UAS – Flight and Operations Assessment Report 2019 - 2020

1. Written communication

SLO: Students will demonstrate the ability to communicate clearly and effectively.

Assessment tool: Final written report in AVT 497: Senior Project (offered in Fall and Spring). Students are assessed on their written communication using their grade on the final written report in AVT 497: Senior Project, which they are required to complete during their senior year. Scoring on this assignment is based on content, organization, writing mechanics (grammar, spelling, punctuation, *etc*.), incorporation of relevant sources from the literature to support the student's ideas, and effective use of figures, charts, and graphs.

Data:

	Written Communication (AVT 497 UAS-FO Students Only)					
	A	B	C	Unacceptable	Incomplete	Total
2019-2020	5	3	1	1	1	11
2018-2019	2	5	1	1	0	9
2017-2018	1	4	6	3	0	14

Reflection: The data collected over two semesters this academic year show a marked improvement in performance from previous years, now averaging in the high "B" range. The UAS faculty believe that students could still benefit from increased writing practice and instructor feedback in UAS program courses. Our instructors continue to increase the number and rigor of writing assignments in courses leading up to AVT 497 in order to give students more opportunities to practice their writing skills during their academic program.

2. Oral communication

SLO: Students will demonstrate the ability to communicate clearly and effectively.

Assessment tool: Final oral presentation in AVT 497: Senior Project (offered in Fall and Spring). Students are assessed on their oral communication using their grade on the final oral presentation in AVT 497: Senior Project, which they are required to complete during their senior year. Scoring on this assignment is based on content, delivery, use of visual aids, and students' proficiency in fielding questions from the audience.

Data:

	Oral Communication (AVT 497 UAS-FO Students Only)					
	A	B	C	Unacceptable	Incomplete	Total
2019-2020	6	3	1	0	1	11
2018-2019	1	7	0	0	1	9
2017-2018	8	5	1	0	0	14

Reflection: Students performed very strongly on their senior capstone project presentations this academic year. We believe this reflects a renewed focus on presentation skills in other courses (UAS 270 and UAS 387, in particular). Additionally, students gave their presentations this semester in a videoconference format, which may have increased their level of comfort and confidence during their presentations.

3. **Critical thinking**

SLO: Students will demonstrate the ability to access and interpret information, respond and adapt to changing situations, make complex decisions, solve programs, and evaluate actions.

Assessment tool: Semester project final presentation in UAS 475: Data Acquisition and Post-Processing (offered in Spring). This project requires students to identify an aerial data collection project, conduct a literature review, conduct an aerial survey with UAS to collect data (usually in the form of imagery), manage the data, and process it into an information product.

Data:

	Critical Thinking: Data Processing (UAS 475: Data Acquisition)					
	A	B	C	Unacceptable	Incomplete	Total
2019-2020*	0	0	0	0	11	11
2018-2019	7	4	0	0	0	11
2017-2018	4	4	0	0	0	8
2016-2017	7	0	0	1	0	8

*An alternative assessment was used in 2019-2020 due to COVID-19.

Reflection: Students were unable to complete the usual semester project in UAS 475 during Spring 2020, which limited the effectiveness of this assessment. A substitute assessment was used this year to provide some indicator of students' critical thinking and data processing skills. This assessment was an assignment that asked students to quantitatively assess the accuracy of a land cover classification they had performed using a satellite image. The students compared and contrasted UAS-based and satellite-based imagery, considered what type of statistical sampling scheme might work best for assessing their data, and created a confusion matrix to quantify the overall accuracy of their classification. This assignment required significant critical thinking, and we decided it would be a suitable alternative assessment for this AY. The students performed very well on this assignment, effectively demonstrating their critical thinking and aerial data processing skills.

4. **Diversity**

SLO: Students will demonstrate awareness and understanding of the skills necessary to live and work in a diverse world.

Assessment tool: Two teamwork projects in UAS 470: Flight and Field Operations. The project broke the class into teams of two people as designated by the instructor. The project involved researching a use case in which an advanced UAS operation benefits society. On one project, a student will serve as pilot in command, with the other supporting, and it is reversed for the next project.

Data:

	Diversity (UAS 470: Flight and Field Operations)					
	A	B	C	Unacceptable	Incomplete	Total
2019-2020	11	2	0	0	0	13
2018-2019	8	1	0	0	0	9

Reflection: This outcome was assessed for the first time during Fall 2018 in UAS 470, then assessed again in the Fall of 2019. The assessment tool was a teamwork-focused UAS mission presentation. Student performance was excellent. UAS 470 is part two of an advanced UAS sequence with UAS 461. Based on approved changes to the curriculum, this series will now be UAS 471/472, and this assessment will be conducted In UAS 471. As the sequence is under redesign, ideas are being discussed for improving the depth and rigor of this assessment.

5. **Academic and Professional Integrity**

SLO: Students will demonstrate awareness and understanding of the ethical standards of their academic discipline and/or profession.

Assessment tool: Ethics training assignment in UAS 387: Crew Resource Management. Students are tasked with considering ethical questions for a UAS company and creating a training program for their UAS crew resource management department. The grade on this assignment is used as the assessment indicator.

Data:

	Academic and Professional Integrity (UAS 387: Crew Resource Management)					
	A	B	C	Unacceptable	Incomplete	Total
2019-2020	8	0	0	0	0	8
2018-2019	8	0	0	0	0	8

Reflection: All students achieved an "A" grade on this assignment, indicating that the SLO had been met. Efforts will be made during the Spring 2020 iteration of UAS 387 to continue to develop this assignment and increase its rigor to improve assessment.

6. **Knowledge**

SLO: Students will demonstrate a depth of knowledge and apply the methods of inquiry in a discipline of their choosing, and they will demonstrate a breadth of knowledge across their choice of varied disciplines.

Assessment tools: There are five areas of knowledge assessment in the UAS – FO program—UAS maintenance, UAS flight proficiency, data processing, aviation regulations, and UAS design and construction. The knowledge SLO will be reported using assessments based on these program-level knowledge outcomes.

6.1 UAS maintenance:

SLO: Students will demonstrate knowledge of aviation maintenance regulations and practices as they relate to UAS.

Assessment tools: Embedded Assessment (UAS 275: Small UAS Maintenance) – Aircraft Maintenance Regulations and Aircraft Systems Assignment. The scoring tool of this assignment is based on three levels of student demonstration of the KNOWLEDGE Learning Outcome: Exceeds standard; Meets standard; Does not meet standard. Assignment scores are derived from student ability to summarize current aviation maintenance regulations, interpret Academy of Model Aeronautics policy, differential operating systems/subsystems of manned and unmanned aircraft, etc.

Data:

	Knowledge 6.1: UAS Maintenance (UAS 275: Small UAS Maintenance I)					
	A	B	C	Unacceptable	Incomplete	Total
2019-2020	5	0	0	0	0	5
2018-2019	Data was not collected this AY					
2017-2018	13	0	0	0	0	13

Reflection: All 5 students were given the lecture on finding and filling out required FAA publications related to SUAS Maintenance. The students were given an assignment to orally communicate and complete write up during the rebuild of a UAS about the operating systems and subsystems of a UAS and if a part were broken or needed replaced, where in the operating manual do you find that system and what publication and write-ups must be completed per FAA.

6.2 UAS flight proficiency:

SLO: Students will demonstrate proficiency in multirotor and fixed-wing UAS flight operations.

Assessment tools: Final flight evaluation in UAS 115: Multirotor Flight Lab; Final flight evaluation in UAS 357: Unmanned Aircraft Fixed-wing Flight Lab. Students are assessed on their proficiency in various flight maneuvers representative of those used in professional UAS flight operations—takeoffs, landings, turns, figure-8s, unusual attitude recovery, *etc*., using both multirotor (UAS 115) and fixed-wing (UAS 357) unmanned aircraft.

Data:

	Knowledge 6.2.1: Multirotor Flight Proficiency (UAS 115: Mult. Flt. Lab)					
	A	B	C	Unacceptable	Incomplete	Total
2019-2020	0	0	0	0	14	14
2018-2019	16	0	0	0	0	16
2017-2018	9	5	1	0	0	15

	Knowledge 6.2.2: Fixed-Wing Flight Proficiency (UAS 357: Fixed-Wing Flt. Lab)					
	A	B	C	Unacceptable	Incomplete	Total
2019-2020	0	0	0	0	2	2
2018-2019	8	0	0	0	1	9
2017-2018	6	0	1	1	0	8

Reflection: This semester, COLFEE funds were used to purchase new external pilot trainers for UAS 357. This in combination with modifications to curriculum has increased the overall student performance. The new UAS have also provided a higher level of confidence in students. Incompletes were given this semester due to COVID-19. When able, students intend to complete the remaining lessons over the 2020 summer session.

UAS 115 students were making good progress towards flight proficiency when the COVID-19 shutdown took place, making it impossible for them to complete their flight training. All students were given incomplete grades until training can be resumed this summer and fall. We will update the assessment data tables as students complete their flight training.

6.3 Data processing:

SLO: Students will demonstrate knowledge of and proficiency in the data-to-information conversion process as it relates to low-altitude aerial datasets collected using UAS.

Assessment tools: Semester project final presentation in UAS 475: Data Acquisition and Post-Processing (offered in Spring). This assessment uses students' scores on the semester project final presentation in UAS 475: Data Acquisition and Post-Processing. This project requires students to identify an aerial data collection project, conduct a literature review, conduct an aerial survey with UAS to collect data (usually in the form of imagery), manage the data, and process it into an information product. This assessment overlaps with the university-level critical thinking SLO. A temporary substitute assessment was used in AY 2019-2020. Please see the reflection section below for more information.

Data:

	Knowledge 6.3: Data Processing (UAS 475: Data Acquisition)					
	A	B	C	Unacceptable	Incomplete	Total
2019-2020*	9	0	0	0	2	11
2018-2019	7	4	0	0	0	11
2017-2018	4	4	0	0	0	8
2016-2017	7	0	0	1	0	8

*An alternative assessment was used in 2019-2020 due to COVID-19.

Reflection: Students were unable to complete the usual semester project in UAS 475, which limited the effectiveness of this assessment. A substitute assessment was used in UAS 475 this year to provide some indicator of students' critical thinking and data processing skills. This assessment was an assignment that asked students to quantitatively assess the accuracy of a land cover classification they had performed using a satellite image. The students compared and contrasted UAS-based and satellite-based imagery, considered what type of statistical sampling scheme might work best for assessing their data, and created a confusion matrix to quantify the overall accuracy of their classification. This assignment required significant critical thinking, and we decided it would be a suitable alternative assessment for this AY. The students performed very well on this assignment, effectively demonstrating their critical thinking and aerial data processing skills.

6.4 Unmanned aviation regulations:

SLO: Students will demonstrate knowledge of U.S. federal aviation regulations as they relate to UAS.

Assessment tools: Remote Pilot Certificate exam from the FAA, which is required during UAS 115. Students report to their instructor whether they passed or failed this exam, which is the industry standard measure for commercial remote pilots.

Data:

	Knowledge 6.4: Aviation Regulations (Assessed in UAS 115: Mult. Flt. Lab)			
	Pass	Fail	Incomplete	Total
2019-2020*	16	0	2	18
2018-2019	9	0	1	10
2017-2018	15	0	0	15

*An alternative assessment was used in 2019-2020 due to COVID-19.

Reflection: It became necessary to use an alternative assessment this year because FAA testing centers were closed due to the COVID-19 pandemic. Students were asked to take an online practice test that simulated the FAA remote pilot examination. Every effort was made to maintain consistency with the FAA exam. Students will still need to complete the FAA exam when testing centers reopen. The overall performance on the practice exam was excellent, and all students who

attempted the exam achieved passing scores. Two students did not take the exam, and were therefore placed in the "incomplete" category.

6.5 UAS design and construction:

SLO: Students will demonstrate knowledge of small UAS design and construction techniques.

Assessment tools: Autopilot integration assignment in UAS 465: Autopilot Integration. This assignment is the final "build check" that assesses the quality of the student's aircraft construction and autopilot hardware integration. Students are checked on their aircraft's center of gravity, presence of required hardware components, organization of wiring, and function of autopilot hardware.

Data:

	Knowledge 6.5: Design and Construction (UAS 465: Autopilot Integration)					
	A	B	C	Unacceptable	Incomplete	Total
2019-2020	0	0	0	0	10	10
2018-2019	14	0	0	0	1	15
2017-2018	11	1	1	1	0	14

Reflection:

The COVID-19 pandemic caused our UAS student lab to be closed, which prevented students from completing their autopilot integration assignments and subsequent "build checks." All students in UAS 465 were given incomplete grades, and the assessment data will be updated when these students are able to return to the lab to complete their assignments this summer and fall.

Program Improvement
Rubric improvement for AY 2020-2021
Work with the Director of Enrollment Management to identify and implement recruitment strategies leading to increased enrollment in our program.

Future Plans
Evaluate the need for seeking accreditation from AABI