Graduate Program Review
Self Study Report

The Department of Aerospace Engineering
Texas A&M University, College Station TX

October 2018

by
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Charge to the 2018 Doctoral Review Committee

External reviews of Graduate Programs at Texas A&M University (TAMU) are mandated by Texas state law and coordinated by the Provost and Executive Vice President. The purpose is to provide TAMU academic leaders with critical information about the quality, impact, strengths, and weaknesses of our graduate programs, to establish the suitability of existing resources, and to assess the overall contribution of the programs to the University mission. Results from this review of the Doctor of Philosophy (Ph.D.), Master of Science (M.S.), and Master of Engineering (M.E.) programs in Aerospace Engineering will be used to assess the status of these programs with respect to our goals and resources and with respect to peer departments. The purpose of this Self Study is to provide the necessary background for the Review Committee to gauge our Graduate Programs and how we assess those programs.

For this review, we seek to further improve the quality of our Doctor of Philosophy, Master of Science, and Master of Engineering programs. As mandated by the TAMU Academic Review Process, we ask that, for each program, the review team address the following questions:

1. Based on the data and information provided in this self-study report and gathered by the review team, what are the department’s overall strengths and weaknesses?
2. How well do the department’s strategic goals align with those of its college and with those of Texas A&M University?
3. How would you compare this department with its peers? Specifically, is the curriculum directly related and appropriate to the mission and goals of the institution?
4. What improvements (including student learning and faculty development) has the department made since the previous program review?
5. With only current resources or a modest infusion of new ones, what specific recommendations could improve the department’s performance, marginally or significantly?

We hope that this document plus your visit in October will provide a strong basis for evaluating the quality, and direction of our program. Your feedback will be extremely valuable as we continue to improve. We appreciate your time and willingness to help in this endeavor.
Executive Summary

The Department of Aerospace Engineering at Texas A&M University strives to be the nation’s leading public aerospace engineering program. As a large and highly ranked department, our mission includes educating leaders of the next-generation aerospace workforce. By virtue of our size, we maintain research strength across the traditional discipline areas of aerodynamics and propulsion, materials and structures, and dynamics and controls. We train students to apply these disciplines in the domains of air vehicles, rockets, spacecraft, and emerging applications of aerospace engineering. Our aim is to prepare students to excel in these areas through rigorous training in the fundamentals of engineering science at the Master of Engineering, Master of Science and Doctor of Philosophy levels. Whichever degree a student pursues, the foundation they gain in our program will serve them well throughout their careers wherever they may lead: industry, government laboratories, or academia.

Over the past few years, the Department has undergone dramatic growth in faculty, students, and new research infrastructure. The faculty has grown from 27 in 2013 to 39 in 2018. Consistent with our strategic plan, this growth has been balanced between junior and senior ranks and across our technical disciplines. The new positions have been enabled through a combination of growth in the College of Engineering and through substantial investments from the Chancellor’s Research Initiative and Governor’s University Research Initiative, programs that aim to recruit National Academy members to faculty positions. Our department has been successful with four such hires over the past three years. These positions include funds for new laboratories as well as associated junior faculty hires so that new research concentrations led by the senior hires will persist over the years. We have improved the reputation and quality of our faculty while growing. The new NAE members are active and have had a dramatic impact on our program while the junior hires have already shown outstanding success winning early career grants and research awards.

At the time of the last review, our research expenditures and graduate population were growing strongly. This trend reversed in 2011. Since then, we have regained momentum in research funding and graduate student growth. We anticipate both indicators will continue to grow strongly as our recent faculty hires reach their potential over the next several years. Besides our traditional focus on the Ph.D. program, we have also seen good growth in our non-thesis Masters of Engineering degree.

The Charges to the Review Team ask that we are evaluated with respect to our peers. We consider the following list of universities to include our peers as they embody the top 10 public aerospace engineering graduate programs as ranked by U.S. News and World Report. Caltech, Stanford, and MIT (all private) are included for comparison purposes as they are routinely the top three ranked programs. Current Aerospace Graduate Program rankings from U.S. News and World Report are given for each institution and, parenthetically, the ranking among public programs. For
comparison, the Aerospace Engineering Graduate Program at Texas A&M University is currently 7th overall and 4th among public programs.

- California Institute of Technology, 1
- Georgia Institute of Technology, 4 (1)
- Massachusetts Institute of Technology, 2
- Pennsylvania State University-University Park, 15 (10)
- Purdue University-West Lafayette, 6 (3)
- Stanford University, 3
- University of Colorado-Boulder, 12 (8)
- University of Illinois-Urbana-Champaign, 8 (5)
- University of Texas-Austin, 8 (5)
- University of Maryland-College Park, 12 (8)
- University Michigan-Ann Arbor, 5 (2)
- Virginia Polytechnic Institute & State University, 11 (7)

This Self Study Report is organized as follows. This preface reviews the motivation for the Graduate Program Review, presents the specific questions we ask the review team to consider, and presents our representative group of peer departments. Chapter 1 is an overview of the Aerospace Engineering Degree Programs at Texas A&M University. Chapter 2 describes the three graduate programs and curriculum that are under review. Chapter 3 provides a profile of the department faculty, faculty diversity, and faculty qualifications plus the faculty teaching and research activity. Chapter 4 provides a profile of the students in the M.E., M.S. and Ph.D. programs in Aerospace Engineering along with various statistics related to student retention and success. Each of Chapters 1–4 contains an assessment of the current state of the department with respect to the information presented therein. A report summary is given in Chapter 5. Additional data are provided in several Appendices.

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1. Introduction to the Degree Programs in Aerospace Engineering

1.1 History of the Department

1.1.1 Founding of the Department

The first course in aerodynamics at Texas A&M University was introduced in the Department of Mechanical Engineering as ME 428 in 1928. The first course in airplane design, ME 434, was introduced in 1931. These courses were the beginning of what became the Department of Aeronautical Engineering in 1940. During the 1942–43 school year, the department was accredited by the Engineering Council for Professional Development. It was the first to be accredited in the Southwest and was fourteenth in the nation. Initially, students and faculty came from Mechanical Engineering. The first two students to graduate with B.S. degrees in Aeronautical Engineering did so in 1944. The number of graduates increased steadily in the post-war years with significant numbers of students supported by the GI Bill. Coincident with the beginning of the U.S. space program, the department was renamed the Department of Aerospace Engineering in 1963.

In the early years of the department, emphasis was placed on aerodynamics, structures, math, and design. Flight training was required for sophomores and juniors until 1948. Graduate courses offered during this time were mainly in structural analysis, testing, and design. Later, advanced courses in fluid dynamics, compressible fluids, and experimental aerodynamics were offered and flight-training courses were phased out. The graduate-level course offering expanded in the 1960s to include the theory of elasticity, plates and shells, and matrix methods of structural analysis. During this time, undergraduate courses were offered in space technology, aircraft propulsion, chemical rocket propulsion, and structural design of missiles and spacecraft. In the late 1970s, major changes were made to the curricula that balanced the three major disciplines of aerodynamics and propulsion, dynamics and controls, and materials and structures. These major discipline areas still define the academic curriculum of the department.

The departmental growth trends shown in Fig. 1.1 demonstrate the evolution of the department in terms of faculty and student enrollment. In the 1980s, the “Star Wars” initiatives of President Reagan boosted enrollment of undergraduate and graduate students. After a sharp decline in the early 1990s, steady enrollment growth has reached the present level of approximately 600 undergraduate students. In 2013, the college of engineering introduced the common freshman year. Hence the 2018 data on Fig. 1.1a only include sophomores, juniors, and seniors. For prior years, freshman are also included. Actual growth since 2010 is, thus, larger than what the figure suggests. The graduate student growth (Fig. 1.1b) was proportional to the faculty size (Fig. 1.1c) and research funding, as the majority (~70%) of our graduate students are Graduate Assistants for Research (GARS), and are externally supported through grants, fellowships, or internal fellowships. The research expenditures for the last 10 years is shown in Fig. 1.2. The trends in Figs. 1.1 and 1.2 show
that research funding and student support is tied to the number of faculty. Federal funding also contributes to the trend.

Figure 1.1: Aerospace Engineering Growth Trends.

(a) Undergraduate Student Enrollment (year 2018 does not include freshman)

(b) Graduate Student Enrollment

(c) Tenure Track Faculty

Figure 1.1: Aerospace Engineering Growth Trends.
1.1.2 Current State and Strengths

Beginning in the 1980s, the department engaged in a successful long-term strategy to become a Top-10 program. The core strategic principles were (i) recruiting faculty with strong basic research excellence, (ii) making corresponding investments in infrastructure, and (iii) ensuring a fundamentals-based aerospace curriculum. The department achieved Top-10 stature in the mid 2000s as shown in Fig. 1.3. A leading-order element to this ascension was faculty growth, as illustrated in Fig. 1.1c. Through careful planning, Texas A&M offers one of the most respected and technically diverse aerospace programs in the United States. Key strengths of the Texas A&M Aerospace Department are faculty excellence, the offering of a fundamentals-based curriculum, and the opportunities provided by the established broad research portfolio.

Fig. 1.3 Overall graduate Program Rankings (4-year averages, 2018-2019 is a 2-year average). TAMU was ranked #4 among public in 2018 and 2019.

Currently, there are currently 39 Tenured/Tenure Track Faculty (TTF) within the aerospace engineering department, 7 of whom are in the national academy of engineering (NAE). The faculty
growth trend over the last 75 years is shown in Fig. 1.1c; of relevance to this review is growth that has taken place since 2012 (this review period), where the faculty has increased from local minimum of 27 in 2013 to 39 in 2018. The growth process is described below in Section 1.2.6.

Through the recent faculty hiring, we have also strived to improve the balance across the ranks, where there are currently 23 (two are 50%) full professors and 17 junior faculty. In 2018, the faculty averaged about $400K each in research expenditures (the annual research expenditures is given in Fig. 1.2). These funds are used sustain a graduate program that currently supports (1) the majority of the graduate students and (2) a suite of advanced laboratories that provide relevant research opportunities for graduate study. In terms of productivity, this research has produced about 5 publications per TTF per year (half are in archival journals). Of the current 174 graduate students, about 72% are research assistants, 11% are internally supported graduate teaching assistants, and 17% are self-funded Masters of Engineering students.

The graduate curriculum aligns with the three core divisions within the department. The department support over 40 courses ranging from fundamental core courses that provide the basis of the qualifying exam to highly specialised topic courses. In addition, the faculty support numerous cross-department courses such as those associated with the college level Mechanics and Materials Program. The annual course offering numbers in Aerospace are plotted in Figure 1.4, where we see that the department offers ~15 regular and 3-5 special topics courses per year. In order for a graduate course to be offered, the student enrollment has to be greater than or equal to 8. This broad range of graduate course offerings is the direct response of the department growth.

Figure 1.4: Aerospace Engineering Graduate Courses Offered
1.2 Mission, Strategic Plans, and Goals

The Aerospace Engineering graduate strategic plans align with (1) The University Vision 2020 Strategic Plan\(^1\), the (2) the College of Engineering Strategic Plan\(^2\), and the TEES Strategic Plan\(^3\). In this section, we summarize the documented missions and strategic goals, and then highlight our alignment.

1.2.1 TAMU Mission and Strategic Planning

Texas A&M University is mission dedicated to the discovery, development, communication, and application of knowledge in a wide range of academic and professional fields. Its mission of providing the highest quality undergraduate and graduate programs is inseparable from its mission of developing new understandings through research and creativity. It prepares students to assume roles in leadership, responsibility and service to society. Texas A&M assumes as its historic trust the maintenance of freedom of inquiry and an intellectual environment nurturing the human mind and spirit. It welcomes and seeks to serve persons of all racial, ethnic and geographic groups as it addresses the needs of an increasingly diverse population and a global economy. In the 21st century, Texas A&M University seeks to assume a place of preeminence among public universities while respecting its history and traditions.

The Southern Association of Colleges and Schools Commission (SACS) and the Texas Higher Education Coordinating Board (THECB) assess the quality of Texas A&M University as a whole. The TAMU strategic plan was adopted in 1999 to meet the SACS and THECB guidelines and to provide a roadmap to enhance the value of Texas A&M University to the Texas A&M University System, the State of Texas, and the Nation. The Division of Research and Graduate Studies at Texas A&M University established the University Vision 2020 plan.\(^4\)

1.2.2 TAMU College of Engineering Mission and Strategic Planning

The vision of the College of Engineering is to define and lead transformative innovation in engineering education, research and service. The corresponding mission is to educate students who are well-grounded in engineering fundamentals for them to succeed in a multi-disciplinary global environment, to be lifelong learners and to conduct research and transform the results into knowledge base, products, and services to benefit society. We actively develop each member of the engineering program and leverage our resources for the betterment of the state, nation and world. The College of Engineering established a 2017-2025 Strategic Plan, A Transformative Transition to Preeminence\(^5\) that defined a balanced strategic approach across undergraduate education, graduate programs, faculty development, staff development, fundraising, scholarship, research, and service.

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\(^1\) [http://vision2020.tamu.edu/](http://vision2020.tamu.edu/)
\(^2\) [https://engineering.tamu.edu/about/strategic-plan.html](https://engineering.tamu.edu/about/strategic-plan.html)
\(^3\) [https://tees.tamu.edu/about/tees-strategic-plan/](https://tees.tamu.edu/about/tees-strategic-plan/)
\(^5\) [https://engineering.tamu.edu/about/strategic-plan.html](https://engineering.tamu.edu/about/strategic-plan.html)
The College of Engineering, working closely with TEES (described in the next section), have undergone numerous research strategic planning exercises, soliciting input from faculty, department heads, federal agencies, state agencies, national laboratories, and industry. Based on these studies, the following research thrust areas have been defined:

- Autonomy and Robotics
- Energy Systems and Services
- Education and Training
- Healthcare
- Information Systems and Sensors
- Infrastructure
- Materials and Manufacturing
- National Security and Safety

Alignment of departmental research thrusts to those of College of Engineering and TEES is an important strategic consideration in our (aerospace) planning.

1.2.3 TEES Mission and Strategic Planning

The Texas A&M University Engineering Experiment Station (TEES) is a State Agency that serves Texas through engineering and technology-oriented research and educational collaborations. Texas A&M University engineering faculty have appointments at both Texas A&M University and TEES. The TEES mission, as defined the Charter as a Texas state agency, is to (1) perform quality research to address society’s needs, (2) support the state’s workforce through continuing and professional education and (3) develop and transfer technology to industry. To achieve this goal TEES has established a Strategic Plan, with objectives in research, workforce development and technology transfer. By supporting these objectives, research centers within the TEES network and business leaders in the private sector can benefit from collaboration and integration that enables them to reach beyond Texas and capture opportunities to work on a global scale.

1.2.4 Aerospace Engineering Mission and Strategic Planning

The mission of the Texas A&M University Aerospace Program is to serve the Nation, State of Texas, Texas A&M University, and the profession by (1) providing a quality undergraduate and graduate aerospace engineering education, (2) advancing the engineering and science knowledge through research, assisting industry in technical applications and innovations, and (4) serving the aerospace profession through leadership. Our vision is to provide a nationally and internationally renowned aerospace program that attracts the world's top faculty and students and promotes a passion for learning and applying the knowledge of science and engineering to lead in providing solutions to the most challenging problems in the field.

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6 https://engineering.tamu.edu/research/index.html
7 https://tees.tamu.edu/about/tees-strategic-plan/
1.2.5 Aerospace Strategic Planning and Alignment

In 2011, the Department undertook a strategic planning process that defined five major multidisciplinary research thrust areas: Aerospace Propulsion and Energy Systems (APES), Autonomous Aerospace Vehicle Systems (AAVS), Controlled Intelligent Materials and Structures (CIMS), Hypersonic Vehicle Systems (HyVS), and Space Exploration and Sensing Systems (SES). The strategic planning document is included in Appendix A. Each aerospace faculty member is associated with one research thrust for planning purpose (many contribute multiple areas). These areas are not intended to be permanent thrusts but to be revisited from time to time as new research areas emerge. However, the current topic areas have remained robust in both their alignment with national needs and the research directions of the College of Engineering and TEES. The alignment the Aerospace thrust areas with those of the College of Engineering, is listed in Table 1.1

The close alignment shown in Table 1.1 has positioned the department to compete for College and University resources. The department has successfully engaged the Chancellor’s Research Initiative to recruit four members of the National Academy of Engineering, as well as cadre of junior faculty in their research areas. This has been a game changing program for aerospace engineering. A second example is our good track record of success with proposals to the Research Development Fund (RDF), an internal program for the acquisition of major research instrumentation.

Table 1.1 Departmental Research Thrust Alignment with College of Engineering and TEES

<table>
<thead>
<tr>
<th>TAMU COE/TEES Research Thrusts</th>
<th>APES</th>
<th>AAVS</th>
<th>CIMS</th>
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<th>SES</th>
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<td>Information Systems and Sensors</td>
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<td>Materials and Manufacturing</td>
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<td>National Security and Safety</td>
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1.2.6 Aerospace Faculty Strategic Alignment

By associating faculty with both with the discipline divisions and the research thrust areas represents a matrix organization for the department faculty, with a goal of encouraging cross

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8 https://tees.tamu.edu/about/
division interaction. The matrix structure is shown in Table 1.2. The intent is to ensure that both core academic disciplines and modern research efforts are well represented by the faculty. The hiring since 2011 has largely balanced the research thrust areas. The faculty are listed in Table 1.3 by division, with their primary thrust area indicated. The faculty hired during this review period are highlighted in red text. In particular, the aerospace program has made the following targeted hires:

- **APES**: The hiring of Drs. Poludnenko and Hara targeted strengthening the APES research thrust and expanding the scope to include space propulsion.
- **AAVS**: The hiring of Drs. Benedict and Jameson added strength to autonomous atmospheric flight systems, helicopters and aircraft design.
- **HyVS**: The hiring Drs. Miles, Andrienko, Gerakis, and Limbach, has added significant strength related to Hypersonics and APES.
- **SES**: The hiring of Drs. Skelton, Dunbar, Majji, Selva, Diaz Artilles, and Chamitoff has added significant strength related to the SES thrust (Space Situational Awareness, Mission Planning and Human Spaceflight).
- **CIMS**: The hiring of Hartl, le Graverend, and Wong added new dimensions to CIMS (morphing structures, high temperature materials, and meta-materials).

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<th>Aerospace Discipline Division</th>
<th>APES</th>
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**Dynamics and Controls Faculty**

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<td>John Valasek</td>
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**Materials and Structures Faculty**

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<tr>
<td>Mohammad Naraghi</td>
<td>X</td>
</tr>
<tr>
<td>Thomas Strganac</td>
<td></td>
</tr>
<tr>
<td>Theofanis Strouboulis</td>
<td>X</td>
</tr>
</tbody>
</table>
1.3 Administrative Structure of the Department

1.3.1 Department Head Office

The TAMU College of Engineering employs a Department Head administrative structure. The Department Head for Aerospace Engineering is Dr. Rodney Bowersox. He is assisted by two Associate Department Heads, Drs. Edward White and Kristi Shryock. They principally assist with issues related to the Graduate and Undergraduate Programs, respectively.

1.3.2 Division Leads

For the purpose of academic administration, the faculty are grouped into the three discipline divisions: Aerodynamics and Propulsion (A&P), Dynamics and Controls (D&C), and Materials and Structures (M&S). This structure enables course management and content at the undergraduate and graduate levels to be effectively delegated to the faculty whose research interests best match the discipline areas. The faculty are listed above in Table 1.3. Resumes are included in the Appendix B.

1.3.3 External Advisory Board

Input to the department leadership is also provided by a external advisory board. The mission of the Advisory Board is to advise and assist the Department in pursuing the following objectives:

- Review and evaluate the Department’s strategic goals and plan, and other specific initiatives
- Review and evaluate the undergraduate curriculum with regard to ensuring that the curriculum is properly focused
- Assist the department in establishing beneficial relationships with industry
- Assist the department in resource development in support of the needs of the department

Membership on the Board is by invitation of the Department Head. Membership is limited to 25, with rolling 3-year terms. Members are selected based on their leadership ability, their contributions to the aerospace community, their ability to contribute to the objectives of the Board and their desire to serve. The Board meets twice each year, once during each academic semester.

1.3.4 Academic Program Leadership

In terms of academic program administration, the principal administrative group is the Department’s Academic Program Committee (APC). This committee consists of the Department Head Dr. Bowersox; the two Associate Department Heads, Drs. White and Shryock; the Directors of the Graduate Program, Drs. Valasek and Donzis; the Graduate Advisor, Ms. Gail Rowe; the
Directors of the Undergraduate Program and Undergraduate Advisors, Drs. Boyd and Strganac and Ms. Christina Escamilla and Ms. Shaifali Mathur. The APC administers all the academic programs of the Department, the B.S., M.E., M.S., and Ph.D. programs in Aerospace Engineering. The committee provides guidance on issues such as the health of the academic programs, hiring needs, laboratory and classroom needs, etc. Separately, decisions on course content and coordination between courses is largely delegated to the Discipline Groups (A&P, D&C, M&S). The Discipline Group Leads also meet routinely with the Department Head to provide guidance on health of the research thrust areas, hiring priorities, laboratory and space needs.

Separate from the Academic Program Committee, a Graduate Committee lead by the Graduate Program Directors, Drs. Valasek and Donzis; the Graduate Advisor, Ms. Rowe; representative members of each of the Discipline Groups meets to discuss matters related to the Graduate Program. These issues include graduate recruiting and admissions, the content and administration of the Ph.D. Aerospace Fundamentals Ph.D. Qualifying Exam (AFQE), graduate student awards, and other topics.

1.4 Degree Program Resources

1.4.1 Facilities, Space, and Equipment

The department moved into the H. R. Bright Building in 1990. This building provides the primary home for the Aerospace Department. Currently, Aerospace utilizes the basement (for laboratories), first, sixth and seventh floors. The space utilization is summarized in Table 1.4. The majority of the undergraduate operations take place in the HR Bright Building. Because of the growth of the faculty, staff, and students since 1990, additional space has been made available on campus in the Munnerlyn, Reed-McDonald, and Wisenbaker Buildings (see Fig 1.5a). In addition, the Department has created an Easterwood Research complex that houses the 7 ft × 10 ft Low-Speed Wind Tunnel, the Klebanoff-Saric Wind Tunnel, Land-Air-Space-Robotics (LASR) Lab, and the National Aerothermochemistry and Hypersonics Laboratory. The Department also utilizes a hangar at the (RELLIS) Campus for UAV flight research (see Fig. 1.5b,c).

The majority of Aerospace Engineering courses are taught in the Bright Building; classrooms 105, 122, 131, 134, and 204 (2,222 sq. ft). Three classrooms (122, 131, and 204) are equipped with computers with network connections and overhead LCD projectors. Additional teaching space is made available through the registrar for large classes. These are typically in an engineering classroom. The space available for supporting the educational objectives and outcomes of the program are adequate.
### Table 1.4 Aerospace Space Utilization

<table>
<thead>
<tr>
<th>Building</th>
<th>Faculty Office</th>
<th>Staff Office</th>
<th>Graduate Office</th>
<th>Dry Lab</th>
<th>Wet Lab</th>
<th>Other[^a]</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>HR Bright</td>
<td>6050</td>
<td>3190</td>
<td>2710</td>
<td>19610</td>
<td>950</td>
<td>7060</td>
<td>39570</td>
</tr>
<tr>
<td>Munnerlyn</td>
<td>120</td>
<td>160</td>
<td>580</td>
<td>2370</td>
<td>0</td>
<td>480</td>
<td>3710</td>
</tr>
<tr>
<td>Reed McDonald</td>
<td>0</td>
<td>0</td>
<td>970</td>
<td>2370</td>
<td>0</td>
<td>2140</td>
<td>5480</td>
</tr>
<tr>
<td>Wisenbaker</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2690</td>
<td>0</td>
<td>0</td>
<td>2690</td>
</tr>
<tr>
<td>Haynes</td>
<td>0</td>
<td>0</td>
<td>950</td>
<td>1000</td>
<td>0</td>
<td>0</td>
<td>1950</td>
</tr>
<tr>
<td>Easterwood Labs</td>
<td>0</td>
<td>0</td>
<td>400</td>
<td>8560</td>
<td>1560</td>
<td>1640</td>
<td>12160</td>
</tr>
<tr>
<td>Riverside Range</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1870</td>
<td>0</td>
<td>9380</td>
<td>11250</td>
</tr>
<tr>
<td>Totals</td>
<td>6170</td>
<td>3350</td>
<td>4660</td>
<td>37470</td>
<td>2510</td>
<td>20700</td>
<td>76810</td>
</tr>
</tbody>
</table>

[^a]: Other includes: Conference Rooms, storage, server rooms

### 1.4.2 Budgets

The educational efforts of the program are supported by the College of Engineering. The budget for college is based on historical allocations and is annually adjusted each year for any new base initiatives awarded. The University Provost office provides the College of Engineering with multiple types of funds each year to complete the fiscal year budget. Funding types range from State of Texas education and general use funds (E&G) that provide fringe benefits for all salaries paid with these funds, designated funds which are tuition dollars collected from our students, differential tuition dollars paid by Engineering students, Qatar management, available use funds (AUF), permanent use funds (PUF) and endowment/investment income. Each different fund type has strategic uses and the college strategizes its spending based on the fund types received each fiscal year. Three years ago, the University implemented a growth funding model. In this model, colleges are awarded an additional increase in base funding based on increases in weighted semester credit hours (WSCH), headcount, semester credit hours (SCH), and number of degrees awarded. In addition to the base funding, one-time funds are awarded each year including funding from the Office of Graduate and Professional Studies (OGAPS) for the graduate programs within the college and funding for the Qatar Service Level Agreements (SLA). From all of these funds, the Dean and Executive Associate Dean make strategic decisions to determine the allocations to the Departments.
The Department’s annual budget is also based on historical levels and adjustments for strategic priorities for that fiscal year. The college funds all tenure track faculty lines nine month salaries. The salary for the addition of new faculty is then transferred to the Departments as a base adjustment. The Department is funded at a level to support all nine-month tenure track faculty salaries, 11.5 months of the Department head, 12 months of staff salaries, and the remaining portion is considered flex funds to be used to support Department-specific initiatives. In addition to the funding received from the University, Texas A&M Engineering Experiment Station (TEES) supports a portion of new faculty member’s start up packages and also supports the Department in its research endeavors as some of our faculty carry dual appointments as TEES Researchers and College of Engineering faculty members. This type of relationship allows the Department to truly
maximize and leverage the financial resources available to the College of Engineering. Table 1.5 shows the budget profile for the Department under six categories. It is evident that the institutional support to the Department’s operating budget has increased steadily from FY14-FY16.

Table 1.5 Aerospace Engineering Budget Profile

<table>
<thead>
<tr>
<th>Fiscal Year</th>
<th>FY14</th>
<th>FY16</th>
<th>FY18</th>
<th>Δ FY18-FY14</th>
</tr>
</thead>
<tbody>
<tr>
<td>E&amp;G ($)</td>
<td>3,457,659</td>
<td>4,139,387</td>
<td>4,636,883</td>
<td>1,179,224</td>
</tr>
<tr>
<td>Designated ($)</td>
<td>75,044</td>
<td>969,888</td>
<td>1,177,725</td>
<td>1,102,681</td>
</tr>
<tr>
<td>Differential Tuition ($)</td>
<td>0</td>
<td>618,838</td>
<td>1,280,080</td>
<td>1,280,080</td>
</tr>
<tr>
<td>OGAP, Qatar Mgmt, AUF, PUF ($)</td>
<td>183,357</td>
<td>184,404</td>
<td>113,544</td>
<td>(69,813)</td>
</tr>
<tr>
<td>Endowment and Other ($)</td>
<td>122,110</td>
<td>28,339</td>
<td>20,394</td>
<td>(101,716)</td>
</tr>
<tr>
<td>Total ($)</td>
<td>3,838,170</td>
<td>5,940,856</td>
<td>7,228,626</td>
<td>3,390,456</td>
</tr>
</tbody>
</table>

The Department has the freedom to use the funds provided by the College of Engineering for supporting undergraduate education through teaching assistants or teaching fellows. The College does not allocate funds specifically for this beyond what the OGAPS funding provides. These OGAPS funds are for the overall graduate programs but how they are allocated is decided by the Department. Table 1.6 shows the Departmental expenditures in six major categories: operations (not including staff), travel, equipment, graduate teaching assistants (TA’s), teaching fellows (highly qualified Ph.D. students), part-time assistance other than teaching, and faculty salaries. The amounts shown in Table 1.6 are for the overall academic program, including undergraduate and graduate programs. While it would be difficult to separate the expenditures between these two programs, the majority of the expenditures are for the undergraduate program. The program utilizes graduate TAs to assist the faculty in grading homework, conducting recitation classes, and providing tutorial help. Where appropriate and as necessary, some of the teaching assistance is provided by senior undergraduate graders on hourly wages. The teaching fellows program is designed to prepare and encourage doctoral students to pursue academic careers. The item, “Gifts/Grants/Royalties”, includes donations from individuals and corporations to the Department as well as income from the fixed-price contract balances on research projects. Instructional laboratories are continuously upgraded, maintained and kept in good condition. Currently, upgrading academic equipment is primarily sourced through differential tuition. The college does support some one-time requests that may arise from the Department especially if the request is in line with the college strategies.
Table 1.6 Aerospace Engineering Support Expenditures

<table>
<thead>
<tr>
<th>Fiscal Year</th>
<th>FY 2014</th>
<th>FY 2016</th>
<th>FY 2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operations (not including staff)</td>
<td>164,857</td>
<td>175,000</td>
<td>184,250</td>
</tr>
<tr>
<td>Travel</td>
<td>7,903</td>
<td>22,000</td>
<td>15,000</td>
</tr>
<tr>
<td>Equipment</td>
<td>15,349</td>
<td>25,000</td>
<td>25,000</td>
</tr>
<tr>
<td>(a) Institutional Funds</td>
<td>0</td>
<td>25,000</td>
<td>25,000</td>
</tr>
<tr>
<td>(b) Grants and Gifts</td>
<td>15,349</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Graduate Teaching Assistants</td>
<td>3,902</td>
<td>0</td>
<td>342,000</td>
</tr>
<tr>
<td>Part-time Assistance (other than teaching)</td>
<td>480,354</td>
<td>311,429</td>
<td>33,660</td>
</tr>
<tr>
<td>Staff Salaries</td>
<td>560,434</td>
<td>551,840</td>
<td>617,920</td>
</tr>
<tr>
<td>Faculty Salaries</td>
<td>3,601,230</td>
<td>3,990,636</td>
<td>5,149,473</td>
</tr>
</tbody>
</table>

Because staff often support both academic and research activities, it is difficult to precisely determine what level that research funds support the academic functions of the program; however, in FY16 it is estimated that 11.5% of the TEES administrative budget was allocated for academic Departmental operations and staff support. In addition, TEES allocates 10% of all indirect cost earnings back to the Principal Investigators and 15% back to participating Departments. These funds are used to support research activities within our academic Departments.

1.4.3 Staffing

The College of Engineering provides IT, business office and communications support directly to the Department. The Department has found this support to be adequate. The Department is responsible for maintain the advising and technical staff. We currently support three staff members for the advising office, three Program Specialists, and three technical staff for the laboratories. While the Department maintains a friendly and open environment, the staff retention activities are under the College of Engineering.

1.4.4 Library Services

TAMU Libraries is comprised of five buildings each supporting part of the TAMU Community. The Sterling C. Evans Library and the Annex serve as the main library and support engineering, science, humanities, social sciences, education, architecture, music. The West Campus (WCL) library serves the business community, the Policy Science & Economics Library (PSEL) serves The George Bush School of Government, The Medical Sciences Library (MSL) serves
medical, veterinary, agricultural and life sciences and Cushing Memorial Library houses the University’s archives and special collections. TAMU also has an institutional repository (Oak Trust) that supports scholarly activities of students and faculty.

Both Evans and Annex are open seven days per week. The Annex is open 24/5 (9am Sunday through 9pm Friday). Evans is open Sunday to Thursday until 2am. Both buildings have extended hours during finals. Evans has 97 individual study rooms (first come, first serve), some of which are on an all quiet floor. Evans and the Annex have 69 group study rooms, many of which have OAL computers and white/chalk boards. Evans also has 200 graduate student carrels (long term check-out) that accommodate 400 students actively working on dissertations. Media & Reserves in the Annex also has a multi-media area equipped with high end computers (non-OAL). Library users can check-out equipment such as laptops, cameras, headphones, projectors, and calculators.

University Libraries’ User Services

- Evans provides seven engineering librarians who serve as liaison to and provide collection development, instructional services and reference expertise for their assignment areas.
- Evans Public Services – AskUs Services – experienced staff serve the Evans and Annex 1st floor AskUs desks and the Media and Course Reserve Desk. Evans Public Services has a dedicated evening and weekend librarian who provides reference and research help Sunday to Thursday 6pm to 10pm. During the current renovation project, the Annex 1 and 4th floor desks will be combined and located on the 1st floor of the Annex
- Learning and Outreach – provides strategic leadership and direction in support of the TAMU Libraries’ instructional mission, teaching and learning initiatives, and outreach programs. The current renovation project will include new instruction labs and office space for L&O on the 4th floor of the Annex.

Library Services:

- Library instruction classroom, small group, and individual (includes graduate student consultations) is provided by the Evans subject librarians Learning and Outreach librarians also provide instruction and support the Evans subject librarians.
- Reference & Research Services
  - Reference desk located on the 1st floor of Evans is staffed by Evans subject librarians and experienced staff seven days a week.
  - Research guides are available for online reference 24/7 on campus or off.
- Get it For Me
  - Traditional Interlibrary Loan – borrow material from libraries worldwide.
  - Library courier service – pick up material located in one library from a more convenient library location.
○ Find and hold a book in the Libraries’ collection
○ Deliver to faculty offices
○ Scan, free of charge, material owned in print by the TAMU Libraries, or or other libraries
○ Journal articles, conference papers, book chapters (50 pages or less).
○ Quiet and group study spaces are available throughout Evans and the Annex. The Dwight Look Reading Room (1st floor of Evans) is a quiet study space and houses the print reference collection.
○ Media & Course Reserves – 4th floor of the Annex
○ Wireless access in both buildings
○ Laptops available for check out from Evans and the Annex
○ Purchase suggestions – online suggestion form for all types of material (books, journals, etc.).
○ Upon request, one copy of a textbook per 100 students in a class will be purchased and put on course reserves.
○ Online library forms -- this list also provides an overview of services.
○ Open Access Lab (OAL) computers, software and printing within the libraries
○ Access to RefWorks and EndNote, for which the library also provides instruction. Use these resources to manage citations.
○ University Writing Center is located in the libraries – Evans 2nd floor

The Collection – Engineering Resources and Library Statistics

The Libraries holds approximately 5.17 million volumes, which include over 120,000 periodical subscriptions and over 880 databases. Subject librarians maintain a collection development policy for each of their subject areas – in alignment with the Libraries’ overarching policy. The library uses its current approval plan vendor, YBP, for its approval plan - the library has set up YBP profiles for all subject areas. The approval plans are monitored and adjusted by the subject librarians to ensure acquisition of relevant academic and professional material. A list of resources exist for each engineering field and related disciplines.

1.5 External Program Accreditations and Academic Program Reviews

The Southern Association of Colleges and Schools Commission (SACS) and the Texas Higher Education Coordinating Board (THECB) assess the quality of Texas A&M University as a whole. Each department that grants Ph.D. degrees is also required to submit a set of statistics called the “18 Characteristics” to the THECB so that it can monitor the performance of Ph.D. programs across the state. The most recent 18-Characteristics Report for the Department of Aerospace Engineering
based on 2017 data is included below as Table 1.7. Data from the 18-Characteristics report will be referred to throughout the later chapters of this document.

The last Academic Program Review of Aerospace Engineering was conducted in 2011 by Drs. Deborah Levin, Andrew Meade, and Philip Varghese. At that time, only the Ph.D. program was reviewed. In this cycle, the M.E., M.S., and Ph.D. programs are all to be reviewed. Recommendations developed by that review team were very useful and have provided critical strategic guidance over the past 7 years. Details of that team’s findings and the Department’s response are given below in Section 1.7.

1.6 Degree Programs Assessment Approach in Aerospace Engineering

The present external review is one of three steps used by the department, University and State to assess the Aerospace Engineering Doctoral Program. A brief overview of the steps is given below.

1. **Internal Assessment.** The department has established a series of internal goals, outcomes and measures to help ensure continual improvement and that we achieve our overarching mission mentioned above. The department tracks the assessment results annually to ensure the graduate programs are on track to meet our internal goals. The department tracks the status of various criteria related to program excellence outcomes. Separately, we also track progress toward student learning outcomes using a university-wide system known as WEAVEOnline.

2. **Texas Higher Education Coordinating Board (THECB) 18 Characteristics.** As noted above, the THECB has adopted a policy requiring all public Texas universities to publish 18 key characteristics of each Ph.D. program. This assessment step compares our program to similar programs within the state of Texas.

3. **External Graduate Program Review.** An external review board is convened every 7 years to assess the department’s graduate programs. This year, 2018, is the first year for all graduate programs to be assessed. Previously, only the Ph.D. Program was subject to this assessment. In preparation, we have prepared this Self Study Report that describes statistical measures, resources, previous assessment results and changes since the last review. This step provides an independent assessment of our program on a national level.
Table 1.7 THECB 18-Characteristics of Texas Public Doctoral Programs for the Aerospace Engineering Ph.D. Program at Texas A&M University

<table>
<thead>
<tr>
<th>Texas A&amp;M University</th>
<th>18 Characteristics of Texas Public Doctoral Programs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Programs included only if in existence 3 or more years. Program is defined at the 8-digit CIP code level.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Department</th>
<th>Aerospace Engineering</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doctoral Degree Program</td>
<td>Aerospace Engineering</td>
</tr>
<tr>
<td>Contact Name</td>
<td>Gail Rowe</td>
</tr>
<tr>
<td>Contact Phone Number</td>
<td>979-845-5520</td>
</tr>
</tbody>
</table>

1. Number of Degrees Per Year

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Degrees</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014-2015</td>
<td>15</td>
</tr>
<tr>
<td>2015-2016</td>
<td>6</td>
</tr>
<tr>
<td>2016-2017</td>
<td>14</td>
</tr>
</tbody>
</table>

Three-year average of the number of degrees awarded per academic year

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Degrees</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014-2015</td>
<td>15</td>
</tr>
<tr>
<td>2015-2016</td>
<td>6</td>
</tr>
<tr>
<td>2016-2017</td>
<td>14</td>
</tr>
</tbody>
</table>

2. Graduation Rates

<table>
<thead>
<tr>
<th>Graduation Rate</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Graduating within 10 Years</td>
<td>2005, 2006, 2007</td>
</tr>
<tr>
<td>Years with Cohort greater than 10</td>
<td>72%</td>
</tr>
</tbody>
</table>

Starting Cohorts: 2005-2007
Three-year average of the percent of first-year doctoral students who graduated within ten years. First-year doctoral students: Those students who have been coded as doctoral students by the institution and have either completed a master's program or at least 30 SCH towards a graduate degree.

3. Average Time to Degree

<table>
<thead>
<tr>
<th>Average Years to Degree</th>
<th>Students Starting 2005-2007</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5.1</td>
</tr>
</tbody>
</table>

Three-year average of the registered time to degree[3] of first-year doctoral students within a ten year period. [3] Registered time to degree: The number of semesters enrolled starting when a student first appears as a doctoral student until she completes a degree, excluding any time taken off during graduate study. The number of years is obtained by dividing the number semesters by three.

4. Employment Profile

<table>
<thead>
<tr>
<th>Year</th>
<th>Employed</th>
<th>Percent</th>
<th>Still Seeking Employment</th>
<th>Percent</th>
<th>Unknown</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014-2015</td>
<td>14</td>
<td>93%</td>
<td>1</td>
<td>7%</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>2015-2016</td>
<td>5</td>
<td>83%</td>
<td>1</td>
<td>17%</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>2016-2017</td>
<td>10</td>
<td>71%</td>
<td>4</td>
<td>29%</td>
<td>0</td>
<td>0%</td>
</tr>
</tbody>
</table>

Employment Profile (in limited one year of graduation). For each of the three most recent years, the number and percent of graduates by year employed, those still seeking employment, and unknown.

5. Admissions Criteria

GPA greater than or equal to 3.25/4.0; GRE (verbal, quantitative) greater than or equal to V152, Q160.

6. Percentage Full-Time Students

<table>
<thead>
<tr>
<th>Year</th>
<th>Percentage Full-Time Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall 2014</td>
<td>97.2%</td>
</tr>
<tr>
<td>Fall 2015</td>
<td>91.2%</td>
</tr>
<tr>
<td>Fall 2016</td>
<td>93.2%</td>
</tr>
</tbody>
</table>

FTS/Number of students enrolled for the last three fall semesters.

7. Average Institutional Financial Support Provided

For those receiving financial support, the average monetary institutional financial support provided per full-time graduate student for the prior year, from assistantships, scholarships, stipends, grants, and fellowships. Does not include tuition or benefits.

Total: $22,980.32
<table>
<thead>
<tr>
<th>Table 1.7 THECB 18-Characteristics (continued)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>8</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>9</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>10</strong></td>
</tr>
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<td></td>
</tr>
<tr>
<td><strong>11</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>12</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>13</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>14</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>White</td>
</tr>
<tr>
<td>Black</td>
</tr>
<tr>
<td>Hispanic</td>
</tr>
<tr>
<td>Other</td>
</tr>
<tr>
<td><strong>15</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>White</td>
</tr>
<tr>
<td>Black</td>
</tr>
<tr>
<td>Hispanic</td>
</tr>
<tr>
<td>Other</td>
</tr>
<tr>
<td><strong>16</strong></td>
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<td><strong>17</strong></td>
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1.6.1 Departmental Excellence Outcomes and Criteria

Aerospace Engineering tracks various criteria related to our internal goals for program outcomes and to help ensure continual improvement. The following outcomes were defined to achieve the departmental mission:

1. **The program and faculty will be excellent**: The faculty will represent the core areas of Aerospace Engineering. They will have advanced knowledge to prepare students with the knowledge needed for the rapidly changing aerospace and related industries.

2. **Research will be of high quality**: The research will be of the high quality required for M.S. thesis and Ph.D. dissertation studies.

3. **Applicants will be diverse and of high quality**: The Ph.D. student applicants will be diverse and of high quality as measured by the diversity of the student body, previous degrees from other schools, GRE scores, GPA standards and national student awards.

4. **Graduates will be of High Quality and Master the Knowledge Required of their Degree Program**: Graduates will master the theories, concepts, principles, and practices associated with their discipline enabling them to live and work productively in a global, diverse and rapidly changing field.

5. **Graduates will communicate complex information effectively (M.S. and Ph.D only)**: Graduates will be able to effectively communicate complex information in both written and oral form.

The following criteria were defined to assess our success in achieving the above outcomes.

1. **Program Ranking**: The department goal is to achieve a #1 ranking among public universities.

2. **Research Activity**: The departmental goals are that each faculty member establishes a well-funded research program of national prominence ($300K/yr), and produces, with their students, at least 3 archival journal publications/year, and maintains 2 M.S. and 3 Ph.D. students/year.

3. **Graduate Student Enrollment**: The departmental goal is to maintain the Ph.D. enrollment at 3 per faculty, while maintaining high GPA and GRE standards.

4. **University Distinguished Professors**: The departmental goal is to maintain the number of Distinguished Professors at 10%. The University Distinguished Professor designation denotes a faculty member who is recognized as being in the top five percent of their field.

5. **NAE Members**: The departmental goal is to maintain a faculty body with at least 10% NAE members. The National Academy of Engineering (NAE) mission is to promote the technological welfare of the nation by marshaling the knowledge and insights of eminent members of the engineering profession.
6. **GRE Scores**: The departmental goal for the GRE of incoming Ph.D. students is greater than 312. We consider the GRE an indicator of the quality of a graduate student’s preparation.

7. **GPA Standards**: The target GPA for graduating Ph.D. students is greater than 3.5. This is also the admission standard for incoming Ph.D. students. We consider GPA to be an indicator of the quality of a graduate student’s preparation.

8. **Diverse Student Body**: The departmental goal is to continue to admit diverse and qualified students, with the target of 10% of under-represented groups and 20% women.

9. **Teaching Evaluations**: The department goal is that teaching be excellent as assessed by the graduate students. In terms of numerical evaluation scores, our target values are 4 out 5 overall. Hence, the department actively tracks student teaching evaluations for every course every semester to ensure that the teaching is meeting student evaluations.

10. **Curriculum Evaluations**: The department goal is to maintain a curriculum that is responsive to industrial and research needs.

11. **Teaching Facilities**: The department maintains classrooms with computer projection systems. In addition, the department maintains the Graduate Computing Laboratory for education and research activities.

12. **Research Facilities**: The department maintains an extensive suite of modern, well instrumented research facilities and laboratories.

13. **Graduate Student Development**: The department maintains a weekly invited seminar series (students are required to attend 5 per semester). In addition, the department offers a mandatory AERO 681 Course that includes sections on communication (seminar) and professional development.

The relationship between the criteria and the program outcomes is given in Table 1.8.

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<th>Criterion</th>
<th>Outcome</th>
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Table 1.8 Mapping of Criteria to Outcomes
1.6.2 Student Learning Outcomes and Metrics — WEAVEOnline

The WEAVEOnline system used by Texas A&M University provides a platform for establishing goals, objectives, and metrics (i.e., strictly quantitative criteria) related to student learning outcomes. These are related to but more specifically student-focused than the set of objectives and criteria described in Section 1.6.1 which encompasses the entire graduate program. WEAVEOnline tracks learning outcomes and associated metrics separately for each degree program, the B.S., M.E., M.S., and Ph.D. in Aerospace Engineering. The three graduate programs are relevant here. Because the trajectory and specific outcomes of research-based degrees can vary so widely, we have developed only a small set of universal goals for each of our graduate programs. Ph.D. students are (1) to obtain the core competencies necessary to function as aerospace engineers, (2) to communicate effectively, and (3) to demonstrate independent research competence. M.S. students are (1) to obtain the core competency and (2) to communicate effectively. Most M.S. students also achieve research competence but not always independently from their research advisors. Finally, M.E. students are simply expected to achieve goal (1) to obtain the core competency. Because the M.E. degree is coursework only and does not require the defense of a research project, there is limited ability to train and evaluate our effectiveness for communication skill with these students and they typically are not trained to perform research.

To evaluate student learning outcomes against each of these goals, we collect data in various venues mostly not connected to course grades. Course grades tend to be tied to certain specific skills and every student takes different course plans so grades alone do not provide specific metric data for evaluating these outcomes. Evaluations tied to Ph.D. qualifying exam (AFQE), preliminary and final defense performances are also discouraged. To evaluate (1), the competency necessary to function as aerospace engineers, we evaluate each M.S. and Ph.D. student who gives a research presentation in the Professional Communication section of the AERO 681 Seminar course. Every student is required to complete this task and, as part of his or her presentation, the instructor and other students evaluate the presenter using a rubric that evaluates how well the student places his or her work within the field of aerospace engineering, develops and defends their ideas, and makes recommendations about how the work could impact the field. A separate rubric is used in the same course to evaluate outcomes related to outcome (2) effective communication. Evaluating a student’s communication skills that are developed in the AERO 681 seminar is separate from the technical competence and instead focus on elocution, clarity, and related skills. For Ph.D. students, outcome (3) to demonstrate independent research competence is measured by means of presenting a research paper at a conference. The assumption is that a student who can author and present a paper has gained significant research skill to be trusted with a public presentation by his or her advisor. Because M.E. students only participate in course work, their performance in the three graduate courses that directly support the Ph.D. qualifying exam are used as a metric for aerospace engineering competence.
1.7 Analysis Questions

1.7.1 How does the program’s strategic plan create a path toward excellence and how does it align with College and University Priorities?

As described in Section 1.2.4, the mission of the Texas A&M University Aerospace Program is to serve the Nation, State of Texas, Texas A&M University, and the profession by (1) providing a quality undergraduate and graduate aerospace engineering education, (2) advancing the engineering and science knowledge through research, assisting industry in technical applications and innovations, and (4) serving the aerospace profession through leadership. Our vision is to provide a nationally and internationally renowned aerospace program that attracts the world's top faculty and students and promotes a passion for learning and applying the knowledge of science and engineering to lead in providing solutions to the most challenging problems in the field.

The strategic plan developed in 2011 and included as Appendix A created five multidisciplinary research thrust areas and provides the department’s strategic guidance as we strive to achieve our goal of becoming the nation’s #1-ranked aerospace engineering program. While not intended to be permanent, the five topic areas have remained robust in both their alignment with national needs and the research directions of College of Engineering and TEES. The specific alignments between the Department’s strategic plan and that of the College of Engineering are given above in Table 1.1. Alignment of faculty groups and individual faculty are given in Tables 1.2 and 1.3, respectively.

This close alignment has positioned the department to compete successfully for College and University resources. The department has successfully engaged the Chancellor’s Research Initiative to recruit four members of the National Academy of Engineering, as well as cadre of junior faculty in their research areas. This has been a game changing program for aerospace engineering. A second example is the Research Development Fund (RDF), which is an internal major research instrumentation program. The impact of this success has been dramatic in terms our growth in faculty, students, research activity, new laboratories, and an improved national ranking.

1.7.2 What are the changes and improvements since the previous APR?

Strategic Growth — Since the last review in 2011, the Department of Aerospace Engineering has undergone significant growth with the faculty increasing from 27 in 2013 to 39 in 2018. Four of the twelve faculty hires are in the National Academy of Engineering. This targeted growth was fueled by TAMU System Chancellor’s Research Initiative (CRI), the State of Texas Governor’s Research Initiative (GURI), and the College of Engineering 25 × 25 campaign, a college-level program to double the engineering enrollment from 12,500 in 2012 to 25,000 in 2025. These programs provided resources to attract top researchers and cluster teams. The founding and success of Hagler Institute of Advanced Study, by Professor Junkins (Aerospace) helped to enable this success by providing a venue to attract top researchers from around the world to visit TAMU and interact with the faculty. These programs have proven very effective in the sense that the NAE faculty are developing new long-term research programs and new laboratories, and are mentoring
new junior faculty. This opportunity is laying the foundation for long-term stability within the department, where there are current 22 full professors and 17 junior faculty. There also currently four unfilled junior faculty positions, and additional opportunities for CRI and GURI hires.

External research funding and the graduate student population were decreasing at the time of the last program review. These numbers have recently rebounded and are growing again as the funding situation improves and new faculty establish their research programs.

**Response to the 2011 Program Review** — The 2011 Doctoral Program Review Committee made a series of recommendations to improve the doctoral (graduate) program. A summary of the recommendations and corresponding actions are summarized below.

1. Streamline the doctoral qualifying exam process:

Before addressing this recommendation, we briefly describe the current examination process. The qualifying exam process consists of two steps: the Aerospace Fundamentals Qualifying Exam (AFQE) and the research preliminary exam (as described by OGS). Each step serves a fundamentally different purpose. The AFQE exam is a written exam administered after the first year in the Ph.D. program. This exam is at the senior undergraduate/first year graduate level, and is comprised of three parts, one from each of the three main disciplines in Aerospace Engineering. The purpose of the AFQE exam is for the students to demonstrate core competency within Aerospace Engineering. The preliminary exam is a research proposal defense, with the option for additional examinations by the committee. The primary purpose of the prelim examination is to ensure that the students have a clear understanding of Ph.D. level research and that they have formulated a well thought-out research plan.

As an action item, we have implemented a simplified three-step Ph.D. Roadmap. A Doctoral Program Guide was designed and approved by the faculty to provide to our Ph.D. graduate students (during new student orientations, advising consultations and posted on the department website at [https://engineering.tamu.edu/media/5190850/PhD-Program-Guide.pdf](https://engineering.tamu.edu/media/5190850/PhD-Program-Guide.pdf). The Ph.D. program guide and equivalent guides for the M.S. and M.E. programs are also included as Appendix E.

To improve the student experience and allay their concerns, the Team noted that the department should provide more clarity regarding the doctoral qualifying exam (Aerospace Engineering Qualifying Exam). The document in the link above will alleviate some concerns, as will an initial informational meetings now held in early February for students registered to take the AFQE. The students have an opportunity to air specific concerns and schedule time with faculty test proctors for topic discussions. Results are available 2-4 weeks after the mid-May exams.

2. Improve Faculty and Student Diversity:

As pointed out by the review panel, diversity is a continuous challenge for the department and college. Through our discussions with the panel, it became clear that they recognized this is a
national challenge. They also recognized that the department has worked very hard at addressing this issue. We believe, based on our conversations with the panel, that the sentiment here is that we (the departmental and college level leadership) not give up on our efforts, as the department (and other department heads) may have given an impression of defeat. As an example, during the faculty reinvestment process, three out of ten (30%) of the new aerospace engineering faculty hires were women. Unfortunately, two of the three left TAMU to meet the professional needs of their spouse. Even with this setback, the department remains committed to diversity in the faculty and students.

The following action items are ongoing and/or proposed to help with this issue:

1) Continue recruiting diverse faculty as we recognize that faculty diversity is a key aspect that helps develop a diverse student body. Of the twelve faculty hired since the 2011 review, 2 are women (including an astronaut who is also an NAE member) and 4 are among URGs (asian or hispanic).

Table 1.9a Faculty Demographics

<table>
<thead>
<tr>
<th>URG</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>4/12</td>
<td>2/12</td>
</tr>
</tbody>
</table>

2) Continue to recruit a more diversified advisory board, as the board members are often the ambassadors of our program and can help with student and faculty recruiting. We have only made modest progress as only a few members of the board of rolled off. Nonetheless, the board has 2 women and 2 URGs (hispanic and black).

Table 1.9b Advisory Board Demographics

<table>
<thead>
<tr>
<th>URG</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>2/25</td>
<td>2/25</td>
</tr>
</tbody>
</table>

3) Continue to strive to find qualified and diverse graduate students during each recruiting cycle. The progress is summarized in Table 1.9c, where we have lost ground with women students, but gained ground with URG.

Table 1.9c Student Body Demographics

<table>
<thead>
<tr>
<th>Year</th>
<th>% URG</th>
<th>% Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004 - 2010 Average (2011 Self Study)</td>
<td>6%</td>
<td>14%</td>
</tr>
<tr>
<td>2014 - 2018 Average</td>
<td>11%</td>
<td>11%</td>
</tr>
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</table>
This is a challenging issue, and the department is working with the College and University to continue to develop and implement strategies to improve our diversity. The Department Head and both Associate Heads are PIs on an NSF RED program that targets improving the demographics of aerospace engineering. Our approach is to broaden the application set (e.g., medical field) of aerospace skills to attract a wider demographic range. The current focus is on the undergraduate level, where the demographic shortfalls are similar to those of the graduate program). However, if successful, the thesis may carry over to the graduate program as well.

3. Fostering a Culture of Entrepreneurship:

Entrepreneurship is not within our mainstream. Moving beyond our current modest efforts will require a significant culture change for the faculty and students. As an action item, we are working with the Texas Engineering Experiment Station (TEES) to integrate entrepreneurship activities into our Ph.D. programs. Over the period of this review, TEES has established a significant commercialization and entrepreneurial program.⁹

4. Maintaining and Upgrading Expensive Research Facilities

We too recognize that one of the key strengths of the department is the extensive research infrastructure, which is attractive to both government and industrial sponsorship. We also agree that much of this infrastructure is aging. The department plans to address this issue directly. Our proposed action items are to maintain a prioritized list of infrastructural requirements, and to work all possible avenues to maintain a modern infrastructure (overhead return, Permanent University Fund, gifts, direct industry support, etc.). As action items, we have created the Aerospace Engineering Infrastructure Committee and the Aerospace Engineering Safety Coordination Committee. This will remain a continual effort. During this review period, we have replaced the 1940’s motor on the Low-Speed Wind Tunnel (in 2012), made critical structural repairs to its circuit (in 2016), and replaced the two 1980’s compressors (in 2012) supplying high-pressure air to the hypersonic facilities. In addition, renovations are underway at the Riverside (now RELLIS) campus.

5. Co-located space

We agree with the panel’s concern over distributing the departmental graduate student offices and laboratories over multiple buildings. However, the department cannot directly address this issue. We are grateful for the space that has been allocated, and we can only recommend, that as the campus evolves, consideration be given to providing a single location for Aerospace Engineering. As an action item, we will continue to advocate unification in one building, as this will have a long-term positive impact on our interdisciplinary education and research initiatives. Over the course of this review, this issue as escalated, as some of the satellite space was lost to the College of Engineering to

| National Average (ADCA, 2012-17) | 13% | 15% |

⁹ https://tees.tamu.edu/research/commercialization-and-entrepreneurship/
facilitate construction of the Zachry Engineering Excellence Complex (ZEEC). This building was completed in September of 2018. Aerospace is programmed to receive an additional floor in their home building (HR Bright) in January 2019, and two more floors in 2020. Addressing the space issue is essential to the future success of the department.

6. Replacement of Key Senior Faculty

The department has a history of successfully recruiting high profile faculty. We will continue in this tradition as our pillar faculty members announce plans for retirement. We will actively work with the college to maintain our momentum in our active research fields. The hiring discussed in Section 1.2.6 has directly addressed this concern.

7. Policies Document

A policies document did exist at the time of the 2011 review. This document was drafted as a result of a recommendation from the 2003 external review. This document is given to all new students during their orientation. During the orientation meeting, the Associate Department Head provides an overview of the program, and introduces key faculty and staff to help the students navigate the program. Our action item, based on this recommendation, was to make sure the document is more prominently displayed. The Graduate Policy was updated, and, in addition to student orientation, the document is now posted at:

http://catalog.tamu.edu/graduate/colleges-schools-interdisciplinary/engineering/aerospace/ph d/#programrequirementstext

8. Student Fees

The student fee concern was the result of governmental sponsors prohibiting some of the included fees. The problem was exacerbated by the inability of the accounting systems to separate out the prohibited fees during the initial stages of the change. To minimize the impact on the students, the department adopted a standard policy that student fees are covered by the students via an increase in their baseline stipend. We did not see this as a long-term problem as the corrective measures have already been taken. During this review period, the allowable fees are now covered on research grants if the faculty member and sponsor allow.

9. Interdisciplinary Course Implication and Master Schedule

Through conversations, it was determined that the review committee was suggesting that the course offerings be mapped to the five departmental interdisciplinary research thrusts (described in the next chapter). This mapping was accomplished and two-year course offering schedules were developed.
2. Academic Programs and Curricula

2.1 Graduate Programs Offered

The Department of Aerospace Engineering offers three graduate degree programs: the Doctor of Philosophy (Ph.D.), the Master of Science (M.S.), and the Master of Engineering (M.E.). Formally, the M.S. program is available with both thesis and non-thesis options. The non-thesis option is rarely used but remains available for special circumstances. The M.E. degree has replaced the non-thesis M.S. degree for students who wish to complete a coursework-only Master’s degree. Additionally, the College of Engineering offers the Doctor of Engineering degree, with emphasis in various areas, including Aerospace Engineering. Below is a brief description of each degree.

2.1.1 The Master of Science Degree

The Master of Science Degree (with the thesis option) requires a minimum of 32 credit hours of coursework beyond a Bachelor of Science degree plus a written thesis that must be defended in an oral defense. A typical degree program includes 22 or more credits of coursework, 2 required credits of graduate seminar (AERO 681 or MEMA 681), and no more than 8 hours of research credit. It is recommended that approximately one third of the courses be taken outside the Department of Aerospace Engineering. The exact distribution of coursework and research credits is determined by the student and their Graduate Advisory Committee with approval of the Department Head or the Director of the Graduate Program. A M.S. Advisory Committee consists of at least two faculty members in Aerospace Engineering and at least one faculty member outside the department. These faculty must be members of the TAMU Graduate Faculty described above.

For the non-thesis option, the M.S. degree requires a minimum of 36 credit hours of approved courses beyond the Bachelor of Science plus a technical report. Of these 36 hours, at least 18 credit hours must be in the major department and at least six credit hours must be in supporting fields. The department requires that 2 of the 36 credits must be graduate seminar (AERO 681 or MEMA 681). A technical report is required for this option. Additional courses and the content of the required technical report are left to the discretion of the student’s Graduate Advisory Committee. Again, the non-thesis M.S. degree is rarely pursued and is retained only as an option for special circumstances.

2.1.3 The Master of Engineering Degree

The Master of Engineering Degree requires 30 credit hours of coursework beyond a Bachelor of Science degree. Similar to the M.S. degree, approximately one third of the courses are taken outside the Department of Aerospace Engineering. The M.E. degree does not require research or a thesis and research credit hours may not be applied to the 30-hour requirement degree. A student pursuing a M.E. degree has a single faculty advisor who provides academic and career advice. Graduate seminar credits are encouraged but not required for the M.E. degree. Referring to Fig. 1.1, the M.E.
degree is quickly gaining in popularity among students who wish to pursue industrial careers. As the Department begins to offer substantial distance-education graduate courses (beginning in Fall 2018), all of the degree-seeking student enrolled in distance sections will be pursuing M.E. degrees.

2.1.4 The Doctor of Philosophy Degree

The Doctor of Philosophy Degree requires a minimum of 64 credit hours beyond the M.S. degree or 96 hours beyond a Bachelor’s degree. Students may enter the Ph.D. program with or without an M.S. degree and the two different credit-hour requirements reflect this. Additionally, the degree requires students to write and conduct an oral defense of a research dissertation. A typical degree program will include 20–40 credits of coursework, two required credits of graduate seminar (AERO 681 or MEMA 681), and the balance in research credits. The distribution of course work and research credits is determined by the student and their Graduate Advisory Committee with approval of the Department Head or the Director of the Graduate Program. A Ph.D. Advisory Committee consists of at least three faculty members in Aerospace Engineering and at least one faculty member outside the department. These faculty must be members of the TAMU Graduate Faculty.

In May, after the completion of the first two semesters of course work (or after the first three semesters if a student’s first semester is spring), each Ph.D. student must pass the Aerospace Fundamentals Qualifying Examination (AFQE). Failure to pass the AFQE results in dismissal from the Ph.D. program. After completion of degree program course work and at least six months prior to the final dissertation defense, each Ph.D. student must pass a Preliminary Examination administered by the student’s Advisory Committee. The AFQE and preliminary examination are described in detail in the section dealing with Degree Program Requirements.

2.1.5 The Doctor of Engineering Degree

The Doctor of Engineering Degree requires a minimum of 64 credit hours beyond the M.S. degree or 96 hours beyond a Bachelor’s degree. The Doctor of Engineering degree is not research oriented. Instead, it is intended to prepare students to work at the highest levels of engineering professional practice. The College of Engineering administers this degree and the Department of Aerospace Engineering has awarded this degree only once in the previous decade and not since the previous Graduate Program Review.

2.2 Administration of the Graduate Program

The Graduate Programs in Aerospace Engineering are jointly administered by the Department of Aerospace Engineering and the TAMU Office of Graduate and Professional Studies. The function and role of each is described below.
The Office of Graduate and Professional Studies (OGAPS) is directed by the Associate Provost for Graduate and Professional Studies, Dr. Karen Butler-Purry. The Associate Provost administers the university’s various graduate programs and advocates for graduate students and their education. OGAPS and the Registrar’s office maintain all official student records. OGAPS further develops, maintains, and administers uniform graduate procedures and maintains the TAMU graduate catalog which can be found at http://ogaps.tamu.edu/. The OGAPS office and the Associate Provost is specifically charged with

- establishing procedures that guarantee the highest quality educational experience at the graduate level;
- fostering and facilitating interdisciplinary and intercollegiate graduate programs and research activities; and
- maintaining and enhancing an environment conducive to creative scholarship and scientific inquiry.

Additionally, OGAPS is responsible for administering the Graduate Faculty. The Graduate Faculty at Texas A&M University consists of the President, the Provost and Executive Vice President, the Associate Provosts, the Deans of the various Colleges, selected Directors, and properly qualified academic groups. For faculty at TAMU to be included in the Graduate Faculty requires participating in graduate programs by directing or administering graduate work, by conducting research and publishing, or by other direct and substantial contributions to the graduate programs of the University. Examples of such contributions include service on Graduate Instruction Committees or administrative assignments related to graduate education. Individuals who have not been appointed to the Graduate Faculty may not serve on student advisory committees unless special approval is granted by the Associate Provost for Graduate and Professional Studies.

An individual’s nomination to the Graduate Committee Faculty is initiated by the Department Head or, under special circumstances, the Dean of the relevant College. Nominations are accepted and evaluated using procedures maintained by OGAPS¹. All the full-time tenure-track faculty members of the Department of Aerospace Engineering are members of the graduate faculty.

Besides TAMU faculty members, Special Appointments can be made for qualified individuals from the faculty and professional staff of Texas A&M University System agencies such as Texas A&M AgriLife Research, Texas A&M Forest Service, Texas A&M AgriLife Extension, Texas A&M Engineering Experiment Station, Texas A&M Transportation Institute; from employees of affiliated research organizations, such as USDA, located near Texas A&M campus sites, and from affiliated hospitals and clinical organizations. Special Appointments are temporary appointments to the Graduate Faculty that allow for membership on a specific student's thesis or dissertation committee.

¹https://ogaps.tamu.edu/OGAPS/media/media-library/documents/Forms%20and%20Information/Graduate-Committee-Faculty-Membership-Guidelines.pdf
in an advising but non-voting capacity. The Special Appointment does not count towards the minimum number of four graduate faculty necessary to form the committee.

The Graduate Program Director in the Department of Aerospace Engineering serves as a liaison between the Department and the Office of Graduate and Professional Studies and is a member of the College of Engineering Graduate Instruction Committee. The Graduate Program Director is also responsible for establishing and maintaining departmental graduate policies and procedures, departmental graduate student records, procedures for applications processing as well as preparing fellowship nominations and offer letters to prospective research and teaching assistants. The Graduate Program Director is a delegate for the Department Head in a variety of matters related to graduate education. Dr. John Valasek and Dr. Diego Donzis serve as the Department Graduate Program Director and Co-Director respectively. They are assisted by Ms. Gail Rowe who serves as the Department's Academic Advisor for its Graduate Programs.

The Aerospace Department faculty, and specifically the Director and Co-Director of the Graduate Program, are responsible for maintaining and enhancing the quality of applicants, admitted students, degree programs, thesis and dissertation proposals, qualifying and preliminary examinations for doctoral candidates, course inventory and content, matriculation of M.S. students into the Ph.D. program, and related matters. All degree programs, thesis and dissertation proposals and new course offerings require Department Head approval. The Ph.D. qualifying exam, preliminary exam and final defense are discussed in detail in a later section.

2.3 Program Curricula

2.3.1 Master of Science Curriculum

The Master of Science Degree (with the thesis option) requires a minimum of 32 credit hours of approved courses and research. University regulations allow up to eight hours of the 32 to be research. The research must lead to a thesis that “reflects a comprehensive understanding of the pertinent literature and expresses in clear and legible English, the problem(s) for study, the method, significance and results of the student’s original research.” A final oral defense of the thesis is required. The student must complete nine credit hours in residence during one regular semester or one 10-week summer session to meet the residency requirement.

The student’s program is under the direction of an advisory committee approved by the Department Head and the University Office of Graduate and Professional Studies. The student’s advisory committee consists of no fewer than three members of the graduate faculty representative of the student’s field(s) of study and research. The chair or one of the co-chairs of the advisory committee must be from Aerospace Engineering and at least one or more of the members must be from a department other than the student’s major department. This committee defines and approves the student’s degree plan, the thesis proposal, and conducts a final oral thesis defense, and provides
other direction as appropriate. The Automated Degree Plan System is located on the web site http://ogsdpss.tamu.edu. Degree requirements for the MS/Thesis Option are presented in Table 2.1. The timeframe for earning the degree is one and a half to two years.

### Table. 2.1. Master of Science (Thesis Option)

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<thead>
<tr>
<th>Course</th>
<th>Number of Courses</th>
<th>Total Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seminar (AERO 681)</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Departmental &amp; Supporting</td>
<td>varies (7-8)</td>
<td>22 (minimum)</td>
</tr>
<tr>
<td>Supporting Courses</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Research (AERO 691)</td>
<td>NA</td>
<td>8 or less</td>
</tr>
<tr>
<td>Total Credit Hours</td>
<td></td>
<td>32 (min), 33 (max)</td>
</tr>
</tbody>
</table>

The department does not require core courses for the M.S. degree. Typical degree programs include advanced mathematics courses, departmental courses supporting the student’s major thrust area, and supporting courses from other departments. A maximum of 8 credits of research (AERO 691) is permitted in the degree program. Each student is required to take the 1-credit departmental seminar course for 2 semesters (AERO 681). Approximately one third of the student’s credit hours are encouraged to be outside Aerospace Engineering.

The rarely used non-thesis M.S. degree has similar requirements except that a thesis is not required and a minimum of 36 approved credit hours are required on the degree program. Of these 36 hours, 18 credit hours must be in the major department and a minimum of six credit hours must be in supporting fields. Degree requirements for the MS/Non-Thesis Option are presented in Table 2.2. The timeframe for earning the degree is one and a half to two years.

### Table. 2.2 Master of Science (Non-Thesis Option)

<table>
<thead>
<tr>
<th>Course</th>
<th>Number of Courses</th>
<th>Total Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seminar (AERO 681)</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Departmental</td>
<td>Varies</td>
<td>18 (minimum)</td>
</tr>
<tr>
<td>Supporting Depts.</td>
<td>Varies</td>
<td>6 (minimum)</td>
</tr>
<tr>
<td>Other</td>
<td>Varies</td>
<td>10 (minimum)</td>
</tr>
<tr>
<td>Total Credit Hours</td>
<td></td>
<td>36 (minimum)</td>
</tr>
</tbody>
</table>
2.3.2 Master of Engineering Curriculum

The Master of Engineering degree requires a minimum of 30 semester credit hours of approved courses, with some restrictions on the use of transfer credit, special topics courses, etc. Approximately one-third of the required 30 credit hours of coursework will be taken in fields outside of the major field of study. The student’s advisory committee for the Master of Engineering is a member of the Graduate Affairs Committee or other faculty member in the student’s principal field of interest or the Director of Graduate Programs. If additional committee members are deemed necessary or desirable by the department, the advising committee chair, in consultation with the student, will select additional members for the advisory committee. The advising faculty member or committee will guide the student in selection of appropriate courses. The Department requires submission of a degree plan by the end of the second semester. The Advisory Committee reviews the student’s degree program and provides other direction as appropriate. The timeframe with the Department for earning the degree is one to one and a half years.

The Fast Track program is tailored for high-achieving undergraduate students who wish to accelerate work toward a graduate degree. The M.E. Fast Track allows qualified students (i.e., those who meet M.E. admissions requirements) to earn up to nine hours of credit towards their graduate degree while simultaneously meeting undergraduate course requirements. The nine hours consist of 600-level aerospace courses which fulfill undergraduate requirements through Credit by Examination. Consequently, through Fast Track a student can earn a Master of Engineering degree in two semesters beyond their undergraduate degree. Students must have completed an application to Fast Track prior to starting senior technical electives, the courses that are typically replaced by graduate courses.

2.3.3 Doctor of Philosophy Curriculum

The Doctor of Philosophy Degree requires a minimum of 64 credit hours beyond the M.S. degree or 96 hours beyond a Bachelor’s degree. Additionally, the degree requires students to write and conduct an oral defense of an original research dissertation. Ph.D. coursework plus the research and preparation leading to the successful defense of a dissertation is designed to give thorough and comprehensive knowledge of a student’s professional field and intensive training in research methods. The basis for granting the degree is the candidate’s knowledge of the subject matter of a broad field of study and a demonstrated ability to add knowledge to that field through new, independent research. In addition, the candidate must have acquired the ability to express research results clearly in writing and orally.

A typical degree program will include 20–40 credits of coursework, two required credits of graduate seminar (AERO 681 or MEMA 681), and the balance in research credits. The distribution of course work and research credits is determined by the student and their Graduate Advisory Committee with approval of the Department Head or the Director of the Graduate Program. The Ph.D. also requires a student to be in residence at Texas A&M University.
The faculty member and student select the advisory committee to direct the student’s doctoral program. A student’s advisory committee consists of no fewer than four members of the graduate faculty representative of the student’s several fields of study and research. The chair or co-chair must be from the student’s department (or intercollegiate faculty, if applicable), and at least one or more of the members must be from a department other than the student’s major department. The advisory committee evaluates the student’s previous education and degree objectives. Then, with the student, develops a proposed degree plan and outlines a research problem which, when completed, will constitute the basic requirements for the degree. The Department requires the degree plan by the end of the student’s third semester. The committee members’ approval of the degree plan indicate their willingness to accept the responsibility for guiding and directing the entire academic program of the student and for initiating all academic actions concerning the student. The online degree plan must be filed with the Office of Graduate and Professional Studies prior to the deadline imposed by the student’s college and no later than 90 days prior to the preliminary examination. The degree plan system is located at http://ogsdpss.tamu.edu.

To be admitted to candidacy for a doctoral degree in aerospace engineering, a student must have (a) satisfied the residency requirements, (b) passed the Aerospace Fundamentals Qualifying Exam, (c) passed the preliminary examination, (d) completed all formal coursework, and (e) filed an approved dissertation proposal with the Office of Graduate Studies. The final examination is not authorized for any doctoral student who has not been admitted to candidacy. The details of the qualifying, preliminary and final examinations are provided in a later section.

The research proposal must be approved at a meeting of the student's advisory committee, at which time the feasibility of the proposed research and the adequacy of available facilities are reviewed. The approved proposal is submitted to the Office of Graduate Studies at least 14 weeks prior to the close of the semester or summer session in which the student expects to receive the degree or prior to the scheduling of the final examination, whichever comes first, for final approval.

The timeframe within the Department for earning the degree is nominally four to five years. The State of Texas recently instituted a 99-hour cap rule which requires that students who complete more than 99 hours of graduate credit beyond the Masters degree to pay out-of-state tuition and fees regardless of whether they are funded or unfunded, state residents or not. This policy is in-place to encourage students to graduate within the four-year period.

The department does not require core courses for the Ph.D. degree program. However, because of the qualifying examination requirement, many students choose to take AERO 602 – Principles of Fluid Motion, AERO 603 – Continuum Mechanics, and AERO 622 – Spacecraft Dynamics and Control. Typical degree programs will include advanced mathematics courses, departmental courses supporting the student’s major thrust area, and supporting courses from other departments. Each student is required to take the departmental seminar course for 2 semesters (AERO 681). Degree requirements are presented in Table 2.3.
All Ph.D. students must complete three examinations. The first, required by the department, is the Aerospace Fundamentals Qualifying Exam (AFQE). The second and third are the Preliminary Exam and the Dissertation Defense which are required of all Ph.D. students at Texas A&M University by the Office of Graduate and Professional Studies.

<table>
<thead>
<tr>
<th>Course</th>
<th>Number of Courses</th>
<th>Total Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seminar (AERO 681)</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Departmental</td>
<td>Variable</td>
<td>Variable</td>
</tr>
<tr>
<td>Supporting Depts.</td>
<td>Variable</td>
<td>Variable</td>
</tr>
<tr>
<td>Research (AERO 691)</td>
<td>Variable</td>
<td>Variable</td>
</tr>
<tr>
<td>Total Credit Hours</td>
<td></td>
<td>64 beyond the M.S.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>96 beyond the B.S.</td>
</tr>
</tbody>
</table>

**Ph.D. Qualifying Examinations** — The Aerospace Fundamentals Qualifying Examination (AFQE) is administered to ensure that students pursuing a doctoral degree in aerospace engineering have a solid understanding of the fundamental physical and mathematical concepts that are the foundations aerospace engineering: Aerodynamics and Propulsion (A&P), Materials and Structures (M&S), and Dynamics and Controls (D&C). All students who enroll pursuing a Ph.D. or who move from a M.S. to pursuing a Ph.D. are required to take the AFQE in May after their first year of study (two semesters for students starting the Ph.D. in the Fall or three semesters for student starting in the Spring). The AFQE cannot be postponed.

The examination covers fundamental topics from the three broad disciplines of A&P, D&C and M&S, as well as the mathematics associated with such disciplines. It is structured to test mastery and understanding of the topics at the Master of Science level. The score from the AFQE, the student’s academic record, and recommendations from a student’s advisor(s) are used as a total evaluation of performance. A positive evaluation will be the basis for continuation in the Ph.D. program. The Graduate Affairs Committee consisting of the Director of Graduate programs plus one faculty member from each discipline area determines whether the student has passed or failed with input from the student’s advisor. Students who fail the exam are given a second opportunity to pass. This can be in the form of an oral exam in the area(s) of weakness several weeks after the May exam or a complete retake in early August following the original exam. Students who fail the AFQE upon their second opportunity or who choose not to make a second attempt may switch to a Master’s program or they must leave the department.

The AFQE consists of three three-hour closed-book examinations covering each of the three broad discipline areas. The examinations are generally given on a Monday-Wednesday-Friday timeframe. The examinations are conducted by a faculty committee; typically, those who teach the
baselines courses in these three areas, i.e., AERO 602 – Principles of Fluid Motion, AERO 603 – Continuum Mechanics and AERO 622 – Spacecraft Dynamics and Control. While the AFQE principally covers these three general discipline areas, the exam content is not restricted to topics covered by these suggested courses alone, nor is the AFQE a repeat of those courses’ final exams. Instead, the content tends to be more fundamental and, where appropriate, shows connections between discipline areas. The pass rate for the AFQE is summarized in Table 2.4. The pass rate is typically around 90% which reflects the high admission criteria including GRE and GPA requirements and faculty commitment to fund admitted students.

<table>
<thead>
<tr>
<th>Year</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
<th>16</th>
<th>17</th>
<th>18</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pass Rate (%)</td>
<td>90</td>
<td>95</td>
<td>93</td>
<td>86</td>
<td>100</td>
<td>100</td>
<td>94</td>
<td>96</td>
</tr>
</tbody>
</table>

**Ph.D. Preliminary Examinations** — The second examination is the Preliminary Exam which is conducted near the end of the student's formal course work on the degree plan and at least 14 weeks prior to the final examination. Through the preliminary examination, the student’s advisory committee should be satisfied that the student has demonstrated mastery of the subject matter of all fields in the program, an adequate knowledge of the literature in these fields, and an ability to carry out bibliographical research. The examination consists both of written and oral components unless otherwise recommended by the student’s advisory committee and approved by the Office of Graduate Studies. The written part of the examination will cover all fields of study included in the student’s degree plan. Each member of the advisory committee is responsible for administering a written examination in his or her particular field, unless he or she chooses to waive participation in this part of the examination. Two or more members of the advisory committee may give a joint written examination. One or more members may require a student to take a departmental or intercollegiate faculty examination to supplement or replace a written examination. Each written examination must be completed and reported as satisfactory to the chair of the advisory committee before the oral portion of the examination may be held. In case any written examination is reported unsatisfactory, the entire advisory committee must agree (1) to proceed with the oral portion of the preliminary examination, or (2) to adopt another course of action regarding the unsatisfactory written examination. Either procedure is subject to the approval of the Office of Graduate Studies.

After passing the required preliminary oral and written examinations for the doctoral degree, the student must complete all remaining requirements for the degree within four calendar years. Otherwise, the student will be required to repeat the preliminary examination.

Prior to scheduling the preliminary examination with the other committee members, the committee chair reviews eligibility criteria with the student. These criteria include:
• Student is registered at Texas A&M University for the semester or summer term during which any portion of the preliminary examination may fall. If the entire examination falls between semesters, then the student must be registered for the term immediately preceding the examination.

• An approved degree plan was on file with the Office of Graduate Studies at least 90 days prior to the first written examination.

• Student’s cumulative GPR is greater than 3.0.

• Student’s degree plan GPR is greater than 3.0.

• All English language proficiency requirements have been satisfied.

• All committee members have scheduled or waived the written portion and agreed to attend the oral portion of the examination or have found a substitute. Only one substitution is allowed and it cannot be for the committee chair.

• At the end of the semester in which the exam is given, there are no more than 6 hours of coursework remaining on the degree plan (except 681, 684, 690, 691 and 692). The head of the student’s department (or Chair of the Intercollegiate Faculty, if applicable) has the authority to approve a waiver of this criterion.

• The time span from the first written examination to the oral is no more than three weeks. (In cases of department-wide written examinations, this criterion is not applicable.) The head of the student’s department has the authority to approve a waiver of this criterion.

Credit for the preliminary examination is not transferable. If a departmental or intercollegiate faculty examination is used as part of the written portion of the preliminary examination, it must be the last examination offered prior to the date scheduled for the preliminary examination. In the schedule of the written portion, all members of the student’s advisory committee are to be included.

In case a student is required to take, as a part of the written portion of a preliminary examination, an examination administered by a department or intercollegiate faculty, the department or intercollegiate faculty must:

• Offer the examination at least once every six months. The departmental or interdisciplinary degree program examination should be announced at least 30 days prior to the scheduled examination date.

• Assume the responsibility for marking the examination satisfactory or unsatisfactory, or otherwise graded, and in the case of unsatisfactory, stating specifically the reasons for such a mark.

• Forward the marked examination to the chair of the student’s advisory committee within one week after the examination.

The chair of the student’s advisory committee is responsible for making all written examinations available to the members of the advisory committee at or before the oral portion of the examination.
A positive vote by all members of the graduate committee with at most one dissention is required to pass a student on his or her exam. A department or interdisciplinary degree program can have a stricter requirement provided there is consistency within all degree programs within a department or interdisciplinary program.

Upon approval of the student’s advisory committee, with no more than one member dissenting, and the approval by the Office of Graduate Studies, a student who has failed the preliminary examination may be given one re-examination, when adequate time has been given to permit the student to address the inadequacies emerging from the first examination (normally six months). The student and the advisory committee jointly negotiate a mutually acceptable date for this purpose.

Ph.D. Final Examinations and Dissertation Defense — The candidate for the doctoral degree must pass a final examination by deadline dates announced in the Office of Graduate Studies calendar each semester or summer session. No student is given a final examination unless her or his current official GPR is 3.0 or better and she or he has been admitted to candidacy. There must be no un-absolved grades of D, F or U for any course listed on the degree plan. To absolve a deficient grade, a student must have repeated the course and achieved a grade of C or better. A student must have completed all coursework on his or her degree plan with the exception of any remaining 691 (Research) for which he/she is registered. Faculty have the option of giving Incomplete (I) grades for all 691 research hours until the time where the student successfully passes the final exam; at which time the I grades in 691 are changed to S (Satisfactory).

The student's advisory committee conducts the final examination. The final examination is not administered until the student has been “admitted to candidacy” for a doctoral degree, which requires that a student must have: (1) satisfied the residency requirements, (2) passed the preliminary examination, (3) completed all formal coursework, and (4) filed with the Office of Graduate Studies the approved dissertation proposal. In addition, the final examination for the Ph.D. student is not administered until such time that the dissertation is available in substantially final form to the student’s advisory committee, and all concerned have had adequate time to review the document. Although the final examination may cover the broad field of the Ph.D. candidate's training, the major portion of the time is generally devoted to the dissertation and closely allied topics. Persons other than members of the graduate faculty may, with mutual consent of the candidate and the major professor, be invited to attend a final examination for an advanced degree. A positive vote by all members of the graduate committee with at most one dissension is required to pass a student on his or her exam. Once the dissertation is acceptable to all advisory committee members and the department head, the student must file a pdf copy of the dissertation in final form with the university Thesis Office. A library bound copy is provided to the department.

A request for permission to hold and announce the final examination must be submitted to the Office of Graduate and Professional Studies a minimum of 10 business days in advance of the scheduled date of the exam. OGAPS must be notified in writing of any cancellation or change to the
scheduled examination date. Exam results must be submitted with original signatures of only the committee members approved by OGAPS. A positive vote by all members of the graduate committee, with at most one dissent, is required to pass a student on their exam. Examinations that are not completed and reported to OGAPS within 10 business days of the scheduled examination date will be recorded as failures. A doctoral student is allowed only one opportunity to take the final exam. Final examinations must be passed by the dates announced each semester or summer term by OGAPS in order for the student to graduate in that semester.

Examination schedules must be arranged so that all members of Advisory Committee can be present for the Final Examination. Substitutions should be requested only as an absolute necessity. Unless emergency circumstances exist, arrangements for a substitution should be made by the individual member of the Advisory Committee who is to be absent—not by the student involved, the Chair of the Advisory Committee, nor the Head of the student’s major department. If a member must be absent from any scheduled examination, he or she should arrange with a Member of the Graduate Faculty from his or her department to sit at the examination as a substitute and should notify the Committee Chair. No substitutions for the Chair of Advisory Committees will be approved. If a Chair cannot attend a scheduled examination, or if two (or more) members of an Advisory Committee must be absent, the examination must be rescheduled.

Doctoral students have one year from successfully completing the final examination to clear the Thesis Office and graduate. Otherwise, the student will be required to repeat the final examination. With the approval of the advisory committee and department head or chair of the interdisciplinary program, the student may request an extension of the one-year with the submission of a Time Limit Petition to OGS.

2.3.4 Doctor of Engineering Curriculum

The Doctor of Engineering program differs from the Ph.D. in that the research experience is replaced by an internship of at least one calendar year in industry, and a Record of Study, which usually consists of a report on the internship experience, replaces the dissertation. The Doctor of Engineering Degree is primarily administered by the College of Engineering, rather than by the individual department in the College. The objective of this program is the education of men and women to function at the highest levels of the engineering profession, with emphasis on solving problems that arise in the use of technology to benefit mankind. The program seeks to couple understanding of the characteristics of social and business institutions with high competence in engineering problem solving.

The College, with the approval of the University Office of Graduate Studies, under the direction of an advisory committee appoints the student’s program. This committee consists of no fewer than four members of the graduate faculty representative of the student's several fields of study. At least one of these members must be from a department other than the student's administrative
department. The student's internship supervisor, a practicing engineer, also is a member of the advisory committee.

The student's advisory committee has the responsibility for guiding and directing the entire academic and internship program of the student and for initiating all action concerning the student. The committee responsibilities include the proposed degree program, the written and oral qualifying examination, the technical adequacy of the internship program, the qualification of the student to embark on the internship, the internship report, and the final examination. The graduate portion of the student's degree plan must include a minimum of 96 semester credit hours, of which at least 80 credit hours are for coursework. The Professional Internship earns four credit hours per semester for summer term.

The internship experience is intended to be at an organizational level such that the student is able to deal with broadly based problems affecting more than one facet of the organization, rather than a single narrow or specific technical problem. The timeframe within the Department to earn the degree is three to four years.

The Doctor of Engineering examinations are administered by the Academic Dean's office in the College of Engineering, and are not described herein. This program is very rarely utilized in the Aerospace Engineering department.

2.3.5 Graduate Course Offerings

A summary of the all the graduate course offerings by the Aerospace Engineering Department is summarized in the Graduate Catalog. Offerings by Aerospace Engineering are given in Appendix C. The courses taught since the last review is summarized in Table 2.5. In addition, some of our materials and structures faculty members teach courses offered by the Mechanics and Materials (MEMA) and Materials Science and Engineering (MSEN) programs. Courses under these programs are taught jointly by the Mechanical, Civil and Aerospace Engineering Departments. The AERO, MEMA and MSEN courses, together, are considered the departmental course offerings for the department. Finally, each semester our faculty may offer special topics courses. These courses are designated AERO 689. These courses often lead to new regularly scheduled courses with independent numbers. Upcoming AERO 689 courses are listed in Table 2.6.
<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>AERO 601</td>
<td>Theory of Aerodynamics</td>
<td>xx</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>AERO 602</td>
<td>Theory of Fluid Mechanics</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>AERO 603</td>
<td>Continuum Mechanics</td>
<td>xx</td>
<td>xx</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>AERO 605</td>
<td>Theory of Elasticity</td>
<td></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>AERO 606</td>
<td>Multifunctional Materials(^b)</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AERO 608</td>
<td>Nanomechanics</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>AERO 609</td>
<td>Sustainability Metrics and Life Cycle Assessment in Engine</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AERO 615</td>
<td>Numerical Methods in Internal Flow</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>AERO 616</td>
<td>Damage in Composite Materials</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AERO 617</td>
<td>Micromechanics(^b)</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AERO 618</td>
<td>Mechanics of Active Materials</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AERO 620</td>
<td>Unsteady Aerodynamics</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>AERO 621</td>
<td>Aeromechanics of Wind Turbines</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AERO 622</td>
<td>Spacecraft Dynamics &amp; Control</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>AERO 623</td>
<td>Optimal Spacecraft Attitude and Orbital Maneuvers</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>AERO 624</td>
<td>Celestial Mechanics</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
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<tr>
<td>AERO 625</td>
<td>Modern Control of Aerospace Systems</td>
<td>x</td>
<td>x</td>
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<td></td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AERO 626</td>
<td>Estimation of Dynamic Systems</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>AERO 627</td>
<td>Principles of Structural Dynamics</td>
<td></td>
<td></td>
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<tr>
<td>AERO 628</td>
<td>Advanced Spacecraft Dynamics &amp; Control</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>AERO 629</td>
<td>Experimental Aerodynamics</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>AERO 630</td>
<td>Intro Random Dynamical Systems</td>
<td></td>
<td></td>
<td>x</td>
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<td></td>
<td></td>
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<td>AERO 631</td>
<td>Model Predictive Control for Aerospace Systems</td>
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<tr>
<td>AERO 632</td>
<td>Design of Advanced Flight Control Systems</td>
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<td>AERO 633</td>
<td>Advanced Aerospace Multibody Dynamics</td>
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<td>AERO 641</td>
<td>High-Speed Combustion for Propulsion</td>
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<td>AERO 642</td>
<td>Laser Diagnostics</td>
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<td>AERO 689</td>
<td>Human Performance in Aerospace Environments</td>
<td>Diaz Artiles</td>
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<td>AERO 689</td>
<td>Computational Combustion for Aerospace Applications</td>
<td>Poludnenko</td>
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<td>AERO 689</td>
<td>Space Situational Awareness</td>
<td>Majji/Alfriend</td>
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<td>AERO 689</td>
<td>Systems Analysis.</td>
<td>Skelton/Majji</td>
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Table 2.6 New Special Topics Courses to be Offered Within the Next Year

Two X’s indicate taught twice a year; Cross-listed course among AERO, MEMA and MSEN.
2.4 Research Centers and Laboratories

The Aerospace Engineering Department houses an array of modern research laboratories. The laboratories are housed in the basement of the HR Bright Building, the Easterwood Complex, the Wisenbaker Building, the Munnerlyn Building and Riverside Airport. A brief description of each is given below.

**Advanced Vertical Flight Laboratory.** The advanced Vertical Flight Laboratory conducts interdisciplinary fundamental research in next-generation vertical take-off and landing (VTOL) concepts, novel aircraft concepts for planetary exploration, energy efficient green aviation, and high-efficiency vertical axis wind turbines. Faculty supervisor: Moble Benedict

**Aero and Fluid Dynamics Laboratory.** This laboratory is the wind and water tunnel laboratory housed within HRBB. Many pressure- and velocity-measuring devices are available, including manometers, pressure transducers, and laser Doppler anemometers. Smoke and helium bubble generators are used for flow visualization. In addition, various data acquisition and signal conditioning instruments are included in this lab.

**Aerospace Lasers and Electromagnetics Laboratory.** This is a new laboratory is being built adjacent to the National Aerothermodynamics and Hypersonics Laboratory (NAL). Research conducted in it will focus on the development of new methods for the use of lasers and electromagnetic concepts for applications relevant to aerospace. These include new diagnostics for high-speed aerodynamics, long-range detection of trace hazardous gases and pollutants, plasma-based methods for flow control, guiding of electromagnetic and laser radiation, and advanced energy conversion methods. The laboratory and the state-of-the-art equipment to be contained within it are jointly funded through the Chancellor’s Research Initiative (CRI) and the Governors University Research Initiative (GURI). Faculty supervisor: Richard Miles

**Aerospace Systems, Technology Research & Operations Laboratory.** The Aerospace Technology Research & Operations Laboratory helps researchers get their advanced engineering concepts to technology readiness levels suitable for adoption by government and commercial users, and helps infuse those customers’ needs into the Texas A&M research and education process. The ASTRO center pursues research, engineering and testing activities in the areas of power systems, thermal management, space sensors, and other electronics systems. It pursues programs that provide valuable applied research and training opportunities for professors, students and industry collaborators. Faculty Supervisor: Gregory Chamitoff

**Aerospace Vehicle Systems Institute.** The Aerospace Vehicle Systems Institute addresses issues that impact the aerospace community through international cooperative research and collaboration conducted by industry, government and academia. Supervisor: Dave Redman

**AggieSat Small Satellite Program Laboratory.** The goal of the AggieSat Lab Satellite Program is to develop and demonstrate modern technologies by using a small-satellite platform,
while educating students and enriching the undergraduate experience. Our lab takes an integrated approach to small-spacecraft research, design-build-fly, and education for multidisciplinary teams of freshmen through graduate students, along with industry and government affiliates. Our lab is currently engaged in a four-mission campaign with the NASA Johnson Space Center to demonstrate autonomous rendezvous and docking technologies. The AggieSat Lab is located in Room 120 of the Munnerlyn Astronomical Laboratory & Space Engineering Building. This facility supports hardware and software design, prototyping, fabrication and on-orbit operations for students conducting research and building microsatellites meeting sponsor objectives and requirements. Our lab complies with federal ITAR and operates under industry-standard configuration management, quality assurance, safety and documentation practices. Faculty supervisor: Dr. Helen Reed

**Center for Intelligent Multifunctional Materials and Structures.** The Center for Intelligent Multifunctional Materials and Structures (CiMMS) consists of some of the top researchers in Texas and the world, including a Nobel Laureate and several members of the National Academies, in biotechnology, nanotechnology, biomaterials and aerospace engineering to develop the next generation of bio-nano materials and structures for aerospace vehicles. CiMMS is a collaborative effort of professors and researchers from six universities: Prairie View A&M University, Rice University, Texas A&M University, Texas Southern University, University of Houston, and The University of Texas at Arlington. Faculty supervisor: Amine Benzerga

**Computational Stability and Transition Laboratory.** The Computational Stability and Transition (CST) lab is focused on understanding these instabilities that cause flow to transition by way of state-of-the-art disturbance modeling. Faculty supervisor: Helen Reed

**Estimation, Decision and Planning Laboratory.** The EDP Laboratory is part of the Dynamics, Navigation and Control Research Group in the Department of Aerospace Engineering at Texas A&M University. Our group’s research focuses on Nonlinearity, Dimensionality and Uncertainty in estimation and control problems, with applications to Mobile Robotics, Morphing Aircraft and Distributed Parameter Systems. Faculty supervisor: Suman Chakravorty.

**High Temperature Gasdynamics Laboratory.** The High Temperature GasDynamics (HTGD) Laboratory, directed by Dr. Daniil Andrienko, focuses on computational and theoretical simulations of high speed and high-temperature flows. We apply first principles of molecular dynamics to describe the paramount of chemical and physical processes taking place in a hypersonic flow. A tight collaboration with experimental groups is another key species of our research. Our approach is multiphysical: we work at the junction of the following disciplines: molecular dynamics, radiation transfer, chemical kinetics, computational fluid dynamics and quantum chemistry. Faculty supervisor: Daniil Andrienko

**Immersive Mechanics Visualization Laboratory.** The Immersive Mechanics Visualization Lab (MAESTRO VR Annex) is a lab space fully dedicated to the tasks and goals of the Immersive and Intuitive Data Environments project. It is a 14x17 foot secure room with an HTC Vive VR
system and associated computer with exceptional graphics card capability. A screen share and projection system allow visitors and collaborators to share the VR experience with the individual directly using the HTC Vive. Legacy dark room lighting (red and amber) allow for a comfortable work environment during in situ investigations. Current research involves the development of robust methods for translating solid models (e.g., SolidWorks files) and finite element models (e.g., Abaqus models) into the VR environment and for interacting with such models in an intuitive manner. Faculty supervisor: Darren Hartl

**Klebanoff–Saric Wind Tunnel.** The Klebanoff-Saric Wind Tunnel (KSWT) is a low-disturbance, closed-loop wind tunnel designed for boundary layer stability and transition experiments. Faculty supervisor: Edward White

**Laboratory for Uncertainty Quantification.** This lab focuses on developing algorithms to understand the influence of uncertainty on the behavior of dynamical systems and how they can be controlled. We use methods from statistical physics, optimization, approximation theory, control and estimation theory, and information theory to develop modeling, analysis and synthesis tools for UQ. Some of the applications we are currently working on include certification of flight control laws, assessment of risk in planetary reentry problems, uncertainty management in cyber-physical systems, design of nonlinear filters and estimators, and probabilistic robust control. Our publications, project information, etc, can be accessed from the webpage. This work is funded by NASA, NSF and AFOSR. Faculty supervisor: Raktim Bhattacharya

**Land, Air and Space Robotics (LASR) Laboratory.** The LASR Lab is a robotics facility operated by the Department of Aerospace Engineering at Texas A&M University. The lab conducts research in robotic sensing and control with an aim to enhance the fields of proximity operations, human-robot interaction, stereo vision, swarm robotics, and autonomous aerial vehicles. Faculty supervisor: Manoranjan Majji

**Laser Diagnostics and High-Speed Combustion.** The lab is a graduate research facility dedicated to the study of high-speed combustion for propulsion applications. Laser diagnostics like spontaneous Raman, Rayleigh scattering, and Laser-Induced Fluorescence are used to study the fundamentals of supersonic flows with or without reactions. The lab is one of the few facilities worldwide capable of producing multiscalar measurements in supersonic flames; the pressure, temperature, density and major species concentrations, i.e., the full thermochemistry, of a supersonic flow can be characterized using the techniques developed here. Reduced-chemistry CFD and detailed-chemistry calculations are also used to complement the experimental effort. High-energy Nd:YAG and dye lasers, and a host of high technology detectors, from high-fidelity scientific CCD and EMCCD to high-speed cameras, intensified systems and long-wave infrared detectors form the core of the experimental facilities. Faculty supervisor: Adonios Karpetis

**Materials and Testing Laboratory.** The Materials and Testing Lab is primarily used for processing and evaluating high-temperature metal matrix composite (MMC) materials, but the lab
can be used to evaluate and process a wide range of materials. Three hydraulically-based MTS load frames are available for uniaxial mechanical testing. Each load frame can be equipped with one of five furnaces used in high-temperature material evaluation. A hot isostatic press (HIP) and various furnaces are available to process metal matrix composites. This lab also includes various temperature-measuring devices. Faculty supervisor: Amine Benzerga

**Multifunctional Materials and Aerospace Structures Optimization (M2AESTRO) Lab.** The M2AESTRO Lab focuses on the development of novel aerospace material and structural concepts that provide multiphysical and multifunctional responses. Material systems of interest include shape memory alloys, liquid metals, high conductivity composites laminates, and others. Laboratory capabilities include a customizable 3x4 foot wind tunnel test section for acquisition of fully three-dimensional surface deformation, strain and thermal fields as measured on adaptive aerospace structures in a flow environment. Integrated augmented reality (AR) and virtual reality (VR) environments allow experiential immersion into the complex data sets generated during such experiments and allow straightforward and intuitive comparison between computational mechanics results and laboratory test data. Faculty supervisor: Darren Hartl

**Nanostructured Materials Laboratory.** Our curiosity to understand the processing microstructure relationships in promising nano-structured materials drives us toward developing lightweight materials, whether it is for structural light-weighting, enhanced energy storage or smart textiles. Faculty supervisor: Mohammad Naraghi

**National Aerothermochemistry and Hypersonics Laboratory.** The Texas A&M University National Aerothermochemistry and Hypersonics Laboratory (NAL) is a graduate research facility founded by Professor R. Bowersox to perform leading research and to house unique facilities in support of National interests in high-speed gas dynamics, unsteady flows, and flows with thermal and chemical non-equilibrium effects. This laboratory houses the NASA Langley Mach 6 Quiet Tunnel, a large-scale high-temperature hypervelocity expansion tunnel, advanced laser diagnostics, as well as numerous conventional high Mach number facilities and test cells. Primary sponsorship is provided by the Air Force, Army, Navy, NASA, NSF, and private industry. The laboratory is a multidisciplinary research resource, with significant faculty involvement from both Aerospace Engineering and Chemistry. Faculty supervisor: Rodney Bowersox

**Oran W. Nicks Low-Speed Wind Tunnel.** The Oran W. Nicks Low Speed Wind Tunnel is a self-contained research facility located near Texas A&M. It is a closed-circuit, single-return type tunnel, with a rectangular test section 10 feet wide and 7 feet high and housed in a two-story building. The administrative building, tunnel and test section, external balance and drive motor all have independent foundations to reduce the transmission of vibrations among them. A wide variety of tests are conducted at the wind tunnel for industry, governmental agencies, educational institutions and private individuals. Tests at the tunnel have dealt with, but are not limited to aircraft, space vehicles, ground vehicles, buildings and offshore structures. The wind tunnel can provide
many different types of information during a test. It is used for both basic and applied airflow research and development and also provides instructional aid for students of various departments. Facility supervisor: Edward White

**Plasma Dynamics Modeling Laboratory.** The Plasma Dynamics Modeling Laboratory (PDML) focuses on developing numerical methods and theoretical models to understand the physical phenomena in various plasma discharges and flows. Primary applications include electric propulsion (EP), such as Hall effect thrusters and hollow cathodes, and fundamental plasma physics phenomena including plasma-material interactions, plasma-wave interactions, and plasma-beam interactions. Faculty supervisor: Kentaro Hara

**Plasma Simulation Laboratory.** Research conducted in the Plasma Simulation Laboratory is focused on modeling of plasma influence on ignition, combustion and turbulent flows. Main problems we are working on include: controllable ignition by discharges plasma; combustion processes control and stabilization by plasma; deflagration to detonation transition control by plasma; laser and microwave discharge dynamics; flow control by plasma discharges; and nanosecond pulsed discharge igniters. Faculty supervisor: Albina Tropina

**Propulsion Laboratory.** This lab contains a fully instrumented and working turbine engine originally designed for cruise missiles. Inlet and nozzle configurations can be changed to vary engine inlet and back pressure. Faculty supervisor: Paul Cizmas

**Systems Engineering, Architecture and Knowledge (SEAK).** SEAK focuses on the development of advanced tools to support the systems engineering process, with emphasis on early system design and system architecture. Facility Supervisor: Daniel Selva

**Tensegrity & Morphing Structures Laboratory.** This lab seeks to develop new analytical tools to merge structure design, control design, integrated with signal processing resource design. The structural paradigm for this research is tensegrity systems, creating minimal mass systems that also allow minimal control energy, within the constraints of allowable computational and sensing/actuating resources. The lab builds physical demonstrations of this integrated system design philosophy. Robots are designed to deploy from small stowed packages. Robots are designed to harvest rocks and regolith from asteroids or the moon. Tensegrity structures are designed for deployment in space. Tensegrity Robots are designed to autonomously build tensegrity structures in space. Wings are designed without hinged surfaces to controllable shapes. Antennas are designed for deployment in space within operational accuracies. Impact tensegrity structures are designed to protect payloads at impact on the moon or mars. Using these techniques, we have performed feasibility studies for truck bumpers for the Ford Motor company. We have created design methods for high rise buildings that can survive any earthquake with a specified energy bound. These studies employ data-based as well as model-based control methods. Facility Supervisor: Robert Skelton.

**Turbulence and Advanced Computations Laboratory (TACL).** The Turbulence and Advanced Computations Laboratory (TACL) conducts research on fundamental understanding of
turbulent flows and turbulent mixing using state-of-the-art simulations at massive scales. While turbulence is the most common state of fluid motion in natural and engineering systems, its complexity has made the topic extraordinarily difficult. TACL develops and uses the most advanced computational tools on the largest supercomputers available combined with theory and analysis to understand a number of aspects of turbulent flows. Current interest include turbulent simulations at extreme scales, universality of turbulent flows, intermittency and anomalous scaling, turbulence mixing at low and high Schmidt numbers, compressible turbulence, shock-turbulence interactions, and turbulence in thermal non-equilibrium. Faculty supervisor: Diego Donzis

**Vehicle Systems & Control Laboratory (VSCL).** The Vehicle Systems & Control Laboratory (VSCL) conducts federal and industrial sponsored research in Computational Intelligence; Vehicle Management Systems; Human-Machine Interfaces; Virtual Instrumentation; and Flight Safety and Training Systems and Software. There are two facilities in this laboratory. The Texas A&M University Unmanned Air System (UAS) Flight Testing Facility is located in a 12,000 square foot facility at the Texas A&M University RELLIS Campus. It stores and operates autonomous fixed-wing, rotorcraft, and rover ground vehicles, and is the operational center from which all VSCL flight testing and autonomous vehicle research has been conducted since 1999. The Engineering Flight Simulator (EFS) facility is located in the basement of the H.R. Bright Building. A dedicated cluster of nine quad-core multi-processor computers enables high fidelity, real-time simulation and control. Three-dimensional terrain is projected onto a 150-degree field of view screen. For piloted simulation, the physical equipment of the EFS consists of the actual side-by-side cockpit and fuselage of an USAF Cessna T-37 with an F-35 traditional center stick and an actual F-35 sidestick. For display research purposes, a glass cockpit consisting of both left and right touchscreen LCD flat panel displays with tactile feel are installed as head down displays. All of the equipment and software is located in the HR Bright Bldg. See http://vscl.tamu.edu. Faculty Director: John Valasek

**ZLab.** The ZLab aims to expand the frontiers of science and technology to meet future materials demand. We experimentally study light and wave interaction with structures to realize materials with extraordinary properties. These exotic materials have interesting applications in photonic, electronic, acoustic, sensing, imaging, energy harvesting, structural and aerospace technologies. Faculty Director: Zi Jing Wong

**Computer Facilities.** The Aerospace Engineering Department houses two clusters, and maintains undergraduate and graduate computer laboratories. In addition, the faculty and students have access to the university Supercomputing Center (https://hprc.tamu.edu).
2.5 Admission Criteria and Procedures

The admission of graduate students is a joint effort of the university Office of Admissions (OA), the Department of Aerospace Engineering and, for international students, the International Student Services (ISS) Office. An application package consists of the application (electronic), official transcripts, GRE test score information (for non-TAMU students), reference letters, and other optional materials such as a C.V. or resume which applicants may choose to provide. For international students, various other documents are required including proper visa and financial support documents and TOEFL scores. A nonrefundable application fee of $50 for U.S. citizens and permanent residents, or $75 for international applicants, is required to process an application. In some cases, the department (or a faculty member) may choose to pay the application fee for the prospective student.

All admission documents are collected by OA and made available for review in an electronic document repository. The student’s application is available to the department in real-time (both partial and complete applications). The admission decision process by the department is handled through an online, web-based admissions decision system called Graduate Review System. The department may admit a student at any point during the admissions process.

In addition, upon request, OA evaluates the transcripts by calculating the GPR on the last 60 hours of undergraduate coursework earned at a senior-level institution, or if the student has a master’s degree, then calculating the GPR on all graduate coursework, excluding non-degree courses or research hours. For international transcripts, grades are converted to an equivalent 4.0 basis. Alternatively, the department can use the cumulative scores on the transcripts.

For international students, the International Student Services (ISS) office assists students with applications, required INS documentation, verification of required insurance and financial information, and other immigration matters.

The Graduate Program Director and Co-Director, Drs. John Valasek and Diego Donzis, and the Graduate Program Advisor, Ms. Gail Rowe, administer the admissions process for the department under the supervision of the Department Head, Dr. Rodney Bowersox. The Graduate Program Directors are assisted by a faculty Graduate Admissions Committee consisting of three faculty (one from each of the major discipline areas) appointed by the Department Head. The committee meets periodically to assess applications and make recommendations for admission or denial.

Applications for prospective M.S. and Ph.D. students that are acceptable to the Admissions Committee are circulated to the faculty for further evaluation before a final admission decision is made to the Graduate Program Directors. This last step in accepting a student requires that a faculty member be identified who will supervise the student and provide funding that will support the student. Unlike some departments, the Department of Aerospace Engineering established a goal in 2002 that all admitted M.S. and Ph.D. students who are admitted should be of sufficiently high caliber to be supported through research assistantships or by a fellowship. Although most students
do have the opportunity to serve as teaching assistants, teaching assistantsships are usually used as professional development opportunities for students who may be interested in academic careers, to strengthen a student’s knowledge in some area, or to cover gaps in funding. Students are not admitted under the premise that they will be supported primarily through teaching support without a strong faculty mentor and research advisor who is thoroughly invested in the student’s success.

Applications for the M.E. program are usually decided by the Graduate Director and not circulated to the faculty. M.E. students are self-funded and do not usually participate in research so the strong faculty commitment to individual students required for a successful M.S. or Ph.D. student is not necessary. While admission to the M.E. program is less stringent than the other programs because no research funding is required, the GRE requirements are the same as for the other degrees.

The formal review process proceeds as follows. At the beginning of each calendar year (January), the department determines the number of graduate students it expects to be able to support given faculty and departmental resources. A committee, called the Graduate Affairs Committee, evaluates applications using criteria that include prior academic performance, GRE for non-TAMU students, and TOEFL scores, reputation of prior institutions attended, faculty recommendations, student statements of purpose, work experience, and other information as deemed appropriate.

The minimum standard GRE standards are a Quantitative score of at least 160, a Verbal score of at least 152, and a Written score of at least 3.0. For Ph.D. applicants, an undergraduate GPA of at least 3.5 is required. For the M.S., an undergraduate GPA of at least 3.25 is required. For the M.E. an undergraduate GPA of at least 3.0 is required. The GPA calculations can be of an applicant’s entire undergraduate program or of the last 60 hours of undergraduate course work.

For international students, the department follows the university requirements for English language proficiency. Texas A&M requires students from other countries to demonstrate the ability to speak, write, and understand the English language. The English Proficiency requirements are independent of admission requirements. Graduate students may meet this requirement in one of four ways:

- English Language Proficiency Verification through official TOEFL score of 550 (213 computer based) or higher taken within the last two years, GRE Verbal score 400 or higher taken within the last five years, or GMAT Verbal score 22 or higher taken within the last five years. Texas A&M requires an official copy of the test scores to meet the English Proficiency requirements;

- English Language Proficiency Certification by taking the English Language Proficiency Examination (ELPE) prior to registration for the first semester at Texas A&M;

- English Language Proficiency Certification by receiving a Baccalaureate degree following four years of study at an accredited U.S. institution; or
• English Language Proficiency Certification through appropriate English training programs at other U.S. institutions.

The English Language Institute (ELI) offers a comprehensive and innovative program designed for international students who want to learn English or improve their English language ability prior to studying at an American college or university, particularly Texas A&M University. Students who do not prove English proficiency by other means must enroll in ELI course (1 per semester) until they are certified.

Students who will serve as Graduate Assistants–Teaching (GAT) must complete the English Proficiency Certification Process at Texas A&M, or show that they have completed an equivalent program at another U.S. institution. All other international students may demonstrate their abilities in English through English Proficiency Verification.

Once admitted, to proceed in the graduate program students must be in good academic standing with Office of Graduate Studies, which means maintaining GPA of 3.0 or better.

2.6 Degrees Awarded and Average Time to Degree

A history of the past 10 years of graduate degrees awarded is given in rows 10, 11, and 12 of Table 2.7 which contains a wide range of department statistics. Over the past decade while total graduate student enrollment in Aerospace varied from approximately 110 to 140, the department would annually graduate between approximately 6 and 20 Ph.D. students, 10 and 25 M.S. students, and a small number of M.E. students. The trend for the last two years has been a rapid increase in student enrollment so we expect that M.E. and M.S. graduation rates will rise sharply in the coming year and that Ph.D. graduation rates will climb as well, lagging the Masters graduations by about two years. Figure 1.1(b) shows the rapid rise that will soon result in increased graduation rates.

The average time to receive a Ph.D. in the aerospace program is 5.1 years as indicated in the THECB 18-Characteristics data, Table 1.7. The average time to receive a Master’s degree is 2.0 years (all 2017 data). The Master’s degree data do not distinguish between the M.S. degree and the M.E. degree. Because M.S. students are the bulk of the Master’s degree population, 2.0 years is likely to approximate the time-to-graduation for M.S. students. As the number of M.E. students increase, this statistic will likely decrease to less than 2.0 as the M.E. student are expected to often only require 3 semesters to graduate.

2.7 Academic enhancements and high-impact student opportunities

Academic enhancement and high-impact opportunities are important goals for the department. Six examples are discussed here. First, the Aerospace Engineering Department offers a weekly seminar series, where renowned researchers and leaders from academia, federal labs, national labs,
and industry are invited to present cutting-edge scientific studies, national program results, etc. The goal for these seminars is to enlighten the students (and faculty) on the Aerospace Profession. The departmental policy is that graduate students are required to attend at least five seminars per semester. However, the student interest is such that there is standing room only at most seminars. Second, the Aerospace faculty have created an array of unique hands-on laboratories (Section 2.4). The laboratory opportunities vary from virtual reality to hypervelocity wind tunnels. As an example, in the graduate course on hypersonics, one of the course projects involved designing a classical wave-rider, 3-D printing the waver-ride, and then testing it at Mach 6 in the NAL. Third, the department, and the University, offer travel grants, on a competitive basis, to attend National conferences. Fourth, the faculty within the department have strong connections with industry, national labs, and federal labs. Hence, graduate student internships are becoming more prevalent. As an example, four students from one research group interned with NASA Langley, the two senior Ph.D. students received permanent job offers 1-year before they defended their dissertation. Fifth, the College of Engineering has created the Graduate Teaching Fellows program, which was piloted as part of a joint CoE funded project with Aerospace and Civil Engineering. This program provides an opportunity for senior Ph.D. students to teach with a faculty mentor. Finally, Dr. Chamitoff was hired with the specific enhancement goal of creating a new course on Space Operations from a NASA perspective, where the lectures are provided by NASA experts. This course only exists at Texas A&M, and a new textbook is nearly complete.

2.8 Assessment of Internal Outcomes

As indicated in Section 1.6, the graduate program assessment includes an Internal Assessment, the THECB, and the External Graduate Review. A summary of the assessment of the internal outcomes are presented in this section.

2.8.1 Student Learning Outcomes — WEAVEOnline

Student learning outcomes are a subset of the goals and outcomes we seek for the entire graduate program. As described in Section 1.6.2, we use the WEAVEOnline system to track data related to student learning outcomes. Specifically for our program we aim that the students

1. obtain the core competencies necessary to function as aerospace engineers, (all degrees);
2. communicate effectively (M.S. and Ph.D); and
3. demonstrate independent research competence (Ph.D. only).

Of course, most of our M.S. students could demonstrate (3) and most of our M.E. students could demonstrate (2). However, given the structure and flexibility of our programs, not all outcomes can apply to all students nor do we have clear mechanisms for collecting metric data that support evaluation of success at meeting the desired outcomes.
For Ph.D. students, we established targets of achieving a rubric score of 3.5 or higher on a 5.0 technical competence rubric; a score of 3.5 or higher on a 5.0 communications rubric; and that 75% of students would be first author on an archival journal paper or be the presenting first author on a conference paper. Our Ph.D. students easily meet these targets and, in recent years, have averaged 3.95/5.0 on the technical competence rubric and 3.81/5.0 on the communication rubric. Looking ahead to Section 4.8, in 2017, our 66 Ph.D. students presented 137 publications or presentations, more than approximately 2.1 per student for a single year. In 2016 the Ph.D. students presented 119 publications or presentations. While some students have more opportunities to travel and present, we are confident that over the entire course of a Ph.D. 75% of students do present their research publicly. As we move forward, we are developing better systems to track which students have and have not presented research so we can be more confident in assessing this outcome. Also, starting in Fall of 2018, somewhat more travel funds may become available to support graduate student attendance at research conferences.

For M.S. students we established targets of achieving a rubric score of 3.0 or higher on the 5.0 technical competence rubric and 3.0 or higher on the 5.0 communications rubric. The M.S. students average 3.29 and 3.36 on technical competence and communications, respectively. While it was expected that M.S. students would score lower than Ph.D. students on both measures, we are surprised that M.S. students’ technical competence scores are somewhat lower than their communication scores. We have evaluated degree plans and find that M.S. students who do not expect to become Ph.D. students often will skip one or two of the courses that serve the three foundational disciplines represented in the Ph.D. qualifying exam. Although this is just speculation, we are encouraging more of the M.S. students to enroll in all three foundational classes in an effort to improve technical competence scores.

M.E. students are evaluated based on course grades in each of the three foundational AFQE courses. They are not required to take these course but almost uniformly do enroll in at least two because their degree is based solely on coursework. We aim for these students to average a 3.0 out of 4.0 across those courses and, as a group, the average score across the classes is approximately 3.25. Considering that these courses are rigorous preparation for the Ph.D. qualifying exam, we find this level of achievement among the M.E. students acceptable.

2.8.2 Departmental Excellence Outcomes

The Departmental Excellence Outcomes are defined in Section 1.6.1. Assessment of the excellence outcomes are based on the criteria in Table 2.7 and the mapping to outcomes presented in Table 1.8.
<table>
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<th>Year</th>
<th>Mean Teaching Evaluations (5.0 scale)</th>
<th>Acceptance Rate</th>
<th>Grad Students (%men)</th>
<th>Grad Students (%of total)</th>
<th>Grad Students (%female)</th>
<th>Grad Students (%ratio)</th>
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<th>GRE Quantitative Score</th>
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Table 2.7: Historical Summary of Department Data

1. Data for 2018 is incomplete or not available.
Outcome 1 – The Program and Faculty will be Excellent

The research oriented results (criteria 1–5) show that, overall, the research-based Ph.D. and M.S. Programs are healthy and growing. The programs suffered setbacks in 2013 but are recovering and all targets are met or on track to be met as new faculty hires develop mature research programs. Student qualification and diversity is quantified in criteria 6–8. The quality of our incoming students remains very high as indicated by both GRE and GPA results and anecdotally by faculty who teach entry-level graduate courses. Our students’ diversity is below our expectations and national trends. This is a challenge that the department continually addresses on an individual basis. The Department recently received a 5-year NSF grant focused improving diversity in Aerospace Engineering Departments that may prove to be a catalyst for more systematic change. The teaching oriented criteria, 9–11, are all satisfactory, especially the growth of new graduate courses shown in Fig. 1.4.

The key element in achieving this outcome is sustained faculty excellence. The faculty hiring process is summarized in Appendix D. The strategic alignment that guides faculty search criteria is discussed in Section 1.2.6, and the resumes of the faculty are in the Appendix B. The University and College have shown outstanding support to Aerospace Engineering for hiring new faculty during this review period (Section 1.2.6). The College and Department also employ faculty development processes, as summarized in Appendix D.

The program is performing well, although we have not yet achieved our goal of becoming the #1-ranked public Aerospace Engineering Graduate Program. However, by continuing to strive toward this goal we deliberately and continuously examine ways in which we can improve our teaching and research in service of our graduate students.

Outcome 2 - Research will be of High Quality

Overall, more than 90% of our faculty have established well-funded research programs, are supporting students, and writing papers. As shown later in Chapter 3, our research grants and awards are strong and lie in the 70th to 90th percentile of U.S. Aerospace Engineering Departments. However, our publication rates and citation rates lag these results. We are hopeful these numbers will improve as our recent faculty hires become fully productive.

Similar to publications and citations, Ph.D. graduation rates are somewhat lower than what we would wish, mainly because research funding has been challenging for the past several years. A comparison to our peer institutions is presented in Table 2.8. As indicated, our rate of 0.4 Ph.D. graduates per TTF per year is below the overall average of 0.7. As research funding and activity increases more high-quality theses and dissertations will be produced which, in turn, will improve publication and citation results. We are pleased that a very high fraction of the students we admit to the M.S. and Ph.D. programs successfully complete their degrees. In this regard, our emphasis on incoming student quality results directly in high-quality research. Our main challenge is to improve the volume of research activity by supporting more high-quality students.
Outcome 3 - Applicants will be Diverse and of High Quality

We are very proud of the high quality of students admitted into all three of our graduate programs. The incoming average GPR is 3.7, and the average GRE score has climbed to 322 well above our College average of 316. As a comparison to our peer institutions listed in the Executive Summary, we have assembled GRE data from various programs’ admissions websites. Mostly these data are GRE minimum scores required for consideration. These data are presented in Table 2.9. (Some programs report percentiles rather than raw scores and these have been converted to scores for comparison purposes.) Overall, the data show that the TAMU Aerospace Graduate programs’ GRE minimum scores for consideration are slightly below our peers. However, among programs that publicize actual average values of GRE scores, ours scores is between University of Michigan (320) and MIT (328).

The average time to graduation is 5.1 years (reported in the THECB 18-Characteristics in Table 1.7), approximately 94% pass the AFQE and 72% of Ph.D. candidates complete the program. Lastly, the In terms of diversity our student body tracks the poor national averages for Aerospace Engineering. We hope to improve in this area by leveraging the NSF project described above.
2.9 Improvements Prompted by Internal Outcome Assessments

Through the WEAVEOnline evaluation process we set goals related to technical competence, effective communications, and research competence. Progressing from the M.E. to the M.S. to the Ph.D., we seek to have the students achieve more outcomes and do so with higher-level performance. By means of our collection of metric data, we find that our students’ learning outcomes are successfully being achieved in the areas we wish. Of course, we strive to continuously improve performance and we have identified mechanisms outlined above to improve the M.S. students’ technical competence scores and to ensure all Ph.D. students have the opportunity to present research findings at research conferences.

More broadly, we are aiming to enable a larger number of students to participate in research training at the M.S. and Ph.D. levels and to enable more students to pursue M.E. degrees. Our challenge will be to effectively maintain the quality of instruction and mentoring and access to research facilities while we do so.

We are pleased with our current level of teaching performance as teaching evaluations are currently around 4.2 on a 5.0 scale for graduate classes. Departmental averages are listed in the last row of Table 2.7. However, these results were obtained in classes featuring usually fewer than 20 graduate students. As we grow, some graduate classes now have 50 or more students so there is some danger the quality of instruction could slip. Student growth is accompanied by faculty growth so many of our graduate courses are being taught by novice instructors. As a means of help establish and maintain high-quality teaching, many new instructors have been paired with a more-senior faculty member for undergraduate courses that are taught in two sections by the 2-person team. Through frequent meetings and discussions, the junior faculty member gains the benefit of the other’s experience and is quickly socialized with good teaching skills. More formally, we have also instituted a new departmental process for peer evaluation of classroom teaching that will have every instructor formally evaluated and given teaching feedback on a regular basis with pre-tenure faculty more frequently evaluated so that formative feedback can be given early and often.
3. Faculty Profile

3.1 Core Faculty

The 18-Characteristics report, Table 1.7, required by the Texas Higher-Education Coordinating Board (THECB) collects data on the “core” doctoral-program faculty who are full time, tenured or tenure-track, teach 50% or more in the doctoral program, or who are integral to the doctoral program and can direct dissertation research. Using the 2017 THECB report (the most recent available) the core faculty data are as follows:

- Number of core faculty: 33 in 2017 (Table 1.7), 39 in 2018 (Table 2.7)
- Student to core faculty ratio: 4.1 all graduate students (Table 2.7), 1.9 Ph.D.s (Table 1.7)
- Archival publications: 122 total, 3.7/faculty (Table 1.7)
- External grants: $15.0M total, $484k/faculty (Table 1.7)
- Teaching load: 32.2 semester credit hours/faculty

No members of our faculty contribute significantly to the graduate programs who are not considered members of the core doctoral-program faculty.

3.2 Professors of Practice and Instruction

During the current review cycle, the College of Engineering and Aerospace Engineering, expanded the role of Professors of Practice and Instruction. Our program is experimenting with one of each in the graduate programs. Dr. Gregory Chamitoff, former NASA Astronaut, is the first Professor of Practice to advise graduate students in Aerospace. Dr. Chamitoff has a Ph.D. from MIT. At TAMU he founded and directs the ASTRO Laboratory. His resume is included in the Appendix. Dr. Kristi Shryock is an Associate Professor of Instruction. She serves as the an Associate Department Head for Academics. Dr. Shryock has a Ph.D. in Engineering Education, with her B.S. and M.S. in Aerospace Engineering. She is a co-PI on a NSF RED project focused on improving student diversity in Aerospace Engineering. Her resume is also included in the Appendix. Because the usage of Professors of Practice and Instruction in the graduate program is still in the experimental phase for our department, we have not yet collected sufficient data for assessment purposes.

3.3 Faculty Diversity

Similar to most departments of Aerospace Engineering, we struggle to recruit a diverse faculty. This was highlighted as a concern in the 2011 Academic Program Review, especially because the department had recently lost two women faculty which left us with only one women among 27 faculty. Since that time, of the twelve faculty hired, two are women (including an astronaut who is
also an NAE member) and four are in under-represented groups (Asian or Hispanic). Nevertheless our results here remain poor with currently three women on the 39-person faculty (2018). Our results similar for URGs, the 2017 18-characteristics report shows 2 hispanic and 9 “other” (principally Asian).

3.4 Faculty Qualifications

Faculty in the Department of Aerospace Engineering are expected to be leading or emerging leaders within their research area within the field of Aerospace Engineering. A Ph.D. is required and only candidates from a leading graduate programs with outstanding credentials, multiple publications in highly ranked journals, and outstanding recommendations are viable in faculty searches. Many of our faculty are Associate Fellows or Fellows of the American Institute of Aeronautics and Astronautics and other societies in which our faculty participate.

As noted earlier, the department strives to hire and retain members of the National Academy of Engineering and to nominate our faculty to be Distinguished Professors at Texas A&M University. These efforts have been successful and, currently, the department boasts four Distinguished Professors, Drs. T. Alfriend, J. Junkins, D. Lagoudas, and W. Saric and seven NAE members, Drs. T. Alfriend, B. Dunbar, J. Junkins, R. Miles, W. Saric, R. Skelton, and, a summer 2018 hire, Dr. A. Jameson. That is, 10% of our faculty are DPs and 18% are NAE members. At the time of the last review, the department had two DPs and three NAE members. Those numbers met department goals and now, the number of DPs meets our departmental goals while the number NAE members nearly doubles our goal. In recent years, we have been very successful in hiring NAE members via the CRI/GURI process described earlier. The addition of the new NAE members has increased the volume of high-quality scholarly achievement in the department which is having a dramatic positive impact on recent growth of research funding, our rankings, our ability to recruit outstanding students, and our ability to recruit future high-caliber faculty candidates.

3.5 Analysis Question: Is the number of faculty adequate to support the institutional mission and ensure the quality of it academic programs?

Thanks to a recent rapid increase in faculty size and quality, the Department of Aerospace Engineering is exceptionally well positioned to provide outstanding graduate education and research opportunities for students. Since the last review the faculty size has increased from 27 to 39. Four of the twelve faculty hires are in the National Academy of Engineering. This targeted growth was fueled by TAMU System Chancellor’s Research Initiative (CRI), the State of Texas Governor’s Research Initiative (GURI), and the College of Engineering 25 × 25 campaign, a college-level program to double the engineering enrollment from 12,500 in 2012 to 25,000 in 2025. These programs provided resources to attract top researchers and cluster teams. The founding and success
of Hagler Institute of Advanced Study, by Professor Junkins (Aerospace) helped to enable this success by providing a venue to attract top researchers from around the world to visit TAMU and interact with the faculty. These program have proven very effective in the sense that the NAE faculty are developing new long-term research programs and new laboratories and are mentoring new junior faculty. This opportunity is laying the foundation for long-term stability within the department, where there are current 22 full professors and 17 junior faculty. There also currently four unfilled junior faculty positions, and additional opportunities for CRI and GURI hires.

Growth in faculty size leaves us well positioned to diversity research activity and graduate courses and to substantially increase the number of graduate students in the department. We are pleased that while we have recruited faculty who are outstanding researchers, teaching is also emphasized and valued by the faculty. Student teaching evaluation results (departmental averages) are listed in the last row of Table 2.7. As indicated, the typical average is 4.0 to 4.2 on a 5-point scale, which slightly exceeds our target. We are satisfied with the quality of instruction in the graduate courses.

Performing leading research is a key aspect of graduate education, particularly for our M.S. and Ph.D. students. Without funded faculty research in which these students could participate, they would not be able to complete meaningful research training. Thus, research activity is a key indicator of whether the faculty size and quality is adequate.

The historical data on departmental research productivity (funding, publications, graduate students and Ph.D. degrees awarded) are listed in Table 2.7. The research expenditure trend was also shown in Fig. 1.2. As described above, research expenditures dropped sharply around 2013 mainly due to Federal Budget Sequestration. Additionally, around the same time, the Texas A&M University College of Engineering added a department of Material Science and Engineering and several Aerospace faculty became joint appointments with that department with research expenditures prorated between the departments. As a consequence of these effects, research expenditures, research expenditure per faculty member (the data are not presented as per FTE), and graduate students numbers in Aerospace decreased. However, these numbers are now almost fully recovered and research expenditures are exceeding our target. As recent faculty hires develop their programs and more graduate students enroll, we expect student and publication numbers to also recover and pass our goal.

As important as examining the trends of our research activity, we compare ourselves to other Departments of Aerospace Engineering across the country. Rankings (metric 1) are can be subjective so we use a service Academic Analytics that collects publicly available data on research activity to provide assess our performance with respect to our peers. This data is presented in the form of a “flower chart” shown in Fig. 3.1. The chart displays our 2018 research performance across a range of quantities as percentile statistics compiled across the country. The inner gray circle represents 50th percentile (or lower) performance on a metric while outside represents higher than
50th percentile performance. Different colors represent different areas of performance. Compared to other departments we perform most strongly in terms of research awards and research grants both in an absolute sense and per faculty member. We also perform well in terms of the number and percentage of faculty with awards and funding. Our participation in research conferences is also very strong. Our weakest areas which hover above and below the 50th percentile are publications and citations. There are many likely causes for the weakness in publications and citations. We feel that the current dislocated distributions of students and faculty has the potential have a major impact on scholarship. This leads to a key strategic goal for the department, which is to unify the aerospace program within the HR Bright Building.

Figure 3.1: Academic Analytics Research Activity “Flower Chart”.
4. Student Profile

4.1 Enrollment

Statistical profiles of Department of Aerospace Engineering graduate students are given in Table 2.7, and Figure 1.1(b), plus the THECB 18-Characteristics Data, Table 1.7. The class starting in the Fall of 2018 includes 172 total graduate students comprising 97 Ph.D. students, 48 M.S. students (some of whom will continue on toward a Ph.D.) and 27 M.E. students. All but about five of the M.E. students are full-time students in residence in College Station.

Examining the historical data, the drop in enrollment near 2013 was due to reductions in federal funding. Over the past 2 or 3 years, the graduate population has increased sharply as the funding situation improves and the new faculty discussed in the previous section establish their research programs. The tenure track faculty support, on average, about four graduate students per year. It is also noteworthy that an increasing number of students are now pursuing the coursework-only Master of Engineering degree (27 in 2018). Historically this program has only graduated five or less students per year. One reason for this is a new emphasis on the Fast Track program that enables high-performing undergraduates to enroll in up to 9 hours of graduate courses and use those courses to meet both undergraduate and graduate requirements. Some students use these credits toward the M.S. or Ph.D. program. However, most use them to accelerate progress toward a M.E. degree. Over the period of 2010 to 2018, the average quantitative GRE score has remained flat at 163–164, with an overall score in the range of 319–322. Hence, the graduate student quality has been maintained during the latest growth cycle.

Graduate student recruitment takes place primarily on an individual basis between the faculty members and potential students. In addition, the Office of Graduate Studies sponsors an annual recruitment visit to Texas A&M University for outstanding applicants, which results in a visit by about 20 highly qualified external student applicants. Several highly qualified TAMU Aerospace Engineering graduate students also participate in the recruiting event.

4.2 Demographics

The demographic makeup of the graduate student body is summarized in Table 4.1. Also included are national averages from the Aerospace Department Chairs Association (ADCA), which are averaged over a period from 2012 to 2017. Our ratio of domestic to international follow the nation trends. However, our program lags national averages in underrepresented groups and women. More must be done to recruit women and minority students. Starting in 2017, the department received a 5-year, $2M NSF grant, “IUSE/PFE: RED: Revolutionizing Diversity of Engineering (REDO-E)” that aims to address exactly this problem in our undergraduate where our diversity numbers are similar. It is hoped that as we execute on that grant we will improve the pipeline for
women and minority graduate students and, over time, the graduate program will see a positive effect from our efforts at the undergraduate level.

Table 4.1 Graduate Student Body Demographics

<table>
<thead>
<tr>
<th>Year</th>
<th>% Dom</th>
<th>% Int</th>
<th>% URG</th>
<th>% Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004 - 2010 Average (2011 Self Study)</td>
<td>***</td>
<td>***</td>
<td>6%</td>
<td>14%</td>
</tr>
<tr>
<td>2014</td>
<td>67%</td>
<td>33%</td>
<td>11%</td>
<td>10%</td>
</tr>
<tr>
<td>2016</td>
<td>59%</td>
<td>41%</td>
<td>8%</td>
<td>10%</td>
</tr>
<tr>
<td>2018</td>
<td>63%</td>
<td>37%</td>
<td>13%</td>
<td>14%</td>
</tr>
<tr>
<td>Average</td>
<td>63%</td>
<td>37%</td>
<td>11%</td>
<td>11%</td>
</tr>
<tr>
<td>National Average (ADCA, 2012-17)</td>
<td>63%</td>
<td>37%</td>
<td>13%</td>
<td>15%</td>
</tr>
</tbody>
</table>

4.3 Degrees Awarded and Average Time to Degree

As described in Section 2.6, the 10-year history of graduate degrees awarded is given in rows 10, 11, and 12 of Table 2.7. Over the past decade, while total graduate student enrollment in Aerospace varied from approximately 110 to 140, the department would annually graduate between 6 and 20 Ph.D. students, 10 and 25 M.S. students, and a small number of M.E. students. The trend for the last two years has been a rapid increase in student enrollment so we expect that M.E. and M.S. graduation rates will rise sharply in the coming year and that Ph.D. graduation rates will climb soon, lagging the Masters graduations by about two years. Figure 1.1(b) shows the rapid rise that will soon result in increased graduation rates.

The average time to receive a Ph.D. in the aerospace program is 5.1 years as indicated in the THECB 18-Characteristics data, Table 1.7. The average time to receive a Master’s degree is 2.0 years (all 2017 data). The Master’s degree data do not distinguish between the M.S. degree and the M.E. degree. Because M.S. students are the bulk of the Master’s degree population, 2.0 years is likely to approximate the time-to-graduation for M.S. students. As the number of M.E. students increase, this statistic will likely decrease to less than 2.0 as the M.E. student are expected to often only require 3 semesters to graduate.

4.4 Average Institutional Financial Support

Except for M.E. students engaged in the just-starting distance-education program, graduate students are required to be full time students at Texas A&M University. In order to be considered a full-time student, a student must register for a minimum of nine credit hours during a regular (fall or
spring) semester and a minimum of six credit hours during the summer semester. The tuition and fees calculator is located at (https://tuition.tamu.edu). For a full time 9-hour load, the tuition is $7,272 per year (in state) or $16,070 (out of state). The program fee for full time students is $2,612 per year.

The THECB 18-Characteristics data, Table 1.7, reports 93% of our Ph.D. students receive institutional funding which averages $22,980 per student. As a general rule, the department does not admit M.S. or Ph.D. students without financial support. The remaining 7% of students not funded by the department receive funding from external fellowships. The practice of admitting students without funding generally has a negative effect on the department because unfunded students can often receive less faculty attention than funded students and struggle to progress in a timely way. All of the M.E. students are self-funded.

The various forms of financial support for graduate students include Graduate Assistant Teaching (GAT), Graduate Assistant Research (GAR), Fellowships, and Other External Funding (e.g., government sponsorship). The breakdown of students for the Fall 2018 are listed in Table 4.2. In terms of departmental and institutional support, the department supports 20 GAT students per year. The College of Engineering provides tuition for GAT-supported Ph.D. students. The department prioritizes Ph.D. students rather than M.S. students as teaching assistants. The Aerospace Engineering students are highly competitive for national and local (TAMU) fellowships, and the department takes an active role in encouraging student applications. This has resulted in nominally ~20% of our Ph.D. students on fellowship. Many of our top students are competitive for National Fellowships (DOE, NASA, NSF, NDSEG, Sandia Laboratories, SMART, etc.). In addition, the University and College of Engineering have dedicated fellowship monies available. The Department nominates its top recruits for fellowships at the College level (e.g., College of Engineering National Excellence and Regents Fellowships) and University level (Merit and Diversity Fellowships). In the recent past, the Department also received tuition-pool monies from the Provost’s Office to pay in-state tuition fees of incoming graduate students. The GAR support results from external grants, fellowships, or internal fellowships. The GATS are supported by the college to assist with the teaching load, and the Self Funded students are Master of Engineering students, most of whom are in the Fast Track program.

<table>
<thead>
<tr>
<th>GAR</th>
<th>GAT</th>
<th>Self Funded (M.E.)</th>
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</thead>
<tbody>
<tr>
<td>73%</td>
<td>11%</td>
<td>15%</td>
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</table>

Students funded as GAR or GAT (50%) are provided with the same health insurance benefits as the employees. For GATs, this health insurance benefit is paid by the State of Texas; however, for a
GAR, the benefit is paid by the faculty member’s research contract or grant (currently the premium paid on behalf of the student is $200 per month).

4.5 Student Publications and Presentations

The THECB 18-Characteristics data (Table 1.7) reports that in 2017, our 66 enrolled Ph.D. students presented 137 publications or presentations, approximately 2.1 per student. Many masters students also presented conference papers so, as a department, our student publication rate is quite good. This is a testament to the quality of students in the department and shows that they are receiving good training in research and communications. This high publication rate among students is associated with our strong performance in the “Conference” portion of the Academic Analytics Flower Chart show in Figure 3.1.

4.6 Graduation Rates and Post-Graduation Employment

Enrollment data maintained by TAMU is used to assess progress of student cohorts toward graduation. Among Ph.D. students who entered in 2010, 71% completed their degree in 5 years and 85% completed there degrees within 7 years (by 2017). By 2017, none of the 2010 cohort remained in the program at that time. The 2012 cohort did not fare as well with 47% receiving degrees in 5 years and only 17% more remaining in the program at that time. That is, once final 7-year graduation numbers are available for that class, it cannot equal the 85% rate of the 2010 cohort. We suspect the drop may be related to the challenging funding environment in 2013 that encouraged students well along with their Ph.D. to graduate quickly while students just beginning may have been discouraged about their prospects and left the program even if they were well prepared to succeed. The peer comparison in shown in Table 2.8 confirms that our Ph.D. degrees granted per year per TTF lags the average of our peer university group.

Among Master’s students, 75% of the 2012 cohort graduated within 3 years (2015) with 12% still remaining in the program after 3 years. 71% of the 2014 cohort graduated with 3 years with 28% still in the program after 3 years. Considering that the average time to graduation for Master's students is 2.0 years, this suggests that there is a wide variation of time-to-graduation among students. Anecdotally, students who pursue industrial positions are motivated to finish quickly while students who transition from M.S. to Ph.D. may linger “officially” as M.S. students even as they move more into Ph.D.-level work and responsibility.

Post-graduation employment statistics are available for Ph.D. students in the THECB 18-characteristics data, Table 1.7. These show that, at the time of graduation, 93%, 83%, and 71% of the graduating Ph.D. students had positions, in years 2014-2015, 2015-2016, and 2016-2017, respectively. Others are listed as “seeking employment” in Table 1.7 but appropriately should be listed as “unknown”. Our students are sought out by industry and rarely struggle to find outstanding
positions, if not before they graduate, very soon thereafter. The occasional exceptions may be non-U.S.-citizens whose research qualifications are related to areas in which only U.S. citizens are often hired in the U.S.

4.7 Analysis Question: Is the Department achieving its mission of contributing to the land grant mission of the university?

The mission of Texas A&M University as a land-grant institution is dedicated to the discovery, development, communication, and application of knowledge in a wide range of academic and professional fields in the service of society in Texas, the U.S. and the world. We take very seriously our charge to educate as many students as we can accommodate to become highly-achieving engineers who will design and implement key technologies within Aerospace and other areas critical to mobility, safety, prosperity, and the environment. Our Departmental mission aligns with College of Engineering and the Texas A&M Engineering Experiment Station both in regards to performing high-quality research and educating graduate students to become experts in their fields and with the capability, at the M.S. and Ph.D. levels, to become leading researchers themselves.

Because of how our program is structured, we rely on vigorous research activity to fund and engage M.S. and Ph.D. students. As our faculty number, faculty quality, and research funding have increased in the past several years, we have begun to enroll substantially more students. As student numbers increase, we see that incoming student quality is staying high or even increasing. By interacting with more students on cutting-edge research, we are confident we are achieving our mission of benefiting society by helping develop new technology while simultaneously training the next generation of engineers leaders. Separately, as we continue to expand our coursework-based M.E. degree program both locally and through distance education, we will be able to engage even more students in advanced training that will help them succeed in their careers.
5. Concluding Observations

5.1 Summary of the Self-Study Report

This Self Study Report gives an overview of the Department of Aerospace Engineering at Texas A&M University, the structure and history of it Ph.D., M.S., and M.E. graduate programs, and provides data on and an assessment of the graduate programs’ performance since the last external academic program review in 2011. Three approaches are used to assess the performance and quality of the graduate programs. First is the internal assessment that tracks program outcomes and performance criteria in order to meet program goals and provide the data needed for continuous improvement. Second, the department reports 18 key metrics to the Texas Higher-Education Coordinating Board (THECB). This assessment ensures that the department is meeting state requirements. Third, the external review of the graduate programs that this self-study report supports provides a critical independent assessment and comparison to other programs across the nation.

For this external review, the specific charge to the review committee was to address five specific questions:

1. Based on the data and information provided in this self-study report and gathered by the review team, what are the department’s overall strengths and weaknesses?
2. How well do the department’s strategic goals align with those of its college and with those of Texas A&M University?
3. How would you compare this department with its peers? Specifically, is the curriculum directly related and appropriate to the mission and goals of the institution?
4. What improvements (including student learning and faculty development) has the department made since the previous program review?
5. With only current resources or a modest infusion of new ones, what specific recommendations could improve the department’s performance, marginally or significantly?

We expect the Review Team’s answers to Questions 1 and 5 will provide critical guidance as we continue to strive toward our goal of becoming the nation’s #1-ranked public graduate program in Aerospace Engineering. The previous review in 2011 helped us to formulate key insights that that have driven the department’s strategic growth since that time as the faculty have increased in number from 27 to 39 while simultaneously increasing quality of both the faculty and students. A summary of our changes made in response to the 2011 report are given in Sec. 1.7.2.

Regarding Question 2, our alignment to university and college goals is specifically addressed in Sec. 1.2, which describes how the Aerospace Engineering strategic planning aligns with the broader college and university. In fact, our good alignment has been a key driver of our success in competing for College and University resources such as our recruiting of Chancellor’s Research Initiative faculty and associated junior faculty. These new hires represent a significant strategic investment that
was only possible due to the alignment between the department's strategic goals and those of the college and university.

Question 3 asks that the Review Team compare this department to our peers across the nation. We consider our peer group to be the U.S. News and World Report top 10 public aerospace graduate program in the U.S. plus the top 3 private programs. Among this group, U.S. News and World Report ranks the Department of Aerospace Engineering at Texas A&M 7th overall and 4th among public programs. This ranking is Criterion 1 of our internal assessment. We also compare ourselves to other programs by way of research activity captured in Criterion 2 and the associated Academic Analytics flower chart shown in Fig. 3.1. Student quality, diversity, strength of our curriculum, and teaching are all tracked using criteria given in Sec. 1.6 and through data presented in Table 2.7. Overall, we are pleased with our achievement and the data trends. We lag somewhat in student diversity and are hopeful that a new NSF-funded research initiative aimed at the improving undergraduate diversity will also pay dividends at the graduate level.

Question 4 asks the Review Team to report on changes made by the department since the last review in 2011. Those past seven years started with the challenge of decreasing research funding but have recently been characterized by rapid program growth, in terms of research expenditures, new faculty hiring, and an increasing student population to the highest levels ever experienced by the department. Again, Section 1.7.2 gives a detailed account of the changes since 2011 including both our successful strategic growth and the programmatic changes made in response to the last academic program review in 2011. We are pleased to report that the 2011 review helped us generate critical strategic plans that have guided us successfully through our recent growth.

5.2 Future Goals for the Graduate Programs

The future goals of the graduate programs are closely tied with overall goals of the department. As described above, the department has undergone significant faculty growth over the last 8-years, and this growth is continuing to have a positive impact on research performance. However, we believe that the major growth period has ended and our focus must now turn toward capitalizing on the recent growth to enhance the degree programs. The two areas that have received the most recent attention are summarized below.

Department Organization. The Aerospace Engineering Department defined a strategy (see Section 1.2.5 and the Appendix A) to help achieve and maintain the departmental goal of being among the top-ranked public Aerospace Engineering Department within the United States. A vision document and matrix organization were established in 2011, which would maintain the three departmental disciplines (Aerodynamics and Propulsion, Dynamics and Control and Materials and Structures) as the core technical foundation of the department, with the addition of five cross-disciplinary research thrust areas to increase national visibility and provide broad foundations to compete for center level research support. Three of the five thrust areas have a history of
center-level funding: Controlled Intelligent Materials and Structures, Hypersonic Vehicle Systems, and Space Exploration and Sensing Systems. Thus, an important goal is continue these success and to elevate Autonomous Aerospace Vehicle Systems and Aerospace Propulsion and Energy Systems. We believe that extending our efforts to five active center-level research thrusts will provide both stability and the necessary resources to advance the graduate program such that we can improved research performance. The Department will assess the viability of the thrust areas annually. These assessments provide guidance on new/replacement hires, new laboratories, etc.

**Student Body.** Our overarching goal is to provide unique educational opportunities to well-qualified graduate students. We currently lag behind our peers in Ph.D. degrees awarded per year per TTF. Our strategic position then is to more heavily weight towards Ph.D. students as these students best help us achieve our research goals. We aim for a target of 2/3 Ph.D. students and 1/3 M.S. students with a corresponding increase in enrollment from nominally 140 to over 240 students. This translates into increasing our student advising goals to 4 Ph.D. and 2 M.S. students per faculty. This Ph.D./M.S. ratio is consistent with current trends in the Office of Graduate and Professional Studies, where College tuition support for teaching assistants is restricted to Ph.D. students. With the proposed Ph.D./M.S. student demographics, the research and teaching duties will rest primarily on the Ph.D. students, while the M.S. program will provide opportunities for more applied research and preparation for engineering practice in industry.

Separately, we also expect to expand the self-funded M.E. program that operates in parallel with the M.S. program as this helps us achieve our mission to educate an advanced aerospace engineering workforce while leveraging the existing graduate curriculum. We expect the M.E. program to continue to grow and include student in-residence at Texas A&M plus a growing cohort of distance-education students.

As we strive to increase the graduate enrollment our target is to increase domestic enrollment to 60% as this fraction is in line with current hiring trends within aerospace engineering. We also believe that international students add intellectual diversity to the program, which enriches the program for all involved.

In terms of financial support, the departmental goal is that 50% of the graduate student body be Graduate Research Assistants, and the remainder funded through a combination of Graduate Teaching Assistants, major fellowships and industry support. We are also continually survey graduate stipend rates, and the College range allows for competitive offers.

Although consistent with national trends, student diversity among women and underrepresented groups remains a challenge, and the department will continue to actively recruit on both fronts. Our goal is to increase the student body to 20% women and 10% underrepresented groups. A concrete action plan to directly address this perceived shortcoming is required. This is also true for the faculty diversity.
In terms of student placement, we are developing new plans to increase our students’ competitiveness for academic positions. This includes creating additional opportunities for teaching experiences including teaching fellows, assistant lecturers and a mentoring course for Ph.D. students. We hope that by providing opportunities such as this, our students will have strengthened resumes and will be inspired to pursue teaching as a career.
Appendix A. 2011 Vision Committee Strategic Plan Report

Aerospace Engineering Vision Committee Final Report
May 20, 2011

New Matrix Organization Administrative Structure for the Aerospace Engineering Department

By
Amine Benzerga, Rodney Bowersox (Chair), Suman Chakravorty,
John Junkins, Adonios Karpetis, William Saric

Executive Summary
The Department Head (Dr. D. Lagoudas) established the Aerospace Engineering Vision Committee (AVC) on Oct. 25, 2010 to consider a new administration structure to help achieve and maintain the departmental goal of being the top ranked Aerospace Engineering Department within the United States. The primary focus was to investigate the merits of a new matrix organization. The matrix would maintain the three departmental disciplines (Aerodynamics and Propulsion, Dynamics and Control and Materials and Structures) as the core foundation (or rows in the matrix terminology). In addition, the department would identify five research thrust areas to increase national visibility. The first step in the committee charter was to assess the department and the reputation thereof via the NRC rankings and informal peer surveys. This analysis suggested that our peers undervalue the department, which has an adverse implication in our placement within the rankings. In addition, the NRC data suggested that departments that are identified by research/application areas received higher perceptions than the their quantitative output would merit, and visa versa. Based on this input, the committee worked with the department to identify research thrusts with the goal of increasing visibility. Thus, as the second step, the committee recommended the following five thrust areas: (1) Autonomous Aerospace Vehicle Systems, (2) Aerospace Propulsion and Energy Systems, (3) Hypersonic Vehicle Systems, (4) Space Exploration and Sensing Systems, and (5) Controlled Intelligent Materials and Structures. The final step is implementation, which is under the purview of the Department Head.

1. Aerospace Vision Committee Objective and Approach
The Aerospace Engineering Department established the vision of achieving the status of top ranked public university in the United States during the 2009 Faculty Retreat. The Aerospace
Engineering Vision Committee (AVC) was founded with the objective of developing a strategy to achieve and maintain the departmental goal of being the top ranked public Aerospace Engineering Department in the United States.

The committee was comprised of (1) the two departmental distinguished professors, Drs. Junkins and Saric, to provide experienced leadership, (2) three junior professors, Drs. Benzeraga, Chakravorty, and Karpetis to provide a long term vested interest, and (3) the associate department chair, Dr. Bowersox to provide an administrative perspective.

A three-step approach was employed to meet the objective. Peer judgment is a key factor determining the overall rank of departments. Hence, the first task was to assess the current views of TAMU Aerospace Engineering department. The committee examined the 2009 NRC Rankings and performed informal surveys from faculty at peer institutions. The second step was to develop education/research roadmap for the next 5-10 years. The department head, based on the 2010 faculty retreat input suggested a matrix organization, with the fundamental core areas forming the basis (rows) and a newly identified list of five research thrust areas forming the columns. The basic premise was that the research thrust areas would bolster the visibility and reputation of the department. The research thrusts were aligned with current success and projected National, State, and University programs and Strategic Plans. The third, and final, step was to suggest an implementation plan to change the overarching structure of the department. Specifically, the committee identified the thrust areas and made suggestions for area leads to the department head.

2. Assessment Results

Professor Karpetis performed an in-depth analysis of the 2009 NRC Survey (R- and S-Ranking) results, which were based on 2006-07 data. In summary, the data showed that the TAMU Aerospace Engineering Department’s measured (quantitative S-ranking) rankings significantly exceeded the corresponding reputation (R-ranking). Upon further examination, it was noted that departments that project research thrusts/aerospace applications tended to outperform departments that emphasized core disciplines in R-rankings (see Fig. 1). Informal surveys of faculty at Caltech, Ga Tech and Stanford confirmed the NRC conclusions, where it was noted by our peers that TAMU provides solid students for industry, and the our programs are not tailored to academia.

3. New Matrix Organization

The assessment results suggested that a corrective measure was warranted to improve the department perception, and thus provided the incentive to consider the matrix organization, suggested by the Department Head, to better emphasize the research strengths of the department. The resulting research roadmap defined five departmental thrust areas that aligned our departmental strengths (success) with COE, University and National strategic plans.
The matrix organization maintains the three departmental core disciplines as the departmental foundation (or rows in the matrix terminology):

- Aerodynamics and Propulsion
- Dynamics and Control
- Materials and Structures

The core area group leaders form an Academic Advisory Committee to provide guidance to the department head on issues such as the health of the academic programs, hiring needs, laboratory and classroom needs, etc.

After considerable deliberation and consultation with the core groups, the following five research thrust areas were defined:

- Aerospace Propulsion and Energy Systems (APES)
- Autonomous Aerospace Vehicle Systems (AAVS)
- Controlled Intelligent Materials and Structures (CIMS)
- Hypersonic Vehicle Systems (HyVS)
- Space Exploration and Sensing Systems (SESS)

The research thrust leaders will form a Research Advisory Committee made up of thrust leaders to provide guidance to the department head on health of the research thrust, hiring needs, laboratory needs, etc.

The resulting matrix organization is given in Table 1. The rows are divided into the three core groups as indicated by the colors in the first column. The first group (blue) lists the Aerodynamics and Propulsion group. The Dynamics and Controls group is listed in the gray rows. Finally, the Materials and Structures group is listed in the last grouping (blue). The group leaders are indicated in bold and underlined. The five thrust areas are denoted columns two through five. The thrust area faculty and area leaders, as indicated by bold type, are listed in the rows. A brief explanation of each thrust area is given in the next section.
Table 1 Matrix Organization (TTF+Chamitoff, updated 2018)

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<tr>
<th>Name</th>
<th>Aerospace</th>
<th>APES</th>
<th>AAVS</th>
<th>CIMS</th>
<th>HyVS</th>
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<td><strong>Srinivas Rao Vadali</strong></td>
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<td>John Valasek</td>
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<tr>
<td><strong>Amine Benzerga</strong></td>
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</table>
4. Research Thrust Areas

Three criteria formed the basis of the five thrust areas. The first criterion was future importance to the nation as this defined future placement for graduates and funding potential. The second was departmental strength, existing or planned, as this defines the credibility of the department to compete for major research initiatives. The last criterion was funding potential as this determines the ability to support a nationally renowned graduate programs.

4.1 Aerospace Propulsion and Energy Systems (APES)

- **Future Importance:** Efficient propulsion is required for access-to-space, commercial transport and space exploration. Many technologies are also applicable to the energy crisis (e.g. power generation, alternate fuels, renewables and wind energy)
  - Rich with scientifically challenging problems that cut across many disciplines
- **Departmental Strength:** Established faculty and nationally prominent laboratories
  - Laser Diagnostics and Combustion Laboratory
  - Low-Speed Wind Tunnel
  - Materials and Testing Laboratory
  - National Aerothermochemistry Laboratory
  - Propulsion Laboratory
- **Funding Potential:** DoE, Sandia National Laboratory, and private industry (e.g., Vestas)
  - Numerous major projects (AFOSR, VESTAS, AFRL …)
4.2 Autonomous Aerospace Vehicles Systems (AAVS)

- **Future Importance:** Unmanned Systems, in particular, UAVs, are a long term goal of the US for military and Space Exploration.
  - Such systems require both autonomy (intelligence) as well as new vehicle design concepts (synergy between control, fluids and structures)
  - Interdisciplinary (AE, CSE, EE, ME)

- **Departmental Strength:** Established faculty and nationally prominent laboratories
  - Centers
    - Consortium for Autonomous Space Systems
  - Laboratories
    - LASR Laboratory
    - Flight Mechanics Laboratory
    - Emergency Robotics Laboratory
    - Vehicle Systems and Control Laboratory

- **Funding Potential:** DoD, NASA, NSF, and private industry
  - Numerous major projects (AFOSR, NSF, NRO, Boeing, NASA and DARPA
4.3 Controlled Intelligent Materials and Structures (CIMS)

- **Future Importance:** Controlled materials are required for many future aerospace and industrial systems
  - Material challenges include extreme environments, multifunctionality, shaping and morphing, …
- **Departmental Strength:** Established faculty and nationally prominent laboratories
  - Centers/Multimillion Dollar Programs
    - Functionally Graded Multifunctional Hybrid Composites for Extreme Environments (MURI)
    - International Institute of Multifunctional Materials for Energy Conversion
    - SMA-RT Vehicles Concepts Center
  - Laboratories
    - Materials Testing Laboratory
- **Funding Potential:** DoD, NASA, NSF, and private industry
  - Numerous major projects (DoD, NSF, and NASA)

![Fig. 4 CIMS Applications](image)

4.4 Hypersonic Vehicles Systems (HyVS)

- **Future Importance:** Hypersonic flight offers the promise of important space (economic) and national defense advantages for the United States
  - Rich with scientifically challenging problems that cut across many disciplines
- **Departmental Strength:** Established faculty, centers and nationally prominent laboratories
  - Centers and major projects
    - National Center for Hypersonic Transition
    - Functionally Graded Hybrid Composites for Extreme Environments
  - Laboratories
• Laser Diagnostics and Combustion Laboratory
• Materials and Testing Laboratory
• NASA LaRC/TAMU Mach 6.0 Quiet Tunnel
• National Aerothermochemistry Laboratory

• **Funding Potential:** This thrust is directly aligned with research interests of the DoD, NASA, Sandia National Laboratory, and private industry
  – $25M in external research funding (2004 – 2014)

**Fig. 5 HyVS Applications**

4.5 **Space Exploration and Sensing Systems (SESS)**

• **Future Importance:** Space exploration and sensing has many cross-cutting applications including Climate Monitoring, National Security, Orbit Debris Mitigation, Near Earth Asteroids/Planetary Defense, Space Situational Awareness, Enhanced Mapping and Reconnaissance, …
  – Requires sophisticated modeling, sensing, guidance, navigation and control, and space system design

• **Departmental Strength:** Established faculty, centers and nationally prominent laboratories
  – Hyland’s Telescopes and ICI Setup
  – LASR Laboratory
  – MPREV

• **Funding Potential:** This thrust is directly aligned with research interests of the NRO, NASA, AFOSR, AFRL, Industrial Partners …
  – Numerous major projects (AFOSR, AFRL, NSF, NRO and industry)
5. Conclusions

The goal of the AVC was to establish a plan to achieve and sustain the status as the top ranked public aerospace engineering program in the United States. The approach was to

1. Perform a systematic study of the departmental strengths and weaknesses
   • TAMU Aerospace appears to be undervalued in the National Rankings and peer assessments
   • Visibility was identified as a key issue

2. Introduce a new matrix organization to highlight visible thrust areas
   • Long term future potential (national needs and funding opportunities)
   • Significant critical mass within the department (people and facilities)

3. Reorganize the department administration to promote
   • Sustainment of highly visible interdisciplinary research and education programs.
Appendix B. Faculty CVs

Name and Academic Rank: Daniil Andrienko, Assistant Professor

Degrees with fields, institution, and date:
PhD, Mechanical Engineering, Wright State University, 2014
PhD, Applied Physics, Moscow Institute of Physics and Technology (State University), 2013
M.S., Applied Physics, Moscow Institute of Physics and Technology (State University), 2010
B.S., Applied Physics, Moscow Institute of Physics and Technology (State University), 2008

Number of years of service on this faculty: 1
Date of original appointment: Jan 2018
Dates of advancement in rank: N/A

Other related experience:
Texas A&M University, Aerospace Engineering, College Station, TX
  Director, High Temperature Gas Dynamics Laboratory, Jan. 2018 – Present
University of Michigan, Aerospace Engineering, Ann Arbor, MI
  Postdoctoral research fellow, June 2014 – Dec 2017
  Lecturer, Jan 2016 – May 2016
Institute for Problems in Mechanics, Moscow, Russia
  Research staff, Aug 2013 – Dec 2013
Wright State University, Mechanical Engineering, Dayton, OH
  Visiting research scholar, Aug 2011 – Dec 2011

Consulting, patents, etc.:
  N/A

State(s) in which registered: None

Principal publications of last five years:
(* indicates Student under the Direction of Dr. Andrienko)
1. D Andrienko, ID Boyd "Vibrational energy transfer and dissociation in O2-N2 collisions at
   hyperthermal temperatures", Journal of chemical physics 148 (8), 084309, 2018
2. D Andrienko, ID Boyd "State-specific dissociation in O2-O2 collisions by quasiclassical trajectory
   method", Chemical Physics 491, 74-81, 2017
4. D Andrienko and ID Boyd "Kinetic models of oxygen thermochemistry based on quasi-classical
5. D Andrienko and ID Boyd "Thermal relaxation of molecular oxygen in collisions with nitrogen atoms",
6. I Ulusoy, D Andrienko, ID Boyd and R Hernandez "Quantum and quasi-classical collisional dynamics of
   O2—Ar at high temperatures", Journal of Chemical Physics, Vol. 144 (23), 234311, 2016

**Scientific and professional societies of which a member:**
- AIAA, American Physical Society

**Honors and awards:**
- Departmental Academic Scholarship, 2013
- Presidential Stipend, 2010
- Best Paper Award, 2009

**Professional development activities in the last five years:** Continuous

**Institutional and professional service in the last five years:**
- N/A

**Percentage of time available for research or scholarly activities:** 100%

**Percentage of time committed to the program:** 100%

**Other:** Director, High Temperature Gas Dynamics Laboratory, Jan. 2018 – Present
Name: Kyle T. Alfriend

Education
M.S., Engineering Mechanics, Stanford University, 1964

Academic experience
Naval Post Graduate School, Visiting Professor, 2003-present, full time
Texas A&M University, Professor, TEES Distinguished Research Chair, 2003-present, full time
Texas A&M University, Professor, Wisenbaker II Chair, 2001-2003, full time
Texas A&M University, Department Head, 1997-2001, full time
Naval Postgraduate School, Navy TENCAP Space Chair, 1994-1996, full time
Cornell University, Assistant Professor, 1967-1973, full time

Non-academic experience
Numerica Corp., Consulting, 2009-present, part time
Booz Allen, Consulting, 2009, part time
MRC, Consulting, 2003, part time
Bracewell & Patterson, Consulting, 2001-present, part time
Texas Space Grant Consortium, Chairman of the Board, 1998-present, full time
AT&T, Consulting, 1997-present, part time
White & Case, Consulting, 1996-present, part time
GRC International, Director of Special Projects Division, Responsible for the management of all activities (technical and marketing) of the office, 1985-1993, full time
CIA, Office of Development and Engineering, Responsible for the development and application of advanced technologies to intelligence systems. Specific duties classified, 1983-1985, full time
Naval Research Laboratory, Head of Advanced Systems Branch Space Systems Division, Responsible for the supervision and management of 25 engineers and scientists engaged in research and development of advanced technologies and techniques with application to space systems. Directed research in satellite dynamics and control, celestial mechanics, autonomous navigation, electromagnetic systems, optical signal processing, applied mathematics, satellite survivability and electronic warfare, 1974-1983, full time
Ithaco Inc., Consulting, 1973-1974, part time
NASA Goddard Space Flight Center, Senior Postdoctoral Research Associate, Awarded research associateship by the National Academy of Sciences to perform research on methods of orbit prediction and determination, 1973-1974, full time
Lockheed Missiles and Space Co., Research Engineer, Performed analyses of spacecraft/booster separation and the effects of winds and gusts on the interaction of the control system and flexible body dynamics of the Saturn booster, 1962-1965, full time

Certifications or professional registrations-Not Applicable

Current membership in professional organizations
Society for Industrial and Applied Mathematics (Member)
AIAA (Elected Fellow)
American Astronautical Society (Elected Fellow)
Society for Engineering Science (Member)
American Society for Engineering Education (Member)
National Space Society (Member)

**Honors and awards**
Elected Honorary Fellow, AIAA
Kyle T. Alfriend Astrodynamics Symposium
Von Karman Lecture, Israel Aerospace Sciences Conference
T.A. Wilson Lecture, Iowa State University
Elected to the Academy of Excellence at Va Tech.
Elected charter member of the Texas Academy of Science, Engineering and Medicine
Elected a member of the European Academy of Sciences
Elected to the National Academy of Engineering
Elected member of the International Academy of Astronautics
Awarded 1989 AAS Dirk Brouwer Award for outstanding contributions in Space Flight Mechanics and Astrodynamics
Elected Fellow, AIAA
Elected Fellow, AAS
Elected Associate Fellow, AIAA
Navy Meritorious Civilian Service Award
NASA/ASEE Summer Faculty Fellowship

**Service activities (within and outside of the institution)**
Special Editor, AIAA JGCD Special Issue Honoring Richard Battin, 2014
Member, Senior Steering Group, USAF Astrodynamics Innovations Committee, 2013-present
Vice Chair, NRC Committee on USAF Algorithms, 2011
Member, Va. Tech College of Engineering Advisory Board, 2011-present
Member of Review Team, Aerospace Engineering, Univ of Colorado, 2011
NRC Committee on Review of NASA Debris Research, 2010
NASA Aeronautics & Space Engineering Board (ASEB), 2009-2010
NRL Space Research Review Board, 2008
Member, Air University Board of Visitors, 2004-present
Member, Air Force Institute of Technology Board of Visitors, 2004-present
Chair AAS Space Flight Mechanics Committee, 2004-2005
Member of NRC Committee on the Future of the US Aerospace Infrastructure, 2000

**Principal publications and presentations from the past five years**
Vadali and Alfriend, *Formation Establishment, Maintenance and Control, Chapter 4 in Distributed Space Missions for Earth System Monitoring, Formation Establishment, Maintenance and Control, Chapter 4 in Distributed Space Missions for Earth System Monitoring*, Springer 2013

**Recent Professional development Activities** Not Applicable
Name: Theocharis Baxevanis

Education
B.S., Mathematics, Aristotle University, Thessaloniki, Greece, 1996
Ph.D., Civil Engineering, Aristotle University, Thessaloniki, Greece, 2003

Academic experience
Texas A&M University, TEES Research Assistant Professor, 2014-present

Non-academic experience-Not Applicable

Certifications or professional registrations-Not Applicable

Current membership in professional organizations
The American Society of Mechanical Engineers (ASME); The Minerals, Metals & Materials Society (TMS); Society of Engineering Sciences (SES); TeXas Materials Modeling Network (TXMMN).

Honors and awards-Not Applicable

Service activities (within and outside of the institution)-Not Applicable

Principal publications and presentations from the past five years
Baxevanis, Th., A. Parrinello and D. Lagoudas, On the driving force for crack growth during thermal actuation in Shape Memory Alloys, accepted in Journal of the Mechanics and Physics of Solids.


Jape, S., Th. Baxevanis and D. Lagoudas, Stable crack growth during thermal actuation of shape memory alloys, accepted in Shape Memory and Superelasticity.


Recent Professional development Activities
52th Annual Technical Conference of So-ciety of Engineering Sciences (SES), College Station, October 26–28, 2015.

10th European Symposium on Martensitic Transformations (ESOMAT), Antwerp, Belgium, 14–18 September, 2015.

Name: Moble Benedict

Education
M. Tech., Aerospace Engineering, Indian Institute of Technology, Bombay, 2004
Ph.D., Aerospace Engineering, University of Maryland, 2010

Academic experience
Texas A&M University, Assistant Professor, 2014-present, full time
University of Maryland, Assistant Research Scientist, 2012-2014, full time
Postdoctoral Research Associate, 2011-2012, full time
Graduate Research Assistant, 2004-2010, part time

Non-academic experience-Not Applicable

Current membership in professional organizations-Not Applicable

Honors and awards
Grand Prize Winner of the Lockheed Martin 2012 Innovate the Future Global Challenge
Young Engineer-Scientist Award – American Institute of Aeronautics and Astronautics (AIAA)
    National Capital Section, 2012
Best Paper Award in the Advanced Vertical Flight Session in 70th Annual National Forum of the
    American Helicopter Society, Montreal, Canada, May 20–22, 2014
Third prize, AIAA student conference 2014 (co-author)
Second prize, AIAA student conference 2013 (co-author)
Co-supervised a PhD student who won the 2013 “Best Doctoral Research Award” in the Aerospace
    Engineering Department
First prize, AIAA student conference 2012 (co-author)
Invited speaker at the SPIE sponsored Micro- and Nanotechnology Sensors, Systems, and
    Applications Conference, Baltimore, April 23–27, 2012
Best Paper Award in the Advanced Vertical Flight Session in 67th Annual National Forum of the
    American Helicopter Society, Virginia Beach, VA, May 3–5, 2011
Co-supervised a Masters student who won the 2011 “Dean’s Best Masters Research Award” for the
    whole of engineering school
Second prize, AIAA student conference 2011 (co-author)
First prize, AIAA student conference 2010 (co-author)
Athena Award 2010
Ann Wylie Fellowship 2009
University of Maryland Future Faculty Fellow 2008
Invited speaker at the National Seminar on Micro Aerial Vehicles organized by Institution of
    Engineers (India), Pune, India, February 28, 2004.
“Best Paper from an Academic Institution” award at the International Seminar on Advances in
    Aerospace Sciences, Bangalore, India, December 2003.

Service activities (within and outside of the institution)
Member, American Institute of Aeronautics and Astronautics, 2009
Member, American Helicopter Society, 2005
Reviewer, Journal of Aircraft (AIAA), 2011-present
Reviewer, Journal of the American Helicopter Society, 2011-present
Reviewer, AIAA Journal, 2013-present
Reviewer, Journal of Fluids and Structures, 2013-present
Reviewer, Journal of Intelligent Material Systems and Structures, 2013-present
Reviewer, The Aeronautical Journal, 2014-present
Reviewer, Journal of Ship Research, 2015-present

Principal publications and presentations from the past five years

Recent Professional development Activities-Not Applicable
Name: Ahmed Amine Benzerga

Education
Preparatory School (Elite College, Physics and Mathematics, Lycée Masséna Nice France, 1989-1992
Ingénieur Diploma, Aerospace Engineering, SUPAERO, Toulouse France, 1995
M.S., Mechanical Engineering, Université Paul Sabatier, Toulouse France, 1995
Ph.D., Materials Science & Engineering, Ecole des Mines de Paris France, 2000

Academic experience
Center for intelligent Multifunctional Materials and Structures (CiMMS) Texas A&M Engineering Experiment Station (TEES), Director, 2014-present, full time
Texas A&M University, Associate Professor, 2010-present, full time
Texas A&M University, Assistant Professor, 2004-2010, full time
Department of Metallic Materials and Structures ONERA (The French Aerospace Lab), Chatillon, France, Senior Visiting Scientist, 2011-2012, full time
Cambridge University, Visiting Assistant Professor, 2004, full time
Brown University, Research Associate, 2000-2003, full time
Gaz de France R&D Center, Research Engineer, 2000-2001, full time

Non-academic experience-Not Applicable

Current membership in professional organizations
American Institute of Aeronautics and Astronautics (Fellow)

Honors and awards
William O. and Montine P. Head Faculty Fellow Award
Texas Engineering Experiment Station (TEES) Faculty Fellow
Holder of the Edward “Pete” Aldridge Career Development Professorship I
Texas Engineering Experiment Station (TEES) Select Young Faculty Award
National Science Foundation CAREER Award Recipient
Visiting Scholar, Pembroke College, Cambridge, UK
Highest Honors for Ph.D. Dissertation Work, Ecole des Mines de Paris, France
Ranked 2nd among foreign students (> 500), “Grandes Ecoles” National Entry Exam, Concours Mines-SupAero, France
Government Fellowship, Classes Préparatoires (Prep School) & Engineering
Ranked 7th (among > 30,000) at the Baccalaureate National Exam, Math Major, Algeria

Service activities (within and outside of the institution)
Department of Materials Science and Engineering, Member of Faculty Search Committee
(Computational Mechanics of Materials position; Chair: Prof. Needleman), Fall 2014-Spring 2015.
Texas A&M Energy Institute, Reviewer of 2014 Energy Institute Fellowships.
Department of Aerospace Engineering, Member of Faculty Search Committee, (Multidisciplinary search, Chair: Prof. Hurtado), Fall 2013 - Spring 2014.
Department of Materials Science and Engineering, Member of Faculty Search Committee  
(Computational Materials Science position, Chair: Prof. Arroyave), Fall 2013 - Spring 2014.  
Aerospace Engineering Department Strategic Aerospace Research (StAR) Committee, 2013-  
Multiple Doctoral and Masters Thesis Committees in AERO and MSEN, and others in ETID,  
MEEN, PETE, CHEN, 2004-.  
College of Engineering, Committee on Advanced Materials for Energy Applications (CAMEA),  
Department of Aerospace Engineering, Chair of Materials & Structures Faculty Search Committee,  
Fall 2010 - Spring 2011.  
Aerospace Engineering Department Graduate Affairs Committee, 2009-2011  
Materials Science and Engineering Program, Graduate Admissions Committee, 2010-2011  
Aerospace Engineering Department Aerospace Vision Committee (AVC), 2010-2011  
Main Reviewer (Rapporteur), Doctoral Thesis of Philippe Burlot (Advisor: J. Besson), Ecole des  
Member, Doctoral Thesis Examination Committee of Alexander Illtchev (Advisor: S. Forest), Ecole  

Principal publications and presentations from the past five years-Not Applicable

Recent Professional development Activities-Not Applicable
Name: Raktim Bhattacharya

Education
M.S., Aerospace Engineering Aug 1997 - Dec 2000
Ph.D., Aerospace Engineering, University of Minnesota, Jan 2001 - Jan 2003

Academic experience

Non-academic experience
United Technologies Research Center, Research Scientist, Technical lead on a $300K project to
develop a new process for rigorous embedded system design for United Technologies (UTC)
Usha Beltron Electronic Software Ltd., Kolkata, West Bengal, India, Junior Engineer, Developed
software for adaptive mesh generation around Light Combat Aircraft (LCA), Developed
computational fluid dynamics code to capture transient forces during store separation in transonic
flow, May, 1996 - Jul, 1997, full time

Certifications or professional registrations
-Not Applicable

Current membership in professional organizations
Member of IEEE and AIAA

Honors and awards
First Prize MACH-1 Contest organized by AIAA GNC Technical Committee & Mathworks
Corporation. A Texas A&M University team of graduate and professors in the Department
of Aerospace Engineering won first place in the inaugural Model-based Aerospace Challenge
#1 (MACH-1). Award was made on Aug 2008, Honolulu, Hawaii at the AIAA GNC
Conference.
Best Paper of the Session - Coauthored paper, with graduate student James Fisher, won the best
Great Job Award from United Technologies Research Center for developing a process for reliable
embedded software design, Sep 2005.
Graduate Student Fellowship from the Dept. of Aerospace Engineering & Mechanics, University of
Minnesota, Sep 97 May 98.

Service activities (within and outside of the institution)
Reviewer for conferences and journals (IEEE, AIAA, ASME)
Member of NSF Panel, NASA postdoctoral review panel
Organized workshops in IEEE ACC and IEEE CDC on Uncertainty Quantification
Consulting work in stochastic optimization, and flight control system design & analysis
Expert Panelist for Uncertainty Quantification in European Air Traffic Control
Group Leader, Systems Engineering/IDEAS Group, Aerospace Engineering, Texas A&M, 2013 - Current
Aerospace Engg. Representative, COE Systems Engineering Curriculum 2013 - Current
Aerospace Engg. Representative, COE Institute for Cyber Physical Engineering Systems 2014 - Current
Aerospace Engg. Representative, COE Institute for Industry and Commercialization Council 2014-Current

**Principal publications and presentations from the past five years** –


S. C. Hsu, R. Bhattacharya, Design of Linear Parameter Varying Quadratic Regulator in Polynomial Chaos Framework.


**Recent Professional development Activities**-Not Applicable
**Name and Academic Rank:** Rodney Bowersox, Professor

**Degrees with fields, institution, and date:**
PhD, Aerospace Engineering, Virginia Polytechnic Institute & State University, 1992
M.S., Aerospace Engineering, Virginia Polytechnic Institute & State University, 1990
B.S., Aerospace Engineering, Virginia Polytechnic Institute & State University, 1988

**Number of years of service on this faculty:** 16
Date of original appointment: August 2002
Dates of advancement in rank: Promoted Full Professor, October 2007

**Other related experience:**
Texas A&M University, Aerospace Engineering, College Station, TX
Professor, Oct. 2007 – Present
  Department Head, Sept 2013 – Present
  Interim Department Head, July 2012 – Sept 2013
  Ford I Professorship, 2014 – Present
  Director, National Aerothermochemistry and Hypersonics Laboratory, 2004–Present
  Associate Professor, Aug 2002 – Sept 2007
  Associate DH for Grad Programs & Research Infrastructure, Jun 2009 – Sept 2012
  Founding Director, National Aerothermochemistry Laboratory, Aug. 2004 – Present
The University of Alabama, Aerospace Engineering & Mechanics, Tuscaloosa, AL
Associate Professor, Aug 2000 – Aug 2002
Interim Department Head, Jan 2001 – Aug 2001
Assistant Professor, Aug 1997 – Aug 2000
Air Force Institute of Technology, Aeronautics and Astronautics, WPAFB, OH
  Assistant Professor, Jan 1993 – Aug 1997

**State(s) in which registered:** None

**Principal journal publications of last five years:** (* indicates Student under the Direction of Dr. Bowersox)

**2013 - 2018**


**Scientific and professional societies of which a member:**
- ASME Fellow, AIAA Associate Fellow, APS Member, ACS Member, OSA Member

**Honors and awards:**
- DoD Vannevar Bush National Security Science and Engineering Faculty Fellow, 2017-2022
- Ford Professorship I, 2014 - Present
- TEES Research Professorship II, 2013 - 2014
- Texas A&M Brocket Professorship Award, 2010
- Texas A&M College of Engineering Fellow, 2009
- Texas A&M Engineering ’43 Webb Faculty Fellow, 2005
- The Lockheed Martin Excellence in Teaching Award, Texas A&M University, 2004
- AIAA Outstanding Aerospace Engineering Faculty at the Univ. of Alabama, 1999, 2001
- Col. Charles A. Stone Award for Leadership at US AFIT, 1995
- Phi Kappa Phi and Sigma Gamma Tau Honor Societies
- Scholastic All American, 1988; Lucille and Gilbert Seay Academic Scholarship, 1987

**Institutional and professional service in the last five years:**
- ASME, Fellow
- AIAA, Associate Fellow
  - General Chair, AIAA 2019 AVIATION Conference
  - Associate Editor, AIAA Journal (2018-Present)
- AIAA 2018 Propulsion and Energy Conference, 360 Forum Panelist on Hypersonic Flight
- HyTASP Program Committee Member (Jan 2005 – Present)
- AIAA Fluid Dynamics Technical Committee Member (June 2005 – Jan 2015)
  - Chair, Technical, Theoretical Fluid Mechanics Conference, Atlanta, GA (2014)
  - Chair, Theoretical and Experimental Fluid Dynamic Subcommittee (2008 – 2013)
  - Chair, National Subcommittee on New Frontiers in Fluid Dynamics (2008)
  - Chair, National Working Group on High Reynolds Number Roughness (2005 – 2007)
  - Chair, Technical, Fluid Dynamics Conference, San Antonio TX (2009)
- AIAA Air Breathing Propulsion Technical Committee Member (Jan 1995 - 2001)

**Technical Advisory Board, National Aerospace Solutions, Inc. (AEDC)**
- US National Committee Member of the International Society of Air Breathing Engines

**American Chemical Society, American Physical Society, Optical Society of America, Member**

**Texas A&M University Aerospace Engineering Department Head**
- Manage Department with 40 Faculty, 31 Staff, 700 students
- Chair, Biomedical Engineering Department Head Search Committee
- COE DH Member of the SRS Texas A&M Stakeholders Operations Committee (TSOC)
- Member, EASA Entry to Major Process Committee
- Successfully Recruited 4 Chancellor Research Initiative (CRI) Professors (NAE Members)
- Successfully Nominated 2 Governors University Research Initiative (GURI) Professors
- Member, Aerospace Engineering Department Search Committees

**Percentage of time available for research or scholarly activities:** 50%
**Percentage of time committed to the program:** 100%

B-13
Name: James G. Boyd

Education
B.S., Mechanical Engineering, University of Texas at Austin, 1983
M.S., Bioengineering, Texas A&M University, 1988
Ph.D., Aerospace Engineering, Texas A&M University, 1994

Academic experience
Texas A&M University, Associate Professor, 2000-present, full time
University of Illinois at Chicago, Assistant Professor, 1994-2000, full time
Texas A&M University, Visiting Assistant Professor, 1992-1994, full time

Non-academic experience-NOT Applicable

Certifications or professional registrations-Not Applicable

Current membership in professional organizations-Not Applicable

Honors and awards
NSF CAREER Award
Best Paper Award in Mechanics and Materials Systems

Service activities (within and outside of the institution)
Member of the College of Engineering Honors and Awards Committee, 2005-2006
Reviewer for College of Engineering Faculty Service Award, Summer and Fall 2006
Reviewer for College of Engineering TEES Select Young Faculty Award, Summer and Fall 2006
Reviewer for College of Engineering Presidential Teaching Award, Spring 2006 AERO 681, organizer in Fall 2002
AERO Faculty Advisor to the Engineering Scholars Program, Sp 2002 – Fall 2004
Member of the Faculty Senate Sp 2002 – Spring 2005
AERO newsletter committee F2002 –
AERO undergraduate committee F02-Sp03
AERO ABET Committee Spring 2003-Spring 2004
Qualifying Exam Committee, TAMU – Boyd wrote and graded the first qualifying exam for continuum mechanics and elasticity, May/June 2001
AERO Search Committee for the URETI positions, junior and senior, Fall 2003-Spring 2005
AERO Admission Representative to the Materials Science and Engineering Program, Fall 2003-Spring 2005
AERO representative to the Engineering Faculty Advisory Committee (EFAC), Spring 2004 – present
Chairman, Engineering Faculty Advisory Committee (EFAC), Fall 2005, Spring 2006
Secretary, Engineering Faculty Advisory Committee (EFAC), Fall 2006, Spring 2007
AERO Equipment Committee, Chair, Fall 2003-Spring 2007, 2011-2012
AERO Space Committee, Spring 2004-present
Graduate Committee, UIC, 1996/97, 1998/99
College of Engineering Materials Science Committee, UIC
Reviewer for Journal of Colloid and Interface Science
Reviewer for Langmuir
Reviewer for IEEE Sensors Journal
Reviewer for Journal of Applied Mechanics
Reviewer for Journal of Damage Mechanics
Reviewer for Journal of Engineering Materials and Technology
Reviewer for Journal of Intelligent Material Systems and Structures
Reviewer for Journal of Micromechanics and Microengineering
Reviewer for International Journal of Plasticity
Reviewer for Mechanics and Materials
Reviewer for Smart Materials and Structures

Principal publications and presentations from the past five years
Majid Tabesh, James G. Boyd, Dimitris C. Lagoudas; Modeling size effect in the SMA response: a gradient theory;
Proc. SPIE 9058, Behavior and Mechanics of Multifunctional Materials and Composites 2014, 905803

Recent Professional development Activities-Not Applicable
Name: Suman Chakravorty

Education
B. Tech, Mechanical Engineering, Indian Institute of Technology, Madras, 1997
Ph.D., Aerospace Engineering, University of Michigan, Ann Arbor, 2004

Academic experience
Texas A&M University, Assistant Professor, 2004-2010, full time
Texas A&M University, Associate Professor, 2010-present, full time

Non-academic experience
Not Applicable

Current membership in professional organizations
Member, American Institute of Aeronautics and Astronautics (AIAA)
Member, IEEE, Institute of Electrical and Electronics Engineers
Member, American Society of Mechanical Engineers (ASME)

Honors and awards
Best Paper in conference award, 2006 Astrodynamics Specialist Conference, Breckenridge, CO
Best Paper in session award, ACC 2006, 2008
Air Force Summer Faculty Fellowship 2010, 2011

Service activities (within and outside of the institution)
Reviewer, AIAA Journal of Guidance
Reviewer, Control and Dynamics
Reviewer, Journal of the Astronautical Sciences
Reviewer, ASME Journal of Dynamical Systems
Reviewer, Measurement and Control
Reviewer, IEEE Transactions on Automatic Control
Reviewer, IEEE Transactions on Neural Networks
Reviewer, IEEE Transactions on Systems
Reviewer, Man and Cybernetics: Part B, Entropy
Reviewer, Journal of Intelligent and Robotic Systems
Reviewer, Journal of Advances in Information Fusion
Reviewer, IEEE Transactions on Aerospace and Electronic Systems
Reviewer, American Control Conference (ACC)
Reviewer, IEEE Conference on Decision and Control (CDC)
Reviewer, IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)
Reviewer, IEEE International Conference on Robotics and Automation (ICRA)
Reviewer, Army Research Office (ARO) Systems and Control program
Reviewer, Air Force Office of Scientific Research (AFOSR) Computational Mathematics program
Reviewer, Panelist for NSF CMMI division, Control Systems Program
Chair, American Control Conference (ACC)
Chair, IEEE/ ASME Conference on Advanced Intelligent Mechatronics (AIM)
Chair, AIAA Guidance, Navigation and Control Conference (GNC)
Chair, IEEE International Conference on Systems
Chair, Man and Cybernetics (SMC)
Member, IEEE International Symposium on Intelligent Control (ISIC), Pacifico Yokohama, Japan, 2010
Member, IEEE/RSJ International Conference on Robots and Intelligent Systems (IROS), 2012
Member, American Control Conference (ACC), 2013
Member, IEEE/RSJ International Conference on Robots and Intelligent Systems (IROS), 2013
Associate Editor, ASME Journal of Dynamical Systems, Measurement and Control

Principal publications and presentations from the past five years

Recent Professional development Activities
2010 IEEE International Symposium on Intelligent Control (ISIC), Pacifico Yokohama, Japan
2012 IEEE/RSJ International Conference on Robots and Intelligent Systems (IROS)
2013 American Control Conference (ACC)
2013 IEEE/RSJ International Conference on Robots and Intelligent Systems (IROS)
Name: Gregory E. Chamitoff

Education
B.S., Electrical Engineering, California Polytechnic State University, 1984
M.S., Aeronautical Engineering, California Institute of Technology, 1985
M.S., Space Science, University of Houston, 2002
Ph.D., Aeronautical & Astronautical Engineering, 1992

Academic experience
Texas A&M University, Professor of Practice, Director of ASTRO Center, 2013-Present, full time
University of Sydney, Professor of Aeronautics, Lawrence Hargrave Chair, 2013-Present, part time
MIT, Research Affiliate, 2011-Present, part time
University of Sydney, Visiting Lecturer, 1993-1995, full time
California Polytechnic State University, Lab Course Instructor, 1984, part time

Non-academic experience
NASA, Astronaut, 1998-2013, full time
Charles Stark Draper Laboratory, Technical Staff and MIT Research Assistant, 1985-1993, full time
IBM, Student Engineer, integrated circuit design and development, 1983, part time
Northern Telecommunications, Student Engineer, outpulsing relay test fixture circuit design and development, 1982, part time
Atari, Student Engineer, statistical quality control database and sampling plan design, 1981, part time
Four Phase Systems, Product Assurance Technician, reliability analysis and quality assurance testing, 1980, part time

Certifications or professional registrations-Not Applicable

Current membership in professional organizations
Association of Space Explorers
Academy of the Magical Arts – Honorary full magician member
AAS – American Astronautical Society
AIAA - American Institute of Aeronautics & Astronautics (Associate Fellow)
IEEE - Institute of Electrical & Electronic Engineers
ETA KAPPA NU - Electrical Engineering Honor Society
Engineering Honor Society
Science & Engineering Honor Society
Honorary Scientific Research Society
National Space Society

Honors and awards
NASA Exceptional Service Medal
Russian Medal of Merit for Space Exploration
NASA Space Flight Medal for STS-134
California Space Authority Spotbeam Award - Astronaut Hall of Fame
NASA Space Flight Medal for ISS Expedition 17
NASA Distinguished Service Medal
Cal Poly Honored Alumni Award
NOAA - Official Aquanaut Certification
NASA - Technical Performance Award
AIAA - Technical Excellence Award
NASA - Silver Snoopy Award
NASA/USA - Space Flight Awareness Honoree (STS-86)
NASA - Going the Extra Mile Award
C.S. Draper Laboratory Fellowship - Tuition & Stipend
IEEE - Graduate Fellowship Award
Tau Beta Pi - Graduate Fellowship Award

Service activities (within and outside of the institution)-Not Applicable

Principal publications and presentations from the past five years

Recent Professional development Activities-Not Applicable
Name: Paul G. A. Cizmas

Education
Dipl. Ing., Aerospace Engineering, Politehnica University, Bucharest, Romania, 1984
Ph. D., Mechanical Engineering and Materials Science, Duke University, 1995

Academic experience
Texas A&M University, Professor, 2009-present, full time
Associate Professor, 2004-2009, full time
Assistant Professor, 1998-2004, full time
Politehnica University, Assistant Professor, 1988-1991, full time
Research Engineer, 1986-1988, full time
Duke University, Research Associate, 1995-1998, full time
Research Assistant, 1991-1995, full time

Non-academic experience
Westinghouse Electric Corporation, Senior Engineer/Scientist, 1995-1998, full time
Turbomecanica Jet Engine Company and National Institute for Heat Engines, Design Engineer, 1984-1988, full time

Certifications or professional registrations-Not Applicable

Current membership in professional organizations
American Institute of Aeronautics and Astronautics, Associate Fellow
American Society of Mechanical Engineers

Honors and awards
Appointed to the National Research Council Committee on Air Force/Department of Defense Aerospace Propulsion that was chartered in 2005 by the Director of Defense Research and Engineering (currently the Undersecretary of the Air Force) to provide input on the needs of DoD propulsion for the next 15 to 20 years.
ASME Structures and Dynamics Committee 2011 Best Paper Award
Herbert H. Richardson Faculty Fellow Award, Texas A&M University, 2009
E. D. Brockett Professorship Award, Texas A&M University, 2008

Service activities (within and outside of the institution)
Appointed to the National Research Council Committee on Air Force/Department of Defense Aerospace Propulsion, 2005
Taught a section of the AIAA Aeroelasticity Short Course (this course is taught every other year at the Structures, Structural Dynamics and Materials Conference).
Member of the editorial board of the Propulsion and Power Research, 2011
Session Chair for CFD Methods, SciTech 2014, National Harbor, Maryland, January 2014
Principal publications and presentations from the past five years


Recent Professional development Activities- International Conference of Aerospace Sciences “AEROSPATIAL 2014
Name and Academic Rank: Ana Diaz Artiles, Assistant Professor

Degrees with fields, institution, and date:
PhD, Aeronautics and Astronautics, Massachusetts Institute of Technology, 2015
M. Sc. Aeronautical Engineering, ETSIA Universidad Politécnica de Madrid, 2006

Number of years of service on this faculty: less than 1
Date of original appointment: May 2018

Other related experience:
- Texas A&M University, Aerospace Engineering, College Station, TX
  Assistant Professor, May 2018 – Present
  Director, Bioastronautics and Human Performance Group, May 2018 - Present
- International Space University, Strasbourg, France
  Department Chair of the Human Performance in Space Department, Space Studies Program, 2017
  Visiting Faculty, Jun 2014 – Present
- Cornell University, Sibley School of Mechanical and Aerospace Engineering, Ithaca, NY
  Lecturer and Research Associate, July 2015 – May 2018
  Director of the Bioastronautics and Human Performance Laboratory, July 2015 – May 2018
- ArianeSpace
  Ariane 5 Operational Engineer, Launch Division, June 2006-Sept 2011

Consulting, patents, etc.: None

State(s) in which registered: None

Principal publications of last five years:
(* indicates Student under the Direction of Dr. Diaz Artiles)

1. D.A. Alonso* and A. Diaz Artiles. Understanding Gravitational Effects on the Cardiovascular Systems
   Investigators’ Workshop, Houston, TX, January 22-25, 2018.
2. F. Perez*, P. Navarro Tichell*, and A. Diaz Artiles. Cardiopulmonary Responses to Exercise in
   Altered-Gravity Environments. In: 2018 NASA Human Research Program Investigators’ Workshop, Houston,
   TX, January 22-25, 2018.
4. G.G. de la Torre, A. Diaz Artiles, J. Jorgensen, A. Vogler. Virtual reality technology and exercise in
   artificial gravity and bed rest settings as a countermeasure for spaceflight deconditioning. In Proceedings
5. A. Diaz Artiles, A. Priesol, T. Clark, D. Sherwood, C. Oman, L.R. Young, and F. Karmali. The Impact of
   Oral Promethazine on Human Whole-Body Motion Perceptual Thresholds. Journal of the Association for
7. 33. E.W. Berg and A. Diaz Artiles. Exercise in Altered-Gravity for Increased Health during Space
   Exploration. In: 2017 NASA Human Research Program Investigators’ Workshop, Houston, TX, January 23-26,
   2017.


**Scientific and professional societies of which a member:**
- American Institute of Aeronautics and Astronautics (AIAA), 2010 - present
- American Physiological Society (APS), 2016- present
- American Society for Gravitational and Space Research (ASGSR), 2016 – present

**Honors and awards:**
- Amelia Earhart Fellowship (Zonta International), 2014
- Man Vehicle Lab ‘Sherry’ Award (MIT) 2014
- MIT-France Fellowship, (MIT International Science and Technology Initiatives), 2014
- IAAA Best Paper Award (Environmental Systems), 2012
- Fulbright Fellowship (MIT), 2011
- European Space Agency Scholarship to attend the Space Studies Program at the International Space University 2010
- European Space Agency Scholarship to participate in a Parabolic Flight Campaign, 2005
- Erasmus Fellowship (SUPAERO, France) 2003

**Professional development activities in the last five years:** Continuous

**Institutional and professional service in the last five years:**
- Editorial Board Frontiers of Physiology
- Conference Session Chair of the IEEE Aerospace Conference. Session: 8.05 Space Human Physiology and Countermeasures, 2016 – present
- Department Chair, Human Performance in Space Department - Space Studies Program 2017, International Space University
- Faculty Advisor Cornell team for NASA Micro-g NExT competition, 2015-2018
- Project Adviser Mars Base Eagle, NASA-funded human exploration project led by the Wings of Eagles Discovery Center (Horseheads, NY)
- Referee Service (Acta Astronautica, Applied Mathematical Modelling, Npj Microgravity, Frontiers of Medicine, Neuroscience Letters, Scientific Reports),

**Percentage of time available for research or scholarly activities:** 100%

**Percentage of time committed to the program:** 100%
Name: Diego A. Donzis

Education
B.S. (5 years), Aeronautical Engineering, Universidad Tecnologica Nacional, Buenos Aires, Argentina, 2002
M.S., Aerospace Engineering, Georgia Institute of Technology, 2004
Ph.D., Aerospace Engineering, Georgia Institute of Technology, 2007

Academic experience
Texas A&M University, co-Director (NAL), 2014-present, full time
Texas A&M University, Assistant Professor, 2009-present, full time
University of Maryland, Research Associate, 2007-2009, full time
Georgia Institute of Technology, Graduate Research Assistant, 2002-2007, part time
International Centre for Theoretical Physics, Trieste, Italy, Invited Scientist, Summer 2004, 2005, 2006, full time
University of Buenos Aires, Teaching Assistant, 2000-2002, part time
University of Buenos Aires, Undergraduate Research, 1999-2002, part time

Non-academic experience-Not Applicable

Certifications or professional registrations-Not Applicable

Current membership in professional organizations
User Advisory Committee for the Extreme Science and Engineering Discovery Environment (XSEDE), 2012-present
American Physical Society
American Institute of Aeronautics and Astronautics
American Society for Engineering Education
American Society of Mechanical Engineers

Honors and awards
2013 Francois Frenkiel Award for significant contributions to fluid mechanics by the American Physical Society
TEES Select Young Faculty, Texas A&M University 2011
NSF CAREER award, 2011
5K Club Award for paper in TeraGrid, 2008.
Best graduates from universities in Argentina, National Academy of Engineering, 2001

Service activities (within and outside of the institution)
Member, User Advisory Committee for the Extreme Science and Engineering Discovery Environment (XSEDE), 2012-present
Member, Local organizing committee for 5th Symposium on Hybrid RANS-LES Methods, College Station TX, March 19-21 2014.
Co-chair, Texas A&M Turbulence Symposium, College Station, TX, March 27-30 2013.
Member, User Advisory Committee at National Institute for Computational Science (NSF Track 2 machine Kraken). 2008-2013
Member, Petascale User Committee at Texas Advanced Computing Center (NSF Track 2 machine Ranger). 2008-2012
Invited TeraGrid Planning Workshop, August 2007.
Fluid Dynamics NSF panel
Engineering Faculty Advisory Council (EFAC), 2011-2013
COE High-performance computing committee, 2013-present
COE 25X25 Faculty Hiring Committee, 2013-present
Chair of Computer Environment Committee in Aerospace Engineering, 2010-present
Strategic Aerospace Research (StAR) Committee in Aerospace Engineering, 2013-present
Distance Education Committee in Aerospace Engineering, 2013-present
Chair of Computer Environment Committee in Aerospace Engineering, 2010-present
Strategic Aerospace Research (StAR) Committee in Aerospace Engineering, 2013-present
Department Head Search Committee, 2013
Faculty Teaching Mentor for the GTA (Graduate Teaching Academy) at TAMU, 2012
Faculty Advisor of student organization Argentine Student Association, (ASA): 2011-present
Faculty Advisor of student organization Society of Flight Test Engineers, (SFTE): 2013-present

Principal publications and presentations from the past five years

Recent Professional development Activities Attended the APS Meetings annually
Name: Bonnie J. Dunbar

Education
B.S., Ceramic Engineering, University of Washington, 1971
M.S., Ceramic Engineering, University of Washington, 1976
Ph.D., Mechanical/Biomedical Engineering, University of Houston, 1983

Academic experience
Texas A&M University, Professor and Director of TEES Institute for Engineering Education and Innovation, 2016-present, full time
University of Houston, Professor, Jan. 2013-2015, full time
University of Houston, Director of UH STEM Center, Jan. 2013-2015, full time
University of Houston, Director of Aerospace Engineering Graduate Program, Jan. 2013-2015, full time
Sasakawa International Center for Space Architecture, Director, Jan. 2013-2015, full time
NASA Fellowship, Senior Managers in Government, Harvard University, full time

Non-academic experience
Dunbar International LLC Consulting, President and CEO, Jul. 2010-Dec. 2012, full time
The Museum of Flight, President and CEO, 2005-2010, full time
Deputy Associate Director, Sept. 2003-Jan. 2005, full time
Assistant Director, Jan. 1999-Sept. 2003, full time
Deputy Director, May 1998-Jan. 1999, full time
Deputy Associate Administrator, Feb. 1993-Dec. 1993, full time
Astronaut Office Representative, Feb. 1990-Dec. 1990, full time
Astronaut Office, 1988-1989, full time
Chairman of NASA Administrators, 1987, full time
NASA Mission Control Center, Jul. 1978-May 1980, full time

Certifications or professional registrations- Not Applicable

Current membership in professional organizations
National Academy of Engineers (NAE)
American Institute of Aeronautics and Astronautics (AIAA)
Royal Aeronautical Society (RAS) Fellow
Royal Society of Edinburgh (Elected CorrFRSE)
American Ceramic Society (AcerS) Fellow
National Institute of Ceramic Engineers (NICE)
National Society of Professional Engineers (NSPE)
Tau Beta Pi National Engineering Honorary
Society of Women Engineers (SWE)
Association of Space Explorers (ASE Member of International Executive Committee)
Materials Research Society (MRS)
International Academy of Astronautics (IAA) Academician
American Society of Engineering Education (ASEE)

**Honors and awards**

Featured in Bent Magazine (Tau Beta Pi)
Astronaut Hall of Fame
Honorary Doctorate of Engineering, Strathclyde University, Glasgow, Scotland
National Academy of Engineering (NAE)
Fellow, American Institute of Aeronautics and Astronautics (AIAA)
Fellow, American Ceramic Society (ACerS)
Fellow, Royal Aeronautical Society (RAeS)
Corresponding Fellow, Royal Society of Edinburgh (RSE)
Washington State Academy of Science (WSAS, Founding Member)
Texas Academy of Medicine, Engineering, Science and Technology (TAMEST, Founding Member)
Women in Technology International (WITI) Hall of Fame
American Association of Engineering Societies National Engineering Award and Norm Augustine Award for Outstanding Achievement in Engineering Communications
University of Washington College of Engineering Distinguished Alumna
University of Houston, Distinguished Engineering Alumna, Cullen College of Engineering Hall of Distinction
Rockwell International Space Division Engineer of the Year
Astronaut Hall of Fame/Astronaut Scholarship Foundation
NASA Outstanding Leadership Medal (1993)
NASA Exceptional Achievement Medal (1993)
University of Washington College of Engineering Diamond Award for Community Service
American Association of Engineering Societies (AAES): Norm Augustine Award For Outstanding Achievement in Engineering Communications
American Association of Mechanical Engineers Ralph Roe Award (Lifetime Achievement)
Induction into Living Legends of Aviation
Washington State Medal of Merit
International Honorary Member of Delta Kappa Gamma Educator Society
Society of Women Engineers National Achievement Award
Arthur L. Friedberg Award, National Institute of Ceramic Engineers (N.I.C.E)
Alumna Dignatus, University of Washington, Seattle, WA
Technical Administrator of the Year, Clear Lake Council of Technical Societies

**Principal publications and presentations from the past five years**-Not Applicable

**Recent Professional development Activities**-Not Applicable
Name: Sharath Girimaji

Education
B. Tech., Mechanical Engineering, IIT, Madras, India, 1983
M.S., Mechanical & Aerospace Engineering, Cornell University, 1986
Ph.D., Mechanical & Aerospace Engineering, Cornell University, 1990

Academic experience
Texas A&M University, Professor, 2005-2010, full time
Associate Professor, 1999-2005, full time
General Dynamics Professor, 2010-present; full time

Non-academic experience
Argonne National Lab, Visiting Scientist, March 1999-October 1999, full time
ICASE NASA Langley, Senior Staff Scientist, 1995-1999; Staff Scientist, 1992-1995, full time

Certifications or professional registrations-Not Applicable

Current membership in professional organizations
American Institute of Aeronautics and Astronautics (Associate Fellow)
American Physical Society (Fellow)

Honors and awards
TEES Senior Fellow, 2015
Brazilian Government `Science Without Borders’ Faculty Fellow, 2014-2017
Association of Former Students (AFS) College teaching Award, 2014
TEES Fellow, Texas A&M University, 2010
Dow Chemical Fellow, Texas A&M University, 2007
Brockett Professor, Texas A&M University, 2006
TEES Fellow, Texas A&M University, 2006
TEES Special Research Fellow, Texas A&M University, 2001
Visiting Fellow, Indian Institute of Science, Bangalore, India, 1997
Japanese Government Research Award for Foreign Specialist, 1996
Burgers Fellowship, Delft University of Technology, the Netherlands, 1996
Superior Accomplishment Award, NASA Langley Research Center, 1991
First Prize: Engineering Division of ‘The 1989 IBM Supercomputing Competition’, 1989
National Merit Scholarship, India, 1977

Service activities (within and outside of the institution)-Not applicable

Principal publications and presentations


**Recent Professional development Activities** - Attends APS Meetings Annually
Name: John E. Hurtado

Education
B.S., Aerospace Engineering, San Diego State University, May 1988
M.S., Aerospace Engineering, Texas A&M University, 1991
Ph.D., Aerospace Engineering, Texas A&M University, 1995

Academic experience
Texas A&M University, Professor, Senior Director for Interdisciplinary Engineering Programs, 2014-Present, full time
Texas A&M University, Associate Department Head for the Graduate Program, 2012-2014, full time
Texas A&M University, Associate Professor, 2007-2014, full time
Texas A&M University, Assistant Professor, 2001-2007, full time

Non-academic experience
Sandia National Laboratories, University Summer Faculty Sabbatical, Navigation, Guidance, and Control, 2013, full time
Sandia National Laboratories, University Summer Faculty Sabbatical, Water Power Technologies, 2011, full time
Sandia National Laboratories, Principal Member of Technical Staff, 1999-2000
Sandia National Laboratories, Senior Member of Technical Staff, 1995-1999
ITW Ride Quality Products, Consulting, 2006

Certifications or professional registrations
Not Applicable

Current membership in professional organizations
American Astronautical Society (Member)
Sigma Gamma Tau (Member)
American Institute of Aeronautics and Astronautics (Associate Fellow)

Honors and awards
William O. & Montine P. Head Faculty Fellow Award, College of Engineering
Sigma Gamma Tau Thomas U. McElmurry Teaching Excellence Award, Department level
BP Tenneco Teaching Excellence Award, College level
Association of Former Students of Texas A&M University Distinguished Achievement Award, College level
Sigma Gamma Tau Thomas U. McElmurry Teaching Excellence Award, Department level

Service activities (within and outside of the institution)
Associate Editor, Special issue of The Journal of Astronautical Sciences, expected 2014
Member of the University AAU STEM Initiative, Chaired by Provost Karan Watson, March 2013-April 2013
Chair, Faculty Search Committee, 2013-2014
Member, Search Committee for Aerospace Department Head, November 2012-June 2013
Keynote Speaker, Freshman Convocation, 2012
Technical chair, Mini-Symposium, International Conference on Computational & Experimental Engineering Sciences, Nanjing, PRC, April 18-21, 2011
Member of the Task Force for Faculty Performance Evaluations, Chaired by Dr. Antonio Cepeda-Benito, Dean of Faculties and Associate Provost, November 2009-May 2010
Member, Development and Transition Team for AERO 211 to AERO 209 & 210, 2010
Faculty Advisor, AIAA student organization, 2009-Present
Member, Undergraduate Affairs Committee, 2009-Present
Member, Faculty Search Committee (Solid Mechanics), 2008-2009
Member, National Research Council Review of NASA’s Exploration Technology Development Program, September 2007 – April 2008
Faculty Mentor, Space Engineering Institute undergraduate robotics research team, 2007-2008

**Principal publications and presentations from the past five years**

**Recent Professional development Activities**-Not Applicable
**Name:** John L. Junkins

**Education**
- B.S., Auburn University, 1965
- M.S., Engineering, UCLA, 1967
- Ph.D., Engineering, UCLA, 1969

**Academic experience**
- Texas A&M University, Interim Director of Institute for Advanced Studies, 2011-Present, full time
- Texas A&M University, Royce E. Wisenbaker Chair, 2006-Present, full time
- Texas A&M University, Distinguished Professor, 1998-Present, full time
- Texas A&M University, George J. Eppright Chair, 1989-2006, full time
- Texas A&M University, TEES Distinguished Chair, 1985-1989, full time
- Virginia Polytechnic Institute, Professor, 1978-1985, full time
- University of Virginia, Associate Professor, 1974-1978, full time
- University of Virginia, Assistant Professor, 1970-1974, full time

**Non-academic experience**
- American Astronautical Society (Fellow)
- Society of Engineering Science (Member)
- American Society of Engineering Education (Member)

**Certifications or professional registrations**
- P.E., Texas, License #64161

**Current membership in professional organizations**
- National Academy of Engineering (Member)
- International Academy of Astronautics (Member)
- American Institute of Aeronautics and Astronautics (Honorary Fellow)
- American Society of Photogrammetry (Member)
- Celestial Mechanics Institute (Member)
- American Geophysical Union (Member)
- American Astronomical Society Division on Dynamical Astronomy (Member)

**Honors and awards**
- Mechanics and Control of Flight Award
- Dirk Brouwer Award
- John Leland Atwood Award
- Theodore Von Karman Lectureship and Medal
- Frank J. Malina Medal
- Regent’s Professor
- Tycho Brahe Medal
Charles W. Crawford Award
Guidance, Navigation and Control Award
Icces Lifetime Achievement Award
Martin Summerfield Best Book Award
Theodore Von Karman Lecture

Service activities (within and outside of the institution)
The Air Force Science Advisory Board, 2005-2008
The Aeronautics and Space Engineering Board (ASEB), 2001-2005
Aerospace Technology Advisory Committee (ATAC), 2001-2005
Board of Directors, American Astronautical Society, 2001-2003
Board of Directors, TX Space Grant Consortium, 1995-2003
Board of Governors, TX Academy of Medicine, Engineering, Science and Technology, 2004-2007
NAE Aerospace Sciences Membership Peer Review Committee, 1997-2000

Principal publications and presentations from the past five years

Recent Professional development Activities-Not Applicable
Name: Adonios N. Karpetis

Education
Dipl.-Ing., Mechanical Engineering (5 years), Aristotle University, Thessaloniki Greece, 1989
M.S., Mechanical and Aerospace Engineering, Princeton University, 1992
M. Phil., Mechanical Engineering, Yale University, 1996
Ph. D., Mechanical Engineering, Yale University, 1998

Academic Experience
Texas A&M University, Holder of the Edward Aldridge ’60 Career Development Professorship II, 2011-2014, full time
Texas A&M University, Associate Professor, 2010-Present, full time
Texas A&M University, Assistant Professor, 2004-2010, full time
Yale University, Post-doctoral Research Associate in the lab of Katepalli Sreenivasan, 1999-2000, full time
Post-doctoral Research Associate in the lab of Alessandro Gomez, 1998-1999, full time
Research Assistant in the lab of Alessandro Gomez, 1993-1998, part time
Teaching Assistant in Fluid Mechanics Laboratory, 1995-1996, part time
Princeton University, Research Assistant in the lab of Frediano V. Bracco, 1989-1992, part time
Princeton University, Teaching Assistant in Fluid Mechanics, 1990, part time
Aristotle University, Research Assistant in the lab of Apostolos Goulas, 1987-1989, part time

Non-academic Experience - Not Applicable

Certifications or professional registrations - Not Applicable

Current membership in professional organizations
Member, American Society of Mechanical Engineers (ASME)
Member, Optical Society of America (OSA)
Member, American Physical Society (APS)
Member, American Institute of Aeronautics and Astronautics (AIAA)
Member, The Combustion Institute

Honors and Awards
Silver Medal of the Combustion Institute, 2004
Invited plenary at the 4th U.S. National Combustion Meeting, Drexel, Philadelphia, 2005
Edward “Pete” Aldridge ’60 Career Development Professorship II, 2011

Service Activities (within and outside of the institution)
Aerospace Engineering Tenure & Promotion Committee, 2014-present
Aerospace Engineering Research Planning Committee (StAR), 2013-present; Head of committee 2014-present
Aerospace Engineering Communications Committee, 2012-present
Study Abroad in Brazil globalization program, 2011-2012
Aerospace Engineering Vision Committee, October 2010-2011
Aerospace Engineering Safety Committee, January 2010-present
Aerospace representative to Engineering Faculty Advisory Council, September 2007-August 2010
Aerospace Engineering Graduate Committee September 2005-August 2007
Member of organizing committee for the 61st annual meeting of the Division of Fluid Dynamics (DFD), American Physics Society (APS), November 23-25, 2008, San Antonio, Texas. Responsible for video Gallery of Fluid Motion
Aerospace Engineering Department Laser Safety Officer 2004-present

Principal publications and presentations from the past five years

Recent Professional Development Activities-Not Applicable
Name: Vikram K. Kinra

Education
B.S., Mechanical Engineering, Indian Institute of Technology, Kanpur, India, 1967
M.S., Mechanical Engineering, Utah State University, 1968
Ph.D., Engineering Mechanics, Brown University, 1975

Academic experience
Texas A&M University, Director, Graduate Teaching Fellows Program, College of Engineering, September 1, 2015 – present, full time
Texas A&M University, Director of Graduate Programs, Department of Aerospace Engineering, College Station, Texas, September 1, 2014 to present, full time
Texas A&M University / Indian Institute of Technology Kanpur and Indian Institute of Technology, Coordinator, Research Abroad Program, College of Engineering, Gandhi Nagar, 20010-present, full time
University of Bordeaux, Visiting Professor, Bordeaux, France, June 1993, full time
Texas A&M University System, Director, Center for Mechanics of Composites, Texas Engineering Experiment Station, College Station, Texas, July 1995-August 1998, full time
Texas A&M University, General Dynamics Professor, Department of Aerospace Engineering, College Station, Texas, April 1995-September 2011, full time

Non-academic experience
Ostgaard and Associates, Inc., Project Engineer, Gardena, 1970, full time
Northrop Corporation, Structural Engineer, Hawthorne, CA., 1969-70, full time

Certifications and professional registrations
- Not Applicable

Current membership in professional organization
Member, Dean’s Award’s Committee, 2012-present
Member, Guggenheim Medal Selection Committee, 2007-present
   This is the highest honor given by a consortium of societies including
   American Institute of Aeronautics and Astronautics (AIAA)
Member, Society for Experimental Mechanics, since 1974.
Member, American Society of Mechanical Engineering, since 1979.
Member, Acoustical Society of America/American Institute of Physics, since 1989.
Member, American Society for Testing and Materials, since 1989.
Member, American Society for Engineering Education, since 1979.
Member, American Academy of Mechanics, since 1976.
Member, Structures and Materials Committee, Aerospace Division, ASME, 1984-present.
Member, ASTM Committee E28 on Mechanical Testing, 1989-present.
Member, ASTM Committee E7 on Nondestructive Testing, 1989-present.
Member, Committee on Composite Materials, Applied Mechanics Division of the ASME, 1983-present.
Member, Composite Committee and Research Committee of the Society for Experimental Mechanics, 1983-present.

Honors and awards
Dow Outstanding Young Faculty Award, American Society for Engineering Education, 1980
Ralph R. Teetor Educational Award, Society of Automotive Engineers, 1982
Halliburton Professorship, Texas A&M University, 1986
Research Fellow, Texas Engineering Experiment Station, 1991
Research Fellow, Texas Engineering Experiment Station, 1992
Fellow, American Academy of Mechanics, (One of only three elected in 2004; Total Number of Fellows worldwide is about 150), 2004

Service activities (within and outside of the institution)
Chairman of the ASTM Committee E28.03.05.01. This committee was charged with the responsibility of developing an International Standard for damping.
Vice-Chairman of the ASTM Committee E28.03.05. This committee wrote the ASTM Code for standardizing the measurement of dynamic elastic modulus.
Member, Review Panel of the Small Business Initiative Research (SBIR) of the National Science Foundation, August 1988.
American Society of Mechanical Engineers (ASME), Member, National Member Interests Committee, 1984-87 (This is the third or fourth highest level committee within the ASME hierarchy).

Principal publications and presentations from the past five years-Not Applicable

Recent Professional Development Activities-Not Applicable
Name: Dimitris C. Lagoudas

Education
Diploma, Aristotle University of Thessaloniki, Greece, Mechanical Engineering, 1982
Ph.D., Applied Mathematics, Lehigh University, 1986
Postdoctoral Studies, Cornell University and Max Planck Institute, Germany, Theoretical and Applied Physics/Mechanics, 1986-1988

Academic experience
Texas A&M University, Senior Associate Dean for Research and Associate Vice Chancellor for Engineering Research, July 2012-present, full time
Texas A&M University, Deputy Director of TEES, August 2012-Present, full time
Texas A&M University, Interim Deputy Director of TEES, July 2012-August 2012, full time
Texas A&M University, Department Head, June 2009-June 2012, full time
Texas A&M University, Interim Department Head, November 2008-May 2009; full time
University of Illinois Urbana-Campaign, Visiting Professor, Bechman Institute, Fall, 2006, full time
Rice University, John and Bea Slattery Chair, September 2004-Present, full time
Director, Texas Institute for Intelligent Materials Structures (TiiMS), September 2002-Present, full time
Full Professor for Aerospace Engineering, September 1998-Present, full time
Director, Active Materials and Intelligent Systems Laboratory, September 1997-Present; full time

Non-academic experience
NASA Langley Research Center, NASA Faculty Fellow, June 2004-August 2004, full time
Adra Sugar Factory, Assistant Mechanical Engineer, Damascus, Syria, Summer 1981, full time
Bor Coer Mines, Assistant Mechanical Engineer, Bor, Yugoslavia, Summer 1979, full time

Certifications or professional registrations
- Not Applicable

Current membership in professional organizations
American Institute of Aeronautics and Astronautics, Senior Member (AIAA) (1992)
American Society for Composites (ASC) (1991)
American Society for Engineering Education (ASEE) (1993)
American Society of Civil Engineers (ASCE) (1988)
American Society of Mechanical Engineers (ASME) (1987)
SPIE — The International Society for Optical Engineers (1993)
Texas Board of Professional Engineers (1999)

Honors and awards
NSF Research Initiation Award, 1991
Adaptive Structures and Material Systems Best Paper Award, ASME-AIAA, 1995, 2005
TEES Senior Research Fellow, 1997
Neely ’52 Dow Chemical Faculty Fellow Award, 1998
Lockheed Excellence in Engineering Teaching Award, 1998
Ford Professor of Aerospace Engineering, TAMU, 1999-2004
Fellow, American Society of Mechanical Engineers, 2000
Texas A&M University Faculty Fellow, 2000-2005
TEES Charles W. Crawford Service Award, 2003
John and Bea Slattery Chair, 2004
ASME Adaptive Structures and Material Systems Prize, 2006
William Sweet Smith Prize, IMechE, 2008
Fellow of the Society of Engineering Science, 2009
Presidential Award of Excellence for Faculty Service to International Students, 2011
Smart Structures and Materials Lifetime Achievement Award, SPIE, 2011
University Distinguished Professor, 2013
Distinguished Achievement Award in Research from Association of Former Students, 2014
AIAA Fellow, 2014

Principal publications and presentations

Recent Professional Development Activities- Not Applicable
Name: Jean-Briac B. le Graverend

Education
Dipl. Eng., Aerospace Engineering, ISAE-ENSMA, Poitiers France, 2009
M.S., Mechanical Engineering (magna cum laude), ENSMA-Poitiers University, Poitiers France, 2009
Ph.D., Materials Science & Engineering, ISAE-ENSMA, Poitiers France, 2013

Academic experience
ENSMA, Laboratory teaching assistant, taught an undergraduate laboratory class on Strength of Materials, 2011-2012, part time
Caltech, Post-Doctoral Scholar in Aerospace, research in the Kochmann Research Group, March 2013-Present, full time
ONERA-The French Aerospace Lab, Ph.D. Candidate, Châlillon France, research in the Mechanical Behavior and Damage Unit, October 2009-February 2013, full time
ONERA-The French Aerospace Lab, Graduation research project, Châlillon France, research in the Mechanical Behavior and Damage Unit, April 2009-September 2009, part time
ENSCP-Mines PARITECH, Junior Engineer Training, Paris France & Concordia University Montreal Canada, research in the Electrocatalytic Green Engineering Group, June 2008-September 2008, full time

Non-academic experience-Not Applicable

Certifications or professional registrations-Not Applicable

Current membership in professional organizations-Not Applicable

Honors and awards
United Technologies Research Center Fellowship, 2013-2014
Doctoral degree awarded with honors, February 2013
French Ministry of Defense Fellowship, 2009-2012
Master of Science awarded with honors, 2009
Diploma awarded with honors, 2009

Service activities (within and outside of the institution)

Principal publications and presentations from the past five years


J.-B. le Graverend, C. S. Wojnar, D. M. Kochmann. Asymmetry of the ferroelectric hysteresis induced by pre-polarization in soft polycrystalline PZT.


Recent professional development activities - Not Applicable
Name and Academic Rank: Richard B. Miles,
TEES Distinguished Research Professor, Aerospace Engineering, Texas A&M University
Robert Porter Patterson Professor Emeritus of Mechanical and Aerospace Engineering and Senior Scholar, Princeton University

Degrees with fields, institution, and date:
Ph.D. Electrical Engineering, Stanford University, 1972
M.S. Electrical Engineering, Stanford University, 1967
B.S. Electrical Engineering, Stanford University, 1966

Number of years of service on this faculty: 1.5
Date of original appointment: February 15, 2017

Other related experience:
2013 – present Robert Porter Patterson Professor Emeritus of Mechanical and Aerospace Engineering and Senior Scholar, Princeton University
2011 - 2013 Robert Porter Patterson Professor of Mechanical and Aerospace Engineering University
1982 - 2011 Professor, Department of Mechanical & Aerospace Engineering, Princeton University
2002 (Spring) Acting Chair, Department of Mechanical & Aerospace Engineering, Princeton University
1980 - 1996 Chairman, Engineering Physics, Princeton University
1994 - 2000 Director of Graduate Studies, Department of Mechanical & Aerospace Engineering, Princeton, New Jersey
1995 (Spring) Visiting Professor, University of Marseilles, Marseilles, France
1995 (Spring) Visiting Research Scientist, CNRS, France
1978 - 1982 Associate Professor, Department of Mechanical and Aerospace Engineering, Princeton University
1972 - 1978 Assistant Professor, Department of Mechanical and Aerospace Engineering, Princeton University
1972 (Summer) NSF Research Associate, Department of Electrical Engineering, Stanford University

State(s) in which registered: None

Principal publications of last five years: (Graduate students indicated with an asterisk)
http://dx.doi.org/10.1098/rsta.2014.0338

Scientific and professional societies of which a member:  
NAE Member, AIAA Fellow, OSA Fellow, IEEE Senior member, APS Life Member

Honors and awards:  
Fannie and John Hertz Fellow, 1969-1972  
Fellow of the Optical Society of America (elected 1998)  
Fellow of the AIAA (elected 2000)  
2005 Frontiers in Spectroscopy Lecturer, Ohio State University  
2011 Malina Lecture, Texas A&M University  
National Academy of Engineering (elected 2011)  
AIAA Plasmadyamics and Lasers Award and Medal, (2012)  
Invited Midwest Mechanics Seminar Speaker, 2015-2016

**Professional development activities in the last five years:** Continuous

**Institutional and professional service in the last five years:**

- TAMU Aerospace Engineering
  - Member, Tenure and Promotion Committee
  - Chair, Faculty Search Committee (3 tenure track appointments completed)

- National Academy of Engineering
  - Panel on Ballistic Science and Engineering at the Army Research Laboratory


- Fannie & John Hertz Foundation
  - Member, Board of Directors
  - Chairman, Fellowship and Program Council
  - Member, Selection Committee
  - Interviewer

- Washington Research Foundation
  - Postdoctoral Fellowship Program Selection Committee

- Board of Directors, Precision Optics Corporation, Inc.

- Board of Trustees, Pacific University, Forest Grove OR

- AIAA Plasma Dynamics and Lasers Technical Committee
  - Chairman, Award Committee

- Elmer A. Sperry Board of Award
  - Representative for the AIAA,

**Percentage of time available for research or scholarly activities:** 40%

**Percentage of time committed to the program:** 100%

**Other:**

B-44
Name: Daniele Mortari

Education
Ph.D., Nuclear Engineering, University “La Sapienza,” 1981

Academic experience
Texas A&M University, Professor, 2010-present, full time
Texas A&M University, Tenured Associate Professor, 2007-2010, full time
Texas A&M University, Associate Professor, 2002-2007, full time
Texas A&M University, Visiting Associate Professor, 1998-2001, full time
University of Perugia, Visiting Professor, 1998-2001, full time
University of Rome, Assistant Professor, 1992-2002, full time

Non-academic experience
San Marco Project, Staff, operationally managed the San Marco V satellite from launch and developed the attitude determination and control system, 1989-1992, full time
Ricerca e Progetti Torino, Consulting, 1985-1989, part time
Centro di Ricerca Progetto San Marco, Consulting, 1983-1990, part time

Certifications or professional registrations-Not Applicable

Current membership in professional organizations
IEEE-AESS Space Systems Technical Panel (Honorary Member)
American Astronautical Society (Fellow)
American Institute of Aeronautics and Astronautics (Associate Fellow)
Institute of Electrical and Electronic Engineers (Senior Member)
Institute of Electrical and Electronic Engineers (Member)
American Institute of Aeronautics and Astronautics (Member)
American Astronautical Society (Member)
Phi Beta Delta Honorary Association (Member)
Sigma Xi, The Scientific Research Society (Member)

Honors and awards
Herbert H. Richardson Fellow Award
William Keeler Memorial Award
Best Paper Award
NASA Group Achievement Award
IEEE Judith A. Resnik Award
IEEE Distinguished Speaker
Spacecraft Technology Center Award
NASA Group Achievement Award
Service activities (within and outside of the institution)
Organized 9 seminar for AERO-681 Seminar Series by inviting external speakers, Texas A&M University.
Member (SES) of Strategic Aerospace Research (StAR) Committee. Oct./Nov. 2013.

Principal publications and presentations from the past five years

Recent Professional development Activities-Not Applicable
Name: Mohammad Naraghi

Education
B.S., Civil Engineering, Sharif University of Technology, Tehran Iran, 2002-2004
M.S., Civil Engineering – Mechanics of Materials and Structures, Sharif University of Technology, Tehran Iran, 2002-2004
Ph.D., Aerospace Engineering – Structures and Materials, University of Illinois at Urbana Campaign, 2005-2009

Academic experience
Texas A&M University, Assistant Professor, Aerospace Engineering, January 2012-Present, full time
Northwestern University, Post doctorate research fellow, Department of Mechanical Engineering June 2009-December 2011, full time
Northwestern University, Lab Assistant: Experiments in Micro/Nano Science and Engineering, 2010, part time
University of Illinois at Urbana Campaign, Teaching and Lab Assistant: Contact Mechanics and Scanning Probe Microscopy (SPM), 2007, part time
University of Illinois at Urbana Campaign, Teaching Assistant: Aerospace Structures I, Aerospace Engineering Department, 2005, part time
Sharif University of Technology, Tehran Iran, Teaching Assistant: Dynamics, Department of Civil Engineering, 2000, part time

Non-academic experience- Not Applicable

Certifications or professional registrations
Invention disclosure: “Porous nanofibers containing encapsulated liquids surrounded by a solid material”, May 2014, Drs. J. Boyd and M. Naraghi

Honors and awards
Roger A. Strehlow Memorial Award for outstanding research accomplishment, 2009. The award is presented annually in honor of professor Strehlow to a senior graduate student in recognition of outstanding research accomplishment. Professor Strehlow joined the aero faculty in 1961. His background was in chemistry, and he was an acknowledged expert in the field of detonations and explosions.
First place award, in the Sandia MEMS university alliance design competition, “Characterization, Reliability and Nanoscale Phenomena” category, April 2008. The award was for the design of “The First MEMS Platform for Creep and Stress Relaxation Tests on Polymeric, Metallic and Biological Nanofibers”
First place award, in the Sandia MEMS university alliance design competition, “Characterization, Reliability and Nanoscale Phenomena” category, April 2007. The award was for the design of “A Mechanical Testing MEMS Platform for Soft Nanofibers and Nanowires with on-chip Actuators for Large Deformation”

Invited participant to the Cell Mechano-sensitivity Workshop organized by Center for Cellular Mechanics (CCM), University of Illinois at Urbana-Champaign, July 30 – Aug 3 2007.

Second place award (Dr. Tavakoli award), in the civil engineering Olympiad, a nation-wide scientific competition, Iran 2004. Dr. Tavakoli prize is granted in commemoration of the late Dr. M. Tavakoli, the former chair of the Department of Civil Engineering, Sharif University.

Second place award, in Iran physics Olympiad, a nation-wide scientific competition, Iran 1998.

Service activities

Proposal reviewer: National Science Foundation, Army Research Office

Departmental and College of Engineering Committees: Representative of the Materials and Structures (M&S) group in the Grad Affair Committee
Representative of the Department of Aerospace Engineering in the Engineering Faculty Advisory Council: Elected by the professors of the Department.

Principal publications and presentations


Recent Professional Development Activities-Not Applicable
Name and Academic Rank: Alexei Poludnenko, Associate Professor

Degrees with fields, institution, and date:
PhD, Physics and Astronomy, University of Rochester, 2004
M.A., Physics and Astronomy, University of Rochester, 2000
B.S., Physics, Nat’l University “Kyiv-Mohyla Academy”, 1998

Number of years of service on this faculty: 2
Date of original appointment: September 2016
Dates of advancement in rank: N/A

Other related experience:
06/2010 – 08/2016, Research physicist, Naval Research Laboratory
10/2007 – 09/2009, National Research Council research associate, Naval Research Laboratory
08/2004 – 09/2007, Research associate/scientist, University of Chicago

Consulting, patents, etc.:
N/A

State(s) in which registered: None

Principal publications of last five years:
(* indicates Student under the Direction of Dr. Bowser)
7. Pulsating Instability and Self-acceleration of Fast Turbulent Flames, Poludnenko, A.Y., 2015, Physics of Fluids, 27, 014106. François Frenkiel Award, Division of Fluid Dynamics, American Physical Society
8. Transverse Waves Resulting from Pulsating Instability of Two-Dimensional Flames, Gamezo, V.N., Poludnenko, A.Y., Oran, E.S., Williams, F.A., 2014, Combustion and Flame, 161, 950
Scientific and professional societies of which a member:

- AIAA, APS, Combustion Institute

Honors and awards:

- Distinguished paper, 36th International Symposium on Combustion, Seoul, Korea, 2017
- 2016 François Frenkiel Award, American Physical Society, Division of Fluid Dynamics
- 2015 Alan Berman Research Publication Award, Naval Research Laboratory, Washington, D.C.
- Frank J. Horton Fellowship, Laboratory for Laser Energetics, Rochester, NY, 1999 - 2004

Professional development activities in the last five years: Continuous

Institutional and professional service in the last five years:

- Workshop on Turbulence-Flame Interactions, AFOSR, 2018 Co-organizer
- 37th International Symposium on Combustion, 2018 Session chair
- Workshop on Highly Turbulent Combustion, AFOSR, 2018 Convener / working group lead
- ICDERS 2017 Session chair
- 2017 François Frenkiel Award Selection Committee Member
- Department of Energy, 2017 Panel review member
- Progress in Energy and Combustion Science, 2015 - 2018 Member of the Editorial Board
- Department of Defense / AFOSR, 2011 – 2018 Proposal reviewer
- ICDERS 2015 Scientific organizing committee member / special session organizer
- NSF, 2013 – 2016 Panel review member
- NASA, 2012 – 2014 Panel review member

- Aerospace Engineering Seminar Series committee, 2017 – present
- Faculty search committee, 2017 – present
- Departmental graduate committees

Percentage of time available for research or scholarly activities: 40%

Percentage of time committed to the program: 100%

Other:
Name: Helen Reed

Education
A.B., Mathematics, Goucher College, 1977
M.S., Engineering Mechanics, Virginia Polytechnic Institute & State University, 1980
Ph.D., Engineering Mechanics, Virginia Polytechnic Institute & State University, 1981

Academic experience
Texas A&M University, Professor, 2004-present, full time
Texas A&M University, Department Head, 2004-2008, full time
Arizona State University, Professor, 1992-2004, full time
Arizona State University, Vice Chair for Graduate Programs, 2003-2004, full time
Arizona State University, Associate Professor, 1985-1992, full time
Tohoku University, Associate Professor, 1991-1992, full time
Stanford University, Assistant Professor, 1982-1985, full time
Virginia Polytechnic Institute & State University, Assistant Professor, 1982, full time
Sandia National Laboratories, Summer University Faculty, 1983, full time

Non-academic experience
NASA-Langley, Aerospace Technologist, Designed supercritical laminar flow control airfoils and
investigated induced drag associated with modular system of aircraft and supervised co-op students
assigned to these projects, 1977-1981, full time
Mathematics Aid, Supported experimental research investigating the effect of wing-tip vortices of
large aircraft on small following aircraft and the attenuation of such vortices, 1976, full time
Chandah Space Technologies, Chief Technology Officer, co-Founder and Member of the Board of
Directors, Products associated with using small satellites for on-orbit inspection and health
monitoring, 2012-present, part time
Institute for Defense Analysis, Consulting, 2014-Present, part time
Aerion Corporation, Consulting, 2014, part time
Universal Technology Corporation, Consulting, 2013-2014, part time

Certifications or professional registrations
P.E., Texas, License #116751
Amateur Radio, Technician Class: KD7GPX

Current membership in professional organizations
American Institute of Aeronautics and Astronautics (Fellow)
American Society of Mechanical Engineers (Fellow)
American Physical Society (Fellow)
American Astronautical Society (Member)
American Society for Engineering Education (Member)
Radio Amateur Satellite Corporation (Life Member)
American Radio Relay League (Life Member)
Honors and awards
Minnie Stevens Piper Professor
ASEE Lee Atwood Award
Holder of the Edward “Pete” Aldridge Professorship
Regents Professor
Presidential Professor for Teaching Excellence
Association of Former Students Distinguished Achievement Award in Teaching
Thomas E. McElmurry Award

Service activities (within and outside of the institution)
Chair, U.S. National Transition Study Group, 2013-Present
Chair, ASEE/AIAA Atwood Award Selection Committee, 2011-Present
Member, AIAA Academic Affairs Committee, 2007-Present

Principal publications and presentations

Recent Professional development Activities
Attended the 2016 AIAA SciTech Forum and Exposition, San Diego, CA
Continuous
Name: William S. Saric

Education
B.S., Mechanical Engineering, Illinois Institute of Technology, 1963
M.S., Mechanical Engineering, University of New Mexico, 1965
Ph.D., Mechanics, Illinois Institute of Technology, 1968

Academic experience
Texas A&M University, Professor, Jan. 2005-present, full time
Arizona State University, Professor, Aug. 1984-Dec. 2004, full time
Vice Chair, Jan. 2000-Nov. 2000, full time
Tohoku University, Professor, Sept. 1991-Jul. 1992, full time
Virginia Polytechnic Institute and State University, Professor, Sept. 1975-Aug. 1984, full time
Illinois Institute of Technology, Instructor, Jan. 1966-June 1968, full time
NSF Undergraduate Research Fellow, Summer 1962, full time

Non-academic experience
Sandia National Laboratories, Staff Member, Jul. 1968-Aug. 1975, full time
Jan. 1963-Jan. 1966, full time

Certifications or professional registrations
P.E., Virginia, License #13427

Current membership in professional organizations
Membre, Commission Aérodynamique de la 3AF (2010 to present)

Honors and awards
Recipient of the MMAE Department, IIT Alumni Recognition Award 2005.
Recipient of the AIAA Fluid Dynamics Award 2003.
Recipient of the AGARD (NATO) Scientific Achievement Award 1996.
Recipient of VPI & SU 1984 Alumni Award for Research Excellence for "...contributions to the understanding of nonlinear flow stability and subharmonic transition to turbulence."
Winner of Gallery of Fluid Motions Prize "...for visualization of different transition mechanisms," at the 26th Annual Meeting of the APS Division of Fluid Dynamics, November 1983.
Invited guest of the U.S.S.R. Academy of Sciences (3 times), Jun 8 - Jul 6, 1976; Sep 2 - 10, 1979; August 16, - Sep 6, 1981

Service activities (within and outside of the institution)
Fellow, American Physical Society (APS) 1982
Life Fellow, American Society of Mechanical Engineers (ASME) 1993
Fellow, American Institute of Aeronautics and Astronautics (AIAA) 2005
Member, National Academy of Engineering 2006.
Member, The Academy of Medicine, Engineering, and Science of Texas 2006.
Board of Directors, The Academy of Medicine, Engineering, and Science of Texas 2013 to present.
Editorial Advisory Board, AIAA J., 2008 – present
Editorial Board Member, Int. J. Aerodynamics 2010 – present
Associate Editor, Physics of Fluids, 1998-2000
Associate Editor, Applied Mechanics Review, 1984-1994
Associate Editor, J. Fluids Engineering, 1993-1996.
Member of AIAA Technical Committee on Fluid Dynamics and the Fluids Liaison to the AIAA
Chairman, U.S. Boundary-Layer Transition Study Group, 2001-present, member since 1981. Now a Working Group of the AIAA Fluid Dynamics TC.
Member of AIAA Technical Committee on Ground Testing, 1983-1986
General Chairman, AIAA 11th Fluid and Plasma Dynamics Conference, Seattle, Washington, Jul 10-12, 1978. With 115 papers presented and 280 attendees, responsibilities included organizing the technical committee, paper review, session topics, invited papers, etc.
Vice Chairman, Executive Committee, APS Division of Fluid Dynamics, 1985-1986.
Member of SAE Technical Committee on Aerodynamics, 1984-1991

Principal publications and presentations-Not Applicable

Recent Professional development Activities-Not Applicable
**Name and Academic Rank:** Daniel Selva Valero, Assistant Professor

**Degrees with fields, institution, and date:**
- PhD, Space Systems, Massachusetts Institute of Technology, 2012
- Dipl. D’Ing., Aerospace Engineering, Ecole Nationale Superieure de l’Aeronautique et de l’Espace (Supaero), 2004
- Ing. Sup., Telecommunications Engineering, Universitat Politecnica de Catalunya, 2004

**Number of years of service on this faculty:** 0
  - Date of original appointment: May 2018
  - Dates of advancement in rank: N/A

**Other related experience:**
- Cornell University, Mechanical and Aerospace Engineering, Ithaca, NY
  - Assistant Professor, July 2014 – May 2018
- Massachusetts Institute of Technology, Cambridge, MA
  - Post-Doctoral Associate, June 2012 – July 2014
- Arianespace, Kourou, French Guiana
  - Electrical & Software Systems Engineer, Member of the Ariane 5 Launch Team, Sep 2004 – Aug 2008

**Consulting, patents, etc.:**
- Akash Systems, Advisory Board (2017-2018)
- Nu Orion, Consultant (2014)
- Cambrian Innovation, Consultant (2010-2012)
  - Electronic Data Systems, Network Management (1999-2002)

**State(s) in which registered:** None

**Principal publications of last five years:**

(* indicates Student under the Direction of Dr. Selva)


**Scientific and professional societies of which a member:**
- AIAA, Senior Member; IEE, Member; ASME, Member; INCOSE, Member.

**Honors and awards:**
- Conference Best Paper Award, Design Computing and Cognition, 2018
- Conference Best Paper Award, IEEE Aerospace Conference, 2013
- Most cited paper in Acta Astronautica Journal since 2012

**Professional development activities in the last five years:** Continuous

**Institutional and professional service in the last five years:**
- Member of AIAA Intelligent Systems Technical Committee
- Panelist and grant reviewer for NSF, NASA, NSERC

**Percentage of time available for research or scholarly activities:** 40%

**Percentage of time committed to the program:** 100%

**Other:**
Name: Kristi J. Shryock

Education
B.S., Aerospace Engineering, Texas A&M University, 1998
M.S., Aerospace Engineering, Texas A&M University, 2000
Ph.D., Interdisciplinary Engineering, Texas A&M University, 2011

Academic experience
Texas A&M University, Senior Director of Retention, Jan. 2014-present, full time
Texas A&M University, Instructional Associate Professor, May 2013-present, full time
Texas A&M University, Assistant Department Head, Sept. 2011-Aug. 2014, full time
Texas A&M University, Senior Lecturer, Sept. 2011-Aug. 2013, full time
Texas A&M University, Lecturer, Sept. 2006-Aug. 2011, full time
Texas A&M University, Director of Undergraduate Programs, Dec. 2006-Aug. 2014, full time
Texas A&M University, Academic Advisor, Aug. 2005-Dec. 2006, full time
Texas A&M University, Graduate Assistant Researcher, Sept. 1998-May 1999, part time
Texas A&M University, Teaching Assistant, June 1998-Aug. 1998
Texas A&M University, Student Research Engineer, Jan. 1996-May 1998
Texas A&M University, Project Manager, Aug. 2004-Aug. 2005, full time
Texas A&M University, Assistant Director, Sept. 2003-Aug. 2004, full time
Texas A&M University, Career Services Coordinator, Sept. 2000-Aug. 2003, full time
Blinn College, Bryan, TX, Instructor, Aug. 2001-present, full time
Blinn College, Job Placement Counselor, June 1999-Sept. 2000, full time

Non-academic experience
NASA / Johnson Space Center, Student Engineer, Jan. 1995-Aug. 1997, part time

Certifications or professional registrations-Not Applicable

Current membership in professional organizations
American Institute of Aeronautics and Astronautics (AIAA)
American Society for Engineering Education (ASEE)

Honors and awards
New Advisor of the Year Award in 2014 for Aggie Aerospace Women in Engineering.
New Advisor of the Year Award in 2013 for Aggie Aerospace Women in Engineering.
Selected for and presented workshop, Using Wikis for Research at 2011 NSF TUES/CCLI Conference.
Washington, DC, January 26, 2011.
Selected for and presented workshop, Discover one instrument that can positively affect learning, retention, and diversity in the engineering classroom. Experience MBTI!, 2005 ASEE Gulf-Southwest Conference, March 23, 2005.

Service activities (within and outside of the institution)
Vice Chair, American Society for Engineering Education, Aerospace Division, 2014-2015
Secretary/Treasurer, American Society for Engineering Education, Aerospace Division, 2013-2014
Program Chair, American Society for Engineering Education, Aerospace Division, 2012-2013
Serve as reviewer for conferences including ASEE and FIE
Emerging Leaders Grand Challenges, Project Lead, Appointed, University Committee, 2014-present
Aggie Aerospace Women in Engineering, Faculty Advisor, Departmental Committee, 2012-present
Assessment of Academic Advising Project, Member, Appointed, University Committee, 2008-present
Engineering Living Learning Community, Faculty Mentor, Appointed, College Committee, 2010-2012
Recruitment Point of Contact, Member, Appointed, College Committee, 2006-2014

Recent Professional development Activities-Not Applicable
Name: Robert E. Skelton

Education
B.S., Electrical Engineering, Clemson University, 1963
M.S., Electrical Engineering, University of Alabama, 1970
Ph.D., Mechanics and Structures, University of California, 1976

Academic experience
Texas A&M University, Faculty, 2015-present, full time
TIAS Faculty Fellow, 2014-2015, full time
UCSD, Professor Emeritus, 2009-present, full time
UCSD, Professor, 1996-2009, full time
Purdue, Professor, 1982-1996, full time
Purdue, Assistant Professor, 1975-1982, full time

Non-academic experience
Lockheed Missiles and Space Company, Engineer 1963-1965, full time
Sperry Rand Corporation, Head of Controls Research and Development, 1965-1975, full time

Certifications or professional registrations-Not Applicable

Current membership in professional organizations
Tau Beta Pi
Phi Kappa Phi
Phi Eta Sigma
Sigma Gamma Tau
Sigma Xi

Honors and awards
TIAS Faculty Fellow, Texas A&M
Member Thomas Green Clemson Academy of Engineering
Member National Academy of Engineering
Alexander von Humboldt Foundation Research Award
NASA Appreciation Award for service to the Hubble repair missions
Distinguished Engineer Award, University Alabama Huntsville
Distinguished Lecturer Award, University of Maryland
Norman Medal, American Society of Civil Engineers
Fellow, Institute of Electrical and Electronic Engineers (IEEE)
Alexander von Humboldt Foundation Senior U.S. Scientist Award
Russell Severance Springer Chair, University of California Berkeley
Certificate of Appreciation, NASA Control-Structures Interaction, Guest Investigator Program
Fellow, American Institute of Aeronautics and Astronautics (AIAA)
Japan Society for the Promotion of Science Award (JSPS)
SKYLAB Achievement Award from James Fletcher, NASA Administrator
ORBIT Award, Sperry Rand Corp.
Walter Merit Riggs Award, Clemson University
Clemson Engineering Foundation Scholarship
W.F. Poole Alumni Scholarship, Clemson University
Certificate of Appreciation for Excellence in Teaching, United States Marine Corps

Service activities (within and outside of the institution)
Editor, Actual Problems of Aviation and Aerospace Systems, Russian-American Scientific Journal, ISSN 1727-6853, Kazan, Russia
Associate Editor, Journal of Systems & Control Engineering, 1998-2004
Member, External Independent Readiness Review Committee, (EIRR), (Servicing Missions for the Hubble Space Telescope), 1997-1999
Associate Editor, Mathematical Modeling of Systems, Swets and Zeitlinger, the Netherlands, 1994-2004
Associate Editor, Mathematical Problems in Engineering, Gordon and Breach Publishing Group, U.S.A., 1994-2004
Fellow, Institute of Electrical and Electronics Engineers, 1995
Fellow, American Institute of Aeronautics and Astronautics, 1990
Chairman, IEEE Control Society, Huntsville, Alabama, 1969-1972
Vice Chairman of Applications Technical Committee, International Federation of Automatic Control (IFAC), 1989-1994
NRC ad hoc committee on NASA-University Relationships, 1984-1985
Member NRC’s Aeronautics and Space Engineering Board (ASEB), 1983-1988

Principal publications and presentations from the past five years

Recent Professional development Activities-Not Applicable

B-60
Name: Thomas Strganac

Education
B.S., Aerospace Engineering, North Carolina State University, 1977
M.S., Aerospace Engineering, Texas A&M University, 1980
Ph.D., Engineering Mechanics, Virginia Polytechnic Institute & State University, 1987

Academic experience
Texas A&M University, Professor, 1989-present, full time

Non-academic experience
NASA, Research Engineer-Aerostructural Dynamics, responsibilities included developing analytical and computational methodologies; performing structural vibration and aeroelastic stability analyses; and, supporting the design and development of spacecraft, aircraft, rotor systems, wind tunnel models, and wind tunnel support systems, 1982-1989; Aerospace Engineer-Flight Analysis & Project Manager, responsibilities included the development of numerical models for design and performance, high-altitude environment studies, flight performance and trajectory studies, flight load and aeroelastic investigations, management of payload design and development, and, planning and conducting test and evaluation projects. He served as a program manager and technical monitor for research activities awarded to external organizations, 1975-1982, full time

Certifications or professional registrations
P.E., Texas, License #70808

Current membership in professional organizations
AIAA, Associate Fellow

Honors and awards
Association of Former Students Distinguished Achievement Award in Teaching
Camp Strganac Namesake, A&M Fish Camp
The Boeing Company, Boeing Welliver Faculty Fellow
Ruth and William Neely ’52 Dow Chemical Fellow
Tenneco Award for Meritorious Teaching of Engineering
Faculty Development Leave / IPA with AFRL
TAMU Texas Engineering Experiment Station (TEES) Research Fellow Award
AIAA Associate Fellow
AIAA Outstanding Faculty Advisor, AIAA Region IV

Service activities (within and outside of the institution)
American Institute of Aeronautics and Astronautics (AIAA), Associate Fellow, Elected, 1987 - .
AIAA, General Chairman, AIAA Structures, Structural Dynamics, and Materials (St. Louis, Missouri), elected, 1999.

Principal publications and presentations from the past five years

Professional Development: AIAA Conferences, Continuous
Name: Theofanis Strouboulis

Education
B.S., Civil Engineering, National Tech. University, Athens Greece, 3rd in class, 1980
M.S., Engineering Mechanics, University of Texas, 1981
Ph.D., Engineering Mechanics, University of Texas, 1986

Academic experience
Texas A&M University, Professor, September 2002-Present, full time
Associate Professor, September 1994-August 2002, full time
Assistant Professor, September 1988-August 1994, full time
University of Texas at Austin, Post-Doctoral Student, September 1986-August 1988, full time

Non-academic experience
Computational Mechanics Co., Austin Texas, Research Engineer, February 1988-August 1988, full time

Certifications or professional registrations-Not Applicable

Current membership in professional organizations
Member, International Association for Computational Mechanics (IACM)
Member, Society for Industrial and Applied Mathematics (SIAM)

Honors and awards
Meritorious Teaching Award for Assistant Instructor by the College of Engineering of the University of Texas at Austin, May 1986

Service activities (within and outside of the institution)-Not Applicable

Principal publications and presentations from the past five years
Babuška, I., Whiteman, L. and Strouboulis, T., Theory and Practice of the Finite Element Method of Engineers and Scientists, Oxford University Press, 2011. (336 pages)

Recent Professional Development Activities-AFOSR Summer faculty program
Name: Ramesh Talreja

Education
B.E., Civil Engineering, University of Bombay, 1967
M.S., Civil Engineering, Northeastern University, 1970
Ph.D., Solid Mechanics, The Technical University of Denmark, 1974

Academic experience
Texas A&M University, Tenneco Professor, 2001-present, full time
Texas A&M University, Department Head, 2001-2003, full time
Georgia Institute of Technology, Professor, 1991-2001, full time
US Air Force Academy, Distinguished Visiting Professor, 1999-2000, full time
The Technical University of Denmark, Docent, 1978-1988, full time
The Technical University of Denmark, Lektor, 1978-1988, full time

Non-academic experience
Riso National Laboratory, Research Scientist, 1978-1983, full time
The Technical University of Denmark, Scientist, 1971-1978, full time

Certifications or professional registrations-Not Applicable

Current membership in professional organizations
American Society of Mechanical Engineers
Sigma Xi

Honors and awards-Not Applicable

Service activities (within and outside of the institution)
Executive Committee member and Treasurer, Technology & Society Division, American Society of Mechanical Engineers (2008-2011) Chair (2011-present)
Chair, Mechanics of Materials Program, Texas A&M University (2006-2011)
President, Sigma Xi Chapter, Texas A&M University (2005-2006) Exec Committee Member (2006-present)
Member, International Programs Enhancement and Coordination Committee (IPECC), Texas A&M University (2010)
Texas A&M University, Faculty Senator (2008-2012)
Member, Faculty Senate Executive Committee (2010-2011)
Texas A&M University, Elected Member (2009-2012) and Executive Committee Member (2009-2011)

Principal publications and presentations from the past five years
Okabe, T., Imamura, H., Sato, Y., Higuchi, R., Koyanagi, J., & Talreja, R., “Experimental and Numerical Studies of Initial Cracking in CFRP Cross-Ply


Recent Professional development Activities-Not Applicable
Name: Srinivas Rao Vadali

Education
B.E., Mechanical Engineering, Sambalpur University, 1976
M.E., Aeronautical Engineering, Indian Institute of Science, 1978
Ph.D., Engineering Mechanics, Virginia Tech., 1983

Academic experience
Texas A&M University, Director of Accreditation and Assessment, 2011-present, full time
Texas A&M University, Stewart Stevenson-I Professor, 2002-2014, full time
Texas A&M University, Professor, 1995-2002, full time
Texas A&M University, Associate Professor, 1991-1995, full time
Texas A&M University, Assistant Professor, 1986-1991, full time
Iowa State University, Assistant Professor, 1983-1986, full time
Virginia Tech, Research Associate, 1983, part time
Indian Institute of Science, Research Associate, 1978-1979, part time

Non-academic experience
American Astronautical Society, Vice President Technical, 2007-2010, full time
Texas Space Grant Consortium, Associate Director, 2003-present, full time
Air Force Research Lab, 1995, full time

Certifications or professional registrations-Not Applicable

Current membership in professional organizations
American Astronautical Society (Fellow)
American Institute of Aeronautics and Astronautics (Associate Fellow)
American Society for Engineering Education (Member)

Honors and awards
AAS Dirk Brouwer Award
Charles W. Crawford Service Award
Distinguished Alumnus Award, Department of Aerospace Engineering, Indian Institute of Science
E. D. Brockett Professor
Stewart and Stevenson-I Professor
Jerry B. Davis Faculty Fellow
Texas Engineering Experiment Station (TEES) Fellow
Service Citation, Journal of Guidance, Control, and Dynamics

Service activities (within and outside of the institution)
Reviewer for Engineering Optimization (2007-present)
Reviewer for Optimal Control Applications and Methods (1983-present)
Reviewer for Journal of Guidance Control and Dynamics (1984-present)
Editorial Board, International Journal of Aerospace Engineering (2010-present)
Member, Astrodynamics Technical Committee, AIAA (1985-1988)
Session Chairman, 6th VPI Conference on Large Space Structures (1991)
Member, AAS Space Flight Mechanics Committee (2001-2007)
AAS Technical Chairman for the 2006 SFM Meeting, Tampa, Florida

Principal publications and presentations from the past five years

Recent Professional development Activities-Not Applicable
Name: John Valasek

Education
B.S., Aerospace Engineering, California State Polytechnic University, 1986
M.S. with Honors, Aerospace Engineering, University of Kansas, 1990
Ph.D., Aerospace Engineering, University of Kansas, 1995

Academic experience
Texas A&M University, Professor, 1990-present, full time
Department Head, 1995-2000, full time
General Dynamics Professor, 2000-present, full time

Non-academic experience

Certifications or professional registrations-Not Applicable

Current membership in professional organizations
American Institute of Aeronautics and Astronautics (Fellow)

Honors and awards
TEES Fellow
ASEE Lee Atwood Award

Service activities (within and outside of the institution)
Chair, University Faculty Development Leave Committee, 2000-2001
Member, Departmental Tenure and Promotion Committee, 2003-2006
AIAA Flight Test Technical Committee, 2003-2006

Recent principal publications and presentations


Valasek, John, and Narang-Siddarth, Anshu “Tracking Control of Non-Standard Multiple Time Scale Systems with Slow and Fast Actuators,” 52nd Society of Engineering Sciences Technical Meeting, College Station, TX, 28 October 2015.


Recent Professional development Activities - AIAA Meetings, Continuous.
Name: John D. Whitcomb

Education
B.S., Mechanical Engineering, North Carolina State University, 1973
M.S., Mechanical Engineering, Stanford University, 1976
Ph.D., Material Engineering Science, Virginia Polytechnic Institute and State University, 1988

Academic experience
Texas A&M University, Aerospace Engineering professor, 1989-present, full time

Non-academic experience
NASA Langley Research Center, Mechanics of Materials Branch, Research Engineer, 1974-1989, full time

Certifications or professional registrations
P.E., Texas, License #69717

Current membership in professional organizations
American Institute of Aeronautics and Astronautics; Associate Fellow
American Society of Mechanical Engineers; Fellow

Honors and awards
Special Achievement Award for Implementation of Real-Time Fatigue Test System.
Special Achievement Award for Innovative research that enhanced ability to compute complex delamination instability problems in composite materials.
Outstanding Performance Award for June 1983 – May 1984
Outstanding Performance Award "For timely and innovative detail analyses of the SRB joint."
Group Achievement Award: Member of the Solid Rocket Motor Improved Field Joint Assessment (SIFT), November 1986.
Certification of Appreciation from NASA Headquarters.
Texas Engineering Experiment Station Research Fellow, September 1994 and 2002.
Associate Fellow, American Institute of Aeronautics and Astronautics, 2000.
Halliburton Professor, 2005.
College of Engineering Faculty Fellow, 2008.
Texas Engineering Experiment Station Senior Fellow, 2008.

Service activities (within and outside of the institution)
Member of the editorial board for ASTM Journal of Composite Technology and Research (until Fall 2003)
Reviewer for American Institute of Aeronautics and Astronautics Journal
Reviewer for American Society of Mechanical Engineers
Reviewer for American Society of Civil Engineers Journal of Engineering Mechanics
Reviewer for American Society for Testing and Materials
Reviewer for Composites Engineering, An International Journal
Reviewer for Communications in Numerical Methods in Engineering
Reviewer for Department of the Army
Reviewer for International Journal of Fracture
Reviewer for International Journal of Solids and Structures
Reviewer for Journal of Applied Mechanics
Reviewer for Journal of Composite Materials
Reviewer for Journal of Composite Science and Technology
Reviewer for Journal of Engineering Materials and Technology
Reviewer for Journal of Thermoplastic Composite Materials
Reviewer for Journal of Sandwich Structures and Materials
Reviewer for Mechanics of Composite Structures
Reviewer for Richard D. Irwin, Inc., A First Course in the Finite Element Method by Bickford
Reviewer for Richard D. Irwin, Inc., Laminated Composites, by George Staab
Reviewer for Simon and Shuster draft of finite element textbook by Moaveni

Principal publications and presentations from the past five years

Recent Professional development Activities-Not Applicable
Name: Edward B. White

Education
B.S., Aerospace Engineering, Case Western Reserve University, 1995
M.S., Mechanical Engineering, Case Western Reserve University, 1997
Ph.D., Aerospace Engineering, Arizona State University, 2000

Academic experience
Texas A&M University, Associate Professor, 2007-present, full time
Associate Department Head, 2014-present, full time
Director of Oran W. Nicks Low-Speed Wind Tunnel, 2011-present, full time
Case Western University, Associate Professor, 2006, full time
Assistant Professor, 2000-2006, full time
Arizona State University, NDSEG Fellow/Allied Signal Graduate Fellow, 1997-2000, full time
Case Western University and NASA Lewis Research Center, Graduate Research Assistant,
1996-1997, full time
Case Western University, Undergraduate Research Assistant, 1994, part time

Non-academic experience
Orbital Research Inc., Aerospace Engineer, conducted wind-tunnel tests; analyzed data; developed
SBIR proposals, 1995, full time

Certifications or professional registrations-Not Applicable

Current membership in professional organizations
American Institute of Aeronautics and Astronautics (Associate Fellow)
American Physical Society (Member)

Honors and awards
William and Montine P. Head Faculty Fellow 2013-2014
Associate Fellow, American Institute of Aeronautics and Astronautics, 2011
ASU Allied Signal Fellowship, 1997
NASA Graduate Student Researchers Program Fellowship, 1997 (declined)
Case Mechanical and Aerospace Engineering Department Fellowship, 1995
Tau Beta Pi, National Engineering Honor Society
Case Garwin Award, 1995
Case Alumni Association Scholarship, 1994

Service activities (within and outside of the institution)-Not Applicable
Associate Department Head, Aerospace Engineering, 2014–present
Director, Oran W. Nicks Low-Speed Wind Tunnel, 2011–present
Aerospace Engineering Graduate Committee Member, 2009–present
Undergraduate Faculty Admissions Committee Member (CWRU) 2000–2006, chairman, 2002–2003
Case School of Engineering Graduate Studies Committee Member (CWRU), 2001–2003
Case School of Engineering Undergraduate Studies Committee Member (CWRU), 2003–2005

**Principal publications and presentations from the past five years**


**Recent Professional development Activities** Not Applicable.
Name and Academic Rank: Zi Jing Wong, Assistant Professor

Degrees with fields, institution, and date:
PhD, Mechanical Engineering, University of California at Berkeley, 2015
M.S., Aerospace Engineering, Korea Advanced Institute of Science and Technology (KAIST), 2008
B.Eng., Mechanical Engineering (Aeronautics), Universiti Teknologi Malaysia, 2005

Number of years of service on this faculty: <1 year
Date of original appointment: January 2018
Dates of advancement in rank: None

Other related experience:
Texas A&M University, Aerospace Engineering, College Station, TX
Assistant Professor, Jan 2018 – Present
University of California at Berkeley, NSF Nanoscale Science and Engineering Center, Berkeley, CA
Postdoctoral Researcher, Aug 2015 – Dec 2017
Research Assistant, Aug 2009 – Dec 2012
Lawrence Berkeley National Laboratory, Materials Sciences Division, Berkeley, CA
Research Assistant, Jan 2013 – Aug 2015
University of Cambridge, Cambridge Nanoscience Centre, Cambridge, UK
Research Assistant, Oct 2008 – Aug 2009
Peking University, Institute of Microelectronics, Beijing, China
Korea Advanced Institute of Science and Technology (KAIST), Aerospace Engineering, Daejeon, South Korea
Research Assistant, Feb 2006 – Jun 2008

Consulting, patents, etc.: None

State(s) in which registered: None

Principal publications of last five years:
(* indicates Student under the Direction of Dr. Wong)

**Scientific and professional societies of which a member:**
- OSA, SPIE, IEEE, MRS, AIAA

**Honors and awards:**
- PIERS (Photonics & Electromagnetics Research) Young Scientist Award, 2018
- MINE (Microsystem & Nanoengineering) Young Scientist Award, 2018
- Jong-Hoon Cho (Aerospace engineering) Young Scientist Award, 2017
- MRS Graduate Student Award (Gold Medal), 2015
- IEEE Photonics Conference Best Student Paper Award (1st Prize), 2015
- SPIE Active Photonic Materials Best Student Paper Award (1st Prize), 2015
- Metamaterials Congress Best Student Paper Award (1st Prize), 2015
- OSA Jean Bennett Memorial Student Award, 2015
- CLEO Pacific Rim Best Student Paper Award, 2015
- Microoptics Conference Best Student Paper Award, 2015
- International Fulbright Science and Technology Award, 2009
- International Master (IM) title by the World Chess Federation, 2006

**Professional development activities in the last five years:** Continuous

**Institutional and professional service in the last five years:**
- Department and University

**Percentage of time available for research or scholarly activities:** 60%

**Percentage of time committed to the program:** 100%

**Other:** None
Appendix C. Aerospace Graduate Catalog, 2017

Department of Aerospace Engineering

Alfriend III, Kyle T; Benzerga, Amine A; Bhattacharya, Rakim; Bowersox, Rodney D; Boyd, James G; Chakravorty, Suman; Chamitoff, Gregory E; Cizmas, Paul G; Donzis, Diego A; Dunbar, Bonnie J; Girimaji, Sharath S; Hara, Kentaro; Hartl, Darren J; Hurtado, John E; Junkins, John L; Karaman, Ibrahim; Karpetis, Adonios N.; Kinra, Vikram K; Kulatilaka, Waruna D; Lagoudas, Dimitris C; Langari, Gholamreza; Le Graverend, Jean-Briac B; Limbach, Christopher M; Majji, Manoranjan; Miles, Richard B; Benedict, Moble; Mortari, Daniele; Naraghi, Mohammad; Pollock, Thomas C; Poludnenko, Oleksiy Y; Reddy, Junuthula N; Reed, Helen L; Richard, Jacques C; Saric, William S; Scully, Marlan O; Shryock, Kristi J; Skelton, Robert E; Strganac, Thomas W; Strouboulis, Theofanis; Talreja, Ramesh R; Tichonor, Nathan R; Tropina, Albina; Vadali, Srinivas R; Valasek, John L; Whitcomb, John D; White, Edward B.

Head: R.D. Bowersox

Graduate Program Director: J.L. Valasek

Graduate Advisor: Gail Rowe

The Department of Aerospace Engineering offers graduate work and research programs in aeronautical/aerospace engineering. Programs leading to the degrees of MEng, MS and PhD are available. The department also offers courses and faculty supervision for students pursuing the Doctor of Engineering degree. Major areas of interest are aero/fluid dynamics, hypersonics, computational fluid dynamics, fluid-structure interaction (aeroelasticity), flight mechanics, astrodynamics, spacecraft/aircraft dynamics and control, rotorcraft, computational mechanics, solid mechanics, micromechanics, nanomechanics, composite materials, bio-nano materials, aging aircraft and structures.

The aerodynamics and propulsion-related research within the department includes airfoil and wing analyses, boundary layer stability, turbulence, combustion, propulsion and flow-control for aircraft, land vehicles, wind turbines and other applications. A major focus within the department is viscous flows across the speed regimes ranging from incompressible subsonic to hypersonic. Fundamental transition research is performed using world-class quiet-flow facilities that include the Klebanoff/Saric Low Disturbance Tunnel and the NASA Langley/TAMU Mach 6 Quiet Tunnel. The Texas A&M University National Aerothermochemistry (TAMU-NAL) Laboratory is a graduate research facility for conducting leading research in support of national interests in high-speed gasdynamics, unsteady flows and flows with thermal and chemical non-equilibrium effects.

Research involving dynamics and control of autonomous intelligent vehicles, formation flying of spacecraft and other problems in astrodynamics is performed in the Center for Mechanics and
Control. The Land, Air and Space Robotics (LASR) laboratory enables sensing and control research with emphasis on high fidelity emulation of close proximity motions of two or more vehicles. LASR is being utilized to research spacecraft on-orbit proximity operations, autonomous aerial refueling of UAVs and astronaut supervision of robots for surface operations on the Moon or Mars. Research related to satellite design, responsive space systems and autonomous rendezvous and docking is conducted by the AggieSat Lab Student Satellite Program. The department has a two-observatory facility on the grounds of the Physics Department’s Astronomy Teaching Observatory, which is used for research on fine resolution interferometric imaging of space objects via photonic quantum correlations. Recently founded Advanced Vertical Flight Lab (AVFL) conducts rotorcraft-related research focusing on design, development and flight testing of revolutionary vertical take-off and landing (VTOL) capable UAVs mainly at meso scales.

Investigations of materials and structural mechanics problems are undertaken in the Center for Mechanics of Composites. Research on nanomaterials, multifunctional material systems, multiscale modeling and integrated adaptive structures is coordinated by the Texas Institute for Intelligent Materials and Structures for Aerospace Vehicles (TiiMS). Research in the Electroactive Materials Characterization Laboratory focuses on processing-microstructure-property relationships in smart materials with the goal of developing new materials with unique combinations of mechanical, electrical and coupled properties for uses that range from advanced electronic devices and autonomous system concepts to the aerospace, automotive, medical and consumer industries.

Numerical simulations of complex fluid and solid mechanics problems are efficiently obtained with university and supporting departmental computational facilities.

Courses relating to structural mechanics and materials listed at the end of this section are contained within the College of Engineering listing. The mechanics and materials courses are administered by the Department of Aerospace Engineering and are taught by faculty from the Departments of Aerospace, Civil and Mechanical Engineering. A foreign language is not required for any of the aerospace degree programs.

Mechanics and Materials (MEMA)

The mechanics and materials course offerings perform three major functions. First, and most importantly, they are interdisciplinary vehicles for staff and students who study and conduct research in those increasingly important areas requiring a blending of mechanics and materials. Second, they provide the support base for graduate students to pursue studies in the traditional areas of either applied mechanics or materials science. Third, they provide a coordinated set of service courses for the engineering departments. Interested students should contact their department's graduate advisor.
Graduate Courses

AERO 601 Advanced Aerodynamics, Credits 3. 3 Lecture Hours. Theoretical and approximate solutions for steady and unsteady incompressible flows and steady transonic flows; applications to airfoil, wing and whole-vehicle aerodynamics; approximate methods for boundary layers; introduction to aerodynamic design concepts; design of swept wings and delta wings and control surfaces. Prerequisite: Approval of instructor.

AERO 602 The Theory of Fluid Mechanics, Credits 3. 3 Lecture Hours. Entry-level theory of fluid mechanics with emphasis on viscous subsonic flows; governing principles and equations, exact solutions to simple problems of the Navier-Stokes equations, similarity solutions and boundary layer theory; flow stability, transition and turbulence. Prerequisite: Graduate classification and approval of instructor.

AERO 603/MEMA 602 Continuum Mechanics, Credits 3. 3 Lecture Hours. Development of field equations for analysis of continua (solids as well as fluids); conservation laws; kinematics, constitutive behavior of solids and fluids; applications to aerospace engineering problems involving solids and fluids. Prerequisite: Graduate classification. Cross Listing: MEMA 602/AERO 603.

AERO 605/MEEN 603 Theory of Elasticity, Credits 3. 3 Lecture Hours. Analysis of stress and strain in two- and three-dimensions, equilibrium and compatibility equations, strain energy methods; torsion of noncircular sections; flexure, axially symmetric problems. Prerequisite: graduate or senior undergraduate standing. Cross Listing: MEEN 603/AERO 605.

AERO 606 Multifunctional Materials, Credits 3. 3 Lecture Hours. In-depth analysis of multifunctional materials and composites, and their novel applications. Prerequisites: MEMA 602/AERO 603/AERO 603/MEMA 602, MSEN 601. Cross Listing: MEMA 606 and MSEN 606.

AERO 608 Nanomechanics, Credits 3. 3 Lecture Hours. Application of mechanics concepts to nano-scale behavior of materials. Review of continuum mechanics; Extensions to generalized continua; Nonlocal elasticity; Nano-scale plasticity. Focus on multi-scale modeling: Dislocation Dynamics; Quasi-Continuum method; Molecular dynamics with introductions to quantum mechanics and statistical mechanics. Prerequisite: AERO 603/MEMA 602. Cross Listing: MEMA 608 and MSEN 608.
AERO 609 Sustainability Metrics and Life Cycle Assessment in Engineering Credits 3. 3 Lecture Hours. Concepts of sustainability with associated metrics; application of systems engineering tools to facilitate assessment of viable options on products and processes; assessment of impact on the entire biosphere; product life cycle analysis. Prerequisite: Graduate classification.

AERO 615 Computational Fluid Dynamics for Aerospace Applications Credits 3. 3 Lecture Hours. Methods for solving internal and external flow problems; viscous and inviscid compressible flow, Euler, Navier-Stokes and Large Eddy Simulation solvers, boundary conditions. Prerequisite: MATH 601 or approval of instructor.

AERO 616 Damage and Failure in Composite Materials Credits 3. 3 Lecture Hours. Mechanisms and models related to damage and failure in composite materials subjected to mechanical loads. Prerequisite: Courses in composite materials, elasticity. Cross Listing: MEMA 616 and MSEN 636.

AERO 617/MEMA 625 Micromechanics Credits 3. 3 Lecture Hours. Eigenstrains; inclusions, and inhomogeneities; Eshelby’s solution for an ellipsoidal inclusion; Eshelby’s equivalent inclusion method. Effective elastic properties of composites; composite spheres and cylinders models; bounds on effective moduli; Hashin-Shtrikman bounds; applications to fiber, whisker and particulate reinforced composites; introduction to micromechanics of inelastic composites and solids with damage. Prerequisites: MEMA 602/AERO 603, or AERO 603/MEMA 602, AERO 605/MEEN 603. Cross Listing: MEMA 625/AERO 617.

AERO 618/MEMA 626 Mechanics of Active Materials Credits 3. 3 Lecture Hours. Introduction to coupled field theories: constitutive response of materials with thermal and electromagnetic coupling; microstructural changes due to phase transformations; shape memory alloys; piezoelectric and magnetostrictive materials; active polymers and solutions. Micromechanics of active composites. Prerequisites: MEMA 602/AERO 603. Cross Listing: MEMA 626/AERO 618.

AERO 620 Unsteady Aerodynamics Credits 3. 3 Lecture Hours. Theoretical formulation of unsteady airfoil theory and techniques used for determining airloads on oscillating lift surfaces; exact solutions and various approximations presented and evaluated; application to problems of unsteady
incompressible, subsonic and transonic flows about airfoils and wings. Prerequisite: Approval of instructor.

**AERO 621 Aeromechanics of Wind Turbines** Credits 3. 3 Lecture Hours. Solid and fluid mechanics concepts applied to aerodynamics and aeroelasticity of wind turbine blades; failure analysis and structural design; composites and hybrid materials. Prerequisite: Graduate Classification.

**AERO 622 Spacecraft Dynamics and Control** Credits 3. 3 Lecture Hours. Elements of analytical dynamics; modeling different types of spacecraft and control systems, sensors, and actuators; stability; control system design; effects of flexibility; attitude and orbital coupling; environmental effects. Prerequisites: AERO 422 or ECEN 420.

**AERO 623 Optimal Spacecraft Attitude and Orbital Maneuvers** Credits 3. 3 Lecture Hours. Application of optimization and optimal control techniques to spacecraft maneuver problems; computation of open loop and feedback controls for linear and nonlinear spacecraft dynamical systems; low-thrust and impulsive control, discretization methods, case studies. Prerequisite: AERO 423 or equivalent.

**AERO 624 Celestial Mechanics** Credits 3. 3 Lecture Hours. Analytical and numerical methods for computing spacecraft orbits under the influence of gravitational, aerodynamic, thrust and other forces; Keplerian two-body problem, perturbation methods, orbit determination, navigation and guidance for aerospace vehicles. Prerequisite: AERO 423 or equivalent.

**AERO 625 Modern Control of Aerospace Systems** Credits 3. 3 Lecture Hours. Linear and nonlinear controllers for aircraft and spacecraft; state and output feedback of sampled-data control systems; feedback linearization and dynamic inversion; direct sampled-data design using optimal MIMO techniques; sensing considerations, sources and modeling of uncertainties unique to aircraft and spacecraft, robustness analysis. Prerequisite: AERO 422 or equivalent.

**AERO 626 Estimation of Dynamic Systems** Credits 3. 3 Lecture Hours. Traditional concepts and recent advances in estimation related to modern dynamic systems found in aerospace disciplines; least squares estimation, state estimation, nonlinear filtering, aircraft position and velocity tracking, attitude determination of spacecraft vehicles, gyro bias estimation and calibration. Prerequisites: AERO 310 or equivalent; STAT 211 or equivalent.
**AERO 627 Principles of Structural Dynamics** Credits 3. 3 Lecture Hours. Examination of flexible structures through a review of single degree-of-freedom dynamical systems followed by an in-depth study of continuous and multiple degree-of-freedom systems; emphasis on discrete modeling of structures for vibration analysis and dynamic analysis, with minimal development of methods such as finite elements. Prerequisite: Graduate classification.

**AERO 628 Advanced Spacecraft Dynamics and Control** Credits 3. 3 Lecture Hours. Review of fundamental principles; introduction to alternate and advanced methods of dynamics and control for aerospace systems; alternate methods for generating and analyzing equations of motion; techniques for complex multibody systems; variable speed control moment gyros; method of quadratic modes; focus on modeling techniques for aerospace systems. Prerequisite: AERO 622.

**AERO 629 Experimental Aerodynamics** Credits 3. 3 Lecture Hours. Review of fundamental principles in aerodynamics; basics of instrumentation, electronics, data-acquisition; experimental techniques in aerodynamics/fluid mechanics; pressure, skin friction, force and velocity measurement techniques in wind and water-tunnel testing; conventional and novel techniques in data-processing and systems modeling; smart systems in experimental aerodynamics. Prerequisite: AERO 601.

**AERO 630 Introduction to Random Dynamical Systems** Credits 3. 3 Lecture Hours. Building on basic probability theory, course covers theory and applications of discrete and continuous random processes. Particular attention shall be paid to the response of dynamical systems (discrete, linear and non-linear), to random input processes and their application to Engineering Systems. Prerequisite: Graduate classification.

**AERO 631 Model Predictive Control for Aerospace Systems** Credits 3. 3 Lecture Hours. Nonlinear optimal control and optimization, optimal control theory, dynamical systems stability and control, approximation theory, convex optimization; control of engineering systems with state and control constraints with parametric uncertainty; formulate optimal control problems, solve as nonlinear programming problems using available solvers; requires background in control theory. Prerequisites: Graduate classification and AERO 623 or comparable course.

**AERO 632 Design of Advanced Flight Control Systems - Theory and Application** Credits 3. 3 Lecture Hours. Modeling, analysis, design and implementation of advanced flight control problems, specifically aerospace engineering applications; includes choice of controlled variables, reduction of controlled variables, design methodology, computational framework, implementation issues, and
software environments using various toolboxes. Prerequisites: Graduate classification and approval of instructor.

**AERO 633 Advanced Aerospace Multibody Dynamics** Credits 3. 3 Lecture Hours. Techniques for modeling, simulation, and analyzing multibody dynamical systems; includes development of kinematic expressions for articulating bodies, adding and constraining degrees of freedom through mappings; familiarization with industry codes, such as DISCOS; appreciation of learned techniques on various systems, including omni-directional vehicles, Stewart platforms, and gyroscopically-stabilized walking robots. Prerequisites: AERO 622 or graduate classification and approval of instructor.

**AERO 640 Turbulence Processes** Credits 3. 3 Lecture Hours. Fundamentals of conservation, Lagrangian, transformation, variance properties; flow features: laminar, transition, turbulence regimes, characteristics, spectrum; statistical (filter/average) description: scales, Reynolds, arbitrary averaging, realizability; elementary turbulence processes: viscous, advective/inertial, role of pressure; elementary process models, viscous RDT, RDT for velocity gradients, equipartition of energy, restricted Euler equations; isotropic, homogeneous turbulence. May be taken 2 times for credit.

**AERO 641 High-Speed Combustion for Propulsion** Credits 3. 3 Lecture Hours. Study topics in combustion relevant to high-speed subsonic/supersonic air-breathing propulsion; emphasis on the structure of detonations and the operation of combustors under supersonic conditions; structure of shock-waves and the mixing/chemical kinetics that take place in high speeds. Prerequisite: Graduate classification.

**AERO 642 Laser Diagnostics for Combustion and Propulsion** Credits 3. 3 Lecture Hours. Laser diagnostics topics as applied to combustion and propulsion: brief exposition of fundamental electromagnetic theory; practice of basic experimental laser techniques used to measure thermochemistry; basic implementation of Raman and Rayleigh scatterings; Laser-Induced Fluorescence (LIF); detection methods, optical systems, noise contributions, and signal enhancement techniques will be discussed. Prerequisite: Graduate classification.

**AERO 643 High-Performance Computational Fluid Dynamics** Credits 3. 3 Lecture Hours. Numerical simulations of fluid dynamics problems on massively parallel computers; focus on Direct Numerical Simulations (DNS) where all dynamically relevant scales are resolved; elements of both high-performance computing (HPC) and numerical methods to solve incompressive and compressible flows. Prerequisite: AERO 615 or approval of instructor.

AERO 649/MEMA 649 Generalized Finite Element Methods Credits 3. 3 Lecture Hours. Systemic introduction to the theory and practice of generalized finite element (FE) methods, including GFEM, the hp-cloud method, particle methods, and various meshless methods with similar character; precise formulation of the methods are presented; known theoretical results for convergence; important issues related to implementation, issues of numerical integration. Prerequisite: Graduate classification. Cross Listing: MEMA 649/AERO 649.

AERO 650 Spacecraft Attitude Determination Credits 3. 3 Lecture Hours. Spacecraft attitude determination systems; attitude and error parameterizations, attitude sensors, data processing and calibration; introduction to single- and three- axis attitude determination and to optimal attitude and error estimation: ECI motion and time definitions. Prerequisite: AERO 423 or equivalent.

AERO 651 Human Spaceflight Operations Credits 3. 3 Lecture Hours. Essential aspects of human spaceflight operations as performed NASA; in-depth understanding of the state-of-the-art in spacecraft operations, including spacecraft systems, ground and launch operations, mission management and on-orbit activities such as science, robotics, spacewalking, and human health maintenance; applications to future space systems. Prerequisite: Graduate classification.

AERO 655 Helicopter Aerodynamics Credits 3. 3 Lecture Hours. Hovering theory, hovering and vertical flight performance, factors affecting hovering and vertical flight performance, auto-rotation in vertical descent, concepts of blade motion and control, aerodynamics of forward flight, forward flight performance, operational envelope and introduction to conceptual design of helicopters. Prerequisites: Grade of C or better in AERO 222, AERO 301, and AERO 310; graduate classification.

AERO 660 Nonlinear Flight Dynamics Credits 3. 3 Lecture Hours. Nonlinear equations of motion for coupled aircraft motions; coupled aerodynamic phenomena; application of the direct method of Lyapunov to nonlinear aircraft motions; elastic airplane equations of motion. Prerequisite: AERO 421 or approval of instructor.
AERO 661 **Optical Methods in Aerospace Engineering** Credits 3. 3 Lecture Hours. Analysis and design of imaging and interferometric instruments for flight in and above the atmosphere and ground-based observation of orbiting objects; assessment of optical component and system performance. Prerequisite: Graduate classification.

AERO 670 **Turbulence Modeling** Credits 3. 3 Lecture Hours. Identification of physical features that render Navier-Stokes equation difficult to compute or model; includes Reynolds-averaged and filtered Navier-Stokes equations for unresolved stresses; development of closure models for pressure-strain correlation, dissipation and turbulent transport Reynolds; algebraic Reynolds stress modeling, Large Eddy Simulations (LES) and hybrid methods; validation and prediction studies. Prerequisites: AERO 640 and graduate classification or approval of instructor.

AERO 672 **Perturbation Methods in Mechanics** Credits 3. 3 Lecture Hours. Develop approximate solutions to algebraic, differential, and integral equations; analysis of nonlinear oscillations, nonlinear waves, and boundary-layers; emphasis on combined numerical/perturbations techniques and reducing Partial Differential Equation (PDE) to Ordinary Differential Equation (ODE). Prerequisites: Graduate classification in aerospace, mechanical or civil engineering.

AERO 673 **Boundary Layer Stability and Transition** Credits 3. 3 Lecture Hours. Analytical, numerical, and experimental methods for the stability of bounded shear flows; includes techniques for estimating transition to turbulence and the control of transition through laminar flow control. Prerequisites: Graduate classification and AERO 601, 602, or 603 or approval of instructor.

AERO 674 **Hypersonic Flow** Credits 3. 3 Lecture Hours. Theoretical formulation of hypersonic flow theory; techniques for hypersonic flowfield analysis; high temperature effects, including both equilibrium and nonequilibrium flows; classical and modern computational methods. Prerequisite: AERO 303 or equivalent.

AERO 676 **Aerothermochemistry** Credits 3. 3 Lecture Hours. Fundamentals of kinetic theory, chemical thermodynamics and statistical mechanics; applications to high temperature chemically reacting equilibrium and nonequilibrium aerodynamic flows. Prerequisite: AERO 303 or equivalent.
**AERO 681 Seminar** Credit 1. 1 Lecture Hour. Selected research topics presented by the faculty, students and outside speakers. Prerequisite: Graduate classification.

**AERO 684 Professional Internship** Credits 1 to 4. 1 to 4 Other Hours. Engineering research and design experience at government or industry facilities away from the Texas A&M campus; design projects supervised by faculty coordinators and personnel at these locations; projects selected to match student’s area of specialization. Prerequisites: Graduate classification and approval of committee chair and department head.

**AERO 685 Directed Studies** Credits 1 to 12. 1 to 12 Other Hours. Special topics not within scope of thesis research and not covered by other formal courses. Prerequisite: Graduate classification in aerospace engineering.

**AERO 689 Special Topics in...** Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of aerospace engineering. May be repeated for credit. Prerequisite: Approval of instructor.

**AERO 691 Research** Credits 1 to 23. 1 to 23 Other Hours. Technical research projects approved by department head.

**MEMA 602/AERO 603 Continuum Mechanics** Credits 3. 3 Lecture Hours. Development of field equations for analysis of continua (solids as well as fluids); conservation laws; kinematics, constitutive behavior of solids and fluids; applications to aerospace engineering problems involving solids and fluids. Prerequisite: Graduate classification. Cross Listing: AERO 603/MEMA 602.

**MEMA 606 Multifunctional Materials** Credits 3. 3 Lecture Hours. In-depth analysis of multifunctional materials and composites, and their novel applications. Prerequisites: MEMA 602/AERO 603/AERO 603/MEMA 602, MSEN 601. Cross Listing: AERO 606 and MSEN 606.

**MEMA 608 Nanomechanics** Credits 3. 3 Lecture Hours. Application of mechanics concepts to nano-scale behavior of materials. Review of continuum mechanics; Extensions to generalized continua; Nonlocal elasticity; Nano-scale plasticity. Focus on multi-scale modeling; Dislocation Dynamics; Quasi-Continuum method; Molecular dynamics with introductions to quantum
mechanics and statistical mechanics. Prerequisite: AERO 603/MEMA 602. Cross Listing: AERO 608 and MSEN 608.

**MEMA 611 Fundamentals of Engineering Fracture Mechanics** Credits 3. 3 Lecture Hours. Understanding of the failure of structures containing cracks with emphasis on mechanics; linear elastic fracture mechanics, complex potentials of Muskhelishvili and Westergaard, J-integral, energy release rate, R-curve analysis, crack opening displacement, plane strain fracture toughness testing, fatigue crack propagation, fracture criteria, fracture of composite materials. Prerequisite: AERO 603/MEMA 602.

**MEMA 613/MSEN 610 Principles of Composite Materials** Credits 3. 3 Lecture Hours. Classification and characteristics of composite materials; micromechanical and macromechanical behavior of composite laminae; macromechanical behavior of laminates using classical laminate theory; interlaminar stresses and failure modes; structural design concepts, testing and manufacturing techniques. Prerequisite: MEMA 602/AERO 603. Cross Listing: MSEN 610/MEMA 613.

**MEMA 616 Damage and Failure in Composite Materials** Credits 3. 3 Lecture Hours. Mechanisms and models related to damage and failure in composite materials subjected to mechanical loads. Prerequisite: Courses in composite materials, elasticity. Cross Listing: AERO 616 and MSEN 636.

**MEMA 625/AERO 617 Micromechanics** Credits 3. 3 Lecture Hours. Eigenstrains; inclusions, and inhomogeneities; Eshelby’s solution for an ellipsoidal inclusion; Eshelby’s equivalent inclusion method. Effective elastic properties of composites; composite spheres and cylinders models; bounds on effective moduli; Hashin-Shtrikman bounds; applications to fiber, whisker and particulate reinforced composites; introduction to micromechanics of inelastic composites and solids with damage. Prerequisite: MEMA 602/AERO 603. Cross Listing: AERO 617/MEMA 625.

**MEMA 626/AERO 618 Mechanics of Active Materials** Credits 3. 3 Lecture Hours. Introduction to coupled field theories: constitutive response of materials with thermal and electromagnetic coupling; microstructural changes due to phase transformations; shape memory alloys; piezoelectric and magnetostrictive materials; active polymers and solutions. Micromechanics of active composites. Prerequisite: MEMA 602/AERO 603. Cross Listing: AERO 618/MEMA 626.
MEMA 634/CVEN 753 Damage Mechanics of Solids and Structures Credits 3. 3 Lecture Hours. Damage mechanics; constitutive modeling of damage behavior of materials; application of thermodynamic laws; computational techniques for predicting progressive damage and failure; plasticity; viscoplasticity; viscoelasticity; cohesive zone modeling; fatigue and creep damage; damage in various brittle and ductile materials (e.g., metal, concrete, polymer, ceramic, asphalt, biomaterial, composites). Prerequisite: CVEN 633 or approval of instructor. Cross Listing: CVEN 753/MEMA 634.

MEMA 635 Structural Analysis of Composites Credits 3. 3 Lecture Hours. Formulation and analysis structural response of laminated composite components; bending, vibration and stability of laminated composite plates; interlaminar stresses, effect of shear deformation on structural response; numerical modeling of laminated plates. Prerequisite: MEMA 613/MSEN 610.

MEMA 641 Plasticity Theory Credits 3. 3 Lecture Hours. Theory of plastic yield and flow of two and three-dimensional bodies; classical plasticity theories, unified viscoplastic theories, numerical considerations; applications and comparisons of theory to experiment. Prerequisite: MEMA 602/AERO 603. Cross Listing: MSEN 641 and MEEN 666.

MEMA 646 Introduction to the Finite Element Method Credits 3. 3 Lecture Hours. Weak or variational formulation of differential equations governing one- and two-dimensional problems of engineering; finite element model development and analysis of standard problems of solid mechanics (bars, beams and plane elasticity), heat transfer and fluid mechanics; time-dependent problems; computer implementation and use of simple finite element codes in solving engineering problems. Prerequisite: Senior or graduate classification.

MEMA 647 Theory of Finite Element Analysis Credits 3. 3 Lecture Hours. Finite elements models of a continuum; virtual work principle; plane stress and plane strain finite element models; bending of plates; axisymmetric problems; three-dimensional stress analysis; isoparametric formulations; finite element computer programs to solve typical structural problems. Prerequisite: Graduate classification or approval of instructor.

MEMA 648 Nonlinear Finite Element Methods in Structural Mechanics Credits 3. 3 Lecture Hours. Tensor definitions of stress and strain, finite strain, geometric and material nonlinearities; development of nonlinear finite element equations from virtual work; total and updated Lagrangian
formulations; solution methods for nonlinear equations; computational considerations; applications using existing computer programs. Prerequisite: MEMA 647 or equivalent.

**MEMA 649/AERO 649 Generalized Finite Element Methods** Credits 3. 3 Lecture Hours. Systemic introduction to the theory and practice of generalized finite element (FE) methods, including GFEM, the hp-cloud method, particle methods and various meshless methods with similar character; precise formulation of the methods are presented; known theoretical results for convergence; important issues related to implementation, issues of numerical integration. Prerequisite: Graduate student status. Cross Listing: AERO 649/MEMA 649.

**MEMA 670 Computational Materials Science and Engineering** Credits 3. 3 Lecture Hours. Modern methods of computational modeling and simulation of materials properties and phenomena, including synthesis, characterization, and processing of materials, structures and devices; quantum, classical, and statistical mechanical methods, including semi-empirical atomic and molecular-scale simulations, and other modeling techniques using macroscopic input. Prerequisites: Approval of instructor; graduate classification. Cross Listing: MSEN 670 and CHEN 670.

**MEMA 689 Special Topics in...** Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of mechanics and materials. May be repeated for credit. Prerequisite: Approval of instructor.
Appendix D. Faculty Hiring and Development

D.1 Faculty Hiring and Retention

The first step in faculty hiring is for the departments to make a request to hire to the college Executive Associate Dean (EAD). Non-tenure track faculty positions are requested in bulk prior to the beginning of each academic year while tenure track positions are requested and approved throughout the year. All the College of Engineering faculty career opportunities are posted at http://engineering.tamu.edu/careers/faculty where candidates may apply. Tenure track positions are advertised in an appropriate scientific journal for at least one month. Applications are reviewed by the appointed search committee and a short list of candidates is identified. For tenure track positions, the department head relays that list to the EAD. The EAD review ensures a diverse applicant pool is reviewed. Candidates on approved short lists have a one- to two-day on-campus interview during which each candidate meets with an engineering dean. Once the department identifies the preferred candidate, the EAD works with the department head to arrange the appropriate start-up package, and other considerations including, if necessary, partner placement assistance and endowed faculty offers. The department sends a draft offer letter and start-up request to the manager of faculty services, who facilitates the approval of both and notifies the department to proceed with the offer. Finally, the departmental faculty hiring coordinator works with the manager of faculty services to complete the hiring paperwork and obtain the university approvals.

The College of Engineering views its faculty as a source of unlimited potential. While the monetary investment is evident through the substantial start-up funds provided by the college, Engineering Deans constantly work on matters pertaining to faculty retention. The college provides an ombudsman to assist faculty who might be having issues, and deans communicate with Department heads to identify faculty members at risk. Ongoing strategies include: salary adjustments to address equity issues and merit; granting of endowed chairs, professorships, career development professorships, and fellowships; provisions for multiple college-level teaching, research and service awards; promotion of our faculty for university and national level awards; social receptions and special recognition events to recognize outstanding performance. The college also works diligently with departments to provide appropriate space and equipment to ensure faculty success. The general approach of the College of Engineering is to be proactive in facilitating an excellent “climate” for faculty members to thrive.

D.2 Faculty Professional Development

The College of Engineering helps provide funds for professional development through the start-up funding upon hire. The college constantly provides information to the engineering faculty regarding on-campus development opportunities provided by the Montague Center for Teaching Excellence, the Dean of Faculties, and the Vice President for Research. Seminar opportunities are advertised across campus. Other funding for the support of external professional development opportunities such as workshops, symposia and conferences, is provided from the faculty member’s departmental budget and gift funds, and through the use of principal investigator (PI) incentive accounts. The college also provides assistance and guidance to faculty members with other professional
development opportunities as they arise, working as a facilitator with upper administration to obtain the proper approvals to encourage the activity.

The department recognizes that faculty development is essential for its strength, reputation, and vitality. The department is proactive in looking for opportunities to enhance the development of its younger faculty by providing resources in the form of laboratory equipment, faculty salary support during the summer for the first year, support of graduate assistants dedicated to young faculty, support for travel, and reduced teaching loads. These resources are negotiated as parts of the starting packages for new hires. All tenured or tenure-track faculty up to the rank of associate professor have assigned senior faculty of the department as mentors. The mentors advise their wards regarding matters such as development of research proposals, joint research activities, graduate student recruitment, and other professional activities. The department also provides travel funds for each faculty member to attend a conference or meet with a research sponsor.

The University and the Aerospace Engineering Department actively support faculty sabbaticals (Faculty Development Leave). Sabbaticals are generally provided at the request of a faculty member who has served on the faculty for a reasonable period of time (generally at least five years); however, no specific interval is specified as to how often a faculty member may request a sabbatical. Sabbaticals are requested through the Department head, and must be approved by the Dean of Engineering and the Provost. Faculty members are also encouraged to apply for Summer Faculty Fellowships sponsored by various governmental laboratories or industry.
Appendix E. Graduate Program Guides

### Doctoral Program Guide

#### Year 1

The department expects the PhD student to demonstrate core competency in Aerospace Engineering by passing a doctoral qualifying exam and maintaining a 3.0 or better GPA.

- **Aerospace Fundamentals Qualifying Exam - AFQE**: A three-day exam held each year in mid-May. Must pass the AFQE to continue to PhD; change to MS or leave if not passed. To prepare for the AFQE, three courses are recommended: AERO 602, AERO 603, AERO 622.
- **Degree Plan and Committee Formation**: Begin in 2nd semester (usually Spring), complete in 3rd semester (following AFQE). Graduate faculty: Chair plus two other AERO faculty members and one from outside the department.
- An advising appointment is required after AFQE and prior to submitting degree plan, most likely 3rd semester.
- **Sign up for the AERO Graduate Student Listserv and computer lab access**. See the registration button “Graduate Listserv” on the Department’s “Current Students” webpage (http://engineering.tamu.edu/aerospace/current-students); see “Computing Information” and follow instructions for computing lab access http://engineering.tamu.edu/aerospace/about/computing-info/labs).
- Attend five (5) Aerospace Engineering Special Seminars each semester. (non-credit bearing departmental requirement)

<table>
<thead>
<tr>
<th>AFQE</th>
<th>Steps to accomplish the Aerospace Engineering Fundamentals Qualifying Exam</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓</td>
<td>- Register for the exam in January - Graduate Advisor sends form by email.</td>
</tr>
<tr>
<td></td>
<td>- Attend departmental AFQE Informational meeting.</td>
</tr>
<tr>
<td></td>
<td>- AFQE given M-W-F in mid-May. 9:00 a.m. - noon each day.</td>
</tr>
<tr>
<td></td>
<td>- Results should be available in June. A pass is required to continue in PhD.</td>
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</tbody>
</table>

| Degree Plan | For TAMU degree plan requirements in the Graduate Student Catalog go to: [http://catalog.tamu.edu](http://catalog.tamu.edu) and use the search function to select Doctor of Philosophy program. Or, from the howdy portal ([https://howdy.tamu.edu](https://howdy.tamu.edu)), select the Graduate Student Tab, then Degree Plan Submission System and Information (or Degree Requirements for catalog requirements checklist.) |
|            | - **Department requires 2 credit hours of AERO 681-Seminar** on the degree plan (one each of Communication and Professional Development); take one during first semester in doctoral program. (Seminar only offered fall and spring terms). |
|            | - Degree plan will have **64 hours coursework following the Master of Science Thesis Option (MS-THO)** or **96 hours following the Bachelor of Science (BS) degree**. (no more / no less). Complete the degree plan online form at [https://ogsdpss.tamu.edu](https://ogsdpss.tamu.edu) or from the link on the Graduate tab in howdy. Discuss coursework with your faculty chair; include the recommended AFQE courses. It is common to have more research hours. |
|            | - **Research hours are listed as a single total on one line in the degree plan.** Note: additional course or research hours may be taken but DO NOT include in the degree plan. TAMU has limits on how many additional hours beyond 99 can be used without incurring nonresident tuition rates. PhD coursework expires after 10 years. |

#### Year 2

In the second year of a doctoral program, the department has these expectations:

- **Preliminary Exam**: Students demonstrate an understanding of the PhD research process by writing and successfully defending their research proposal in the Preliminary Exam.
- **Research Proposal**: Committee and student determine research goals and sign the Research Proposal form (attach entire proposal for your dissertation). Form at: [http://ogaps.tamu.edu/incoming-students/student-forms-and-information/getting-a-proposal](http://ogaps.tamu.edu/incoming-students/student-forms-and-information/getting-a-proposal). **Student** reports to Graduate Advising Office/HRBB 750C for approval and forwarding to OGAPS. Student may bring draft of the proposal to the Committee 15 working days before the Prelim. **Advisory Committee** gives guidance on future research effort as part of a pass decision at the Prelim.

| Preliminary Exam | - Type and print the Preliminary Exam and Checklist Forms and schedule the Prelim with your Committee. Forms: [http://ogsdpss.tamu.edu](http://ogsdpss.tamu.edu)/New-Current-Students. Take any written tests required by your Committee no more than 3 weeks prior to the test date. |

| Research Proposal | Research Proposal Title Page for Dissertation Form: (http://ogaps.tamu.edu/New-Current-Students) Student provides a draft of the proposal to the Committee 15 working days before the Prelim: Advisory Committee gives guidance on future research effort as part of a pass decision at the Prelim. |
Overview: Complete approved research, compile research results and develop conclusions in professional publications, conferences and dissertation. Final oral exam (Final Defense) will be scheduled, dissertation completed, submitted to Committee 15 working days prior to defense, defense must be successfully passed.

<table>
<thead>
<tr>
<th>Year 3 &amp; 4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Research</strong></td>
</tr>
<tr>
<td>✓ Schedule frequent meetings with advisor to discuss your progress and receive guidance.</td>
</tr>
<tr>
<td><strong>Writing &amp; Presenting Skills</strong></td>
</tr>
<tr>
<td>✓ Technical writing and observation/participation in seminar help: Prepare professional quality publications, make engaging professional presentations.</td>
</tr>
<tr>
<td><strong>Academic Experience</strong></td>
</tr>
<tr>
<td>✓ Teaching/mentoring experience available to all doctoral students and can be enhanced for those definitely interested in an academic career.</td>
</tr>
<tr>
<td><strong>Dissertation</strong></td>
</tr>
<tr>
<td>✓ Attend a Pre-Submittal Conference at the Thesis Office: <a href="http://thesis.tamu.edu/">http://thesis.tamu.edu/</a> Observe deadlines for OGAPS, Thesis Office and Department, obtain required forms, including document template, copyright/publication release form, complete doctoral survey. <strong>NOTE:</strong> Department requirement—Provide a substantially complete document to your Committee at least 15 days prior to Final Defense.</td>
</tr>
<tr>
<td><strong>Final Defense or Final Oral Exam</strong></td>
</tr>
<tr>
<td>✓ Complete (type) and download the Request &amp; Announcement of the Final Examination from OGAPS: <a href="http://ogaps.tamu.edu/New-Current-Students">http://ogaps.tamu.edu/New-Current-Students</a>. Arrange a date that all your committee can attend your defense, reserve a conference room, complete the form, bring to the AERO Graduate Advisor, 750 HRBB, for departmental approval. Request department template to announce the defense 2 weeks prior to defense. After the defense, your professor will return the result form to the Graduate Advising Office, 750 HRBB for approval and copy, then it is delivered to OGAPS in 112 Jack K Williams Administration building. Upload the final pdf version of dissertation to the Thesis Office and submit the signed approval page (download from <a href="http://thesis.tamu.edu/">http://thesis.tamu.edu/</a>).</td>
</tr>
<tr>
<td><strong>Graduation</strong></td>
</tr>
<tr>
<td>Apply to graduate during the first week of your final semester at: <a href="http://graduation.tamu.edu/">http://graduation.tamu.edu/</a>. Order hood, cap and gown if attending graduation. Let your Chair know that you wish to be hooded by him or her.</td>
</tr>
<tr>
<td>✓ Complete and return the Exit Interview Form to the Graduate Advisor, 750 HRBB. Stop by the Advising office for one or request it to be sent to you by email.</td>
</tr>
<tr>
<td>✓ Attend the AERO Graduation Celebration hosted in Aerospace Engineering; invite family and friends. Attend the TAMU graduation ceremony at Reed Arena. Congratulations!</td>
</tr>
</tbody>
</table>
For TAMU degree plan requirements in the Graduate Student Catalog, go to: http://catalog.tamu.edu/ and use search function to select Master of Science. Or from the howdy portal (https://howdy.tamu.edu), select the Graduate Student Tab, then Degree Plan Submission System and Information (or Degree Requirements for catalog requirements checklist).

- **Department requires 2 hours of AERO 681-Seminar on the degree plan (one each of Communication and Professional Development); take one during the first semester in Master of Science program. (Seminar only offered fall and spring terms.)**

- **Degree plan will be 32 hours for a Master of Science Thesis Option (MS-THO) or 30 hours for a Master of Engineering (see the separate MEN handout) or 36 hours for a Master of Science Non-Thesis Option (MS-NTO) (no more/no less). Complete the degree plan online at: https://ogsdpss.tamu.edu or from the link on the Graduate Tab in howdy. MS-NTO and MEN may not include 691-Research hours. MS-THO may list a maximum of 8 hours AERO 691-Research or a combination of 12 hours of 691 and 685 (Directed Studies).**

- **Research hours are listed as a total on one line in the plan.**
  
  Note: Additional course or research hours may be taken but DO NOT include in the degree plan. TAMU has limits on how many additional hours beyond 99 can be used without incurring nonresident tuition rates. MS coursework expires after 7 years.

---

**Years 2-3**

In the second/third years of the Master of Science program, the department has these expectations:

Complete approved research, compile research results and develop conclusions in a professional publication and thesis. Final oral exam (Final Defense) will be scheduled, thesis completed, thesis submitted to Committee 15 working days prior to defense, defense accomplished and results submitted to OGAPS and the department.

- **Schedule frequent meetings** with advisor to discuss your progress and receive guidance.
| Writing and Presentation Skills | Technical writing and observation/participation in seminar help to:  
• Prepare professional quality publications  
• Prepare and make engaging professional presentations |

| Academic Experience | Teaching/mentoring experience is available to Master of Science students and can be enhanced for those definitely interested in an academic career. Students should also discuss the possibility of continuing to the PHD with their Committee Chair. A Letter of Intent (form available on OGAPS website) to Continue to a Second Degree may be submitted in final semester (replaces full application process of a new student) to the Graduate Advising Office, HRBB 750. |

| Thesis | • Attend a Pre-Submittal Conference at the Thesis Office. Thesis Office website:  
http://thesis.tamu.edu/  
• Observe deadlines for OGAPS, Thesis Office and Department, obtain required forms, including document template, copyright form and publication release form and read other helpful information.  

Department requirement: Provide a substantially complete document to your Committee at least 15 days prior to Final Defense. |

| Final Defense or Final Oral Exam | • Complete (type the form) and download the Request and Announcement of the Final Examination from the OGAPS website: http://ogaps.tamu.edu/New-Current-Students.  
• Contact your committee and arrange a date that all can attend your defense, complete the form, bring to the AERO Graduate Advising Office for department approval. Afterwards, take it to OGAPS (must be approved by OGAPS before defense can be held).  
• Request department defense announcement template, complete and return 2 weeks prior to defense so the defense can be announced.  
• A few days before the defense, your professor will come to the Graduate Advising Office to pick up the result of the exam report form. The Committee will complete the form and sign at the defense.  
• After signatures, professor returns the result form to the Graduate Advising Office for approval and a copy is made. The form is delivered to OGAPS by Graduate Advising office.  
• Upload the final pdf version of thesis to the Thesis Office and submit the signed approval page (download from http://thesis.tamu.edu/) and copyright release form. |

| Graduation | Apply to graduate during the first week of your final semester at: http://graduation.tamu.edu/. Order cap and gown if you will attend graduation. |

| Exit Interview Form | Complete and return the Exit Interview Form to the Graduate Advising Office, 750 HRBB. |

| Reception & Graduation | Attend the AERO Graduation Celebration hosted in Aerospace Engineering; invite family and friends. Congratulations! |
Master of Engineering Program Guide

Three entry paths to the Master of Engineering (MEN) program:

• For TAMU Aerospace Engineering undergraduates, the applicants must have an overall undergraduate grade point average of 3.0 or better.
• For TAMU Aerospace Engineering undergraduates, participation in Fast Track may allow a student to have automatic admission to the MEN program. Applicants must have an overall undergraduate grade point average of 3.25 or better. AND, must have completed an application to Fast Track prior to starting senior technical electives. In final semester of BS degree, must submit Apply Texas application to MEN degree program. Application fee is waived.
• For external applicants, apply through the Texas A&M University Admissions process; requires an online application, fee payment, GRE, etc. For more information, see: http://admissions.tamu.edu/graduate/apply

Year 1

The department expects the MEN student to demonstrate core competency in aerospace engineering and to maintain a 3.0 or better GPA in graduate program. Usually involves one or two written reports and may include an oral presentation.

• **Degree Plan and Committee Formation:** Submit an online degree plan in 2nd semester; Committee consists of only the Committee Chair who must be an Aerospace Engineering faculty member and is also a member of the TAMU graduate faculty. Degree plan does not require additional members. No research hours permitted.
• Attend advising office meeting prior to submitting the degree plan in 2nd semester.
• Attend five (5) Aerospace Engineering Special Seminars each semester. (non-credit bearing departmental requirement)
• Sign up for the AERO Graduate Student Listserv and computer lab access. See the registration button “Graduate Listserv” on the Department’s “Current Students” webpage (http://engineering.tamu.edu/aerospace/current-students); see “Computing Information” and follow instructions for computing lab access (http://engineering.tamu.edu/aerospace/about/computing-info/labs).
• Register for courses during preregistration period (9 hours each spring/fall, 6 hours each summer term for full-time status).

For TAMU degree plan requirements in the Graduate Student Catalog go to: http://catalog.tamu.edu/ and use the search function to select Master of Engineering program. Or, from the howdy portal (https://howdy.tamu.edu), select the Graduate Student Tab, then Degree Plan Submission System and Information (or Degree Requirements for catalog requirements checklist.)

• Department allows **2 hours of AERO 681-Seminar** (one each of Communication and Professional Development) on the degree plan; take one during first semester in Master of Engineering program. (Seminar only offered fall and spring terms).
• Degree plan will total **30 hours coursework following the BS** (no more/no less). Complete the degree plan online at: http://ogsdpss.tamu.edu or from the link on the Graduate Tab in howdy.
• One-third of the hours will be in another major (~10 hours) such as MEEN, MATH, etc.
• No research hours allowed for the MEN; system does not permit registration for research.

Note: May register for more course hours but do not include in the degree plan. TAMU has limits on how many additional hours beyond 99 can be used without incurring nonresident tuition rates. MEN coursework expires after 7 years.

Year 2

In the second year of the Master of Engineering program, the department has these expectations:

• Coursework will be completed.
• Final exam is waived for the MEN degree program.
• Academic Calendar and Office of Graduate and Professional Studies Calendar deadlines must be followed.

From the Howdy portal or OGAPS website: http://ogaps.tamu.edu/New-Current-Students, see Calendar and Deadlines or Forms and Information.
### Graduation

Apply to graduate during the first week of your final semester at: [http://graduation.tamu.edu/](http://graduation.tamu.edu/). Order cap and gown if attending graduation.

<table>
<thead>
<tr>
<th>Apply to Graduate, Exit Interview Form</th>
<th>Complete and return the Exit Interview Form to Graduate Advising Office, 750 HRBB. Stop by for one or request it be sent to you by email.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reception &amp; Graduation</td>
<td>Attend the AERO Graduation Celebration hosted in Aerospace Engineering; invite family and friends. Attend the TAMU graduation ceremony at Reed Arena. Congratulations!</td>
</tr>
</tbody>
</table>
Appendix F. Institutional Profile

March 15, 2018

TO: External Program Reviewers and Program Accreditors

FROM: Michael T. Stephenson
Vice Provost for Academic Affairs and Strategic Initiatives

RE: Information required for USDOE Accrediting Bodies

Texas A&M University is accredited by the Southern Association of Colleges and Schools Commission on Colleges to award baccalaureate, master's, and doctoral degrees. Consistent with comprehensive standard 3.13.1, the following provides the institution’s official position on its purpose, governance, programs, degrees, diplomas, certificates, personnel, finances, and constituencies and is published in official university documents as noted.

Purpose

 Classified by the Carnegie Foundation as a Research Doctoral University (Highest Research Activity), Texas A&M embraces its mission of the advancement of knowledge and human achievement in all its dimensions. The research mission is a key to advancing economic development in both public and private sectors. Integration of research with teaching prepares students to compete in a knowledge-based society and to continue developing their own creativity, learning, and skills beyond graduation.

The institution’s official mission statement, published both on the institution’s web page as well as in its annual university catalog, is:

Texas A&M University (Texas A&M) is dedicated to the discovery, development, communication and application of knowledge in a wide range of academic and professional fields. Its mission of providing the highest quality undergraduate and graduate programs is inseparable from its mission of developing new understandings through research and creativity. It prepares students to assume roles in leadership, responsibility and service to society. Texas A&M assumes as its historic trust the maintenance of freedom of inquiry and an intellectual environment nurturing the human mind and spirit. It welcomes and seeks to serve persons of all racial, ethnic and geographic groups, women and men alike, as it addresses the needs of an increasingly diverse population and a global economy. In the twenty-first century, Texas A&M University seeks to assume a place of preeminence among public universities while respecting its history and traditions.

Governance

The governance of the institution was described in the 2012 certification of compliance submitted to SACSCOC.
Texas A&M University at College Station, the flagship institution of the Texas A&M University System, has branch campuses located in Galveston, Texas and Doha, Qatar. A ten-member Board of Regents, appointed by the Governor, directs the Texas A&M System. The appointment of each Regent follows Texas Education Code (TEC, Chapter 85, Section 21).

TEC outlines the duties and responsibilities of the Board of Regents. These responsibilities are also defined in System Policy 02.01 Board of Regents and TEC 51.352. The Board elects two officers: Chair and Vice Chair. There are four standing committees: Audit, Academic & Student Affairs, Finance, and Buildings & Physical Plant. Special committees may be appointed by the Chair with Board approval.

At Texas A&M University the President is the chief executive officer; the President is not the presiding officer of the Board of Regents. The President reports to the state-appointed Board of Regents through the Chancellor of the Texas A&M University System. System Policy 2.05 Presidents of System Member Universities defines the duties of the President. The appointment of the President follows conditions set forth in System Policy 01.03 Appointing Power and Terms and Conditions of Employment, section 2.2.

**Personnel**

The institution is led by the President and members of his cabinet:

- Michael K. Young, President
- Carol A. Fierke, Provost and Executive Vice President, Chief Academic Officer
- Jerry R. Strawser, Executive Vice President for Finance and Operations and Chief Financial Officer
- Michael Benedik, Vice Provost and Chief International Officer
- M. Dee Childs, Vice President for Information Technology and CIO
- Michael G. O’Quinn, Vice President for Government Relations
- Col Michael E. Fossum, Vice President and COO, TAMU-Galveston
- Barbara A. Abercrombie, Vice President for HR & Organizational Effectiveness
- Robin Means Coleman, Vice President and Associate Provost for Diversity
- Mark Barteau, Vice President for Research
- Carrie L. Byington, Senior Vice President TAMU Health Science Center, Dean of the College of Medicine, and Vice Chancellor for Health Services
- Daniel J. Pugh, Sr., Vice President for Student Affairs
- Joseph P. Pettibon, II, Vice President of Enrollment and Academic Services
- Gen Joe E. Ramirez, Jr. Commandant, Corps of Cadets
- Amy B. Smith, Senior Vice President and Chief Marketing and Communications Officer
- Scott Woodward, Director of Athletics
- R. C. Slocum, Special Advisor to the President
- David Batson, Sr. Associate Athletic Director, Athletic Compliance
- Shane Hinkley, Vice President of Brand Development
- Andrew P. Morris, VP of Entrepreneurship & Economic Development, Dean of the I-School

**Programs, Degrees, Diplomas, and Certificates**

See the Institutional Summary submitted to SACSCOC

**Finances**

See the Financial Profile 2017 submitted to SACSCOC
GENERAL INFORMATION

Name of Institution  Texas A&M University

Name, Title, Phone number, and email address of Accreditation Liaison
Michael T. Stephenson
Vice Provost for Academic Affairs and Strategic Initiatives
979.845.4016
mstephenson@tamu.edu

Name, Title, Phone number, and email address of Technical Support person for the Compliance Certification
Alicia M. Dorsey
Assistant Provost for Institutional Effectiveness
979.862.2918
amdorsey@tamu.edu

IMPORTANT:

Accreditation Activity (check one):

☒  Submitted at the time of Reaffirmation Orientation
☐  Submitted with Compliance Certification for Reaffirmation
☐  Submitted with Materials for an On-Site Reaffirmation Review
☐  Submitted with Compliance Certification for Fifth-Year Interim Report
☐  Submitted with Compliance Certification for Initial Candidacy/Accreditation Review
☐  Submitted with Merger/Consolidations/Acquisitions
☐  Submitted with Application for Level Change

Submission date of this completed document:  September 29, 2015
EDUCATIONAL PROGRAMS

1. Level of offerings (Check all that apply)

☐ Diploma or certificate program(s) requiring less than one year beyond Grade 12
☐ Diploma or certificate program(s) of at least two but fewer than four years of work beyond Grade 12
☐ Associate degree program(s) requiring a minimum of 60 semester hours or the equivalent designed for transfer to a baccalaureate institution
☐ Associate degree program(s) requiring a minimum of 60 semester hours or the equivalent not designed for transfer
☒ Four or five-year baccalaureate degree program(s) requiring a minimum of 120 semester hours or the equivalent
☒ Professional degree program(s)
☒ Master's degree program(s)
☒ Work beyond the master's level but not at the doctoral level (such as Specialist in Education)
☒ Doctoral degree program(s)
☐ Other (Specify) ______

2. Types of Undergraduate Programs (Check all that apply)

☐ Occupational certificate or diploma program(s)
☐ Occupational degree program(s)
☐ Two-year programs designed for transfer to a baccalaureate institution
☒ Liberal Arts and General
☒ Teacher Preparatory
☒ Professional
☐ Other (Specify) ______

GOVERNANCE CONTROL

Check the appropriate governance control for the institution:

☐ Private (check one)

☐ Independent, not-for-profit

Name of corporation OR
Name of religious affiliation and control: ______

☐ Independent, for-profit *

If publicly traded, name of parent company: ______
Public state * (check one)

☐ Not part of a state system, institution has own independent board
☒ Part of a state system, system board serves as governing board
☐ Part of a state system, system board is super governing board, local governing board has delegated authority
☐ Part of a state system, institution has own independent board

* If an institution is part of a state system or a corporate structure, a description of the system operation must be submitted as part of the Compliance Certification for the decennial review. See Commission policy “Reaffirmation of Accreditation and Subsequent Reports” for additional direction.

INSTITUTIONAL INFORMATION FOR REVIEWERS

Directions:
Please address the following and attach the information to this form.

1. History and Characteristics
Provide a brief history of the institution, a description of its current mission, an indication of its geographic service area, and a description of the composition of the student population. Include a description of any unusual or distinctive features of the institution and a description of the admissions policies (open, selective, etc.). If appropriate, indicate those institutions that are considered peers. Please limit this section to one-half page.

2. List of Degrees
List all degrees currently offered (A. S., B.A., B.S., M.A., Ph.D., for examples) and the majors or concentrations within those degrees, as well as all certificates and diplomas. For each credential offered, indicate the number of graduates in the academic year previous to submitting this report. Indicate term dates.

3. Off-Campus Instructional Locations and Branch Campuses
List all locations where 50% or more credit hours toward a degree, diploma, or certificate can be obtained primarily through traditional classroom instruction. Report those locations in accord with the Commission’s definitions and the directions as specified below.

Off-campus instructional sites—a site located geographically apart from the main campus at which the institution offers 50% or more of its credit hours for a diploma, certificate, or degree. This includes high schools where courses are offered as part of dual enrollment. For each site, provide the information below. The list should include only those sites reported and approved by SACSCOC. Listing unapproved sites below does not constitute reporting them to SACSCOC. In such cases when an institution has initiated an off-campus instructional site as described above without prior approval by SACSCOC, a prospectus for approval should be submitted immediately to SACSCOC.
<table>
<thead>
<tr>
<th>Name of Site</th>
<th>Physical Address (street, city, state, country) Do not include PO Boxes.</th>
<th>Date Approved by SACSCOC</th>
<th>Date Implemented by the institution</th>
<th>Educational programs offered (specific degrees, certificates, diplomas) with 50% or more credits hours offered at each site</th>
<th>Is the site currently active? (At any time during the past 5 years, have students been enrolled and courses offered? If not, indicate the date of most recent activity.)</th>
</tr>
</thead>
</table>

**Institutions with off-campus instructional sites** at which the institution offers 25-49% credit hours for a diploma, certificate, or degree—including high schools where courses are offered as dual enrollment—are required to notify SACSCOC in advance of initiating the site. For each site, provide the information below.

<table>
<thead>
<tr>
<th>Name of Site (Indicate if site is currently active or inactive. If inactive, date of last course offerings and date of projected reopening)</th>
<th>Physical Address (street, city, state, country) Do not include PO Boxes.</th>
<th>Date Notified SACSCOC by SACSCOC</th>
<th>Date Implemented by the institution</th>
<th>Educational programs offered (specific degrees, certificates, diplomas) with 25-49% credit hours offered at each site</th>
<th>Is the site currently active? (At any time during the past 5 years, have students been enrolled and courses offered? If not, indicate the date of most recent activity.)</th>
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</thead>
</table>

**Branch campus**—an instructional site located geographically apart and independent of the main campus of the institution. A location is independent of the main campus if the location is (1) permanent in nature, (2) offers courses in educational programs leading to a degree, certificate, or other recognized educational credential, (3) has its own faculty and administrative or supervisory organization, and (4) has its own budgetary and hiring authority. The list should include only those branch campuses reported and approved by SACSCOC. Listing unapproved branch campuses below does not constitute reporting them to SACSCOC. A prospectus for an unapproved branch campuses should be submitted immediately to SACSCOC.

<table>
<thead>
<tr>
<th>Name of Branch Campus</th>
<th>Physical Address (street, city, state, country) Do not include PO Boxes.</th>
<th>Date Approved by SACSCOC</th>
<th>Date Implemented by the institution</th>
<th>Educational programs (specific degrees, certificates, diplomas) with 50% or more credits hours offered at the branch campus</th>
<th>Is the campus currently active? (At any time during the past 5 years, have students been enrolled and courses offered? If not, indicate the date of most recent activity.)</th>
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</thead>
</table>

4. Distance and Correspondence Education
Provide an initial date of approval for your institution to offer distance education. Provide a list of credit-bearing educational programs (degrees, certificates, and diplomas) where 50% or more of the credit hours are delivered through distance education modes. For each educational program, indicate whether the program is delivered using synchronous or asynchronous technology, or both. For each educational program that uses distance education technology to deliver the program at a specific site (e.g., a synchronous program using interactive videoconferencing), indicate the program offered at each location where students receive the transmitted program. Please limit this description to one page, if possible.

5. Accreditation

(1) List all agencies that currently accredit the institution and any of its programs and indicate the date of the last review by each.

(2) If SACS Commission on Colleges is not your primary accreditor for access to USDOE Title IV funding, identify which accrediting agency serves that purpose.

(3) List any USDOE recognized agency (national and programmatic) that has terminated the institution’s accreditation (include the date, reason, and copy of the letter of termination) or list any agency from which the institution has voluntarily withdrawn (include copy of letter to agency from institution).

(4) Describe any sanctions applied or negative actions taken by any USDOE-recognized accrediting agency (national, programmatic, SACSCOC) during the two years previous to the submission of this report. Include a copy of the letter from the USDOE to the institution.

6. Relationship to the U.S. Department of Education

Indicate any limitations, suspensions, or termination by the U.S. Department of Education in regard to student financial aid or other financial aid programs during the previous three years. Report if on reimbursement or any other exceptional status in regard to federal or state financial aid.

Document History
Adopted: September 2004
Revised: March 2011
Revised: January 2014
1. History and Characteristics

Provide a brief history of the institution, a description of its current mission, an indication of its geographic service area, and a description of the composition of the student population. Include a description of any unusual or distinctive features of the institution and a description of the admissions policies (open, selective, etc.). If appropriate, indicate those institutions that are considered peers. Please limit this section to one-half page.

**History.** Texas A&M University was established in 1871 as the state’s first public institution of higher education and opened for classes in 1876. We are now one of a select few institutions in the nation to hold land grant, sea grant (1971) and space grant (1989) designations. We are also one of few universities to host a presidential library; the George Bush Presidential Library and Museum opened in 1997. A mandatory military component was a part of the land grant designation until 1965 and today we are one of only three institutions with a full-time corps of cadets, leading to commissions in all branches of service. We have two branch campuses, one in Galveston, Texas, (established in 1962, officially merged with Texas A&M in 1991) and one in Doha, Qatar (established in 2003). In 2001 we were admitted to the Association of American Universities (AAU) and in 2004 to Phi Beta Kappa. We are classified by the Carnegie Foundation as a Research University (very high research activity).

**Mission.** Texas A&M University is dedicated to the discovery, development, communication, and application of knowledge in a wide range of academic and professional fields. Its mission of providing the highest quality undergraduate and graduate programs is inseparable from its mission of developing new understandings through research and creativity. It prepares students to assume roles in leadership, responsibility and service to society. Texas A&M assumes as its historic trust the maintenance of freedom of inquiry and an intellectual environment nurturing the human mind and spirit. It welcomes and seeks to serve persons of all racial, ethnic and geographic groups as it addresses the needs of an increasingly diverse population and a global economy. In the 21st century, Texas A&M University seeks to assume a place of preeminence among public universities while respecting its history and traditions.

**Enrollment Profile.**
77.42% Undergraduate, 18.41% Graduate, 4.02% Professional, and 0.14% Post-Doc Certificate

**Undergraduate Students:**
93.58% Texas Residents, 3.96% non-Texas Residents, 2.46% non-Texas, non-US Residents;
62.41% White, 3.11% Black, 22.33% Hispanic, 6.21% Asian

**Graduate Students:**
45.09% Texas Residents, 16.57% non-Texas Residents, 38.34% non-Texas, non-US Residents

**Admissions Process.** Selective. Automatic admission for Texas resident applicants in the top 10% of their high school graduating class; automatic admission for applicants who rank in the top 25% of their high school graduating class and achieve a combined (old) SAT math and SAT critical reading score of at least 1300 with a test score of at least 600 in each component, or combined (newly redesigned) SAT math and SAT evidence based reading and writing (EBRW) score of at least 1360 with a test score of at least 620 in Math and 660 in EBRW, or 30 composite on the ACT with a 27 in the math and English components; review of all other applicants based on academic potential, distinguishing characteristics, exceptional circumstances and personal achievements.

**Peer Institutions.** Georgia Institution of Technology, Ohio State University, Pennsylvania State University, Purdue University, University of California- Berkeley, Davis, Los Angeles, San Diego, University of Florida, University of Illinois – Champaign/Urbana, University of Michigan, University of Minnesota, University of North Carolina – Chapel Hill, University of Texas – Austin, and University of Wisconsin – Madison.
### 2. List of Degrees

List all degrees currently offered (A. S., B.A., B.S., M.A., Ph.D., for examples) and the majors or concentrations within those degrees, as well as all certificates and diplomas. For each credential offered, indicate the number of graduates in the academic year previous to submitting this report. Indicate term dates.

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</tr>
<tr>
<td></td>
<td>WATER MANAGEMENT AND HYDRO SCI</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>WATER MANAGEMENT AND HYDRO SCI</td>
<td></td>
</tr>
<tr>
<td>VETERINARY MEDICINE &amp; BIOMEDICAL</td>
<td>BIOMEDICAL SCIENCES</td>
<td></td>
</tr>
<tr>
<td>SCIENCES</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
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</tr>
<tr>
<td></td>
<td>SCIENCE &amp; TECHNOLOGY JOURNALISM</td>
<td></td>
</tr>
<tr>
<td></td>
<td>VETERINARY MEDICINE</td>
<td></td>
</tr>
<tr>
<td></td>
<td>VETERINARY PATHOBIOLOGY</td>
<td></td>
</tr>
<tr>
<td></td>
<td>VETERINARY PUBLIC HEALTH - EPIDEMIOLOGY</td>
<td></td>
</tr>
</tbody>
</table>
3. Off-Campus Instructional Locations and Branch Campuses

List all locations where 50% or more credit hours toward a degree, diploma, or certificate can be obtained primarily through traditional classroom instruction. Report those locations in accord with the Commission’s definitions and the directions as specified below.

Off-campus instructional sites—a site located geographically apart from the main campus at which the institution offers 50% or more of its credit hours for a diploma, certificate, or degree. This includes high schools where courses are offered as part of dual enrollment. For each site, provide the information below. The list should include only those sites reported and approved by SACSCOC. Listing unapproved sites below does not constitute reporting them to SACSCOC. In such cases when an institution has initiated an off-campus instructional site as described above without prior approval by SACSCOC, a prospectus for approval should be submitted immediately to SACSCOC.

Off-Campus Instructional Locations – 50% or more.

<p>| Name of Site                                      | Physical Address                      | Date Approved by SACSCOC | Date Implemented by the institution | Educational programs offered (specific degrees, certificates, diplomas) with 50% or more credits hours offered at each site | Is the site currently active? (At any time during the past 5 years, have students been enrolled and courses offered? If not, indicate the date of most recent activity.) |
|--------------------------------------------------|---------------------------------------|--------------------------|-------------------------------------|----------------------------------------------------------------------------------------------------------------|
| Texas A&amp;M Health Science Center                   | 8441 State Highway 47                 | 2000                     | 2000                                | EDUCATION FOR HEALTHCARE PROFESSIONALS MS MEDICAL SCIENCES MD MEDICAL SCIENCES MS MEDICAL SCIENCES PhD MEDICINE MD NURSING BSN NURSING EDUCATION MSN PHARMACY PHMD FAMILY NURSE PRACTITIONER MSN | Yes |
| Arabian Society for Human Resource Management     | Saudi Aramco – Box 8926               | 2012                     | 2007                                | HUMAN RESOURCE MANAGEMENT MS | Yes |
| City Centre                                      | 842 West Sam Houston Parkway North, Suite 200 Houston, Texas 77024-3920 | 2012                     | 2012                                | ANALYTICS MS BUSINESS ADMINISTRATION MBA | Yes |
| College of Dentistry                             | 3302 Gaston Ave. Dallas, TX 75246     | 2001                     | 2000                                | ADVANCED EDUCATION IN GENERAL DENTISTRY CTGFA DENTAL HYGIENE BS DENTAL PUBLIC HEALTH Certific ate DENTISTRY DDS ENDODONTICS CTGFA MAXILLOFACIAL SURGERY CTGFA ORAL AND MAXILLOFACIAL PATHOLOGY CTGFA ORAL AND MAXILLOFACIAL CTGFA | Yes |</p>
<table>
<thead>
<tr>
<th>Name of Site</th>
<th>Physical Address (street, city, state, country) Do not include PO Boxes.</th>
<th>Date Approved by SACSCOC</th>
<th>Date Implemented by the institution</th>
<th>Educational programs offered (specific degrees, certificates, diplomas) with 50% or more credits hours offered at each site</th>
<th>Is the site currently active? (At any time during the past 5 years, have students been enrolled and courses offered? If not, indicate the date of most recent activity.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Institute of Biosciences and Technology</td>
<td>2121 W. Holcombe Blvd. Houston, TX 77030</td>
<td>2000</td>
<td>2000</td>
<td>HEALTH ADMINISTRATION MHA</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>MEDICINE MD</td>
<td>Yes</td>
</tr>
<tr>
<td>Rangel College of Pharmacy</td>
<td>1010 W. Avenue B. Kingsville, TX 78363</td>
<td>2011</td>
<td>2006</td>
<td>PHARMACY PHMD</td>
<td>Yes</td>
</tr>
<tr>
<td>College of Medicine - Temple</td>
<td>2401 S. 31st Street Temple, TX 76508</td>
<td>2000</td>
<td>2000</td>
<td>MEDICINE MD</td>
<td>Yes</td>
</tr>
<tr>
<td>Clinical Learning Resource Center</td>
<td>Health Professions Building 3950 North A. W. Grimes Blvd. Round Rock, TX 78665</td>
<td>2011</td>
<td>2010</td>
<td>MEDICINE MD</td>
<td>Yes</td>
</tr>
<tr>
<td>Rural Public Health - McAllen Teaching Site</td>
<td>2101 South McColl Road McAllen, TX 78503</td>
<td>2011</td>
<td>2010</td>
<td>HEALTH POLICY AND MANAGEMENT MPH</td>
<td>Yes</td>
</tr>
<tr>
<td>Texas A&amp;M University School of Law</td>
<td>1515 Commerce St Fort Worth, TX 76102</td>
<td>2013</td>
<td>2013</td>
<td>HEALTH CARE LAW JM</td>
<td>Yes</td>
</tr>
<tr>
<td>Houston Methodist Hospital</td>
<td>6670 Bertner Avenue, R2-216 Houston, TX 77030</td>
<td>2015</td>
<td>2015</td>
<td>MEDICINE MD</td>
<td>Yes</td>
</tr>
<tr>
<td>Baylor University Medical Center</td>
<td>3500 Gaston Avenue Dallas, TX 75246</td>
<td>2012</td>
<td>2011</td>
<td>MEDICINE MD</td>
<td>Yes</td>
</tr>
</tbody>
</table>
# Off-Campus Instructional Locations – 25%-49%

<table>
<thead>
<tr>
<th>Name of Site (Indicate if site is currently active or inactive. If inactive, date of last course offerings and date of projected reopening)</th>
<th>Physical Address (street, city, state, country) Do not include PO Boxes.</th>
<th>Date Notified SACSCOC</th>
<th>Date Implemented by the institution</th>
<th>Educational programs offered (specific degrees, certificates, diplomas) with 25-49% credit hours offered at each site</th>
<th>Is the site currently active? (At any time during the past 5 years, have students been enrolled and courses offered? If not, indicate the date of most recent activity.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Department of State Health Services</td>
<td>1100 West 49th Austin, TX. 78756</td>
<td>2011</td>
<td>2004</td>
<td>HEALTH POLICY &amp; MANAGEMENT - MPH</td>
<td></td>
</tr>
</tbody>
</table>

## Branch Campuses

<table>
<thead>
<tr>
<th>Name of Branch Campus</th>
<th>Physical Address (street, city, state, country) Do not include PO Boxes.</th>
<th>Date Approved by SACSCOC</th>
<th>Date Implemented by the institution</th>
<th>Educational programs (specific degrees, certificates, diplomas) with 50% or more credits hours offered at the branch campus</th>
<th>Is the campus currently active? (At any time during the past 5 years, have students been enrolled and courses offered? If not, indicate the date of most recent activity.)</th>
</tr>
</thead>
</table>
4. Distance and Correspondence Education

Provide an initial date of approval for your institution to offer distance education. Provide a list of credit-bearing educational programs (degrees, certificates, and diplomas) where 50% or more of the credit hours are delivered through distance education modes. For each educational program, indicate whether the program is delivered using synchronous or asynchronous technology, or both. For each educational program that uses distance education technology to deliver the program at a specific site (e.g., a synchronous program using interactive videoconferencing), indicate the program offered at each location where students receive the transmitted program. Please limit this description to one page, if possible.

<table>
<thead>
<tr>
<th>Credit Bearing Degree Programs</th>
<th>Site</th>
<th>Synchronous/Asynchronous/Both</th>
</tr>
</thead>
<tbody>
<tr>
<td>AEROSPACE ENGINEERING MENG</td>
<td>Asynchronous</td>
<td></td>
</tr>
<tr>
<td>AGRICULTURAL DEVELOPMENT MAGR</td>
<td>Asynchronous</td>
<td></td>
</tr>
<tr>
<td>AGRICULTURAL EDUCATION EDD</td>
<td>Synchronous course offered worldwide via PC or LMS</td>
<td>Both</td>
</tr>
<tr>
<td>AGRICULTURAL SYSTEMS MANAGEMENT MS</td>
<td>Asynchronous</td>
<td></td>
</tr>
<tr>
<td>ANALYTICS MS</td>
<td>Asynchronous</td>
<td></td>
</tr>
<tr>
<td>BILINGUAL EDUCATION MED</td>
<td>Asynchronous</td>
<td></td>
</tr>
<tr>
<td>BILINGUAL EDUCATION MS</td>
<td>Asynchronous</td>
<td></td>
</tr>
<tr>
<td>BIOLOGICAL AND AGRICULTURAL ENGINEERING MENG</td>
<td>Asynchronous</td>
<td></td>
</tr>
<tr>
<td>COMPUTER ENGINEERING MENG</td>
<td>Synchronous course offered worldwide via PC or LMS</td>
<td>Both</td>
</tr>
<tr>
<td>CURRICULUM &amp; INSTRUCTION EDD</td>
<td>Asynchronous</td>
<td></td>
</tr>
<tr>
<td>CURRICULUM &amp; INSTRUCTION MED</td>
<td>Asynchronous</td>
<td></td>
</tr>
<tr>
<td>Program</td>
<td>Degree</td>
<td>Type</td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>--------</td>
<td>------------</td>
</tr>
<tr>
<td>EDUC HUMAN RESOURCE DEVELOPMENT</td>
<td>MS</td>
<td>Asynchronous</td>
</tr>
<tr>
<td>EDUCATION FOR HEALTH CARE PROFESSIONALS</td>
<td>MS</td>
<td>Asynchronous</td>
</tr>
<tr>
<td>EDUCATIONAL ADMINISTRATION</td>
<td>MED</td>
<td>Asynchronous</td>
</tr>
<tr>
<td>EDUCATIONAL PSYCHOLOGY</td>
<td>MED</td>
<td>Synchronous course offered worldwide via PC or LMS Both</td>
</tr>
<tr>
<td>EDUCATIONAL PSYCHOLOGY</td>
<td>MS</td>
<td>Asynchronous</td>
</tr>
<tr>
<td>EDUCATIONAL TECHNOLOGY</td>
<td>MED</td>
<td>Asynchronous</td>
</tr>
<tr>
<td>ELECTRICAL ENGINEERING</td>
<td>MENG</td>
<td>Asynchronous</td>
</tr>
<tr>
<td>ENERGY</td>
<td>MS</td>
<td>Asynchronous</td>
</tr>
<tr>
<td>ENGINEERING</td>
<td>MENG</td>
<td>Asynchronous</td>
</tr>
<tr>
<td>ENGINEERING SYSTEMS MANAGEMENT</td>
<td>MS</td>
<td>Asynchronous</td>
</tr>
<tr>
<td>EPIDEMIOLOGY</td>
<td>MPH</td>
<td>Asynchronous</td>
</tr>
<tr>
<td>FAMILY NURSE PRACTITIONER</td>
<td>MSN</td>
<td>Bryan, TX Both</td>
</tr>
<tr>
<td>HEALTH EDUCATION</td>
<td>MS</td>
<td>Asynchronous</td>
</tr>
<tr>
<td>INDUSTRIAL DISTRIBUTION</td>
<td>MID</td>
<td>College Station, TX Both</td>
</tr>
<tr>
<td>INDUSTRIAL ENGINEERING</td>
<td>MENG</td>
<td>Asynchronous</td>
</tr>
<tr>
<td>LAWS</td>
<td>LLM</td>
<td>Asynchronous</td>
</tr>
<tr>
<td>JURISPRUDENCE</td>
<td>MJ</td>
<td>Asynchronous</td>
</tr>
<tr>
<td>MARITIME ADMINISTRATION &amp; LOGISTICS</td>
<td>MMAL</td>
<td>Asynchronous</td>
</tr>
<tr>
<td>MATHEMATICS</td>
<td>MS</td>
<td>Asynchronous</td>
</tr>
<tr>
<td>MECHANICAL ENGINEERING</td>
<td>MENG</td>
<td>Asynchronous</td>
</tr>
<tr>
<td>NATURAL RESOURCES DEVELOPMENT</td>
<td>MNRD</td>
<td>Asynchronous</td>
</tr>
<tr>
<td>NURSING</td>
<td>BSN</td>
<td>Asynchronous</td>
</tr>
<tr>
<td>NURSING EDUCATION</td>
<td>MSN</td>
<td>Bryan, TX Both</td>
</tr>
<tr>
<td>PETROLEUM ENGINEERING</td>
<td>MENG</td>
<td>Asynchronous</td>
</tr>
<tr>
<td>PLANT BREEDING</td>
<td>MS</td>
<td>Asynchronous</td>
</tr>
<tr>
<td>PLANT BREEDING</td>
<td>PHD</td>
<td>Asynchronous</td>
</tr>
<tr>
<td>POULTRY SCIENCE</td>
<td>MAGR</td>
<td>Asynchronous</td>
</tr>
<tr>
<td>PUBLIC SERVICE AND ADMINISTRATION</td>
<td>MPSA</td>
<td>College Station, TX Both</td>
</tr>
<tr>
<td>Program</td>
<td>Degree</td>
<td>Format</td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>--------</td>
<td>---------------------------------------------</td>
</tr>
<tr>
<td>RECREATION &amp; RESOURCES DEVELOPMENT</td>
<td>MRRD</td>
<td>College Station, TX</td>
</tr>
<tr>
<td>SAFETY ENGINEERING</td>
<td>MS</td>
<td>Synchronous course offered worldwide via PC or LMS</td>
</tr>
<tr>
<td>SPECIAL EDUCATION</td>
<td>MED</td>
<td>Synchronous course offered worldwide via PC or LMS</td>
</tr>
<tr>
<td>SPECIAL EDUCATION</td>
<td>MS</td>
<td>Synchronous course offered worldwide via PC or LMS</td>
</tr>
<tr>
<td>SPORTS MANAGEMENT</td>
<td>MS</td>
<td>Asynchronous</td>
</tr>
<tr>
<td>STATISTICS</td>
<td>MS</td>
<td>Asynchronous</td>
</tr>
<tr>
<td>WILDLIFE SCIENCE</td>
<td>MWSC</td>
<td>Asynchronous</td>
</tr>
<tr>
<td>MILITARY LAND SUSTAINABILITY</td>
<td>CERT</td>
<td>Asynchronous</td>
</tr>
<tr>
<td>ADVANCED INTERNATIONAL AFFAIRS</td>
<td>CERT</td>
<td>College Station, TX; Houston, TX</td>
</tr>
<tr>
<td>AGRICULTURE E-LEARNING DEVELOPMENT</td>
<td>CERT</td>
<td>Asynchronous</td>
</tr>
<tr>
<td>APPLIED BEHAVIOR ANALYSIS</td>
<td>CERT</td>
<td>Asynchronous</td>
</tr>
<tr>
<td>EDUCATION FOR HEALTHCARE PROFESSIONALS</td>
<td>CERT</td>
<td>Asynchronous</td>
</tr>
<tr>
<td>ENERGY</td>
<td>CERT</td>
<td>Asynchronous</td>
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<tr>
<td>ENERGY SUSTAINABILITY ENGINEERING</td>
<td>CERT</td>
<td>Asynchronous</td>
</tr>
<tr>
<td>FORENSIC HEALTH CARE</td>
<td>CERT</td>
<td>Asynchronous</td>
</tr>
<tr>
<td>HOMELAND SECURITY</td>
<td>CERT</td>
<td>Asynchronous</td>
</tr>
<tr>
<td>INDUSTRIAL DATA ANALYTICS</td>
<td>CERT</td>
<td>Asynchronous</td>
</tr>
<tr>
<td>NATIONAL SECURITY AFFAIRS</td>
<td>CERT</td>
<td>College Station, TX; Livermore, CA; Sandia, NM</td>
</tr>
<tr>
<td>NONPROFIT MANAGEMENT</td>
<td>CERT</td>
<td>College Station, TX; Houston, TX</td>
</tr>
<tr>
<td>PUBLIC HEALTH</td>
<td>CERT</td>
<td>McAllen, TX</td>
</tr>
<tr>
<td>REGULATORY SCIENCE IN FOOD SYSTEMS</td>
<td>CERT</td>
<td>Asynchronous</td>
</tr>
<tr>
<td>SAFETY ENGINEERING</td>
<td>CERT</td>
<td>Asynchronous</td>
</tr>
<tr>
<td>APPLIED STATISTICS</td>
<td>CERT</td>
<td>Asynchronous</td>
</tr>
</tbody>
</table>

5. Accreditation

<table>
<thead>
<tr>
<th>Accreditation Council for</th>
<th>The pharmacy professional degree program</th>
<th>Last Review: April 2014</th>
</tr>
</thead>
</table>

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<table>
<thead>
<tr>
<th>Organization</th>
<th>Curriculum/Program Details</th>
<th>Last Review Date(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pharmacy Education</td>
<td>The B.S. and M.S. curriculum in construction science</td>
<td>2011 (B.S.) and 2012 (M.S.)</td>
</tr>
<tr>
<td>American Psychological Association</td>
<td>The clinical psychology program in the Department of Psychology and the counseling psychology and school psychology program in the Department of Educational Psychology</td>
<td>April/May 2015</td>
</tr>
<tr>
<td>American Veterinary Medical Association Council on Education</td>
<td>The veterinary medicine degree program</td>
<td>2013</td>
</tr>
<tr>
<td>Association to Advance Collegiate Schools of Business (AACSB)</td>
<td>The business baccalaureate, master’s, and doctoral programs in Mays Business School</td>
<td>Fall 2012</td>
</tr>
<tr>
<td>Commission on Accreditation for Dietetics Education</td>
<td>The dietetic track in the nutritional sciences curriculum and the dietetic internship program</td>
<td>January 2015</td>
</tr>
<tr>
<td>Commission on Accreditation of Athletic Training Education (caATE)</td>
<td>Athletic Training (College of Education)</td>
<td>2013</td>
</tr>
<tr>
<td>Commission on Accreditation of Healthcare Management Education</td>
<td>The Master of Health Administration</td>
<td>Fall 2010</td>
</tr>
<tr>
<td>Commission on Collegiate Nursing Education and the Texas Board of Nursing</td>
<td>The nursing degree programs</td>
<td>July 2013</td>
</tr>
<tr>
<td>Commission on Dental Accreditation, (CODA)</td>
<td>The degree programs in dentistry and dental hygiene and the certificate programs in the ten advanced dental graduate education programs</td>
<td>August 2013</td>
</tr>
<tr>
<td>Commission on English Language Program Accreditation (CEA)</td>
<td>The English Language Institute</td>
<td>2013</td>
</tr>
<tr>
<td>Computing Accreditation Commission of ABET</td>
<td>The computer science program</td>
<td>2010</td>
</tr>
<tr>
<td>Council of the Section of Legal Education and Admissions to the Bar of the American Bar Association</td>
<td>Texas A&amp;M University School of Law</td>
<td>2010</td>
</tr>
<tr>
<td>Council on Education for Public Health</td>
<td>The School of Public Health degree programs</td>
<td>April 2011</td>
</tr>
<tr>
<td>Engineering Accreditation Commission of ABET</td>
<td>Undergraduate programs in aerospace, biological and agricultural, biomedical, chemical, civil, computer, electrical, industrial, mechanical, nuclear,</td>
<td>2010-2011 (College Station) and 2015 (Qatar)</td>
</tr>
<tr>
<td>Accrediting Agency</td>
<td>Program Description</td>
<td>Last Review:</td>
</tr>
<tr>
<td>--------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------</td>
<td>--------------</td>
</tr>
<tr>
<td><strong>Engineering Accreditation Commission of ABET</strong></td>
<td>Maritime systems engineering (Offshore and Coastal Systems Engineering) – TAMU Galveston</td>
<td>2010-11</td>
</tr>
<tr>
<td><strong>Engineering Technology Accreditation Commission of ABET</strong></td>
<td>The electronic systems engineering technology program, the manufacturing and mechanical engineering technology program,</td>
<td>2013-14</td>
</tr>
<tr>
<td><strong>Engineering Technology Accreditation Commission of ABET</strong></td>
<td>marine engineering technology – TAMU Galveston</td>
<td>2013-14</td>
</tr>
<tr>
<td><strong>Forensic Science Education Programs Accreditation Commission (FEPAC)</strong></td>
<td>The forensics and investigative sciences program</td>
<td>Last Site Visit: October 2011 Accreditation dates: 1/2012-1/2017</td>
</tr>
<tr>
<td><strong>Institute of Food Technologists</strong></td>
<td>The food science and technology curriculum</td>
<td>December 2011</td>
</tr>
<tr>
<td><strong>Landscape Architectural Accreditation Board</strong></td>
<td>The curriculum in landscape architecture</td>
<td>July 2015</td>
</tr>
<tr>
<td><strong>Liaison Committee on Medical Education</strong></td>
<td>The medical education degree program</td>
<td>August 2012</td>
</tr>
<tr>
<td><strong>National Architectural Accrediting Board</strong></td>
<td>The curriculum in architecture</td>
<td>March 2013</td>
</tr>
<tr>
<td><strong>Network of Schools of Public Policy, Affairs, and Administration</strong></td>
<td>The Master of Public Service and Administration degree in the Bush School of Government and Public Service</td>
<td>April 2014</td>
</tr>
<tr>
<td><strong>National Recreation and Park Association</strong></td>
<td>The curriculum in recreation, park and tourism sciences</td>
<td>June 2010</td>
</tr>
<tr>
<td><strong>Planning Accreditation Board</strong></td>
<td>The Master of Urban Planning curriculum</td>
<td>2013</td>
</tr>
<tr>
<td><strong>Society for Range Management</strong></td>
<td>The curriculum in rangeland ecology and management</td>
<td>2006</td>
</tr>
<tr>
<td><strong>Society of American Foresters</strong></td>
<td>The curriculum in forestry</td>
<td>2013</td>
</tr>
<tr>
<td><strong>State Board of Educator Certification Texas Education Agency</strong></td>
<td>Programs in professional education and degrees conferred by Texas A&amp;M University</td>
<td>Last review 2011</td>
</tr>
</tbody>
</table>

(2) If SACS Commission on Colleges is not your primary accreditor for access to USDOE Title IV funding, identify which accrediting agency serves that purpose.

Not applicable.

(3) List any USDOE recognized agency (national and programmatic) that has terminated the institution’s accreditation (include the date, reason, and copy of the letter of termination) or list any agency from which the institution has voluntarily withdrawn (include copy of letter to agency from institution).
None.

(4) Describe any sanctions applied or negative actions taken by any USDOE-recognized accrediting agency (national, programmatic, SACSCOC) during the two years previous to the submission of this report. Include a copy of the letter from the USDOE to the institution.

None.

6. Relationship to the U.S. Department of Education.

Texas A&M University does not have any limitations or suspensions, nor have we been terminated by the U.S. Department of Education in regard to student financial aid or other financial aid programs during the previous three years. We are not on reimbursement nor do we have any other exceptional status in regard to federal or state financial aid.
## Financial Profile 2017

Texas A&M University, College Station, TX

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total All Revenues &amp; Other Additions (IPEDS Part B, line 25)</td>
<td>$3,448,016,331</td>
</tr>
<tr>
<td>Instruction (IPEDS Part C line 01, Column 1)</td>
<td>$869,772,172</td>
</tr>
<tr>
<td>Research (IPEDS Part C line 02, Column 1)</td>
<td>$745,169,263</td>
</tr>
<tr>
<td>Public Service (IPEDS Part C line 03, Column 1)</td>
<td>$251,228,181</td>
</tr>
<tr>
<td>Academic Support (IPEDS Part C line 05, Column 1)</td>
<td>$301,091,516</td>
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<tr>
<td>Student Services (IPEDS Part C line 06, Column 1)</td>
<td>$99,426,748</td>
</tr>
<tr>
<td>Institutional Support (IPEDS Part C line 07, Column 1)</td>
<td>$114,397,808</td>
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<tr>
<td>Scholarships &amp; Fellowships, excluding discounts &amp; allowances</td>
<td>$95,452,110</td>
</tr>
<tr>
<td>Auxiliary Enterprises (IPEDS Part C line 11, Column 1)</td>
<td>$228,444,634</td>
</tr>
<tr>
<td>Hospital Services (IPEDS Part C line 12, Column 1)</td>
<td>$0</td>
</tr>
<tr>
<td>Independent Operations (IPEDS Part C line 13, Column 1)</td>
<td>$0</td>
</tr>
<tr>
<td>Other Expenses &amp; Deductions (IPEDS Part C line 14, Column 1)</td>
<td>$333,851,618</td>
</tr>
</tbody>
</table>

### Financial Indicators (From Audited FY 2016 Financial Statements)

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Assets</td>
<td>$5,868,331,289</td>
</tr>
<tr>
<td>Total Liabilities</td>
<td>$676,361,109</td>
</tr>
<tr>
<td>Total Unrestricted Net Assets</td>
<td>$4,023,541,614</td>
</tr>
<tr>
<td>Expendable/Temporarily Restricted Net Assets</td>
<td>$189,683,286</td>
</tr>
<tr>
<td>Nonexpendable/Permanently Restricted Net Assets</td>
<td>$978,745,280</td>
</tr>
<tr>
<td>Total Revenue</td>
<td>$2,135,725,112</td>
</tr>
<tr>
<td>Tuition and Fees, Net</td>
<td>$563,324,692</td>
</tr>
<tr>
<td>Current Debt</td>
<td>$84,318,326</td>
</tr>
<tr>
<td>Long-term Debt</td>
<td>$1,355,011,877</td>
</tr>
</tbody>
</table>

### Signatures of Verification

We certify that the information provided in the Financial Profile and Indicators is correct.

Chief Executive Officer

Chief Financial Officer

Respondent (if other than CEO or CFO)

Please Mail Signed Profile Form To:

SACSCOC
Attn: Profiles
1866 Southern Lane
Decatur, GA 30033

Texas A&M University, College Station, TX 72801
MEMORANDUM

TO: Vice Presidents
    Directors Reporting to the President

SUBJECT: Delegation of Authority

To ensure that operations are unaffected when I am out of the office for extended periods of time, I hereby issue delegation of authority to the following individuals in the order they are listed. They are authorized to act on matters regarding Texas A&M University, Texas A&M University at Galveston, Texas A&M University at Qatar, Texas A&M University Health Science Center and Texas A&M University School of Law. This delegation shall be effective as of the date of execution and shall remain in effect until revoked.

1. Carol A. Fierke, Provost and Executive Vice President
2. Jerry R. Strawser, Executive Vice President and Chief Financial Officer
3. Michael G. O'Quinn, Vice President for Government Relations and Strategic Initiatives
4. Amy B. Smith, Senior Vice President, Chief Marketing and Communications Officer
5. Daniel J. Pugh, Sr., Vice President for Student Affairs
6. Barbara Abercrombie, Vice President for Human Resources and Organizational Effectiveness
7. M. Dee Childs, Vice President for Information Technology and Chief Information Officer

Tracy Cullen will know how to contact me if necessary.

cc: Mr. John Sharp

Michael K. Young

July 25, 2018