Aerospace Engineering

SJSU Annual Program Assessment Form
Academic Year 2013-2014

Department & College: Aerospace Engineering
Website: <ae.sjsu.edu>

University Learning Goals addressed at:
<https://ae.sjsu.edu/academics/msae/msae-program-educational-objectives>
<https://ae.sjsu.edu/academics/bsae/bsae-program-educational-objectives>
<https://ae.sjsu.edu/academics/bsae/bsae-program-outcomes>

Program Accreditation (if any): ABET (BSAE)
Contact Person and Email: Dr. Nikos J. Mourtos nikos.mourtos@sjsu.edu
Date of Report: 01 June 2014

Part A

1. List of Program Learning Outcomes (PLOs)

1A. - **BSAE Program Learning Outcomes** are specified by ABET. AE faculty have broken down each outcome into elements and proposed performance criteria for each outcome element.

**Outcome A:** Ability to use mathematics, science, and engineering principles to identify, formulate and solve aerospace engineering problems.

*Outcome Elements*
A-1: Ability to apply mathematics.
A-2: Ability to apply physics.
A-3: Ability to apply engineering principles.
A-4: Ability to identify, formulate and solve AE problems.

**A-1: Ability to apply mathematics**

*Outcome Performance Criteria:*
A-1.1: Apply calculus.
A-1.2: Derive and solve differential equations.
A-1.3: Use linear algebra.

**A-2: Ability to apply physics**

*Outcome Performance Criteria:*
A-2.2: Apply Newton’s laws / physics concepts (e.g. angular momentum, friction, thermal/Fluid concepts etc.).
A-3: Ability to apply engineering principles  
*Outcome Performance Criteria:*  
A-3.1: Apply structures principles.  
A-3.2: Apply rigid body dynamics principles.  
A-3.3: Apply aerodynamics principles.  
A-3.4: Apply flight mechanics principles.  
A-3.5: Apply propulsion principles.  
A-3.6: Apply stability and control principles.  

A-4: Ability to identify, formulate and solve AE problems  
*Outcome Performance Criteria:*  
A-4.1: Engage in the solution of problems (spend adequate time on task, ask questions, etc.).  
A-4.2: Define (open-ended) problems in appropriate engineering terms.  
A-4.3: Explore problems (i.e., examine various issues, make appropriate assumptions, etc.).  
A-4.4: Develop a plan for the solution (i.e., select appropriate theories, principles, approaches).  
A-4.5: Implement their solution plan and check the accuracy of their calculations.  
A-4.6: Evaluate their results and reflect on their strengths and weaknesses in the process.  

Outcome B: Ability to design and conduct water tunnel and wind tunnel experiments, as well as to analyze and interpret data from such experiments.  
*Outcome Elements*  
B-1: Ability to design water tunnel and wind tunnel experiments.  
B-2: Ability to conduct water tunnel and wind tunnel experiments.  
B-3: Ability to analyze data from water tunnel and wind tunnel experiments.  
B-4: Ability to interpret data from water tunnel and wind tunnel experiments.  

B-1: Ability to design experiments  
*Outcome Performance Criteria:*  
B-1.1: Define goals and objectives for the experiment.  
B-1.2: Research relevant theory and published data from similar experiments.  
B-1.3: Select the dependent and independent variables to be measured.  
B-1.4: Select appropriate methods for measuring/controlling each variable.  
B-1.5: Select a proper range for the independent variables.  
B-1.6: Determine an appropriate number of data points for each type of measurement.  

B-2: Ability to conduct experiments.  
*Outcome Performance Criterion:*  
Given an experimental setup, become familiar with the equipment, calibrate the instruments to be used, and follow the proper procedure to collect the data.
B-3: Ability to analyze data from experiments.

Outcome Performance Criterion:
Given a set of experimental data, carry out the necessary calculations and tabulate / plot the results using appropriate choice of variables and software.

B-4: Ability to interpret data from experiments.

Outcome Performance Criteria:
B-4.1: Given a set of results in tabular or graphical form, make observations and draw conclusions regarding the variation of the parameters involved.
B-4.2: Given a set of results in tabular or graphical form, compare with theoretical predictions and/or other published data and explain any discrepancies.

Outcome C: Ability to perform conceptual and preliminary design of aircraft or spacecraft to meet a set of mission requirements within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.

Outcome Performance Criteria:
C-1: Research, evaluate, and compare vehicles designed for similar missions.
C-2: Follow a prescribed process to develop the conceptual/preliminary design of an aerospace vehicle.
C-3: Develop economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability constraints and design a vehicle that meets these constraints.
C-4: Select an appropriate configuration for an aerospace vehicle with a specified mission.
C-5: Apply AE principles (ex. aerodynamics, structures, flight mechanics, propulsion, stability and control) to design various vehicle subsystems.
C-6: Develop and compare alternative configurations for an aerospace vehicle, considering trade-offs and appropriate figures of merit.
C-7: Develop final specifications for an aerospace vehicle.

Outcome D: Ability to collaborate with people from different cultures, abilities, backgrounds, and disciplines to complete aerospace engineering projects.

Outcome Performance Criteria:
D-1: Participate in making decisions, negotiate with partners, and resolve conflicts arising during teamwork.
D-2: Set goals related to team projects, generate timelines, organize and delegate work among team members, and coach each other as needed to ensure that all tasks are completed.
D-3: Demonstrate leadership by taking responsibility for various tasks, motivating and disciplining others as needed.
D-4: Demonstrate adequate understanding of other fields (ex. different branches of engineering/physical sciences, economics, management, etc.) to participate effectively on multidisciplinary projects.
D-5: Communicate ideas relating to AE in terms that others outside the discipline can understand.

**Outcome E:** Ability to communicate effectively through technical reports, memos, and oral presentations as well as in small group settings.

*Outcome Elements*
E-1: Ability to communicate in writing
E-2: Ability to communicate orally

**E-1: Ability to communicate in writing**

*Outcome Performance Criteria:*
E-1.1: Produce well-organized reports, following guidelines.
E-1.2: Use clear, correct language and terminology while describing experiments, projects or solutions to engineering problems.
E-1.3: Describe accurately in a few paragraphs a project/experiment performed, the procedure used, and the most important results (abstracts, summaries).
E-1.4: Use appropriate graphs and tables following published engineering standards to present results.

**E-2: Ability to communicate orally**

*Outcome Performance Criteria:*
E-2.1: Give well-organized presentations, following guidelines.
E-2.2: Make effective use of visuals.
E-2.3: Present the most important information about a project/experiment, while staying within allotted time.
E-2.4: In small group settings, listen carefully, ask clarifying questions when others speak, and respect the opinion of others when disagreeing.

**Outcome F:** Understanding of professional and ethical responsibility.

*Outcome Elements*
F-1: Understanding of professional responsibility.
F-2: Understanding of ethical responsibility.

**F-1: Understanding of professional responsibility.**

*Outcome Performance Criterion:*
Demonstrate professional excellence in performance, punctuality, collegiality, and service to the AE profession.
F-2: Understanding of ethical responsibility.

*Outcome Performance Criteria:*
F-2.1: Are aware of the various professional codes of ethics (ex. NSPE, ASME).
F-2.2: Properly acknowledge the work of others by citing all their sources when writing reports.
F-2.3: Given a job-related scenario that requires a decision with ethical implications they can identify possible courses of action, discuss the pros and cons of each one, decide on the best course of action, and justify their decision.

**Outcome G:** Broad education to understand current events, how they relate to aerospace engineering, as well as the impact of engineering solutions in a global and societal context.

*Outcome Performance Criteria:*
G-1: Identify regional, national, or global contemporary problems that involve AE.
G-2: Discuss possible ways AE could contribute to the solution of these problems.
G-3: Describe accurately the environmental impact of aerospace vehicles, including those they have designed in course projects.
G-4: Describe accurately the health / safety impact of aerospace vehicles, including those they have designed in course projects.

**Outcome H:** Recognition of the need for, and ability to engage in life-long learning.

*Outcome Elements*

H-1: Recognition of the need for lifelong learning.
H-2: Ability to engage in lifelong learning.

**H-1: Recognition of the need for lifelong learning**

*Outcome Performance Criteria:*
H-1.1: Are willing to learn new material on their own.
H-1.2: Participate in professional societies.
H-1.3: Read non-course related AE related articles / books, attend short courses, workshops, seminars, conferences and plan to attend graduate school.

**H-2: Ability to engage in lifelong learning.**

*Outcome Performance Criteria:*
H-2.1: Develop a systematic approach to studying a new topic, reflect regularly on their learning process and make any necessary adjustments to improve the efficiency of this process.
H-2.2: Can access information effectively and efficiently from a variety of sources (e.g. articles, books, experts, etc.) and learn new material on their own.
**Outcome I:** Ability to use the techniques, skills, and modern engineering tools (analytical, experimental, and computational) necessary for aerospace engineering practice.

**Outcome Performance Criteria:**
I-1: Can access information effectively and efficiently from the internet.
I-2: Use state-of-the-art software to write technical reports and give oral presentations.
I-3: Use computer simulations to conduct parametric studies and ‘what if’ explorations.
I-4: Use modern software to analyze aerospace systems.
I-5: Use modern equipment and instrumentation in AE laboratories.
I-6: Are aware of state-of-the-art tools and practices used in the aerospace industry through plant visits and presentations by practicing engineers.

**BSAE PLO performance targets are defined as follows:**
The scores earned by all students, in the assignments and test questions, which pertain to a particular performance criterion, in each course where this performance criterion is assessed, must be at least 70%.

1.B - AE faculty have proposed the following **MSAE Program Learning Outcomes** with input from the AE Advisory Board.

**Outcome A:** Ability to use graduate level mathematics to model and solve aerospace engineering problems.

**Outcome B:** Ability to apply aerospace engineering science (aerodynamics, propulsion, flight mechanics, stability & control, aerospace structures & materials, etc.) to perform an in-depth analysis and / or design of an aerospace engineering system taking into consideration economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability constraints.

**Outcome C:** Ability to use modern tools (computational or experimental).

**Outcome D:** Ability to perform a literature search related to a given problem, cite the references in appropriate ways, and demonstrate an understanding of the cited literature.

**Outcome E:** Graduate level technical writing ability, including correct language and terminology, appropriate visuals, and summarizing key ideas.

2. **Map of PLOs to University Learning Goals (ULGs)**
The maps below are the product of several discussions in AE faculty meetings.
MSAE Program Outcomes / University Learning Goals Map

**UNIVERSITY LEARNING GOALS**

- Specialized Knowledge
- Broad Integrative Knowledge
- Intellectual Skills
- Applied Knowledge
- Social and Global Responsibilities

**MSAE PROGRAM OUTCOMES**

- Use graduate level mathematics to model and solve aerospace engineering problems.
- Apply aerospace engineering science to perform in-depth analysis and/or design of aerospace engineering systems taking into consideration economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability constraints.
- Use modern tools (computational or experimental).
- Perform a literature search related to a given problem, cite the references in appropriate ways and demonstrate an understanding of the cited literature.
- Demonstrate graduate level technical writing ability, such as use of correct language and terminology, appropriate visuals, and an ability to summarize key ideas.
# 3. Alignment – Matrix of PLOs to Courses

## BSAE Course / Outcome Mapping

<table>
<thead>
<tr>
<th>BSAE Course / Outcome Mapping</th>
<th>Student Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BSAE</strong></td>
<td>A</td>
</tr>
<tr>
<td><strong>Original ABET Outcomes</strong></td>
<td>(a), (e)</td>
</tr>
<tr>
<td><strong>Required Courses</strong></td>
<td></td>
</tr>
<tr>
<td>Engr. 100W</td>
<td></td>
</tr>
<tr>
<td>AE 112</td>
<td></td>
</tr>
<tr>
<td>AE 114</td>
<td>++</td>
</tr>
<tr>
<td>AE 140</td>
<td>++</td>
</tr>
<tr>
<td>AE 157</td>
<td></td>
</tr>
<tr>
<td>AE 160</td>
<td>++</td>
</tr>
<tr>
<td>AE 162</td>
<td>++</td>
</tr>
<tr>
<td>AE 164</td>
<td>++</td>
</tr>
<tr>
<td>AE 165</td>
<td>++</td>
</tr>
<tr>
<td>AE 167</td>
<td>++</td>
</tr>
<tr>
<td>AE 168</td>
<td>++</td>
</tr>
<tr>
<td>AE 169</td>
<td>++</td>
</tr>
<tr>
<td>AE 171 A, B</td>
<td></td>
</tr>
<tr>
<td>AE 172 A, B</td>
<td></td>
</tr>
<tr>
<td><strong>Extra Curriculum Activities</strong></td>
<td></td>
</tr>
</tbody>
</table>

+: Skill level 1 or 2 in Bloom’s Taxonomy  
++: Skill level 3 or 4 in Bloom’s Taxonomy  
+++: Skill level 5 or 6 in Bloom’s Taxonomy  
✈: Skill addressed but not assessed

## MSAE Course / Outcome Mapping

<table>
<thead>
<tr>
<th>MSAE Course / Outcome Mapping</th>
<th>Student Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MSAE</strong></td>
<td>A</td>
</tr>
<tr>
<td><strong>Required Courses</strong></td>
<td></td>
</tr>
<tr>
<td>AE 200</td>
<td>+++</td>
</tr>
<tr>
<td>AE 245 or AE 246</td>
<td>★</td>
</tr>
<tr>
<td>AE 250</td>
<td>★</td>
</tr>
<tr>
<td>AE 262 or AE 264</td>
<td>★</td>
</tr>
<tr>
<td>AE 267</td>
<td>★</td>
</tr>
<tr>
<td>AE 269</td>
<td>★</td>
</tr>
<tr>
<td>AE 271</td>
<td>★</td>
</tr>
<tr>
<td>AE 295 A, B or AE 299</td>
<td>★</td>
</tr>
</tbody>
</table>

+: Skill level 1 or 2 in Bloom’s Taxonomy  
++: Skill level 3 or 4 in Bloom’s Taxonomy  
+++: Skill level 5 or 6 in Bloom’s Taxonomy  
★: Skill addressed but not assessed
4. Planning – Assessment Schedule

Timeline for BSAE Outcome Assessment

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>3A</th>
<th>3B</th>
<th>3C</th>
<th>3D</th>
<th>3E</th>
<th>3F</th>
<th>3G</th>
<th>3H</th>
<th>3I</th>
</tr>
</thead>
<tbody>
<tr>
<td>AY 11-12</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AY 12-13</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AY 13-14</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AY 14-15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AY 15-16</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AY 16-17</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>AY 17-18</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

Improvements in the BSAE Program in AY 2013 - 2014

- Total number of units reduced to 120.
- Lower division core was strengthened by introducing two AE courses:
  - AE20 (2 units) to replace ME20 (2 units)
  - AE30 (2 units) to replace ME30 (2 units)
  Both courses emphasize AE applications, including MATLAB, which was not adequately covered in ME30. More importantly, these courses will serve as vehicles for reaching out to AE freshmen and sophomores and connect them with AE seniors through projects.
- BSAE core was strengthened by:
  - Integrating 12 AE experiments in AE core courses and dropping ME120 (2 units)
  - Introducing AE112 – Aerospace Structural Analysis I (lecture/lab, 4 units), which integrates statics, strength of materials and structural analysis using aircraft and spacecraft geometries, materials, and hardware in replacement of CE99 (2 units) and CE112 (3 units).
  - Introducing AE157 – Aerospace Automatic Systems Control Design (3 units) in support of the Dynamics & Control stem, which supports both aircraft and spacecraft design and reducing the # of elective units from 6 to 3.
  - Introducing AE164 – Aerothermodynamics (5 units), which integrates compressible flow (old AE164, dropped, 3 units), thermodynamics (ME113, dropped, 4 units), and heat transfer, previously not included in the curriculum.
- BSAE senior design, capstone experience was strengthened by integrating GE areas S and V into AE171A&B (aircraft design) and AE172A&B (spacecraft design) and introducing Engr.195A&B (two one-unit seminars taught by faculty in Social Science).
**Improvements in the MSAE Program in AY 2013 - 2014**

- MSAE core was strengthened by:
  - Introducing AE200 - Engineering Analysis & Control of Aerospace Systems
  - Requiring one course in each of the fundamental AE subjects: stability and control, aerospace structures and materials, aerodynamics, and aerospace propulsion.
  - Offering students a choice of courses to satisfy the stability and control (AE245 or AE246) and aerodynamics (AE262 or AE264) requirements.

- Introducing two new electives:
  - AE247 – Trajectory Optimization in Aerospace Systems
  - AE280 – Hypersonics and Reentry Systems

- Introducing AE297 – Special Topics in Aerospace Engineering, to serve as a vehicle for inviting industry experts to teach current topics of interest. In Fall 2014 a NASA expert will teach about intellectual property rights in today’s globalized world.

5. **Student Experience**

PLOs and ULGs are:

- Posted on the BSAE and MSAE websites
- Included on course syllabi, linked to specific course learning objectives.
- Communicated to students on the first day of class and throughout the semester in relationship to specific topics and course assignments.

---

**Timeline for MSAE Outcome Assessment**

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>AY 11-12</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AY 12-13</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AY 13-14</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AY 14-15</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AY 15-16</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>AY 16-17</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AY 17-18</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>
Part B

Graduation Rates for Total, Non URM and URM students (per program and degree)

<table>
<thead>
<tr>
<th>Academic Programs</th>
<th>First-time Freshmen: 6 Year Graduation Rates</th>
<th>New UG Transfers: 3 Year Graduation Rates</th>
<th>Grads: 3 Year Graduation Rates</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fall 2007 Cohort</td>
<td>Fall 2010 Cohort</td>
<td>Fall 2010 Cohort</td>
</tr>
<tr>
<td>Entering % Grad</td>
<td>Entering % Grad</td>
<td>Entering % Grad</td>
<td>Entering % Grad</td>
</tr>
<tr>
<td>-------------------</td>
<td>----------------</td>
<td>----------------</td>
<td>----------------</td>
</tr>
<tr>
<td>Aerospace Engineering Total</td>
<td>45</td>
<td>33.3%</td>
<td>8</td>
</tr>
<tr>
<td>URM</td>
<td>14</td>
<td>21.4%</td>
<td>2</td>
</tr>
<tr>
<td>Non-URM</td>
<td>22</td>
<td>36.4%</td>
<td>6</td>
</tr>
<tr>
<td>Other</td>
<td>9</td>
<td>44.4%</td>
<td>0</td>
</tr>
</tbody>
</table>

The AE Program was part of the MAE Department during the time period reflected in these data. We have no recollection of any discussion on graduation rates in general and for URM in particular during the time AE was merged with ME. We have become aware of these numbers only recently since AE became an independent Program (effective August 19, 2013). Typically almost all of our juniors stay on track and graduate within two or two-and-a-half years from the time they enter their fall junior semester, hence a possible explanation for the low graduation rates shown above may be that a large percentage of freshmen and/or sophomores changed majors out of AE. We cannot devise an intelligent plan for improving these rates without knowing what happened to the students who left the AE Program: did they graduate with a different degree or did they drop out altogether? Nevertheless, we plan to track our freshmen starting with our Fall 2013 cohort and implement a support system for our freshmen and sophomores staring Fall 2014.

The MSAE Program is structured to help full-time students graduate in three semesters. The graduation rates shown above are low for two reasons. First, many of our students are part-time, as they are employed full-time in the local industry. Second, we admit many students with non-BSAE degrees conditionally. Depending on their background, these students are required to take up to 18 units of BSAE core courses. This adds another year to their degree.
6. Headcounts of program majors and new students (per program and degree)

<table>
<thead>
<tr>
<th>Degree</th>
<th>1st Fr.</th>
<th>UG Transf.</th>
<th>1st Grads</th>
<th>UGs</th>
<th>Grads</th>
<th>UGs</th>
<th>Grads</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>67</td>
<td>37</td>
<td>24</td>
<td>146</td>
<td>25</td>
<td>250</td>
<td>49</td>
<td></td>
</tr>
<tr>
<td>BS</td>
<td>67</td>
<td>37</td>
<td>0</td>
<td>146</td>
<td>0</td>
<td>250</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>MS</td>
<td>0</td>
<td>0</td>
<td>24</td>
<td>0</td>
<td>25</td>
<td>0</td>
<td>49</td>
<td></td>
</tr>
</tbody>
</table>

The headcount has been steadily rising in the BSAE Program: from 166 in Fall 2010, 192 in Fall 2011, 211 in Fall 2012 to 250 in Fall 2013 showing a strong demand. The headcount has been fairly steady in the MSAE Program at approximately 50 from Fall 2009 to Fall 2013.

7. SFR and average section size (per program)

<table>
<thead>
<tr>
<th>Course Level</th>
<th>Fall 2013</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SFR</td>
</tr>
<tr>
<td>Total</td>
<td>25.7</td>
</tr>
<tr>
<td>Upper Division</td>
<td>30.9</td>
</tr>
<tr>
<td>Graduate Division</td>
<td>17.3</td>
</tr>
</tbody>
</table>

In AY13-14:
- Our junior level courses averaged about 60 students each.
- Our graduate courses averaged about 20 students each (11 to 26) with the exception of our project and thesis courses AE295A, AE295B, AE298, and AE299, which have a total enrollment of 16 to 18 students and are all combined under one instructor-of-record.

8. Percentage of tenured/tenure-track instructional faculty (per department)
9. Closing the Loop/Recommended Actions

Recommendations by ABET (2013):

- **Program Weakness: Criterion 6 – Faculty.**
  The Program was cited for (a) not having a sufficient number of FTF at the time of the visit as well as at the time of the interim review and (b) because *AE faculty did not have sufficient authority to ensure the proper guidance of the program and to develop and implement processes for the evaluation, assessment and continuing improvement of the program.*
  Weakness (a) was removed with the addition of Dr. Kamran Turkoglu as a tenure-track faculty member in Fall 2013. Regarding weakness (b):

At the time of the ABET Team visit in Fall 2011, the Aerospace Engineering program was housed within the Mechanical and Aerospace Engineering department. As of August 19, 2013 the MAE Department no longer exists; it has been divided into the ME Department and the AE Program, which operates as an independent program, with a Director reporting to the Dean. As a result of this re-organization:

(a) The AE Program now has its own budget, handled by the AE Director, just like any department in the College.
(b) The AE Director participates in the Council of Chairs / Directors and is directly informed about University and College policies, initiatives, opportunities or any other issues affecting the AE Program.
(c) The AE Director meets with the Dean on a monthly basis, just like any department chair in the College.
(d) The AE Program now has its own admin, technician, and its own office.
(e) The AE Program now has its own Curriculum and RTP committees. Furthermore, AE faculty are represented in the College RTP, Strategic Planning, Assessment, Undergraduate Studies, Graduate Studies, and Student Affairs committees, allowing AE faculty to represent the interests of the AE Program directly at the College level. This was not the case when the AE Program was housed in the MAE Department. AE Program faculty was always a minority on any MAE Department committee, often outvoted on important curriculum or personnel issues and did not always have an opportunity to represent the AE Program on College committees.
(f) The AE Program has its own entry in the new SJSU Catalogue (2014-2016) reflecting the separation from the ME Program as well as a newly revised BSAE curriculum, which better addresses AE Program Criteria. Among other things, this increases the visibility of the Program.
(g) The AE Program has its own website: [http://ae.sjsu.edu](http://ae.sjsu.edu)

In summary, beginning in Fall 2013, the AE Program functions essentially as a department with the full support of the College. Enrollment is growing showing a strong interest in our Program. As of Fall 2013 there are 250 students enrolled in the BSAE Program, up from 201 in Fall 2012.
The intention is to grow the AE Program until it is robust enough, in terms of enrollment and faculty positions, to be an independent department with an elected chair.

- **Concern: Program Criteria**
  Program Criteria require that program faculty have responsibility and sufficient authority to define, revise, implement, and achieve program objectives. ABET was not satisfied with the documentation they received at the time, however, the separation of the AE Program from the ME Program has fully addressed this concern, as described above.

**Recommendations by the external evaluator of the MSAE Program (2013):**

- *The program should continue its strengths in strong fundamentals but examine options to provide students electives in related but outside of aerospace department courses such as control theory and implementation in electrical engineering and computer engineering, and composite materials in mechanical engineering.*
  The MSAE curriculum was revised to include required courses in stability & control, as well as aerospace structural analysis, including design with composite materials. MSAE students are allowed and encouraged to take electives outside the AE Program and even outside the College of Engineering.

- *The program should immediately implement a plan to hire additional T/TT faculty to bring the faculty size to at least 5 to be in compliance with the new CSU requirement for graduate programs.*
  With College support, the AE Program plans to recruit one new T/TT faculty member each year starting in AY14-15, to bring the total number of T/TT faculty to seven (7). The University has already approved the hiring of a 4th FTF member in AY15-16. The search will commence in Fall 2014.

- **Enrollment Trend:** The headcount enrollment in the Aerospace Engineering graduate program has more than doubled in the last five years from 17 to 38. The FTES count for the same period is about half of the headcount indicating that most students are part-time and possibly working professionals. Actually, the headcount in the MSAE Program has gone up to 56 in Spring 2014. The Program typically offers three (3) courses per semester, following a 3-semester rotation schedule. The enrollment for the three courses offered in Fall 2013 varied from 21 to 24.

- **Graduation Trends:** The three-year graduate rate for AE program is well below the College average. It is not clear why there is such large discrepancy between College rates and the AE program. It is likely that the students enrolling in these programs have full-time employment commitment hence they are progressing slowly through the program. The trends in graduation rates requires a careful review of admission policy, adequate offering of required courses, adequate access to full-time faculty, and other factors that might cause the deviation from the college average.
MSAE students with a BSAE degree are encouraged and supported to complete their degree in three semesters. The degree requirements are flexible enough, allowing students to complete all their degree requirements in three semesters, assuming they are available to study on a full-time basis. However, Dr. Goel identified one of the main reasons why the graduation rate is below the College average. Many MSAE students work, some of them full-time, hence they cannot take more than 6 units (two courses) per semester. An additional reason contributing to longer graduation times is that many students do not hold BSAE degrees hence they must take additional courses (up to six, depending on their background) to fulfill AE core requirements.

- Develop and introduce assessment methods to measure student perception of attainment of the Program Objectives. Seeking student/alumni input in the attainment of Program Objectives is critical to the assessment process. The College and various graduate programs develop consistent assessment practices. The AE Program currently sends out surveys to alumni and employers every three years for the purpose of assessing Program Educational Objectives.

10. Assessment Data

Following the timelines for BSAE/MSAE Outcome Assessment shown above, we assessed in AY13-14:

- BSAE Program: Outcome C (design skills) in AE171A&B and Outcome H (Lifelong learning skills) in AE162.
- MSAE Program: Outcome C (modern tools) by evaluating all 14 project/thesis reports of students who graduated in Fall 2013 and Spring 2014.
11. Analysis

BSAE Outcome C

Courses Statistics

<table>
<thead>
<tr>
<th>Course</th>
<th>Semester</th>
<th>Faculty Member</th>
<th>Enrollment</th>
<th># of students who passed</th>
<th>% of students who passed</th>
</tr>
</thead>
<tbody>
<tr>
<td>AE 171A&amp;B</td>
<td>Fall ’13 / Spring ’14</td>
<td>Gonzalo E. Mendoza</td>
<td>24</td>
<td>23</td>
<td>96%</td>
</tr>
</tbody>
</table>

Performance Criterion 3C-1: Research, evaluate, and compare vehicles designed for similar missions.

Assessment Summary: The performance target is met for Performance Criterion 3C-1.

Course Activities (AE 171 A)
Students present a comparative study of airplanes with a mission similar to theirs. The objective is to become familiar with the competition and work done by others. They use encyclopedias, the internet, and intelligence gathered from previous projects to collect data on various airplanes. Students compare and discuss important design parameters for the airplanes selected, such as takeoff and payload weight, available thrust, cruise speed and altitude, range, wing area, wingspan, wing aspect ratio, fuselage length, type of payload, etc.

Assessment Tool
Section 3 of Design Report 1 – Mission specification and comparative study

Student Performance Results

<table>
<thead>
<tr>
<th>Course</th>
<th>Students who scored 70% or higher</th>
</tr>
</thead>
<tbody>
<tr>
<td>AE 171 A – Fall 2013</td>
<td>19 (76%)</td>
</tr>
</tbody>
</table>

Analysis
Students typically do well on this assignment; no improvements are needed. Statistics were skewed by a team which did not meet the requirements of the assignment. Part of the course involves the preparation of a final design report which must contain information from all previous reports in one place. Deficiencies found in the specific reports must be corrected on the final design report for a satisfactory grade.

Recommendation: None
Performance Criterion 3C-2: Follow a prescribed process to develop the conceptual / preliminary design of an aerospace vehicle.

Assessment Summary: The performance target is met for Performance Criterion 3C-2.

Course Activities (AE 171A&B)
Students follow an iterative process (Roskam, 1985, Raymer, 199?) to design their airplanes. This process involves mission specification, configuration selection, weight sizing, performance sizing, fuselage design, wing design, empennage design, landing gear design, weight and balance, stability and control analysis, drag polar estimation, and final specification. The open-ended nature of design requires students to iterate through their design process in order to meet their mission requirements.

Assessment Tool
4 group (two in AE171A, two in AE171B) design briefings and 2 written examinations with concepts from all aspects of design (one on each class). The briefings include directed Q&A sessions.

Student Performance Results

<table>
<thead>
<tr>
<th></th>
<th>Written Examination</th>
<th>Team Design Reviews (DR)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Students scoring 70% or higher</td>
<td>Students scoring 70% or higher</td>
</tr>
<tr>
<td>1st Exam (F13)</td>
<td>6 (25%)</td>
<td>24 (100%)</td>
</tr>
<tr>
<td>2nd Exam (S14)</td>
<td>11 (46%)</td>
<td>24 (100%)</td>
</tr>
<tr>
<td>Prelim. DR (F13)</td>
<td>24 (100%)</td>
<td>24 (100%)</td>
</tr>
<tr>
<td>Interm. DR (F13)</td>
<td>24 (100%)</td>
<td>24 (100%)</td>
</tr>
<tr>
<td>Critical DR (S14)</td>
<td>24 (100%)</td>
<td>24 (100%)</td>
</tr>
<tr>
<td>Final DR (S14)</td>
<td>24 (100%)</td>
<td>24 (100%)</td>
</tr>
</tbody>
</table>

Analysis
Student performance was mixed in AY 13-14, despite the fact that student teams produced reasonably good designs. Students divide the tasks among Team members and thus do not get detailed exposure to the various aspects of the design. Rather, they tend to specialize in particular areas of the design, for which they take responsibility. To ensure that all students are adequately knowledgeable in the entire design process, students are challenged with random questions on various aspects of the design individually during each of their design briefings in class. On this, they do relatively well, as evidenced by the design review scores. More detailed questions, as included in the written examinations, posed greater difficulty for the students. This is reflected in the far less positive exam scores. The exams are conceptual in nature, with a design issue posed and a series of questions regarding potential treatments to improve mission suitability of the design, followed by more general questions regarding design procedures and aerodynamic, systems, and stability and control concepts.

Recommendation
Conceptual design questions used in the written exams form the basis for excellent discussions following the actual test. Similar exercises should be posed to the students during class to facilitate these discussions before the test and thus potentially improve the results.
Performance Criterion 3C-3: Develop economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability constraints and design a vehicle that meets these constraints.

Assessment Summary: The performance target is met for Performance Criterion 3C-3.

Course Activities (AE 171A&B)
- Develop economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability constraints as appropriate for their airplane.
- Take into consideration these constraints in the design of their airplane and discuss how well their particular design meets these constraints.

Assessment Tools: Sections in two design reports (Mission Specification and Final Design Reports) and participation in online and class discussions on this topic.

Student Performance Results

<table>
<thead>
<tr>
<th></th>
<th>Students who scored 70% or higher</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mission Spec. Report (F13)</td>
</tr>
<tr>
<td>AE170A&amp;B – F13/S14</td>
<td>19 (100%)</td>
</tr>
<tr>
<td></td>
<td>Final Design Report (S14)</td>
</tr>
<tr>
<td></td>
<td>24 (100%)</td>
</tr>
<tr>
<td></td>
<td>Participation (S14)</td>
</tr>
<tr>
<td></td>
<td>24 (100%)</td>
</tr>
</tbody>
</table>

Analysis
Student performance is generally good in this area. Sometimes students need help identifying realistic constraints, especially for airplanes designed for the SAE Aero-Design or the AIAA Design-Build-Fly competitions. Students may also need help analyzing how well their airplane meets certain constraints. Nevertheless, they seem to grasp the importance of specific constraints in airplane design and do a fairly good job meeting those constraints in their designs. Their assignments for outcomes 3F and 3G helpful in this area, as they broaden their horizons beyond the technical aspects of airplane design. As a result of these assignments students have a much better understanding of how to deal with their specific constraints. The class incorporates a fair number of examples of real life designs which test safety, ethical, environmental, economic, and other societal concerns. Participation in online discussion threads on these topics are part of the evaluation plan. In addition, individual and group assignments related to outcome 3F and 3G are tied to specific design examples during class discussion. Early deficiencies during the Mission Specification Report are required to be addressed in the Final Design Report for a satisfactory score.

Recommendation: None
**Performance Criterion 3C-4:** Select an appropriate configuration for an aerospace vehicle with a specified mission.

**Assessment Summary:** The performance target is met for Performance Criterion 3C-4.

**Course Activities (AE171A)**

- Study the configurations of aircraft with a mission specification similar to the proposed airplane; discuss the reasons for the selection of the particular configuration in each of these aircraft.
- Select and sketch a few overall configurations for the proposed airplane; discuss the pros and cons of each configuration. Select one of these configurations for preliminary design purposes and justify the choice.
- Select the specific wing, empennage, landing gear, and propulsion system configuration, discuss the pros and cons of each configuration and justify the choice.

**Assessment Tool:** Configuration Design Report and Schematics, Final Design Report

**Student Performance Results**

<table>
<thead>
<tr>
<th></th>
<th>Students who scored 70% or higher</th>
</tr>
</thead>
<tbody>
<tr>
<td>AE170A&amp;B – F13/S14</td>
<td>20 (83%)</td>
</tr>
</tbody>
</table>

**Analysis**

Students typically do well on this assignment; no improvements are needed.

**Recommendation:** None
**Performance Criterion 3C-5:** Apply AE principles (ex. aerodynamics, structures, flight mechanics, propulsion, stability and control) to design various vehicle subsystems.

**Assessment Summary:** The performance target is met for Performance Criterion 3C-5.

**Course Activities (AE171A&B)**
Students apply AE principles throughout their conceptual and preliminary design of their airplane.

**Assessment Tools**
The following design reports: Weight and Performance Sizing (AE171A), Weight and Balance (AE171A), Stability and Control (AE171A, report includes aerodynamic data estimation, as well as empennage and control surface sizing), and iterations of the Final Design Reports (AE171B).

**Student Performance Results**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>AY 13-14</td>
<td>17 (71%)</td>
<td>16 (67%)</td>
<td>15 (63%)</td>
<td>19 (79%)</td>
<td>24 (100%)</td>
</tr>
</tbody>
</table>

**Analysis**
This Criterion is very broad. Student performance in the various reports varies from team to team and from year to year. It is not uncommon for a team to receive a low score in one of their reports and a number scored grades just below the 70% threshold. Detailed written and oral feedback is provided to each team, and opportunities for resubmitting the assignment are given. The offer for re-submitting reports is often declined early in the semester, as students place their efforts in either hardware research or other priorities. In the end, a satisfactory evaluation of the analyses employed in the design of their aircraft is required to approve the course. Thus, performance improves as the students dedicate additional time to their assignments toward the final design report.

**Recommendation**
The development of appropriate aerodynamic and mass models, as well as the completion of meaningful stability and control analyses, represent the areas which require additional attention. Re-introduction of the joint stability and control project tested out in prior years would add emphasis in these areas. This joint assignment increased the stakes for students to develop good quality weight estimation and aerodynamic models for analysis. The assignment was carried out in conjunction with the AE 168 course, a co-requisite for the aircraft design course.
Performance Criterion 3C-6: Develop and compare alternative configurations for an aerospace vehicle, considering trade-offs and appropriate figures of merit.

Assessment Summary: The performance target is met for Performance Criterion 3C-6.

Course Activities (AE171A&B)
Extensive class discussion related to aircraft designs of varying configurations, missions, and degrees of success. Selection of configuration and design concepts for application in student design projects. Comparative analysis of projects with similar performance goals.

Assessment Tools
The following design reports: Configuration Design and Schematics Report (AE171A) and Final Design Report (AE171B). Both documents require the students to compare and select between various configurations for major components or overall design concepts. The selection must be based on objective or practical evaluation of a reasonable number of alternatives and how they are tied to mission requirements for their design.

Student Performance Results

<table>
<thead>
<tr>
<th></th>
<th>Students who scored 70% or higher</th>
</tr>
</thead>
<tbody>
<tr>
<td>AE170A&amp;B – F13/S14</td>
<td>20 (83%)</td>
</tr>
</tbody>
</table>

Analysis
Students enjoy and perform well in these areas. Re-directive feedback typically results from the student’s inclusion of clearly impractical design choices for the sake of providing what is felt is an appropriately large selection. In addition, design concepts are sometimes qualitatively selected or dismissed based on design myths which are common among popular enthusiast groups. These are relatively minor issues which are improved upon throughout the class experience.

Recommendations
None
Performance Criterion 3C-7: Develop final specifications for an aerospace vehicle.

Assessment Summary: The performance target is met for Performance Criterion 3C-7.

Course Activities (AE171A and B)
Students are required to develop specifications for their designs such that the mission goals from the Mission Analysis exercise are met. Students either test proof of concept aircraft or, if impractical, provide design validation analyses for their designs and are asked to compare the actual or estimated performance of their airplane against their design specifications.

Assessment Tools
Outcome 3C-7 is specifically assessed through the Critical Design Review, where suitability of design specifications is evaluated, and the Final Design Report, which contains the final set of specifications for the design and relevant mission scorecard.

Student Performance Results

<table>
<thead>
<tr>
<th></th>
<th>Students who scored 70% or higher</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Critical Design Review</td>
</tr>
<tr>
<td>AE170A&amp;B – F13/S14</td>
<td>24 (100%)</td>
</tr>
</tbody>
</table>

Analysis
Students typically participate in design competitions such as AIAA Design Build Fly or SAE Aero Design. These competitions provide an interesting exercise in that the specifications are the product of mission score analyses, rather than suitability to a particular mission. Thus, aircraft with rather poor performance characteristics may very well achieve high scores based on one or more design attributes (low weight, short wingspan, etc). Students at San José State have done very well in these types of contests through careful analysis and definition of design specifications which result in high scoring aircraft. Three teams chose to design AIAA DBF aircraft this year. Other projects also showed reasonable judgment in the selection and analysis of final design specifications. One team struggled with the idea of having mission requirements dictate the specifications of their design. Corrective feedback resulted in a satisfactory outcome, but significant time for other activities was lost.
BSAE Outcome H

Course Statistics

<table>
<thead>
<tr>
<th>Course</th>
<th>Semester</th>
<th>Faculty Member</th>
<th>Enrollment</th>
<th># of students who passed</th>
<th>% of students who passed</th>
</tr>
</thead>
<tbody>
<tr>
<td>AE 162</td>
<td>Spring 2014</td>
<td>Dr. Nikos J. Mourtos</td>
<td>66</td>
<td>55</td>
<td>83 %</td>
</tr>
</tbody>
</table>

Assessment Summary: The performance target is met for Outcome H.

Performance Criterion H-1.1: Are willing to learn new material on their own.

Assessment Summary: The performance target is met for Performance Criterion H-1.1.

Course Activities

- The importance of learning new material on your own as part of developing lifelong learning skills was discussed in class.
- AE alumni currently working at NASA Ames RC were invited to speak on the expectation to constantly learn new material on their own by reading manuals, websites, and consulting with experts, in order to perform various tasks on the job.
- In their course projects, students take responsibility to learn material not discussed in the lectures and demonstrate their knowledge of this material in their written report at the end of the semester. Students are encouraged to discuss this material with the course instructor as needed, outside of class.

Assessment Tool: Final project report, worth 20% of the course grade.

Student Performance Results

<table>
<thead>
<tr>
<th>AE162 – Spring 2014</th>
<th>Students who scored 70% or higher</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>47 (85%)</td>
</tr>
</tbody>
</table>

Analysis

Developing proper attitudes towards learning is the first step in the process of becoming a lifelong learner. Unfortunately, some students still hold on to the expectation that everything they need to know will be discussed explicitly during lectures.

Recommendations: None.

Performance Criterion H-1.2: Participate in professional societies.

Assessment Summary: The performance target is not met for Performance Criterion H-1.2.
Course Activities

• Students are encouraged to join AIAA, the student chapter of the professional society for AE and are given bonus points in AE160 and AE162.

Assessment Tool: AIAA officers track student membership and participation in the activities of AIAA.

Student Performance Results

<table>
<thead>
<tr>
<th></th>
<th>Students who scored 70% or higher</th>
</tr>
</thead>
<tbody>
<tr>
<td>AE162 – Spring 2014</td>
<td>21 (38%)</td>
</tr>
</tbody>
</table>

Analysis

Although AIAA membership has increased tremendously among AE students in the past few years to almost 150 members, only 38% of the students in AE162 were active members of their professional society. This probably reflects the fact that many of our students are not well off financially and are not willing to invest even the small amount of money required to join the national and local chapter of their professional society. Furthermore, many of them work hard to support themselves through school and they do not have the time to participate in the activities of AIAA.

Recommendations: None.

Performance Criterion H-1.3: Read non-course related AE related articles / books, attend short courses, workshops, seminars, conferences and plan to attend graduate school.

Assessment Summary: To be assessed in AY14-15 with a survey.

Performance Criterion H-2.1: Develop a systematic approach to studying a new topic, reflect regularly on their learning process and make any necessary adjustments to improve the efficiency of this process.

Assessment Summary: The performance target is not met for Performance Criterion H-2.1.

Course Activities

• Students summarize key ideas and generate questions related to the material presented in lectures.
• Students reflect on their learning process during the semester, identify personal strengths and weaknesses, and develop strategies to improve their learning process.
Assessment Tool: Reflection assignment

Student Performance Results

<table>
<thead>
<tr>
<th></th>
<th>Students who scored 70% or higher</th>
</tr>
</thead>
<tbody>
<tr>
<td>AE162 – Spring 2014</td>
<td>14 (25%)</td>
</tr>
</tbody>
</table>

Analysis

Only 25% of the students completed the reflection assignment and even fewer included a reflection with their open-ended problem solutions as required. The students who completed their reflection assignment did very well, however, the majority of the students have difficulty reflecting effectively on their learning process and even more importantly, identifying effective strategies for correcting any weaknesses and improving their learning process.

Recommendation

- Address this performance criterion in AE160 as well as in AE162.
- Post on the course websites and discuss in class examples of proper reflections.
- Work with students individually to help them develop and apply strategies for improving their learning process.

Implementation: AY 2014 – 2015

Performance Criterion H-2.2: Can access information effectively and efficiently from a variety of sources (e.g. articles, books, experts, etc.) and learn new material on their own.

Assessment Summary:

The performance target is met for Performance Criterion H-2.2.

Course Activities

In their course projects, students take responsibility to learn material not discussed in the lectures and demonstrate their knowledge of this material in their written report at the end of the semester. For example, students:

- Learn on their own how to use a piece of software, which allows them to model the flow around a body using flow singularities (sources, sinks, doublets, vortices) and use this software to model the flow around the fuselage of their selected airplane.
- Find software on the web for evaluating airfoils (e.g. XFLR5), learn to use this software on their own, and use it effectively to compare several airfoils, which they have determined would be good candidates for a particular airplane wing.
- Learn on their own empirical ways for estimating the various types of drag and combine them with methods they have learned in previous courses (AE160) as well as in AE162 to calculate the drag polar of their selected airplane.

Students are encouraged to discuss this material with the course instructor as needed, outside of class.
**Assessment Tool:** Final project report, worth 20% of the course grade.

**Student Performance Results**

<table>
<thead>
<tr>
<th></th>
<th>Students who scored 70% or higher</th>
</tr>
</thead>
<tbody>
<tr>
<td>AE162 – Spring</td>
<td>47 (85%)</td>
</tr>
</tbody>
</table>

**Analysis**

85% of the students accessed appropriate references from a variety of sources including the textbook, instructor notes and the worldwide web. These students demonstrated adequate understanding of the software they used to evaluate airfoils and wings. A smaller percentage (75%) performed adequately well on their drag polar assignment of their report. Overall, students who passed the course demonstrated an adequate understanding of the material related to their project, although few of them made the time to discuss this material with the instructor outside of class.

**Recommendations:**

- Provide more guidance in class and on the course website on how to estimate the drag polars of an airplane by estimating skin friction and pressure drag, drag-due-to-lift, and compressibility drag, to better guide the students on how to use the various references available to them.

**MSAE Outcome C**

Fourteen (14) students graduated in AY13-14, four (4) in Fall 2013 and 10 in Spring 2014 and their reports were assessed for all MSAE outcomes. All reports satisfied Outcome C. In particular:

- 4 students received scores 60% - 79% (acceptable)
- 5 students received scores 80% - 89% (good)
- 5 students received scores 90% - 100% (excellent)

In general, our students perform very well in this area. Some have an opportunity to work at NASA Ames RC, where they use state-of-the-art software and equipment to design, build, and test microsatellites, which subsequently launch to and deploy from the International Space Station. The rest use modern software to analyze complex flows or design aircraft.

**12. Proposed changes and goals (if any)**

Goal for AY 14-15: Initiate a research project to:
(a) Track first-time-freshmen who entered the AE Program in Fall 2013.
(b) Monitor their academic performance.
(c) Creating small group learning communities to support AE freshmen and sophomores academically and connect them with junior and senior students in the Program.
(d) Check impact of these activities on retention and graduation rates down the road.

Areas to be assessed in AY14-15 are identified in the BSAE and MSAE timelines shown above.