

Aviation Management Capstone: An Industry-Centered Academic Experience

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Abstract

The Aviation Management Capstone course (AMT 491) at Arizona State University East has been developed to provide students with an industry-centered educational experience during the final phase of their Bachelor of Science degree program. Students normally enroll for the Aeronautical Management Technology (AMT) Capstone course during the spring semester of their senior year. Each student is assigned as a member of a two or three-member team to work closely with an industry sponsor throughout the term. Students must coordinate their activities to address a significant and challenging issue facing the manager within the sponsor's organization. Each sponsor commits to a mentorship role for the student team(s) assigned to the organization, while at the same time, serving as the manager who is responsible for personnel performance within his/her department and/or division.

The AMT Capstone course provides each student with real-world exposure to problems and issues faced by line and staff managers across a wide variety of aviation-oriented disciplines. Recently completed capstone team projects include: evaluations of current and pending Federal Aviation Administration (FAA) regulations and procedures for the Civil Aviation Security Field Office (CASFO), training requirements analyses for Mesa Airlines, marketing strategies for Williams Gateway Airport Authority, process improvement analyses for Honeywell, alternative fuels analyses for ground transportation serving Phoenix Sky Harbor International Airport (PHX), and gate expansion analyses for Southwest Airlines at PHX. Since the inception of the AMT Capstone course, 38 industry-sponsored projects have been completed for 16 different industry sponsors, with 10 more projects scheduled for the Spring 2001 semester. A description of selected capstone projects, with corresponding peer and project sponsor evaluations, are included in this paper.

Background

The Aviation Management Capstone course has been developed during the past four years at Arizona State University East to satisfy various demands from academia, the aviation industry, and the Council on Aviation Accreditation (CAA) for enhanced student exposure to real-world business principles before students complete their Aeronautical Management Technology degree

programs. A central component of a successful AMT 491 capstone experience is the commitment by industry sponsors to guide and direct student involvement as an integral component of their continuing organizational activities. This sponsorship is completed *without monetary commitment* to or from industry personnel, other than the commitment of time and effort from industry leaders and managers as they host student teams during the semester. Students benefit from direct industry involvement in a variety of ways. Some examples of this value-added educational approach include:

- 1) Working directly with senior managers to define specific project objectives.
- 2) Participation in mentoring programs led by technical experts in the organization.
- 3) Use of organizational resources to accomplish the specified tasks.
- 4) Participation in multi-disciplinary, project-centered activities.
- 5) Recognition of feasible solution sets under constrained resource conditions.

Each student in the capstone course is a key participant on a small team formed to address a specific problem (or set of problems) faced by the sponsoring organization. The student team is comprised of 2 to 3 people, without regard to previous teaming relationships or friendships developed during the period of their academic experience. The student team must join forces to address specific needs of the customer. In so doing, they are able to achieve a high degree of understanding regarding organizational resources, task coordination problems, scheduling and resource constraints, and personality differences that affect the project outcome. In order to complete this project-centered approach to the capstone experience and the corresponding academic requirement for AMT 491, the students are required to:

- 1) Help define the problem for the customer.
- 2) Allocate time and material resources to adequately address the problem.
- 3) Identify tools and resources needed to complete the job effectively.
- 4) Conduct a thorough tradeoff analysis of identified alternative solutions.
- 5) Develop a professional report for the customer and for the instructor of record.

Capstone Course Requirements

The capstone course for the Airway Systems Management concentration at ASU East is designed to enhance the student's academic program and to help them develop and test some of the essential skills required in today's business environment. The Aviation Management Capstone course was developed, in part, to meet the needs of the AMT department as part of the CAA accreditation process. More importantly, it was designed to expose students to real-world management problems, constraints, and performance issues before they face them in the actual job environment. Following an extensive review and revision of the entire Aeronautical Management Technology curriculum, AMT 491 was first offered during the Spring 1997 semester as an omnibus course (AMT 494). At that time, all AMT courses were evaluated and several courses were modified to meet the changing needs of the aviation industry. These needs were based on a review of requirements cited by aviation industry experts (including members of the Aeronautical Management Technology department Industry Advisory Board), the faculty,

and from criteria specified in CAA accreditation guidelines. The CAA aviation management capstone course guidelines, under the Aviation Management Option states:

Focus

This area **MUST** be defined by the institution and **SHOULD** provide preparation for a career. It **SHOULD** provide depth and special expertise in a particular area, and **SHOULD** be carefully developed with advice from industry associations and professionals in the field. Additional management and other support courses may be used, but the capstone requirement **MUST** deal with material that is unique to the desired area of focus in the aviation industry.¹

These clearly defined CAA curriculum specifications provided the faculty with the necessary structural components around which the Aviation Management Capstone experience could be developed. Based on feedback from students and sponsors alike, AMT 491 is continually being modified to maximize the benefit for management students who come to the AMT program from a wide range of academic backgrounds. While some students are interested in traditional management philosophies, others are more interested in non-traditional management tools and techniques. Regardless of the student's area of interest, however, the capstone course provides a flexible and dynamic template which can be tailored to meet the individual student's educational goals and objectives. This learner-centered approach provides the faculty and the student with a powerful educational tool to prepare the students for the real-world, high-technology workplace.

Capstone Sponsors

The capstone experience allows the instructor to customize the academic experience for each student within the range of sponsored activities. For example, during the Spring 2000 semester (the fourth year of the capstone course) nine industry sponsors volunteered to host ten separate student teams throughout the term. The sponsors included America West Airlines, Mesa Airlines and Southwest Airlines, all located at Phoenix Sky Harbor International Airport, two units from Boeing, the Federal Aviation Administration (FAA) Civil Aviation Security Field Office (CASFO), Honeywell, Williams Gateway Airport Authority (WGAA), Royal Aviation, and the City of Phoenix Transportation Department. The complete list of industry sponsors and their capstone project support roles during the Spring 2000 semester are described in Table 1. Each student team was assigned specific project tasks in cooperation with a manager at the sponsor organization. Each sponsor agreed to host the student team and to facilitate their information and data collection needs during the term of the project. Students were required to identify specific resources needed to complete their assigned tasks in the timeframe available. In addition to the project activities, students met weekly with the entire class to participate in a mandatory management presentation, based on the extensive work of Kerzner.² This publication is 24 chapters in length and covers 1180 pages of detailed information, yet the student teams are able to complete the entire textbook as part of their project management experience. Time commitments and time management skills are emphasized to the student teams throughout the term. Students are required to use a wide range of skills they have learned during their

educational program or to develop those skills that they may be deficient in, in order to meet the needs of the sponsor. To accomplish these challenging objectives, students are expected to invest from 12 to 16 hours *outside of class* working with the industry sponsor and his/her staff to develop well structured recommendations to solve specific project issues.

Table 1. Capstone Sponsored Projects - Spring 2000

Host Sponsor	Student Project	Students Assigned
America West Airlines	Flight Crew Training Analysis	3
Honeywell	Aviation Services - Distribution Cost Analysis	2
Williams Gateway Airport Authority	Telecommunications Requirements Analysis	2
Mesa Airlines	Ground Operations/Safety Analysis	2
Boeing	Flight Operations Procedures Analysis	2
Southwest Airlines	Terminal Expansion Analysis	2
City of Phoenix Transportation Department	Ground Congestion Analysis - Sky Harbor Airport	2
Royal Aviation	Organizational Effectiveness Evaluation	2
Boeing	Product Data Management Analysis	2
FAA - CASFO	Field Security Measures	2

Each sponsor agreed to provide one or more senior level managers to serve as mentors and hosts for each student team assigned to the organization. During the first year, only one student team was assigned to a given sponsoring organization, but in the second year and subsequent years, this procedure was eased to allow the host organization to support one, two, or three teams, depending on their individual requirements. This opportunity to expand the depth and breadth of the capstone experience was a direct result of the positive comments and continued support of industry sponsors from the first year experience.

Expectations of Capstone Students

The students were briefed on the scope of the course requirements, including the capstone projects, and the instructor's expectations for their successful completion by the end of the term. These expectations included:

- ✓ Attendance at all scheduled class meetings
- ✓ Participation in all class discussions
- ✓ Presentation of two chapters (minimum) from the selected management textbook ^a
- ✓ Completion of a case study analysis from the selected management textbook
- ✓ Coordination with industry sponsors
- ✓ Definition of project objectives

- ✓ Collection and analysis of project data
- ✓ Presentation of Project Results to Class ^a
- ✓ Presentation of Project Results to Sponsor ^a
- ✓ Delivery of Final Report to Sponsor
- ✓ Delivery of Final Report to Instructor

^a - All student teams must be professionally attired during each presentation.

Each of these requirements were clearly specified and reinforced throughout the term, leaving little room for alternative interpretations by any of the student teams.

The capstone course structure is used as a forum to expose the students to real-world requirements, constraints, problems, opportunities, and results by placing them in a responsible position where their combined efforts are needed to meet the customer objectives. In this regard, the students were acting as pseudo-consultant teams to the sponsoring organization and the instructor served as the consultant group manager. Issues faced by students were addressed in *closed consultant-company meetings* (regularly scheduled class meetings) where individual consultant teams discussed problems faced in their project. Other project team members could then offer their own approaches, recommendations, or solutions to the stated problems. This open discussion facilitated a strong student-to-student and student-to-instructor synergy, which improved the final product for all ten capstone teams. As the semester progressed, several business issues were addressed, consistent with typical project management issues cited by various authors, including Kerzner ², Babcock ³, Cook and Russell ⁴, and Mitchell and Larson ⁵. An example of these problems and issues include:

- ✓ Inadequate resource allocation
- ✓ Insufficient data on which to base decisions
- ✓ Inappropriate data formats
- ✓ Inexperience with computerized analysis tools
- ✓ Insufficient time available to complete tasks
- ✓ Difficulty scheduling participant meeting times
- ✓ Poorly defined goals and objectives

As each team worked on their individual projects to identify and locate the requisite project resources, the capstone class as a whole benefited from the discussions, which ensued throughout the semester.

Evaluation Methodology

The Aviation Management Capstone course structure was centered around the individual industrial partnership projects and as such, a traditional classroom evaluation methodology using examinations and quizzes was impractical and would unfairly bias some student's performance based on previous academic backgrounds. In order to standardize the evaluation procedure, a project-centered evaluation protocol was developed. This procedure was based on a three-part evaluation process wherein the instructor developed an evaluation tool for instructor use only

(see Figure 1), for the industry sponsor to use, (see Figure 2), and one for the students. The student's peer-to-peer evaluation form is not shown in this paper, however, it is available by contacting the author directly. Each form was designed to provide the instructor with a consistent means of scoring individual students and group project efforts. For completeness, the results of the Spring 2000 evaluation methodology for both the instructor and the sponsors evaluations are shown in Table 2.

Table 2. Instructor and Sponsor Evaluation Results

Instructor Evaluation	Topic 1	Topic 2	Topic 3	Topic 4	Topic 5	Topic 6	Topic 7	Topic 8	Topic 9	Topic 10
Student 1	3	3	2	3	2	2	2	2	3	3
Student 2	4	4	4	5	4	5	4	4	5	5
Student 3	4	4	4	5	4	5	4	4	5	5
Student 4	5	5	5	5	5	5	5	5	5	5
Student 5	5	5	5	5	4	5	5	5	5	5
Student 6	5	5	5	5	5	5	5	5	5	5
Student 7	4	5	4	5	4	5	5	4	4	5
Student 8	5	5	5	5	5	5	5	5	5	5
Student 9	3	3	4	4	3	4	4	5	4	4
Student 10	5	5	5	5	5	5	5	5	5	5
Student 11	4	4	5	5	4	5	5	4	5	5
Student 12	4	5	5	5	5	5	5	5	5	5
Student 13	5	5	5	5	5	5	5	5	5	5
Student 14	4	4	5	5	4	5	5	4	5	5
Student 15	4	5	5	5	5	5	5	5	5	5
Student 16	4	4	3	4	4	4	4	4	4	4
Student 17	5	5	5	5	4	5	5	5	5	5
Student 18	3	3	2	3	3	2	2	2	3	3
Student 19	3	3	4	4	3	4	4	5	4	4
Student 20	4	5	4	5	4	5	5	4	4	5
Student 21	4	4	3	4	4	4	4	4	4	4

Sponsor Evaluation	Topic 1	Topic 2	Topic 3	Topic 4	Topic 5	Topic 6	Topic 7	Topic 8	Topic 9	Topic 10
Team 1	5	4	0	5	0	4	3	3	5	5
Team 2	5	5	5	5	5	5	5	5	5	5
Team 3	3	4/2	4/2	4/3	3	3	0	3	4/3	3
Team 4	4	5	4	5	3	4	4	3	5	5
Team 5	5	5	5	5	5	5	5	5	5	5
Team 6	4	5	4	5/3	4	4/3	4/3	4	4	5/4
Team 7	4/0	4/0	4/0	4/0	5/0	4/0	4/0	4/0	4/0	4/0
Team 8	5	2	3	5/4	2	5	4	4	4/5	3/4
Team 9	4	4	3	5	3	4	3	3	5	5
Team 10	5	5	5	5	5	5	5	5	5	5

Legend:		
Excellent = 5	Above Average = 4	Average = 3
Below Average = 2	Unsatisfactory = 1	Not Observed = 0
/ - Indicates Sponsor Assigned Individual Scores to Students on the Team		

The student peer-to-peer evaluations were based on a 300 point system wherein each student could assign any combination of points to the team members (including themselves) as long as the combined total equaled 300 points. Most team members who shared the project responsibilities graded each team member with an equal split of the available points. For those teams where one (or more) students felt their share of the effort was worth more (or less) than that of their team member(s), the points could be adjusted accordingly. Table 3 shows the results of this peer-to-peer evaluation effort for AMT 491. These combined evaluation tools permit the instructor to use *any, all, or none* of the information from the forms as the situation dictates in evaluating his/her students and assigning the appropriate grade for the course. When used

consistently, this evaluation method results in a fair and impartial means to quantify student performance, even without traditional in-class or take-home examinations.

Table 3. AMT 491 Peer-to-Peer Evaluation Results - Spring 2000

Peer-to-Peer Evaluation	Self Evaluation	Team Member 1	Team Member 2
<i>Student 1</i>	130	170	X
<i>Student 2</i>	150	150	X
<i>Student 3</i>	150	150	X
<i>Student 4</i>	100	100	100
<i>Student 5</i>	150	150	X
<i>Student 6</i>	150	150	X
<i>Student 7</i>	130	170	X
<i>Student 8</i>	150	150	X
<i>Student 9</i>	150	150	X
<i>Student 10</i>	100	100	100
<i>Student 11</i>	150	150	X
<i>Student 12</i>	150	150	X
<i>Student 13</i>	100	100	100
<i>Student 14</i>	150	150	X
<i>Student 15</i>	160	140	X
<i>Student 16</i>	250	50	X
<i>Student 17</i>	150	150	X
<i>Student 18</i>	150	150	X
<i>Student 19</i>	150	150	X
<i>Student 20</i>	275	25	X
<i>Student 21</i>	150	150	X

Note: An "X" in the fourth column denotes only two members on the team

Summary

Student and industry participants alike have responded positively to the AMT 491 capstone experience. Several students have been offered starting positions with sponsoring organizations as a direct result of the capstone experience. This, above all else, points to the success of the AMT 491 - Aviation Management Capstone course. Another indicator of success is the repeat sponsorship from ten of the total sixteen sponsors. Two of the industry sponsors have supported the capstone course each semester since its inception. Williams Gateway Airport Authority has hosted seven teams and the FAA - CASFO office has sponsored six teams since AMT 491 began in 1997. New sponsors have been added each term, as business demands for previous sponsors limit their ability to host a student team for a given semester. Continued interest and support from current and previous industry sponsors is anticipated, based on written and verbal feedback received from participating managers. The Aviation Management Capstone course is proving to

be a strong component of the Aeronautical Management Technology academic program at Arizona State University East and it is expected that this trend will continue for years to come.

Bibliography

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Arizona State University East
Sponsor Evaluation Form
Department of Aeronautical Management Technology
 Aviation Management Capstone - AMT 491
 Spring 2000

Student Project: _____ Supervising Manager: _____ Phone Number: _____	Team Member: <u>Student 1</u> Team Member: <u>Student 2</u>					
Evaluation Item	5	4	3	2	1	0
Please Rate Your Student Team on the Following Items	Excellent	Above Average	Average	Below Average	Unsatisfactory	Not Observed
1. Interest in Project						
2. Student Availability						
3. Responsiveness						
4. Attitude/Motivation						
5. Time Management Skills						
6. Quality of Work						
7. Knowledge of Business Principles						
8. Attention to Detail						
9. Willingness to Learn						
10. Professionalism						
Individual Student Rating						
<i>Student 1</i>						
<i>Student 2</i>						
Comments:						
Did the Student Projects Meet Your Expectations? (Please Circle One) Yes No Somewhat						
Explain:						
Desire to Support Future Student Teams (Please Circle One) High Medium Low Don't Bother						
Point of Contact for Future Team Assignments:						

Figure 2. Sponsor Evaluation Form