Flight Standards Service

Alaskan Region, Flight Standards Division

Report to the Manager, AAL-200

System Safety Evaluation

Capstone Phase 1 Implementation

Yukon Kuskokwim Delta, Western Alaska

System Safety and Analysis Branch, AAL-240

March 5, 2003

Executive Summary.

Purpose. To evaluate Alaskan Region, Flight Standards Division effectiveness and participation in the Capstone Phase I implementation and operational approval process.

Background. Phase I of the Capstone project has been operational in Western Alaska since 1998. Twenty-seven FAR Part 135 operators have been using Capstone throughout the operating area with equipment installed in approximately 180 individual aircraft. In addition there are 15 Capstone equipped aircraft operating under Part 91. Phase I installations are primarily for VFR operations.

An initial purpose of Capstone was to reduce aircraft accidents and fatalities due to controlled flight into terrain (CFIT), and a review of the implementation process by Mitre® Corporation shows an overall safety improvement in the Capstone Phase I operations area. Accident statistics, however, do not show a reduction in CFIT accidents and the safety improvement in Western Alaska could not be directly attributed to Capstone. Data also suggested that not all pilots have been trained effectively in the proper application of Capstone and may not be using the equipment as designed.

Capstone Phase II involves the installation of additional advanced avionics and includes plans for IFR operations in Southeast Alaska. Phase II is scheduled to be implemented during the first quarter of calendar year 2003. Equipment installation is currently underway and training program modules are being evaluated for deployment to operators.

The Flight Standards Division Manager requested a systems evaluation of Capstone Phase I to determine the validity of reports that the program is not being used effectively. Lack of pilot training and non-standard use of equipment indicates that Federal Aviation Administration (FAA) Flight Standards responsibilities may not have been met during the training program and operational approval process.

Conclusions. Using questionnaires to survey FAA and operator personnel involved in Capstone Phase I, the System Safety and Analysis Branch determined that many operators did not develop comprehensive policy and procedure for the use of Capstone equipment. The result was non-standard use of the equipment by company pilots. The evaluation also indicated that operator training programs were not approved in accordance with FAA directives.

Recommendations. The following actions are recommended based on evaluation findings.

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. This may require use of the regional King Air or rental aircraft properly equipped with Phase I or Phase II equipment as appropriate.
8. Ensure that the PTRS and SDR databases are used for Capstone related activities in accordance with national guidance.
9. Complete the TapRooT® analysis of causal factors identified through the SnapCharT® and Root Cause Tree® process. The process includes documenting and tracking proposed corrective actions for each causal factor as well as identifying the office and/or individual responsible for that corrective action.

Purpose and Scope. Evaluate Alaskan Region, Flight Standards Division participation in the Capstone Phase I implementation and operational approval process to determine if Flight Standards responsibilities were met. Data gathered during the evaluation will be used to enhance phase II implementation.

Background. The Capstone project was initiated in 1997 by a congressional mandate to introduce advanced electronics systems to improve aviation safety, particularly in the FAR Part 135 environment. A primary input to this effort was a study of operations in Alaska (Aviation in Alaska, NTSB/SS-95/03) that recommended using global positioning and satellite-based communications systems to provide an infrastructure that better meets Alaska's air transportation system needs. An offshoot of Vice President Al Gore's Flight 2000 program, Capstone was designed to reduce the fatal accident rate due to navigational errors and mid-air collisions. Under Phase I of Capstone, the Yukon Kuskokwim Delta in Western Alaska was selected to test the first generation of avionics and ground based electronics to improve safety and system efficiency.

The Delta is an area of extensive FAR Part 135 commuter operations originating from a central hub located at Bethel, Alaska. The operating environment is hostile most of the year and includes severe winter weather with low temperatures, icing, snow, high winds, and widespread whiteout conditions. Most operations are VFR using small, single engine aircraft with a high incidence of CFIT accidents throughout the area. The introduction of new situational awareness tools such as terrain and mid air collision warnings for VFR operations is expected to have the greatest impact in reducing accidents and improving safety.

Following deployment of Phase I in Western Alaska, a second wave of Capstone, Phase II, is being implemented in Southeast Alaska, where there is an equally hostile environment, but for different reasons. This area is comprised generally of coastal mountains with numerous valleys and fjords. Like Western Alaska, local communities are served primarily by air using small, single engine aircraft also with a high incidence of CFIT accidents due to low visibility, rain, and fog. Phase II uses more sophisticated technologies and IFR en route and approach operations.

After three years of Phase I operations, the Capstone Program Office (CPO) commissioned the Mitre® Corporation to collect data, review project accomplishments, and determine if primary objectives were met. In August 2002, the Mitre® Corporation published an interim report summarizing preliminary findings that indicated lack of pilot training and non-standard use of the Capstone equipment by pilots. With Phase II implementation pending in Southeast Alaska, it was decided that a complete systems evaluation of Capstone was warranted to determine if Flight Standards in the Alaskan Region was fulfilling its responsibilities, which include training program surveillance as well as operational approvals. Evaluation findings would first be applied to enhance Phase II and then be employed retroactively where appropriate in Phase I.

An evaluation team was formed with specialists from the System Safety and Analysis Branch (AAL-240) as the nucleus. The team included an Anchorage Flight Standards District Office principal operations inspector experienced in Capstone Phase I, along with operations and airworthiness inspectors from the Juneau FSDO, which will be the field office responsible for operational approvals for Phase II. Additional support was available from field supervisors and managers during the actual evaluation process.

Methodology. In the past several years, the FAA initiated a program to ensure that certificate holders apply the principles of risk management in their operations. This follows the concepts of system safety, which uses managerial techniques in a systematic manner to identify and control hazards. System safety has been introduced into FAR Part 121 operations through Air Transportation Oversight System (ATOS) and Certification Standardization and Evaluation Team (CSET) programs. The Alaskan Region is active in introducing system safety to local FAR Part 135

operations and conducting a systems evaluation on Capstone provides opportunity to apply these principles to that program.

The first step was to identify the purpose of the evaluation in terms of functional requirements and existing problems. Data in the Mitre® report indicated a lack of effective pilot training and non-standard use of Capstone equipment. The evaluation team believed that if these two conditions actually existed, they reflected potential failure in program oversight since Flight Standards is responsible for approving training programs and operating authorizations. A systems evaluation would determine if these responsibilities were met during Capstone implementation.

The next step was to identify local stakeholders that affect Flight Standards with respect to Capstone Phase I in Alaska. Applying the principles of system safety, the team noted that the interfaces attribute points directly to where Flight Standards played an active role in the process by granting approval for certificate holders to use the equipment. The team determined that there were four key stakeholder groups located in Alaska whose direct exchange of information affected operational approval. The four stakeholders identified were the Capstone Program Office who developed the program, certificate holder management who exercised operational control, company pilots who used the equipment in flight, and Flight Standards inspectors who conducted field surveillance and granted approval in accordance with national policy. The team decided to conduct direct interviews with representatives from each stakeholder group to determine the scope of the interface and the effectiveness of the approval process. For the last step, the team used standard investigative techniques to design survey questionnaires and gather data.

At the time of the evaluation, there were 27 certificate holders using Capstone equipped aircraft. By reviewing the operator size, scope and accident history, the system evaluation team selected nine operators to be surveyed. In December 2002, team members interviewed representatives from the four stakeholder groups. Answers to questions were returned to an AAL-240 representative in the same form and manner as collected to assure accuracy in interpreting responses. The data was then sanitized, consolidated, and summarized before specific issues were identified and findings formulated. (Appendix 1, Detailed Summary of Surveys)

The following personnel were interviewed and provided data for the evaluation. A member of the Capstone Program Office staff provided information regarding implementation procedure. At least two of the three principal inspectors assigned to each certificate holder were interviewed, with some principals assigned to multiple operators. At least one of the required management personnel for each certificate holder was interviewed, either the Director of Operations or Chief Pilot. The Chief Operating Officer for one certificate holder was interviewed in lieu of the Director of Operations, who was not available. Lastly, twenty-one pilots were interviewed, with at least two pilots from each operator. One certificate holder was an exception and no company pilots were interviewed due to lack of availability during the evaluation period. A chance encounter, however, allowed one member of the survey team to interview pilots from an operator not listed on the original plan and that information was included.

To review and analyze system weaknesses, the AAL-240 branch employed a nationally recognized root cause analysis system developed by System Improvements, Inc., of Knoxville, Tennessee. This software program, called TapRooT®, enabled an in-depth, step-by-step review of the process and facilitated identifying causal factors for negative outcomes. The software then assisted the team in determining root cause and documenting corrective actions.

Analysis. Using data collected from the surveys, which supported the interim Mitre® report, AAL-240 developed a problem statement to initiate the SnapCharT® analysis.

> "Pilots/operators are not fully using/implementing the Capstone program as intended"

The process identified key actions and events in Capstone implementation as well as conditions that affected or influenced those events. Each event and condition was then analyzed individually for its impact on the problem statement. If an event or condition was determined to directly contribute to the problem, it was identified as a "causal factor". Using the TapRooT® "SnapCharT®" software, this process was graphically charted in a logical progression toward the problem identified by the problem statement. Appendix 2 is the SnapCharT® graphic presentation of that evaluation.

After developing the graphic flow diagram, each identified causal factor was analyzed using a second TapRooT® software system, the "Root Cause Tree ®". Like the SnapCharT®, the Root Cause Tree® is a structured process to determine and document where the "root cause" of each causal factor originated. Appendix 3 is a summary of the Root Cause Tree® report.

Concerns. Although the Capstone project and equipment received an overall favorable and enthusiastic response from operator management and pilots, survey results indicated that pilots were not fully using the Capstone equipment as designed. The following system weaknesses were identified.

1. National guidance was incomplete, confusing and conflicted with information published by the Capstone Program Office (Appendix 2, SnapCharT® Causal Factor CF1).
   a. Capstone Program Office information was not published through headquarters as required.
   b. Capstone Program Office information was sent directly to inspectors without going through the AAL-200 chain of command.
   c. PTRS data indicated that inspectors did not follow either the formal and informal guidance.
   d. Inspectors generally were unable to identify FAA or Flight Standards policy regarding the Capstone project, program implementation, or use of the equipment.

2. Avionics and maintenance inspectors received limited written policy and guidance on Capstone installations (Appendix 2, SnapCharT® Causal Factor CF2).
   a. Most operators' aircraft equipment lists have not been modified to reflect the newly installed Capstone equipment.
   b. Most avionics and maintenance inspectors did not know the equipment had been initially installed.
   c. Airworthiness inspectors stated they had little if any involvement or responsibility for Capstone.
   d. Most airworthiness inspectors did not receive information on the application of the Capstone STC and many were not aware of the STC or program participation until the operator submitted paperwork for approval after the equipment was installed.
   e. MELs have not been modified to reflect Capstone equipment.
   f. Few inspectors were aware of specific Capstone procedures for reviewing manuals, training programs, operations specifications, and minimum equipments lists.

3. FAA approval for operator training programs was not accomplished in accordance with Order 8400.10 on most Capstone operators (Appendix 2, SnapCharT® Causal Factor CF3).
   a. Surveys indicated that many operations inspectors believed the Capstone office was performing training approval functions or that the training module was pre-approved when delivered to the operator by UAA.
   b. Interviews indicated that some training programs distributed to operators by UAA received initial approval without further review by the principal operations inspector.
   c. Many operations inspectors did not attend the training offered by UAA and Capstone. The training was not mandatory, attendance records were not kept, and inspectors that did attend did not initiate PTRS records for the training.
   d. Few inspectors were aware of specific Capstone procedures for reviewing manuals, training programs, operations specifications, and minimum equipments lists.

4. The training module was not delivered to every pilot that used Capstone (Appendix 2, SnapCharT® Causal Factor CF4). The Capstone Program Office stated that the UAA training module was developed to comply with Order 8400.10, and would be delivered to company pilots through a train-the-trainer program.

a. Most pilots stated that they received initial training but there was no company policy requiring them to use the equipment as trained. In most cases there has been no recurrent training.
b. Most operators did not modify the training module to reflect company policy or procedures.
c. Most operators did not audit/evaluate pilots for their ability to use Capstone.
d. Operations inspectors have not required pilots to use Capstone during FAA check flights.

5. Most operators did not have written policy or procedures for using Capstone equipment (Appendix 2, SnapCharT® Causal Factor CF5).

a. Most company management stated that policies and procedures were part of the training program and not in the manual system.
b. Most company pilots were unable to identify company policy other than to turn it on when flying. Pilots stated in general they have used the equipment as they wanted to.
c. There were few PTRS records found that indicated review of company manuals for policy or procedure related to Capstone.
d. An analysis of a Capstone-equipped CE 207 crash in April 2001 reflected no company policy for Capstone and indicated improper use of the equipment by the pilot.

7. The SnapCharT® shows two equipment causal factors related to equipment development that were identified during prior investigation of a Capstone-equipped Cessna 207 crash in April 2001 (Appendix 2, SnapCharT® Causal Factors CF6 and CF7). These two factors, equipment displays and controls, were documented in the SnapCharT® because they related directly to the pilot's decision-making process during that flight. Further analysis of these items was beyond the scope of this evaluation.

Recommendations. The following actions are recommended based on evaluation findings.

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 UAA 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. This may require use of the regional King Air or rental aircraft properly equipped with Phase I or Phase II equipment as appropriate.
8. Ensure that the PTRS and SDR databases are used for Capstone related activities in accordance with national guidance.
9. Complete the TapRooT® analysis of causal factors identified through the SnapCharT® and Root Cause Tree® process. The process includes documenting and tracking proposed corrective actions for each causal factor as well as identifying the office and/or individual responsible for that corrective action.

Capstone Management

Name: Gary Childers **Position: National Free Flight Field Coordinator**

Explain your duties and responsibilities:

I work in conjunction with all FAA straight-line organizations, other governmental agencies, and external users while coordinating the development of scope, concepts and requirements that are used to initiate the operational demonstration, validation, and implementation of various Free Flight and Capstone program components. During this process I work to identify the appropriate operational/technical regulations, policies, and procedures, and ensure system integration, human factors implications, schedules, and funding are considered for each element. I also coordinate the acceleration of cost effective avionics certification and approval processes; equipage, and operation of new technology, to assure that space based navigation and automatic dependent surveillance UAT data link transfer of flight information become available to users at the earliest possible date. I continuously evaluate the newest 21st Century technology, in an effort to assure Capstone bundles the current capabilities into each end-to-end demonstration. I coordinate the validation of Navigation, Communications, and Surveillance system performance under real-time operational conditions in Alaska in preparation for National Airspace System wide modernization and full implementation of free flight elements. I help assure that every organization involved has the opportunity to contribute to the accomplishments of Capstone goals and objectives. I also provide assistance, guidance, and information, as required, to various AVR offices, Flight Standard Divisions, other straight-line organizations and governmental agencies as well as industry and users groups.

Note: In order to fully appreciate overall effort undertaken by the Capstone program office and to enable a through analyze of Capstone Phase One to the extent indicated by the enclosed questions, a review of the entire contents of the Capstone website should be conducted. Answers to the each high level question presented can be found in documents previously given to flight standards and located on the web site. For your convenience I will provide some lead-in information under each question, these answer should not, however, be taken as a complete summary of Capstone Phase One element involved.

1. Elements 8.2.4 Cooperative Relations with Assigned PIs

A. What did congress mandate for the implementation of Capstone?

The primary congressional desires flow out from a series of reports generated around the globe that point out the need to improve aviation safety and capacity through the injection of new technology. One of the primary studies used was forwarded to FAA in 1997 by the NTSB This study, Aviation in Alaska, NTSB/SS-95/03 states in pertinent part,

Implement, by December 31, 1997, a model program in the Arctic and southeast regions of Alaska to demonstrate a low altitude instrument flight rules (IFR) system that better fulfills the needs of Alaska's air transportation system. The model should include the following components:

The use of the global positioning system (GPS) as a sole source of navigational information for en route navigation and for non-precision instrument approaches at a representative number of airports where instrument approaches do not currently exist. (Operators participating in the program will have to be allowed to conduct these operations without the integrity monitoring functions of the wide area augmentation system (WAAS) until WAAS is fully implemented in the demonstration region.)

The use of satellite-based voice communications and satellite-based, Mode S, or VHF data link (for aircraft position and altitude) between aircraft in flight and air traffic controllers.

The operation of commercial, passenger-carrying flight under IFR in turbine-powered single-engine airplanes equipped with redundant sources of electrical power and gyroscopic instrument vacuum/pressure.

The use of currently uncontrolled airspace for IFR departures, en route flight, and instrument approaches in the demonstration program region. (Class II, Priority Action) (A-95-121)

This safety study is supported by a plethora of other scientific studies dating back to 1882.
From these many reports, the Vice President of the United States, with guidance from senior FAA executives, mandated an out growth of Aviation infrastructure within Alaska and across the rest of the NAS. From the resulting presidential decree came the Flight 2000 program, which later became Capstone, which was funded by direct specific language found in the 1999 Congressional omnibus. Each year since 1999 similarly worded language has directed new elements and provided more fenced monies from Congress to the Capstone program.

B. Explain the guidance you were given for this program?

No additional Flight Standards guidance material was provided beyond an assignment letter by AAL-200 to my present position in support of the congressional and executive decree to initiate the work.

C. What was program supposed to accomplish?

These specific Phase I objectives of Capstone are (these are taken directly from a Flight Standards coordinated version the Capstone plan:

1.5.1 Safety.

1.5.1.1 Reduce the fatal accident rate (on a per-flight-hour basis) due to en route and approach navigational errors in reduced visibility by 25 percent in the equipped aircraft within one year after installation of equipment and new low altitude airspace design and procedures are in place.

1.5.1.2 Reduce the fatal accident rate from mid-air collisions en route between the airports involved in Capstone and in the vicinity of Bethel by 25%.

1.5.1.3 Reduce the fatality rate due to search and rescue failures for equipped aircraft in the Bethel area.

1.5.2 Capacity and Efficiency.

1.5.2.1 Reduce the number of flights canceled due to inadequate destination weather reporting at airports equipped with new automated weather sources by 10% within one year.

1.5.2.2 Reduce fight delays due to weather by 5% within one year for flights into Capstone airports.

1.5.2.3 Reduce operators costs for fuel wasted due to adverse weather situations on equipped aircraft in the Bethel area within one year.

1.5.3 Information for Decision Makers

1.5.3.1 Provide a report to the Associate Administrator for Regulations and Certification containing the relevant technical data on ADS-B system performance of all three candidate ADS-B systems (Mode S, VDL4, UAT) in mountainous terrain including at lower altitudes, in extremely low temperature operations, and on a variety of small airframes.

1.5.3.2 Provide a report to cargo operators on the fuel savings achieved due to better in flight information on the location and severity of icing conditions, winds aloft, and below minimums landing conditions.

1.6 Benefits

Under Capstone, the Alaskan Region will serve as a real-world test bed for tools, procedures and certification techniques. During the project selected commercially operated aircraft are equipped to interface with ground sites installed within Alaska.

Immediate impact items include:

- *Improved situational awareness for pilots,*
- *More weather reporting sites,*
- *Improved area navigation and instrument approach capabilities,*
- *Stimulation of the avionics manufacturing industry,*
- *Improved capability for dispatchers and controllers to flight follow aircraft.*
- *Improved search and rescue,*
- *Adapted MEARTS for Anchorage ARTCC,*
- *Fuel savings for equipped carriers,*
- *Immediate potential for reducing near mid air collisions.*
- *radar like coverage at altitudes below 10,000 feet*

1.6.1 Capstone long term benefits:

- *Procurement of avionics to attract manufacturers who can, individually or jointly, deliver avionics and ground equipment which meet performance specifications in a timely manner.*
- *Provides answers to questions regarding GPS performance during periods of natural interference.*
- *Launches efforts to accommodate 180,000 small aircraft nation wide with affordable avionics.*

  Facilitates search and rescue missions by recorded aircraft flight tracks

D. What was the FAA's purpose for deploying Capstone equipment?

Capstone provides the avionics and ground system infrastructure that will lead to improved aviation safety in Alaska. It also provides the launching platform for validation of many essential elements needed to move toward a "proof of concept" demonstration of the Free Flight concept. Introduction of the future communication, navigation and surveillance components of the NAS 4.0 Architecture allows an assessment of operational capabilities and mitigation of monetary and safety risk exposure. The technology fielded under Capstone may be modified during national implementation and need to be replaced.
Capstone provides for field evaluation of alternative ADS-B technologies. The technology fielded under Capstone may be modified during national implementation and need to be replaced. For a full and complete understanding reading every document on the Capstone web site is recommended.

E. Do you have a written policy concerning program implementation (End users, AFS, etc.) Explain your response.

The following document was developed and disseminated in concert with FS personnel at the the Regional Headquarters, and the Anchorage and Fairbanks FSDO's The HBAT for ADS-B, now a portion of the inspectors handbook was developed in conjunction with local, Regional and National Flight Standards personnel.

CAPSTONE INFORMATION

IFR AND VFR USE OF CAPSTONE AVIONICS EQUIPMENT BY AIR CARRIERS AND OPERATORS IN THE STATE OF ALASKA

Version 2 February 12, 2001

1. *PURPOSE: The information within this document is intended as interim guidance for Alaskan Region Aviation Safety Inspectors providing certificate management oversight of certificate holders participating in the FAA Alaskan Region Capstone Program. It is not intended to preempt or replace any other regional or national guidance. This pamphlet replaces the Capstone Information pamphlet dated 02-17-00.*

2. BACKGROUND: Capstone is an Alaskan Industry/FAA safety initiative. Industries role includes establishing requirements and helping field technology. FAA's role includes processing Alaska aviation industry requirement into viable answers to safety initiatives. Industry selected the Yukon Kuskokwin Delta to begin Phase I of the Capstone program. The area, with a blend of approximately 125 VFR aircraft and 25 IFR commercial aircraft, serving 50 communities from a centralized hub airport located at Bethel, Alaska, had a very high accident rate. Technology was selected that could address causes of, primarily, fatal accidents. Since most fatal accidents result from collisions with terrain and other aircraft, these two factors were placed as the highest priority for improvements. It was felt that offering pilots new enhanced situational awareness tools, such as terrain and mid air collision warnings in the cockpit, could have the greatest impact. Passed studies aimed at identifying the cause of accidents show that the large number of VFR destinations served by scheduled carriers around Bethel influenced the number of accidents. As possible counter measures new weather stations and IFR approaches are ready for use by carriers and ADS-B ground stations were certified to enable Air Traffic Controllers to use ADS-B as a radar-like separation tool.

3. ENVIRONMENT

It is important for each Alaskan safety inspector to share a common understand of the environment involved.

Capstone Phase I

The Lower Yukon Kuskokwin Delta, not unlike several other coastal regions of Alaska, is an area of flat tundra intermingled with low gently rising sparsely vegetated hills. A large range of mountains borders the area to the east. Snow conditions, present up to nine months a year, create low or flat light conditions that affect a VFR pilot's ability to judge terrain clearance. This large flat area is known for rapidly changing weather conditions. When instrument flight conditions move rapidly into the area VFR aircraft are caught outside the class D airspace surrounding the hub airport. When IFR traffic is approaching the Bethel airport, Special VFR aircraft are held outside Class D airspace until IFR traffic complete their approaches. This results in multiple VFR aircraft flying in a "daisy chain" holding pattern, in reduced visibility, and adds to and already preexisting risk of midair collisions.

Capstone Phase II

Southeast Alaska will become the site of Capstone Phase II. Due to the terrain constrained environment there are many challenges to be met in order to reduce the number of fatal accidents in this region of the State. With over 1000 islands the Alexander Archipelago is made up of the exposed tops of the submerged coastal mountains that rise steeply from the Pacific Ocean. Deep, fjord-like channels separate the islands and cut them off from the mainland; the northern part of the inside passage threads its way among the islands. The largest islands are Chichagof, Admiralty, Baranof, Wrangell, Revillagigedo, Kupreanof, Mitkoff, and Prince of Wales. All the islands are rugged and densely forested, with few forced landing areas. Some of the islands communities have hard surfaced runways, with the remainder served by seaplane landing areas. Only a few of the airports are served by instrument approach aids. Minimum enroute altitudes, ranging from 6000 to 10000 feet MSL, are due to: mountainous island terrain; communication and navigation limitations The weather is somewhat typical of coastal regions, however, numerous glaciers cascading toward warm ocean water intensifies the affect. The channeled affect created by the islands tend to funnel aircraft into narrowing airspace, while low ceilings increase traffic concentrations at lower altitudes. The transitional areas leading to the airports become congested, intensifying the risk of collisions.

Both of these regions are faced with unique environmental conditions which include: minimal aviation support services, large numbers of VFR destinations, and customer pressure, factors that have resulted in the Alaskan industry selecting them for improvements.

4. DISCUSSION: The Capstone program includes:

A. Phase I and Phase II, Purchasing up to 200 sets of modern avionics during Phase I, and 200 during Phase II (sets include all cables, antennas, mounting hardware, and manuals).

Phase I, 1. Approve the avionics sets for installation under Supplemental Type Certificate (STC) Number SA02149AK, as amended future STC's or the field approval process.

B. Install the avionics sets in commercial aircraft in Alaska.

1. Phase I, These avionics suites consists of:

Multi-function displays (MFD)

TSO-129 or equivalent GPS

Universal Access Transceiver (UAT) or an equivalent ADS-B data link

C. Phase I and Phase II, Purchase and install ten new Automated Weather Observation Systems (AWOS) in western Alaska, install .

D. Phase I and Phase II, Purchase and install ADS-B ground stations capable of transcieving flight information data and sending data to Anchorage ARTCC.

E. Phase I, Initiate operational use of ADS-B for radar-like services to participating aircraft.

F. Phase I and Phase II, Enable the use of ADS-B as a flight following tool for airline operations centers

G. Phase I and Phase II, Verify the accuracy of the ADS-B data collected

H. Phase I and Phase II, Analyze information and program impacts before, during and after implementation.

I. Phase I and Phase II, Provide generic training material and initial cadre carrier crew training.

4. ACTION: FAA Flight Standards role is:

A. Training Program approvals: Each participating Air Carrier/Operator received a complete FAA order 8400.10 compliant sample training module developed and provided by the University of Alaska Anchorage (UAA). This program was developed in conjunction with carriers and ASI's from the Alaskan Region FSDO's. The modules cover the operation of the GX-60 and MX-20 avionics units. Amendments and new modules will be provided as new features are added to Capstone. The most recent addition was forwarded to participants on 12-09-00. Carriers can adapt and adopt Capstones generic program or develop their own version. Regardless, each carrier is responsible to present their adaptation to assigned Principal inspectors for initial approval. Sample train the trainer and initial approval letters for each company are included in Appendix A of this document for convenience. Capstone funded a minimum on one train the trainer slot (larger companies

received more than one slot as training needs and personnel have dictated) to initiate a cadre of instructors. Additional funding is not available, at this time, through the Capstone office to train additional instructors. It is important for each certificate holder to incorporate the necessary modules and maintain a cadre of instructors internally for all future training. Capstone owns 6 "simulator boxes" which can be used in conjunction with the training programs. Certificate holders may borrow the simulators on a first come first serve basis to enable trainees to become familiar with both the GX-60 and MX-20 during classroom sessions. Contact Leonard Kirk at UAA, 907-264-7436 for the simulator use schedule.

B. Authorize initial and approve adaptations of Minimum Equipment Lists (MEL): National MMEL Global Change 86 covers the FAA policy regarding relief for the ADS-B system found in the Capstone avionics (Appendix B). Inspectors should refer to and follow the MEL approval procedures in FAA Order 8400.10, Volume 4, Chapter 4 for those Capstone operators requesting approval or revision to a MEL.

C. Enforcement policy: Due to the nature and type of testing ADS-B equipment and data is undergoing, the Alaskan Region Flight Standards Division does not consider Capstone ADS-B demonstration data appropriate evidence in enforcement actions. Therefore, Capstone ADS-B data will not be used as an item of proof to initiate enforcement actions. Please review the AAL-200 Memorandum dated August 9, 1999 to the field office managers for more information concerning this issue.

D. Operations Specifications: The following discussion may help clarify this subject. National ADS-B bulletin's contain new automated operations specification verbiage for the future approval of a variety of potential uses of that technology. As a result of ADS-B's inclusion in the national bulletin system, when you issue new Operations Specifications today, and part A4 prints, ADS-B appears under section b. 'the certificate holder is not authorized and shall not: "Use ADS-B for certain operational applications." Issuing A52 to an ADS-B user will automatically transfer "use ADS-B for certain operations" to the "authorized" area of A4. There are several reasons why it is important for ADS-B to remain in the "not authorized" portion of A4 for the time being. One area of concern includes the mixed equipage (aircraft transmitting ADS-B verses those who are not) environment in the Capstone area. Not being able to detect all existing traffic electronically dictates an even higher degree of external vigilance by aircrews than normal. Until a national data link decision is made, and self equipage broadens UAT usage, an increased collision risk may be created if crews are prematurely authorized to use "on screen" ADS-B targets to see and avoid or visually acquire traffic. Increase external vigilance should be stressed during all training and checking events for the flight crews using Capstone equipment to help maximize awareness of potential hazards associated with "heads down" time. As carriers identify benefits and evaluate risks, procedures for specific functions using ADS-B targets will mature. Once this happens, carriers will develop procedures and training that ensure ADS-B is used safely, and operations specifications for the capabilities identified in HBAT 00-06 and HBAW 00-05 will be issued.

Inspectors assigned to operators electing to use the GPS portion of the Capstone avionics package for IFR operations should refer to their general guidance, HBAT 95-02A and HBAT 95-03 for approval guidance.

FAA now certifies the ADS-B signal transmitted by each aircraft for use by ATC as a surveillance tool. ATC will use ADS-B to separate participating IFR traffic and provide advisory information to VFR users. This signal is seamless to the flight crews, operators, as well as ATC, it therefore requires training, but no operation specification approvals.

E. Flight following: Each participating Capstone carrier will be able to monitor aircraft transmitting ADS-B signals in the future. The ability to closely monitor the progress of each flight can improve dispatching and operational control capability of the carriers involved. Assigned inspectors, after individual evaluations, may elect to approve the use of this method of tracking flights into each company's operating procedures per current handbook guidance.

F. Program Tracking and Reporting System (PTRS): Inspectors conducting job functions associated with the Capstone program will document their work by placing the word "Capstone" in the "regional use" block of the (PTRS) reporting form. Please note if work is completed relating to HBAT 00-06, HBAW 00-05, etc. additional entries may be required by these bulletins.

5. Other information

A. Barometric pressure entries: Current barometric pressure is vital to the accuracy readout of the terrain data base display on the MX-20 multi-function screen. Inspectors should make sure that each company incorporates a process or procedure that ensures the most current and accurate barometric pressure entries are placed into the MX-20 before pilots select and use the "terrain" information. The unit automatically provides 30-minute reminders to the pilots as an opportunity to update to the most recent pressure setting.

B. Temperature: The multi function display unit makes no corrections for non-standard temperatures. As with any altitude equipment, crews should continue to calculate altitude errors when operating in areas of extreme cold.

C. Information on the web: It is recommended that each inspector assigned or interested in Capstone visit and read the information found on the web site. A Capstone information and procedures package for certificate holders, installers, and inspectors may reviewed and copied at http://www.alaska.faa.gov/capstone or a hard copy may be obtained by contacting the Capstone Program office. This site also contains all Capstone program information collected to date.

6. The Future

Alaska offers a unique operating environment that provides an excellent demonstration area for initiating new technology. Southeast Alaska offers many new challenges in the quest for life saving technology. With many narrow inlets, canals and bays bounded by high terrain, low altitude IFR routes built with conventional navigation and TERPS are virtually unobtainable and therefore non existent below 6,000 feet MSL. New technology may allow FAA to safely incorporate an IFR structure that accommodates the industry desire for a usable system.

4. INQUIRIES. All Regional inquiries should be directed to James Call 907-271-3771 or Gary Childers, 907-271-6304

Appendix A

XYZ Airlines
Director of Operations
Main Street
Anywhere, AK 99XXX

DATE

Flight Standards District Office
Airport

XXXXX, Alaska 99XXX

Dear Mr. _____:

XYZ Airlines request approval to incorporate the Capstone training module for initial, recurrent, requalification, ground and flight, instructor/check airman and dispatcher training program per page XXX, XXX, dated February 15th 2000. This request for training curriculum approval is in accordance with the provisions of FAR 135.325(a) of the Federal Aviation Regulations.

XYZ Airlines also requests that Mr. Leonard Kirk be added to our list of instructors. Mr. Kirk will be the ground instructor for the Capstone training module of our training program.

Director of Operations

U.S. Department of Transportation **Federal Aviation Administration**

Flight Standards District Office

Airport Alaska 99XXX

February 15, 2000

XYZ Airlines
Director of Operations

Main Street
Anywhere, AK 11001

Dear Mr. _____:

Initial approval is granted for XZY Airline's to incorporate the Capstone training module for initial, recurrent, requalification ground and flight, instructor/check airman and dispatcher training program per the list of effective pages dated February 15th 2000. This training curriculum is initially approved in accordance with the provisions of FAR 135.325(a) of the Federal Aviation Regulations.

Initial approval of this training curriculum shall remain in effect until February 28, 2001, or upon the granting of final approval, whichever occurs first. XYZ Airlines is requested to notify this office at least 10 days in advance of any training to be conducted under this program, other that that scheduled by the University of Alaska, so that the FAA may evaluate the effectiveness of the program, in accordance with FAR 135.325(b) of the Federal Aviation Regulations.

Initial approval is also given for Leonard Kirk to act as a ground instructor for the Capstone training module of the XYZ airline training program.

Principal Operations Inspector

Appendix B

PL-105 October 11, 2000

SUBJECT: Policy Regarding Automatic DependentSurveillance-Broadcast System Relief

MMEL CODE: 34 (NAVIGATION)

REFERENCE: Original

FROM: Manager, Air Transportation Division, AFS-200

TO: All Regional Flight Standards Division Managers
All Aircraft Evaluation Group Managers

REPLY TO ATTN OF: Manager, Program Management Branch, AFS-260

PURPOSE:

The purpose of this policy letter is to provide updated guidance for Flight Operations Evaluation Board (FOEB) Chairmen and principal operations inspectors (POI) in assigning relief for Automatic Dependent

Surveillance-Broadcast System (ADS-B) in Master Minimum Equipment Lists (MMEL) and operators Minimum Equipment Lists (MEL).

DISCUSSION:

The ADS-B is an onboard aircraft system that is designed to assist the flightcrew in avoiding conflicting traffic. ADS-B like Traffic Alert Collision Avoidance System (TCAS) is considered a backup to "see and avoid" concept and the air traffic control (ATC) radar environment. This system is certified as an aid to visual acquisition of conflicting traffic and may not be used to maneuver the aircraft based upon traffic information displayed.

The ADS-B communicates with other ADS-B equipped aircraft and transmits/receives data; such as, Global Positioning System latitude/longitude

position, ground speed, altitude, a flight identifier, and velocity vector.

Other traffic information may be uplinked from the ground radar station. This information is derived from the Traffic Information Service (TIS). This service uplinks the traffic radar data from ATC and will generate both TIS traffic targets and TIS traffic alerts.

The ADS-B system is in a developmental process and has not been authorized for fleet-wide installation. Installation is limited to a small number of aircraft under a certificate of eligibility. Relief has been requested for the entire system and for subsystems to allow use of those functions which operate normally, e.g. transmit or receive information if the other function is inoperative.

POLICY:

The Flight Operations Policy Board (FOPB) finds sufficient cause to grant relief for the ADS-B system. It also recognizes that as a developmental system the capabilities will be enhanced and the system will be certified to perform tasks currently being accomplished by Title 14 Code of Federal Regulations (14 CFR) required equipment, e.g. TCAS. Therefore, the POI will ensure, that if ADS-B is installed in lieu of or as a replacement for 14 CFR required equipment, that the repair category in the operator's MEL will be the same as that of the 14 CFR required equipment.

34 NAVIGATION

XX. Automatic Dependent | D | - | 0 | May be inoperative provided Surveillance- it is not required by 14 CFR. Broadcast (ADS-B) System NOTE: If ADS-B is installed in lieu of or as a replacement for 14 CFR required equipment, the repair category in the operator's MEL will be the same as that of the 14 CFR required equipment.

1) Link and Display | D | - | 0 | Processor Unit (LDPU) NOTE: Cockpit Display Traffic Information (CDTI) display of data from other aircraft systems may be used.

2) Cockpit Display | D | - | 0 | and Traffic Information (CDTI) NOTE: ADS-B data transmissions may continue.

3) CDTI Control | D | - | 0 | May be inoperative provided: Panel a) Flight ID can be set, and, b) Screen display is acceptable to the flight crew.

4) Data Link | D | - | 0 | transmitter(s)

5) Data Link | D | - | 0 | Receivers

Gary E. Davis for Gregory L. Michael

2 Elements 9.1.1 Tests and Demonstrations

A. What procedures did you use to deploy Capstone equipment to the industry?

Deployment was done as dictated by the Capstone Avionics Installation Program developed under Contract with Aviation Systems Engineering Inc.

B. What procedures did you use to disseminate training, proper use, and installation information, etc., to industry managers, crewmembers, dispatchers, flight followers?

Capstone followed the procedures found in the the Federal Aviation Regulations and Flight Standards Aviation Inspector handbook. All materials disseminated were processed through the CHDO for each participating carrier.

C. What procedures did you use to disseminate installation, training, and proper use information info to FAA PIs?

Each piece of information was disseminated directly to the PI both by Email and during meetings at the CHDO.

D. Are these procedures documented, and have the procedures and changes been tracked?

Yes.

For the **Certificate Management Team** and **Operator Management** sections, this document shows the number (in parenthesis) of interviewees who gave that answer to each question. For the **Crewmember** section, all actual answers are given due to the variety.

We have applied the ATOS program elements to each series of questions and identified them with four reasons for human error: **Management Function failures**, **Lack of Standards**, **Lack of Training**, and **Poor Individual Performance**. These four reasons for human error encompass the various attributes, which should be incorporated into operator programs under the concept of System Safety.

Certificate Management Team (CMT) principal inspectors

Seventeen inspectors assigned to operator Certificate Management Teams were interviewed, including four Principal Operations Inspectors (POI), five Principal Avionics Inspectors (PAI), and six Principal Maintenance Inspectors (PMI). Some of these inspectors are assigned to more than one of the operators surveyed.

Standards **FAA must have a policy and a procedure to achieve a standard.**

1. Elements: 3.1.4 Operational Control
8.2.4 Cooperative Relations with Assigned PIs.

A. What do you think the Capstone program is supposed to accomplish? *(Note: Some inspectors responded with multiple answers)* *2 responded "Situational awareness", 5 responded as "CFIT", 4 responded "safety", 3 responded "traffic avoidance", 1 responded "radar-like coverage and air traffic control", 4 responded "test program", 3 responded "navigation", 2 responded "flight following".*
B. Describe the FAA's purpose for deploying Capstone equipment, as you understand it? *These answers were the same as A above since the question was so similar to that one.*
C. Were you provided with policy information regarding training, proper use, and installation? If yes, explain your understanding of the policy. *9 responded "no policy information", 4 responded "some policy information", 1 said "policy changed in midstream".*
D. If you received policy information, who distributed that information (Capstone, FAA Region, FSDO management, UAA, etc.) *8 responded "Capstone", 3 responded "UAA", and 4 responded "None". (Note – responses here are inconsistent with C above, likely due to misunderstanding of policy information versus instructions as distinguished in the questions))*
E. What procedures were used for:
1. Approval of training program? *4 of 4 POI said HB 8400.10. All PAI/PMI indicated no involvement.*
2. Operations specifications changes as applicable. *1 of 4 POI said HB 8400.10 for OPSS approval, other 3 POI said no OPSS issued. All PAI/PMI indicated not involved.*
3. Company manuals (maintenance and operations)?. *2 of 4 POI said 8400.10; other 2 said no procedures in manuals. 4 of 5 PMIs said not in manuals, other PMI said data cards change procedures only. All PAI said not in manuals, except 1 said manual is under development now.*
4. Are these procedures documented? *Answers are reflected in block "E.3", above*.

Training **FAA must make the employee aware that the standard or policy exists and teach how to achieve the standard**

2. Element 8.2.4 Cooperative Relations with Assigned PIs
9.1.1 Tests and Demonstrations.

A. Did you receive an overview briefing on Capstone background and development from the Capstone office? *11 said yes, 4 said No.*
B. What training did you receive on the Capstone program, the process, and its operation? *9 said none, 4 said some from observing training or from briefings above, 2 said 2-day UAA class (1POI, 1 PAI)*
C. What training did you receive on the use of the equipment? *Same as B*
D. Have you used the Capstone equipment and operational simulator? How often? *4 POI said yes, only 1 POI in training. 5 of 5 PMI said no, but a couple have watched bench testing. 3 of 5 PAI said some from watching, 2 PAI said yes from UAA training.*
E. Have you used the Capstone equipment in the King Air or any other aircraft? *4 of 4 POI said yes, but varied – 2 in King Air, 1 in both, 1 during en routes. PMI/PAI – all said no except for during en routes or while in shop.*
F. Other than what you provided, if any, do you know if your operator was given any other guidance to incorporate Capstone into the operations manual and training program? *Sporadic answers: 6 said unknown, 7 said some knowledge but could not expand.*
G. If so, who provided the guidance and were you included in the distribution of that guidance, either as a participant or for information? Explain. *Same as F above except 10 of the total could not specify who actual distributed the info, UAA or Capstone. Only one said they participated in the distribution.*
H. What materials were provided with this guidance – VHS, CD, examples, etc? *2 of 4 POI tapes, manuals, handouts; 2 did not know. 2 PAI said manufacturer manuals. All other PAI/PMI did not know*.
I. Did the operator use this guidance when developing their training program? *2 POI said yes, 1 PMI said yes. All others said unknown.*
J. Was this guidance available to you when evaluating the manual and approving the training program? 3 of 4 POI said yes. All others said no.

Management **Must provide the tools to achieve a standard; must enforce the standard.**

3. Elements 3.1.4 Operational Control

A. When and how did you become aware that your operator was participating in Capstone?
(Answers were extremely varied, non-specific, or not clear enough to fully analyze, mostly due to passage of time (3-4 years ago). See question B.

B. Was this before or after the installation of the actual equipment in the first company aircraft?
Before – 8; During – 5, After – 1, Other – 2.

C. At what stage of implementation did you become actively involved with this operator on the Capstone program: equipment installation, ops specs, during an enroute, training program additions, training of crewmembers, Manual changes, etc? (Record the answer as given)
(See question B above.)

D. Did you need support from either FAA management or the Capstone office? What support did you receive?

1. *PMI – Some questions were raised to Capstone office but little resolve was obtained. I was left with the feeling that questions were rocking the boat. POI – primarily ops spec authorization, guidance is weak. PAI – Some questions were raise but we felt that questions were rocking the boat.*
2. *PAI – did not need any but felt that Capstone office would not have responded if I asked. PMI – No; POI – Talked to a couple of folks from Capstone and DC, but don't remember exactly what.*
3. *PMI/PAI – yes but never received any; POI – No.*
4. *PMI-did not need information other than what Childers passed; PAI – no very active, checked 337 and performed in flight checks after installation; POI – No, pretty straight forward stuff.*
5. *POI – see nr.4; PMI – see nr.1*
6. *PMI – don't remember if I asked for help but I did pass information to Capstone. What they did with it I do not know. POI – See nr. 1. PAI – no one in Capstone has an airworthiness background.*
7. *PAI – see nr.2; POI – see nr.4; PMI – see nr.6*
8. *PAI – see nr.2; POI – what I really needed was a proper introduction to the program and familiarization with the product; PMI – see nr.6*
9. *POI – See nr.1; PAI – see nr.4*

E. What does your operator management use the capstone equipment for? (*Note - answers are only opinion, not actual proof)*
2 said company uses for operating in less than VFR, 1 said enhanced GPS, 4 said flight following, 1 said situational awareness, 1 said CFT and collision avoidance, 1 said terrain avoidance and navigation, 2 said don't know, 1 said it is used at outlined in the equipment manual.

F. Do you have any concerns regarding your operator's use of this equipment? Explain.

1. *PMI – My concern is that pilots will use this equipment to a higher level of navigational assistance than the FAA intended (i.e., VFR situational awareness R&D project.) With equipment that has the ability to mislead a pilot, training and recurrent training would see to be a valuable tool to use during this R&D project. PAI – concern that they (PAIs) are not aware of changes in Capstone data bases. Feel totally left out of process and program. POI – Yes, utilized equipment for weather in less than FAR allowance. PAI – pilots will tend to use the equipment to a higher level of navigational assistance than FAA intended.*
2. *PAI – none to speak of. PMI - Absolutely no formal training given to maintenance inspectors at any point in the project. We would ask questions and not get support. A major concern is the STC. The STC gives the installer cart blanc to move radio racks and other equipment around in order to install the Capstone boxes and heads. During installation on company aircraft, the Capstone contracted mechanics just moved stuff around and did not interface with the principals. I was also not given a copy of the STC until I asked for one from of the contracted mechanics. Supervisor Fred Handy expressed some concern to the Capstone folks about the STC and they just "blew him off". POI – carrier seems to be doing good with what they have.*
3. *PMI/PAI – no trace ability to national standard; no support for install of initial equipment; POI – no,*
4. *PMI-concerned that other operators may be turning it off when needed most because of distrust; PAI – only concern is possible pilot distraction but benefits outweigh this; POI – No, very happy with it.*
5. *POI – seenr.4; PMI – see nr.1*
6. *All three seem to be OK with it. Concerned with new aircraft added to certificate that are not equipped. Specifically with relation to operating special VFR with aircraft that have mixed installations. He said that this is a very common complaint among several operators because they were told as a selling point that SVFR operation and ATC handling would improve but it has not. POI – see nr.1; PAI – see below this box for concerns.*
7. *PAI – see nr.2; POI – see nr.4; PMI – see nr.6*
8. *PAI – see nr.2; POI – Not if it keeps them in the air and out of accident reports; PMI – nr.6*
9. *POI – See nr.1; PAI – see nr.4*

Additional Concerns from PAI, operator number 6.

There have been many concerns since the start of the project but no one seems to want to listen to the field inspector, or provide guidance as to how to deal with the equipment. Inspector Tom Hodenfield was to be the point of contact in the FSDO for this project and states that he has been completely left out of the project and has no idea as to what is going on with it, or how it is working. The equipment has inherent problems that have been identified and not fixed, or addressed in any form other than training. Many of the aircraft that the equipment was installed in already had a GPS receiver, of a different manufacture and adding the GX50/60 only added confusion to an already very busy cockpit, such as a DC-6. This aircraft has four engines, prop controls, fuel and all the associated gages for four engine aircraft that is operated from raw air data. The Capstone display and the GPS were installed in the lower left side of the co-pilot instrument panel, a difficult place for the Pilot to identify with. A congested throttle quadrant blocks his view of the Capstone display.

Failure to reset or update the baro setting on the Capstone equipment was a contributing factor of an accident by Grant aviation. Failure to reset the auto CDI scaling function of the equipment inhibits the auto sensitizing of the CDI in the approach mode. STC's were issued to pressurized aircraft and the installation to be done IAW AC43.13 instead of the SRM. The capstone equipment added a second Altitude Encoder to most of the aircraft. If the original Altitude Encoder is calibrated to the correct altitude, the pilots encoder can legally be 125 feet below that. Utilizing that altimeter to test the capstone encoder, (per. The ICA instructions) another 125 ft error would be within tolerance. Thus we now have a 250ft error in a DC-6 accepting ADS-B vectors on approach into Bethel, possibly in an IFR environment with other aircraft that have the opposite error, and also accepting vectors from ATC who believes that the information presented to them places the aircraft within 125ft of there assigned altitude. The FAA just put two aircraft at the same flight level believing they were maintaining a 1000ft separation. The possibility for a catastrophic accident exists. Bethel is a very busy place. Based on this analysis I personally saw to it that the second encoder was deleted from the aircraft and both the ADS-B and ATC transponder now receive altitude information from the same encoder. This encoder is calibrated and tested regularly. There are many of these types of anomalies associated with this program. The Capstone personal state that the equipment is used for "IFR situational awareness."
By the time the Bethel pilot mentality hear this it means IFR, good to go.

Operator Management

Standards **Company must have a policy and a procedure to achieve a standard.**

1. Elements 2.0 Manuals
3.1.4 Operational Control
8.1.4 Internal Evaluation Program

Note from AAL-240: It is not clear if management understands the difference between policy and procedure. 1 of the 9 is a single pilot.

A. Does your company have a policy for use of Capstone equipment? *7 of 9 said yes, they have a policy; the other two said no. Of the 7 with a policy, only one has policy in the manual, 2 have policy in training program. 4 have policy passed in training but it is not in clear writing.*
B. Explain the company's policy on the use of this equipment. *7 gave answers as follows: use to support ops, use to equipment capabilities, 3 say just turn it on with no other direction, 1 said not a tool for bootleg IFR, 1 has instructions for IFR/VFR operations.* *(Note - most statements did not seem like clear policy but just general guidance.)*
C. Can you show me a copy of the company policy? *1 was in company manual, 3 were in training program, others not written as policy. (See Note added to question B above)*
D. Does your company have an audit process to ensure that the company policy is being followed? *None had a written audit process. 4 of 8 said they conduct periodic en routes. 1 left is single pilot.*
E. Do you have a company procedure for the use of Capstone equipment? *Same as A*
F. Explain the company's procedure for the use of this equipment? *Same as B*
G. Can you show me a copy of the company procedure? *Same as C*
H. Is there an audit process to ensure that company procedures are being followed? *Same as D.*

2. Elements 2.0 Manuals
3.1.4 Operational Control
5.1.2 Weather Reporting/SAWRS
5.1.6 Use of Approved Routes, Areas, and Airports.
8.1.5

A. Are Capstone equipped aircraft used for specific trips or specific purposes? *Clear answer from all was not for specific trips, but since almost all aircraft are equipped, this was not an issue.*
B. Are there any special requirements for the assigning a Capstone aircraft for specific trips or purposes? *NA*
C. What conditions initiate the use of special requirements for assignment of Capstone? *NA*
D. Who makes these determinations? *NA*
E. Are these procedures in the company manual? *NA*
F. The Capstone program is readily used for in flight avoidance of terrain and other aircraft. What other ways are you aware of that pilots and other personnel in your company, may be using the equipment and Capstone system, such as for preflight planning, or post flight analysis of a particular flight or series of events? *One uses it as an item for operational risk assessment, others to ID aircraft, locate concentrations of aircraft at an airport, concentrations of aircraft in areas of questionable weather, terrain, some weather. See expanded answer of full report.*
G. This is a new program to employ advanced technology to 135 operations and there may be advantages and uses not yet discovered or documents. Have your employees found innovative or new ways to employ the advantages and applications of the Capstone equipment and program? If so, explain. *No real innovations indicated. Some anticipated responses include: contact known aircraft in area for PIREP, note number of aircraft on ground or in pattern at small airport, others same as question F above.*
H. If yes to either of these two areas, have you been able to provide feedback to the Capstone office? *a. Company uses another program called "Flight Explorer" that shows area, terrain, weather, etc. and the DO has suggested to Capstone that they consider better interface rather than the "blank" screen available at home on a computer. DO would rather see what the situation really is rather than just where the aircraft is. He passed this to Capstone but their response was that "this is our focus". In other words, they blew him off.* *b. We provide feedback to Capstone on many issues and in many formats, including phone calls and direct contact. We rarely get follow up information unless it is a critical issue such as recent database error giving incorrect altitudes.* *c. They said they have several issues they have pushed forward to the Capstone office but do not seem to get feedback or action from them. In many cases, these items are brought up at the monthly Capstone meetings in Bethel but at the following meeting the item is not resolved. One concept put forward is to see if ATC can have the positions of non-Capstone equipped aircraft in the areas of radar coverage transmitted to the Capstone equipment and displayed in the aircraft. They were told they would look into it but nothing was further said.* *d. NA* *e. NA* *f. NA* *g. NA* *h. Mr. Nelson is a member of the Capstone committee and has direct access.* i. *None, only contact is for following inoperative equipment*

3. Elements 1.1.2 Appropriate Operational Equipment
3.1.3 Airman Duties/Flight Deck Procedures
3.1.4 Operational Control
3.2.1 Dispatch or Flight Release
8.1.4 Internal Evaluation Program

One operator is a single pilot.

A. Does your company have a policy for operating in marginal weather conditions? *All say they have a policy.*
B. Can you explain that policy? *5 say they do not operate in less than 500/2 but not much else than that. 1 says they will transition to IFR when encounter those conditions (FAR 121 operator). Others did not expand except to avoid violating FAR.*
C. Can you show me the policy? *5 of 8 were in either manual or training program, 3 were not written.*
D. Does your company have a process to ensure that employees are adhering to company policy? *Only 1 of 8 had a formal process, which is a dispatch process. 4 perform periodic checks. 3 no.*
E. Does your company have a procedure for operating into marginal weather conditions? *Same as A thru D above.*
F. Can you explain that procedure? *Same*
G. Can you show me the procedure? *Same*
H. Does your company have a process to ensure that employees are adhering to company procedures *Same.*

Training Company must make the employee aware that the standard exists and teach how to achieve the standard.

4. Elements 2.1.2 Interfaces
3.1.3 Airman Duties/Flight Deck Procedures
3.1.4 Operational Control
3.2.1 Dispatch or Flight Release
4.3.1 Pilot Operating Limitations/Recent Experience
4.3.2 Airman/Crewmember Checks and Qualifications
5.1.2 Weather Reporting/SAWRS
8.3.6 Outsourcing, Maintenance, Training, Ground Handling

A. Is your company authorized and qualified to perform maintenance on Capstone equipment, and what training have you received to support this? *Operators do not perform maintenance on equipment. Only replace data cards and remove/replace boxes. Some limited troubleshooting when talk to manufacturer to validate that box needs to be removed.*
B. If your company is not authorized to perform maintenance on Capstone equipment and you are using an avionics repair station, what training have their employees received on handling, maintaining, and installing the equipment, if you are aware of any? *Some received R&R training but most was OJT IAW equipment manuals. None have clear maintenance training.*
C. Were you provided with materials to put Capstone into your training program? *Yes to all – 1 was single pilot but have materials.*
D. Where, how, and from whom did you receive these materials? *UAA for all.*
E. Were these materials adequate for use in your training program, and if not, why? *All said yes. Some operators made changes to meet company standards*
F. What materials did you develop as part of the training program other than those provided? *3 said they reformatted materials to meet company standards and 2 added presentation processes. Others used as given, with two saying they share training with another operator in Bethel..*
G. What approximate percentage of company pilots are trained and qualified to use Capstone equipment? Total?___ VFR?___ IFR?___ *Essentially 100% for all operating in Bethel. One small operator half are equipped.*
H. Do you plan to train and qualify all pilots in the use of Capstone? *Yes.*
I. If you have decided not to have all pilots trained in Capstone, what was the basis for that choice? Only one operator uses a non-qualified pilot and does not assign to a Capstone aircraft. Does plan to train him and any other untrained pilot if/when hired
J. What procedure do you use to keep unqualified pilots from using Capstone when operating an aircraft with equipment installed? *DO/CP say just don't assign him.*

5. Element 8.1.4 Safety Program/Internal Evaluation

A. In the normal course of training and qualification, VFR pilots only receive training and checking once a year and IFR pilots twice a year. What controls do you have in your internal evaluation/audit system to validate that your policies and procedures are being followed throughout the year? *Half use periodic line checks. Two are IFR. Rest use only competency check annually*
B. How often do you perform line checks or other on-the-spot knowledge checks on your pilots using Capstone? *Most don't but the ones that do say they try for twice a year on VFR pilots*
C. Does this system of audits/internal evaluations include other employees involved in the Capstone program? *Only one includes dispatch/fight following*

6. Element 4.2.3 Training of Flight Crewmembers
5.1.2 Weather Reporting/SAWRS
8.1.5 Resource Management Training

A. Does the company provide training on recognition of loss of visual references due to flat light, white out, or deteriorating visibility conditions? *All say yes but non-specific. One is single pilot*
B. Does the company teach pilots how to estimate in flight visibility? *All say yes, but is non specific, not clearly written in training program*

Management: Must provide the tools to achieve a standard; must enforce the standard.

7. Elements 2.1.1 Manual Currency
2.1.2 Content Consistency Across Manuals

A. How did you find out about Capstone? *5 said from Capstone briefings in Bethel and contact from UAA, 1 was already in process when company purchased, 1 small operator for a prior POI, 1 small operator from when he was a pilot for Village Aviation already involved.*
B. What background information were you given on Capstone and deployment in the Yukon-Kuskokwim Delta? *Essentially all do not clearly remember – some test bed for new technology, improve SVFR, Safety, radar-like ATC, reduce mid-airs, reduce accidents.*
C. Why did your company want to participate in the capstone project? *Answers included: Safety, free equipment, CFIT, Mid air avoidance, track aircraft, new program, ADS-B, increase value of airframes with equipment, enhances operations in Bethel, increase awareness, many other benefits non specified.*
D. What was the key factor that made your company want to participate? *Equipment free, increased safety, CFIT. One stated that it helped standardize their cockpits.*
E. What were your expectations of the program at the onset of implementation? Examples may be operational control, safety, accidents, marginal weather capabilities, etc. *All items above listed above in C. Track aircraft, situational awareness*
F. Did it meet with your expectations? *Yes. All want to keep it and like to have it.*
G. If either enthusiastic or disappointed about a specific area, explain further. *1. Disappointed in response from Capstone in expansion of equipment involving other technologies such as "Flight Explorer" interface. Recent crash: DO says Capstone did not show actual position of aircraft (but this may be a wrong interpretation of actual situation/. DO says that Grant is the only dual installation in the area, allowing better use of GPS for navigation and IFR. DO says Capstone response is poor but did not give any other clear issues.* *2. Flight crew morale significantly improved during training and after training because of the capabilities of Capstone. There were installation problems – primarily, there were few technicians available and installations did not run as smooth as we could. Until this past July, there was no process of notifying users when problems arose. There is now a process in place.* *3. There were developmental problems that have been eliminated. Also, they were originally assured that they would not be subject to enforcement if the equipment were misused. This was not true and two pilots were violated at the onset of the program – status in unknown. Training and deployment were not coordinated. Equipment was installed and they were told to use it before they were trained. ERA would like to install the equipment in all aircraft and in a planned Level 5 FTD. But Capstone tells them equipment in not available. There are also ergonomic issues such as a large number of key strokes for certain tasks. Another key issue is the time it takes to initialize the set up when shut down on short legs.* *4. CP – Concerned with RAM warnings, more than other GPSs. Happens in all airplanes 2-3 times a week, more often than other units in same aircraft. DO – see F above.* *5. **Installation cost the owner $1387.29 – was supposed to be free!!!! (see Bill Missal for more)*** *6. NA* *7. Air Traffic in Bethel is not better. This was big selling point in the beginning. Thought IFR/SVFR would move faster.* *8. Biggest problem is that Flight Standard inspectors are generally left out of the entire process. Mr. Nelson's experience and information from several sources reveals that many inspectors are not trained in the products, process, or capabilities. Assigned inspectors seem to be left out. He expects that inspectors will be a extension of his structure to ensure that FAA policies are followed in addition to manuals and training programs* *9. altitude software glitch*

8. Elements 3.1.4 Operational Control
8.1.4 Safety Program/Internal Evaluation Program

Note: One operator is a Single Pilot Operator.

A. Does you company have an internal audit procedure ensure that pilots are using Capstone equipment as intended or IAW with company policy? If yes, explain the procedure. *4 of 8 have a process that consists mostly of line checks. Policy not written*
B. Explain what action management takes when Capstone procedures are not followed, e.g., how does the company enforce the standards: e.g., disciplinary action, remedial training, manual revisions, etc. *2 say has not been an issue. 1 said just fire if caught. 5 said retrain, 4 said will fire if repeated.*
C. Do you have a method to determine if procedures are not effective: direct feedback from pilots, flight log entries, safety reports, trip records, passenger complaints/comments, etc? *Only one has a formal system but it is not written.*
D. Explain what action management takes when procedures appear ineffective: e.g., manual revisions, training program revision? *4 say they issue Revisions. 4 will use revisions but have not needed to do so. 1 gives to safety committee to work.*

Crewmembers.

Individual **The individual must know the standard and must follow the standard—may have to explain.**
Note: The verbiage in each question is a consolidation of all comments from pilots interviewed at each company, which are indicated by a number rather than name or designator to maintain impartiality.

1. Elements 3.1.3 Airman Duties/Flight Deck Procedures
3.1.4 Operational Control

A. How does the company expect you to use this equipment?
1. *No pilots for this company interviewed.*
2. *CE207 - Situational awareness and traffic separation. CE208 – not positive*
3. *Pilots are trained to use full capabilities at all times, IFR and VFR*
4. *traffic avoidance, secondary navigation, situational awareness, VFR safety equipment*
5. *SINGLE PILOT OPERATOR (SPO), GPS tracking, terrain mode, traffic information*
6. *Back up when needed, terrain avoidance increased situational awareness, dispatch tool, increased safety*
7. *Always on, primary navigation, situational awareness,*
8. *Unsure, always on*
9. *Use if installed if trained*
10. *use it to keep out of trouble if needed, keep it turned on all the time.*

B. Do you know the company policy for using Capstone equipment?
1. *Not interviewed*
2. *CE207 – None. CE208 – not sure*
3. *Yes*
4. *None*
5. *NA*
6. *Not sure, always have system on when flying*
7. *None. Similar to VOR or autopilot, no specific policies, just another piece of equipment*
8. *Not sure*
9. *Use map mode near mountains*
10. *No response*

C. Where can you find the written company policy?
1. *Not interviewed*
2. *CE207 – None. CE208 – not sure.*
3. *Policy is part of the training program*
4. *NA*
5. *Not written*
6. *Not sure*
7. *None*
8. *Not sure*
9. *NA*
10. *not sure*

D. Explain the company procedures for use of Capstone equipment?
1. *Not interviewed*
2. *CE207 – none. CE208 - located aboard the aircraft and a video is available.*
3. *Procedures are contained in the training program.*
4. *None, just use it.*
5. *No procedures*
6. *No answer*
7. *NA*
8. *No answer*
9. *No*
10. *No response*

E. Can you show me the procedures?
1. *Not interviewed*
2. *CE207 – No system, self explanatory. CE208 – Not aware of any.*
3. *None that are specific but they are developing more effective uses all the time.*
4. *NA*
5. *NA*
6. *Located on company aircraft*
7. *None*
8. *Believe there are procedures located at the stations in Dillingham and Bethel, but not sure. Have my own procedures manual he carries*
9. *No*
10. *probably could use more detailed instructions*

F. Are there procedures that are missing, or need improvement?
1. *Not interviewed*
2. *CE – 207 no. CE208 – no to company, yes to other crews.*
3. *Several items were passed to Capstone office with little or no response; Yes through Chief pilot both positive and negative items.*
4. *No, other than no procedures written*
5. *NA*
6. *Not aware of any, be vigilant in maintaining correct baro pressure dialed into system*
7. *NA*
8. *don't know*
9. *No*
10. *No*

G. Have you given feedback on procedures to company management, either positive or negative?
1. *Not interviewed*
2. *CE207 – No. CE208 – use the internet plus a Capstone observer was on one flight.*
3. *Phone calls, oral during meetings. Items are passed to Capstone in a variety of ways.*
4. *No*
5. *NA*
6. *Yes, and no*
7. *No*
8. *yes*
9. *no*
10. *No*

H. What method did you use to provide this feedback?
1. *Not interviewed*
2. *Various*
3. *Above in G*
4. *NA*
5. *NA*
6. *Oral discuss with CP*
7. *NA*
8. *directly talk to CP*
9. *NA*
10. *NA*

I. Would you rather operate a Capstone equipped aircraft than one not equipped?
1. *Not interviewed*
2. *Yes*
3. *Yes and definitely. Would like to see all aircraft in fleet equipped- 5 of 9 now. Policy is that equipped aircraft are assigned to Bethel.*
4. *Yes*
5. *Capstone equipped*
6. *Yes and No*
7. *Yes*
8. *Yes*
9. *Capstone equipped*
10. *Yes*

J. Do you anticipate that Capstone equipped aircraft will be given priority handling for special VFR operations?
1. *Not interviewed*
2. *No but should*
3. *We operator mostly IFR in marginal conditions and do not routinely use SVFR procedures.*
4. *No*
5. *No*
6. *Not sure, probably not.*
7. *No but desirable. Bethel air traffic over congested and slow. Should use Capstone to its capabilities but the Bethel tower does not. No-BIG PROBLEM, Have technology but no using it, big safety problem*
8. *No comment, yes*
9. *No*
10. No

2. Elements 4.2.3 Training of Flight Crewmembers
4.2.8 Simulators/Training Devices

A. What initial training did you receive for Capstone? Expand.
1. *Not interviewed*
2. *CE 207 – UAA; CE208 – UAA plus ground school at Hageland*
3. *First exposure was through UAA and Capstone. One pilot interviewed is a Capstone instructor at ERA.*
4. *Initial indoc aircraft and ground, flight training and handouts, philosophy and problems with incorrect programming. Do route programming on ground prior to flight.*
5. *Village Aviation 3 years ago*
6. *Ground school in Anch provided by company, received 8 hours as an instructor for another company*
7. *Manuals, videos, simulator, flight training*
8. *Ground school in Anchorage provided by company.*
9. *Company ground school*
10. *Company training in Fairbanks*

B. When did you receive initial on this equipment?
1. *Not interviewed*
2. *CE 207 – 2000. CE208 – July 2002*
3. *At initial program implementation a couple of years ago*
4. *a year to two years ago.*
5. *No answer*
6. *August 2002, September 2002*
7. *2 years ago, 18 months ago.*
8. *July 2002 both*
9. *a few months ago*
10. *August and September 2002*

C. Who provided this training?
1. *Not interviewed*
2. *UAA*
3. *Capstone and UAA*
4. *UAA*
5. *UAA*
6. *Chief pilot, UAA*
7. *In house. UAA also provided training after Grant crash*
8. *company*
9. *Company instructor*
10. *Company CP and DO*

D. What materials and equipment were available during training?
1. *Not interviewed*
2. *Simulator use plus handouts*
3. *Simulators, handouts, videos, manuals. Modified to meet ERA standards*
4. *lectures, handouts, no video, no simulator*
5. *sims, videos, written material*
6. *Simulator, worksheets*
7. *No simulator; manuals, videos, flight training*
8. *handouts and simulator*
9. *simulator, handouts*
10. *no simulator available, but use actual installation in aircrafts*

E. Did the initial training prepare you for everyday use of the equipment during operations?
1. *Not interviewed*
2. *Good start but learn more as you go, had to use the equipment for a while to really learn it, no*
3. *Yes*
4. *Good start but need to use equipment to really learn.*
5. *Yes*
6. *Yes under right conditions, and on the job training in required*
7. *yes but learned more as you go, use more to get used to it.*
8. *Probably. Almost, but the real teacher was experience gained from actually flying the aircraft with the equipment.*
9. *Yes*
10. *Yes but some experience in the actual aircraft was still required for rounding things out.*

F. If you have received recurrent training, has that been equally effective?
1. *Not interviewed*
2. *Recurrent ground school conducted by UAA was effective*
3. *Six month recurrent for IFR is effective but use ERA program*
4. *yes with simulator exercise, one pilot is a new hire.*
5. *SPO.*
6. *No and yes.*
7. *No and yes*
8. *haven't been to recurrent as yet.*
9. *NA*
10. *Not yet*

3. Elements
- 4.2.3 Training of Flight Crewmembers
- 3.2.1 Dispatch or Flight Release
- 5.1.2 Weather Reporting/SAWRS
- 5.1.6 Use of Approved Routes, Areas, and Airports

A. Do you personally have a method to determine in flight visibility?
1. *Not interviewed*
2. *Yes from all*
3. *Yes but seldom use it because company policy is to go IFR in marginal weather.*
4. *Yes by all*
5. *Experience*
6. *Yes assisted by GPS and Capstone*
7. *Yes*
8. *No, yes*
9. *Estimate*
10. *Yes*

B. Can you explain the method you use?
1. *Not interviewed*
2. *Ref with point ahead, experience judging distances, can't explain*
3. *Back up visuals with GPS and experience.*
4. *experience, timing, moving map and visual, GPS*
5. *Can't explain, just experience*
6. *Not really able to explain it; local geographical knowledge is the best way to put it.*
7. *Capstone assists, visual reference points on ground, experience*
8. *NA, pick out a spot on the windshield and use it to reference outside distances.*
9. *Runway length comparison, flight training, reference points on aircraft*
10. *Timing, use watch and ground speed to determine distance between objects*

C. Where did you learn this method (company training, flight school, recurrent training, other company, other pilots, etc.)?
1. *Not interviewed*
2. *experience, common knowledge, no response*
3. *Experience and other pilots*
4. *experience, common knowledge, self taught*
5. *years of flying*
6. *experience using equipment, experience and other pilots.*
7. *self taught*
8. *NA, fellow company pilot*
9. *primary flight training*
10. *self taught, Use for years successfully in all types of AC*

D. Does the company have a procedure for determining in flight visibility? Explain it.
1. *Not interviewed*
2. *No and not sure*
3. *Use all equipment available, including Capstone. If visibility is decreasing significantly, enter IFR.*
4. *No*
5. *no*
6. *No*
7. *No*
8. *Not aware of any*
9. *No*
10. *No*

E. Where is the company procedure outlined?
1. *Not interviewed*
2. *NA*
3. *Outlined in training program*
4. *NA*
5. *No*
6. *NA*
7. *NA*
8. *NA*
9. *NA*
10. *NA*

4. Elements
- 1.1.2 Appropriate Operational Equipment
- 3.1.4 Operational Control
- 3.1.13 Other Personnel with Operational Control
- 4.3.1 Pilot Operating Limitations/Recent Experience
- 4.3.2 Airman/Crewmember Checks and Qualifications
- 7.2.1 Safety Program
- 8.3.2 Varied Fleet Mix and Mixed Fleet Configuration

A. In what aircraft are you qualified for this company?
1. *Not interviewed*
2. *CE208 and 207*
3. *Multiengine r Captain and First Officer/Instructor.*
4. *CE172. CE207*
5. *Cherokee*
6. *CE 207*
7. *CE172/207/208*
8. *CE206/207*
9. *CE207*
10. *PA32 and 32A*

B. Which of these aircraft have capstone equipment?
1. *Not interviewed*
2. *All are equipped*
3. *5 of 9 are equipped*
4. *All are equipped*
5. *NA, one aircraft*
6. *All*
7. *All*
8. *approximately 50%*
9. *50%, 2 of 4*
10. *all assigned to Bethel*

C. Are Capstone equipped aircraft used for specific trips? Explain.
1. *Not interviewed*
2. *All are equipped*
3. *Not for trips but equipped aircraft are assigned to Bethel*
4. *NA*
5. *No*
6. *NA*
7. *NA*
8. *No*
9. *No*
10. *NA*

D. Are there any special requirements for the assignment of Capstone aircraft to the specific trip?
1. *Not interviewed*
2. *NA*
3. *NA*
4. *NA*
5. *NA*
6. *NA*
7. *NA*
8. *NA*
9. *No*
10. *NA*

E. Who determines what these special requirements are, when they are applied, and who makes the final decision on the assignment of a Capstone aircraft?
1. *Not interviewed*
2. *through 10. NA*

F. Show me where these special requirements and procedures are located?
1. *Not interviewed*
2. *NA*
3. *NA. There is no written company policy about Bethel aircraft, it is just that way.*
4. *through 10. NA*

G. How are you assigned to a flight with a Capstone equipped aircraft?
1. *Not interviewed*
2. *NA*
3. *NA*
4. *NA*
5. *NA*
6. *NA*
7. *NA*
8. *NA*
9. *Training qualifies you to be assigned*
10. *NA*

H. In relation to this flight above, when and how are made aware of that assignment?
1. *Not interviewed*
2. *NA*
3. *NA, except that it is common knowledge among pilots if a specific aircraft in Bethel does not have Capstone, and pilots complain.*
4. *NA*
5. *NA*
6. *NA*
7. *NA*
8. *NA*
9. *PIC assignment to flight*
10. *NA*

I. If you as a pilot are involved in the choice to use a Capstone aircraft for a specific flight or any flight in general, what process do you use to make that choice?
1. *Not interviewed*
2. *NA*
3. *Complain if not available.*
4. *NA*
5. *NA*
6. *NA*
7. *NA*
8. *NA*
9. *Capstone makes flights safer*
10. *NA*

J. Is that process in writing as a company policy and procedure? Show me the process?
1. *Not interviewed*
2. *NA*
3. *No*
4. *through 10. NA*

5. Element 4.2.3 Training of Flight Crewmembers
7.2.1 Safety Program

A. What do you think controlled flight into terrain (CFIT) means?
1. *Not interviewed*
2. *Wrecking due to loss of situational awareness due to low visibility, crashing in bad weather and low visibility, flying into terrain in low visibility, not sure*
3. *Crashing in low visibility and lighting, especially during VFR, Unwanted collision with ground regardless of circumstances.*
4. *flying into ground or hillside by accident, accident in poor weather, pilot error, crashing due to weather*
5. *Related to terrain avoidance*
6. *Both felt they know what it is but were unable to effectively explain it.*
7. *Flying a good airplane into a hillside, low ceiling, poor visibility*
8. *Unable to put into words, did not understand the question initially.*
9. *other than landing crashes*
10. *familiar with term but did not explain*

B. What are all the conditions that you think need to exist for there to be a risk of CFIT? Explain (record the specifics).
1. *Not interviewed*
2. *Positional awareness not known, poor visibility, bad weather and no knowing exactly where you are, low or no visibility*
3. *Low visibility, flat light and whiteout, inattention to operating parameters, precipitation, night ops, many other conditions.*
4. *poor visibility, lack of weather reporting, low ceilings, lack of altimeter settings, hills, low visibility, flat land in low vis*
5. *Altimeter settings*
6. *low altitude, poor weather, time of day, health of pilot, AC condition.*
7. *Low visibility, poor situational awareness, poor visibility, low ceiling. Don't trust terrain feature—not a radar altimeter. Uses baro setting which could be wrong. Not practical when needed at a low altitude due to necessity(???)*
8. *Not sure. Low level flight, poor visibility, whiteout situation,*
9. *low visibility, mountainous terrain, night*
10. *dark, low ceiling, low visibility*

C. Does the company provide information about these conditions?
1. *Not interviewed*
2. *Yes, in ground training, turn around it is gets too bad, in ground school and annual recurrent*
3. *Yes during training and pilot discussions*
4. *Not formally, verbal discussions during training,*
5. *NO SPO*
6. *Yes in ground school and annual recurrent*
7. *No answers*
8. *Yes*
9. *Ground school video, CFIT accident review*
10. *Yes*

D. Have you received training for operations in flat light conditions?
1. *Not interviewed*
2. *Yes, in ground school, hood work during instrument training, some*
3. *Yes*
4. *Above for CE single engine, Hood work in 212*
5. *SPO*
6. *Yes*
7. *Yes, ground training, hood work, oral, discussion on ground*
8. *Some mostly discussions with other pilots, no*
9. *No*
10. *Yes*

E. Have you received training for operations in white out conditions?
1. *Not interviewed*
2. *Yes, same as flat light,*
3. *Yes*
4. *same as D*
5. *SPO*
6. *Yes*
7. *Same as above*
8. *yes, Unsure*
9. *No*
10. *yes*

F. Does your company safety program address CFIT?
1. *Not interviewed*
2. *No,*
3. *Yes during safety meetings*
4. *No*
5. *No, SPO*
6. *Yes, and don't know.*
7. *Discussions only*
8. *unsure*
9. *Yes*
10. *no response (don't know?)*

G. Do you think that Capstone equipment will help you when you encounter these conditions? Have you experienced this?
1. *Not interviewed*
2. *Yes, good for reference.*
3. *Yes very definitely*
4. *Yes, some have experienced it.*
5. *Yes, No*
6. *No answer*
7. *Map mostly, not terrain feature-don't trust. Yes but low hills dangerous. At 500 feet, screen is red so a 300 foot hill will get you.*
8. *Yes, Prefer more traditional indicating systems such as artificial horizon indicators.*
9. *Yes but won't help if not used correctly. Have not experienced situation as yet.*
10. *Yes*

6. Elements 3.2.3 MEL/CDL Procedures

A. Have you encountered Capstone equipment problems? Describe?
1. *Not interviewed*
2. *CE207 – Altitudes were off but has been fixed, slow startup in winter, Blue Screen of Death, screen has lines, route flags, weather gathering sometimes inop and often outdated; CE208 = Altitude reporting has been erroneous, baro pressure has to be entered manually every start due to constant changing in this area, wx data uplink problems, ELT function should be more obvious and easier. In an emergency, time is of the essence.*
3. *Not recently, several problems early on, all pilots are IFR and use all equipment available. Would like all aircrafts to be equipped.*
4. *Blue Screen of Death a lot at beginning but still happens occasionally, have to reboot to clear. Terrain feature not available in some areas near Nome, and not reliable at all times*
5. *Initial installation, costs, bad encoder, UAT failure.*
6. *Altitude problems, baro pressure needs to be entered manually at every start, MFD show lines when heated up in cold weather, system often shuts itself off in rainy conditions. When not actually in the "Terrain" mode, the only warning of a possible CFIT is a small flashing white light in the corner of the MFD. Should be brighter or some other way of getting attention.*
7. *Takes a while to come up to terrain feature in winter – 20-30 minutes. Some screens have lines in them—3 screens in 2 years. One screen looks black and white. Altitude encoders erroneous several times. Two ADS-B boxes failure. Screen very hot in summer.*
8. *False altitude reporting, system not painting other known Capstone equipped aircraft. Altitude related problems, displayed and broadcast, improper directional readouts for other aircraft-3 o'clock given when aircraft was actually at 9 o'clock*
9. *Obtaining weather, screen went blank.*
10. *Yes. Altitude reporting of other aircraft has been erroneous. Our AC are all good though. Suspect some installations may not be the best on other operators' aircraft. MX-60 failures—total blank screen*

B. If these problems were not obvious equipment failures, did you stop using the equipment?
1. *Not interviewed*
2. *CE207 – no; CE208 – yes.*
3. *We routinely use all capabilities of aircraft and equipment at all times, and are trained to use back up information at all times.*
4. *No. When Blue Screen happens, recycle box clears the problem.*
5. *Yes*
6. *No*
7. *No weather in Platinum, Kipnuk.*
8. *No, continued to use what part were functioning. Yes, but then found out that he could fool the system into giving what he knew to be his actual altitude by dialing up or down the barometric pressure on the box till system displayed his actual altitude.*
9. *Told company and equipment was repaired*
10. *Not sure*

C. Does your company MEL procedures include deferring Capstone equipment?
1. *Not interviewed*
2. *CE 207 Don't know, CE-208 has MEL*
3. *Yes, multi engine.*
4. *No, not even in CASA*
5. *No*
6. *Don't know*
7. *None*
8. *Don't know*
9. *NA*
10. *no*

D. Show me the Capstone MEL procedure? (Record that the pilot can do this)
1. *Not interviewed*
2. *CE 207 Don't know; don't think so; NA; CE208 pilot was able to show procedure;*
3. *Yes*
4. *NA*
5. *NA*
6. *NA single engine*
7. *None*
8. *NA*
9. *NA*
10. *NA*

E. If Capstone equipment problems that you encountered were not listed in the MEL, have those problems affected the way you use the equipment?
1. *Not interviewed*
2. *NA*
3. *NA – has not occurred*
4. *MMEL is approved but does not cover Capstone*
5. *NA*
6. *NA*
7. *NA*
8. *NA*
9. *NA*
10. *NA*

F. To whom and how did you report these problems that are not MEL issues?
1. *Not interviewed*
2. *NA*
3. *NA*
4. *Some information issued from AAL-200 but not incorporated into MEL, sitting in front of binder.*

5. *NA*
6. *NA*
7. *NA*
8. *Dispatch and CP*
9. *NA*
10. *NA*

G. If your opinion, is the Capstone equipment reliable?

1. *Not interviewed*
2. *Give it 9 out of 10 overall; weather date 6 out of 10; very much like to have it; mostly except for the Altitude problems.*
3. *Works well most of the time and like to have it, very useful*
4. *Yes, very happen to have it, except for Blue Screen*
5. *Currently Yes*
6. *Yes, except for altitude related problems*
7. *Yes. Map especially, even in cold weather, but not too accurate, needs work.*
8. *Yes. Yes, but never place all your faith in it.*
9. *NA*
10. *Yes*

Additional Comments:

1. None

2: Pilots commented that there is confusion about using N-numbers rather than unique designators. This makes it more difficult to identify conflicting traffic. Skammon Bay AWOS needs a repeater. No provision for cooling, the equipment gets hot. Some locations in wrong place on map – EEK, KWT, WNA, Mountain Village. Weather system is awful and not working much of the time. ADS-B not always accurate and other aircraft altitudes often wrong. Not sure how altimeter setting affects ADS-B. Flight plan feature a waste for VFR small hops.

3. through 9. No additional comments

10: Weather uplink status? It is needed. Magnetic variation—is it plugged into the database? Pilot suspects so, but is curious.

Report on Capstone Phase I Interviews by John S. Fisher, Interviewer (Juneau FSDO)

The following is a summary of what I was able to glean from the interviews with Capstone Phase I Operators in the Bethel area and other key people back in Anchorage, as well as my personal observations during my time in the area. There are some items here that may not be apparent from the raw interview reports, which were sent separate from this report.

Interviews:

Almost every one of the eight (8) pilots I interviewed was very happy to have Capstone in their aircraft. In fact, there was only one pilot who seemed a little unenthusiastic about the system. And even he admitted that it did have a lot of merits.

I was only able to interview two (2) of the CMT Inspectors, but feel they did contribute honestly to the survey. It is noteworthy that both of the Inspectors I was able to interview were on the Airworthiness side of the house. I did get to speak with POI some, but did not actually capture his comments in a complete interview unfortunately. What surfaced from the Inspector's interview was a desire on their part for more involvement with the program, but an apparent lack of such a request by Capstone. Whether this was intentional, or (more than likely) an oversight, is hard to determine. Both mentioned that there had been Capstone briefings at the FSDO, but there does not appear to have been much, if any, follow-through for those CMTs that were responsible for the selected Operators.

As far as Operator Management personnel, there was only one (1) successful interview, that being with (operator 8, who was interviewed twice). The individual was enthusiastic about the Capstone program. In fact he stated that he has been a vocal proponent of the program since its inception. It appears that even with a gung-ho management on board however, there is still room for much improvement in the Training and Auditing of the Capstone system. Many of the Responses to questions on these areas seemed vague at best.

Findings:

If there were common denominators for the end users in the Bethel area, they are as follows:

- *No consistency in the **Training Programs**. Some appear almost non-existent.*
- *The **Altitude Reporting** part of the system was reported as most problematic.*
- *A fairly close second was the **lack of sufficient weather data** for many situations.*
- *There seems to be some variation on who is actually **updating the databases** on the aircraft. It appears to be a **Maintenance responsibility**, but it also appears that the pilots are often the ones who actually plug the new info into the unit. Perhaps it should be considered an **Ops responsibility?** Just thinking out loud here.*

One item, which came up more than once, was the question on how they are to ID themselves within the system. It appears that someone (Capstone? ATC? CMT?) put out the word that they must use N-numbers as ID for use within the ADSB system. Most had been using a mix of their designator and a flight number (and many still appear to be, from what I saw displayed in their dispatch offices on the screens!) such as "XYZ-04" rather than "N-1234". Most would prefer to use the Designator style for faster location of their own as well as other's aircraft.

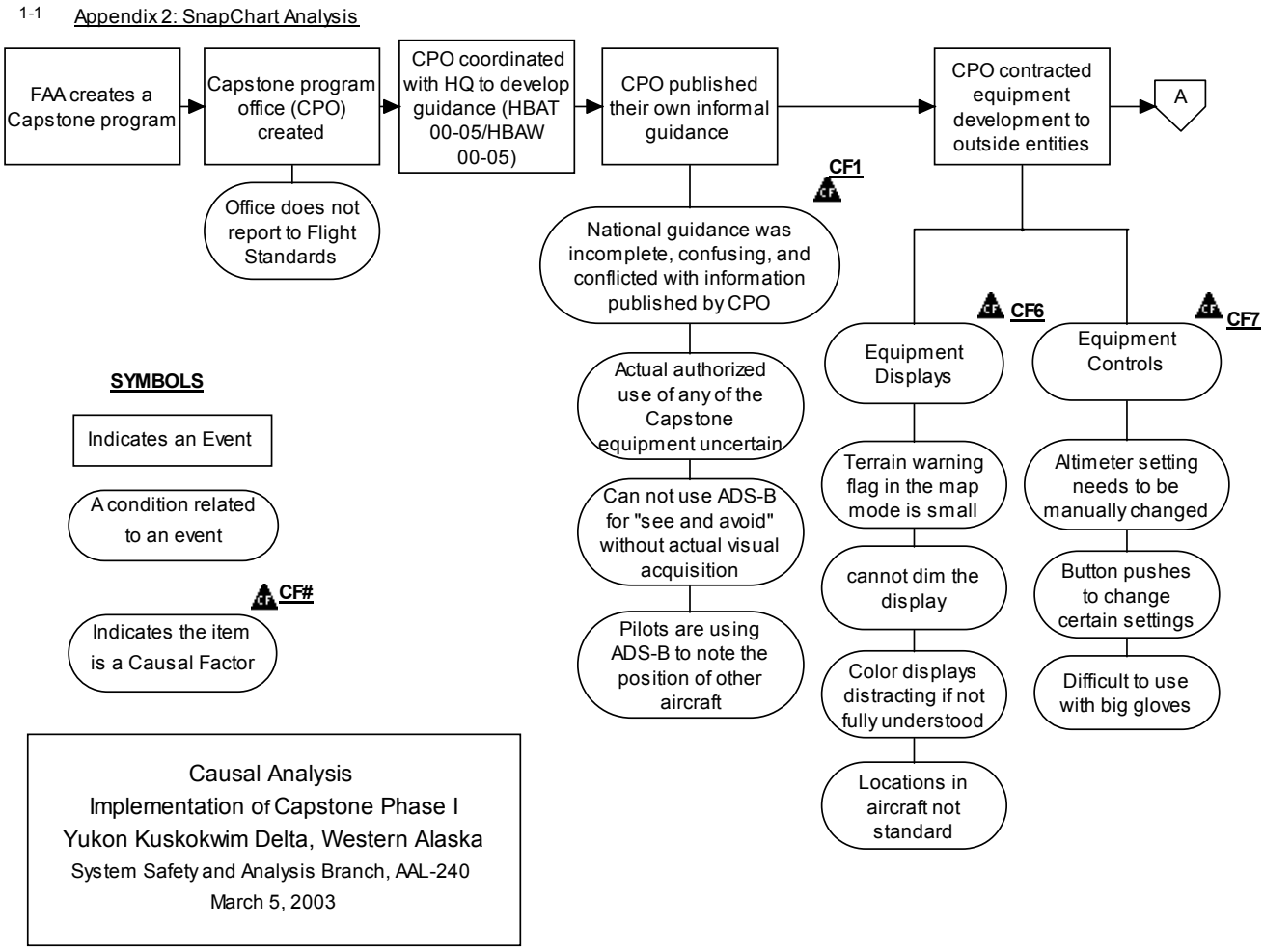
The locating of the spare parts at one of the local Operators within the Bethel area was an excellent and necessary idea! I spoke with the DOM for Village Aviation who has that responsibility in Bethel, and he seemed to be happy with the system and how it is functioning. He did have one suggestion concerning the local database on those units which are sent in for repair however: Consider having the Repair Station, or manufacturer, retain that data rather than automatically setting the unit back to it's default values. This would be if the unit is known to be going right back to the same Operator in the same area, such as Bethel.

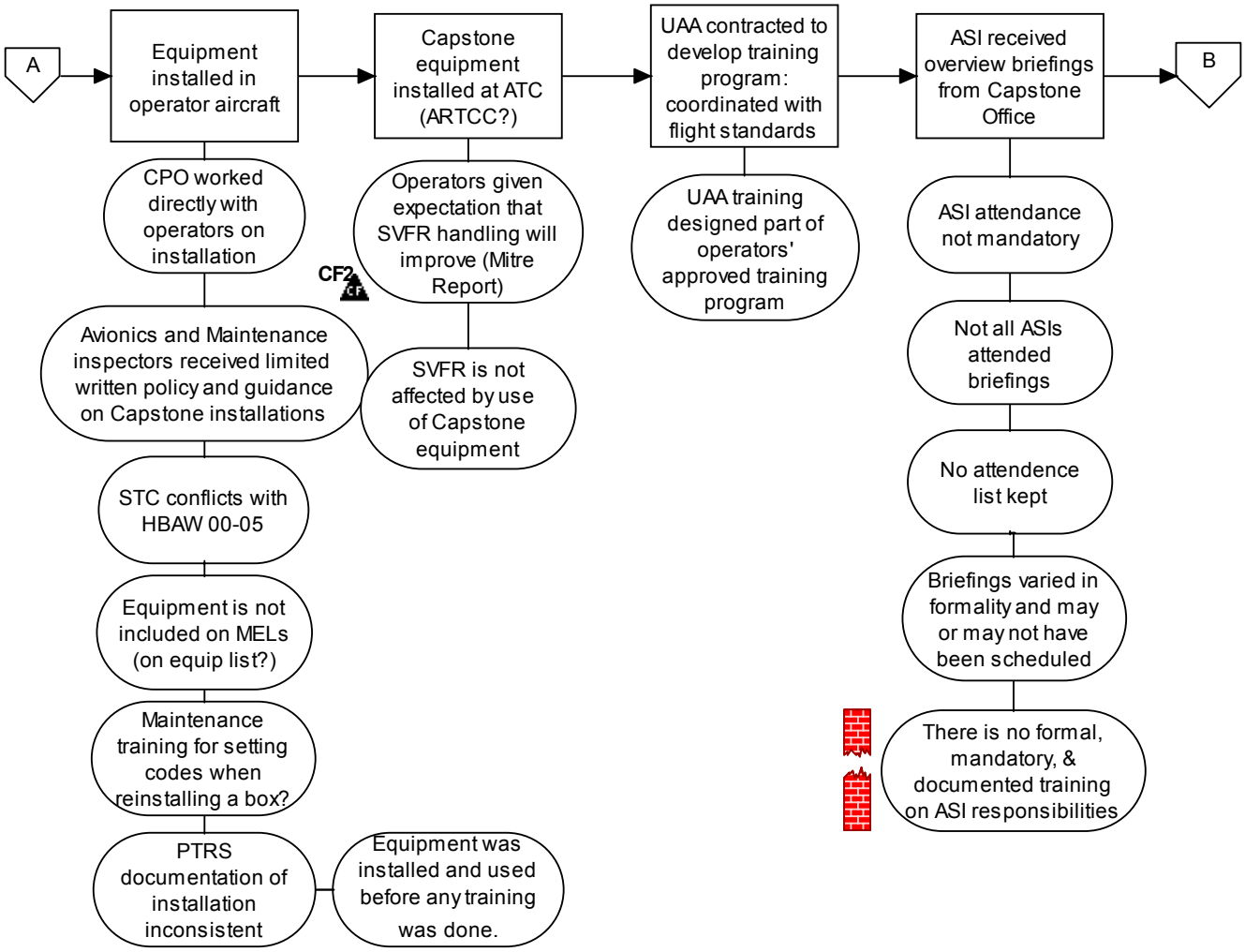
*Lastly, but certainly not least, was the question about **what happens after the end of the three-year test**. Has someone at Capstone or the manufacturer thought out the long-range plan as far as support? If we really do want the program to succeed, **we must have a follow-through plan**. The **Operators are certainly considering it!***

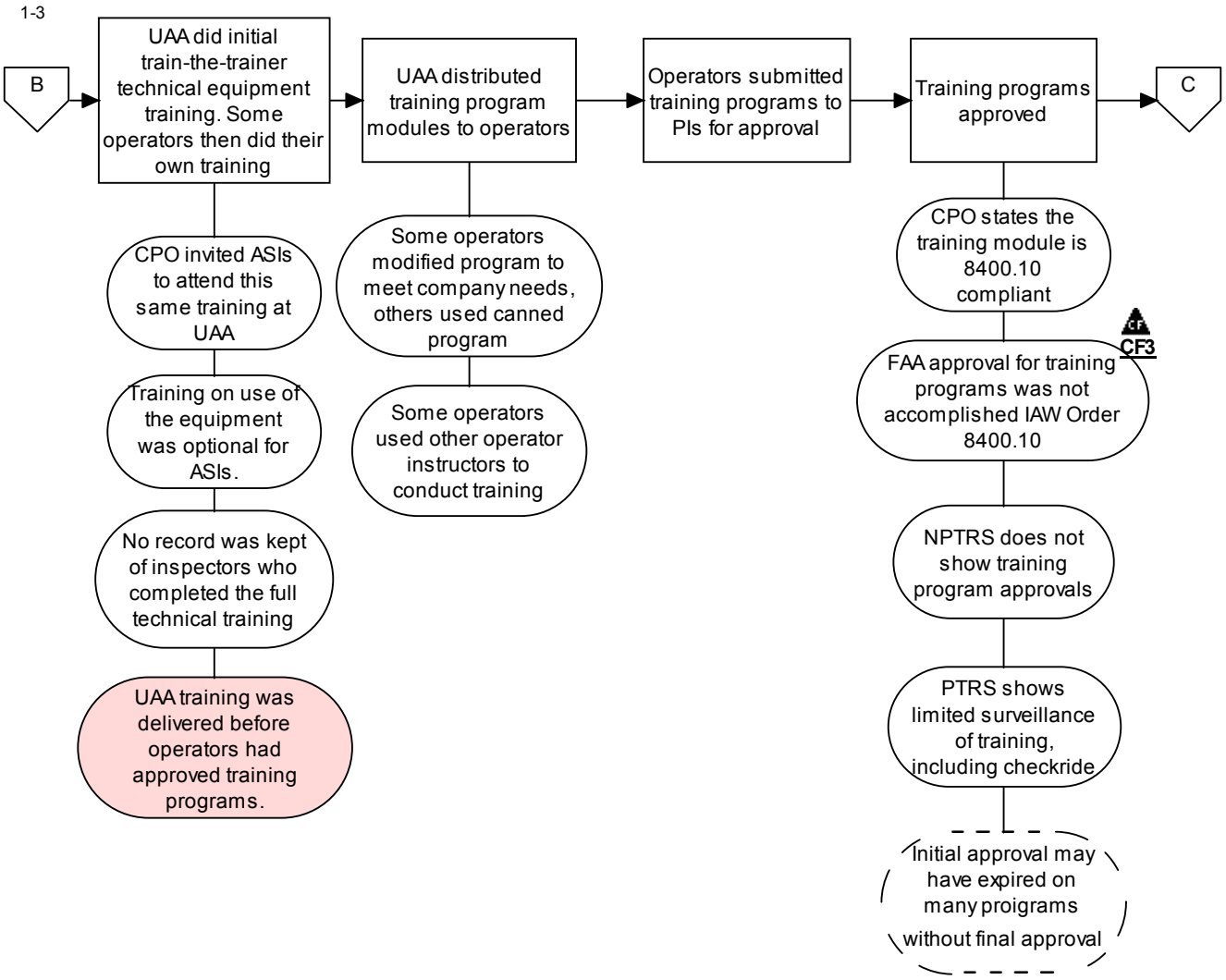
Recommendations:

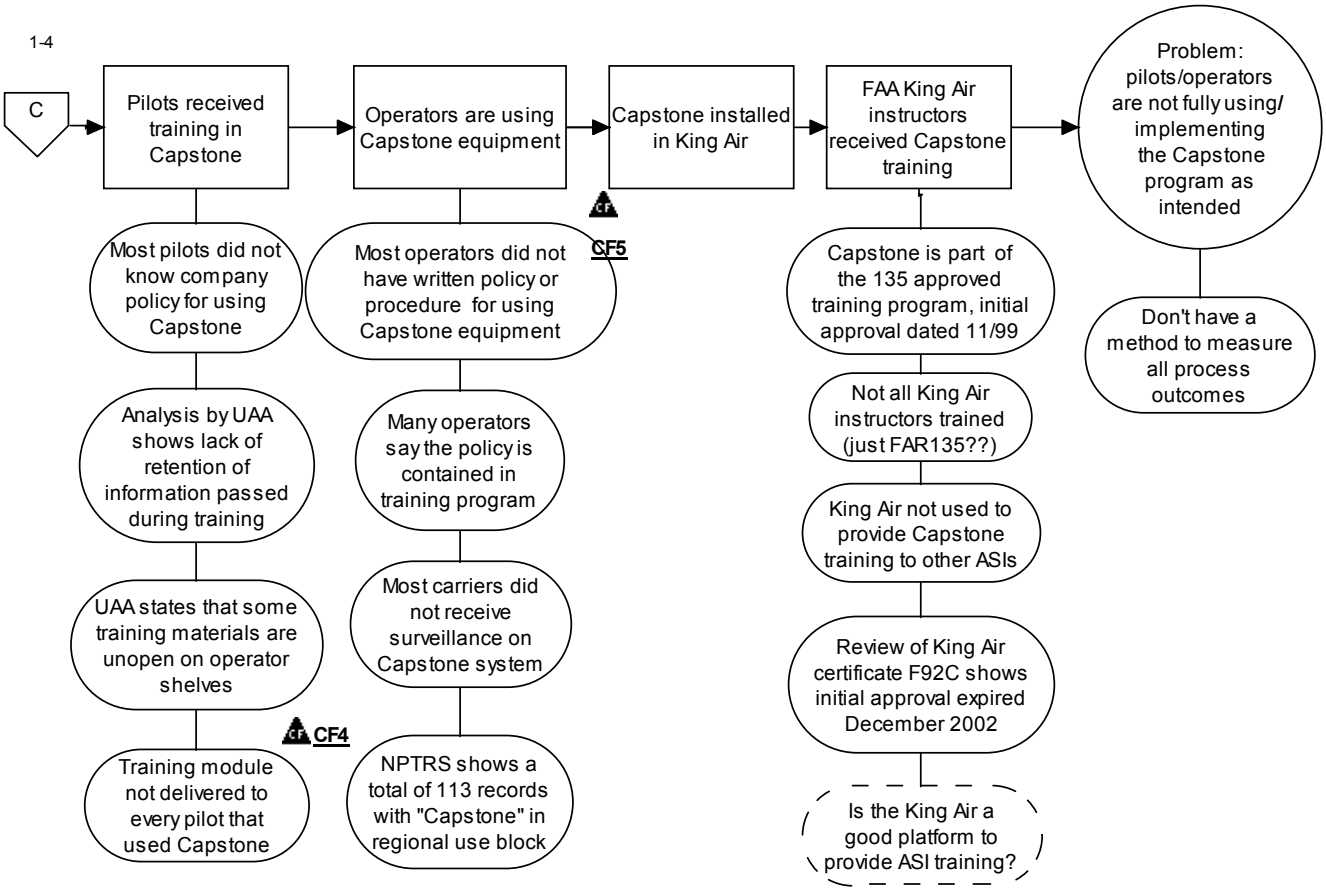
- *Look into a better Standard for Training, which can be more easily made available to all Operators.*
- *Consider placing a Simulator out there in the local area (Bethel) for use by those Operators. This would, I believe, promote more practice by those crews with the systems capabilities.*
- *For better interaction between Capstone and CMT, consider additional instruction and equipment familiarization for those Inspectors directly responsible for the selected Operators.*
- *Be sure that we do have a program set up for continuing support from not only the manufacturer, but ourselves as well, to ensure survival of the system beyond the test phase!*

Appendix 2: SnapCharT®




A
Equipment installed in operator aircraft
Capstone equipment installed at ATC (ARTCC?)
UAA contracted to develop training program: coordinated with flight standards
ASI received overview briefings from Capstone Office
B
CPO worked directly with operators on installation
Operators given expectation that SVFR handling will improve (Mitre Report)
UAA training designed part of operators' approved training program
ASI attendance not mandatory
CF2
Avionics and Maintenance inspectors received limited written policy and guidance on Capstone installations
SVFR is not affected by use of Capstone equipment
Not all ASIs attended briefings
STC conflicts with HBAW 00-05
No attendence list kept
Equipment is not included on MELs (on equip list?)
Briefings varied in formality and may or may not have been scheduled
Maintenance training for setting codes when reinstalling a box?
There is no formal, mandatory, & documented training on ASI responsibilities
PTRS documentation of installation inconsistent
Equipment was installed and used before any training was done.


1-3
B
UAA did initial train-the-trainer technical equipment training. Some operators then did their own training
UAA distributed training program modules to operators
Operators submitted training programs to PIs for approval
Training programs approved
C
CPO invited ASIs to attend this same training at UAA
Training on use of the equipment was optional for ASIs.
No record was kept of inspectors who completed the full technical training
UAA training was delivered before operators had approved training programs.
Some operators modified program to meet company needs, others used canned program
Some operators used other operator instructors to conduct training
CPO states the training module is 8400.10 compliant
CF3
FAA approval for training programs was not accomplished IAW Order 8400.10
NPTRS does not show training program approvals
PTRS shows limited surveillance of training, including checkride
Initial approval may have expired on many proigrams without final approval


1-4
C
Pilots received training in Capstone
Operators are using Capstone equipment
Capstone installed in King Air
FAA King Air instructors received Capstone training
Problem: pilots/operators are not fully using/ implementing the Capstone program as intended
Most pilots did not know company policy for using Capstone
Most operators did not have written policy or procedure for using Capstone equipment
CF5
Capstone is part of the 135 approved training program, initial approval dated 11/99
Don't have a method to measure all process outcomes
Analysis by UAA shows lack of retention of information passed during training
Many operators say the policy is contained in training program
Not all King Air instructors trained (just FAR135??)
UAA states that some training materials are unopen on operator shelves
Most carriers did not receive surveillance on Capstone system
King Air not used to provide Capstone training to other ASIs
CF4
Training module not delivered to every pilot that used Capstone
NPTRS shows a total of 113 records with "Capstone" in regional use block
Review of King Air certificate F92C shows initial approval expired December 2002
Is the King Air a good platform to provide ASI training?