



Flight Standards Service

Alaskan Region, Flight Standards Division

Report to the Manager, AAL-200

System Safety Evaluation

Capstone Phase II Implementation

Southeast Alaska

System Safety and Analysis Branch, AAL-240

January 9, 2006

EXECUTIVE SUMMARY

Purpose. Conduct an internal systems evaluation of the Capstone Phase II implementation and operational approval process to determine if Flight Standards responsibilities were met.

Background. The Capstone project was initiated by congressional mandate to introduce advanced electronics systems to improve aviation safety, particularly in the Federal Aviation Regulations (FAR) Part 135 environment. The first generation of Capstone avionics and ground-based electronics was designed for Visual Flight Rules (VFR) operation and deployed to Western Alaska in 1998. The second generation of Capstone, which uses more sophisticated technologies and includes development of an Instrument Flight Rules (IFR) en route infrastructure, was implemented in Southeast Alaska and has been operational for approximately two years.

The Capstone project encompasses essentially all lines-of-business within the Federal Aviation Administration (FAA), particularly at the headquarters level. For the purposes of gathering data to evaluate flight standards responsibilities in Alaska, the following stakeholders were contacted: Capstone Program Management Office (CPMO) in Anchorage; Alaskan Region, Flight Standards Division (AAL-200); Alaskan Region, Flight Standards District Offices; Central Region, Aircraft Evaluation Group (AEG); and, Central Region, Small Airplane Directorate, Aircraft Certification Office, ACE-115N (ACO) in Anchorage.

Areas of Concern. The data gathered by the evaluation team were consolidated and analyzed. Concerns fell into the following areas:

- Some Flight Standards AEG functions may not have been accomplished in a timely manner.
- The Memorandum of Understanding (MOU) between the CPMO, the Flight Standards Division (AAL-200), and the Anchorage Aircraft Certification Office (ACO) addresses equipment problems but does not address Flight Standards responsibilities.
- Operator training programs were not modified to address company scope of operations, and company manuals did not include policy and procedures on the use of Capstone equipment.
- Capstone-related job functions were either not reported or not reported properly in Program Tracking and Reporting Subsystem (PTRS).

Recommendations. The following actions are recommended:

1. Formalize the Flight Standards interface with the Capstone Program Management Office, participating Aircraft Evaluation Groups, and the Anchorage Aircraft Certification Office (ACE-115N), with respect to the Capstone program.
2. Supplement the joint MOU with Flight Standards internal processes dealing with internal communications and responsibilities in addition to analyzing and tracking Capstone implementation and equipment problems.
3. Design, develop and deploy a Capstone training module for principal inspectors emphasizing Flight Standards inspector roles, responsibilities, and internal processes in addition to existing equipment operation and maintenance modules.
4. In the Regional Procedure Manual, define "special emphasis" with respect to inspector work activities. Establish procedures to designate a program as special emphasis, and include reporting and tracking requirements.

Note: Because issuing the final version of this report was delayed, many corrective actions were developed and adopted during the interim period between the end of the evaluation period in December 2004 and the date of this final report.

EVALUATION REPORT

Purpose. Conduct an internal systems evaluation of the Capstone Phase II implementation and operational approval process to determine if Flight Standard responsibilities are being met. A third phase of Capstone is planned that includes statewide deployment of the system. Data gathered during this evaluation will be used to enhance further Capstone implementation.

Background. The Capstone program was initiated by congressional mandate to improve safety by introducing advanced electronics systems, particularly in the FAR Part 135 environment. Because of the varying complexities of Part 135 operations, the project was planned in stages. The first generation of Capstone avionics was designed for VFR operations and deployed to Western Alaska in 1998. After three years of Phase I operation, the System Safety and Analysis Branch (AAL-240) conducted an internal systems evaluation to determine if Flight Standards in Alaska was fulfilling its responsibilities. The Phase I report was published in March 2003, with these corrective actions recommended. ([Appendix A](#): Capstone Phase I Evaluation Report)

1. Establish national guidance for implementation and operational use of Capstone. Current guidance on technology related to the Capstone project should be reviewed and updated.
2. Establish effective liaison between Capstone Program Office and Flight Standards Division, AAL-200, which includes written procedure regarding that interface.
3. Standardize the approval process for use of the University of Alaska Anchorage Capstone training module.
4. Ensure certificate holders develop policy and procedure for use of Capstone equipment.
5. Provide mandatory Capstone program training for inspectors who are reviewing operator programs for acceptance or approval as appropriate.
6. Develop standards for using Capstone equipment during check flights.
7. Provide Capstone equipment operational technical training for inspectors who will be conducting check flights.
8. Ensure that the PTRS and Service Difficulty Report (SDR) databases are used for Capstone related activities in accordance with national guidance.

The second generation of Capstone was deployed to Southeast Alaska beginning in late 2002/early 2003 and has been operational for almost three years. The Phase II concept involves technologies that are more sophisticated and includes development of an IFR en route infrastructure as well as GPS non-precision approach procedures to many communities. The Phase II internal evaluation was planned as a follow-up to the Phase I evaluation.

Scope. The Phase II evaluation provides a continuing look at how Flight Standards accomplished its responsibilities with respect to the Capstone project ([Appendix B](#): Order FS 1100.1, Flight Standards Service Organizational Handbook, Section 3). For a comprehensive look of Alaskan Region, Flight Standards Division actions during the implementation of Phase II, the evaluation team focused in the following areas:

- Review of documentation for the installation of the Chelton Flight Systems Supplemental Type Certificate (STC), FAA STC No. SA02203AK into individual aircraft.
- Visits to several operators using the Capstone avionics suite for discussions with company personnel and the inspection of several aircraft.
- Review of Capstone equipment malfunction/defect reporting systems.
- Review of the MOU between CPMO, AAL-200, and the ACO with emphasis on effective communication between those offices as well as internal within the Flight Standards Division.

- Review of FAA orders addressing Flight Standards and Aircraft Certification Services functions, with emphasis on new aircraft systems development and deployment.
- Review of Juneau Flight Standards District Office files for approval of operator training programs and content of company manuals.
- Analysis of inspector job function records in FAA databases, primarily PTRS.
- Review of inspector training regarding job functions and responsibilities.

During the evaluation period, there were 17 certificate holders in eight Southeast Alaska communities, using 66 aircraft with the Capstone II avionics suite installed. Two of these operators hold authorization to use the equipment under IFR with two aircraft at each company. Team members visited seven operators in four communities, interviewing 14 personnel from operators and the Acrahelipro repair station, as well as one representative from the University of Alaska. The team also inspected a total of ten aircraft, including all four of the airplanes being used under IFR. All principal inspectors at the Juneau Flight Standards District Office (FSDO) who are assigned operators using Capstone were interviewed, as well as the facility manager and supervisor.

In addition to operators using the equipment, Capstone project stakeholders encompass essentially all lines-of-business within the FAA, particularly at the headquarters level. Stakeholders also include other government agencies, air carriers, equipment manufacturers, and a myriad of related organizations. For the purposes of the Phase II Flight Standards responsibilities evaluation, key personnel from the following stakeholders were contacted: Capstone Program Management Office (CPMO) in Anchorage; Alaskan Region, Flight Standards Division (AAL-200); Alaskan Region, Flight Standards District Offices; Central Region, Kansas City Aircraft Evaluation Group (MKC AEG); and Central Region, Small Airplane Directorate, Anchorage Aircraft Certification Office (ACO), ACE-115N.

Methodology. The evaluation team consisted of three maintenance inspectors, three avionics inspectors, and two operations inspectors. The Anchorage ACO participated by assigning a certification engineer to support the team. The AAL-240 branch requested participation from the MKC-AEG and they declined. The team gathered data from several sources to follow up on concerns, recommendations, and corrective actions outlined in the Phase I evaluation report. A supervisor from the Anchorage FSDO conducted formal interviews with Capstone program representatives and Flight Standards Division managers.

The Capstone Internet web site contains copies of essentially all critical documents and installation plans, including the equipment manufacturer's Supplemental Type Certificate (STC) and a comprehensive listing of all aircraft with the Capstone avionics suite installed. AAL-240 staff specialists researched the web site to obtain specifics on the STC development and approval process, as well as details on aircraft installations and continuing airworthiness records. Several team members traveled to Southeast Alaska during the evaluation period to interview inspectors at the Juneau FSDO and review operator files. They visited operator facilities to interview representatives from companies using Capstone avionics, including mechanics and managers. These discussions were candid and free flowing to assure that information focused on their primary concerns. The team also inspected several aircraft with the Phase II avionics suite installed.

To collect more specific information, the team coordinator sent questionnaires to all Juneau FSDO inspectors who had worked with Capstone in the previous two years, the period when Phase II was being introduced to Southeast Alaska. Some of these individuals had transferred out of the region and, since they were involved during a critical time, their input was considered valuable. The questionnaires were based on survey tools used for the Phase I evaluation to maintain consistency but were modified for Phase II specifics. Modified questionnaires were also used to interview Capstone personnel and the Flight Standards Division Manager. ([Appendix C: Questionnaires](#))

Areas of Concern. The data were summarized by individual team members and forwarded to the AAL-240 evaluation coordinator for consolidation. Concerns fell into the following areas:

- A. Some Flight Standards AEG functions may not have been accomplished in a timely manner.
- B. The Memorandum of Understanding (MOU) between the CPMO, the Flight Standards Division, AAL-200, and the Anchorage Aircraft Certification Office (ACO) addresses equipment problems but does not address Flight Standards responsibilities.
- C. Operator training programs were not modified to address company scope of operations, and company manuals did not include policy and procedures on the use of Capstone equipment.
- D. Capstone-related job functions were either not reported or not reported properly in Program Tracking and Reporting Subsystem (PTRS).

Some Flight Standards functions may not have been accomplished in a timely manner.

Analysis of evaluation information indicates that the Alaskan Region, Flight Standards Division, AAL-200 might not have been involved effectively during Capstone project equipment and program development and implementation. AAL-200 is responsible to provide approval in accordance with 14 CFR Part 135 for operators to use Capstone equipment and was available to assist the AEG in program operational evaluation.

FAA Order 8430.21A, Flight Standards Division, Aircraft Certification Division, and Aircraft Evaluation Group Responsibilities, provides instructions and guidelines for decisions concerning the operational acceptability of newly certificated aircraft and significant changes to existing aircraft. In part, this includes but is not limited to pilot qualification, crew training, minimum equipment lists, and continuing airworthiness requirements. The order states that Aircraft Certification and Flight Standards should ensure close liaison between the appropriate ACO and AEG so that Flight Standards can provide the necessary support. This includes AEG authority to delegate functions to the Flight Standards Division in regions having certificate management responsibility for Part 121, 125, and 135 operators. ([Appendix D](#): Order 8430.21A)

The following is a summary of the normal process to obtain AEG technical services, such as for a STC, as outlined in FAA Order 8100.5A, Aircraft Certification Service Mission, Responsibilities, Relationships, and Programs, and Order 8110.4C, Type Certification. A manufacturer or developer of a STC notifies the ACO directly and maintains continuous interaction throughout the project. The ACO notifies the appropriate Aircraft Certification Directorate, who notifies the appropriate AEG. If the AEG elects to be involved, the AEG may exercise its responsibilities directly or may delegate to a Flight Standards Division in another region the authority to accomplish the required tasks. This is allowed because it is recognized that it may not be practical for an AEG to complete all aircraft operation evaluations with assigned resources. ([Appendix D](#): Order 8430.21A; [Appendix E](#): Order 8100.5A; and [Appendix F](#): Order 8110.4C.)

The evaluation team interviewed representatives from the ACO to determine what steps were actually taken for the Capstone II project. The evaluation team located copies of two Capstone II Certification Program Notifications (CPN) from the ACO to the Directorate, one for all aircraft identified in the original Capstone II STC project plan, and a second for only the de Havilland DHC-6 STC project that is a modification from the original STC. Neither of these notifications included a request for AEG involvement, although ACO personnel state that the AEG was involved during the project. ([Appendix G](#): CPN from ACO to Directorate regarding Capstone II STCs)

Based on analysis of information obtained during the evaluation period, some deficiencies exist in the following general functional areas, many of which involve operational approvals by the Flight Standards Division. ([Appendix D](#): Order 8430.21 A, Para 6 through 9)

- Reviewing maintenance programs for continuing airworthiness. Maintenance programs that exist for the equipment are ones the manufacturer developed only for individual pieces of avionics rather than for the entire aircraft system as installed. This is new technology installed in very old aircraft and maintenance programs associated with those aircraft may not be adequate. Approval for the use of maintenance programs for Capstone equipped aircraft in Alaska is the responsibility of the Alaskan Region, Flight Standards Division.
- Reviewing flight manuals and revisions, and establishing unique or special training requirements. Airplane Flight Manual (AFM) Supplements and revisions were reviewed by the ACO and the AEG, with limited coordination with the Alaskan Region, Flight Standards Division, who is responsible for approving operations with Capstone equipment. The flight crew training program developed by University of Alaska, Anchorage (UAA), was developed for an IFR operation and did not address use of this equipment under VFR conditions, which is the primary operating environment for FAR Part 135 operators in Southeast Alaska.
- Developing master minimum equipment list (MMEL). Capstone equipped aircraft were operated in passenger-carrying service for appropriately 18 months before the MMEL global change was approved by the AEG and issued by policy letter.
- Participate in operational evaluation of new aircraft instruments, and in function and reliability tests for compatibility with regulations and Aviation Standards orders. The Capstone project was designed as a model program to improve aviation safety and capacity through the injection of new technology that had not been widely used in the Part 135 operating environment. Alaska was chosen to be a demonstration region. The AEG determined that testing for fixed wing was not needed, but testing was accomplished for helicopters. The Alaskan Region, Flight Standards Division was available for delegated authority to perform evaluation and test functions.

Concern B: The Memorandum of Understanding (MOU) between the CPMO, the Flight Standards Division, (AAL-200) and the Anchorage Aircraft Certification Office (ACO) addresses equipment problems but does not address Flight Standards responsibilities.

The March 2003 Capstone I evaluation report identified the need to establish effective liaison between the CPMO and the AAL-200. This was recommended because Phase I surveys showed that information given to inspectors did not follow the AAL-200 internal chain of command and did not contain local or national policy. When operators approached field inspectors for guidance, inspectors were reacting with incomplete or unofficial information.

In March 2004, a MOU was put in place between the CPMO, AAL-200, and the ACO. This MOU addresses the process to be used to gather, review, assign and resolve Capstone problem difficulty events, defines organizational roles and responsibilities, and lists points of contact (POC). The evaluation team is concerned that the MOU focuses solely on resolution of equipment problems and does not address overall Flight Standards responsibilities relating to the entire Capstone project. A second concern is that the three Flight Standards Division POCs listed in the MOU are all operations inspectors assigned to the Technical Standards Branch (AAL-230) and the MOU addresses only airworthiness issues. ([Appendix H](#): MOU)

In addition to issues with the specifics of the MOU, the evaluation team noted that many stakeholder interactions that fall within the scope of the MOU are not conducted in accordance with the MOU. The evaluation team was provided with a list of project/program assignments for specialists in the AAL-230 branch. Several specialists are assigned duties related to the Capstone project but none are listed on the MOU as POCs. AAL-230 personnel also indicated that all

specialists in that branch interact with the CPMO, the ACO, and field office inspectors on matters directly related to the Capstone program, not just those people identified by the MOU. This includes issues related to both airworthiness and operations responsibilities. ([Appendix I](#): Technical Standards Branch, AAL-230, assignments)

To discuss Capstone issues and problems, the CPMO coordinates a series of weekly telecons, attended by representatives from essentially all Capstone stakeholders. These Tuesday morning Telecom sessions focus on equipment issues and problems, and Alaskan Region Flight Standards MOU POCs and field office inspectors are invited to participate. However, field inspectors state they are only permitted to attend a telecom that includes operators and they are prohibited from the telecom that includes only CPMO and FAA personnel. Inspectors say they cannot effectively air their concerns to Capstone management when operator representatives are listening or present. Further, one of the AAL-230 POCs stated that only the POCs actually identified in the MOU are permitted to attend the telecons. The result is two fold: if only the designated POCs attend the telecom, then the Flight Standards airworthiness perspective is not represented since POCs are all operations inspectors. Secondly, if none of the designated POCs are able to attend the telecom, then no other alternates from the Flight Standards Division can replace them.

There is no indication in the MOU or any other document of the need to formally evaluate and transmit any information within Flight Standards beyond the specific POC listed, such as to headquarters, the AEG, field office management, or principal inspectors. In addition, the MOU does not provide a mechanism for principal inspectors formally to raise any concerns they may have. While the CPMO keeps detailed action and status records of problems reported and discussed on weekly telecons, there are no specific records of actions taken by the Flight Standards Division to evaluate corrective actions or mitigate problems. These weekly telecons in essence are the only formal feedback loop to field inspectors or division specialists but the information does not accurately reflect Flight Standards perspective and does not follow the AAL-200 internal chain of command. ([Appendix H](#): MOU, Page 5, Difficulty Resolution Process)

During interviews, inspectors stated that often they were not readily aware of problems reported to either UAA or CPMO. They sometimes became aware through the Tuesday telecom, but if particular problems were not discussed, inspectors did not know that they existed. In some instances, inspectors stated that operators approached them directly about problems asking what was being done to address those issues. Although not technically in the loop but being proactive, inspectors believed they have an obligation to call UAA, the CPMO, or the Flight Standards Division to get information and help the operator. Inspectors said that answers were often slow in coming and did not appear to be an official response because the principle mode of communications was through email.

The MOU provides background information to stakeholders on how and when operators report equipment failures, to whom, and provides forms for reporting and tracking. The MOU, however, is inconsistent with instructions given to operators in the Aircraft Owner Agreement that is signed by both the operator and the CPMO. The MOU says that operators are to report equipment failures within 24 hours by telephone or facsimile to the CPMO and/or UAA. The Aircraft Owner Agreement directs operators to report any Capstone avionics malfunctions to the FAA but gives no specifics. During interviews by the evaluation team, JNU FSDO inspectors and operator representatives said that failures could be reported to UAA or the CPMO over the telephone or by mail using special post cards provided by UAA. During the evaluation, principal inspectors said that at times operators reported equipment problems directly to the installer (ACROHELIPRO Global Services USA Inc.) and that ACROHELIPRO then reported those problems to the manufacturer rather than to the FAA. ([Appendix H](#): MOU, and [Appendix J](#): Aircraft Owner Agreement)

Concern C. Operator training programs were not modified to address company scope of operations, and company manuals did not include policy and procedures on the use of Capstone equipment.

The Capstone Phase I evaluation was initiated in part because of reports that not all pilots of companies using Capstone had been trained effectively in the proper use of the equipment. That evaluation revealed that many Capstone training programs had not been approved by principal inspectors, were not modified to adapt to company scope of operations, and company policy did not require pilots to use the Capstone equipment in accordance with procedures outlined in the training program. Because of this finding, the Phase II evaluation team focused on training programs and company manuals. ([Appendix A](#): Phase I Evaluation Report,)

During the Phase II evaluation period, there were 17 operators listed as using the Phase II avionics suite. Four of these 17 companies are single pilot operators and a training program is not required. Inspection of FSDO files showed that all companies that require a training program had received initial approval to use the Capstone II training module. The evaluation team noted, however, that the Capstone training program was designed for operation under IFR while the majority of Southeast operations are VFR.

The concern is that, while principal inspectors approved the use of the UAA Phase II training program, some did not consider that it should be amended for individual operator needs, such as for VFR operations. This could result in pilots relying on the equipment to provide more information within the cockpit during operations when their attention should be outside the cockpit for navigation and to avoid traffic or obstacles. The Capstone training program does not include a module that addresses the use of the equipment during VFR flight, when encountering inadvertent IMC, or when avoiding severe weather conditions. Further, a review of company manuals in the FSDO files showed that companies also did not include specific policy statements or guidance for flight crews regarding the use of Capstone equipment while in flight. The only standard that applied was contained in the IFR pilot training program and was essentially equipment operation while in instrument conditions. Again, the majority of Capstone II operations are VFR.

Related to this is the matter of developing a standard for checking effectiveness of training. The Phase I evaluation team recommended that test standards for use of Capstone avionics be developed and applied by inspectors while performing flight checks on company pilots. Pilot testing standards have not been developed and inspectors may not be able to objectively evaluate how pilots are using Capstone equipment.

Concern D: Capstone-related job functions were either not reported or not reported properly in Program Tracking and Reporting Subsystem (PTRS).

During the evaluation of Capstone Phase I implementation, team members were unable to determine the scope of Capstone-related inspector job functions because the PTRS database did not contain accurate representation of work performed to support that project. The Phase II evaluation resulted in a similar finding, although there was some improvement.

The Regional Procedure Manual, 8000-2, outlines PTRS procedures for documenting activities related to any Special Emphasis work functions and identifies specific terms to be entered into the Regional Use Block. The procedure gives only broad explanation of some work functions that should be treated as special emphasis and directed inspectors to use hyperlinks on the document to get further instructions. The Procedure Manual is available on the intranet but the indicated links do not function and there was no other information found on how to locate the special emphasis PTRS procedures or what projects/programs should be treated as special emphasis. ([Appendix K](#): 8000-2a, Special Emphasis PTRS Reporting)

Juneau FSDO PTRS records dated from June 30, 2003 through December 17, 2004 were reviewed for entries related to Capstone. There were 57 PTRS records with the term "CAP II" in the Regional Use Block, three records with the word "Capstone" in the Regional Use Block, and no records with the phrase "Capstone II" in the Regional Use Block. Few PTRS records reflected review and approval of the Capstone II training program or surveillance of Capstone II training, yet FSDO files contained letters of training program initial approval for all operators using Capstone II. In addition, PTRS records that do reflect review and approval of the training program use an inappropriate activity code for that work function.

All inspectors interviewed said that Capstone job functions should be reported using normal PTRS procedures and most recalled that the term "CAP II" should be entered in the Regional Use Block but could not say where this procedure was documented and when it applied. Some inspectors reported that they did not insert the term "CAP II" into the Regional Use Block unless the specific purpose of that job function was related directly to Capstone II. For example, a routine or R-item en route inspection on a Capstone-equipped aircraft was reported as normal surveillance and did not reflect the special emphasis code "CAP II", even if the pilot actively used the equipment during the flight. During follow-up discussions, Juneau FSDO inspectors stated that they were recently advised by the AAL-230 branch to use the CAP II Regional Use Block procedure to document any job function on any aircraft with Capstone II equipment installed.

Recommendations. The following corrective actions are recommended.

1. Formalize the Flight Standards interface with the Capstone Program Management Office, participating Aircraft Evaluation Groups, and the Anchorage Aircraft Certification Office (ACE-115N), with respect to the Capstone program.
 - The AEG should consider delegating appropriate AEG responsibilities to AAL-200 to provide current and future technical support to Flight Standards inspectors with oversight responsibilities of carriers operating Capstone equipment.
 - Establish formal airworthiness maintenance and avionics support and interface with the Capstone Program Management Office, the Aircraft Evaluation Group, and Aircraft Certification Office for the continuing Capstone project.
2. Supplement the joint MOU with Flight Standards Division internal processes dealing with internal communications and responsibilities in addition to tracking Capstone implementation and equipment problems.
 - Increase inspector awareness of Capstone program issues, equipment problems and corrective actions, giving them ability to adequately respond to operators.
 - Provide a procedure for field office principal inspectors to elevate their concerns to the Regional Flight Standards Division and the Capstone Program Management Office within the MOU process.
 - Ensure consistency between the MOU and other related documents and procedures.
3. Design, develop and deploy a Capstone training module for inspectors with focus on Flight Standards inspector roles and responsibilities in addition to the existing equipment operation and maintenance modules. This new module should include:
 - Capstone program specific responsibilities and job functions. This should include an overview of evaluation findings for Phase I and II, and expectations for Phase III.
 - General responsibilities for any program designated as special emphasis, including reporting and tracking job functions using official databases.
 - Methodology for review and analysis of operator policy and procedure development for use of specialized equipment, such as for emergency IMC operations.

4. In the Flight Standards Division Regional Procedures Manual, define “special emphasis” with respect to inspector work activities. Establish procedures for designating a program as special emphasis, to include detailed reporting and tracking requirements.

- Identify specifically and separately which programs are treated as special emphasis.
- Establish general inspector roles and responsibilities for programs identified as special emphasis.
- Identify specific job functions that are to be performed by inspectors for each program designated as special emphasis.
- Identify specific procedures for reporting and tracking job functions for each special emphasis program.
- Provide training to inspectors on special emphasis programs, to include emphasis on specific roles and responsibilities for each special emphasis program.