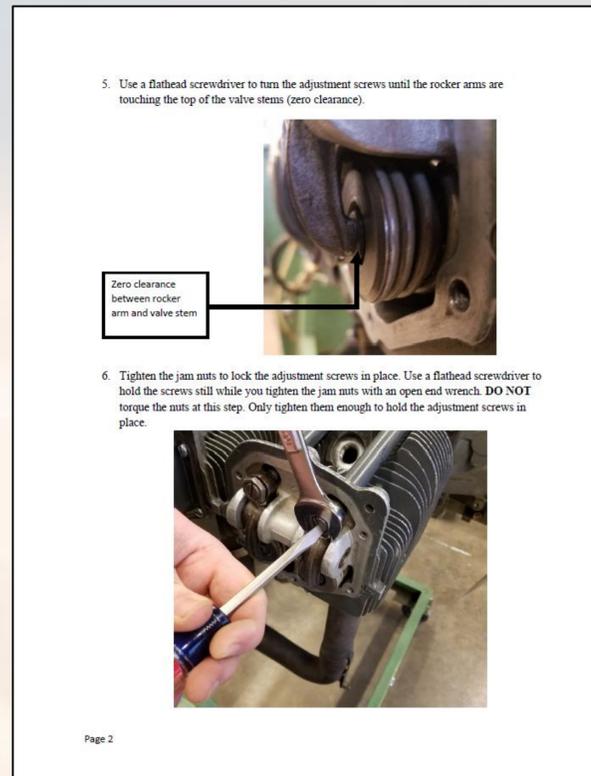
- **True experimental research** with experimental and control groups
- **Participants:** 26 students in the Advanced Aircraft Powerplants class at Purdue University during Spring 2017 semester
- **Laboratory Project:** Valve Clearance Adjustment
 - Lycoming O-290 aircraft engine
 - Adjust space between rocker arm and valve stem
- **Data Collection:** Date, Participant number, Type of instructions, Number of attempts, Time, Questions Asked/Number of questions, Students perception of the quality of the instructions (scale 1-5)

Instruction Materials

Current



Proposed



Literature Review

Maintenance Errors

- Maintenance errors are primary cause for 8% of commercial accidents worldwide
- Leading factor for Letters of Investigation (LOI) for aviation maintenance technicians (AMTs) is failure to follow written procedures
- 83% of Aviation Safety reports from 2010 to 2013 were related to technical publications and other written procedures
- The highest ranking human error in aircraft maintenance relates to information interpretation

Documentation and Usability

- Usability of aircraft manuals "includes how easy they are to use, how well they match the technician's representation of a task, how easy they are to read and interpret, and how useful the information is they contain"
- Often the technicians did not refer to the information, misunderstood the information, or disregarded it in favor of an alternative method of performing the maintenance procedure
- Potential consequences of usability problems are the safety, speed, and cost of aircraft maintenance
- Recommendations for addressing usability problems are increased feedback from the users, including an error reporting system, and controlling formatting consistency and reading level through standardization guidelines, including the ordering of procedural steps, the wording of procedures, the use of illustrations, and the level of detail

Preliminary Results

Proposed Instructions

- Lower average times
- Fewer questions
- Fewer attempts
- Higher student rating

Current Instructions

- Students got the correct solution, but not always correct procedure
- Clarification on what to measure, where to measure it and how to tighten without moving the screw



Discussion

Future Research

- Larger sample size
- Test long-term information retention

Research Ethics

- Protection of student participants was a primary goal and close collaboration with Purdue IRB office was a critical component of research

References

- Chaparro, A., & Groff, L. S. (2002). Human Factors Survey of Aviation Technical Manuals. *16th Human Factors in Aviation Maintenance Symposium*. Retrieved from <https://pdfs.semanticscholar.org/e83d/24811b445cf1df6ab5b09a8a592a39350ec3.pdf>
- Federal Aviation Administration. (2014). *The Operator's Manual for Human Factors in Aviation Maintenance*. Washington, DC: Office of Aerospace Medicine. Retrieved from https://www.faa.gov/about/initiatives/maintenance_hf/library/documents/media/human_factors_maintenance/hf_ops_manual_2014.pdf