

**Program Planning Summary
For a
Masters Program
in
Aerospace Engineering**

**Master of Science with a Major in Aerospace Engineering
Master of Engineering with a Major in Aerospace
Engineering**

Submitted by

University of South Carolina, Columbia

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Commission on Higher Education Program Planning Summary

Name of Institution: University of South Carolina – Columbia Campus

Designation: New Program Proposal

Name of Degree: Master of Science (MS) in Aerospace Engineering

Master of Engineering (ME) in Aerospace Engineering

Name of Program: Aerospace Engineering

Number of credit hours in program: 30 hours for MS (24 hours of graded course work
and 6 hours of Thesis Preparation);

30 hours for ME (30 hours of graded course work)

If undergraduate, designation as four- or five-year program: N/A

**Program qualifies for supplemental Palmetto Fellows Scholarship/LIFE Scholarship
awards:** No

Proposed date of implementation: Fall 2012

CIP Code: 14.0201

Justification of need for the proposed program:

The state of South Carolina is poised for explosive growth of the aerospace industry led by **Boeing** Company's expansion of its fabrication facilities for the 787 Dreamliner aircraft in Charleston, SC, with construction and launch of the Dreamliner operations factory scheduled for July of 2011. Almost 6,000 jobs will be directly created during the construction and subsequent operational phase of the project. Jobs will be created in many industrial sectors and in other sectors, such as retail, health care, food and beverage, automobile, and other areas. For example, aerospace company ACAS Landing Gear Services already has announced locating a new facility in Marion County that will service Boeing's operations. Economists have estimated that the initial increase in economic output of South Carolina including the direct investment, indirect impact, and induced impact, will be approximately \$1.4 B. The long-term impact could bring many thousands of jobs and investment by Boeing alone, totaling as much as \$10B.

GE Aviation has outgrown the building it is currently sharing with GE Energy in upstate SC and is making a multimillion-dollar investment in the Matrix Industrial Park¹. It is apparent that a constellation of multi-tier aerospace suppliers will also follow shortly. In spite of the economic downturn, the aerospace industry is currently recruiting engineers in materials, mechanical design, computing, and electronic systems and is seeking 40,000 specialists nationwide².

The aerospace industry moving into SC will create a demand for a work force of engineers with competence and expertise in the aerospace sciences, engineering and related topics. However, none of the universities in the State of South Carolina offer aerospace engineering degrees or specialties. Thus, the proposed Master of Science/Master of Engineering degree programs will respond to the needs of our future aerospace industry and will help the industry recruit engineers locally, filling a critical need within the growing Aerospace cluster in our state. Specifically, the establishment of this program will lead to curriculum and research activities that will provide our graduates with the skills needed to enter the aerospace workforce. Noteworthy features of the proposed program are:

- Responsiveness to the needs of the aerospace industry, contributing to its success
- Strengthening of the technical and knowledge bases of the state
- Promotion of SC in the select group of high-tech aerospace-related states
- Help provide high paying jobs for South Carolinians

Anticipated program demand and productivity:

¹ Arend, M. "Boeing's South Carolina Strategy Takes Shape", *Site Selection*, Nov. 2009, pp. 770-772, www.siteselection.com

² Anon. "Aerospace Industry Seeks 40,000 specialists in 2010," *Site Selection*, Nov. 2009, pp. 778, www.siteselection.com.

The proposed Masters Degree program will be in large demand from engineers interested in pursuing a career in the budding aerospace industry in South Carolina. The degree will attract both on-campus and off-campus students. The off campus students will be instructed via the existing distance learning program, APOGEE. All courses offered on campus will be video streamed for off campus students. The pool of off-campus students will primarily be SC residents working full time in SC industries, but may also include students nationally and internationally as well as US citizens on overseas deployment. The program will also be of interest to current undergraduate Mechanical, Electrical, and Chemical Engineering students who are interested in acquiring skills needed for employment in the aerospace industry. USC already has an accelerated Masters Degree program: students with a GPA of 3.5/4.0 and above may take up to three graduate courses while pursuing their undergraduate degrees. This allows students to get the MS/ME degree within a year of their Baccalaureate degree. Employees with Masters Degrees will potentially be for challenging and better paying jobs in the aerospace industry.

Once fully developed, we anticipate enrollment of about 15-20 students annually for in-class instruction and about 30-35 annually through distance education.

Assessment of extent to which the proposed program duplicates existing programs in the state:

Other institutions in SC may offer a few of the related courses, but no other institutions in South Carolina offer an MS/ME in Aerospace or Aeronautical Engineering. Therefore, the proposed program does not duplicate existing programs in the state.

Relationship of the proposed program to existing programs at the proposing institutions:

The expertise of the current College of Engineering and Computing (CEC) at USC faculty will partially meet the research and teaching needs of the proposed program. The CEC has nationally and internationally recognized expertise in a number of critical aerospace structures and materials research areas, such as composite materials (material-level chemistry, mechanics, structural analysis, and manufacturing), structural analysis and fracture mechanics, advanced joining science for metals, surface chemistry, coating science, electrochemistry, structural health monitoring, condition based maintenance, sensing and detection of structural damage, structural diagnosis and prognosis, future fuels and power sources, electric power modeling and analysis. Hiring of three additional faculty members will form a critical mass to sustain research and education in aerospace engineering.

The proposed program will complement the existing graduate programs of the College of Engineering and Computing by making additional graduate courses available to the full-time graduate students as well as those enrolled in the distance education program. For this MS/ME program in Aerospace Engineering several of the existing courses in Civil and Environmental Engineering, Mechanical Engineering, Electrical Engineering and Computer Science and Engineering will partially meet the core course requirements. Eight additional classes will be developed for the proposed program. The new classes will be comprised of two classes each in four focus areas (for each focus area an introductory class at 500-level

and an advanced class at 700-level). The four focus areas are: Aerospace Structures, Materials for Aerospace Applications, Aerospace/Aeronautical Controls, and Advanced Aerospace Manufacturing.

The College of Engineering and Computing has one of the oldest distance education programs in the nation. We have been successfully offering distance-education graduate programs in all five departments for four decades. This planned program in aerospace engineering will be an excellent addition to the existing programs and provide additional options to graduate students in the future.

Relationship of the proposed program to other institutions via inter-institutional cooperation:

The graduate program in aerospace engineering will create opportunities for collaborative research initiatives with Clemson, The Citadel and SC State University. The proposed Aerospace Engineering program is multi-disciplinary in nature, and therefore will be an ideal venue for multi-university initiatives where each of the universities complements the others. For example, Clemson's International Center for Automotive Research (ICAR) will provide collaborative opportunities related to product design, manufacturing and risk assessment studies. Discussions regarding collaborative opportunities will be held with other universities in the state, as well.

Total new costs associated with implementing the proposed program (general estimates):

USC's College of Engineering and Computing (CEC) already have faculty with expertise in several areas related to aerospace engineering. The expertise of the current CEC faculty in materials, thermo-fluids, structural health monitoring, and future fuels will partially meet the instructional needs of the proposed aerospace engineering program. Additionally, the Provost has approved the hiring of 3 faculty members as a cluster in safety-critical systems, with a focus on aerospace applications. The current laboratory facilities and class rooms are adequate for the proposed program. Also, the program will be housed in the Mechanical Engineering Department, thereby incurring no additional staff and management costs. To the best of our estimation, no significant additional costs will be associated with implementing the proposed program beyond the cost of the 3 faculty hires. No additional state resources will be required or requested for this proposal.