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Cover Sheet for In-State Institutions
New Program or Substantial Modification to Existing Program

Institution Submitting Proposal	Capitol Technology University

Each action below requires a separate proposal and cover sheet.

- (●) New Academic Program
- ( ) New Area of Concentration
- ( ) New Degree Level Approval
- ( ) New Stand-Alone Certificate
- ( ) Off Campus Program
- ( ) Substantial Change to a Degree Program
- ( ) Substantial Change to an Area of Concentration
- ( ) Substantial Change to a Certificate Program
- ( ) Cooperative Degree Program
- ( ) Offer Program at Regional Higher Education Center

Payment Submitted: (●) Yes ( ) No Payment Type: ( ) R*STARS # 99845 (●) Check # 99845 Payment Amount: 850.00 Date Submitted: 3/2/2026

Department Proposing Program	Astronautical and Space Engineering	
Degree Level and Degree Type	Bachelor of Science (B.S.)	
Title of Proposed Program	Bachelor of Science in Aerospace Engineering	
Total Number of Credits	123	
Suggested Codes	HEGIS: 4940.00	CIP: 14.0101
Program Modality	( ) On-campus ( ) Distance Education (fully online) (●) Both	
Program Resources	(●) Using Existing Resources ( ) Requiring New Resources	
Projected Implementation Date (must be 60 days from proposal submisison as per COMAR 13B.02.03.03)	(●) Fall ( ) Spring ( ) Summer	Year: 2027
Provide Link to Most Recent Academic Catalog	URL: http://catalog.captechu.edu	
Preferred Contact for this Proposal	Name: Prof. Jeffrey Volosin	
	Title: Director of Astronautical and Space Engineering	
	Phone: (240) 965-2457	
	Email: jfvolosin@captechu.edu	
President/Chief Executive	Type Name: Dr. Bradford Sims	
	Signature: [signature]	Date: 3-2-26
	Date of Approval/Endorsement by Governing Board: MARCH 2, 2026	

Revised 1/2021

CAPITOL
Technology University

March 2, 2026

Dr. Sanjay Rai
Secretary of Maryland Higher Education
Maryland Higher Education Commission
217 E. Redwood Street, Suite 2100
Baltimore, MD 21202

Dear Dr. Rai,

Capitol Technology University respectfully seeks approval to establish a Bachelor of Science (B.S.) in Aerospace Engineering. This proposed program will be delivered by highly qualified faculty and supported by a rigorous, industry-informed curriculum that integrates the study of atmospheric and space systems, flight mechanics, propulsion, orbital dynamics, electronics, and control systems. Emphasis will be placed on experiential learning through hands-on design, modeling, and simulation to ensure graduates develop both theoretical understanding and applied technical expertise.

The program aligns closely with the University's mission to provide practical, career-focused education in engineering, computing, and related STEM disciplines. By combining strong analytical foundations with real-world application, the proposed degree will prepare graduates to contribute meaningfully to Maryland's civil, defense, and commercial aerospace sectors.

This initiative directly addresses documented workforce needs driven by continued growth and investment in aerospace and defense organizations across the Baltimore–Washington region. Through this program, Capitol Technology University seeks to support the state's economic development priorities while expanding opportunities for students to enter high-demand, high-impact fields.

Enclosed please find the complete proposal for the Bachelor of Science in Aerospace Engineering, including all required documentation and confirmation of adequate library resources. We respectfully request the Commission's review and approval.

Respectfully,

Bradford L. Sims, PhD

President

CAPITOL
Technology University

March 2, 2026

Dr. Sanjay Rai
Secretary of Maryland Higher Education
Maryland Higher Education Commission
217 E. Redwood Street, Suite 2100
Baltimore, MD 21202

Dear Dr. Rai,

This letter is provided in response to the request for confirmation of the adequacy of library resources at Capitol Technology University to support the proposed Bachelor of Science in Aerospace Engineering.

As President of Capitol Technology University, I affirm that the Puente Library possesses sufficient and appropriate resources to support the academic, research, and instructional needs of this program. The library provides access to professional staff support, comprehensive digital databases, scholarly journals, research collections, and industry-relevant technical publications. These resources are adequate to support coursework in aerodynamics, propulsion, structures, and flight dynamics.

The University remains committed to the ongoing enhancement and continuous evaluation of its library holdings. Dedicated budget allocations ensure that resources remain current, accessible, and aligned with evolving industry standards, research advancements, and workforce demands.

Capitol Technology University affirms its continuing commitment to providing the academic resources necessary to maintain program quality and support student success in the Bachelor of Science in Aerospace Engineering.

Respectfully,

Bradford L. Sims, PhD

President

PROPOSAL FOR:

X NEW INSTRUCTIONAL PROGRAM
_____ SUBSTANTIAL EXPANSION/MAJOR MODIFICATION
COOPERATIVE DEGREE PROGRAM
X WITHIN EXISTING RESOURCES or _____ REQUIRING NEW RESOURCES

CAPITOL Technology University

Institution Submitting Proposal

Fall 2027
Projected Implementation Date

Bachelor of Science
Award to be Offered

Bachelor of Science in Aerospace Engineering
Title of Proposed Program

4940
Suggested HEGIS Code

14.0101
Suggested CIP Code

Engineering
Department of Proposed Program

Prof. Mohamed Shehata
Name of Department Head

Prof. Jeffrey Volosin
Director of Astronautical and Space Engineering

jfvolosin@captechu.edu
Contact E-Mail Address

(240) 965-2457
Contact Phone Number

3/2/26
Signature and Date

President/Chief Executive Approval

MARCH 2, 2026
Date

Date Endorsed/Approved by Governing Board

Bachelor of Science (B.S.) in Aerospace Engineering

Capitol Technology University
Laurel, Maryland

A. Centrality to Mission and Planning Priorities

1. Program description and alignment with institutional mission

The Bachelor of Science in Aerospace Engineering is a 123-credit undergraduate program that prepares students for professional careers and advanced study in the design, development, manufacturing, testing and operations of aerospace systems. The program combines the study of atmospheric and space, flight mechanics, propulsion, orbital dynamics, electronics, and control systems with hands-on experience in design, modeling, and simulation.

Students gain comprehensive knowledge in aerodynamics, propulsion, structures, and flight dynamics, reinforced through extensive laboratory work, simulation projects, and a two-semester senior design sequence focused on real-world aerospace applications. The curriculum integrates a strong foundation in mathematics and science (33 credits), a rigorous engineering core (66 credits), that includes a focused aerospace systems and flight core (27 credits) as well as Senior level tracks that enable specialization in atmospheric or space, applications (12 unique credits for each track), computer science and simulation (6 credits), and general education in communication, social sciences and ethics (18 credits). This program is compliant with all ABET requirements for Aerospace Engineering undergraduate programs. The program emphasizes the design and operation of both atmospheric and spaceflight systems, providing students with the analytical tools and technical breadth to contribute immediately to Maryland's civil, defense and commercial, aerospace sectors.

This degree is built directly on Cap Tech's 20+ years of experience in running a successful ABET accredited Astronautical and Space Engineering (ASE) undergraduate program. Cap Tech's ASE program provides the well established core of the proposed Aerospace program which will leverage the ASE curriculum as the "Space Track" of the Aerospace program, while a corresponding "Aeronautical Track" will leverage Cap Tech's existing "Aviation" degree program - adding the required rigor to ensure this track provides engineering level aircraft systems training.

This Aerospace program supports the mission of Capitol Technology University, which is *"to educate individuals for professional opportunities in engineering, computer and information sciences, and business by providing relevant learning experiences that lead to success in the evolving global community."* The B.S. in Aerospace Engineering advances that mission by producing workforce-ready engineers with the technical depth, design experience, and interdisciplinary fluency required in the modern aerospace industry. Maryland has the most aerospace engineering positions of all states and the Cap Tech aerospace program will provide additional qualified students to enter this workforce.

The program also directly aligns with Capitol's strategic vision by:

- Delivering STEM-based, hands-on education that addresses emerging workforce needs in aerospace technologies;

- Expanding the University's engineering portfolio through an applied, systems-oriented curriculum;
- Fostering innovation and interdisciplinary learning environments; and
- Contributing to enrollment growth by attracting students interested in aircraft, spacecraft, and autonomous flight systems engineering.

2. Support for institutional strategic goals and evidence of priority

The Aerospace Engineering program directly supports Capitol Technology University's strategic goals for expanding STEM education, increasing enrollment, and strengthening partnerships with Maryland's aerospace industries.

- Goal I – Expand Educational Offerings: The program provides a distinctive pathway for students interested in both aircraft and spacecraft systems engineering while utilizing existing faculty, labs and other resources from the astronautical, mechanical and electrical engineering programs as well as programs in robotics, mechatronics and aviation.
- Goal II – Increase Enrollment and Institutional Awareness: The program is expected to attract students from Maryland and surrounding states who seek careers in aerospace engineering. Its applied focus appeals to both traditional undergraduates and community-college transfers.
- Goal III – Improve Resource Utilization and Institutional Effectiveness: The program builds on established courses and faculty expertise in astronautical, electrical, mechanical, and systems engineering, maximizing instructional efficiency with minimal new capital cost.
- Goal IV – Increase Partnerships and External Engagement: The program creates opportunities to expand the current Astronautical Engineering Industry Advisory Board and associated industry partnerships with NASA Goddard Space Flight Center, JHU Applied Physics Laboratory, NOAA's Satellite Operations Facility in Suitland, Rocket Lab, Northrop Grumman, Lockheed Martin, the Naval Air Station Patuxent River, and other aerospace organizations.

Evidence of institutional priority
a. Developed under the direction of the Chair of Engineering and Office of Academic Affairs as part of the University's strategic plan to expand aerospace-related programs.
b. Discussed and supported during academic planning retreats and Undergraduate Academic Council meetings as a flagship initiative for aerospace workforce preparation.
c. Draws on existing faculty expertise and approved engineering and computer-science courses to ensure efficient implementation.
d. Identified as a key element in Capitol's strategic enrollment plan targeting students interested in space systems, flight technology, and defense applications.
e. Advances the University's institutional commitment to applied, hands-on STEM education.

3. Funding and sustainability for the first five years

The B.S. in Aerospace Engineering will be funded primarily through existing institutional resources and strategic allocation of faculty workload within the Department of Engineering. Almost all courses in the program already exist, allowing the program to launch immediately, with minimal new expense.

Existing laboratories for systems integration/test, satellite flight operations, physics, mechanics, materials, and electronics will support the program's requirements. New courses in aerodynamics, aircraft dynamics/control and aircraft propulsion, will be developed using current faculty and adjunct specialists.

Tuition revenue will cover instructional costs, and the program is projected to be self-sustaining within three to five years with the Space Track, self-sustaining immediately.

Key funding measures include:
a. Institutional support for curriculum development and faculty assignment within the existing budget;
b. Use of current laboratories and instructional technologies, avoiding significant capital investment;
c. A tuition-revenue model that ensures cost recovery by year five;
d. Pursuit of external funding and partnerships with NASA Space Grant, Space Force, Space Command and regional aerospace employers for student projects and scholarships.

4. Institutional commitment

Capitol Technology University is fully committed to the long-term success of the B.S. in Aerospace Engineering. Cap Tech's focus on Astronautical Engineering over the past 20+ years, and the industry/government relations that have been established to support this program, will be the cornerstone we will build on in establishing the Aerospace Engineering program.

a) Administrative, financial, and technical support: Oversight will be provided by the Department of Engineering in collaboration with Academic Affairs, Enrollment Management, and Finance. The Chair of Engineering will manage staffing, scheduling, and assessment. Financial and technical support will be integrated into the University's annual operating budget, with resources allocated for laboratory maintenance and modernization.

b) Continuation and teach-out assurance: Capitol Technology University guarantees program continuity for all enrolled students. In the event of curricular revision, the University will implement a formal teach-out plan to ensure all students complete their degrees without interruption.

B. Critical and Compelling Regional or Statewide Need as Identified in the State Plan

1. Demonstrate demand and need for the program in terms of meeting present and future needs of the region and the State in general

a) The need for the advancement and evolution of knowledge

The Bachelor of Science in Aerospace Engineering increases Maryland's capacity to meet the technical and innovation demands of the civil, defense and commercial space sectors by expanding Cap Tech's successful Astronautical and Space Engineering program, to include aviation focused engineering classes and labs. Modern aerospace systems rely on the fusion of multiple domains—mechanical design, electrical systems, computer control, and data integration—to achieve performance, safety, and sustainability objectives. This program addresses that evolution by equipping students with both foundational theory and practical experience in system design, modeling, and simulation. Graduates will be prepared to contribute directly to Maryland's expanding aerospace ecosystem, which includes NASA Goddard Space Flight Center, NOAA's Satellite Operations Facility, Northrop Grumman, Rocket Lab, Lockheed Martin, Johns Hopkins Applied Physics Laboratory, the Space Telescope Science Institute and Naval Air Station Patuxent River. The program supports the advancement of knowledge not only through classroom instruction but also through applied research and design projects. Cap Tech prioritizes learning from experienced Maryland-based practitioners in aerospace. The current ASE program has 8 instructors

who have a total of 200+ years of experiences supporting local Maryland aerospace companies and Federal Agencies. The Aerospace Engineering program will leverage this instructional team while adding new members, drawn from experts in the local community. This focus on choosing instructors with significant hands-on, local, applied experience and expertise, aligns with Maryland's goal to strengthen STEM innovation and workforce readiness in emerging technologies. As a Lighthouse Industry, Maryland has identified aerospace as a top-tier industry for boosting economic growth. Cap Tech actively supports the Maryland Aerospace Alliance and is connected to the government, industry and academic organizations supporting growth of this critical industry in the state. Cap Tech also attends meetings of the Maryland Aerospace and Technology Commission, to better understand State-wide aerospace skill needs. Through these relationships, and the knowledge gained in working with this group, the proposed Aerospace Engineering program focuses on the key needs of these Maryland aerospace employers.

b) Societal needs, including expanding educational opportunities and choices for minority and educationally disadvantaged students at institutions of higher education

The Aerospace Engineering program expands access to high-quality aerospace education for students who have historically been underrepresented in this field. Capitol Technology University serves a diverse student body, including first-generation college students, adult learners, veterans, and community-college transfers—groups often excluded from traditional, research-intensive, aerospace programs. The program's design emphasizes accessibility through transfer pathways, small class sizes, and extensive faculty mentoring. It provides clear entry points for community-college graduates in engineering or pre-engineering programs and offers an affordable, practice-oriented path to aerospace careers.
By delivering hands-on, project-based education supported by industry engagement, the program empowers students from varied backgrounds to develop strong technical and professional competencies, supporting the State's broader goals for diversity, equity, and inclusion in STEM fields. Cap Tech also has a Memorandum of Understanding and serves on the Board of Directors of the Fire Rockets organization (501(c) 3). We regularly host and participate in Fire Rockets events. Fire Rockets is designed to be an inclusive environment to engage diverse youth from underrepresented and under-resourced groups in STEM activities and encourage them to pursue a career in a STEM field, i.e., aerospace. Implementation of culturally responsive strategies and activities support students of various races/ethnicities, genders, socioeconomic statuses, and physical or mental abilities. Through our role in Fire Rockets, we are actively supporting the development of the next generation of aerospace engineers.

c) The need to strengthen and expand the capacity of historically black institutions to provide high-quality and unique educational programs

While Capitol Technology University is not an HBI, it maintains cooperative relationships with Maryland's Historically Black Institutions—Morgan State University, Bowie State University, Coppin State University, and University of Maryland Eastern Shore—through articulation and outreach initiatives that expand access to engineering education statewide.

This program provides an opportunity for future collaboration with HBIs by offering dual-degree or transfer pathways for students in physics, engineering technology, or computer science programs who wish to specialize in aerospace engineering. Such partnerships would enhance Maryland's collective capacity to train a more diverse aerospace workforce and contribute to the State's goal of equitable access to high-demand STEM programs.

2. Provide evidence that the perceived need is consistent with the Maryland State Plan for Postsecondary Education

The Maryland State Plan for Postsecondary Education establishes three overarching goals: Student Access, Student Success, and Innovation. The B.S. in Aerospace Engineering supports all three.

Goal 1: Student Access — "Ensure equitable access to affordable and quality postsecondary education for all Maryland residents."

Capitol Technology University is committed to expanding access to aerospace education across Maryland. The program provides a clear and affordable pathway for students seeking careers in the civil, defense and commercial sectors of the aerospace field - all critical to Maryland's economy.

Transfer agreements with community colleges, combined with flexible scheduling and individualized advising, create opportunities for both traditional and nontraditional students. With many current Astronautical Engineering students working at year-round internships in the aerospace field, they have the ability to start earning money early and building their resume, while attending classes at night and finishing their degree on time. The same will be true for our Aerospace students. This same schedule flexibility also ensures that working professionals looking to upgrade their skills and earn a degree to advance their career, can do so while not needing to stop working. Financial support through scholarships, federal aid, and veteran education benefits further ensures affordability and access.

These initiatives align with the State Plan's priorities for expanding equitable access and increasing participation of underrepresented populations in high-demand STEM fields.

Goal 2: Student Success — "Promote and implement practices and policies that will ensure student success."

The program promotes student success through its structured integration of theory and hands-on experience. Students gain progressive mastery of engineering concepts through labs, simulations, and design projects. This starts in their Freshman year with the design, build, test, flight and data analysis, of a high-altitude balloon payload. From soldering to programming CAD design and test plan development, systems engineering skills are taught early on. The two-semester senior design sequence serves as a capstone integrating aerodynamics, propulsion, flight controls, and systems engineering into an applied project aligned with real industry challenges.

Students benefit from close faculty mentorship, individualized academic advising, tutoring, and early intervention systems that track academic progress. Partnerships with aerospace employers provide internship and co-op opportunities, reinforcing experiential learning and job readiness.

These practices fulfill the Maryland State Plan's priorities for retention, completion, and lifelong learning, ensuring that graduates are both academically and professionally prepared for the demands of the aerospace industry.

Goal 3: Innovation — "Foster innovation in all aspects of Maryland higher education to improve access and student success."

The Aerospace Engineering program embodies innovation in curriculum design, teaching methods, and workforce alignment. It unites aeronautical and astronautical engineering principles with embedded computing, controls, and robotics—reflecting the technological convergence shaping modern aerospace systems.

Program innovations include:

- Integration of aerodynamics, propulsion, and space systems with electronics, control, and simulation tools;
- Industry-driven capstone projects developed in collaboration with Maryland aerospace partners;
- Hands-on labs and simulation experiences emphasizing system-level design and problem-solving; led by faculty with extensive work experience in the aerospace field.

These elements align directly with the State Plan's priorities encouraging pedagogical innovation, applied learning, and stronger links between higher education and workforce development. The current Astronautical Engineering instructional team have a total of 200+ years of industry/government experience in the aerospace field. This faculty forms the core of Aerospace Engineering program faculty.

C. Quantifiable and Reliable Evidence and Documentation of Market Supply and Demand in the Region and State

1. Describe potential industry or industries, employment opportunities, and expected level of entry for graduates of the proposed program

Graduates of the Bachelor of Science in Aerospace Engineering will be prepared for careers in Maryland's robust civil, defense and commercial aerospace sectors. The program emphasizes both atmospheric and orbital systems, equipping students with competencies in aerodynamics, propulsion, flight dynamics, and control systems integration.

Graduates will be qualified for positions in industries such as:

- Aerospace systems engineering
- Aircraft manufacturing and flight testing;
- Spacecraft and launch vehicle systems design, testing and operations;
- Defense and intelligence technology maturation;
- Unmanned and autonomous aerial systems development (UAS) development and testing;
- Propulsion, power, and control engineering; and
- Research and development in aeronautics and space applications.

Representative entry-level job titles include Aerospace Systems Engineer, Flight Dynamics Analyst, Satellite Operations Engineer, Systems Integration & Test Engineer and Mission Analyst.

Most graduates will enter the workforce as junior engineers or engineering associates and, with experience, advance to senior or supervisory roles in systems design, analysis, and integration. The program's combination of technical rigor, simulation training, and two-semester senior design experience provides graduates with immediate readiness to contribute to multidisciplinary aerospace engineering teams.

The Aerospace Engineering program will leverage and expand on the current Astronautical Engineering Industry Advisory Board, that includes members from many of Maryland's key aerospace employers, including: JHU Applied Physics Lab, SAIC, KBR, General Dynamics, ASRC and PTX. It will also leverage the existing Astronautical and Space Engineering Alumni Advisory Board that brings together 30+ alumni working through the aerospace industry, both here in Maryland and around the country. The

voice of these working professionals will be factored into the Aerospace Engineering program curriculum and labs to ensure that our students are fully prepared to enter today's rapid evolving aerospace sector.

2. Present data and analysis projecting market demand and the availability of openings in a job market to be served by the new program

According to the U.S. Bureau of Labor Statistics (BLS, 2024), employment of aerospace engineers is projected to grow 6 percent between 2023 and 2033, faster than the average for all occupations. The BLS projects about 3,600 openings per year nationwide as a result of growth and replacement needs, with a median annual wage of $131,800—among the highest in engineering professions (Occupational Outlook Handbook, Aerospace Engineers).

In Maryland, aerospace and defense represent one of the state's most strategically significant sectors. The Maryland Department of Labor (2022–2032 Projections) anticipates an 8.5 percent increase in engineering and architecture occupations, equivalent to over 6,000 new positions statewide. Aerospace systems, controls, and flight operations are expected to contribute substantially to this growth due to the presence of NASA Goddard Space Flight Center, NOAA's Satellite Operations Facility, Naval Air Station Patuxent River, Northrop Grumman, Lockheed Martin, Rocket Lab, Intuitive Machines and Johns Hopkins Applied Physics Laboratory.

The Baltimore–Washington region ranks among the top ten U.S. metropolitan areas for aerospace employment, with over 6,700 engineers employed and an average annual wage exceeding $138,000 (BLS OES, 2024). Maryland's workforce demand remains strong in propulsion design, guidance and navigation, systems integration, and autonomous flight systems—core competencies embedded in this program's curriculum.

These indicators demonstrate consistent market demand for graduates prepared to work at the intersection of flight, space, and systems engineering.

3. Discuss and provide evidence of market surveys that clearly provide quantifiable and reliable data on the educational and training needs and the anticipated number of vacancies expected over the next five years

Multiple independent and state-level studies confirm sustained demand for aerospace professionals:

- Maryland Department of Commerce (2024 Aerospace & Defense Industry Profile) identifies aerospace and defense as one of the state's top five technology clusters, employing over 60,000 workers with continued growth expected in propulsion, avionics, and unmanned systems.
- Lightcast Labor Market Analytics (2024) projects a 7 percent increase in aerospace and engineering positions statewide over the next five years, averaging 1,500 unique postings annually requiring bachelor's-level credentials.
- NASA and Department of Defense contracting data (FY 2023) show Maryland-based institutions and companies receiving more than $14 billion in aerospace-related federal contracts, underscoring the sector's scale and need for local engineering talent.
- The Maryland Workforce Innovation and Opportunity Act (WIOA) Plan 2024–2028 highlights aerospace systems, autonomous vehicles, and space technologies as "strategic priority industries" facing persistent shortages of graduates trained in modeling, simulation, and propulsion systems analysis.

Collectively, these data demonstrate a sustained need for a pipeline of aerospace engineers who

combine classical flight-engineering knowledge with modern computational and control-systems proficiency—precisely the skill set addressed by Capitol Technology University's proposed program.

4. Provide data showing the current and projected supply of prospective graduates

The current statewide supply of aerospace engineering graduates is limited relative to workforce demand. Based on the U.S. Department of Education IPEDS (2022) data, Maryland institutions awarded approximately 190 bachelor's degrees in aerospace or astronautical engineering, primarily from the University of Maryland College Park and the U.S. Naval Academy. These programs are research intensive and do not focus on applied systems integration or hybrid flight-engineering disciplines.

The B.S. in Aerospace Engineering will help close this gap by providing a practice-oriented degree emphasizing hands-on system design, control, and simulation aligned with industry applications.

Projected enrollment and graduation rates are as follows:

• Initial enrollment: 15–20 students in Year 1
• Enrollment by Year 5: 60–75 students
• Annual graduates by Year 5: 10–15 students

These graduates will directly strengthen Maryland's aerospace workforce pipeline and reduce the region's reliance on out-of-state recruitment for flight and systems engineers.

D. Reasonableness of Program Duplication

1. Identify similar programs in the state and/or same geographical area. Discuss similarities and differences between the proposed program and others in the same degree to be awarded.

Within the State of Maryland, only a limited number of institutions offer undergraduate programs specifically focused on aerospace or astronautical engineering. The University of Maryland, College Park (UMCP) and the United States Naval Academy (USNA) in Annapolis currently offer bachelor's programs in Aerospace Engineering, each emphasizing traditional research-oriented or military-focused curricula. With Naval Academy graduates focused on a post-graduation military career, that leaves only the University of Maryland program to support the Maryland aerospace workforce requirements. Other Aerospace Bachelors/Associates Aerospace focused programs in Maryland include:

- University of Maryland, College Park, Pre-Aerospace Engineering Program: This program is specifically focused on allowing students who do not meet the minimum requirements in math and physics, or who have a lower high-school or community college GPA than is acceptable to apply to the UMCP Aerospace Engineering undergraduate program. The "pre-Aerospace Engineering" program allows students to register for the classes they need to complete, prior to applying for entry into the UMCP Aerospace Engineering undergraduate program. This pre-Aerospace program does not include any of the Aerospace-specific classes that can be used in differentiating Aerospace programs. Although Capitol Tech is not proposing adding a pre-Aerospace program, we have a summer program that allows students, who have not completed core pre-requisite math, to complete these "catch up" classes prior to entering their first semester of the Aerospace Engineering program. The goal is to minimize the time required to complete the Aerospace Engineering program requirements while helping students acquire the skills required to be

successful in the Aerospace Engineering Program (a practice already used in the Capitol Tech Astronautical and Space Engineering Program).

- Montgomery College, Associates in Engineering Science Degree, Aerospace Engineering Area of Concentration: This program provides students with the foundational coursework needed to transfer to a 4-year program in Aerospace Engineering. UMCP has been a primary recipient of graduates of this program. In looking at the courses in the Montgomery College program, this program would also be a perfect match with the proposed Capitol Tech Aerospace Engineering Program. This will provide more Montgomery College graduates with a local transfer opportunity. Capitol Tech would work with Montgomery College to ensure graduates of this program has can easily transfer to our Aerospace Engineering program while maximizing their transfer credits.
- University of Maryland, Eastern Shore, Undergraduate Aviation Sciences program: In reviewing the curriculum and degree objectives for this program, it is more aligned with the Aviation program at Capitol Tech and does not include the ABET Aerospace Engineering topics that are included in the UMCP, Naval Academy and Capitol Tech's proposed program.
- Johns Hopkins Mechanical Engineering Undergraduate Degree Program, Aerospace Engineering Track: Built on the Mechanical Engineering program, this Track has students complete 5 aerospace-focused courses. Mechanical Engineers graduating from this program can contribute significantly to the Maryland Aerospace workforce. The difference between this program and the proposed Capitol Tech Aerospace Engineering Program, includes the 13 aerospace focused classes as part of a program accredited by ABET under Aerospace Engineering.

In addition, there are a number of general differences between the Johns Hopkins, UMCP and Naval Academy undergraduate programs versus the proposed Capitol Tech Aerospace Engineering program. The Aerospace Engineering program at Capitol Technology University differs from these programs in focus, structure, and delivery. While the others emphasize advanced theoretical research and large-scale system design, Capitol Tech's program centers on applied systems integration, hands-on experimentation, and interdisciplinary engineering practice. It uniquely blends aerospace engineering, control systems, and electronics—areas critical to the development of autonomous flight systems, spacecraft operations, and defense applications. It also offers courses in spacecraft ground systems and operations engineering, held in the only Maryland virtual satellite control center. This facility provides students with the opportunity to train on industry-standard, state-of-the-art, ground system software. Our Aerospace Engineering program uniquely combines spacecraft/aircraft design with the operations aspects that having a virtual control center provides. These ground/operations engineering skills are in high demand by commercial space companies as well as Space Command and Space Force.

Distinctive features of Capitol's program include:

- Applied and systems-oriented focus: Emphasizes flight dynamics, propulsion, and control integration through simulation and laboratory-based instruction rather than research specialization.
- Comprehensive systems approach: Combines aeronautical and astronautical content with mechanical, electrical, and computing principles to prepare graduates for modern, interconnected aerospace environments.
- Accessibility and workforce alignment: Offers a transfer-friendly structure designed to attract community college graduates, veterans, and working professionals, filling a gap not addressed by large research institutions.
- Industry-focused faculty: Capitol Tech recruits and retains industry/government practitioners to teach our core Aerospace classes. With a total of over 200+ years of industry/government experience, our faculty team is dominated by individuals who have led efforts and served in key roles in the areas they teach. Although ensuring that theory is taught thoroughly, these faculty members bring their real-world experience to the classroom, ensuring students are learning about

the most up-to-date applications and technologies being used in industry and also ensuring that real-world problem solving skills and ethical considerations are taught.
- Regional industry engagement: Located near and with established relationships with NASA Goddard Space Flight Center, NOAA's Satellite Control Center, the Space Telescope Science Institute, and Johns Hopkins Applied Physics Lab and major aerospace contractors, the program provides direct pathways for internships, cooperative education, and project collaboration. Cap Tech Astronautical students are already interning in each of these facilities and they provide support to our Industry Advisory Board.

Given Maryland's position as a national hub for aerospace and defense innovation, the introduction of this program is both reasonable and complementary. It expands student choice by offering a practical, workforce-aligned option that supports industry needs while avoiding unnecessary duplication of existing research-oriented programs.

Rather than competing with the programs at UMCP or USNA, Capitol Technology University's degree enhances the overall educational ecosystem by producing graduates with applied, system-level expertise. The program contributes to Maryland's goal of strengthening aerospace innovation capacity, diversifying educational opportunities, and sustaining the region's competitive advantage in aircraft and space engineering.

E. Relevance to High-Demand Programs at Historically Black Institutions (HBIs)

1. Discuss the program's potential impact on the implementation or maintenance of high-demand programs at HBIs

The proposed Bachelor of Science in Aerospace Engineering is designed to complement—rather than compete with—high-demand engineering and technology programs currently offered by Maryland's Historically Black Institutions (HBIs). Maryland's HBIs—including Morgan State University, Bowie State University, Coppin State University, and the University of Maryland Eastern Shore (UMES)—play a vital role in advancing diversity and excellence in science, technology, engineering, and mathematics (STEM). Their programs emphasize academic rigor, leadership, and community engagement while preparing underrepresented students for professional and graduate-level STEM careers.

Capitol Technology University's Aerospace Engineering program differs in both scope and orientation. It focuses on the integration of aeronautics, astronautics, electronics, control systems, and robotics—fields not currently represented in depth within Maryland's HBI curricula. The program is hands-on and systems-driven, targeting students who wish to enter the aerospace workforce directly after graduation rather than pursue primarily research-based academic pathways.

Rather than drawing students away from existing HBI programs, this degree will strengthen Maryland's collective capacity to educate a diverse aerospace workforce through:

- Transfer and articulation opportunities for students in physics, pre-engineering, or computer-science tracks at HBIs who wish to specialize in aerospace engineering.
- Collaborative design, research, and internship initiatives involving aerospace systems, propulsion testing, or unmanned flight operations that connect faculty and students across institutions.
- Statewide workforce development partnerships that jointly address industry needs in aerospace, defense, and space systems engineering.

The implementation of this program will not diminish enrollment or institutional support for HBI programs. Instead, it offers a complementary pathway that broadens the range of STEM opportunities available to Maryland students and reinforces shared goals of diversity, inclusion, and workforce readiness in high-demand technical fields.

Through coordination and collaboration, the Aerospace Engineering program will help expand Maryland's overall aerospace education capacity, ensuring that all institutions—HBIs included—benefit from enhanced partnerships, student mobility, and access to emerging aerospace and flight technologies.

F. Relevance to the Identity of Historically Black Institutions (HBIs)

1. Discuss the program's potential impact on the uniqueness and institutional identities and missions of HBIs

The proposed Bachelor of Science in Aerospace Engineering is not expected to negatively impact the uniqueness, missions, or institutional identities of Maryland's Historically Black Institutions (HBIs). Instead, the program complements Maryland's broader strategy to expand access to high-quality, workforce-aligned STEM education while supporting the missions of HBIs to advance equity, inclusion, and leadership in technical and scientific disciplines.

Maryland's HBIs—including Morgan State University, Bowie State University, Coppin State University, and the University of Maryland Eastern Shore—play an essential role in preparing underrepresented students for success in engineering, computer science, and applied technology. Their missions emphasize academic excellence, leadership development, research engagement, and community advancement through high-demand educational programs that strengthen Maryland's innovation economy.

The Cap Tech Aerospace Engineering program differs in both content and purpose. It offers a specialized curriculum in flight mechanics, propulsion, control systems, and spacecraft design, integrating these with electrical and computer engineering principles to prepare students for immediate employment in aerospace, defense, and space technology industries. Its focus on applied, systems-level engineering complements the more traditional or research-intensive engineering programs currently offered at HBIs.

Rather than duplicating or competing, this program creates opportunities for synergy through:

- Collaborative partnerships with HBI faculty and students on aerospace design projects, flight research, and systems integration initiatives;
- Transfer and dual-enrollment pathways for students from HBI physics or pre-engineering programs seeking a specialized aerospace concentration; and
- Shared outreach initiatives promoting diversity and inclusion in aerospace and space-related professions.
- Many of these organizations are represented, along with Cap Tech, on the Maryland Space Grant consortium. Through this organization, regular discussions on the focus of each program can be coordinated and opportunities for collaboration can be identified.

The program aligns with the State's broader commitment to strengthen participation of underrepresented groups in STEM, reinforcing—not detracting from—the missions of Maryland's HBIs. Capitol Technology University recognizes and respects the historical significance and educational leadership of

these institutions and seeks to build partnerships that expand access to aerospace engineering education for all Maryland students.

In this way, the B.S. in Aerospace Engineering contributes positively to the State's collective goals for equitable STEM education while preserving and enhancing the distinctive identities, missions, and community impact of Maryland's Historically Black Institutions.

G. Adequacy of Curriculum Design, Program Modality, and Related Learning Outcomes

1. Describe how the proposed program was established, and also describe the faculty who will oversee the program.

The Bachelor of Science in Aerospace Engineering was developed through a collaborative process involving faculty from Capitol Technology University's School of Engineering, the Office of Academic Affairs, and the Engineering Advisory Board, which includes representatives from Maryland's aerospace, defense, and space industries. The program was designed to address the region's growing demand for engineers who can integrate flight, propulsion, and control systems with electronics, computing, and materials technologies.

The program builds on Capitol Tech's existing Astronautical & Space Engineering (ASE) Program. The ABET accredited ASE program (accredited under the "Aerospace" category) has a strong local Industry Advisory Board that includes: JHU/APL, ASRC, SAIC, PTX, General Dynamics and many other local aerospace companies. Leveraging this core strength, with over 20 years of alumni working in the space field, the Aerospace Engineering program will follow the ABET accreditation guidelines for Aerospace programs. It will combine the Astronautical program with other core Cap Tech strengths in electrical, mechanical, and systems engineering, incorporating approved courses already taught within these programs and adding specialized aerospace systems and flight courses. The structure ensures a rigorous and cohesive sequence covering mathematics, physics, mechanics, electronics, propulsion, orbital mechanics, and spacecraft systems, consistent with EAC-ABET expectations. The Aerospace Engineering Program will include a "astronautical" and an "aeronautical" track for the fourth year students. This allows students to specialize in their final year, while leveraging a core curriculum throughout the first 3 years. A senior design/capstone course will be incorporated for fourth year students, providing them to exhibit their end-to-end systems engineering skills within their area of specialization.

The program will be overseen by full-time faculty with doctoral degrees and industry experience in aerospace engineering, mechanical engineering, control systems, and avionics. Faculty are actively engaged in applied research, professional practice, and advisory partnerships with regional aerospace employers. Qualified adjunct instructors with expertise in propulsion, flight dynamics, and systems integration will support upper-level courses and senior design supervision.

2. Describe educational objectives and learning outcomes appropriate to the rigor, breadth, and modality of the program.

The program will be delivered primarily in on-campus, face-to-face format, supported by hybrid and online options for select lecture or simulation-based courses. The curriculum emphasizes rigorous, hands-on learning through laboratories, simulation projects, and multidisciplinary design experiences.

Educational Objectives:

Graduates of the Aerospace Engineering program will:

1. Be prepared for professional employment in aerospace, defense, and space technology industries.
2. Apply fundamental and advanced principles of flight mechanics, propulsion, controls, and systems integration to engineering design and analysis.
3. Demonstrate professional responsibility, ethical decision-making, and effective teamwork in multidisciplinary environments.
4. Pursue professional licensure, continuing education, or graduate study in aerospace or related technical fields.

Student Learning Outcomes (Aligned with ABET Student Outcomes 1–7):

Upon graduation, students will be able to (this will expand on the existing compliance with these outcomes in the ABET accredited Astronautical Engineering program at Cap Tech):

1. Identify, formulate, and solve complex engineering problems using principles of engineering, science, and mathematics.
2. Apply engineering design to produce solutions that meet specified needs with consideration of safety, welfare, and global and environmental factors.
3. Communicate effectively with diverse audiences.
4. Recognize ethical and professional responsibilities and make informed judgments in engineering contexts.
5. Function effectively on teams that establish goals, plan tasks, and produce deliverables.
6. Develop and conduct experiments, analyze and interpret data, and apply engineering judgment to reach conclusions.
7. Acquire and apply new knowledge as needed, using appropriate learning strategies.

3. Explain how the institution will:

a) Provide for assessment of student achievement of learning outcomes in the program

Assessment of learning outcomes will occur through both direct and indirect measures. Each course will include defined outcomes mapped to program-level objectives. Faculty will evaluate these through exams, lab reports, design projects, presentations, and written technical reports.

A two-semester senior design sequence (SDE 457 and SDE 458) will serve as the culminating assessment of student achievement. These courses will evaluate students' ability to integrate principles of mechanics, propulsion, flight dynamics, and control systems to design and demonstrate a complete aerospace system.

Annual assessment reports will be compiled by the program coordinator, reviewed by the Chair of Engineering, and submitted to the Office of Academic Affairs. The Engineering Advisory Board will review findings and recommend continuous improvement actions.

b) Document student achievement of learning outcomes in the program

Capitol Technology University maintains a centralized system for documenting student learning outcomes, course assessment results, and continuous improvement actions. Each course portfolio will

include assessment rubrics, student samples, and outcome attainment data. These artifacts will be reviewed annually and retained for internal quality assurance and external accreditation (ABET) reviews.

4. Provide a list of courses with title, semester credit hours, and course descriptions, along with a description of program requirements.

The Bachelor of Science in Aerospace Engineering is a 123-credit undergraduate degree integrating the principles of flight, space systems, and ground/operations engineering with strong foundations in mathematics, science, and computer programming. The curriculum includes five major components:

Category	Credit Hours	Description
Mathematics & Science	33	Calculus sequence, Physics I–III, Linear Algebra, and Differential Equations provide the analytical foundation for flight and system modeling.
Engineering Core	27	Covers mechanics, materials, circuits, electronics, control systems, robotics, and design with laboratory experience.
Aerospace Engineering Core	39	Specialized courses in aerodynamics, propulsion, flight dynamics, spacecraft systems, and aircraft operations.
Computer Science	6	Programming in Python and C for data analysis, modeling, and embedded control.
General Education	18	Communication, ethics, management, and social sciences support professional and leadership development.
Total Credits	**123**	

Curriculum Structure:

Category	Course Number	Course Title	Credit Hours
Mathematics & Science (33 Credits)			
	MA 261	Calculus I	4
	MA 262	Calculus II	4
	MA 263	Calculus III	4
	MA 330	Linear Algebra	3
	MA 340	Differential Equations	3
	PH 261	Engineering Physics I	4
	PH 262	Engineering Physics II	4
	PH 263	Engineering Physics III	4
	CH 120	Chemistry	3
Engineering Core (27 Credits)			
	MEC 210	Engineering Mechanics – Statics	3
	MEC 255	Mechanics of Materials and Materials Science	3
	MEC 310	Engineering Mechanics – Dynamics	3
	MEC 330	Fluid Mechanics	3
	MEC 215	Introduction to Engineering Design (CAD)	3
	EL 100	Introduction to DC/AC Circuits	3
	EL 204	Digital Electronics	3
	EE 453	Control I	3
		Technical Elective	3

Aerospace Engineering Core (39 Credits)			
	SDE 457	Senior Design I	3
	SDE 458	Senior Design II	3
	AE 150	Introduction to Aerospace	3
	AVT 255	Aerodynamics	3
	AE 210	Aerospace Subsystems	3
	AE 250	Aerospace Ground Systems and Operations	3
	AE 325	Aerospace Systems Engineering	3
	AE 351	Navigation & Orbital Mechanics	3
	AE 361	Remote Sensing	3
	AE 451	Propulsion & Structures (Astro Track)	3
	AE 454	Attitude Determination & Control (Astro Track)	3
	AE-455	Satellite Communications (Astro Track)	3
	AE-350	Autonomous Ground Systems (Astro Track)	3
	AE-456	Advanced Aircraft Aerodynamics (Aero Track)	3
	AE-470	Aircraft Flight Dynamics & Control (Aero Track)	3
	AE-458	Aircraft Propulsion Systems (Aero Track)	3
	AVT	Aviation Elective (Aero Track)	3
Computer Science (6 Credits)			
	CS 120	Introduction to Programming Using Python	3
	CS 150	Programming in C	3
General Education (18 Credits)			
	EN 101	English Communications I	3
	EN 102	English Communications II	3
	HU 331	Arts and Ideas	3
	AE 400	Aerospace Policy, Law and Ethics	3
	SS 351	Ethics	3
	SS Elective	Social Science Elective	3

Courses Descriptions

Mathematics and Science (33 credits)

MA 261 - Calculus I (4 credits): This course covers lines, circles, ellipses; functions and limits, differentiation, power rule, higher-order derivatives, product, quotient and chain rules, implicit differentiation, and applications. Regarding integration, it addresses definite integrals; indeterminate forms; exponential, logarithmic, trigonometric and hyperbolic functions; differentiation and integration, and graphing. Prerequisite(s): MA 114

MA 262 - Calculus II (4 credits): This course centers on methods of integration, including completing the square, substitution, partial fractions, integration by parts, trigonometric integrals, power series, and parametric equations. It also addresses partial derivatives, directional derivatives, and an introduction to multiple integrals. Prerequisite(s): MA 261

MA 263 – Calculus III (4 credits): Focuses on multivariable and vector calculus, including partial derivatives, multiple integrals in two- and three-dimensional coordinate systems, and applications using cylindrical and spherical coordinates. Topics include vector functions and their derivatives, gradients, divergence, curl, and the fundamental theorems of vector calculus—Stokes', Green's, and Gauss'. Prerequisite(s): MA 262.

MA 330 – Linear Algebra (3 credits): This course introduces the study of linear systems of equations, vector spaces and linear transformations. Students will solve systems of linear equations as a basic tool in many mathematical procedures used in science and engineering. Topics include solving linear equations, performing matrix algebra, calculating determinants, finding eigenvalues and eigenvectors and developing an understanding of a matrix as a linear transformation relative to a basis of a vector space. Prerequisite: MA 262

MA 340 - Ordinary Differential Equations (3 credits): This course addresses methods for solving first order equations with applications to mechanics and rate problems. It also covers solutions of second order equations by undetermined coefficients and variations of parameters. Applications to circuits are also included as well as an introduction to systems of equations and operational and numerical methods. Prerequisite(s): MA 262

PH 261 – Engineering Physics I (4 credits): This calculus-based physics course covers displacement, velocity, and acceleration; equations of motion; Newton's laws and their applications; gravitation; work and energy; impulse and momentum; conservation laws; rotational motion and dynamics; equilibrium; elasticity; and periodic motion. Students completing this course may not enroll in PH 201 for additional credit. Prerequisite(s): MA 261. Corequisite(s): MA 262.

PH 262 – Engineering Physics II (4 credits): Continuation of PH 261 covering wave motion, vibration and sound, electricity and magnetism, Coulomb's Law, electric fields, and induction. Prerequisite(s): PH 261.

PH 263 – Engineering Physics III (4 credits) This is a calculus-based physics course. It covers an introduction to light, lenses, and diffraction; photons and their interaction with matter; wave-particle duality, basic quantum discoveries leading to the Bohr atom and atomic spectra; and the interaction of electrons and photons with matter with special emphasis on the design of detectors and electronic devices that use quantum effects. Prerequisite: PH 262

CH 120 – Chemistry (3 credits): Introduces fundamental concepts of chemistry including the metric system, significant figures, and stoichiometry. Covers atomic structure, periodic relationships, and electron configurations; chemical bonding and electronegativity; gases, oxidation-reduction reactions, solutions, acids and bases, states of matter, thermodynamics, and chemical kinetics and equilibrium. Prerequisite(s): MA 112 or MA 114.

Engineering Core (27 credits)

MEC 210 – Engineering Mechanics – Statics (3 credits): Introduces static equilibrium principles and their applications in engineering systems. Topics include force and moment analysis, centers of gravity, centroids, and moments of inertia. Uses engineering software tools for modeling and visualization. Prerequisite(s): MA 261. Corequisite(s): PH 261.

MEC 255 – Mechanics of Materials and Materials Science (3 credits): Covers the mechanical behavior of engineering materials and analysis of stresses, strains, and deformations in structural components under various loading conditions. Topics include axial loading, torsion, bending, shear, and material failure theories. Also introduces the fundamentals of materials science, including crystal structure, phase diagrams, heat treatment, and common failure mechanisms such as fatigue and fracture. Emphasizes applications in aerospace structural design and material selection. **Prerequisite(s):** MEC 210.

MEC 310 – Engineering Mechanics – Dynamics (3 credits): Covers motion of particles and rigid bodies, Newton's laws, work-energy and impulse-momentum methods, and vibrations. Applies dynamic analysis to aerospace and mechanical systems using engineering modeling tools.

MEC 330 – Fluid Mechanics (3 credits): Continuum, velocity field, fluid statics, manometers, basic conservation laws for systems and control volumes, dimensional analysis. Euler and Bernoulli equations, viscous flows, boundary layers, flow in channels and around submerged bodies, one-dimensional gas dynamics, turbomachinery. Applications in hydraulic, pneumatic, and fluidics discussed. **Prerequisite(s):** MEC 310, MA 262.

MEC 215 – Introduction to Engineering Design – Computer-Aided Design (3 credits): Introduces fundamentals of engineering and CAD design with emphasis on product design, 3D modeling, GD&T, and simulation. Students complete individual and team projects using advanced CAD tools for stress and motion analysis.

EL 100 – Introduction to DC/AC Circuits (3 credits): Introduces basic electrical concepts and laboratory techniques. Topics include current, voltage, resistance, and power; Ohm's Law; series and parallel resistive circuits; and Kirchhoff's voltage and current laws. Covers capacitors and inductors, charging and discharging, RC and RL time constants, and an introduction to AC signals including sinusoidal waveforms, phasors, reactance, and admittance. Laboratory work emphasizes the use of meters, testing equipment, and circuit breadboarding. MATLAB Part I introduces variables, functions, data types, programming, and basic plotting. Corequisite(s): MA 112.

EL 204 – Digital Electronics (3 credits): Covers number systems including binary, octal, and hexadecimal, along with binary arithmetic and Boolean algebra. Introduces logic simplification using Karnaugh maps and the design of combinational and sequential circuits such as decoders, multiplexers, flip-flops, and multivibrators. Examines logic families including TTL, CMOS, and ECL, as well as memory devices, shift registers, and counters.

EE 453 – Control I (3 credits): This course provides a comprehensive introduction to feedback control systems, focusing on the analysis and design of dynamic systems. Key topics include mathematical modeling of physical systems, transfer functions, system response for first- and second-order systems, and stability analysis using Routh-Hurwitz criterion. Students will study steady-state error, system performance metrics, and compensator design methods such as lead and lag compensators. Frequency-domain analysis is emphasized with Bode plots, gain and phase margins, and crossover frequencies. Practical applications are integrated through laboratory exercises and industry-standard computer-aided design tools (e.g., MATLAB/Simulink), equipping students with skills to design and analyze control systems for mechatronics and robotics applications. This course emphasizes both theoretical foundations and hands-on implementation to bridge the gap between theory and practice. **Prerequisite(s):** MA 340.

Technical Elective (3 credits): A university-approved elective course in a technical area that supports an understanding of the application of aerospace engineering. Could include: cybersecurity, computer science, artificial intelligence, electrical, mechanical, robotics or mechatronics, engineering.

Aerospace Engineering Core (39 Credits)

SDE 457 – Senior Design I (3 credits): Students/teams select a project, develop an understanding of the project scope that includes research and documentation of related work, prepare a feasibility study, develop project requirements (constraints) and engineering, software, and/or security specifications,

propose solutions and multiple designs, analyze proposed designs, select a final proposed design, and prepare and present a preliminary design review (PDR). Students are expected to apply proper systems engineering and project management to their work. Additional components may be required in some projects. Students/teams submit a final report at the end of the semester. **Prerequisite(s):** Senior standing.

SDE 458 – Senior Design II (3 credits): Students/teams build and test their selected designs (completed in SDE 457). Each student team delivers a tested prototype and defends its project in front of a panel of experts. Students/teams submit a final report that includes description of the design, realization, and test processes as well as test results, discussion, and conclusion. Failure to deliver a completed design and a working prototype that meets engineering, software, and/or security specifications by the end of the semester may result in failing the course. Note: Course must be completed with a grade of "C" or higher to meet undergraduate graduation requirements. Prerequisite(s): SDE 457.

AE-150 – Introduction to Aerospace (3 credits): Introduces students to elements of aeronautics and space engineering. History of aerospace, aircraft/spacecraft types and applications. Air/space environments. Overview of systems engineering process, including team project to design, build, test and fly, a high altitude balloon payload. **Prerequisites:** None

AVT 255 – Aerodynamics (3 credits): This course provides a comprehensive understanding of the principles and applications of aerodynamics within the context of aviation for single and multiengine airplanes. Students will delve into the fundamental concepts governing the behavior of aircraft in flight, including lift, drag, thrust, and weight. Through theoretical study, practical demonstrations, and hands-on exercises, participants will explore topics such as airflow patterns over airfoils, wing design, stability and control, as well as the effects of various factors such as altitude, speed, and angle of attack on aircraft performance. Additionally, the course will cover the latest advancements in aerodynamic technologies and their impact on modern aviation. **Prerequisite(s):** PH 201.

AE-210 – Aerospace Subsystems (3 credits): This course provides an understanding of the key requirements and technologies leveraged to meet these requirements, in each subsystem area. Covers aircraft and spacecraft architectures for: avionics, propulsion, electrical power, orientation control, communication. **Prerequisites:** AE 150, AVT 255, MA 261

AE-250 – Aerospace Ground Systems and Operations (3 credits): An introduction to the design of ground systems that support aviation and spacecraft operations. Includes an introduction to ground systems architectures for aviation (air space management) and spacecraft (control centers, science centers and networks). Introduces data standards and tools used for mission planning. **Prerequisites:** AE 150, CS 120, EN 102

AE-325 – Aerospace Systems Engineering (3 credits): Understand the basic principles and processes for designing effective systems, including how to determine customer needs and wants. Students will learn how to translate customer requirements into designs for systems that provide required performance and that are reliable, supportable and maintainable throughout the system life-cycle. Explore illustrative case studies. Team projects are assigned. Written reports and oral presentations are required. **Prerequisites:** AVT 255 and AE 210

AE 350 – Autonomous Ground Systems (3 credits): Provides an in-depth introduction to the components that compose satellite ground systems in the commercial, military, and civil sectors from the inception of the space program to present day. Discusses conceptual and planned software development, integration and testing, launch operations, sustainment engineering, decommissioning of ground systems

components and the system engineering processes involved in these activities. Introduces students to the tools and methods needed to create dynamic ground system components based on automation and autonomic principles. Cover CCSDS, ISO-900X, CMMI, UML, mission planning, flight dynamics principles and risk mitigation/anomaly resolution practices. Provides an introduction to STOL, CECIL, XML, and XTCE languages. **Prerequisite:** AE 250

AE 351 – Orbital Mechanics (3 credits): Focuses on Newton's equations, Kepler's laws, and orbital trajectory solutions in spherical coordinates. Includes perturbations due to Earth's geometry and gravitational effects of the Moon and Sun. Prerequisite(s): CS 120, PH 261, MA 340.

AE361 – Remote Sensing (3 credits): This is an introductory remote sensing and sensor course with a focus on methods, instruments and techniques used to obtain satellite imagery. Students will be introduced to physical principles of remote sensing, Earth and other planetary observing systems and sensors, and various digital processing techniques related to satellite sensing imagery. Topics include optics, solar radiation, principles of satellite imaging, image quality analysis, introduction to charged coupled devices (CCDs), and basics of sensor design. **Prerequisite: PH 263**

AE 451 – Vehicle Propulsion and Structures (3 credits): Analysis and design of spacecraft propulsion systems. Liquid and solid-fueled rockets, nuclear and electric propulsion, propellant thermodynamics, and supersonic nozzle design. Key performance and analysis metrics, including the rocket equation, specific and total impulse, and exhaust characteristics. Overview of vehicle structure design, materials, and solid mechanics. **Prerequisites:** CS 150, AE 210, AE 250

AE 454 – Attitude Determination and Control (3 credits): Analysis of methods of monitoring maintaining and controlling spacecraft attitude and positioning. Propulsion systems. Effects of gravity gradients, space environment and atmospheric drag. Stabilization using controllers, actuators, sensors and impulse devices. Design of control subsystems. Systems engineering approach. **Prerequisites:** CS 120, AE 210, EE 453

AE 455 – Satellite Communications (3 credits): Analysis of satellite communications systems. Communications subsystems, telemetering and commanding, data handling, satellite link design, noise and loss, propagation effects, modulation techniques and performance, error control. Overview of common standards, regulation, and equipment. Intro to optical communication topics. **Prerequisites:** AE 210, MA 262

AE 456 – Advanced Aircraft Aerodynamics: Fundamentals of aerodynamics. Elements of compressible flow. Normal and oblique shock waves. Flows through Nozzles, diffusers and wind tunnels. Elements of the method of characteristics and finite difference solutions for compressible flow. Aspects of hypersonic flow. **Prerequisites:** MA 262, PH 262,

AE 458 – Aircraft Propulsion Systems (3 credits): This course introduces the principles and analysis of propulsion systems used in atmospheric flight. Topics include thermodynamic cycles for jet engines, thrust generation, specific impulse, and efficiency. Students will study the components and performance of turbojets, turbofans, ramjets, and scramjets, as well as the fundamentals of electric and hybrid propulsion. Emphasis is placed on real-world applications in aircraft and unmanned aerial systems (UAS). **Prerequisite(s):** MEC 330.

AE 470 – Aircraft Flight Dynamics and Control (3 credits): This course explores the dynamic behavior and control of aerospace vehicles. Topics include equations of motion for rigid body flight, aerodynamic

stability derivatives, longitudinal and lateral-directional dynamics, and stability analysis. Students will examine feedback control systems, autopilot functions, and stability augmentation systems. Emphasis is placed on the design and simulation of control systems for aircraft and unmanned aerial systems (UAS) using modern tools such as MATLAB/Simulink. **Prerequisite(s):** EE 453.

Computer Science (6 Credits)

CS 120 - Introduction to Programming Using Python (3 credits): The course will cover basic concepts and elements of computer programming using Python. Topics include variables, constants, operators, expressions, statements, branching, loops, and functions. Additionally, Python specific data structures, built-in functions, library modules and working with external files will be applied in developing working code.

CS 150 – Programming in C (3 credits): This introductory course in programming will enable students to understand how computers translate basic human instructions into machine executable applications. The language of choice for this course is C. The C syntax that will be covered includes functions; variables and memory allocations including pointer notation; conditional statements and looping. Students will also learn binary to hexadecimal and decimal conversions along with basic computer architecture. Memory management, data input/output, and file manipulations will be among some other topics discussed and applied during this course. Formerly titled *Introduction to Programming Using C*. **Prerequisite(s):** MA 111 or MA 112 and CS 120 or placement test.

General Education (18 Credits)

EN-101 – English Communications I (3 credits): This introductory college-level course focuses on effective oral and written communication skills and the development of analytical abilities through various reading and writing assignments. Students must demonstrate competence in writing mechanics, including grammar, sentence structure, logical content development, and research documentation through 4 essays/research papers. Rhetorical modes may include description, comparison/contrast, narrative, and process analysis. Students are expected to develop effective oral communication skills through speeches. Group projects will develop effective team skills such as decision-making, time management, and cooperation. Prerequisite(s): Acceptance based on placement test scores.

EN-102 – English Communications II (3 credits): This sequel to EN-101 involves more sophisticated reading, writing, speaking, and research assignments. Students must demonstrate competence in writing mechanics, as well as advanced research skills, the ability to handle complex information, and effective team skills. Students write research papers: an information paper, a cause-and-effect paper, an argument paper, and a final research paper. Course includes group work. Presentations are required. Prerequisite(s): EN 101**2.**

HU 331 - Arts and Ideas (3 credits): This course enables students to study and appreciate various forms of art, including painting, sculpture, architecture, music, drama, film, and literature through in-class and on-site experiences. The arts are also surveyed from an historical perspective, focusing primarily on eras in Western civilization. This enables students to sense the parallel development of the arts, of philosophy, and of sociopolitical systems and to recognize various ways of viewing reality. Prerequisite(s): EN 102

SS 351 – Ethics (3 credits): This course is designed to help students improve their ability to make ethical decisions. This is done by providing a framework that enables the student to identify, analyze, and resolve ethical issues that arise when making decisions. Case analysis is a primary tool of this course. Prerequisite(s): EN 102

AE 400 – Aerospace Policy, Law and Ethics (3 credits): Review of state, national and international policies, laws and requirements for operating in air and space. Case studies used to discuss ethical issues in air and space using mock trial format. Includes completing certification course in UN space policy. **Prerequisites:** EN 102, AE 325

Social Science Elective (3 credits): A university-approved elective course in the social sciences that supports an understanding of human behavior, social systems, or global dynamics. Options may include sociology, psychology, economics, or political science.

5. Discuss how general education requirements will be met, if applicable.

The Bachelor of Science in Aerospace Engineering fully satisfies the general education requirements established by the Maryland Higher Education Commission (MHEC) and outlined in COMAR 13B.02.03. The program includes 18 credits of general education coursework designed to ensure that all students graduate with strong competencies in written communication, ethical reasoning, critical thinking, and global awareness.

The general education distribution includes English composition (EN 101 and EN 102), ethics (SS 351), the arts and humanities (HU 331), social sciences (Social Science Elective), and aerospace policy, law and ethics (AE 400). These courses promote student development in oral and written communication, cultural literacy, and civic responsibility. In addition, the program includes substantial coursework in mathematics and natural sciences—including calculus, differential equations, physics, and chemistry—which fulfills the quantitative reasoning and scientific literacy components of general education.

This structure ensures that graduates of the program possess not only specialized knowledge in aerospace engineering, but also the broader intellectual and professional competencies needed for success in advanced technical fields and lifelong learning.

6. Identify any specialized accreditation or graduate certification requirements for this program and its students.

The Bachelor of Science in Aerospace Engineering is designed to meet the criteria established by the Accreditation Board for Engineering and Technology (ABET) for engineering programs. The program will be included in the institution's regular ABET accreditation cycle under the Engineering Accreditation Commission (EAC). It is not designed to lead to professional licensure (e.g., PE license) but does meet the academic standards typically expected of accredited aerospace engineering programs. The program is academically aligned with Capitol Technology University's existing ABET-accredited Astronautical and Space Engineering program which is already ABET accredited under the Aerospace program. The Aerospace program follow ABET accreditation guidance that an Aerospace Engineering program must include curricula in one area (astronautical or aeronautical), which our program fulfills by offering our existing accredited Astronautical Engineering classes as part of the Aerospace Engineering program. ABET then requires at least 2 topics be covered in the "other" area (astronautical or aeronautical) to be accredited as an "Aerospace Engineering" degree. The ABET aeronautical topics are defined as" aerodynamics, aerospace materials, structures, propulsion, flight mechanics, stability and control. With the addition of AE 56, AE 458 and AE 470, Cap Tech fully meets this requirement. The Aerospace Engineering degree will also be subject to the university's continuous improvement and academic quality assurance processes.

7. If contracting with another institution or non-collegiate organization, provide a copy of the written contract.

This program does not involve any contractual agreements with other institutions or non-collegiate organizations. All instruction, curriculum development, academic oversight, and student support services for the Bachelor of Science in Aerospace Engineering will be provided directly by Capitol Technology University using existing faculty, facilities, laboratories, and administrative infrastructure.

8. Provide assurance and any appropriate evidence that the proposed program will provide students with clear, complete, and timely information on the curriculum, course and degree requirements, nature of faculty/student interaction, assumptions about technology competence and skills, technical equipment requirements, learning management system, availability of academic support services and financial aid resources, and costs and payment policies.

Capitol Technology University ensures that students enrolled in the Bachelor of Science in Aerospace Engineering program will receive complete and timely information regarding all aspects of their degree experience.

Information will be disseminated through multiple channels, including:

- The university catalog and program website, which include the full degree plan, course descriptions, and student learning outcomes.
- Course syllabi, which specify technology requirements, grading policies, faculty office hours, assignment schedules, and expectations for student engagement.
- Academic advising services, where each student is assigned a faculty advisor who provides individualized degree planning and academic guidance.
- Orientation materials and support documentation detailing required technology (e.g., simulation software, lab kits, or computing tools), platform access (e.g., MATLAB, SolidWorks, Canvas), and expected technical proficiency.
- The Canvas learning management system (LMS), used for delivering all course content, assignments, and communications. Students are oriented to Canvas at the start of their program and receive continued LMS support through the Office of Information Technology.
- A comprehensive set of academic support services, including tutoring, disability accommodations, writing assistance, and career services.
- Financial aid guidance, tuition information, scholarship listings, and billing procedures, available through the Financial Aid and Business Offices and published online.

These coordinated systems ensure that students are consistently informed, well-supported, and able to make responsible academic and financial decisions.

9. Provide assurance and any appropriate evidence that advertising, recruiting, and admissions materials will clearly and accurately represent the proposed program and the services available.

Capitol Technology University affirms that all promotional, admissions, and recruiting materials for the Bachelor of Science in Aerospace Engineering will accurately reflect the program's content, objectives, and support structures.

The Office of Marketing and Communications, working with the School of Engineering and the Office of Admissions, will ensure that:

- All brochures, program web pages, and social media content align with the approved curriculum and clearly communicate program features and outcomes.
- Recruiting materials describe the program as a systems-focused aerospace engineering degree, with emphasis on aircraft/spacecraft design, propulsion, flight control systems, and autonomous platforms.
- Admissions counselors and faculty representatives are trained to deliver accurate and consistent messaging during outreach events, webinars, and one-on-one conversations with prospective students.
- Technical expectations, degree costs, financial aid opportunities, and available support services are clearly communicated through official university platforms.

This approach ensures that all marketing and recruitment communications are factually accurate, aligned with institutional policies, and provide prospective students with the transparency needed to make informed enrollment decisions.

H. Adequacy of Articulation

1. **If applicable, discuss how the program supports articulation with programs at partner institutions. Provide all relevant articulation agreements.**

Capitol Technology University actively maintains articulation agreements and institutional partnerships to support seamless transfer pathways for students across Maryland and beyond. The proposed Bachelor of Science in Aerospace Engineering is designed with these pathways in mind and will provide new opportunities for students transferring from community colleges, technical institutes, and military-affiliated programs in engineering and aerospace technology.

The curriculum is intentionally structured to accept transfer credit for general education, mathematics, computer programming, and foundational engineering courses in alignment with COMAR and MHEC guidelines. Students with associate degrees in engineering, physics, mechatronics, electronics, or aerospace technology will find clear pathways into the program. The emphasis on flight systems, propulsion, and control makes the program particularly well-suited for students from community colleges offering pre-engineering or applied engineering technology tracks.

Capitol Tech currently maintains articulation and dual-enrollment agreements with institutions such as Cecil College and the Community College of Baltimore County (CCBC), among others. The Bachelor of Science in Aerospace Engineering will be formally added to the university's articulation portfolio and used to expand partnerships with Maryland community colleges offering associate degrees in engineering, physics, or aerospace-related fields.

The university also supports early college and high school-to-university STEM pipelines through Project Lead The Way (PLTW), dual enrollment, and strategic partnerships with local school systems such as Prince George's County Public Schools (PGCPS) and the Baltimore City Public School System. These programs help build early interest in aerospace and engineering careers and provide a foundation for future transfer enrollment.

Degree requirements in the Aerospace Engineering program preserve the academic integrity of upper-division technical and capstone coursework while remaining flexible for transfer students. Students entering with appropriate associate degrees or relevant coursework may be admitted at junior standing,

provided they have completed key lower-division prerequisites in mathematics, physics, programming, and engineering fundamentals.

Formal articulation agreements and sample transfer guides will be developed in conjunction with partner institutions and submitted as supporting materials to this proposal.

I. Adequacy of Faculty Resources

1. Provide a brief narrative demonstrating the quality of program faculty. Include a summary list of faculty with appointment type, terminal degree title and field, academic title/rank, status (full-time, part-time, adjunct) and the course(s) each faculty member will teach in the proposed program.

The Bachelor of Science in Aerospace Engineering is supported by a distinguished faculty team composed of full-time professors, professors of practice, and experienced adjuncts. Faculty members bring expertise across core engineering disciplines, flight science, computer science, mathematics, and aerospace systems integration. Their combined academic backgrounds and extensive industry experience ensure that students gain deep theoretical foundations alongside practical, application-oriented training aligned with current aerospace workforce needs.

FULL-TIME FACULTY

Dr. Mohamed Shehata, Dean of Academics, and the Chair of Engineering Department earned a Ph.D. in Engineering from Purdue University. His thesis focused on power electronics and its application on electric drive. He leads curriculum planning and teaches courses in engineering design, control systems, Mechatronics and energy systems.

Mr. Jeff Volosin, (B.S., Space Science, Florida Institute of Technology) is Chair of Astronautical and Space Engineering at Capitol Technology University (he will also be the Chair for the Aerospace Engineering Program). He brings over 38 years of industry and NASA experience in spacecraft systems, mission operations, and autonomous systems development. He served in roles including, flight project manager, program manager and Senior Executive at NASA. He retired in 2024 and received NASA's highest civil service award, the Distinguished Service Medal for his technical leadership in Earth Sciences, Space Sciences and Network Operations and Development.

Mr. Frank E. Turney, is Chair of the Aviation Department at Capitol Technology University. He holds a J.D. from the University of Baltimore and is an FAA-certified commercial pilot, flight instructor, and remote pilot. With extensive experience in flight training, charter operations, and aviation law, he brings both legal and operational expertise to the program.

Dr. Gregory P. Behrmann (Ph.D., Mechanical Engineering, The Catholic University of America) teaches robotics, engineering mechanics, and systems engineering. His applied research includes intelligent systems and human-robot collaboration.

Dr. Amelia Wear (M.S., Software Engineering; B.S., Mechanical Engineering) is a practicing systems engineer with experience in embedded control systems and agile development. She teaches robotics, systems analysis, and capstone design.

Dr. Nisma M. Omar, holds a Ph.D. in Analytical Chemistry and an M.S. in Physical Chemistry. She teaches general education science and mathematics courses. Her experience includes curriculum development, lab instruction, and pharmaceutical testing. She contributes to foundational STEM education and academic success initiatives.

Dr. Andrew Mehri, holds a Ph.D. in Computer Science, Masters in Information Architecture and B.S. in Electrical and Electronics Engineering, all from Capitol Technology University. He has an extensive career in teaching computer science and electronics courses, beginning in the mid-1990s and he has also worked as a Data Analyst at the World Bank.

PROFESSOR OF PRACTICE

Mr. Marcel Mabson holds a B.S. in Astronautical Engineering from Cap Tech and has worked in the Maryland's aerospace industry for 15 years. In his roles at the Hammers Company he worked to commercialize the NASA GSFC, ground system software. He now works with ASRC, supporting satellite ground system development and operations at the NOAA Satellite Operations Facility in Suitland, MD. He teaches AE-250 and AE-350 ground system courses and maintains our Cap Tech control center where simulated operations of up to 10 virtual satellites, provides Cap Tech students with a unique satellite operations experience.

Ms. Suzanne Hall holds an M.S. in Degree Administration, served 26 years in the U.S. Air Force as an aircrew member and maintenance officer, managed a civilian flying club and flight school after retirement, and brings nearly 40 years of aviation, flight training, and aircraft maintenance experience to Capitol Technology University's aviation program.

ADJUNCT FACULTY

Dr. Julie Halverson has a B.S. in Aerospace Engineering from the University of AZ, M.S. in Applied Physics from Johns Hopkins, and a PhD in Aerospace Engineering from the University of MD. She has a 30+ year career at NASA GSFC where she supported Spacecraft Attitude Control as well as Satellite Operations. She previously taught Satellite Attitude Control at the US Naval Academy and now teaches Control courses at Cap Tech.

Mr. Robert Scheid has a B.S. in Aerospace Engineering from Embry-Riddle University and M.S. in Aerospace Engineering from Virginia Tech. He has an 18 year career supporting spacecraft development and operations at NASA GSFC and with the Space Development Agency, as a employee of General Dynamics.

Mr. Glenn Bock has a B.S. in Physics from the University of DE. For the past 20+ years, he has supported the development, integration and test of a significant number of NASA GSFC spacecraft

Mr. Rishab Maharaja has a B.S. in Astronautical Engineering from Cap Tech, a Masters in International Policy and Practice from the George Washington Elliott School of International Affairs and a M.S. in Astronautical Engineering from Cap Tech. He has a 15+ year career in Mission Assurance at NASA GSFC and currently works in Space Policy at the FAA.

Dr. Leana Brown has a B.S. in Economics from UC Boulder, M.S. in Corporate Finance from UC Boulder, a J.D. in Space Cyber and Telecommunications Law and a J.D. in US and International Business and Tax Law from the University of Nebraska-Lincoln. She previously served as legal counsel

to the President o the National Space Society and currently is an Attorney in the Chief Counsel's Office in the FAA Space Regulatory Office.

Mr. John Carrico has a B.S. in Physics from Michigan State University. He has a 40 year career in orbital mechanics. He previously was the lead developer for the AGI/STK Astrogator tool (the primary orbit planning tool for industry) and is now owner and CTO of Space Exploration Engineering (SEE) a company focused on supporting commercial and government customers planning space missions throughout the solar system.

Dr. Conrad Schiff has a B.S. and M.S. in Physics from Carnegie Mellon University and a PhD from the University of MD. He has a 40 year career in orbital mechanics and recently retired as the NASA GSFC Branch Manager for the Flight Dynamics Facility.

Dr. Hasna Banu has a Ph.D. in Applied Math and Theoretical Physics from the University of London. Dr. Banu is a globally experienced professor of mathematics.

Faculty Teaching Assignment Table

Faculty Member	**Courses Taught**
Dr. Nisma M. Omar	MA 114, CH 120
Mr. Jeff Volosin	AE 150, AE 100, AE 361, SDE 57, SDE 458, AE 455, AE 325
Dr. Mohamed Shehata	PH 261, EE 453
Dr. Gregory P. Behrmann	MEC 210, MEC 255, MEC 310, MEC 330, PH 262
Dr. Amelia Wear	MEC 215, EL 100, EL 204
Dr. Andrew Mehri	EL 200, CS 120, CS 150
Dr. Frank Turney	SDE 457, SDE 458, AVT 141
Ms. Suzanne Hall	AVT 255
Ms. Megan Miskovish	EN 101, EN 102, HU 331, SS 351, SS Elective
Mr. Marcel Mabson	AE 250, AE 350
Mr. Robert Scheid	AE 451, AE 456, AE 458
Mr. Glenn Bock	AE 210
Mr. Rishabh Maharaja	AE 400
Dr. Leana Brown	AE 400
Mr. John Carrico	AE 351
Dr. Julie Halverson	AE 454, AE 470, MA 330
Dr. **Conrad Schiff**	PH 263, MA 340
Dr. Hasna Banu	MA 261, MA 262, MA 263

2. Demonstrate how the institution will provide ongoing pedagogy training for faculty in evidenced-based best practices, including training in:

Capitol Technology University is committed to providing ongoing professional development for faculty in evidence-based instructional strategies and emerging educational technologies. The Center for Innovation in Teaching and Learning (CITL) leads these efforts by offering regular workshops, seminars, and individualized consultations focused on improving teaching effectiveness across all delivery modes.

a) Pedagogy that meets the needs of students

New and continuing faculty engage in training that emphasizes student-centered learning, inclusive pedagogy, and formative assessment practices. These efforts are designed to support Capitol's diverse student body, including adult learners, first-generation students, and underrepresented groups in STEM. Faculty are encouraged to integrate active learning, project-based learning, and collaborative techniques to enhance engagement, retention, and learning outcomes.

b) The learning management system

Capitol Technology University utilizes Canvas as its learning management system. All faculty receive onboarding training on Canvas and have ongoing access to instructional design support. Training includes use of Canvas tools for course content delivery, grading rubrics, feedback mechanisms, and learner analytics to support data-informed instruction and student progress monitoring.

c) Evidence-based best practices for distance education, if distance education is offered

Not applicable.

J. Adequacy of Library Resources

(As outlined in COMAR 13B.02.03.12)

1. Describe the Library Resources Available and/or the Measures to Be Taken to Ensure Resources Are Adequate to Support the Proposed Program

Capitol Technology University provides extensive library resources to support the Bachelor of Science in Aerospace Engineering. The university's Puente Library serves as the central hub for physical and digital research materials, providing students and faculty with access to scholarly content, technical databases, and personalized research support.

Library Resources Available:

- **Aerospace and Engineering Databases:** The Puente Library subscribes to authoritative databases such as IEEE Xplore, ScienceDirect, ProQuest Technology Collection, and EBSCOhost Engineering Source. These platforms offer access to peer-reviewed journal articles, aerospace technical reports, space systems research, and engineering conference proceedings.
- **E-books and Digital Journals:** Students can access thousands of aerospace and space systems e-books and journals covering propulsion, orbital mechanics, avionics, autonomous systems, spacecraft design, and related disciplines.
- **NASA and Industry Publications:** The library houses digital and print access to NASA technical documentation, FAA handbooks, and aerospace industry standards relevant to the program's curriculum.
- **Interlibrary Loan Services:** In partnership with the Maryland Digital Library (MDL) and other consortia, students and faculty may request additional resources from external institutions to support coursework and research.
- **Research Instruction and Support:** The Puente Library provides individualized research consultations, discipline-specific research guides, and instructional sessions aligned with engineering and aerospace topics.

Measures to Ensure Adequate Support:

- The library will conduct annual reviews of holdings in collaboration with program faculty to ensure that collections remain aligned with technological advances in aerospace systems and engineering education.
- New resources—including technical manuals, standards, and textbooks on spacecraft systems, control systems, and spaceflight dynamics—will be acquired as needed to support student projects and capstone design.
- Faculty-librarian collaboration will ensure that emerging topics in autonomous systems, flight control, and aerospace integration are adequately represented.
- Access to digital resources will be continuously expanded to ensure parity for both on-campus and online learners in accessing scholarly aerospace content.

K. Adequacy of Physical Facilities, Infrastructure, and Instructional Equipment

(As outlined in COMAR 13B.02.03.13)

1. Provide an assurance that the physical facilities, infrastructure, and instructional equipment are adequate to initiate the program, particularly as related to spaces for classrooms, staff and faculty offices, and laboratories for studies in the technologies and sciences. If the program is to be implemented within existing institutional resources, include a supportive statement by the President regarding adequate equipment and facilities to meet the program's needs.

The B.S. in Aerospace Engineering will be launched using the existing instructional infrastructure and facilities at Capitol Technology University. The university is fully equipped to support the program with modern classrooms, dedicated faculty and staff offices, and specialized laboratories for instruction in electronics, engineering mechanics, propulsion systems, robotics, and spacecraft design.

Instructional Facilities:

- **Classrooms:** Capitol Tech features multimedia-enabled classrooms and smart lecture halls that support theoretical and computational instruction. These are equipped with projection systems, lecture capture tools, and collaborative learning technology.
- **Faculty and Staff Offices:** Faculty supporting the program are housed in the Engineering and Computer Science wings, with dedicated office space for advising, mentoring, and instructional preparation.
- **Engineering and Technology Laboratories:** Students will have access to state-of-the-art labs in electronics, control systems, robotics, and digital design, which are shared across engineering programs to promote interdisciplinary learning.

Aerospace-Specific Resources:

- **Orbital Mechanics and Propulsion Modules:** The program will utilize simulation software and modeling tools for teaching orbital mechanics, spacecraft trajectories, and propulsion analysis. This includes AGI/STK and ai Solutions Freeflyer industry-standard orbital design software hosted in our Cap Tech Control Center.
- **Space Flight Operation Training Center (SFOTC):** The Cap Tech SFOTC, provides the only Maryland academic-focused satellite control center virtual environment for student training on ground systems and operations. Using industry standard software for: mission planning, command/control, trending and offline data management, students learn the end-to-end ground

system and operations skills that directly apply to Maryland based aerospace engineering positions. From NASA GSFC and NOAA Suitland to the Space Telescope Science Institute in Baltimore, student training in this control center has contributed to their ability to jump right in to support these operational facilities.

- **Robotics and Autonomous Systems Lab:** Shared with the mechatronics and aerospace engineering programs, this facility supports instruction in sensor integration, microcontroller programming, and autonomous system navigation.
- **Fusion Innovation Lab:** Shared with other engineering disciplines. This space includes, 3D printers, CNC machines, soldering equipment and a variety of electronic and radio-frequency test units. From high-power rocket construction, to high-altitude balloon build/test facilities to robotic systems and other engineering projects – this lab provides the resources needed to support the hands-on learning our program focuses on.

The university's existing academic and lab infrastructure is sufficient to launch the program without the need for major capital expansion. The President of Capitol Technology University affirms that current institutional resources—including faculty offices, classroom technology, and engineering labs—are adequate to support the Aerospace Engineering program.

2. Provide assurance and any appropriate evidence that the institution will ensure students enrolled in and faculty teaching in distance education will have adequate access to:

a. An Institutional Electronic Mailing System

Capitol Technology University ensures that all students and faculty have continuous access to the university's electronic mailing system, regardless of their learning modality.

- Each user is assigned a secure university email address (e.g., name@captechu.edu).
- The system is hosted on Microsoft Office 365 and supports cloud-based email, calendaring, and file sharing.
- All official academic communication is conducted via this institutional platform to ensure consistency and data security.

b. A Learning Management System that Provides the Necessary Technological Support for Distance Education

Capitol Tech uses **Canvas** as its primary Learning Management System (LMS), providing a robust and flexible platform for hybrid and online course delivery.

Canvas LMS Capabilities:

- **Course Management:** Centralized access to syllabi, lectures, assignments, rubrics, and quizzes.
- **Interactive Tools:** Embedded discussion boards, Zoom video conferencing, multimedia uploads, and integrated feedback features.
- **Mobile Access:** Fully responsive design accessible via mobile app or browser, with offline capabilities.
- **Analytics and Reporting:** Faculty can track student progress, provide early alerts, and support personalized learning interventions.

Canvas is fully integrated into Capitol's academic technology ecosystem and supports the complex needs of engineering education. It will serve as the platform for supplemental instruction, project collaboration, and digital submission of design and analysis assignments in the Aerospace Engineering program.

L. Adequacy of Financial Resources with Documentation

1. Table 1: Resources

The B.S. in Aerospace Engineering will be implemented using existing classrooms, engineering labs, flight dynamics and propulsion facilities, and instructional infrastructure already available at Capitol Technology University. The University's current physical and digital resources will sufficiently support program operations during the initial years, while growth will be matched with additional staffing and equipment investments.

TABLE 1: RESOURCES

Resource Categories	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**
1. Reallocated Funds	$0	$0	$0	$0	$0
2. Tuition/Fee Revenue (c + g below)	$350,060	$707,940	$1,065,072	$1,449,072	$1,851,644
a. Number of F/T Students	8	16	24	32	40
b. Annual Tuition/Fee Rate	$27,808	$28,503	$29,216	$29,946	$30,695
c. Total F/T Revenue (a x b)	$222,464	$465,048	$701,184	$958,272	$1,227,800
d. Number of P/T Students	7	13	19	25	31
e. Credit Hour Rate	$1,519	$1,557	$1,596	$1,636	$1,677
f. Annual Credit Hours	12	12	12	12	12
g. Total P/T Revenue (d x e x f)	$127,596	$242,892	$363,888	$490,800	$623,844
3. Grants, Contracts, and Other Sources	$0	$0	$0	$0	$0
4. Other Sources	$0	$0	$0	$0	$0
TOTAL (1–4)	**$350,060**	**$707,940**	**$1,065,072**	**$1,449,072**	**$1,851,644**

Narrative Rationale for Table 1:

1. **Reallocated Funds**: No existing funds will be reallocated for this program. It will utilize the university's current instructional and administrative resources.
2. **Tuition and Fee Revenue**: Tuition projections are based on enrolling 8 full-time and 7 part-time students in Year 1, increasing steadily to 40 full-time and 31 part-time students by Year 5. Tuition rates assume an annual 2.5% increase.
3. **Grants and Contracts**: No grants or contracts are included at this stage. Capitol Tech may pursue future federal, industry, or workforce development funding related to aerospace education and applied research.
4. **Other Sources**: No other revenue streams are projected, although donations or innovation grants may be pursued later.

2. Table 2: Program Expenditures

TABLE 2: EXPENDITURES

Expenditure Category	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**
1. Faculty (b + c below)	$113,468	$155,071	$238,421	$325,843	$417,486
a. #FTE	1.5	2	3	4	5
b. Total Salary	$94,557	$129,226	$198,684	$271,536	$347,905

c. Total Benefits (20%)	$18,911	$25,845	$39,737	$54,307	$69,581
2. Admin Staff (b + c below)	$5,942	$6,091	$6,244	$6,400	$6,559
a. #FTE	0.08	0.08	0.08	0.08	0.08
b. Total Salary	$4,952	$5,076	$5,203	$5,333	$5,466
c. Total Benefits	$990	$1,015	$1,041	$1,067	$1,093
3. Support Staff (b + c)	$59,885	$92,076	$125,837	$161,230	$198,313
a. #FTE	1	1.5	2	2.5	3
b. Total Salary	$49,905	$76,730	$104,864	$134,358	$165,261
c. Total Benefits	$9,980	$15,346	$20,973	$26,872	$33,052
4. Technical Support/Equipment	$840	$1,425	$2,320	$3,145	$4,140
5. Library	$0	$0	$0	$0	$0
6. New or Renovated Space	$0	$0	$0	$0	$0
7. Other Expenses	$5,850	$14,210	$25,370	$39,330	$56,090
TOTAL (1–7)	**$185,985**	**$268,873**	**$398,192**	**$535,948**	**$682,588**

Narrative Rationale for Table 2:

1. **Faculty**: Faculty salaries and benefits are budgeted based on 1.5 FTE in Year 1, growing to 5 FTE in Year 5, supporting instruction in areas such as flight mechanics, propulsion, orbital systems, and control systems. Mix includes full-time and adjunct faculty.
2. **Administrative Staff**: A fractional FTE (0.08) supports student advising, scheduling, and academic operations. No new hires are needed initially.
3. **Support Staff**: Lab technicians and instructional assistants are crucial to maintaining aerospace labs (e.g., wind tunnels, propulsion test benches, electronics labs). Support staff increase from 1 to 3 FTE as enrollment grows.
4. **Technical Support and Equipment**: Includes software (MATLAB, SolidWorks, XFOIL, etc.), sensors, avionics kits, and materials for propulsion and flight simulation labs. Growth in lab use is matched by increased spending.
5. **Library**: No additional investment required; existing subscriptions and FAA/NASA repositories already support aerospace curriculum.
6. **New or Renovated Space**: Existing lab infrastructure and classrooms are sufficient. No new space is required during the startup period.
7. **Other Expenses**: Includes student recruitment, accreditation preparation, faculty development, project supplies, and professional society memberships (e.g., AIAA).

M. Adequacy of Provisions for Evaluation of Program

1. Procedures for Evaluating Courses, Faculty, and Student Learning Outcomes

Capitol Technology University maintains robust processes for evaluating academic quality and instructional effectiveness across all degree programs, including the proposed Bachelor of Science in Aerospace Engineering.

Courses are evaluated each semester through standardized student course evaluations that measure instructional quality, organization, engagement, and clarity of learning outcomes. These evaluations are administered electronically and results are reviewed by department chairs and the Vice President for Academic Affairs.

Faculty performance is assessed using a combination of methods:

- Student feedback via course evaluations
- Peer classroom observations
- Annual performance reviews conducted by academic leadership

Student Learning Outcomes (SLOs) are assessed systematically at both the course and program levels. Courses mapped to specific ABET Student Outcomes will include embedded assessments (e.g., design projects, lab reports, exams) that are evaluated using standardized rubrics. Assessment results are compiled and analyzed by program faculty during structured assessment meetings, with documented plans for continuous improvement based on findings.

2. Evaluation of Program Educational Effectiveness

The educational effectiveness of the Aerospace Engineering program will be evaluated using an evidence-based framework that integrates academic assessment, institutional research, and strategic oversight. The evaluation process includes:

- **Assessment of Student Learning Outcomes**
  The program will track performance across key learning domains including aerodynamics, propulsion, control systems, systems integration, ethics, and engineering design. SLO data from capstone projects, senior design evaluations, lab performance, and embedded course assessments will be collected each semester and reviewed annually by the program faculty and assessment committee.
- **Retention and Graduation Rates**
  Program-specific student retention and completion rates will be tracked by the Office of Institutional Research. Early intervention systems, such as academic alerts and proactive advising, will be used to support student success and minimize attrition.
- **Student and Faculty Satisfaction**
  Annual surveys will be administered to students and faculty to assess satisfaction with instructional quality, lab resources, academic advising, and program coordination. Results will be analyzed to guide enhancements in curriculum, scheduling, and support services. Industry advisory board feedback will supplement these measures.
- **Cost-Effectiveness**
  The Office of Finance and Academic Affairs will jointly conduct annual cost-effectiveness reviews of the program. These will examine trends in enrollment, instructional cost per credit hour, faculty load, and resource utilization to ensure the program remains fiscally sustainable.
- **External Validation and Accreditation**
  The program will seek ABET accreditation under the Engineering Accreditation Commission (EAC) following its initial graduating cohort. In preparation, the program will align curriculum, assessment methods, and documentation with ABET criteria. Feedback from the Aerospace Advisory Board and industry partners will be integral to ensuring the program meets workforce demands and maintains technical currency.

N. Consistency with the State's Minority Student Achievement Goals

1. **Addressing Minority Student Access and Success, and Advancing Cultural Diversity Goals**

The proposed Bachelor of Science in Aerospace Engineering supports Maryland's strategic priorities to expand educational opportunity, promote equity, and increase the participation of underrepresented groups in STEM disciplines, in alignment with COMAR 13B.02.03.05 and the *Maryland State Plan for Postsecondary Education*.

Capitol Technology University serves a diverse student body and has demonstrated a strong institutional commitment to increasing access and success for historically underrepresented students, including African American, Hispanic, first-generation, female, and veteran populations. The Aerospace Engineering program is designed to further this mission by offering a future-focused, interdisciplinary degree that opens pathways into high-demand aerospace careers.

Key strategies to support minority student achievement include:

- **Inclusive Recruitment and Transfer Access**
  The university maintains articulation agreements with Maryland community colleges, many of which serve highly diverse populations. The program is structured to support smooth transfer pathways for associate degree holders and non-traditional students.
- **Holistic Advising and Mentoring**
  Minority and first-generation students will benefit from individualized academic advising, early alert systems, and targeted mentoring to foster persistence and graduation.
- **Financial Aid and Scholarships**
  Capitol Tech participates in state and federal financial aid programs and provides need-based and merit scholarships to reduce financial barriers for underrepresented and low-income students.
- **Culturally Responsive Instruction**
  Faculty are trained in inclusive teaching practices and Universal Design for Learning (UDL) to ensure classroom instruction supports diverse learning styles and backgrounds.
- **Hands-On, Applied Learning**
  The project-based structure of the curriculum has been shown to enhance engagement and retention for underrepresented groups in STEM. Students will apply aerospace concepts in real-world design challenges and multidisciplinary team projects.
- **Institutional Diversity Initiatives**
  The university supports student affinity groups, cultural programming, and DEI-focused professional development to promote a welcoming and inclusive environment for all students.

By emphasizing access, mentorship, and workforce alignment, the B.S. in Aerospace Engineering directly supports Goal 1 (Student Access) and Goal 2 (Student Success) of the Maryland State Plan. The program strengthens the STEM talent pipeline by preparing a more diverse generation of aerospace professionals equipped to lead in a global, innovation-driven industry.

O. Relationship to Low Productivity Programs Identified by the Commission

1. **Reallocation of Resources from Low Productivity Programs**

The proposed Bachelor of Science in Aerospace Engineering is not a direct continuation or redesign of any program currently identified by the Maryland Higher Education Commission (MHEC) as low productivity. However, the program has been developed as part of Capitol Technology University's

broader strategic initiative to optimize academic offerings and align program development with enrollment trends, institutional capacity, and workforce demand.

Through internal program reviews, the university has identified opportunities to consolidate instructional resources and faculty expertise from narrowly focused or declining engineering and technology programs. These reallocated resources are being redirected into emerging, interdisciplinary areas—such as aerospace systems, flight engineering, and autonomous technologies—that show stronger student interest and labor market relevance.

To support the Aerospace Engineering program, Capitol Technology University will:

- **Share faculty with expertise in dynamics, control systems, propulsion, avionics, and embedded systems** who are currently supporting Astronautical and other Engineering programs.
- **Share existing laboratory infrastructure and instructional resources** with related programs (e.g., Astronautical Engineering, Mechatronics, Electrical Engineering), ensuring cost-effective delivery of lab-intensive courses.
- **Integrate administrative and advising support** into existing structures, maintaining operational efficiency while scaling program offerings.
- **Attract new enrollments** by offering an industry-relevant, multidisciplinary curriculum aligned with federal and state aerospace workforce priorities.

While not officially designated as a replacement for a low-productivity program, the Aerospace Engineering degree represents a thoughtful reallocation and sharing of existing institutional resources to promote academic sustainability, student access, and economic relevance in Maryland's growing aerospace sector.

P. Adequacy of Distance Education Programs

1. Institutional Eligibility for Distance Education

Capitol Technology University is fully authorized by the Maryland Higher Education Commission (MHEC) to offer distance education programs. The university has a strong record of delivering high-quality onine and hybrid instruction across numerous engineering, technology, and management disciplines. Capitol is also an approved member of the National Council for State Authorization Reciprocity Agreements (NC-SARA), allowing the institution to offer distance education to students in all participating states and territories.

2. Compliance with C-RAC Guidelines

Capitol Technology University affirms full compliance with the Council of Regional Accrediting Commissions (C-RAC) guidelines for evaluating distance education. The university maintains the following practices:

- Ensures that the **academic rigor and learning outcomes** of distance-delivered courses are equivalent to those of on-campus instruction.
- Maintains **regular and substantive faculty-student interaction** through synchronous virtual meetings, asynchronous discussion forums, and timely grading with feedback.
- Verifies **student identity** through secure login credentials, proctored assessments, and academic integrity protocols.
- Provides **equitable access to student services** (advising, tutoring, disability services, library access, career support) for all online learners.
- Supports students and faculty with a robust **technology infrastructure**, including a dedicated learning management system (Canvas), 24/7 technical support, and digital collaboration tools.
- Requires **faculty training in online pedagogy and LMS usage** to ensure quality instruction in virtual environments.

Although the Bachelor of Science in Aerospace Engineering will be primarily delivered in an on-campus format—due to the laboratory-based, project-driven nature of its core curriculum—selected general education and technical elective courses may be offered online or in hybrid format. All distance education components will conform to institutional and accreditation standards for instructional quality, accessibility, and student engagement.