Expected Outcome 1: Competency in Aerospace Sub-Fields

Upon graduation, graduates of the Aerospace Engineering program will have demonstrated an ability to apply knowledge of mathematics, basic science and engineering to solve problems encompassing the four fundamental areas of aerospace engineering: aerodynamics, structures, flight dynamics, and orbital mechanics.

Assessment Method 1: Course Data Collection

Assessment Method Description

Data is collected typically from final exam question in junior level courses that cover the four fundamental areas of aerospace engineering. These courses are assessed every year. A rubric is employed that consists of two performance indicators to determine the extent of the students' understanding of the problem ("PI1: Understands Problem") and their ability to solve the problem correctly ("PI2: Execution"). A three point scale is used for each performance indicator within the rubric. A score of 1 corresponds to unsatisfactory, a score of 2 corresponds to meets expectations, a score of 3 corresponds to exceeds expectations. The course instructor performs this assessment for each student in their class. The success metric is that at least 85% of the students rate scores of either 2 or 3.

The Spring 2014 assessment for this outcome was carried out in AERO 3120, AERO 3230, AERO 3310 and AERO 3610.

Findings

The success metric was met on all performance indicators for students in the AERO 3230, and 3610 courses. In AERO 3120, the success metric was achieved by 84% of the students which is slightly below the target level of 85%. Also, in AERO 3310, the success metric was achieved by 84% of the students.

How did you use findings for improvement?

The faculty members responsible for the AERO 3120 and AERO 3310
courses are meeting this fall to discuss the assessment results. The discussion will include the content of prerequisite courses such as AERO 2200 and ENGR 2350. Also the content and topic coverage parameters will be examined to see if spending additional lecture time on the material associated with the "weakness" areas displayed by students in the AERO 3120 and 3310 courses is warranted.

**Additional Comments**

**Assessment Method 2: Alumni Senior Exit Survey**

**Assessment Method Description**

A group of three senior alumni with extensive industrial/governmental experience have volunteered for the last 11 years to construct and administer an online, self-assessment survey of our graduating seniors each spring semester. All graduating seniors are required to complete this survey. There are fourteen questions in the survey and one of the questions is "How would you assess your current knowledge of basic aerodynamics, structures, flight dynamics and orbital mechanics"? The students are asked to select a knowledge level by using the numerical scale shown below.

- 9-10 Excellent
- 7-8 Very Good
- 5-6 Average
- 3-4 Below Average
- 0-2 Poor

The online survey results are sent directly to this group of alumni and only they see the "raw" survey results. During the summer (after the students have graduated), the alumni members write a summary report of the survey results to present to the department chair.

**Findings**

For the 2014 survey year, the alumni report included the following statement regarding this outcome

"Overall assessment: Very Good; composite assessment for all students was a 7. Numerical scores ranged from 4 to 10. General consensus among the interviewees was they had acquired a very good background."

**How did you use findings for improvement?**

The survey findings show that the department is doing a good job in educating the students in the four fundamental areas of Aerospace Engineering. Over the 11 years that the alumni have been conducting this self-assessment, some very useful information has been collected and forwarded to the department chair. The online survey form encourages written comments in addition to the numerical scores and several comments over the years have resulted in curriculum changes that have certainly enhanced the undergraduate program. The
department chair shares the results of this survey each year with the faculty and the results have always led to a lively discussion and as mentioned above, certainly some improvements to the Aerospace Engineering program.

Additional Comments

Assessment Method 3: Senior Exit Interviews with Department Chair

Assessment Method Description
The department chair conducts an individual interview with each senior in Aerospace Engineering during the semester of their graduation. This interview lasts approximately 15 to 45 minutes and during the interview the chair asks each student a set of questions related to their opinions of their undergraduate experience. One of the questions that the chair asks concerns their assessment of their understanding of the subject matter of the four core areas of aerospace engineering: aerodynamics, structures, orbital mechanics, and flight dynamics.

Findings
For the 2012-2013 academic year the chair summarized the student responses to this question as follows. "Most of the students indicated that they were most interested in either aerodynamics or orbital mechanics and that they thought that their understanding of the subject matter in those areas was very good. Most students liked basic structures and indicated a good knowledge of that subject area. While some students did not "like" the advanced structures (finite element methods) material, all considered an understanding of that material to be a necessary part of their education as aerospace engineers. Some were contemplating future work in the flight structures area. Regarding flight dynamics, many students indicated that they liked the lab portion of the one course in that subject area. All considered the analysis of the stability and control of airplanes important. Almost all students indicated that the application of information from the four core areas in the airplane design courses increased their understanding significantly".

How did you use the findings for improvement?
The student responses indicate that the material in these four core areas are being presented in a manner that inspires confidence in their ability to tackle problems related to aerodynamics, orbital mechanics, structures and flight dynamics. The basic courses related to their four areas are taught during the junior year in the curriculum and it is very encouraging that the senior students felt that their background in these areas prepared them very well to handle the material in the senior design capstone sequence AERO 4710 and AERO 4720 courses.
The department conducts a complete curriculum review on a five year cycle. The review has been initiated during the spring of 2014 and will continue into the spring of 2015. Results from the senior exit interviews are used extensively during this review process as the faculty meet to discuss each AERO course in the curriculum and seek course improvements.

Additional Comments

Expected Outcome 2: Proficiency in Oral Communication
Students must demonstrate proficiency in oral communication

Assessment Method 1: Individual oral presentation in AERO 4710:
Senior Design I

Assessment Method Description
Each student in the AERO 4710: Aerospace Design I course (required for graduation) must prepare a PowerPoint presentation on a selected aircraft design of historic significance. The instructor assigns each student a unique aircraft design. The student then prepares a 10 minute presentation, in a professional briefing format, and presents it to the instructor and his/her fellow students during class. The presentation is not a mathematical component of the course grade, but each student must obtain a "satisfactory" evaluation from the instructor to complete the course. A student that obtains an "unsatisfactory" evaluation from the instructor, must repeat the assignment until he/she obtains a "satisfactory" evaluation. The student receives oral feedback from both the instructor and the audience regarding the presentation.

Findings
During the 2013-2014 academic year there were 62 students enrolled in the required AERO 4710 course. All 62 students earned a "satisfactory" rating on their first presentations.

How did you use findings for improvement?
The instructor for the AERO 4710 course met with the departmental Undergraduate Program Coordinator to discuss additional lecture material that will aid the students in improving their oral presentation skills.
Additional Comments

Assessment Method 2: Design group presentation in AERO 4720: Senior Design II

Assessment Method Description
In the required AERO 4720: Senior Design II course the students are divided into teams of 4-5 students. The semester long design project requires that each student team design an aircraft in response to a formal industrial-style request for proposals (RFP). Each team must complete a 30-page written proposal describing their design and presenting a complete performance analysis of their vehicle. In addition, the team must prepare and present a 20-slide PowerPoint oral presentation to a group of three to four external industrial/governmental reviewers. The reviewers are typically alumni of our program that have retired after spending many years as technical managers in either industrial concerns or governmental agencies. The individual teams are given one hour to make their oral presentations and each member of the team must participate in the presentation. Students from other teams are encouraged to attend the presentations. Each reviewer scores the individual teams on four criteria

- Design Quality (35%)
- Analysis of Design Performance (35%)
- Design Compliance with Requirements (15%)
- Oral Presentation Skills (15%)

The reviewers then meet with the course instructor to establish the final composite team scores.

Findings
For the 2014-2014 academic year, all but one of the teams scores on "Oral Presentation Skills" ranged from 10.5 to 15 on a 15 point scale. One team scored a 4 out of 15 on "Oral Presentation Skills". The instructor prepared a written report for the Undergraduate Program Coordinator where he stated "The teams impressed the reviewers and me with the quality of the presentations. Several student told me they didn't know what I was up to in Design I, but at the end of Design II it all made sense and they were grateful for the experience."

How did you use findings for improvement?
The instructor for this course met with the Undergraduate Program Coordinator to discuss various aspects of the course, including the oral presentations. Alterations to the lecture material is being implemented...
by the instructor that should continue to improve the quality of the presentations. The group that scored a 4 on the presentation was provided with a written critique to explain the deficiencies. The instructor plans to provide written critiques to all of the groups in the future.

**Additional Comments**