Subject Area Committee Name: **Aviation Maintenance Technology (AMT)**

Focal Outcome Being Assessed: **Develop and act upon a personal attitude and plan of "Safety Awareness" and compliance that includes one's self, one's co-workers, the work area, and the aircraft.**

Contact Person:

Name	*e-mail*
Anders Rasmussen	anders.rasmussen@pcc.edu

This form is for the initial assessment of a focal outcome.

- Refer to the help document for guidance in filling out this report. If this document does not address your question/concern, contact Nora Stevens to arrange for coaching assistance.
- Please attach all rubrics/assignments/etc. to your report submissions.
- **Subject Line of Email:** Assessment Report Form (or ARF) for <your SAC name> (Example: ARF for NRS)
- **File name:** SACInitials_ARF_2018 (Example: NRS_ARF_2018)
- SACs are encouraged to share this report with their LAC coach for feedback before submitting.
- Make all submissions to **learningassessment@pcc.edu.**

Due Dates:

- **Planning Sections of LAC Assessment or Reassessment Reports: November 27th, 2017**
- **Completed LAC Assessment or Reassessment Reports: June 16th, 2018**

Please Verify This Before Beginning this Report:

☒ *This project is not the second stage of the assess/reassess process (if this is a follow-up, re-assessment project, use the LAC Re-assessment Report Form CTE. Available here).*

1. Outcome Chosen for Focal Analysis

1A. How does your field interpret the outcome you are assessing?

It's one of the primary attributes being evaluated when individuals are testing for their FAA certification (licensing) (Ref FAA document 8900.2, FAA-S-8083-26A, -27A, -28A ¶ on unsatisfactory performance). Additionally, there are significant implications once in the workforce: in the aerospace industry, more so than many others, a lack of safety awareness/consciousness very literally could be a life-or-death matter.

1B. If the assessment project relates to any of the following, check all that apply:

☒ ***Degree/Certificate Outcome – if yes, include here:*** See "Focal Outcome" page 1.
☒ ***PCC Core Outcome – if yes, which one:*** Community & Environmental Responsibility, Cultural Awareness, Self-Reflection
☒ ***Course Outcome – if yes, which one:*** Communicate effectively with employers, co-workers, and customers in a professional manner.
☐ ***Exploratory Outcome – if yes, briefly describe***:

2. Project Description

2A. Assessment Context

Check all the applicable items:

☒ **Course-based assessment.**
Course names and number(s): AMT 115, Aircraft Structures & Inspection
Type of assessment (e.g., essay, exam, speech, project, etc.): Class Project

Are there course outcomes that align with this aspect of the outcome being investigated? ☒ Yes ☐ No
If yes, include the course outcome(s) from the relevant CCOG(s): Communicate effectively with employers, co-workers, and customers in a professional manner.

☒ **Common/embedded assignment in all relevant course sections.** An embedded assignment is one that is already included as an element in the course as usually taught. Please attach the activity in an appendix. If the activity cannot be shared, indicate the type of assignment (e.g., essay, exam, speech, project, etc.): **Project: Performing aircraft jacking and retracting the landing gear; follow-up quiz to determine student safety awareness. Project will be shared as an appendix in the final submittal.**

☐ **Common – but not embedded - assignment used in all relevant course sections.** Please attach the activity in an appendix. If the activity cannot be shared, indicate the type of assignment (e.g., essay, exam, speech, project, etc.):

☐ **Practicum/Clinical work.** Please attach the activity/checklist/etc. in an appendix. If this cannot be shared, indicate the type of assessment (e.g., supervisor checklist, interview, essay, exam, speech, project, etc.):

☐ **External certification exam.** Please attach sample questions for the relevant portions of the exam in an appendix (provided that publically revealing this information will not compromise test security). Also, briefly describe how the results of this exam are broken down in a way that leads to nuanced information about the aspect of the core outcome that is being investigated.

☐ **SAC-created, non-course assessment.** Please attach the assessment in an appendix. If the assessment cannot be shared, indicate the type of assignment (e.g., essay, exam, speech, project, etc.):

☐ **Portfolio.** Please attach sample instructions/activities/etc. for the relevant portions of the portfolio submission in an appendix. Briefly describe how the results of this assessment are broken down in a way that leads to nuanced information about the aspect of the core outcome that is being investigated:

☐ **TSA.** Please attach the relevant portions of the assessment in an appendix. If the assessment cannot be shared, indicate the type of assignment (e.g., essay, exam, speech, project, etc.):

☐ **Survey**

☐ **Interview**

☐ **Other.** Please attach the activity/assessment in an appendix. If the activity cannot be shared, please briefly describe it:

In the event publicly sharing your assessment documents will compromise future assessments or uses of the assignment, do not attach the actual assignment/document. Instead, please give as much detail about the activity as possible in an appendix.

2B. How will you score/measure/quantify student performance?

☒ **Rubric** (used when student performance is on a continuum - if available, attach as an appendix – if in development, attach to the completed report that is submitted in June)

☐ **Checklist** (used when presence/absence rather than quality is being evaluated - if available, attach as an appendix – if in development, attach to the completed report that is submitted in June)
☐ **Trend Analysis** (often used to understand the ways in which students are, and are not, meeting expectations; trend analysis can complement rubrics and checklist)
☐ **Objective Scoring** (e.g., Scantron-scored examinations)
☒ **Other** – briefly describe: Student reflection, quiz.

2C. Type of assessment (select one per column)

☐ **Quantitative**	☒ **Direct Assessment**
☒ **Qualitative**	☐ **Indirect Assessment**

If you selected 'Indirect Assessment', please share your rationale:

Qualitative Measures: projects that analyze in-depth, non-numerical data via observer impression rather than via quantitative analysis. Generally, qualitative measures are used in exploratory, pilot projects rather than in true assessments of student attainment. Note that the use of a numerical rubric is considered quantitative analysis, even if the artifacts under consideration are not based on quantitative calculations (e.g. an essay scored by a rubric counts as quantitative in the context of assessment).

Indirect assessments (e.g., surveys, focus groups, etc.) do not use measures of direct student work output. These types of assessments are also not able to truly document student attainment.

2D. Check any of the following that were used by your SAC to create or select the assessment/scoring criteria/instruments used in this project:

☒ Committee or subcommittee of the SAC collaborated in its creation
☐ Standardized assessment
☐ Collaboration with external stakeholders (e.g., advisory board, transfer institution/program)
☐ Theoretical Model (e.g., Bloom's Taxonomy)
☐ Aligned the assessment with standards from a professional body (for example, The American Psychological Association Undergraduate Guidelines, etc.)
☐ Aligned the benchmark with the Associate's Degree level expectations of the Degree Qualifications Profile
☐ Aligned the benchmark to within-discipline post-requisite course(s)
☐ Aligned the benchmark to out-of-discipline post-requisite course(s)
☐ Other (briefly explain:)

2E. In which quarter will student artifacts (samples of student work) be collected? If student artifacts will be collected in more than one term, check all that apply.

☐ **Fall** ☒ **Winter** ☐ **Spring** ☐ **Other** (e.g., if work is collected between terms)

2F. What student group do you want to generalize the results of your assessment to? For example, if you are assessing performance in a course, the student group you want to generalize to is 'all students taking this course.'

All students taking the course.

2G. There is no single, recommended assessment strategy. Each SAC is tasked with choosing appropriate methods for their purposes. Which best describes the purpose of this project?

☒ **To measure established outcomes and/or drive programmatic change**
☐ **To participate in the Multi-State Collaborative for Learning Outcomes Assessment**
☐ **Preliminary/Exploratory investigation**

If you selected 'Preliminary/Exploratory' (most often a 'pilot study'), briefly describe why you opted to do a pilot study, along with your rationale for selecting your sampling method:

2H. Which will you measure?

☒ **the population** (all relevant students – e.g., all students enrolled in all currently-offered sections of the course)
☐ **a sample** (a subset of students)

If you are using a sample, select all of the following that describe your sample/sampling strategy (refer to the Help Guide for assistance):

☐ **Random Sample** (student work selected completely randomly from all relevant students)
☐ **Systematic Sample** (student work selected through an arbitrary pattern, e.g., 'start at student 7 on the roster and then select every 5th student following'; repeating this in all relevant course sections)
☐ **Stratified Sample** (more complex, consult with an LAC coach if you need assistance)
☐ **Cluster Sample** (students are selected randomly from meaningful, naturally-occurring groupings (e.g., SES, placement exam scores, etc.)
☒ **Voluntary Response Sample** (students submit their work/responses through voluntary submission – e.g., via a survey)
☐ **Opportunity/Convenience Sample** (only a few instructors are participating in a project taught via multiple sections, so, only those instructors' students are included)

The last three options in bolded red have a high risk of introducing bias. If your SAC is using one or more of these sample/sampling strategies, please share your rationale: ——With respect to the survey, the instructor has no way of identifying students who have or have not completed, only # of completers. See the appendices for further detail on this.

2I. Briefly describe the procedure you will use to select your sample **(including a description of the procedures used to ensure student and instructor anonymity.)**

All students in the class.

2J. Follow this link to determine how many artifacts (samples of student work) you should include in your assessment: http://www.raosoft.com/samplesize.html (see screen shot below).

Start with the number of students you estimate will be enrolled in the course(s) from which you will draw the sample – that is your "population." Enter the other numbers as indicated in the screenshot. The sample size calculator will tell you how many artifacts you need to collect. Enter that number below:

N/A – All students in class.

3. Project Mechanics

3A. Does your project utilize a rubric for scoring? ☒ **Yes** ☐ **No**

If 'No', proceed to section B. If 'Yes', complete the following:

Which method of ensuring consistent scoring (inter-rater reliability) will your SAC use for this project?

☐ **Agreement** – the percentage of raters giving each artifact the same/similar score in a norming session; ideally, that will be 75% agreement or greater.

If you are using agreement, describe your plan for plan for conducting the "norming" or "calibrating" session:

☒ **Consensus** - all raters score all artifacts and reach agreement on each score

☐ **Consistency*** – raters' scores are correlated: this captures relative standing of the performance ratings - but not precise agreement. Briefly describe your plan:

Notes: the agreement method is the most frequently used for assessment, but the **calculation of inter-rater reliability is also among the more challenging issues** within assessment as a whole. If your SAC is unfamiliar with norming procedures, contact your assessment coach, or if you don't know who your coach is, contact LAC Vice Chair Chris Brooks to arrange for coaching help for your SAC's norming session.

The consistency method is not generally recommended; see the help guide for details.

3B. Have performance benchmarks been specified?

The fundamental measure in educational assessment is the number of students who complete the work at the expected/required level. We are calling this SAC-determined performance expectation the 'benchmark.'

☒ **Yes**
☐ **No**

If yes, briefly describe your performance benchmarks, being as specific as possible (if needed, attach as an appendix):

Students attain 70% on quiz and/or exhibit awareness of both safety and human factor protocols associated with task; in addition, students exhibit thoughtful post-assignment self-reflection through discussion about assignment (project) and performance.

If no, what is the purpose of this assessment? (For example, this assessment will provide information that will lead to developing benchmarks in the future; or, this assessment will lead to areas for more detailed study; etc.)

3C. The purpose of this assessment is to have SAC-wide evaluation of student work, not to evaluate a particular instructor or student. Before evaluation, remove student-identifying information (and, when possible remove instructor-identifying information). **Please share your process for ensuring that all identifying information has been removed.**

Electronic data acquisition; SAC/Instructor(s) will ensure student-specific data deleted.

3D. Will you be coding your data/artifacts in order to compare student sub-groups? ☐ **Yes** ☒ **No**

If yes, select one of the boxes below:

☐ **student's total earned hours** ☐ **previous coursework completed** ☐ **ethnicity** ☐ **other**

Briefly describe your coding plan and rationale (and if you selected 'other', identify the sub-groups you will be coding for):

3E. Ideally, student work is evaluated *by both full-time and adjunct faculty, even if students being assessed are taught by only full-time and/or adjunct faculty. Further, more than one rater is needed to ensure inter-rater reliability. If you feel only one rater is feasible for your SAC, please explain why:* Only one instructor teaches this course.

Who will be assessing student work for this project? Check all that apply.

- ☐ PCC Adjunct Faculty within the program/discipline
- ☒ PCC FT Faculty within the program/discipline
- ☐ PCC Faculty outside the program/discipline
- ☐ Program Advisory Board Members
- ☐ Non-PCC Faculty
- ☐ External Supervisors
- ☐ Other:

End of Planning Section – Complete the remainder of this report after your assessment project is complete.

Beginning of End-of-Year Reporting Section – complete the following sections after your assessment project is complete.

4. Changes to the Assessment Plan

Have there been changes to your project since you submitted the planning section of this report? ☒ Yes ☐ No

If so, summarize those changes below:

¶ 2h: Added some clarifying detail, changed a response.

5. Narrative

Broadly, what did your SAC learn from the assessment of the focal outcome under consideration this year?

This is taken from the "Executive Summary," see Appendix B.

Overall, having a digital way to capture student thoughts has been very beneficial, especially considering that prior to the implementation of this LAC project there has been no formal way to capture the data. Other things, such as the inclusion of the various safety scenarios and selecting students to act as PIC (Person In Command) has been, as expected, an excellent pedagogical choice. In addition, the need for repairs on some of the equipment is also highlighted in some of the student's responses; this, too, is unsurprising and is something the department is working to address.

One thing the instructor did was to have expanded and additional time talking about safety and human factors prior to commencement of the exercise. This seems to have had a very positive effect, as noted by survey question #3.4. The instructor by-in-large agrees with the student's self-assessments: previous times this class has been run, as noted in the narrative (Appendix A), there have been very significant delays; that wasn't the case this time, as people were more or less ready and performance times would be acceptable in the industry, according to the instructor's observations and professional opinion.

Finally, it can be seen that some changes to this LAC assessment project as well as to the course-based assessment would yield better results. Firstly, by developing more robust and quantifiable models of assessment internal to the course, as well as capturing more data, will aid in identifying if the stated course/program/PCC Core outcome goals are actually being properly taught. Secondly, it can aid the SAC by being able to better assess the assessment and possibly tweak or fine-tune the assessment project. In addition, it is recommended that more detailed notes and instructions be developed to better maintain instructional quality and consistency of instruction for this particular area.

6. Results of the Analysis of Assessment Project Data

6A. Quantitative Summary of Sample/Population

How many students were enrolled in all sections of the course(s) you assessed this year? 17
If you did not assess in a course, report the number of students that are in the group you intend to generalize your results to.

How many students did you actually assess in this project? 17
Did you use a recommended sample size (see the Sample Size Calculator linked to in section 2J)? ☐ Yes ☒ No

If you did not use a recommended sample size in your assessment, briefly explain why:

Sample was entire class.

6B. Did your project utilize a rubric for scoring? ☒ Yes ☐ No

If 'No', proceed to section C. If 'Yes', complete the following:

How was inter-rater reliability assured? (Contact your LAC Coach if you would like help calculating this.)

- ☐ **Agreement** – the percentage of raters giving each artifact the same/similar score in a norming session
- ☐ **Consensus** - all raters score all artifacts and reach agreement on each score
- ☐ **Consistency** – raters' scores are correlated: this captures relative standing of the performance ratings - but not precise agreement
- ☒ **Inter-rater reliability was not assured.**

If you utilized agreement or consistency measures of inter-rater reliability, report the level here:

COMMENT: Only one instructor taught the course and provided analysis and interpretation of results.

6C. Brief Summary of Your Results

1. If you used frequencies of benchmark achievement, report those here. For example, "46 students attained or exceeded the benchmark level in written communication and 15 did not." If necessary, provide detailed results in an appendix.

All students received > 70% on the quiz; however, see Appendix B for further information.

2. If you used percentages of the total to identify the degree of benchmark attainment in this project, report those here. For example, "75% of 61 students attained or exceeded the benchmark level."

See above.

6D. Attach a more detailed description or analysis of your results (e.g., rubric scores, trend analyses, etc.) as an appendix to this document. Appendix attached? ☒ Yes ☐ No

6E. Do the results of this project suggest that academic changes might be beneficial to your students (changes in curriculum, content, materials, instruction, pedagogy etc.)? ☒ *Yes* ☐ *No*

If you answered 'Yes,' briefly describe the changes to improve student learning below. If you answered 'No', detail why no changes are called for.

- Additional and more appropriate assessment methods
- Defining the items to talk about during the safety & human factors briefing
- Consider adjusting the course/class project grading scheme to account for the importance of safety and human factors; or at least incorporating this into the existing grade scheme.

See Appendix B for further details and expanded discussion.

If you are planning changes, when will these changes be fully implemented?

It is anticipated a majority of these changes will be implimented for the Fall 2018 term, although some of the changes may take longer and may not be implimented until Winter 2019 (or later depending on instructional workload and other factors).

6F. Has all identifying information been removed from your documents? (Information includes student/instructor/supervisor names/identification numbers, names of external placement sites, etc.)
☒ Yes ☐ No

7. SAC Response to the Assessment Project Results

7A. Assessment Tools & Processes: Indicate how well each of the following worked for your assessment:

Tools (rubrics, test items, questionnaires, etc.):

☐ *very well* ☒ *some small problems/limitations to fix* ☒ *notable problems/limitations to fix* ☐ *completely inadequate/failure*

Please comment briefly on any changes to assessment tools that would lead to more meaningful results if this assessment were to be repeated (or adapted to another outcome).

- Additional places to capture instructor input to verify and validate quizzes, surveys, project grades, etc.
- Consider adjusting the course/class project grading scheme to account for the importance of safety and human factors; or at least incorporating this into the existing grade scheme.
- Keeping the results of any survey anonymous only when being shared publically or in other FERPA-specific situations, but allowing the instructor to correlate the student's/participant's answers between the survey, any quizzes, project performance, and other matrices of evaluation.
- Consider moving survey to a different survey recording platform such as *Google Forms, Qualtrix,* etc.
- Consider adding some written [follow-up] questions to some of the current Likert/numerical-based questions; consider adding some additional numerical-based questions tied to some of the current written questions – together, these changes could potentially lead to a more valuable set of responses

See Appendix B for further details and an expanded discussion.

Processes (faculty involvement, sampling, norming, inter-rater reliability, etc.):

☐ *very well* ☒ *some small problems/limitations to fix* ☒ *notable problems/limitations to fix* ☐ *tools completely inadequate/failure*

Please comment briefly on any changes to assessment process that would lead to more meaningful results if this assessment were to be repeated (or adapted to another outcome):

See the list of changes recommended in Appendix B for a further discussion.

8. Follow-Up Plan

8A. How will the changes detailed in this report be shared with all FT/PT faculty in your SAC? (select all that apply)

☒ *email*
☐ *campus mail*
☐ no changes to share
☐ *phone call*
☒ *face-to-face meeting*
☐ *workshop*
☐ *other*

If 'other,' please describe briefly below.

8B. Is further collaboration/training required to properly implement the identified changes? ☐ *Yes* ☒ *No*

If 'Yes,' briefly detail your plan/schedule below.

8C. Re-assessment is a critical part of the overall assessment process. This is especially important if academic changes have been implemented. How will you assess the effectiveness of the changes you plan to make?

☒ *follow-up project in next year's annual report*
☐ *in a future assessment project*
☒ *on-going informal assessment*
☐ *other*

If 'other,' please describe briefly below.

POSSIBLE follow-up project, but primarily the on-going informal assessment.

8D. SACs are learning how to create and manage meaningful assessments in their courses. This development may require SAC discussion to support the assessment process (e.g., awareness, buy-in, communication, etc.). Please briefly describe any successful developments within your SAC that support the quality assessment of student learning. If challenges remain, these can also be shared.

The AMT SAC has a good working relationship; there are many times where the SAC/Department members engage in brief on-the-spot conversations, which aren't very well captured (or capturable in a formalized sense).

Appendices

AMT LAC Focal Outcome Annual Report 2017-2018 #1

Develop and act upon a personal attitude and plan of "Safety Awareness" and compliance that includes one's self, one's co-workers, the work area, and the aircraft.

Appendix List

Appendix A – Instructor Narrative & Expanded Description

AMT 115, Aircraft Structures and Inspection, is the final course in the Airframe series of courses in the AMT[1] program.[2] In a sense, it is also a capstone course in that while students are learning new content, there is also an expectation that they must draw heavily on prior learning from the entire program to date (at this point, students have been in the program at least a year). The aim, therefore, is to try to encourage greater personal decision-making, situational and safety awareness, critical thinking, and self-reflection; this is precisely the goal of the class project.

Class Project Description

The project begins with the instructor giving a briefing on the project and dividing the class into two teams/groups. At the same time, a discussion on various Human Factors, especially Safety Awareness, is given. The instructor will give examples of a variety of tools and resources to use to encourage a culture of safety. Students are then released to the lab to begin work on the project.

The first step students take is to individually research an FAA document on retractable landing gear systems as well as the Aircraft Maintenance Manual (AMM) and Operator's Manual (POH – Pilot's Operating Handbook) for two of the program aircraft. There is a list of questions that students need to answer or at least take into consideration as they are preparing for subsequent steps. (See Appendix C, page 10 for a list of these questions.)

Students then split into their assigned team/group and as a group decide on the appropriate division of labor to create two checklists (one for each aircraft) to use later while performing the landing gear extension and retraction tests. This step draws heavily on the research just completed by the students but does require some additional research as well. As the students prepare the document, the instructor gives input on some of the various human factors involved (e.g. when formatting the checklist ensuring are entries are assessable, line items are not overly-complex, any cautions or warnings are presented

[1] **AMT** may mean either *Aviation Maintenance Technology* or *Aviation Maintenance Technician*. Generally speaking, when this abbreviation is used as a noun (singular or plural), the latter definition is meant, but when used adverbially will usually mean the former, and is usually located just before "Department" or "SAC" or some other term denoting that it is specific to PCC.

[2] Technically, the last course in the Airframe series is "AMT Practicum/Airframe," but it is a different format and is primarily designed to prepare students for testing and to "force" a review, as opposed to gaining new learning.

appropriately, items don't span pages, order and logic, etc.) and pointers on technical information to include and other formatting advice.

Once the checklists are approved by the instructor [following any necessary revisions], the teams prepare to physically begin the project. The instructor meets with each team individually for a briefing. The first thing the instructor does is to ask the team which individual would like to act as the "PIC" – the "Person In Charge." The instructor's goal is to provide an opportunity to practice leadership skills, but also to give the team a bit more agency than normal. (It should be mentioned that the instructor doesn't relinquish any oversight responsibility and is still closely monitoring all aspects should the need arise to intervene on any aspect, especially anything safety-related.) Once and individual volunteers and the team agrees (or, in some instances, individuals are "volun-told"), the instructor presents the team PIC with a list of roles that are necessary for the first operation (aircraft jacking) and has the PIC take the lead in matching the jobs to the team members. At this point the instructor usually gives a safety and job briefing using one of the tools demonstrated in class. The purpose of the instructor giving the briefing (instead of the student PIC) is to demonstrate the process of running a safety briefing and give a better example of one of the methods shown in class. Following this, the team performs the aircraft jacking. Usually both teams are ready about the same time, so often the instructor will pause the first team and get the second team to the same place before continuing.

Once any final preparations are in place, the students are ready to begin the task of performing the aircraft landing gear extension and retraction. The instructor gives a new list of roles for this portion and has the PIC assign jobs and give a safety and job briefing. But, the instructor also adds a few points to the briefing as well: how to stop the gear in an emergency, pointing out that anyone has the authority to call stop, the absolute criticality of being vigilant and stopping quickly to avoid personnel injury, only the student PIC has the authority (with instructor assent) to call job resume, number of times and order, etc.

Right before commencing the first gear retraction, the instructor quietly coaches the PIC to call a stop a few seconds in to the operation. The retraction begins, the PIC yells stop and the results vary wildly. The idea is a real-life scenario to demonstrate and reinforce the concept that one needs to be always alert and prepared – sometimes people are caught completely unaware and the entire gear retraction finishes before the appropriate people take the necessary actions; other times it is significantly delayed, and occasionally people are actually ready. In any case, immediately following, the instructor gathers the entire team and has a short debrief – and to drive home the point, especially when there has been a significant delay, will say something to the effect of, "That could have been someone's arm or worse that just got crushed." Following this, things usually progress normally for the remainder of the check for the first aircraft.

When switching to the second aircraft (when the other team has concluded their first check), the team performing the check will use the checklist developed by the other team. A new student PIC is selected and new roles are assigned. Usually (not on the first check) the instructor will tell a team member (not the PIC) to call a stop to see the response to someone other than the PIC calling it. As is necessary and appropriate, a debriefing is held.

Depending on time of day that the first check is completed, the following class day the instructor gives an in-class quiz on retractable landing gear systems, which includes a question asking students what safety precautions were taken the previous day. *(See Appendix D, page 14 for further details on this.)*

At the conclusion of the exercise, students are asked to fill out the safety survey. Based on those results, the entire class then gathers for a debriefing session to share things learned.

Appendix B – Lessons Learned: Data Synopsis and suggested changes

Executive Summary:

Overall, having a digital way to capture student thoughts has been very beneficial, especially considering that prior to the implementation of this LAC project there has been no formal way to capture the data. Other things, such as the inclusion of the various safety scenarios and selecting students to act as PIC (Person In Command) has been, as expected, an excellent pedagogical choice. In addition, the need for repairs on some of the equipment is also highlighted in some of the student's responses; this, too, is unsurprising and is something the department is working to address.

One thing the instructor did was to have expanded and additional time talking about safety and human factors prior to commencement of the exercise. This seems to have had a very positive effect, as noted by survey question #3.4. The instructor by-in-large agrees with the student's self-assessments: previous times this class has been run, as noted in the narrative (Appendix A), there have been very significant delays; that wasn't the case this time, as people were more or less ready[3] and performance times would be acceptable in the industry, according to the instructors observations and professional opinion.

Finally, it can be seen that some changes to this LAC assessment project as well as to the course-based assessment would yield better results. Firstly, by developing more robust and quantifiable models of assessment internal to the course, as well as capturing more data, will aid in identifying if the stated course/program/PCC Core outcome goals are actually being properly taught. Secondly, it can aid the SAC by being able to better assess the assessment and possibly tweak or fine-tune the assessment project. In addition, it is recommended that more detailed notes and instructions be developed to better maintain instructional quality and consistency of instruction for this particular area.

List of specific changes recommended

- Additional and more appropriate assessment methods
- Defining the items to talk about during the safety & human factors briefing
- Additional places to capture instructor input to verify and validate quizzes, surveys, project grades, etc.

[3] It should be noted that the second team was alerted to this and, I believe, was therefore already attuned to the fact that a "STOP" order would be issued. While this doesn't completely detract from the validity of the exercise, it unquestionably did affect the results, though it is impossible to empirically verify this or express it quantitatively.

- Consider adjusting the course/class project grading scheme to account for the importance of safety and human factors; or at least incorporating this into the existing grade scheme.
- Keeping the results of any survey anonymous only when being shared publically or in other FERPA-specific situations, but allowing the instructor to correlate the student's/participant's answers between the survey, any quizzes, project performance, and other matrices of evaluation.
- Consider moving survey to a different survey recording platform such as *Google Forms, Qualtrix,* etc.
- Consider adding some written [follow-up] questions to some of the current Likert/numerical-based questions; consider adding some additional numerical-based questions tied to some of the current written questions – together, these changes could potentially lead to a more valuable set of responses

Evaluation and analysis of results from in-class quiz

The instructor has realized that basing this LAC assessment project on the in-class quiz is insufficient. This is due to several reasons, but includes: the quiz itself is very open-ended and doesn't very specifically assess either student knowledge or performance, and students could potentially receive a lower grade simply by misunderstanding the question (although the instructor does make an effort to ensure "plain language" is used). So, as an evaluation tool, it is decidedly lacking – the grade ends up essentially being a tool to ensure student feedback as opposed to a quantifiable tool for assessment. The recommendation is to develop more methods of assessing this, particularly if this class project/exercise continues to be conducted in AMT 115.

Having said this, though, by reading through some of the responses it is clear that the vast majority of quiz participants did, in fact, exhibit a sufficient level of preparedness and self-reflection (this is confirmed and augmented by the results from the safety survey – although due to the anonymous nature of the safety survey, it is impossible to directly correlate the quiz to the safety survey).

In summation: while the quiz is lacking in its efficacy as an assessment tool, it does give one a sense that not only did the students learn some valuable lessons, but also possess the critical thinking and self-reflective qualities to adjust future actions based on these experiences. But, this glimpse into some of the student learning, is only as valuable as students are internally motivated to write; while it worked well in the period under consideration, it could just as easily be next to meaningless. Thus the recommendation to develop different (or at least additional) methods of assessment.

Evaluation of course/class project

Overall, the project appears to be constructed quite well, although there were several deficiencies noted as well as some room for improvement. The only variations in the final project grade that students received reflected their own input in the individual portion and

criterion (15/50 points); the instructor gave all students full marks on the other grading criteria (checklist development and performing the project in the lab) – chiefly for participation. While this isn't "bad" *per se*, if the instructor wishes to make this a graded project, it would make sense to have the grade be based on something more than just "doing the work;" it is likely that the project, the instructor, and the students could all benefit from this. In that same vein, another recommendation is for the instructor to develop a recordkeeping system and associated grading rubric in order to evaluate both team and individual performance. This will allow for better assessment as well as linking any quiz and survey results to an individual for better trend and analysis. Overall this seems like it would be a more robust means of grading and conducting the project. Additionally, since safety and human factors plays such a large role in this project, the instructor may wish to modify the grading scheme to account for this, or at very least incorporate this into the existing grade structure (i.e. since creating a checklist is worth *x* points, appropriate safety and human factors considerations are worth *y% or y* points; the same applies for the actual performance of the project).

It is also recommended that the instructor develop a "flow" and outline for conducting this so that it can be repeated with consistency, transferred or picked up by another instructor, and so any changes can be properly accounted for. In addition, by having specifics on the briefing, as with any course, it ensures the proper points are covered as well as guarding from going too far off-track on a tangent. This would also allow for better collaboration by other instructors.

Evaluation and analysis of Safety & Human Factors survey

Overall, the survey provided useful analysis and feedback. It largely echoed some of the same strains of thought and other things noted in responses collected from the quiz given in-class, although the survey definitely reflected better design and thus elicited better quality responses, both in length and depth. Naturally, the design could be tweaked a bit, but as a tool to get a pulse on the outcomes of the project, it seems to have done just that. While some of the responses weren't very useful or indicative of much self-reflection (or anything else, for that matter) on the part of the student, this was more than made up for by many of the other responses that were reflective and thoughtful. Mostly, though, in its current format, it seems to be another means to cement the learning in student's minds, although it does give the instructor (and SAC) some insights on which to make suggestions for future changes.

However, there were several noticeable defects as well. The first being that the setup was not correctly configured, so the results were anonymized *before* being released to the instructor. This was an error due to not having used the survey tool inside *D2L* before and not being aware of this. More validity and the ability to correlate data between quizzes, the course project, and a safety survey will be attained by allowing the instructor to positively identify individual students/participants and anonymizing or removing identifying data after analysis is complete. In addition, due to the technical method of receiving the data[4], it took

[4] The data was received as a CSV file that was not very well formatted. The initial file was > 1,650 rows and not very well filtered; it more reflected the database characteristics of the quiz tool than useful data on which to perform analysis.

several hours of labor working with *Excel* in order to distill the data into useful forms to analyze. If this survey is conducted in the future, it is recommended to evaluate the benefits of migrating the survey out of *D2L* and into a different survey platform, such as *Google Forms*, *Qualtrix*, *Survey Monkey*, etc., that is designed with analysis and reporting in mind, instead of seemingly as an afterthought.

Data Analyses

A quick glance at the responses to the Likert scale (numerical)-based questions (See question text in Appendix E on page 19; Figure 1: Overall Averages, page 23 and Figure 2: Individual Responses, page 24) indicates that on average (both as a whole class and by teams), the overall consensus was that students felt adequate to fair preparation for the class project, both from the individual work done via the research project as well as in their assigned groups/teams. However, this is an average, and it should be noted that several participants gave a "5/10" rating, while several others gave a "10/10" rating. With an average of 7½ to 8½ for these questions (sections 2-3), it's clear that there is room for improvement in the class – as already discussed in the class project analysis and evaluation section. The evaluation of the other team's checklist fell into the same range. When reading through the text/written responses, it becomes clear that there is a common theme of safety preparedness, or the lack thereof.

However, it is worth pointing out that while some inferences can be made from these results, a large part of the project is also to expose the students to scenarios and situations *for the purpose of learning* – in other words, if everything was spelled out ahead of time, students might "Ace" the survey or give top marks, but then rapidly flush all they learned. However, it is probably a safe bet to place that going through the experiences that are a part of the project will result in greater long-term retention, especially of the important concepts. So there remains a caution of making modifications and adjustments merely to inflate the ratings received in a quiz.

The current questions do seem to all be valid– particularly considering one of the goals of the survey is to assist students in the process of engaging in self-reflection. It could be useful to have some follow-up written questions tied to these questions to gather a greater depth of response. Additionally, it could be useful to create some additional Likert or numerical-based questions tied to some of the other written questions currently asked.

Written response analysis

It was encouraging to read that students felt that there was good communication and good systems in place for this, as well as a general sense of working effectively in teams.

There was a variety of responses to question 6 regarding what the team would need to do to improve, ranging from technical procedures to "stepping up" to an assigned role or responsibility, etc. There didn't seem to be any glaring deficiencies or errors noted, and most responses seemed to indicate that, at least on some level, there were some lessons learned.

While the responses to question 7, personal take-aways, were also varied, there was a noticeable common thread in that students responded very positively to the enhanced focus on safety and human factors. Three quotes in particular stand out:

- *"The [safety] & human factors briefings were helpful to me, in that they helped make the process more than just a school thing. I felt it was a good way to get us as students more in the mindset of a mechanic on the job."*
- *"My top take away from this [experience] was that a pre operation huddle to review safety and process is a really good idea."*
- *"Preparing a brief for the team with an emphasis on safety was difficult [in the] spur of the moment. The project was effective at getting our group thinking about safety more specifically, especially with regards to jacking the aircraft."*

These responses coupled with the instructor's personal observations and evaluations seem to indicate that the project and follow-up was quite effective in doing its job.

In the students' comments and suggestions on what should/could be changed in the class project, nothing in particular stood out, other than a few individuals recommended that the instructor require safety information to be put in checklists (which the instructor agrees is a good suggestion, to within limits – it should be noted that there is a delicate balance between having too few and too many safety call-outs; too few and this could be dangerous, but too many and one runs the risk of having an overload and then checklist users just ignore the cautions and warnings, as is a common tendency). It is unclear if one response in particular was supposed to be humorous or was in a round-about way stating that the "STOP" command portion (see class project description) was a good exercise: *"I think that when it comes to safety, the best way to go the extra mile is to simulate an accident to induce real life stress."* In either case, it seems that the project has done a decent job of accomplishing its goals.

Appendix C– Course Project Sheet

Project #11 – Landing Gear Retraction

Name: _____ Date: _____

Team (Names): _____

Project description from "Pink Sheet"

11. Perform a gear retraction check.

Evaluation Criteria:

Score: _____/50

Successful completion of this project includes:

- **Individually conducting research on both the Cessna 310 and Cessna T337 "Skymaster" to determine proper gear retraction check procedures; answering worksheet questions.** **__/ 10 (-½ pt for each incorrect answer)**
- **Developing (as a team) a checklist for each aircraft that meets the requirements specified in the instructions (below).** **__/ 10 (5 pts ea. aircraft)**
- **Performing gear retraction on Cessna 310 as part of a team.** **__/ 15**
- **Performing gear retraction on Cessna 337 as part of a team.** **__/ 15**

Instructions:

1. Work **individually** to complete the required reading (as listed in the "Blue Sheet" Unit Handout) for both the *Cessna 310* and the *Cessna 337 "Skymaster"* aircraft. In addition, read the appropriate section in AC43.13-1B.

2. Complete the project worksheet by answering the questions (**individually**). You may use neat and legible handwriting, or you may use the fill-in PDF or Word Doc available on *D2L*.

3. As part of a team, develop a checklist for each aircraft containing the following procedures; ensure to include quantitative data where appropriate and references to the aircraft maintenance manual or other technical documentation (as applicable):
    a. Jacking
    b. Using Ground Power equipment
    c. Gear retraction and extension (normal)
    d. Emergency extension
    e. Other inspection items (pertaining to landing gear) while the aircraft is on jacks

4. As part of a team, perform a landing gear retraction tests on both the *Cessna 337 "Skymaster"* and the *Beechcraft Queen Air*.
    (The Cessna may be experiencing equipment issues, in which case the full gear retraction will not be performed, but everything up to that point will be completed and the gear retraction procedures will be discussed to the satisfaction of your instructor.)

Project Questions

The questions that begin on this page are found in AC43.13-1B.
Cite answers with a paragraph and page number.

Data to Find / Question	*Write your Answer below*
1. What are the different types of retraction systems use in aircraft? *(How are they operated?)*	
2. What are some of the emergency systems utilized by the retraction systems in retractable-gear aircraft?	
3. According to AC43.13-1B, what should be done every time a retractable-gear aircraft is on jacks?	
4. According to AC43.13-1b, what should be done if a crack is discovered on a landing gear structural member?	
5. What is a problem you can potentially encounter when using "re-tread" tires on retractable-gear aircraft?	
6. What are some of the dangerous conditions or outcomes that could result from "progressive cracking" of the landing gear door hinges?	
7. AC43.13-1B lists a number of places and areas where cracking can occur with regards to landing gear and associated components; note at least three (3) of these, or what the indications of cracking may be.	
8. What is the paragraph and page number in AC43.13-1B that lists some of the procedures and items to check for retraction tests? What are some of those items?	

Data to Find / Question	Cessna 337	Cessna 310
9. What is the Aircraft Registration #?		
10. What is the Aircraft Make and Model? *(Include full Model #)*		
11. What is the Aircraft Serial Number?		
12. What is the TCDS number, revision number, and revision date?		
13. What is the moment change due to retracting the landing gear?		
14. What are the FAA "Personal Minimums Checklist" items that apply here?		
15. How many jack-points are there on this aircraft?		
16. Where are the jack-points located?		
17. What jacks does this aircraft call for? *(Capacity, height requirements.)*		

18. What is/are the ground power requirements for this aircraft? _____ _____

19. Where is procedure for manual gear extension found in the maintenance manual? _____ _____

20. List any precautions associated with a manual gear extension procedure. _____ _____

21. What is/are the page number(s) in the maintenance manual containing landing gear inspection items and/or criteria?
(You will need to have at least one copy of the relevant items <u>printed</u> per team!) _____ _____

22. How many times should the landing gear be cycled for the inspection? _____ _____

23. What are the frequency or interval limitations for cycling the gear (if any)? _____ _____

24. Where are the troubleshooting procedures located? _____ _____

25. Can the emergency <u>extension</u> procedures be used to <u>retract</u> either aircraft?

Appendix D – In-Class Quiz – Questions and Responses

Blank Quiz

Note that the original quiz was administered on D2L.

1. Write down three safety precautions that you or your team took while either jacking the aircraft or performing the gear retraction. *(**3 pts)***

[Written Response]

2. List two items of inspection or criteria you or your team were looking for while performing the extension and retractions. ***(2 pts)***

[Written Response]

3. Is there anything (procedure, checklist item, inspection item, etc.) that you would add, remove, or do differently in the future – or is there anything you learned that especially stood out to you? ***(2 pts)***

[Written Response]

Responses

Question 1

Write down three safety precautions that you or your team took while either jacking the aircraft or performing the gear retraction. (3 pts)

1	1. Before operate the test, let your team knows(Safety). 2.Check the equipment for proper operation. 3. Get your position and know what you have to do during operation.
2	1. Stay away from props when the gpu is connected and on. 2. Roped off the aircraft when jacking was performed. (Established a perimeter) 3. Made sure we had a way to cut off power during an emergency.
3	1. every one had safety glasses we also put signs up and safety tape, 2. while doing the retraction test we had one person near the gpu ready to turn the power off as soon as some one would yell "stop" . 3. 4 people were watching the retraction two were near the jacks aft of the aircraft on the floor and two were in front of the aircraft.
4	1. Taped off an area around the aircraft so that nobody would blunder into the aircraft on jacks. 2. Stayed clear of the props when turning on the GPU. 3. Set up signs around the jacking operation informing others that the aircraft is on jacks.
5	1) All must wear safety glasses. 2) Going over the procedures and having everyone know whats going to happen when jacking the plane up. 3) Read over the AESOP MINI HUDDLE so that we can look at potential problems or fix the problem we already have. 4) Ask questions that we are not sure of.
6	rope off area Human Factors Briefing Close supervision
7	1. Use of the safety collars on the stands for the main gear. If there were better safety collars on the front jacks, that would be good. 2. Safety spotters surrounding the aircraft. 3. Safety tape was surrounding the act as well.
8	1. Jack aircraft in an even and steady manner. 2. Have personnel stationed at points around the aircraft where damage could occur while jacking. 3. Make sure there is adequate clearance for gear to retract .
9	1. We made sure the GPU was outside the Prop area. 2. We made sure everyone knew what their role was and what was expected of them in their role. 3. We reviewed the maintenance manual prior to starting to make sure everyone understood the scope and steps of the operation.
10	1. We make sure to verify that the procedures we did were correct. 2. We made sure that everyone knew what they were doing, and that the aircraft had tape around it when on Jack's. 3. We simulated an emergency stop during that gear retraction test, to verify that we were able to stop fast enough.

11 1. Put a perimeter around the aircraft to let others know it is on jacks.
2. We wore proper PPE.
3. We had 3 safety observers making sure nothing went wrong.

12 1. roped off aircraft
2. had multiple people watching to make sure it went smoothly
3. had someone at gpu for emergency shutdown

13 1. Make sure the area is cone and tape,
2. have designated safety personnel and the cockpit person communicate with the person who control the GPU for safety shutoff during unsafe condition.

14 1. When we were jacking the 337, we made sure to have plenty of people watching the rear engines and making sure the aircraft was level.
2. Also during jacking procedures, we had a second person running the safety collars on the jacks if possible, to allow the person running the jack to focus on being consistent and level with the person on the other jack and not be distracted.
3. We also made absolutely sure to be clear of the prop region anytime there was potential power either from the GPU or aircraft during the landing gear retraction testing.

15 1.) Jack the aircraft in a uniform even manner.
2.) Ensure aircraft wheels are free and clear of Jacks prior to landing gear retraction.
3.) Have personnel stationed at points around the aircraft to keep watch of landing gear retraction and yell "Stop" incase of any problems.

16 1. As our two jacks were raising the aircraft our group had three safeties standing around the aircraft looking to ensure the aircraft raised in an even and level manner and watch for any other unsafe conditions.
2. Our group members on the tail of the aircraft balancing it held the aircraft on rivet lines to mitigate the opportunity for damage to aircraft skin.
3. The group member in the cockpit kept a hand on the circuit breaker that would immediately cut power to the landing gear if there was a need for it.

17 1. Clear of propellers while A/C power is applied.
2. Make sure jacks are clear of gear to be swung.
3. Area is roped off and trip hazards around the aircraft are eliminated or minimized.

Question 2

List two items of inspection or criteria you or your team were looking for while performing the extension and retractions. *(2 pts)*

1 Landing gear, jacking, checklist or M.M.

2 Time it takes to extend and retract. Made sure the green lights are on when down and locked

3 we were following a check list created using information we got form manuals, we were looking for how long it take and if the gears were cycling correctly.

4 Correct timing on the extend and retract cycles. LG doors for at least .5" clearance with LG or any other parts during operation.

5 1) To see how fast the landing gear retracted. 2) To have the landing gear retraction fit with the checklist we have. 3) Checking everything is in safety condition for all (Biggest human error) .

6 Teamwork & proper checklists, IN addition, time of retraction Safety.

7 1. timing of retraction and extension of landing gear. 2. timing of hand pumped gear extension.

8 1. Watching for landing gear lights to illuminate (3 total, should be green while gear down and locked) 2. Listen for unusual noises, grinding, while the gear is being swung.

9	We were looking for the full extension of the nose gear strut. Which we did observe was stuck. We were looking to see that the mechanical down-locks were physically engaging
10	1. We timed the retraction and extension of the landing gears. 2. We inspected the level of hydraulic fluid in the landing gear system.
11	1. Time it took to retract/extend. 2. Operation of 3 green indicator lights.
12	make sure 3 greens when gear down and lockedtime requirements for retraction
13	Look for leaks and corrosion in hydraulic system, extension and retraction timing and make sure aircraft landing gear is working properly.
14	During the gear swing process, the team looked for the proper sequence of the doors opening/closing when doing the retraction and extension. We also made sure the emergency extension/retraction system worked properly.
15	1.) Visually looking for Smooth and uniform retraction. Free of binding or grinding.2.) Once the landing gear is down and locked visually ensure the three landing gear lights in the cockpit are green.
16	1. The extension and retraction of the landing gear to be completed within the time window stated in the aircraft manual. 2. Proper levels of hydraulic fluid were checked via a dipstick on the reservoir
17	Timing sequence. Proper operation of down and up locks.

Question 3

Is there anything (procedure, checklist item, inspection item, etc.) that you would add, remove, or do differently in the future – or is there anything you learned that especially stood out to you? *(2 pts)*

1	Not much. We are not going to do a leveling on Cessna 310Q, so we will do just checking a time for retraction and extension. Also, we will inspect a landing gear main support bushing for wear.
2	One thing that stood out to me was how bad the 337's landing gear are. The nose gear barely works even right after the previous class serviced that shock struts. We literally had to bang on the tire in order to actuate the WOW switch.
3	i learned that if you pull the circuit breaker the motor for the retraction of the landing gear can still operate
4	The fact that nobody should be near the props when the Ground Power Unit was turned on may not have occurred to me- the emphasis on staying clear of the props will stick with me. I think I would change some of the checklist order to make it more in line with the sequence of the operation.
5	To read all the criteria before doing a procedures because certain steps will have certain problems ahead of what I and my partners are reading. So that we can prevent and think ahead of the things we are about to do to have maximum results. The hardest thing is to pay attention to your surrounding and people you are working with since everyone has a role and everyone must pay attention to safety.
6	Always give good briefings. Monitor students.
7	Powering down on the ground power unit needs to be tended to with more scrutiny.
8	In the checklist, I would add a note to read over the Hobart GPU manual for emergency shutdown procedures.
9	We did not fully understand how the tail boom leveling would go. We could have added more detail to the checklist because it wasn't well depicted in the maintenance manual.

10 I was surprised to learn that if the shock strut was not serviced correctly it would fail to activate the squat switch that allows the gear to retract. I like our checklist the way it is, but I would probably add something about the squat switch.

11 Proper procedures for shutting down the gpu

12 no

13 It would be nice to know when was the last time the landing gear was service. I learned you can use the circuit breaker to shutoff the landing gear for safety. The center jack for the T337G is only use for stabilization only.

14 For me, the research was helpful in learning the procedures and processes for the landing gear swing, but felt like more of a mental frustration while doing. There were several questions that seemed like the majority of the class struggled unnecessarily to find. I think the confusing with which specific manual to use was part of the issue; another issue was that some of the answered were in the POH, rather than the maintenance manual, such as the emergency extension of he landing gear for the 310Q. I also think if the checklists are required, that they should be more implemented in the project. Our team followed the maintenance manuals more than the checklists. In addition, I personally didn't see the value in using the other team's checklist upon switching aircraft. The research was more helpful in knowing the procedures, and if we were unsure, then the first consultant was the maintenance manual. The issue with using the other team's checklist was that each team's checklist was of different thoroughness. Neither proved especially helpful when it came to covering safety issues or specific procedures. The actual manuals were more of a quality resource.

15 Something that stood out to me was before retraction of the landing gear all the unnecessary circuit breakers were pulled in the cockpit. This would help isolate just the landing gear and supply power only to the system that we are trying to operate. Even though the manual doesn't say anything about this it makes sense both in safety and practicality.

16 1. I would add cockpit familiarization to the inspection/landing gear test. Or an illustrated diagram of the controls needed to conduct the test. 2. I found it interesting that the forward jack/jackpad on the 337 is used just to stabilize tha aircraft, rather than actually carry the weight of the aircraft.

17 Communicate, Communicate, Communicate. I would have written down or at least gathered everyone around to have a standard verbiage to be used and everyone was on the same page with procedures. Such as “On my mark... Mark.” To start timing.

Appendix E – Safety & Human Factors Survey – Blank form

Question 1

Select your Team/Group number

- ○ Team 1
- ○ Team 2

Question 2

For each of the statements below, please indicate how **you** felt about **your own** performance or preparation for the unit 1 project (Aircraft Jacking & Landing Gear retraction tests).

10 being strongly agree or high level of preparedness/awareness, 1 being strongly disagree or low level of preparedness/awareness.

#	Statement	1	2	3	4	5	6	7	8	9	10	N/A
1	How well did your research portion of the project prepare you for the safety risks in the performance part of the project?	○	○	○	○	○	○	○	○	○	○	○
2	How well did the discussion on Safety & Human Factors, and the accompanying team briefings prepare you for risks inherent with the performance portion of the project?	○	○	○	○	○	○	○	○	○	○	○
3	How would you rate your own performance and awareness from a Safety & Human Factors standpoint?	○	○	○	○	○	○	○	○	○	○	○

Question 3

For each of the statements below, please indicate how **you** felt about **your team's** performance or preparation for the unit 1 project (Aircraft Jacking & Landing Gear retraction tests).

10 being strongly agree or high level of preparedness/awareness, 1 being strongly disagree or low level of preparedness/awareness.

#	Statement	1	2	3	4	5	6	7	8	9	10	N/A
1	The team checklists adequately covered the procedures necessary for jacking the aircraft and performing the gear retraction(s)	○	○	○	○	○	○	○	○	○	○	○
2	The team checklists adequately and effectively addressed safety issues, or contained appropriate (and enough) cautions, etc.	○	○	○	○	○	○	○	○	○	○	○
3	The team checklists were written in such a way that there was no confusion or uncertainty regarding procedures or cautions (or other Human Factors errors).	○	○	○	○	○	○	○	○	○	○	○
4	What score would you give your team for the response when a "Stop" order was given during the performance of the gear retraction & extension tests?	○	○	○	○	○	○	○	○	○	○	○
5	How would you rate your team's overall Safety consciousness?	○	○	○	○	○	○	○	○	○	○	○

Question 4

For each of the statements below, please indicate how **you** felt about **the other team's** outputs for the unit 1 project (Aircraft Jacking & Landing Gear retraction tests).

10 being strongly agree or high level of preparedness/awareness, 1 being strongly disagree or low level of preparedness/awareness.

#	Statement	1	2	3	4	5	6	7	8	9	10	N/A
1	The other team's checklist adequately covered the procedures necessary for jacking the aircraft and performing the gear retraction(s)	○	○	○	○	○	○	○	○	○	○	○
2	The other team's checklist adequately and effectively addressed safety issues, or contained appropriate (and enough) cautions, etc.	○	○	○	○	○	○	○	○	○	○	○
3	The other team's checklist was written in such a way that there was no confusion or uncertainty regarding procedures or cautions (or other Human Factors errors).	○	○	○	○	○	○	○	○	○	○	○

Question 5

What did your team do well?

[Written Response]

Question 6

Where did your team need to improve (or in what ways did your team *not* do well)?

What would you do differently?

[Written Response]

Question 7

What did you learn or what are your top carry-aways from this project – especially in the area of Safety & Human Factors?

[Written Response]

Question 8

What changes would you recommend be made to this project?

[Written Response]

Appendix F –Safety & Human Factors Survey – Graphs

Figure 1: Overall Averages

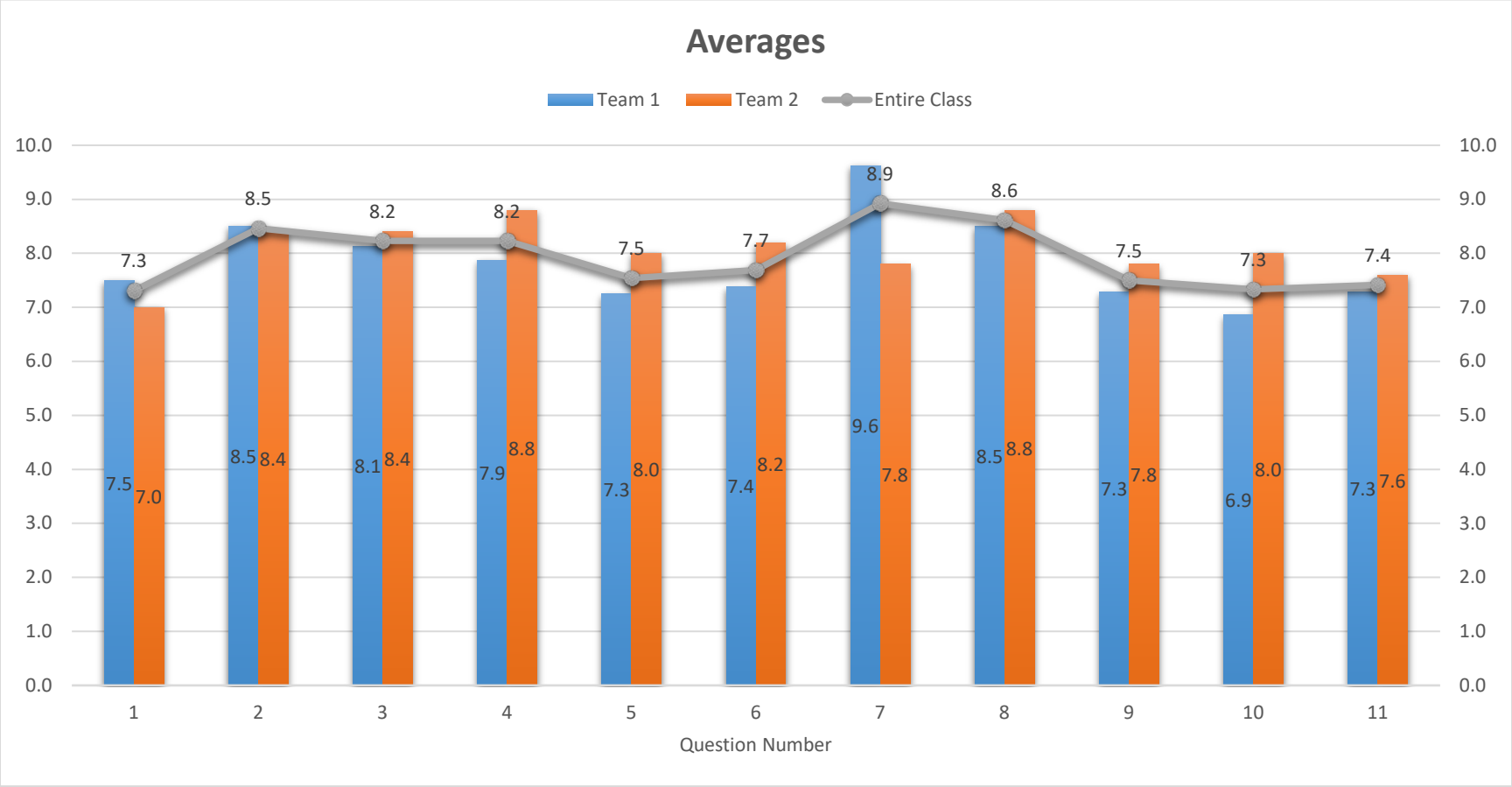
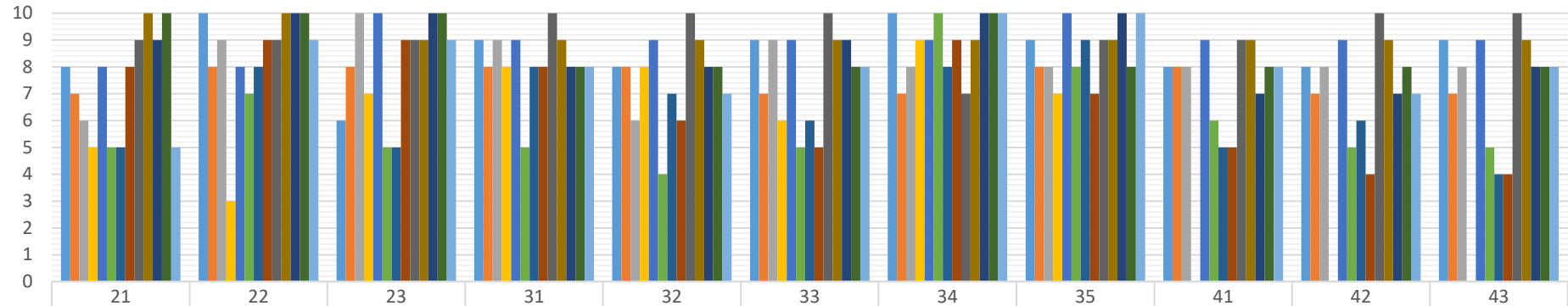


Figure 2: Individual Responses



	21	22	23	31	32	33	34	35	41	42	43
1	8	10	6	9	8	9	10	9	8	8	9
2	7	8	8	8	8	7	7	8	8	7	7
3	6	9	10	9	6	9	8	8	8	8	8
4	5	3	7	8	8	6	9	7			
5	8	8	10	9	9	9	9	10	9	9	9
6	5	7	5	5	4	5	10	8	6	5	5
7	5	8	5	8	7	6	8	9	5	6	4
8	8	9	9	8	6	5	9	7	5	4	4
9	9	9	9	10	10	10	7	9	9	10	10
10	10	10	9	9	9	9	9	9	9	9	9
11	9	10	10	8	8	9	10	10	7	7	8
12	10	10	10	8	8	8	10	8	8	8	8
13	5	9	9	8	7	8	10	10	8	7	8

Appendix G –Safety & Human Factors Survey – Written Responses

5 – What did your team do well?

1. Good communication and getting all the proper tools. Follow instructions and made changes of action that prevent unsafe condition.
2. Good communication. Everyone had a good understanding of their roles.
3. I thought our team did well with communication and the overall process. We hardly ever had trouble with what to do.
4. I would say that my team did well in explaining the precedures and telling each person what their roles are. We did well in safety glasses department. Explaining the main objective well.
5. Our group worked well together. Were lenient towards the appointed leader. Leadership was outstanding. We did not initially do a great job of gearing up towards safety, but when on the hangar floor that became the priority.
6. Overall we worked well as a team.
7. Paid attentoin to eachother during the jacking up and down of the aircrafts.
8. Team 1 seemed to have a solid communication system, for the most part. We were able to work well together, and didn't have too many chiefs. We all semed to be for the most part on the same page, and have adequate knowledge of the procedures.
9. We adequately addressed position assignments and everyone knew what position they were in and the roles and responsibilities of that position prior to starting the evolution.
10. We all worked well togeather.
11. We communicated very well.
12. We could get an oppertunity to get different position during 2 times. Our PIC leaded us very well to carry on.
13. We did a good job on the first emergancy stop.

6 – Where did your team need to improve (or in what ways did your team not do well)? What would you do differently?

1. Certain individuals need to work on their performance of TAKING responsibility and playing a role rather than just standing around or taking on one of the "lesser involved" roles. It is important to understand every position and the responsibilities of every position on a team even if you are not participating in that capacity currently yourself. Everyone on the team should be willing and confident to jump into any position when needed and when assigned a position by the person in charge. Also, you don't mope about it if asked to be in a certain role or play a certain part.
2. I think we need to improving on our jacking skills. Where to put the jacks and how high the plane has to go. I would like it if we were more synchronize at jacking and if the safety people where to say if we are level or not instead of guessing.
3. It would be nice if everyone in our team felt comforterable to do any of the assigned tasks. (not excluding me). I would explain every task to the whole team.
4. My team need to work on jacking the aircraft because one side is faster than the other when lifting the aircraft.
5. Our checklist was not tailored as well to the procedure performed. The checklist was more geared towards inspections surrounding having the gear. Our checklist itself was not really sufficient for the procedure; we had to supplement it with the maintenance manual.

6. Several students are new to the aviation field, that is obvious. The retraction/extension project reflected the exposure these students have to safety. Not all of them were conscientious of what was expected of them. Not many, but a few were this way.
7. There was no one glaring problem with our execution I think it was sufficant to be safe and effective.
8. We could have had better tandem work concerning the jacking process. It seemed like during jacking at first, every one was not working together or paying attention to the surrounding members.
9. We need to have more synchronization for jacking the aircraft.
10. We needed to improve on communication.
11. We needed to improve on the timing of the "stop" proceedure. Also there was some hesitation and lack of confidence through parts of the project.
12. We should have had more information regarding safety in our checklist. For instance, there should have been a note on the 310 checklist to ensure that the jacks didnt interfere with the LG's range of motion.
13. When we were testing on Cessna 310Q, our reaction from "Stop" did not instant. However, it was a first time to face with the situation, so we will be better at second time.

7 – What did you learn or what are your top carry-aways from this project – especially in the area of Safety & Human Factors?

1. Alway verifiy an action, for example, the person in comand says "raise landing gear" and you should say "raising landing gear".
2. Communication is always key. Everyone needs to know when to speak up and SOUND OFF. Being able to loudly and clearly communicate during a power failure or other emergency shut off situation when they occur.
3. Ensure everyone is paying attention when the command "stop" is called and know exactly what to do.
4. For me, I felt I was able to fully grasp the procedures after being in the cabin and physically moving the gears and feeling the motor stop. I learn better by doing, being able to do more than observe really cemented my knowledge of the landing gear swing process.The safty & human factors briefings were helpful to me, in that they helped make the process more than just a school thing. I felt it was a good way to get us as students more in the mindset of a mechanic on the job. The safety briefing on jacking was also helpful because I have not been part of the groups tht hvae jacked those particular aircraft previously, and had no clue how to even go about that process. It doesn't help that the manuals tend to be vague in that particular subject.
5. Good communication, individual task and teamwork. Must have good communication so everyone is in sync and able to work togther and speak up if theres any unsafe condition. The idea of individual task really help out the team, no one is just standing there not being preoccupied. We work well together in getting the task done.
6. I learned that it is important to have a good reaction time when turning off the gpu. One second can be the difference between life and death.
7. I learned that we really have to understand precedures and to know what problems to deal with. To look at a problem in multiple stand points. I also learned that when you are tired your reaction time is extremely slow.
8. I learned that, before we start any task, everyone should be awared the safety and human factors. Cessna T337G could not operate landing gear to extend.
9. My top take away from this experence was that a pre operation huddle to review safety and process is a really good idea.

10. Preparing a brief for the team with an emphasis on safety was difficult spur of the moment. The project was effective at getting our group thinking about safety more specifically, especially with regards to jacking the aircraft.
11. That anyone can cause an accident if they dont keep their attention on their role and working in unison with the rest of the team.
12. The exposure to the different kinds of aircraft and their jacking points is quite varied. And the procedures are equally different. Fleixibility is required.
13. When creating a checklist, it is important that other people are able to understand and follow the steps that someone else has written.

8 – What changes would you recommend be made to this project?

1. Before you carry on jacking, safety is the biggest portion of the jacking. Also, make sure and follow a checklist.
2. Further detailed instructions to groups on clear communication. What to say and when to say it, so everyone is on the same page and knows what to listen for.
3. Giving the main objective before we do the assignment and to tell us if theres anything wrong with the plane before hand.
4. I think if the groups had known that we would be divided into teams with specific jobs prior to the procedure, it would get us thinking about the jobs and the safety considerations associated with them. My understanding of the checklist was focused more on the inspections and concerns about the aircraft, rather than safety considerations.
5. I think it would be better if the research were done completely as groups, with the groups talking over all the answers and how they relate to the practical part of the project. I feel like everyone would be equally prepared when it came time to do the operation.
6. I think that when it comes to safety , the best way to go the extra mile is to simulate an accident to induce real life stress.
7. I would require some safety information to be put on the check list.
8. I would suggest that there be an official checklist for the projescts for students to compare to after writting their own.
9. If it's possible, I would recommend having a different person in the cabin during the different processes of the landing gear swing. That way, a larger portion of the group can get that hands on experience. The research for this helped in gaining the knowledge for the process, but it also felt like a huge headache bc of not being able to find the answers. The references on the blue page were a useful aid, but there were still a lot of students that were unsure of procedures and the actual answers. I would suggest including the POH for the 310, specifically for the emergency extension procedures of the landing gear.
10. In regards to the checklist add a "note" about the landing gear being able to swing free and clear of the jacks.
11. Make 337 better
12. Placement of jacks need to be address for the 310Q because the main landing gear can get caught on the tripod jacks when extending and retracting.
13. Well, there are no helicopters with retractable gear in this facility. So, that's a....downwash. haa haa. Lame. Sorry. I guess get the 337's gear problem needs to be fixed or the project will come down to one operating acft being the 310Q with reliably retractable gear.