WICHITA STATE UNIVERSITY

Program Review Self-Study Template

Academic unit: Aerospace Engineering

College: Engineering

Date of last review: Fall 2008

Date of last accreditation report (if relevant): Summer 2008

List all degrees described in this report (add lines as necessary)

Degree: BS Aerospace Engineering CIP* code: 14.0201

Degree: MS Aerospace Engineering CIP code: 14.0201

Degree: PhD Aerospace Engineering CIP code: 14.0201

*To look up, go to: Classification of Instructional Programs Website, http://nces.ed.gov/ipeds/cipcode/Default.aspx?y=55

Faculty of the academic unit (add lines as necessary):

Name	Signature
Walter Horn	
Michael Papadakis	
Klaus Hoffmann	
Kamran Rokhsaz	
Roy Myose	
James Steck	
Chihdar Yang	
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Linda Kliment	
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L. Scott Miller	

Submitted by: L. Scott Miller, Professor & Chair (name and title) Date: April 1, 2012

1. Departmental purpose and relationship to the University mission (refer to instructions in the WSU Program Review document for more information on completing this section).

a. University Mission:

Wichita State University is committed to providing comprehensive educational opportunities in an urban setting. Through teaching, scholarship and public service the University seeks to equip both students and the larger community with the educational and cultural tools they need to thrive in a complex world, and to achieve both individual responsibility in their own lives and effective citizenship in the local, national and global community.

b. Program Mission (if more than one program, list each mission):

The mission of the Aerospace Engineering undergraduate program is to:

- Prepare students for productive careers in aerospace engineering, related fields, and for graduate study
- Engage in high-quality teaching, research, scholarship, and service to the benefit of students, faculty, industry, government, and society

The mission of the Aerospace Engineering graduate (MS & PhD) program is to:

- Prepare students for careers in aerospace engineering and related fields, for further graduate studies, and to work in research organizations and universities:

c. The role of the program (s) and relationship to the University mission: Explain in 1-2 concise paragraphs.

The role of the Aerospace Engineering undergraduate program is:

- To provide an undergraduate education to its students that will produce aerospace engineering graduates who are sufficiently knowledgeable of the fundamental principles of engineering to meet the requirements of potential employers in not only the Wichita region, but in the global community
- To provide an undergraduate education that prepares capable students to pursue graduate studies in aerospace engineering and related fields

The role of the Aerospace Engineering graduate (MS & PhD) program is:

- To provide comprehensive educational opportunities in an urban setting, through teaching and scholarship and to seek to provide its graduates with the educational and cultural tools they need to thrive in a complex world
- To advance the University's goals of providing high quality instruction, making original contributions to knowledge and human understanding through research and publications
- To serve as an agent of community service

d. Has the mission of the Program (s) changed since last review? ☐ Yes ☒ No

i. If yes, describe in 1-2 concise paragraphs. If no, is there a need to change?

At this time, undergraduate and graduate program review suggests there is no need to change the program mission.

e. Provide an overall description of your program (s) including a list of the measurable goals and objectives of the program (s) (both programmatic and learner centered). Have they changed since the last review?

☐ Yes ☒ No

If yes, describe the changes in a concise manner.

The Aerospace Engineering (AE) BS degree includes 135 credit hours of required course work. The program is designed such that students can complete a degree in 4-years.

The undergraduate program has been developed and refined over time by department faculty, most of who have considerable academic and industrial experience. Input from constituents (i.e., students, employers, alumni, etc.) has also been used to further refine the curriculum content.

To ensure the stated Program Educational Objectives (i.e., PEOs) are achieved, the department has structured its curriculum and other educational opportunities to lead students to the program outcomes required for successful entry into engineering practice or further study at the graduate or professional level. These same outcomes provide the graduate with a sound foundation for subsequent career development and ultimate success in the engineering profession.

Specifically, mathematics, statistics, and science courses in chemistry and physics provide basic knowledge required for understanding and analyzing engineering systems. Subsequent studies in materials science, aerodynamics, structures, propulsion, and aircraft stability and control enable the graduate to apply engineering principles to create, analyze and improve aerospace processes, devices, and systems to meet customer needs.

Design and other open-ended problems assigned to students throughout the curriculum help students develop sound engineering judgment. The design experience is distributed throughout the curriculum and culminates in the senior year two-semester capstone design courses. The principal purpose is to integrate material, covered by earlier individual courses, into an aerospace vehicle design process.

Finally, the social science and humanities courses students select assist them in developing an understanding of the societal context in which they will practice engineering. This experience includes issues related to environmental, legal, aesthetic, and human aspects of an engineering project.

Furthermore, all students must take a general education Issues and Perspectives course in "Professional and Ethical Issues in Engineering." This course was designed by the WSU Department of Philosophy. As a result, ethics, professionalism, life-long learning, and societal perspectives of engineering projects are complimented in the engineering curriculum.

Course offerings are substantial and timely. However, students and faculty must be attentive to assure prerequisites are met. This case becomes very important during the junior year when certain core courses are offered as two-part sequences. Given basic staffing limitations these and other related classes are offered only once a year.

A notable number of AE students participate in the cooperative education program, working locally or out of town. Not surprisingly, the NASA Johnson Space and Dryden Flight Research Centers tours are the most popular. Additionally, many other students work with faculty on research projects or with the National Institute for Aviation Research in their laboratories. Obviously, such experiences dramatically compliment the student's education.

The AE department meets standards established by the Engineering Accreditation Commission (EAC) of the Accreditation Board for Engineering and Technology (ABET). We simply call it "ABET."

ABET requires accredited undergraduate programs to utilize a comprehensive process of continuous improvement. Programs must establish clear objectives, quantifiably measure progress, achieve minimum outcomes, and effectively identify changes as needed to improve the program. Constituent (i.e., students, alumni, industry, graduate programs, etc.) needs are paramount within the effort.

Accreditation reviews involve generation of a comprehensive self-study document and a campus visit by a qualified team of evaluators. At minimum, programs seeking accreditation are reviewed every 6-years. The WSU AE program completed an ABET visit in the fall of 2007. The EAC ABET reported on their review in the summer of 2008. The AE program received full accreditation.

Specific measureable objectives and outcomes directly related to the program are evaluated yearly and externally reviewed during the ABET accreditation cycle. The AE Program Educational Objectives (PEOs) are:

- To provide an undergraduate education to its students that will produce aerospace engineering graduates who are sufficiently knowledgeable of the fundamental principles of engineering to meet the requirements of potential employers in not only the Wichita region, but in the global community
- To provide an undergraduate education that prepares capable students to pursue graduate studies in aerospace engineering and related fields

Interestingly, these objectives are not static. Department faculty utilize program-related input, from students, employers, and graduates, to regularly review the Program Educational Objectives. Hence, a mechanism to change or update the PEOs exists.

The following AE undergraduate program outcomes are central to measuring success in meeting the PEOs. Graduating students are expected to clearly demonstrate:

a. An ability to apply knowledge of mathematics, science, and engineering
b. An ability to design and conduct experiments, as well as to analyze and interpret data
c. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
d. An ability to function on multi-disciplinary teams
e. An ability to identify, formulate, and solve engineering problems
f. An understanding of professional and ethical responsibility
g. An ability to communicate effectively

h. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
i. A recognition of the need for, and an ability to engage in life-long learning
j. A knowledge of contemporary issues
k. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

The above outcomes are evaluated utilizing a variety of methods related to the following:

- Curriculum
- Design activities
- Aerospace Engineering Department Assessment Exam (AEDAE)
- Graduating senior exit survey
- Alumni survey
- Employer survey

The MS & PhD program goals and objectives are:

a. To achieve an acceptable placement rate within one year of graduation either in jobs or in graduate programs for further study
b. To ensure graduates are satisfied with the program (three years after graduation)

2a. Describe the quality of the program as assessed by the strengths, productivity, and qualifications of the faculty in terms of SCH, majors, graduates and scholarly productivity (refer to instructions in the WSU Program Review document for more information on completing this section). Complete a separate table for each program if appropriate.

UG Program (SCH from entire department)

Last 3 Years	Tenure/Tenure Track Faculty (Number)	Tenure/Tenure Track Faculty with Terminal Degree (Number)	Instructional FTE (#): TTF= Tenure/Tenure Track GTA=Grad teaching assist O=Other instructional FTE			Total SCH - Total SCH by FY from Su, Fl, Sp	Total Majors - From fall semester	Total Grads – by FY
			TTF	GTA	O			
Year 1→	12	12	9.4	0.5	2.5	6059	178	41
Year 2→	11	11	9.2	0.5	0.7	6376	173	46
Year 3→	11	11	9.1	1.0	0.7	6326	363	44
						SCH/ FTE	Majors/ FTE	Grads/ FTE
			Total Number Instructional (FTE) – TTF+GTA+O					
					↓			
Year 1→					12.4	489	14	3
Year 2→					10.4	613	17	4
Year 3→					10.8	586	34	4

Scholarly Productivity	Number Journal Articles		Number Presentations		Number Conference Proceedings		Performances			Number of Exhibits		Creative Work		No. Books	No. Book Chaps.	No. Grants Awarded or Submitted	$ Grant Value
	Ref	Non-Ref	Ref	Non-Ref	Ref	Non-Ref	*	**	***	Juried	****	Juried	Non-Juried				
Year 1	8		23	20	23									0	1	17	$5.3M
Year 2	4		17	52	17									1	1	27	$4.7M
Year 3	3		20	32	20									1	2	14	$3.6M

* Winning by competitive audition. **Professional attainment (e.g., commercial recording). ***Principal role in a performance. ****Commissioned or included in a collection. KBOR data minima for UG programs: Majors=25; Graduates=10; Faculty=3; KBOR data minima for master programs: Majors=20; Graduates=5; Faculty=3 additional; KBOR data minima for doctoral programs: Majors=5; Graduates=2; Faculty=2 additional.

a. Provide a brief assessment of the quality of the faculty/staff using the data from the table above as well as any additional relevant data. Programs should comment on details in regard to productivity of the faculty (i.e., some departments may have a few faculty producing the majority of the scholarship), efforts to recruit/retain faculty, departmental succession plans, course evaluation data, etc.

Provide assessment here:

The quality of AE faculty/staff is high. They are effective and productive in the areas of teaching, research, scholarship, and service. Obviously, some faculty are more prolific or play stronger roles in certain areas (e.g., research & scholarship), but overall the department is balanced and effective.

Interestingly, the table above omits a significant item. Specifically, engineering grants require extensive amounts of reporting. Progress and final report preparation represents a notable faculty responsibility and burden. Sadly, the reports are often times significantly larger and more involved to prepare than journal articles. Faculty submitted fifty-five (55) reports during the same three years noted above.

The department is currently working to fill two new tenure-track faculty positions. Interestingly, within the process, it is appears other universities are offering significantly higher pay and larger start-up packages. The implications of this observation are not fully understood yet.

Approximately three senior faculty are within fives years of retirement.

2b. Describe the quality of the program as assessed by the strengths, productivity, and qualifications of the faculty in terms of SCH, majors, graduates and scholarly productivity (refer to instructions in the WSU Program Review document for more information on completing this section). Complete a separate table for each program if appropriate.

MS Program

Last 3 Years	Tenure/Tenure Track Faculty (Number)	Tenure/Tenure Track Faculty with Terminal Degree (Number)	Instructional FTE (#): TTF= Tenure/Tenure Track GTA=Grad teaching assist O=Other instructional FTE			Total SCH - Total SCH by FY from Su, Fl, Sp	Total Majors - From fall semester	Total Grads – by FY
			TTF	GTA	O			
Year 1→	*	*	*	*	*	N/A	91	9
Year 2→	*	*	*	*	*	N/A	120	13
Year 3→	*	*	*	*	*	N/A	128	12
					Total Number Instructional (FTE) – TTF+GTA+O	SCH/ FTE	Majors/ FTE	Grads/ FTE
Year 1→					N/A	N/A	N/A	N/A
Year 2→					N/A	N/A	N/A	N/A
Year 3→					N/A	N/A	N/A	N/A

Scholarly Productivity	Number Journal Articles		Number Presentations		Number Conference Proceedings		Performances			Number of Exhibits		Creative Work		No. Books	No. Book Chaps.	No. Grants Awarded or Submitted	$ Grant Value
	Ref	Non-Ref	Ref	Non-Ref	Ref	Non-Ref	*	**	***	Juried	****	Juried	Non-Juried				
Year 1	8		23	20	23									0	1	17	$5.3M
Year 2	4		17	52	17									1	1	27	$4.7M
Year 3	3		20	32	20									1	2	14	$3.6M

* Winning by competitive audition. **Professional attainment (e.g., commercial recording). ***Principal role in a performance. ****Commissioned or included in a collection. KBOR data minima for UG programs: Majors=25; Graduates=10; Faculty=3; KBOR data minima for master programs: Majors=20; Graduates=5; Faculty=3 additional; KBOR data minima for doctoral programs: Majors=5; Graduates=2; Faculty=2 additional.

*From the table on page 3, indicate number of faculty (and instructional FTE) teaching in the graduate program.

b. Provide a brief assessment of the quality of the faculty/staff using the data from the table above as well as any additional relevant data. Programs should comment on details in regard to productivity of the faculty (i.e., some departments may have a few faculty producing the majority of the scholarship), efforts to recruit/retain faculty, departmental succession plans, course evaluation data, etc.

Provide assessment here:

The quality of AE faculty/staff is high. They are effective and productive in delivering the MS program. Faculty research and scholarship is integrally connected to the graduate program.

2c. Describe the quality of the program as assessed by the strengths, productivity, and qualifications of the faculty in terms of SCH, majors, graduates and scholarly productivity (refer to instructions in the WSU Program Review document for more information on completing this section). Complete a separate table for each program if appropriate.

PhD Program

Last 3 Years	Tenure/Tenure Track Faculty (Number)	Tenure/Tenure Track Faculty with Terminal Degree (Number)	Instructional FTE (#): TTF= Tenure/Tenure Track GTA=Grad teaching assist O=Other instructional FTE			Total SCH - Total SCH by FY from Su, Fl, Sp	Total Majors - From fall semester	Total Grads – by FY
			TTF	GTA	O			
Year 1→	*	*	*	*	*	N/A	14	1
Year 2→	*	*	*	*	*	N/A	19	2
Year 3→	*	*	*	*	*	N/A	128	12
Total Number Instructional (FTE) – TTF+GTA+O						SCH/ FTE	Majors/ FTE	Grads/ FTE
Year 1→					N/A	N/A	N/A	N/A
Year 2→					N/A	N/A	N/A	N/A
Year 3→					N/A	N/A	N/A	N/A

Scholarly Productivity	Number Journal Articles		Number Presentations		Number Conference Proceedings		Performances			Number of Exhibits		Creative Work		No. Books	No. Book Chaps.	No. Grants Awarded or Submitted	$ Grant Value
	Ref	Non-Ref	Ref	Non-Ref	Ref	Non-Ref	*	**	***	Juried	****	Juried	Non-Juried				
Year 1	8		23	20	23									0	1	17	$5.3M
Year 2	4		17	52	17									1	1	27	$4.7M
Year 3	3		20	32	20									1	2	14	$3.6M

* Winning by competitive audition. **Professional attainment (e.g., commercial recording). ***Principal role in a performance. ****Commissioned or included in a collection. KBOR data minima for UG programs: Majors=25; Graduates=10; Faculty=3; KBOR data minima for master programs: Majors=20; Graduates=5; Faculty=3 additional; KBOR data minima for doctoral programs: Majors=5; Graduates=2; Faculty=2 additional.

*From the table on page 3, indicate number of faculty (and instructional FTE) teaching in the graduate program.

a. Provide a brief assessment of the quality of the faculty/staff using the data from the table above as well as any additional relevant data. Programs should comment on details in regard to productivity of the faculty (i.e., some departments may have a few faculty producing the majority of the scholarship), efforts to recruit/retain faculty, departmental succession plans, course evaluation data, etc.

Provide assessment here:

The quality of AE faculty/staff is high. They are effective and productive in delivering the PhD program. Faculty research and scholarship is integrally connected to the graduate program.

3.Academic Program: Analyze the quality of the program as assessed by its curriculum and impact on students. Complete this section for each program (if more than one). Attach updated program assessment plan (s) as an appendix (refer to instructions in the WSU Program Review document for more information).

c. For undergraduate programs, compare ACT scores of the majors with the University as a whole.

Last 3 Years	Total Majors - From fall semester	ACT – Fall Semester (mean for those reporting)	
		Majors	All University Students - FT
Year 1→	178	26.4	22.66
Year 2→	173	26.0	22.72
Year 3→			22.81

KBOR data minima for UG programs: ACT≤20 will trigger program.

d. For graduate programs, compare graduate GPAs of the majors with University graduate GPAs.*

Last 3 Years	Total Admitted - By FY		Average GPA (Admitted) – Domestic Students Only (60 hr GPA for those with ≥54 hr reported) By FY					
					Comparisons			
	MS	PhD	MS GPA	PhD GPA	College – MS	College – PhD	Univ - MS	Univ PhD
Year 1→08	75	11	3.38	3.49	3.33	3.51	3.48	3.62
Year 2→09	90	15	3.39	3.60	3.36	3.57	3.48	3.62
Year 3→10	47	13	3.52	3.63	3.40	3.60	3.48	3.67

*If your admission process uses another GPA calculation, revise table to suit program needs and enter your internally collected data.

c. Identify the principal learning outcomes (i.e., what skills does your Program expect students to graduate with). Provide aggregate data on how students are meeting those outcomes. Data should relate to the goals and objectives of the program as listed in 1e. Provide an analysis and evaluation of the data by learner outcome with proposed actions based on the results.

In the following table provide program level information. You may add an appendix to provide more explanation/details. Definitions:

Learning Outcomes: Learning outcomes are statements that describe what students are expected to know and be able to do by the time of graduation. These relate to the skills, knowledge, and behaviors that students acquire in their matriculation through the program (e.g., graduates will demonstrate advanced writing ability).

Assessment Tool: One or more tools to identify, collect, and prepare data to evaluate the achievement of learning outcomes (e.g., a writing project evaluated by a rubric).

Criterion/Target: Percentage of program students expected to achieve the desired outcome for demonstrating program effectiveness (e.g., 90% of the students will demonstrate satisfactory performance on a writing project).

Result: Actual achievement on each learning outcome measurement (e.g., 95%).

Analysis: Determines the extent to which learning outcomes are being achieved and leads to decisions and actions to improve the program. The analysis and evaluation should align with specific learning outcome and consider whether the measurement and/or criteria/target remain a valid indicator of the learning outcome as well as whether the learning outcomes need to be revised.

Learning Outcomes (most programs will have multiple outcomes)	Assessment Tool (e.g., portfolios, rubrics, exams)	Target/Criteria (desired program level achievement)	Results	Analysis
Undergraduate Program: a. An ability to apply knowledge of mathematics, science, and engineering	• Course folders • Design activities • Assessment exam • Employer survey	• Significant shortcomings in student abilities should not be observed • Assessment exam scores should fall within historical trends • Employer performance assessments of students should be satisfactory or higher (quantitative results above 2.4 (or 60 percent) are considered to indicate acceptable performance levels)	• Course folders and design experiences show no significant shortcomings • However, faculty note a small number of upper-level students (<5%) who display weaker than desired abilities • Assessment exam scores are within expected ranges • Employers appear satisfied with outcomes	• The department has no significant concerns with respect to this outcome • Nonetheless, faculty are further analyzing how to improve weaker students and assessment exam scores • Some program changes have been implemented and more are under consideration
Undergraduate Program: b. An ability to design and conduct experiments, as well as to analyze and interpret data	• Course folders • Laboratory activities • Design activities • Senior exit survey • Employer survey	• Significant shortcomings in student abilities should not be observed • Senior student feedback should be predominately positive (ratings in excess of 60 percent are considered acceptable) • Employer performance assessments of students should be satisfactory or higher (quantitative results above 2.4 (or 60 percent) are considered to indicate acceptable performance levels)	• Course folders, lab activities, and design experiences show no significant shortcomings • Senior exit surveys identify no significant concerns • Employers appear satisfied with outcomes	• The department has no significant concerns with respect to this outcome
Undergraduate Program: c. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic,	• Course folders • Design activities • Senior exit survey • Alumni survey • Employer survey	• Significant shortcomings in student abilities should not be observed • Senior student feedback should be predominately positive (ratings in excess of 60 percent are considered acceptable)	• Course folders and design experiences show no significant shortcomings • Seniors are positive, but perceive a need for more experience in this area • Alumni and employers appear satisfied with	• The department has no significant concerns with respect to this outcome • However, the

environmental, social, political, ethical, health and safety, manufacturability, and sustainability		• Alumni feedback should be predominately positive (a rating of 60 percent or higher in each program outcome is considered satisfactory) • Employer performance assessments of students should be satisfactory or higher (quantitative results above 2.4 (or 60 percent) are considered to indicate acceptable performance levels)	outcomes	department is expanding student experiential activities to address this outcomes
Undergraduate Program: d. An ability to function on multi-disciplinary teams	• Design activities • Senior exit survey • Alumni survey • Employer survey	• Significant shortcomings in student abilities should not be observed • Senior student feedback should be predominately positive (ratings in excess of 60 percent are considered acceptable) • Alumni feedback should be predominately positive (a rating of 60 percent or higher in each program outcome is considered satisfactory) • Employer performance assessments of students should be satisfactory or higher (quantitative results above 2.4 (or 60 percent) are considered to indicate acceptable performance levels)	• Design experiences show no significant shortcomings • Senior exit surveys identify no significant concerns • Alumni and employers appear satisfied with outcomes	• The department has no significant concerns with respect to this outcome
Undergraduate Program: e. An ability to identify, formulate, and solve engineering problems	• Course folders • Design activities • Senior exit survey • Assessment exam • Alumni survey • Employer survey	• Significant shortcomings in student abilities should not be observed • Senior student feedback should be predominately positive (ratings in excess of 60 percent are considered acceptable) • Assessment exam scores should fall within historical trends • Alumni feedback should be predominately positive (a rating of 60 percent or higher in each program	• Course folders and design experiences show no significant shortcomings • However, faculty note a small number of upper-level students (<5%) who display weaker than desired abilities • Senior exit surveys identify no significant concerns • Assessment exam scores are within expected ranges • Alumni and employers appear satisfied with outcomes	• The department has no significant concerns with respect to this outcome • Nonetheless, faculty are further analyzing how to improve weaker students and assessment

		outcome is considered satisfactory) • Employer performance assessments of students should be satisfactory or higher (quantitative results above 2.4 (or 60 percent) are considered to indicate acceptable performance levels)		exam scores • The department is expanding student experiential activities addressing these outcomes • Further program changes are under consideration
Undergraduate Program: f. An understanding of professional and ethical responsibility	• Course folders • Design activities • Senior exit survey • Alumni survey • Employer survey	• Significant shortcomings in student abilities should not be observed • Senior student feedback should be predominately positive (ratings in excess of 60 percent are considered acceptable) • Alumni feedback should be predominately positive (a rating of 60 percent or higher in each program outcome is considered satisfactory) • Employer performance assessments of students should be satisfactory or higher (quantitative results above 2.4 (or 60 percent) are considered to indicate acceptable performance levels)	• Course folders and design experiences show no significant shortcomings • Senior exit surveys identify no significant concerns • Alumni and employers appear satisfied with outcomes	• The department has no significant concerns with respect to this outcome
Undergraduate Program: g. An ability to communicate effectively	• Course folders • Design activities • Senior exit survey • Alumni survey • Employer survey	• Significant shortcomings in student abilities should not be observed • Senior student feedback should be predominately positive (ratings in excess of 60 percent are considered acceptable) • Alumni feedback should be predominately positive (a rating of 60 percent or higher in each program outcome is considered satisfactory)	• Course folders and design experiences show no significant shortcomings • However, faculty note a small number of upper-level students (<5%) who display weaker than desired abilities • Senior exit surveys identify no significant concerns • Alumni and employers appear satisfied with outcomes	• The department has no significant concerns with respect to this outcome • Nonetheless, faculty are further analyzing how to improve weaker students

		• Employer performance assessments of students should be satisfactory or higher (quantitative results above 2.4 (or 60 percent) are considered to indicate acceptable performance levels)		• Program changes are under consideration
Undergraduate Program: h. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context	• Course folders • Design activities • Senior exit survey • Alumni survey • Employer survey	• Significant shortcomings in student abilities should not be observed • Senior student feedback should be predominately positive (ratings in excess of 60 percent are considered acceptable) • Alumni feedback should be predominately positive (a rating of 60 percent or higher in each program outcome is considered satisfactory) • Employer performance assessments of students should be satisfactory or higher (quantitative results above 2.4 (or 60 percent) are considered to indicate acceptable performance levels)	• Course folders and design experiences show no significant shortcomings • Senior exit surveys identify no significant concerns • Alumni and employers appear satisfied with outcomes	• The department has no significant concerns with respect to this outcome
Undergraduate Program: i. A recognition of the need for, and an ability to engage in life-long learning	• Course folders • Design activities • Senior exit survey • Alumni survey • Employer survey	• Significant shortcomings in student abilities should not be observed • Senior student feedback should be predominately positive (ratings in excess of 60 percent are considered acceptable) • Alumni feedback should be predominately positive (a rating of 60 percent or higher in each program outcome is considered satisfactory) • Employer performance assessments of students should be satisfactory or higher (quantitative results above 2.4 (or 60 percent) are considered to indicate acceptable performance	• Course folders and design experiences show no significant shortcomings • Senior exit surveys identify no significant concerns • Alumni and employers appear satisfied with outcomes	• The department has no significant concerns with respect to this outcome

		levels)		
Undergraduate Program: j. A knowledge of contemporary issues	• Course folders • Design activities • Senior exit survey • Alumni survey • Employer survey	• Significant shortcomings in student abilities should not be observed • Senior student feedback should be predominately positive (ratings in excess of 60 percent are considered acceptable) • Alumni feedback should be predominately positive (a rating of 60 percent or higher in each program outcome is considered satisfactory) • Employer performance assessments of students should be satisfactory or higher (quantitative results above 2.4 (or 60 percent) are considered to indicate acceptable performance levels)	• Course folders and design experiences show no significant shortcomings • Senior exit surveys identify no significant concerns • Alumni and employers appear satisfied with outcomes	• The department has no significant concerns with respect to this outcome
Undergraduate Program: k. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice	• Course folders • Design activities • Senior exit survey • Assessment exam • Alumni survey • Employer survey	• Significant shortcomings in student abilities should not be observed • Senior student feedback should be predominately positive (ratings in excess of 60 percent are considered acceptable) • Assessment exam scores should fall within historical trends • Alumni feedback should be predominately positive (a rating of 60 percent or higher in each program outcome is considered satisfactory) • Employer performance assessments of students should be satisfactory or higher (quantitative results above 2.4 (or 60 percent) are considered to indicate acceptable performance levels)	• Course folders and design experiences show no significant shortcomings • Seniors are positive, but perceive a need for more experience in this area • Assessment exam scores are within expected ranges • Alumni and employers appear satisfied	• The department has no significant concerns with respect to this outcome • However, the department is expanding student experiential activities addressing these outcomes • Some program changes have been made and more are under consideration
Graduate Program: Competency in the area of specialty	• Passing core classes in areas of specialty	• 100% must comply	• 100% complied	• Outcome achieved

Graduate Program: Competency in graduate level mathematics	• Passing one graduate level class per degree in mathematics/statistics	• 100% must comply	• 100% complied	• Outcome achieved
Graduate Program: Ability to perform independent research	• Preparation of theses, dissertations, or directed project reports	• More than 90% must comply	• 100% complied	• Outcome achieved

d. Provide aggregate data on student majors satisfaction (e.g., exit surveys), capstone results, licensing or certification examination results, employer surveys or other such data that indicate student satisfaction with the program and whether students are learning the curriculum (for learner outcomes, data should relate to the goals and objectives of the program as listed in 1e).

Student Satisfaction (e.g., exit survey data on overall program satisfaction).* If available, report by year, for the last 3 years			Learner Outcomes (e.g., capstone, licensing/certification exam pass-rates) by year, for the last three years				
Year	N	Result (e.g., 4.5 on scale of 1-5, where 5 highest)	Year	N	Name of Exam	Program Result	National Comparison±
1	42	Score of 4.1 on the senior exit survey	1	42	Assessment exam	3.8	
2	39	Score of 4.2 on the senior exit survey	2	39	Assessment exam	3.9	
3	38	Score of 4.2 on the senior exit survey	3	38	Assessment exam	3.4	
1	24	90% were satisfied or very satisfied (Grad School survey)					
2	15	90% were satisfied or very satisfied (Grad School survey)					
3	21	90% were satisfied or very satisfied (Grad School survey)					

*Available for graduate programs from the Graduate School Exit Survey. Undergraduate programs should collect internally. ± If available.

e. Provide aggregate data on how the goals of the *WSU General Education Program* and *KBOR 2020 Foundation Skills* are assessed in undergraduate programs (optional for graduate programs).

Goals/Skills Measurements of: -Oral and written communication -Numerical literacy -Critical thinking and problem solving -Collaboration and teamwork -Library research skills -Diversity and globalization	Results	
	Majors	Non-Majors
These goals/skills are assessed directly or indirectly within the department's established AE undergraduate program assessment activities (see section 3c above)	See section 3c above for AE results	

Note: Not all programs evaluate every goal/skill. Programs may choose to use assessment rubrics for this purpose. Sample forms available at: http://www.aacu.org/value/rubrics/

f. Indicate whether the program is accredited by a specialty accrediting body including the next review date and concerns from the last review.

Provide information here:

The AE undergraduate program meets standards established by the Engineering Accreditation Commission (EAC) of the Accreditation Board for Engineering and Technology (ABET). We simply call it "ABET." ABET does not apply to graduate programs.

ABET requires accredited undergraduate programs to utilize a comprehensive process of continuous improvement. Programs must establish clear objectives, quantifiably measure progress, achieve minimum outcomes, and effectively identify changes as needed to improve the program. Constituent (i.e., students, alumni, industry, graduate programs, etc.) needs are paramount within the effort.

Accreditation reviews involve generation of a comprehensive self-study document and a campus visit by a qualified team of evaluators. At minimum, programs seeking accreditation are reviewed every 6-years. The WSU AE program completed an ABET visit in the fall of 2007. The EAC ABET reported on their review in the summer of 2008. The AE program received full accreditation.

There were no significant program concerns. However, the ABET team provided the following observations about the AE department:

1. Even through there is some, there should be more opportunities for exposing freshmen to hands-on-experiences.
2. The lab course (e.g., AE 512) should have more structures related content.
3. There is some overlap of content in AE 424 and ME 521.

Since the 2007 review, the department (and college) has made substantial changes to expand hands-on-experiences for all students. Indeed, the mentioned lab course now includes more structures related content. Additionally, the department faculty has approved replacing ME 521 with a new aerodynamics course sequence that will avoid overlap and better round out student skills.

The next ABET visit is scheduled for Fall of 2013.

g. Provide a brief assessment of the overall quality of the academic program using the data from 3a – 3f and other information you may collect, including outstanding student work (e.g., outstanding scholarship, inductions into honor organizations, publications, special awards, academic scholarships, student recruitment and retention).

Provide assessment here:

The overall quality of AE undergraduate program is high. However, there is both room and desire to further improve the program. Particular attention is being focused on better understanding weaknesses, via further assessments, and in identifying logical program improvements.

A number of undergraduate program changes have been implemented over the last three years, directly as a result of continuous assessment activities. The following summarizes the changes:

- The AE 528/628 capstone design courses now require students to design, build, test, and fly their vehicles (over 30 aircraft have been built and flown in the last three years)
- Department support for involvement on the AIAA Design/Build/Fly team has been greatly expanded to include more students
- The department now sponsors the Bronze Propeller aircraft competition for students
- A new aircraft design class has been developed and offered, as a selected topic, specifically to freshmen and sophomore AE students
- The department also supports two new extra-curricular student activities - the WSU Rocket Club and the Near-Space Launch Program
- The AE 512 laboratory course now includes more structures related content
- The department plans to replace ME 521 with a new aerodynamics course and sequence that avoids AE 424 content overlap and better rounds out student abilities
- The AE 525/625 Aerospace Structures I & II courses now include a recitation component, to provide students with more applied and hands-on experiences
- The need for a new computing course has been identified, and the EECS department has developed it as a result
- A more detailed analysis or assessment of recent graduating seniors (e.g., comparing assessment exam scores, corresponding class grades, core class grades, GE grades, GPA's, and transfer status histories) is being conducted with the intent of perhaps better identifying problems and ways to improve student quality

The overall quality of AE graduate (MS & PhD) program is high. Specifically:

- 100% of the students passed the core courses in their areas of specialty
- 100% of the students showed competency in at least one graduate level class per degree in mathematics/statistics
- 100% of the graduates showed the ability to perform independent research by preparing, theses, dissertations, or final project reports.
- All graduates were employed by the local and national aerospace industry or continued with their studies for a higher graduate degree.

4a. Analyze the student need and employer demand for the program. Complete for each program if appropriate (refer to instructions in the WSU Program Review document for more information on completing this section).

a. Utilize the table below to provide data that demonstrates student need and demand for the program.

Undergraduate

Majors						Employment of Majors*						
Last 3 FYs – Su, Fl, and Sp	No. new applicants or declared majors	No. who enter or are admitted in the major	No. enrolled one year later	1 Year Attrition %	Total no. of grads	Average Salary	Employment % In state	Employment % in the field	Employment: % related to the field	Employment: % outside the field	No. pursuing graduate or professional education	Projected growth from BLS**
Year 1→	355	323	201	37%	41	$55-58K	~70%	~75%	~20%	~5%	~15%	Current year only ↓
Year 2→	367	338	214	37%	46	$55-58K	~70%	~75%	~20%	~5%	~15%	
Year 3→	288	270	202	25%	33	$55-58K	~70%	~75%	~20%	~5%	~15%	10%

Race/Ethnicity by Major***										Race/Ethnicity by Graduate***								
	NRA	H	AI/AN	A	B	NH/PI	C	MR	UNK	NRA	H	AI/AN	A	B	NH/PI	C	MR	UNK
Year 1→	58	4	1	20	5	0	86	0	4	13	1	0	3	1	0	23	0	0
Year 2→	53	5	1	15	6	0	86	0	7	19	0	0	4	2	0	20	0	1
Year 3→																		

* May not be collected every year

** Go to the U.S. Bureau of Labor Statistics Website: http://www.bls.gov/oco/ and view job outlook data and salary information (if the Program has information available from professional associations or alumni surveys, enter that data)

*** NRA=Non-resident alien; H=Hispanic; AI/AN=American Indian/ Alaskan Native; A=Asian; B=Black; NH/PI=Native Hawaiian/Pacific Islander; C=Caucasian; MR=Multi-race; UNK=Unknown

KBOR data minima for UG programs: Majors=25; Graduates=10; Faculty=3; KBOR data minima for master programs: Majors=20; Graduates=5; Faculty=3 additional; KBOR data minima for doctoral programs: Majors=5; Graduates=2; Faculty=2 additional.

Provide a brief assessment of student need and demand using the data from the table above. Include the most common types of positions, in terms of employment, graduates can expect to find.

Provide assessment here:

A need for engineering students is strong, even in the face of hard economic times. AE undergraduate enrollments are stable (too high) and the industry demand for quality graduates appears to be growing. Furthermore, political and state government commitments to increasing graduation rates in response to industry interests are well know (e.g., Senate Bill 127).

Most AE students take on traditional engineering positions, especially in structures and testing areas. Interestingly, students are often hired at higher levels because of WSU's strong Cooperative Education program, on-campus research activities, and experiential learning opportunities. Their prior work experience proves very valuable.

4b. Analyze the student need and employer demand for the program. Complete for each program if appropriate (refer to instructions in the WSU Program Review document for more information on completing this section).

a. Utilize the table below to provide data that demonstrates student need and demand for the program.

Graduate (MS and PhD)

Majors						Employment of Majors*						
Last 3 FYs – Su, Fl, and Sp	No. new applicants or declared majors	No. who enter or are admitted in the major	No. enrolled one year later	1 Year Attrition %	Total no. of grads	Average Salary	Employment % In state	Employment % in the field	Employment: % related to the field	Employment: % outside the field	No. pursuing graduate or professional education	Projected growth from BLS**
Year 1→	78	36			10	~$70K	80%	90%			1	Current year only
Year 2→	74	42			15	~$70K	58%	58%			5	↓
Year 3→	50	37			17	~$70K	29%	41%			4	10%

Race/Ethnicity by Major***										Race/Ethnicity by Graduate***								
	NRA	H	AI/AN	A	B	NH/PI	C	MR	UNK	NRA	H	AI/AN	A	B	NH/PI	C	MR	UNK
Year 1→	40	1	1	4	0	0	53	0	6	0	0	0	2	0	0	7	0	1
Year 2→	61	2	1	5	0	0	65	0	5	6	0	0	0	0	0	8	0	1
Year 3→																		

* May not be collected every year

** Go to the U.S. Bureau of Labor Statistics Website: http://www.bls.gov/oco/ and view job outlook data and salary information (if the Program has information available from professional associations or alumni surveys, enter that data)

*** NRA=Non-resident alien; H=Hispanic; AI/AN=American Indian/ Alaskan Native; A=Asian; B=Black; NH/PI=Native Hawaiian/Pacific Islander; C=Caucasian; MR=Multi-race; UNK=Unknown

KBOR data minima for UG programs: Majors=25; Graduates=10; Faculty=3; KBOR data minima for master programs: Majors=20; Graduates=5; Faculty=3 additional; KBOR data minima for doctoral programs: Majors=5; Graduates=2; Faculty=2 additional.

Provide a brief assessment of student need and demand using the data from the table above. Include the most common types of positions, in terms of employment, graduates can expect to find.

Provide assessment here:

The need and demand for MS and PhD students is still significant, even in the face of hard economic times. Industry interest in employee development is a major driver. Additionally, many of our graduate students are working to better position themselves, through graduate education, to work in a more competitive environment.

Most of the MS and PhD students take on more advanced engineering positions or advance in-grade, especially in structures and testing areas.

In summary:

- We have one of the largest graduate programs in aerospace engineering in the country, among stand-alone departments
- Many of the local companies encourage their employees to pursue graduate degrees at WSU
- Despite the slight up-turn in the aerospace industry over the last two years, the demand for graduate education in this field has not dropped much
- The masters program exceeds KBOR minimums in terms of enrolment and graduation
- The doctoral program meets KBOR requirements for enrolment, but not in graduation rate

5. **Analyze the cost of the program and service the Program provides to the discipline, other programs at the University, and beyond. Complete for each program if appropriate (refer to instructions in the WSU Program Review document for more information on completing this section).**

Percentage of SCH Taken By (last 3 years)			
Fall Semester	Year 1	Year 2	Year 3
UG Majors	54.0	53.8	
Gr Majors	18.8	20.7	
Non-Majors	27.2	25.5	

a. Provide a brief assessment of the cost and service the Program provides. Comment on percentage of SCH taken by majors and non-majors, nature of Program in terms of the service it provides to other University programs, faculty service to the institution, and beyond.

Provide assessment here:

The Aerospace Engineering undergraduate program's cost and service contribution is notable, especially given its size. Enrollments (SCH) are stable (high). Faculty are fully engaged in both teaching, research, scholarship, and service activities (both on and off campus).

The Aerospace Engineering graduate (MS & PhD) program:

- Is the primary provider of advanced degrees in aerospace engineering in the state of Kansas
- Offers the local engineers the opportunity to further their technical skills while employed.
- Serves other university programs, especially in the generation of graduate credit hours in the Department of Mathematics, Statistics, and Physics

6. **Report on the Program's goal (s) from the last review. List the goal (s), data that may have been collected to support the goal, and the outcome. Complete for each program if appropriate (refer to instructions in the WSU Program Review document for more information on completing this section).**

(For Last 3 FYs)	Goal (s)	Assessment Data Analyzed	Outcome
	Attract, retain, and graduate more top-quality undergraduate and full-time graduate students	• Enrollments, credit hours, and graduation rates are higher • Only antidotal data on in-coming undergraduate student quality is currently available (e.g., ACT/SAT scores, faculty impressions)	The programs appears to have made progress

7. **Summary and Recommendations**

a. Set forth a summary of the report including an overview evaluating the strengths and concerns. List recommendations for improvement of each Program (for departments with multiple programs) that have resulted from this report (relate recommendations back to information provided in any of the categories and to the goals and objectives of the program as listed in 1e). Identify three-year goal (s) for the Program to be accomplished in time for the next review.

Provide assessment here:

The Aerospace Engineering (AE) undergraduate and graduate programs fulfill the mission and goals of the university, college, and department. Program strengths include:

- Students and employers demonstrate a clear need for the undergraduate and graduate programs
- The graduate program is the primary provider of advanced degrees in aerospace engineering in the state of Kansas
- The graduate program offers local engineers the opportunity to further their technical skills while employed
- Program curriculum align with local, state, and national aerospace (e.g., aviation and ABET) interests
- The AE programs are delivered in a very efficient and cost effective manner (e.g., the annual state funding allocation for AE is approximately $1.1 million)
- Faculty are qualified and extremely productive, annually averaging over 25 significant publications (43 if you include contract reports) and $4.5 million in external funds (for only about $1.1 million in state funds)
- A clear mechanism to evaluate and improve both the undergraduate and graduate programs exists and is utilized continuously (the undergraduate program enjoys full ABET accreditation)
- Approximately 60% of the university's Honors Program students are AE majors

- The undergraduate program has been changed to include notably more experiential activities, both in and outside of the classroom
- Faculty and students contribute significantly to the well being of the university, the local community, the state, and the U.S. (e.g., faculty serve leaderships roles in professional organizations, review journal articles, and participate in many committees)
- Students, alumni, and employers rate the program highly

Nonetheless, the faculty has the following program concerns:

- AE program major numbers and credit hours have increased, respectively 32% and 59%, over the last five (5) years
- The current student-to-faculty ratio (>30) is dangerously high, with accreditation and recruiting risks
- AE class sizes have essentially doubled over the last five years, making it difficult to work one-on-one with students and to offer experiential learning activities (with an obvious impact on learning, recruiting, and retention)
- Current core engineering (e.g., statics, dynamics, & strength of materials) and AE specific courses have enrollments between fifty and ninety (50-90) students
- Desired enrollment, retention, and graduation rate increases (e.g., SB 127) have the potential to take the current difficult situation and make it even worse
- Faculty note a small number of upper-level undergraduate students (<5%) who display weaker than desired abilities
- The effectiveness of the university's undergraduate General Education (GE) program is not fully understood
- Research and external funding is strong, but it can't be sustained or increased with greater academic program accomplishment expectations
- A number of senior faculty (3) are nearing retirement

Recommendations for improvement, based on this report, include:

- The current AE undergraduate student-to-faculty ratio (>30) needs to reduced (the national average is around 20)
- A more specific means of assessing in-coming undergraduate student quality needs to be identified (e.g., ACT scores alone or a combination of factors)
- Additional assessment and/or analysis on how to improve the noted (<5%) weaker undergraduate students is needed
- Additional assessment data on the effectiveness of the university's General Education program is required (indeed, this might provide further insight into the above concern)

Three-year program goals include:

- Attract, retain, and graduate more top-quality undergraduate students
- Improve the quality of graduating undergraduate students
- Attract and retain more full-time graduate students

College: Engineering

Department/Program (s): Aerospace Engineering

Degree (s) Offered: Bachelor, Master and Doctorate

Triggers: Each program meets all minimum criteria. Doctoral degrees awarded are limited with only 6 the last four years. Average composite ACT is 26, above the university mean.

Brief Description of Each Degree:
***Undergraduate*:** The undergraduate program prepares students for entry into engineering practice or for graduate study. The engineering courses build on the physical sciences and mathematics culminating in a year-long capstone course emphasizing the "aerospace vehicle design process." The social sciences and the humanities courses as well as the ethics and professional practice course are seen as integral and foundational to professional practice.

Master/PhD: Descriptions of the graduate programs are limited within the document. Specialization, advanced mathematics and independent research are program objectives. Differentiation between master and doctoral programs is not described. These two programs are the primary providers of advanced education in aerospace engineering for the state.

Assessment of Learning Outcomes (for UG and GR):
Undergraduate: A detailed assessment plan for each program objective is provided including the assessment tools, targets, results and analyses. Very little quantitative data are provided as outcomes of the assessment process. General qualitative statements such as "no significant concerns", "no significant shortcomings" and "employers appear satisfied" are included. The program's senior exit survey documents student satisfaction. Scores from an assessment examination between 3.4 and 3.9 are listed but the range of possible scores is not provided. The program is fully accredited by Accrediting Board for Engineering and Technology (ABET). Faculty responded to all concerns from the last ABET review. The next accreditation visit is in 2013.

Graduate: The three program objectives (i.e. Competency in specialty, competency in graduate level mathematics and performance of independent research) are listed with 100% of students meeting these criteria. Student satisfaction is at 90 percent based on the Graduate School survey. Other assessment information is not provided.

Placement of Graduates (types of positions, starting salary):
Undergraduates: Opportunities for employment in "structures and testing areas" are high and is predicted to continue to grow. Funds to increase enrollment are available through the University Engineering Initiative Act (Senate Bill127). The department reports 100 percent employment of graduates with 15 percent pursing graduate education. Starting salaries are $55,000 to $58,000.

Master and doctoral graduates: Department reports that MS and PhD graduates are able to take advanced engineering positions especially in structures and testing areas. Starting salaries are about $70,000. Employment or further study is documented for the majority of graduates even within the first year of graduation.

Faculty Resources: There have been 11-12 tenure/tenure track faculty (TTT) during the last three years with instruction in the department supported by graduate teaching assistants and lecturers. TTT faculty teach more than 70% of total student credit hours. Some faculty have reduced teaching responsibilities due to research funding. Scholarly productivity in refereed articles and conference proceedings is documented. There were two failed searches for TTT faculty last year. The dean's evaluation indicates that the department is now searching for three engineering educators and three new TTT faculty positions.

Sources of External Support: The department has a long history of external funded that has been maintained over the last three years ranging from $3.6 to $5.3 million.

Conclusions and Recommendations:

Commendations:

- Faculty productivity in teaching, research, publications and external funding.
- Addressing recommendations from ABET in a timely manner.
- An integrated undergraduate curriculum that provides a balance between hands-on experience (e.g. capstone course, cooperative education) and with the principles/theory of engineering practice.
- Emphasis the department places on the foundational courses in mathematics, physical sciences, social sciences and humanities.
- The addition of a professional ethics course
- Satisfaction of students (all levels) and employers
- Maintenance of enrollment and degree production with what might be considered limited faculty resources.

By April 1, 2013 (send to the Office of the Provost):

- Document that the program review process is a part of a continuous improvement approach involving all departmental faculty.
- Document program changes that occurred through assessment of student learner outcomes and other data collected.
- The learning outcomes for the programs should be further developed and a revised assessment process needs to be implemented to include the following for all programs:
    - Learning Outcomes: Statements that describe what students are expected to know and be able to do by the time of graduation. These relate to the skills, knowledge, and behaviors that students acquire through their program (e.g.,

graduates will have the ability to explain information presented in mathematical forms).

- Assessment Methods: Direct measures used to identify, collect, and prepare data to evaluate the achievement of learning outcomes (e.g., quantitative literacy evaluated by a rubric, not grades or other indirect measures).
- Targets: Expectations of students to achieve the desired outcome to demonstrate program effectiveness (e.g., 90% of students will demonstrate at least the benchmark performance on a project).
- Results: Actual achievement on each measurement (e.g., 94% of the students achieved at least the benchmark performance on the project).
- Analysis: An evaluation that determines the extent to which learning outcomes are being achieved and leads to decisions and actions to improve the program. The analysis and evaluation should align with specific learning outcomes and consider whether the measurement and target remain valid indicators of the learner.

- Address concerns of the Graduate School in terms of the assessment process for the graduate programs.

Prior to the next review in 2015:

- Review failed searchers to determine reason(s) and make adjustments as needed and feasible in recruitment initiatives.
- Determine appropriate mix of faculty, i.e. TTT and engineering educators.
- Recruit faculty to address increased enrollment as required by the Senate Bill 127. Current faculty/student ratio is high at 1/30.
- Include the university's alumni and exit survey data in the assessment for all three programs.