


AABInternational

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|  MIDDLE TENNESSEE STATE UNIVERSITY | Middle Tennessee State University Murfreesboro, TN |
| | Department of Aerospace |
| | B.S., Aerospace, Technology |
| October 2020 | STUDENT ACHIEVEMENT DATA |

The Technology concentration has developed a robust and comprehensive assessment plan based on the criteria of its specialized accrediting body, the Aviation Accreditation Board, International (AABI).

This assessment plan consists of the annual evaluation of goals in ten areas. These include: students; program mission and educational goals; student learning outcomes; curriculum; faculty and staff; facilities, equipment, and services; institutional support; aviation safety culture and program; and industry relations. The assessment plan further consists of annual assessment of 1) program specific outcomes, 2) student outcomes in the AABI aviation core, and 3) outcomes in AABI a-k general education requirements.

The outcome and measures that are specifically related to student performance are provided below:

Technology Concentration (Program) Outcomes

Outcome 1: The Technology Concentration will maintain a curriculum which meets or exceeds the entrance requirements of appropriate engineering, engineering science, or science Masters' programs.

Measure 1: Percentage of students who applied to graduate programs that are accepted. Goal: 100% acceptance for students recommended by the Technology Concentration Coordinator

Outcome 2: Students will demonstrate the ability to use mathematics, physics, and engineering concepts to evaluate flight vehicle aerodynamic characteristics and performance.

Measure: Successful use of mathematics, physical principles, and engineering concepts

to calculate airplane aerodynamic characteristics and performance from flight test data in AERO 3440, Fundamentals of Aerodynamics, and AERO 4440, Aircraft Performance. Goal: 100% of Technology students will complete AERO 3440 and AERO 4440 with a grade of 80% or better.

Outcome 3: Students will demonstrate the ability to communicate effectively using appropriate technical language regarding aerodynamics and flight vehicle performance.

Measure: Successful completion of flight test reports in AERO 3440 and AERO 4440.
Goal: 80% completion of flight test reports in AERO 3440 and 4440.

Aviation Core Student Learning Outcomes

Outcome 1: Students will demonstrate their ability to describe the professional attributes, requirement or certifications, and planning applicable to aviation careers.

Measure 1: Questions 1-4 on the Major Field Test (MFT) correspond to AABI 3.3.2 outcome (1a); questions 5-13 correspond to (1b); questions 14-17 correspond to (1c). The overall percentage score for all students on each of these subsets of Aviation Core Outcome 1 will be calculated, with a minimum average score of 80% expected.

Measure 2: Questions 1-4 on the MFT correspond to AABI 3.3.2 outcome (1a); questions 5-13 correspond to (1b); questions 14-17 correspond to (1c). The percentage of students answering each question correctly will be determined, and any one question receiving less than 70% correct responses will be identified for further analysis.

Outcome 2: Students will demonstrate their ability to describe the principles of aircraft design, performance and operating characteristics; and the regulations related to the maintenance of aircraft and associated systems.

Measure 1: Questions 18-41 on the MFT correspond to AABI 3.3.2 outcome (2a); questions 42-49 correspond to (2b); questions 50-62 correspond to (2c); questions 63-66 correspond to (2d). The overall percentage score for all students on each of these subsets of Aviation Core Outcome 2 will be calculated, with a minimum average score of 80% expected.

Measure 2: Questions 18-41 on the MFT correspond to AABI 3.3.2 outcome (2a); questions 42-49 correspond to (2b); questions 50-62 correspond to (2c); questions 63-66 correspond to (2d). The percentage of students answering each question correctly will be determined, and any one question receiving less than 70% correct responses will be identified for further analysis.

Outcome 3: Students will demonstrate their ability to evaluate aviation safety and the impact of human factors on safety.

Measure 1: Questions 67-72 on the MFT correspond to AABI 3.3.2 outcome (3a); questions 73-76 correspond to (3b). The overall percentage score for all students on each of these subsets of Aviation Core Outcome 3 will be calculated, with a minimum average score of 80% expected.

Measure 2: Questions 67-72 on the MFT correspond to AABI 3.3.2 outcome (3a); questions 73-76 correspond to (3b). The percentage of students answering each question correctly will be determined, and any one question receiving less than 70% correct responses will be identified for further analysis.

Outcome 4: Students will demonstrate their ability to discuss the impact of national and international aviation law, regulations and labor issues on aviation operations.

Measure 1: Questions 77-80 on the MFT correspond to AABI 3.3.2 outcome (4a); questions 81-82 correspond to (4b); question 83 corresponds to (4c). The overall percentage score for all students on each of these subsets of Aviation Core Outcome 4 will be calculated, with a minimum average score of 80% expected.

Measure 2: Questions 77-80 on the MFT correspond to AABI 3.3.2 outcome (4a); questions 81-82 correspond to (4b); question 83 corresponds to (4c). The percentage of students answering each question correctly will be determined, and any one question receiving less than 70% correct responses will be identified for further analysis.

Outcome 5: Aerospace students will demonstrate their ability to explain the integration of airports, airspace, and air traffic control in managing the National Airspace System.

Measure 1: Questions 84-85 on the MFT correspond to AABI 3.3.2 outcome (5a); questions 86-88 correspond to (5b); questions 89-90 correspond to (5c). The overall percentage score for all students on each of these subsets of Aviation Core Outcome 5 will be calculated, with a minimum average score of 80% expected.

Measure 2: Questions 84-85 on the MFT correspond to AABI 3.3.2 outcome (5a); questions 86-88 correspond to (5b); questions 89-90 correspond to (5c). The percentage of students answering each question correctly will be determined, and any one question receiving less than 70% correct responses will be identified for further analysis.

Outcome 6: Aerospace students will demonstrate their ability to discuss the impact of meteorology and environmental issues on aviation operations.

Measure 1: Questions 91-95 on the MFT correspond to AABI 3.3.2 outcome (6a); questions 96-100 correspond to (6b). The overall percentage score for all students on each of these subsets of Aviation Core Outcome 6 will be calculated, with a minimum average score of 80% expected.

Measure 2: Questions 91-95 on the MFT correspond to AABI 3.3.2 outcome (6a);

questions 96-100 correspond to (6b). The percentage of students answering each question correctly will be determined, and any one question receiving less than 70% correct responses will be identified for further analysis.

Outcome 7: Students will demonstrate effective written and oral communication skills appropriate to the field of Aviation/Aerospace.

Measure 1: Within the AERO 4040 Aerospace Seminar class an individual senior project is completed that involves oral communication, written communication, and research skills. This assignment involves student research regarding a company they wish to work for, followed by development of a formal paper and a presentation on that company. Students will be graded by the course instructor on both the paper and presentation using a formal rubric. A minimum average score of 80% on both parts (paper and presentation) of this assignment will be maintained.

Measure 2: The number of students scoring below 70% on either part (paper or presentation) of the assignment described in Measure 1 will be determined, and weaknesses identified.

General Student Learning Outcomes

AABI requires that students demonstrate competence in the following general learning outcomes:

- a. apply mathematics, science, and applied sciences to aviation-related disciplines;
- b. analyze and interpret data;
- c. work effectively on multi-disciplinary and diverse teams;
- d. make professional and ethical decisions;
- e. communicate effectively, using both written and oral communication skills;
- f. engage in and recognize the need for life-long learning;
- g. assess contemporary issues;
- h. use the techniques, skills, and modern technology necessary for professional practice;
- i. assess the national and international aviation environment;
- j. apply pertinent knowledge in identifying and solving problems;
- k. apply knowledge of business sustainability to aviation issues.

Technology concentration students are assessed in their achievement of these outcomes via measures within the Aerospace Department core courses, AERO 1010, AERO 1020, AERO 3020, AERO 3030, and AERO 4040.

The chart below indicates in which courses learning outcomes that address the AABI general learning criteria are identified and the number of times a criterion is addressed by a learning outcome for that course (as denoted by the number of X's).

| AABI Criteria | AERO 1010 Intro to Aerospace | AERO 1020 Theory of Flight | AERO 3020 Aerospace Materials | AERO 3030 Propulsion Fundamentals | AERO 4040 Aerospace Seminar |
|--|---|---|--|--|--|
| a. apply mathematics, science, and applied sciences to aviation-related disciplines | | X | X | X | X |
| b. analyze and interpret data | X | X | X | X | X |
| c. work effectively on multi-disciplinary and diverse teams | X | | | | |
| d. make professional and ethical decisions | XXX | | | | X |
| e. communicate effectively, using both written and oral communication skills | XX | X | | X | X |
| f. engage in and recognize the need for life-long learning | XX | | | | X |
| g. assess contemporary issues | XXXXX | | XX | X | XXX |
| h. use the techniques, skills, and modern technology necessary for professional practice | | | XX | | X |
| i. assess the national and international aviation environment | XXXX | | | X | X |
| j. apply pertinent knowledge in identifying and solving problems | | X | X | X | X |
| k. apply knowledge of business sustainability to aviation issues | | | X | | |

Following are charts that identify specific learning outcomes and measurements by core course and by AABI criteria. Assessment of learning outcomes informs curriculum improvement(s) to further enhance student learning.

AERO 1010 covers AABI general learning outcomes b, c, d, e, f, g, and i.

| AERO 1010 | | |
|--|---|--|
| AABI Criteria | Learning Outcome | Measurement |
| <p>d. make professional and ethical decisions e. communicate effectively, using both written and oral communication skills f. engage in and recognize the need for life-long learning g. assess contemporary issues</p> | <p>The student will demonstrate an understanding of career opportunities in the aerospace industry and the career planning required to maximize their career choice.</p> | <p>1. Mastery of the following AERO 1010 test item: List the six Aerospace concentration areas, and describe the type of entry-level job opportunities available in each area.</p> <p>2. Successful completion of an essay related to career opportunities in the aerospace industry and career planning. Success is determined by evaluation of the essay using a rubric denoting appropriate use of aerospace industry careers and career planning information.</p> |
| <p>g. assess contemporary issues i. assess the national and international aviation environment</p> | <p>The student will demonstrate an understanding of the aerospace infrastructure including airports, airspace, and air traffic control.</p> | <p>Mastery of selected AERO 1010 final exam items related to airports, airspace, and air traffic control. Numerous AERO 1010 final exam items are assessed in this area, including: runway markings and lighting, airspace classification and operating characteristics and components of the national air traffic control systems.</p> |
| <p>d. make professional and ethical decisions f. engage in and recognize the need for life-long learning g. assess contemporary issues</p> | <p>The student will demonstrate an understanding of safety, human factors, and crew resource management.</p> | <p>Mastery of selected AERO 1010 final exam items related to safety, human factors, and crew resource management. Several AERO 1010 final exam items are assessed in this area, including: the impact of human factors and weather on safety, the purpose of CRM, and the basic components of CRM.</p> |

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| <p>d. make professional and ethical decisions g. assess contemporary issues i. assess the national and international aviation environment</p> | <p>The student will demonstrate knowledge of aviation legal and labor issues, including responsibilities of regulatory bodies.</p> | <p>Mastery of selected AERO 1010 final exam items related to aviation legal and labor issues, including responsibilities of regulatory bodies. Several final exam items are assessed in this area, including: the benefits and drawbacks of unions at air carriers, the functions and responsibilities of the FAA, and the function of ICAO and the NTSB.</p> |
| <p>i. assess the national and international aviation environment</p> | <p>The student will demonstrate knowledge of the history of aviation.</p> | <p>Mastery of selected AERO 1010 final exam items related to the history of aviation. Since the history of aviation constitutes a fairly large portion of the AERO 1010 course, numerous final exam items were assessed regarding aviation history. The assessed items are grouped by: early history, WWI-WWII, the development of commercial aviation, and the ramifications of air carrier deregulation.</p> |
| <p>b. analyze and interpret data c. work effectively on multi-disciplinary and diverse teams e. make professional and ethical decisions g. assess contemporary issues i. assess the national and international aviation environment</p> | <p>The student will demonstrate an understanding of the current issues and events in the aviation industry.</p> | <p>Mastery of selected AERO 1010 final exam items related to current issues and events in the aviation industry. Final exam items are assessed in this area, including: current major and regional air carriers, current aircraft commercial and general aviation manufacturers, and current issues in airport and air carrier security.</p> |

AERO 1020 covers AABI general learning outcomes a, b e, and j.

| AERO 1020 | | |
|---|--|---|
| AABI Criteria | Learning Outcome | Measurement |
| <p>a. An ability to apply knowledge of math, science, and applied science to aviation related disciplines</p> | <p>The student will demonstrate the ability to apply concepts from mathematics and physics to aviation scenarios.</p> | <p>Mastery of selected test items related to mathematics and physics in aviation scenarios.</p> <p>1. 80% of students sampled will be able to apply the physical principles described by the continuity equation and Bernoulli's equation in making predictions about airspeed and pressure through a channel.</p> <p>2. 80% of students sampled will be able to perform a center of gravity calculation.</p> |
| <p>b. An ability to analyze and interpret data</p> | <p>The student will demonstrate the ability to analyze and interpret atmospheric and aerodynamic data.</p> | <p>Mastery of selected test items related to the analysis and interpretation of atmospheric and aerodynamic data.</p> <p>1. 80% of students sampled will be able to read and use an ISA chart and to read and use an airfoil's characteristics curve for determination of lift coefficient and angle of attack.</p> |
| <p>j. An ability to apply pertinent knowledge in identifying and solving problems</p> | <p>The student will demonstrate the ability to apply classroom knowledge to real world problems involving aircraft design.</p> | <p>Successful flight of a student designed and built balsa wood glider.</p> <p>1. 80% of students sampled will successfully design and built a glider which completes a successful flight in MTSU's Campus Recreation Center.</p> |
| <p>e. An ability to communicate effectively using written communication skills</p> | <p>The student will demonstrate the ability to effectively communicate technical content in writing using appropriate aviation terminology.</p> | <p>Successful completion of research paper(s) related to balsa wood glider design, fabrication, and testing. Success is determined by evaluation of the research paper using a rubric denoting pertinent use of technical content, appropriate aviation terminology,</p> |

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| | | and APA formatting. 1. 80% of students sampled will be able to successfully complete the glider research paper documenting the glider they had designed, built, and tested. |
| N/A | The student will show completion of a five hour flight requirement (or equivalent) | 1. Successful completion of flight log/certificate. OR 2. Presentation of logbook documenting solo flight hours. OR 3. Presentation of FAA pilot certificate. |

AERO 3020 covers AABI general learning outcomes a, b, g, h, j and k.

| AERO 3020 | | |
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| AABI Criteria | Learning Outcome | Measurement |
| g. assess contemporary issues h. use the techniques, skills, and modern technology necessary for professional practice | Students will understand the progression of materials development and changes in structural designs as they apply to aerospace vehicles. | Successful completion of a test exercise that requires the use of pertinent historical knowledge related to aircraft materials. |
| a. Apply mathematics, science, and applied sciences to aviation-related disciplines b. analyze and interpret data h. use the techniques, skills and modern technology necessary for professional practice j. apply pertinent | Students will identify variation in physical, mechanical, and chemical properties of materials and how these properties affect their use and application. | Successful completion of Test 1 questions related to aircraft materials, which requires the use of combinations of data with appropriate formulae to arrive at a correct conclusion. |

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| knowledge in identifying and solving problems | | |
| g. assess contemporary issues h. use the techniques, skills, and modern technology necessary for professional practice k. apply knowledge of business sustainability to aviation issues | Students will understand the economic impact of material selection from both the manufacturer and end user perspectives. | 3. Successful completion of a writing assignment related to aerospace materials. Success is determined by evaluation of the assignment using a rubric denoting pertinent use of trend and development information. |

AERO 3030 covers AABI general learning outcomes a, b, e, g, i, and j.

| AERO 3030 | | |
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| AABI Criteria | Learning Outcome | Measurement |
| j. apply pertinent knowledge in identifying and solving problems | The student will demonstrate an understanding of the historical development of both aircraft reciprocating and turbine engines and their support systems. | 1. Successful completion of test exercises that requires the use of pertinent historical knowledge related to aircraft reciprocating engines. |
| a. apply mathematics, science, and applied sciences to aviation-related disciplines b. analyze and interpret data | The student will demonstrate an understanding of the mathematical theories that describe the operation of both aircraft reciprocating and turbine engines. | 1. Successful completion of a problem test related to aircraft reciprocating engines that requires the use of combinations of data with appropriate formulae to arrive at the correct conclusion. |

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| <p>e. An ability to communicate effectively using written communication skills</p> <p>g. assess contemporary issues</p> <p>i. assess the national and international aviation environment</p> | <p>The student will demonstrate an understanding of current trends and developments within the area of aerospace propulsions systems.</p> | <p>Successful completion of a writing assignment related to recent advancement in aerospace propulsion systems. Success is determined by evaluation of the assignment by a rubric.</p> <p>Specific Assignment Evaluated: Students must prepare and submit, in accordance with APA guidelines, ten annotated bibliographies, each on a recent development in aircraft propulsion systems. Acceptable sources include books, magazines, internet sources - no textbooks.</p> |
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AERO 4040 covers AABI general learning outcomes a, b, d, e, f, g, h, i, and j.

| AERO 4040 | | |
|---|--|--|
| AABI Criteria | Learning Outcome | Measurement |
| <p>d. make professional and ethical decisions</p> <p>f. engage in and recognize the need for life-long learning</p> <p>g. assess contemporary issues</p> <p>i. assess the national and international aviation environment</p> | <p>The student will develop an understanding of the economic, social, and political aspects of the aerospace industry.</p> | <p>Student performance on an average of the "depth of information" and "application of information" sub-scales of research paper evaluation rubric will be utilized to calculate an average score for this outcome. A goal of 80% has been set as a baseline.</p> |
| <p>e. communicate effectively, using both written and oral communication skills</p> <p>g. . assess contemporary issues</p> <p>h. use the techniques, skills, and modern technology necessary for professional practice</p> | <p>Students will develop the ability to communicate effectively, orally, and in writing, regarding current aviation and transportation issues</p> | <ol style="list-style-type: none"> 1. Student average performance on the paper evaluation rubric sub-sets of "Overall mechanics" and "References and Citations" will be at or above 80% 2. Student average performance on the "Presentation Rubric" will be at or above 80%. |

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| a. apply mathematics, science, and applied sciences to aviation-related disciplines b. analyze and interpret data g. assess contemporary issues j. apply pertinent knowledge in identifying and solving problems | Students will demonstrate aviation core knowledge on the Major Field Test (MFT). | Average student performance on the MFT for the academic year will be determined, with a goal of an average of 80% |
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Graduation Rates

The table below shows the four five, and six year graduation rate of a cohort of students which first enrolled in fall 2014.

| Fall 2014 Cohort | | | | | | |
|------------------|--------------------|-----|--------------------|-----|--------------------|-----|
| FTF | Graduated in 4 Yrs | | Graduated in 5 Yrs | | Graduated in 6 Yrs | |
| # | # | % | # | % | # | % |
| 15 | 5 | 33% | 6 | 40% | 7 | 47% |

Because many students change degree programs after enrolling at the university, and because the program has a number of students who transfer into the program with previous credit, retention, enrollment, and graduation numbers provide a better metric of student outcomes within the program than do cohort graduation rates. This information is provided in the following tables.

Technology Concentration Annual Retention/Graduation Rate

| Fall 2016-Fall 2017 | | Fall 2017-Fall 2018 | | Fall 2018-Fall 2019 | | Fall 2019-Fall 2020 | |
|---------------------|---------|---------------------|---------|---------------------|---------|---------------------|---------|
| Retained/Graduated | Percent | Retained/Graduated | Percent | Retained/Graduated | Percent | Retained/Graduated | Percent |
| 35 | 71% | 31 | 72% | 19 | 68% | 25 | 76% |

| BS in Aerospace – Technology Concentration | Fall 2010 | Fall 2011 | Fall 2012 | Fall 2013 | Fall 2014 | Fall 2015 | Fall 2016 | Fall 2017 | Fall 2018 | Fall 2019 | Fall 2020 |
|--|--------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| | Student Enrollment | 56 | 56 | 65 | 64 | 58 | 47 | 49 | 43 | 28 | 33 |

| BS in Aerospace – Technology Concentration | 2008- 2009 | 2009- 2010 | 2010- 2011 | 2011- 2012 | 2012- 2013 | 2013- 2014 | 2014- 2015 | 2015- 2016 | 2016- 2017 | 2017- 2018 | 2018- 2019 | 2019- 2020 |
|---|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
| Number of Graduates | 5 | 1 | 4 | 4 | 5 | 7 | 4 | 6 | 3 | 4 | 4 | 4 |

Rates and Types of Employment of Graduates

There were 4 graduates of the Technology concentration in the 2019-20 academic year. One graduate is employed by Defense Acquisition, Inc. as a Cost Analyst, one graduate has started graduate school at the University of TN Space Institute, and the status of the other two students is unreported/unknown.