

# Kansas State University

Master of Science in Aeronautics

## Program Approval

### I. General Information

**A. Institution** Kansas State University Polytechnic Campus

### B. Program Identification

Degree Level: Master's  
Program Title: Aeronautics  
Degree to be Offered: Master of Science  
Responsible Department or Unit: College of Technology and Aviation/Aviation Department  
CIP Code: 49.0101  
Modality: Hybrid  
Proposed Implementation Date: Spring 2022

Total Number of Semester Credit Hours for the Degree: 30 total credits

**II. Clinical Sites:** Does this program require the use of Clinical Sites? No

### III. Justification

The Master of Science in Aeronautics with options in leadership/policy and Aerospace Certification, is a unique program well connected to emerging industry trends in an industry which is dramatically shifting and has been disproportionately affected by the current global pandemic. These factors present unique challenges in the areas of leadership and policy implementation.

Further, due to industry events in recent years, the aerospace manufacturing sector is calling for a new set of skills to emerge from academia to better support current and forecast workforce needs. The sector most impacted by this recent development is aerospace manufacturing where recent high-profile failures have highlighted a skills gap in the technical area of airworthiness certification. Recently, two major industry standards groups have developed both knowledge/skill standards in airworthiness certification, as well as recommended career pathway guidance. Both standards groups are currently collaborating through a reconciliation effort and KSU is one of several institutions actively engaged in that process.

Both needs point to a necessity for a Master of Science degree in aeronautics with options to support these two industry demands. This program will prepare graduates for leadership and advanced technical positions in the Aviation/Aerospace industry. Students will be prepared to be thought leaders within their spheres of influence proffering unique, resilient solutions aimed at assisting U.S. Aviation/Aerospace industries to maintain their position of global competitiveness.

The M.S.in Aeronautics (M.S.A.) will further the Polytechnic campus mission to bring Kansas State University's high-quality academic programs, research, and public service to the greater global

community to serve workforce, economic, and community development needs. This program is central to the recent campus strategic initiative in aviation.

The M.S. in Aeronautics is also closely aligned with the mission of the refreshed K-State 2025 plan: “By 2025, Kansas State University will be a premier, student-centered, public research university serving communities at home and across the globe through our land-grant mission.” It also supports the following two of seven thematic goals and common elements of K-State 2025:

1. RSCAD- Create a culture of excellence that results in flourishing, sustainable, and widely recognized **research, scholarly and creative activities, and discovery** in a variety of disciplines and endeavors that benefit society as a whole.
2. Graduate Scholarly Experience- Advance a culture of excellence that attracts highly talented, diverse graduate students and produces graduates recognized as outstanding in their respective professions.

Given its close alliance with national industry needs, the program will promote entrepreneurship and vibrant external partnerships in the Aviation/Aerospace industry critical to the economic growth of the state and region.

The KSU Polytechnic campus is currently the only institution in the Kansas Board of Regents System that will offer a Master of Science in Aeronautics. Currently airworthiness certification is an emerging discipline in the field of engineering. The M.S.A. program will focus specifically on airworthiness certification and not aeronautical engineering/aerospace engineering which are different disciplines. Thus, this degree is not duplicated anywhere else in the KBOR system.

This graduate program has been created in direct response to the campus Global Aviation Initiative strategic planning process which aims to raise our competitiveness in the aviation sphere to international prominence. One main element lacking in the establishment of this vision is a research-based graduate program in aeronautics. This program will be aimed at the establishment of thought leadership in the aviation/aerospace industry and will provide the needed expertise, incentive, and opportunity for this campus to be industry influencers across multiple segments of aeronautics.

#### **IV. Program Demand:**

##### **A. Student demand for the program**

This is the only program of its kind in the central U.S., in addition to the fact that central Kansas is a recognized aerospace sector manufacturing node. Students in the B.S. program in Aeronautical Technology at the Polytechnic campus (by far the largest program) will be able to transition into the M.S.A. following graduation. Another characteristic that will drive enrollments nationally and globally is the online availability of the program.

##### **B. Market Analysis**

Demand for graduates with skill sets in both leadership/policy and Aerospace Certification

engineering has been strongly indicated by industry feedback through industry interviews and the results of a survey with over 60 industry respondents. Moving forward beyond the traumatic events of 2020, this industry has a strong need of talented leadership and thought leaders who can help ensure the safety of our National Airspace System in an era of diminished resourcing, environmental sensitivities, disease mitigation and a host of other increasing existential threats.

Our survey of just over 60 industry respondents included alumni, advisory board members, and industry representatives. The survey closed in late May of 2020. Industries represented in these groups ranged from aircraft manufacturers, airlines, and other aviation service industries. Over 85% of those respondents indicated that they either agreed (27%) or strongly agreed (58%) with the intended direction of this degree. Positive respondents commented that this degree would fulfill a large current gap in industry and would provide an increased level of competitiveness for our graduates in the workforce. Companies represented and job titles of respondents (in their own words) in this survey are available on request.

Regarding the second track or option of the M.S. in Aerospace Certification, we in Kansas are uniquely positioned to offer this program with our proximity to Wichita, the Air Capital, being home to a variety of tier 1, 2 and 3 aviation manufacturers (OEMs- Original Equipment Manufacturers). Tier 1 companies are the largest manufacturers while tiers 2 and 3 are progressively smaller supporting companies. This industry is an enormous contributor to the economy of Kansas and has a global impact. It was in a Polytechnic aviation advisory board meeting that the idea for academic involvement in airworthiness skill set was first requested to help fill the skill gap in view of a large wave of looming retirements. This situation has only been worsened by the pandemic, as often the most experienced employees are best-positioned to accept buy-out packages which lower overall payroll obligations and thereby make more room for younger workers.

A survey of aerospace industry data obtained from the Kansas Department of Commerce (EMSI, 2020) indicates the following:

1. Over 87% of the jobs advertised in this sector required at least a B.S. with 37% requiring an M.S. or Ph.D.
2. Kansas is listed in the top 12 states for aerospace manufacturing jobs
3. The average number of nationwide job postings at any one time is approximately 2,500 with an average salary of over \$116,000/year.
4. Over 56% of current employees in this sector are over age 45.
5. Average number of job postings in the sector for the year ending in July 2020 was 6,451 with only 1,479 of those being filled.
6. Of the ten top common job skills listed by employers in these advertisements, the M.S.A program, between both options, as it stands now covers nine of ten of those solidly, with ten of ten, given the right electives.

## V. Projected Enrollment for the Initial Three Years of the Program

Year	Headcount Per Year		Sem Credit Hrs Per Year	
	Full- Time	Part- Time	Full- Time	Part- Time
Implementation	4	7	72	63
Year 2	8	12	120	108
Year 3	14	18	228	162

FT Student = 18 hours/year 1 (includes summer), 12 hours/year 2

PT students = 9 hours/year (includes summer)

## VI. Employment

A trend that is well-established in the aviation sector which is related to higher education in general is the fact that as the general economy declines, enrollments in institutions of higher education, specifically aviation programs in this case, most always increase as people return to gain a new and more current arsenal of skills. It is therefore incumbent on academic programs to more competitively leverage their programs to provide unique value during periods of economic growth to sustain enrollments.

The hybrid delivery format will allow maximum flexibility that compliments a trend toward going directly into the workforce as soon as possible after high school (perhaps with a certificate of skills from a technical school etc.). Those who need, and have become accustomed to, flexible degree offerings may find the online option more appealing as they continue their education into graduate school.

The following figures, taken from state economic modeling data illustrate a high level of demand in the employment market for graduate degree options in the aerospace sector. For example, figure 1 shows that nearly 37% of the position openings in the aerospace industry in 2020 specified the requirement for a graduate degree.

### National Educational Attainment

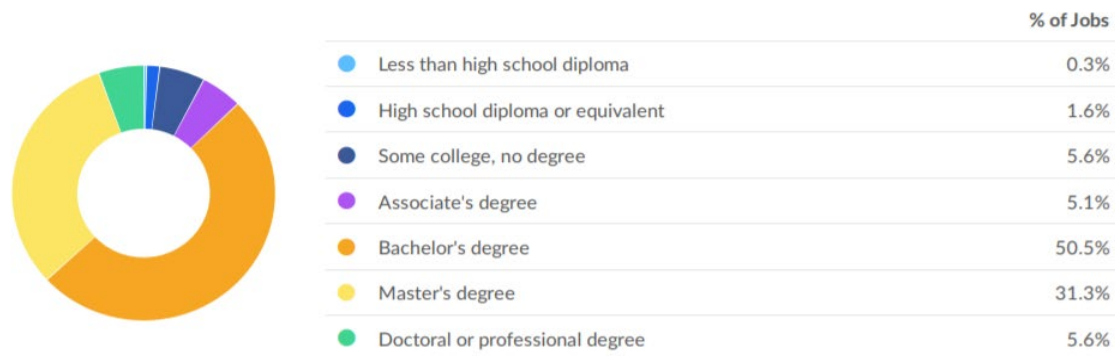
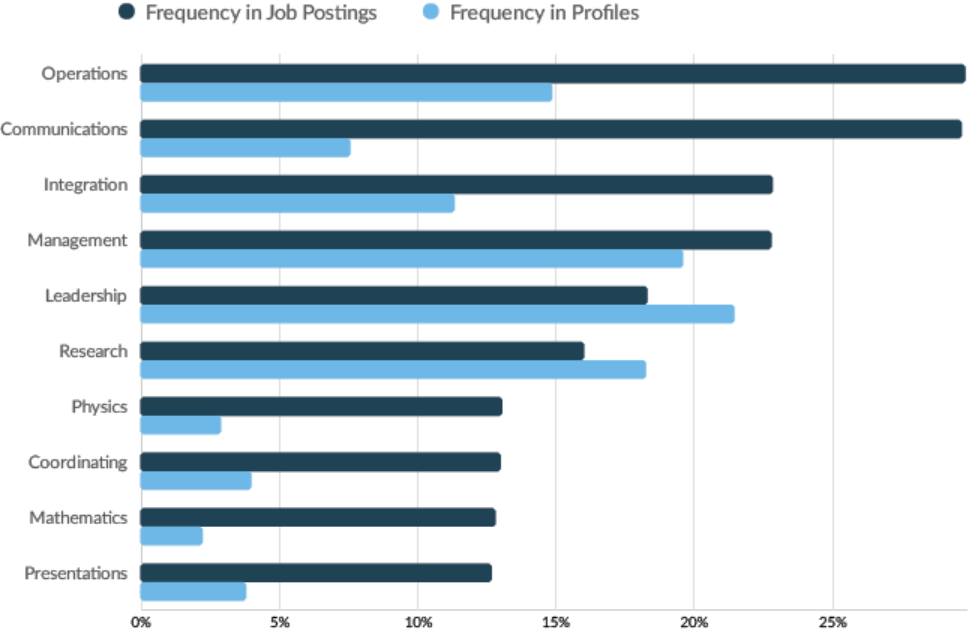


Fig. 1. Comparison of workforce needs by educational training- note that nearly 37% of jobs specified post-baccalaureate education (EMSI, 2020).

A 2020 scan of Aerospace Industry job postings indicated the top ten common skills mentioned in those postings included those listed in Figure 2. With reference to this proposal, the coursework included in the Master of Science in Aeronautics covers nine of those ten subject areas with the exception being physics.

**Top Common Skills**



Skills	Postings	% of Total Postings	Profiles	% of Total Profiles
Operations	27,107	30%	8,048	15%
Communications	26,998	30%	4,086	8%
Integration	20,785	23%	6,137	11%
Management	20,736	23%	10,585	20%
Leadership	16,642	18%	11,607	21%
Research	14,578	16%	9,884	18%
Physics	11,879	13%	1,564	3%
Coordinating	11,829	13%	2,154	4%
Mathematics	11,661	13%	1,208	2%
Presentations	11,552	13%	2,058	4%

*Fig. 2. Top common skills mentioned in aerospace job postings (EMSI, 2020).  
Note the M.S.A. curriculum covers all of these topics with the exception of Physics.*

**VII. Admission and Curriculum**

**A. Admission Criteria**

Admission criteria and entrance requirements will follow the standard requirements outlined in the

Kansas State University Graduate Handbook:

- a. A bachelor's degree from a college or university accredited by the cognizant regional accrediting agency,
- b. Undergraduate preparation in the proposed major field equivalent to that acquired by a graduate of Kansas State University, or evidence of an appropriate background for undertaking an advanced degree program, and
- c. Cumulative grade point average (GPA) of 3.0 or higher on a 4.0 scale or GPA of 3.0 in the last 60 hours of coursework. This GPA is based only on courses graded on a multi-level scale, usually A, B, C, D, F.

Students with undergraduate backgrounds other than aviation or engineering will be admitted conditionally at the discretion of the admissions committee. A 3.0 undergraduate G.P.A. on a 4.0 scale during the last 60 hours of coursework is required for admission. Other material required for admission: Official undergraduate transcripts, two letters of recommendation and a letter expressing personal goals in the completion of this program.

**B. Curriculum**

**Year 1: Fall**

**SCH = Semester Credit**

**Hours**

Course #	Course Name	SCH....
AVT 611	Aviation Regulation & Certification	3
COT 701	Advanced Technical Writing	3

**Year 1: Spring**

Course #	Course Name	SCH....
AVT 707	Research Methods	3
AVT 771	Leadership in the Aerospace Sector	3
	OR	
AVT 841	Management of Aerospace Safety	3

**Year 1: Summer**

Course #	Course Name	SCH....
AVT 722	Aircraft Type Certification	3
AVT 734	Aircraft Production Certification	3
	<b>OR</b> (Above is for Aerospace certification, below is for Leadership option)	
AVT 704	Managerial Finances, Metrics, and Analytics	3
AVT 751	Aerospace Policy	3

**Year 2: Fall**

Course #	Course Name	SCH....
AVT 744	Aviation Human Factors Analysis and Design	3
AVT 841	Management of Aerospace Safety	3

	<b>OR</b> (Above is for Aerospace certification, below is for Leadership option)	
AVT 771	Leadership in the Aerospace Sector	3
AVT	One restricted technical elective from designated list	3

**Year 2: Spring**

Course #	Course Name	SCH....
AVT 838	M.S. Aeronautics Thesis	6
	<b>OR</b>	
AVT 836	M.S. Aeronautics Capstone Project	3
	and elective	3

**Total Number of Semester Credit Hours** ..... **30**

**VIII. Core Faculty**

Note: \* Next to Faculty Name Denotes Director of the Program, if applicable  
 FTE: 1.0 FTE = Full-Time Equivalency Devoted to Program

Faculty Name	Rank	Highest Degree	Tenure Track Y/N	Academic Area of Specialization	FTE to Proposed Program
1. Kurt Barnhart	Professor	Ph.D.	tenured	Aviation	0.5
2. Austin Walden	Assistant Professor	Ph.D.	Y	Aviation	0.5
3. New Hire	Assistant Professor	M.S./Ph.D.	Y	Aviation/Aerospace	1.0
4. New Part-time Hire	Professor of Practice	M.S./Ph.D.	N	Aviation/Aerospace	0.5
Various	PT Adjunct	M.S.	N	Aviation/Aerospace	

Number of graduate assistants assigned to this program ..... **0**

**IX. Expenditure and Funding Sources** (*List amounts in dollars. Provide explanations as necessary.*)

A. EXPENDITURES	First FY	Second FY	Third FY
<b>Personnel – Reassigned or Existing Positions</b>			
Faculty	\$65,000	\$160,000	\$160,000
Administrators ( <i>other than instruction time</i> )			
Graduate Assistants			
Support Staff for Administration ( <i>e.g., secretarial</i> )	\$2,500	\$5,000	\$5,000
Fringe Benefits ( <i>total for all groups</i> )	\$21,600	\$52,800	\$52,800
Other Personnel Costs			

<b>Total Existing Personnel Costs – Reassigned or Existing</b>	\$89,100	\$217,800	\$217,800
<b>Personnel – New Positions</b>			
Faculty	\$50,000	\$200,000	\$200,000
Administrators ( <i>other than instruction time</i> )			
Graduate Assistants			
Support Staff for Administration ( <i>e.g., secretarial</i> )	\$2,500	\$5,000	\$5,000
Fringe Benefits ( <i>total for all groups</i> )	\$16,800	\$65,600	\$65,000
Other Personnel Costs			
<b>Total Existing Personnel Costs – New Positions</b>	\$69,300	\$270,600	\$270,600
<b>Start-up Costs – One-Time Expenses</b>			
Library/learning resources			
Equipment/Technology	\$2,000	\$2,000	\$4,000
Physical Facilities: Construction or Renovation			
Other			
<b>Total Start-up Costs</b>	\$2,000	\$2,000	\$4,000
<b>Operating Costs – Recurring Expenses</b>			
Supplies/Expenses	\$100	\$200	\$200
Library/learning resources			
Equipment/Technology	\$100	\$200	\$200
Travel	\$180	\$360	\$360
Other			
<b>Total Operating Costs</b>	\$380	\$760	\$760
<b>GRAND TOTAL COSTS</b>	\$160,780	\$491,160	\$493,160

<b>B. FUNDING SOURCES</b> <i>(projected as appropriate)</i>	Current	First FY (New)	Second FY (New)	Third FY (New)
Tuition / State Funds		\$56,943	\$96,170.40	\$164,502
Student Fees		\$0	\$0	\$0
Other Sources		\$50,000	\$50,000	\$50,000
<b>GRAND TOTAL FUNDING</b>		\$106,943	\$146,170	\$214,502



<b>C. Projected Surplus/Deficit (+/-)</b> (Grand Total Funding <i>minus</i> Grand Total Costs)		(\$53,837)	(\$344,990)	(\$278,658)
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**X. Expenditures and Funding Sources Explanations**

**A. Expenditures**

**Personnel – Reassigned or Existing Positions:** A combined 1.0 FTE will come from faculty members 1 and 2 in section VIII of this document. Faculty will be reassigned in the second half of the 2022-23 Academic Year.

**Personnel – New Positions:** 2 New faculty positions are anticipated by year 2, The first at 1.0 FTE assigned to MSA and the second at .5 FTE assigned to MSA. A varying number of adjunct instructors will be critical to the success of this program from the standpoint of content currency and relevancy and will share the teaching load.

**Start-up Costs – One-Time Expenses:** Limited to computer and office equipment.

**Operating Costs – Recurring Expenses:** Limited to office costs and travel

**B. Revenue: Funding Sources**

A combination of Tuition/State Funding + \$50,000 in annual program startup funding from central administration in Manhattan. Using SCH at \$421.80/credit hour at in state tuition:

- Year 1 = \$421.80 x 135 full and part time students = \$56,943,
- Year 2 = \$421.80 x 228 full- and part-time students = \$96,170.40
- Year 3 = \$421.80 x 390 full- and part-time students = \$164,502.

**C. Projected Surplus/Deficit**

Program enrollments are expected to increase significantly after year three as reputation builds. Break-even and surplus revenue should occur in year four or five.

**XI. References**

**Economic Modeling Specialists International (EMSI). (2020). Third Quarter 2020 Report for Aerospace Engineers. (Provided by Kansas Department of Commerce.)**