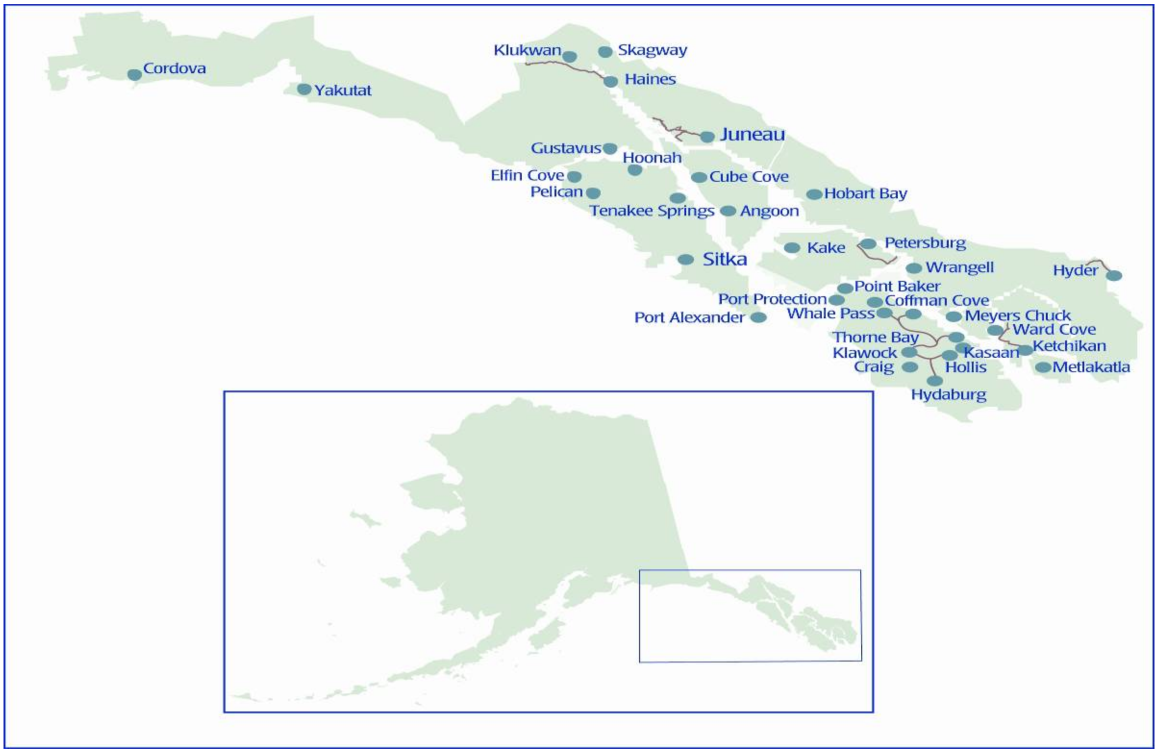
Capstone Phase II Implementation and Impact Assessment, 2005

September 2006



CAASD

The MITRE Corporation's Center for Advanced Aviation System Development

UAA UNIVERSITY of ALASKA ANCHORAGE

Aviation Technology Division

Acknowledgement

The authors of this report gratefully acknowledge information provided to this report by the following organizations or groups:

Airlines, Operators and Pilots in Southeast Alaska;

Points of Contact

University of Alaska Anchorage, Aviation Technology Division
Paul Herrick, Associate Dean, Community and Technical College
University of Alaska Anchorage
3211 Providence Drive
Anchorage, Alaska 99504
Telephone: 907 786-6411
Fax: 907 786-6401
Email: afpeh@uss.alaska.edu

MITRE, Center for Advanced Aviation Systems Development
Patrick Murphy, Safety Management
7515 Colshire Drive
McLean, Virginia, 22102
Telephone: 703 983-7080
Fax: 703 983-6653
Email: psmurphy@mitre.org

Table of Contents

1 INTRODUCTION 4

1.1 BACKGROUND 4
1.2 DESCRIPTION OF THE CAPSTONE PHASE II AREA 4
1.3 AVIATION ACCESS PRIOR TO CAPSTONE 5
1.4 ACCIDENTS PRIOR TO CAPSTONE 6

2 THE CAPSTONE PHASE II PROGRAM 9

2.1 PROGRAM OVERVIEW 9
2.2 SUMMARY OF SYSTEMS AND CAPABILITIES 10
2.3 GROUND INFRASTRUCTURE 11
2.3.1 Voice Communications 11
2.3.2 Ground Based Transceivers, and ATC and Broadcast Services 12
2.3.3 Automated Weather Observation Sites 12
2.3.4 Other Infrastructure Changes Supporting Capstone Phase II 13
2.4 AIRSPACE 13
2.5 AIRCRAFT SYSTEMS 16

3 CAPSTONE PHASE II PROGRESS 18

3.1 VOICE COMMUNICATIONS 19
3.2 GROUND BASED TRANSCEIVERS 20
3.3 AUTOMATED WEATHER OBSERVATION STATIONS 21
3.4 TOWER DISPLAYS 21
3.5 AIRSPACE 21
3.6 AIRCRAFT SYSTEMS 22
3.7 EQUIPMENT RELIABILITY 24
3.8 PHASE II OPERATOR TRAINING 26

4 OPERATOR SURVEY RESULTS 28

4.1 AIRLINE MANAGEMENT'S VIEWPOINT 28
4.2 PILOT SURVEYS 32

5 OTHER PHASE II SAFETY PROGRAMS/IMPACTS 41

5.1 CHANGES IN OPERATIONS ASSOCIATED WITH CAPSTONE 41
5.2 MEDALLION PROGRAM 41

6 AVIATION SAFETY 43

6.1 TRANSITION PERIOD 43
6.2 ACCIDENTS IN 2005 46
6.3 COMPARISON OF SE ALASKA ACCIDENT RATES TO OTHER PARTS OF ALASKA 47
6.4 COMPARISON OF ACCIDENT RATES BEFORE, DURING, AND AFTER EQUIPAGE/START OF SERVICES 49
6.5 COMPARISON OF ACCIDENT RATES BETWEEN OPERATOR AND OPERATIONS TYPES 50

7 CONCLUSIONS 52

8 APPENDICES 53

8.1 APPENDIX A: CAPSTONE EQUIPPED AIRCRAFT ACCIDENTS 53
8.2 APPENDIX B: SUMMARIZED OPERATING DATA TABLES 65
8.3 APPENDIX C: PARTICIPATING OPERATOR AND AIRCRAFT TABLES 70
8.4 APPENDIX D: AIRLINE SURVEYS 77
8.4.1 D.1 Management Surveys 77
8.4.2 D.2 Pilot Surveys 89
8.5 APPENDIX E: AIRPORT FACILITIES IS SE ALASKA 107
8.6 ACRONYMS AND ABBREVIATIONS 109

Capstone Phase II Implementation and Impact Assessment, 2005[1]

1 Introduction

Capstone is a joint initiative by the FAA Alaska Region and the aviation industry to improve aviation safety and efficiency in Alaska by using new technologies. FAA started Phase I of the Capstone program during 2000 in the watershed of the Yukon and Kuskokwim rivers of southwest Alaska – the Y-K Delta. In March 2003, the FAA began Phase II in Southeast Alaska. This report summarizes Phase II's progress in 2005.

1.1 Background

Capstone Phase II is installing a suite of IFR-capable avionics in commercial aircraft in southeast Alaska, building ground infrastructure for aircraft surveillance and up-link of weather and flight information, installing automated weather observation systems and remote ATC voice communication sites, and increasing the number of airports served by instrument approaches. Capstone is also making changes in air space requirements to reduce minimum enroute altitudes on some airways so that suitably equipped aircraft can provide greater air transportation access to cities and villages in Southeast Alaska during poor weather conditions. The FAA expects these improvements will reduce the number of mid-air collisions, controlled-flight-into-terrain (CFIT) accidents, and weather-related accidents while lowering weather-related restrictions that affect routine and emergency air transport and improving operational control and pilot decision-making.

The program focuses on passenger and cargo operations under Parts 133 and 135 of Federal Aviation Regulations (FAR; 14 CFR, Chapter 1). Part-135 operators fly fixed-wing and helicopter air taxi, commuter, and sightseeing (flightseeing) operations. Part-133 operators also use helicopters for various non-passenger activities such as helicopter logging. Aircraft owned by these carriers are eligible to receive Capstone Phase II avionics. Float planes, flying under Visual Flight Rules (VFR) in the summer season, account for a large share of FAR Part-135 operations in Southeast Alaska and will also be receiving this equipment.

1.2 Description of the Capstone Phase II Area

Capstone Phase II covers an area of Alaska south of latitude 61 degrees north and east of longitude 146 degrees west. As shown in Figure 1.2-1, this area includes Alaska's panhandle and extends westward from the north end of the panhandle along the Gulf of Alaska to Cordova near the eastern edge of Prince William Sound. The area is relatively isolated. Only a few villages are connected by roads, and only Haines and Skagway have a road that connects to the Alcan Highway providing access to cities in Canada, or to the Lower 48. Most residents travel by air or water. The 45 communities in the area have more than 75,000 residents with almost half living in the regional hub of Juneau, which is also the state capital. Of the 44 other communities, 29 have fewer than 500 residents. Figure 1.2-1 also shows the general levels of flight activity serving the 25 communities that have more than one flight per week by scheduled commercial operators.

---

[1] The contents of this material reflect the views of the authors. Neither the Federal Aviation Administration nor the Department of Transportation, makes any warranty or guarantee, or promise, expressed or implied, concerning the content or accuracy of the views expressed herein.

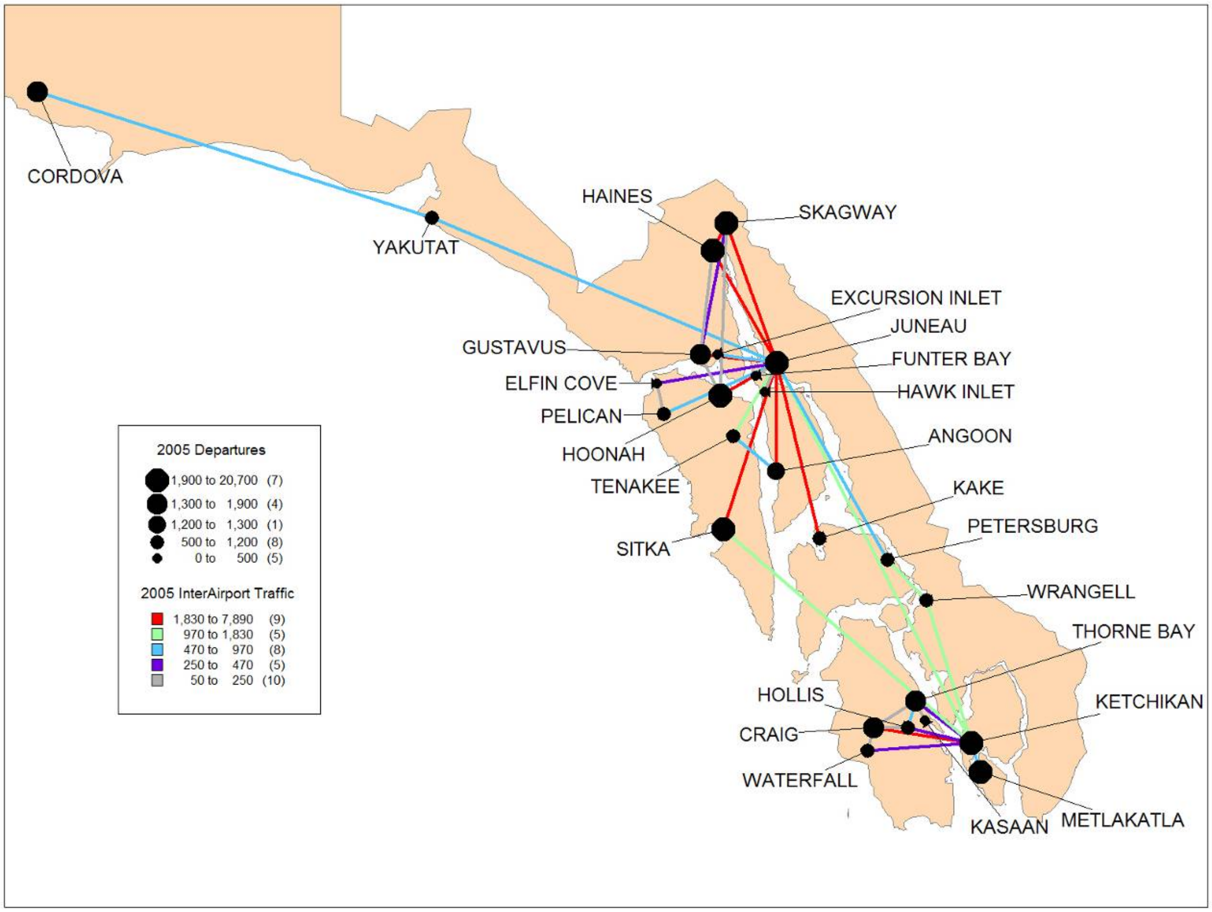


Figure 1.2-1. Southeast Alaska Major Communities

1.3 Aviation Access Prior to Capstone

Southeast Alaska has 89 airport facilities—24 airports, 9 heliports, and 56 seaplane bases. (See Appendix 8.5 for a listing of these airport facilities.) These numbers are greater than those presented in the Baseline Report due to a later analysis of the flight patterns in Southeast Alaska which indicated other facilities should be included. Figure 1.3-1 summarizes the scheduled and unscheduled departures for all of Alaska in 2005 by Part-135 aircraft that are required to report their operations. Operators with no scheduled flights or operating as on-call charters only are not required to file flight data with the Bureau of Transportation Statistics and are not included in the figure. This figure indicates that 16% of flights are either completely within the Capstone area or are flying from/to other points in Alaska to/from the Capstone Phase II area. Of the approximately 10% of Alaska flights that fly completely within the Capstone Phase II region, 79% of these depart from the seven top airports.

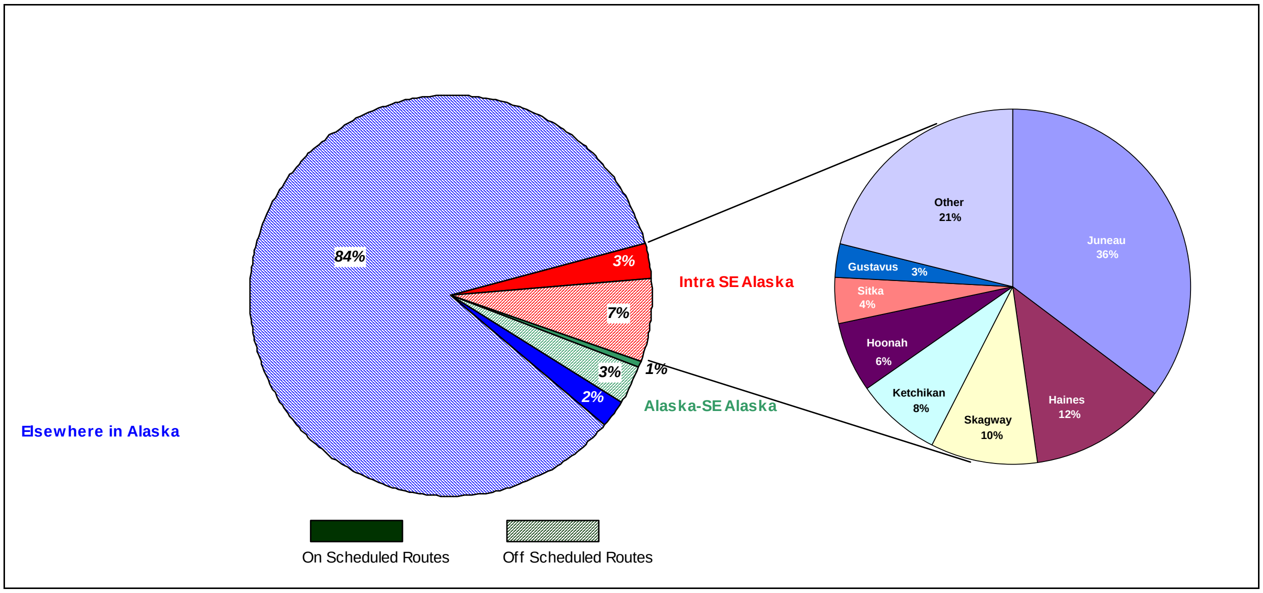


Figure 1.3-1. Scheduled and Unscheduled Alaska Flights To or From Capstone Phase II Airports

Weather, terrain, and communications are primary limitations on aviation access in Southeast Alaska. Weather hazards include several conditions that create poor visibility and low ceilings. The area is a marine environment with extremely variable weather and frequent storm systems with low ceilings and fog. Many destinations in the area do not have weather reporting facilities. Operators depend on area forecasts and pilot reports to make Go/NoGo decisions. Some flight routes have long distances between weather stations; for example, the route from Yakutat to Sitka is 201 nautical miles between weather stations. The terrain is extremely mountainous, which often causes low enroute ceilings due to fog and clouds trapped in the area's numerous valleys. These low ceilings reduce opportunities for VFR flight. The high terrain-limited Minimum Enroute Altitude (MEA) on pre-Capstone IFR airways limited IFR flights that might be affected by icing. The mountains and the valley and inlet locations of most airports restrict aircraft-to-ground and line-of-sight communications abilities.

1.4 Accidents Prior to Capstone

There were 179[2] accidents, 41 of them fatal, within the Phase II area reported by the National Transportation Safety Board from 1990 through 2002. The Capstone Phase II Baseline Report divided these into the categories and sub-categories described in Table 1.4-1. The result of this categorization of these accidents is presented in Figure 1.4-1. There is a transition period during 2003 through 2005 that is after the baseline but before Capstone implementation has reached a point where any significant benefit could be realized. This is described in Section 6 of this report

For all of the accident charts in this section, the inner pie shows all accidents divided into major categories, the outer pie extensions show more detail within the major categories. For example, difficulties with off-airport landing sites may occur, such as soft spots on packed sand or unseen logs during water landings. Float planes flying in the summer are indicated by the extension labeled as 'Site' outside the wedge labeled 'Landing'.

[2] Revised data after Capstone Phase II operating areas were validated. The previous accident total of 231 in the UAA-ISER Phase II Baseline Report was modified after the specific operating areas were defined and the accident locations were identified.

Table 1.4-1. Accident Causal Categories

Basic Cause Categories

1. **Mechanical:** Engine failure, inoperable control surfaces, failed landing gear or floats, propeller or shaft failure.
2. **Navigation:** Controlled Flight into Terrain (CFIT) while en route is often associated with reduced visibility and small navigational errors. Some CFIT accidents are due to pilots being off-course.
3. **Traffic:** Usually mid-air collisions. Also includes ground or water accidents from last-moment avoidance of other aircraft and from jet blast on airport surface.
4. **Flight Information**: Usually accidents that result from inadequate weather information and are often caused by icing and sometimes poor visibility but rarely convective weather. (Surface winds contributing to take-off or landing accidents have been included under take-off or landing rather than here.)
5. **Fuel:** Accidents caused by fuel mismanagement.
6. **Flight Prep:** Accidents caused by a variety of poor flight preparation measures, including failure to insure that cargo is tied down and within the aircraft's weight and balance limits and failure to check whether fuel has been contaminated by water.
7. **Takeoff:** Accidents during take-off, including pilots' failure to maintain control in wind, improper airspeed, waterway debris, hazards at remote lakes, rivers without markings or moorings, poor runway conditions and obstacles at off-runway sites.
8. **Landing:** Accidents during landing, including pilots' failure to maintain control in wind, improper airspeed, waterway debris, hazards at remote lakes, rivers without markings or moorings, poor runway conditions and obstacles at off-runway sites.
9. **Other:** Includes colliding with watercraft or ground vehicles, hitting birds and pilots under the influence of alcohol or drugs.
10. **Unknown:** Missing aircraft, cause not determined.

Cause Sub-Categories

Runway: Accidents on take-off or landing related to runway or waterway conditions such as potholes, submerged obstacles the runway
Site: unusual hazards of water or off-runway sites
Water taxi: collisions with objects (not a/c) while taxiing on the ocean, rivers or lakes
Maneuvering: Typically, stalling the aircraft while maneuvering

<u>Capstone Relevant Sub-Categories or Categories</u>

Weather: Accidents where the availability of weather information was a factor.
CFIT: Controlled Flight into Terrain (or Water) accidents
TCF: Terrain Clearance Floor violation - CFIT that occurs on approach or departure.
Map: Accidents where the pilot did not know aircraft's location
Midair: Midair Collisions between aircraft.
Runway Collisions: between aircraft on the ground or water.
Fuel: Accidents caused by fule mismanagment.

NOTE:

This analysis is from UAA-ISER's Phase II Baseline Report and reflects the applicability of Phase I avionics plus TCF violations and runway collisions. It is updated here only to reflect fuel management enhancements available with the Chelton avionics. Chelton also includes other capabilities such as glide-range guidance that might help with emergency landings and Highway In The Sky (HITS) guidance which may help with complex navigtion. Re-analysis of the historical accidents in light of additional capabilities will be performed in the coming year.

Half of the 41 fatal accidents are from causes specifically targeted by Capstone Phase II and were due to causes that Capstone avionics, training, and data are intended to address. The largest share of fatal accidents is identified as Controlled Flight Into Terrain (CFIT) accidents, operating either in cruise flight or on approach or departure.

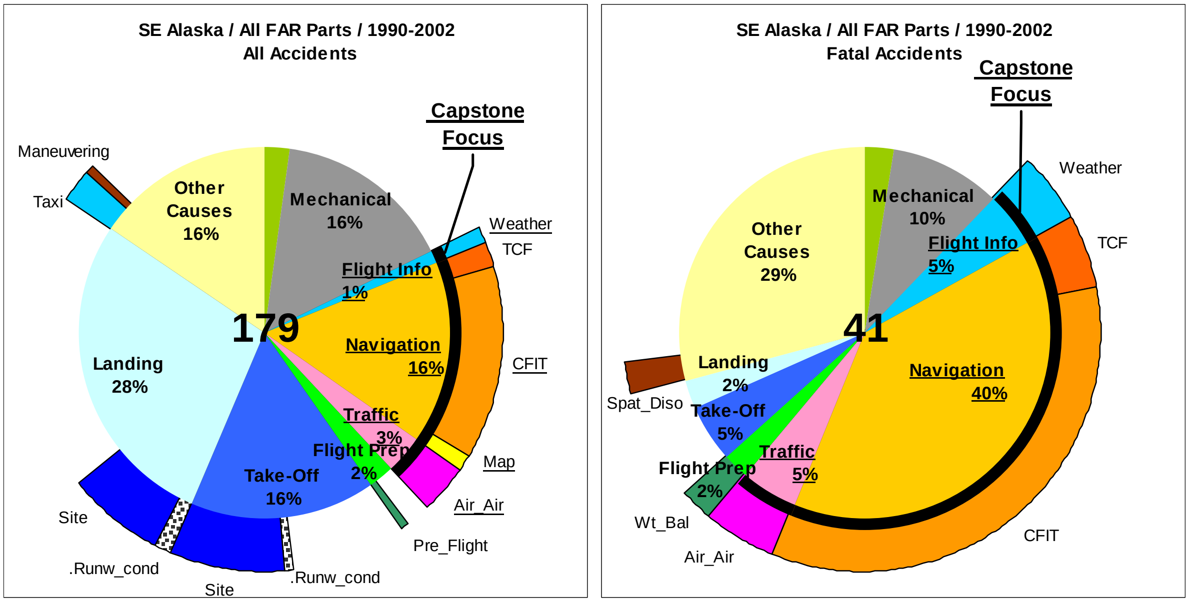


Figure 1.4-1. Accidents in SE Alaska, by Category, 1990-2002

2 The Capstone Phase II Program

Capstone seeks near-term safety and efficiency gains in aviation by accelerating implementation and use of modern technology. The capabilities of Capstone Phase II target four specific safety problems in Southeast Alaska:

- CFIT accidents (within the navigation category)
- Accidents associated with aircraft traffic – especially mid-air collisions
- Inadequate flight information – especially weather information
- Inadequate infrastructure to support IFR operations.

2.1 Program Overview

Capstone implements new technologies enabling pilots to cope with terrain, traffic conflict and weather hazards. These technologies also allow dispatchers/operators better means to monitor their aircraft and give air traffic controllers expanded surveillance coverage to provide Air Traffic Control (ATC) services.

The first objective in support of expanded IFR operations is to allow the use of GPS/WAAS technology for the enroute portion of flights on routes in Alaska outside the operational service volume of ground based navigation aids. This requires changes to Federal Aviation Regulations, and the results are threefold. First, it permits satellite navigation as the sole means of navigation onboard the aircraft. Second, it allows the use of lower Minimum Enroute Altitudes (MEAs) than those currently based on ground-based navigation aids. In this process, Capstone used current Terminal Instrument Procedures (TERPS) criteria for enroute airways; however Capstone applied it to the use of the GPS/WAAS navigation signal. Low enroute RNAV GPS MEAs will eventually cover the entire region and become available publicly. Third, it promotes safety by creating and promoting a usable IFR environment that allows an IFR option for pilots that have had to fly predominantly in the visual flight rules (VFR) environment that exists today.

The second objective is to establish new departure and approach procedures, initially at Juneau, Haines, Hoonah and Gustavus airports and, with operator acceptance, expand to other parts of Southeast Alaska. This allows safer airport-to-airport access. These procedures will be developed as “specials” and achieve the lowest possible minimums for RNAV/GPS non-precision approaches by applying waivers with special training and equipment requirements to current TERPS criteria.

Activities supporting these objectives include certifying and installing state-of-the-art GPS/WAAS avionics, amending air routes to achieve lower MEAs, developing special approach and departure procedures, filling communication gaps, and ensuring accomplishment of all supporting training and operational approval guidance for operators as well as FAA oversight personnel.

Capstone is also providing additional flight and traffic information services in Southeast Alaska to improve overall safety. This initiative promotes better situational awareness of weather and other traffic by expanding the Automatic Dependent Surveillance-Broadcast (ADS-B) ground infrastructure to Southeast Alaska and adding data link avionics. This provides a data link for ADS-B and Flight Information Services-Broadcast (FIS-B). The objective is to use multiple means to alert pilots of possible traffic conflicts and weather hazards. Adding a universal access transceiver (UAT) to the avionics enables display of other ADS-B aircraft (cockpit display of traffic information or CDTI). Installing an ADS-B ground system provides track information to controllers and Automated Flight Service Station (AFSS) specialists. The UAT data link will also be used to relay weather information to the cockpit. Multilateration and Traffic Information Services – Broadcast (TIS-B) are being evaluated for possible inclusion in the future to enhance the surveillance picture in the cockpit.

2.2 Summary of Systems and Capabilities

Figure 2.2-1 depicts Phase II capabilities. Avionics systems are being installed to enable instrument approaches/departures and GPS/WAAS navigation on lower-altitude airways. This also requires the publishing of new navigation charts and instrument departure and approach procedures for use by pilots and controllers. New communications transceiver sites support this by preventing gaps when MEAs are lowered below the line-of-sight of existing communication sites. Finally, new weather observation facilities are included at airports to meet the requirements of commercial IFR operations.

There are now two airborne configurations available to the operators: a primary flight display (PFD)/primary navigation display (PND) pair developed by Chelton and a Garmin MFD similar to the Phase I avionics. Garmin was a late addition to the Phase II program in response to operator requests for a less complex and more compact installation. Section 3 provides additional details on the evolution from the original plan of having Chelton be the sole provider of cockpit avionics for the Phase II program. The operators can now select the configuration that best suits their operations and aircraft. Both are coupled with WAAS-GPS receivers capable of increased accuracy and integrity to enable Capstone area navigation (RNAV) capabilities. Automated Weather Sensor System (AWSS), Remote Communications Air-Ground (RCAGs) facilities and Remote Communications Outlets (RCOs) complement and support these airborne components. Phase II also includes traffic situation awareness displays in the Juneau Air Traffic Control Tower (ATCT) and Juneau Aeronautical Flight Service Station (AFSS), connection into existing air traffic automation and display facilities at Anchorage ARTCC (Air Route Traffic Control Center) through interconnecting telecommunications via the Alaska NAS Inter-Facility Communications System (ANICS), and ground broadcast transceiver (GBT) sites which communicate with the aircraft avionics.

Capstone Phase II plans to integrate these new and existing systems and equipment to complement RNAV services and provide a lower altitude, usable IFR infrastructure. Together, these systems and equipment should enhance operations and safety in the Southeast Alaska airspace system.

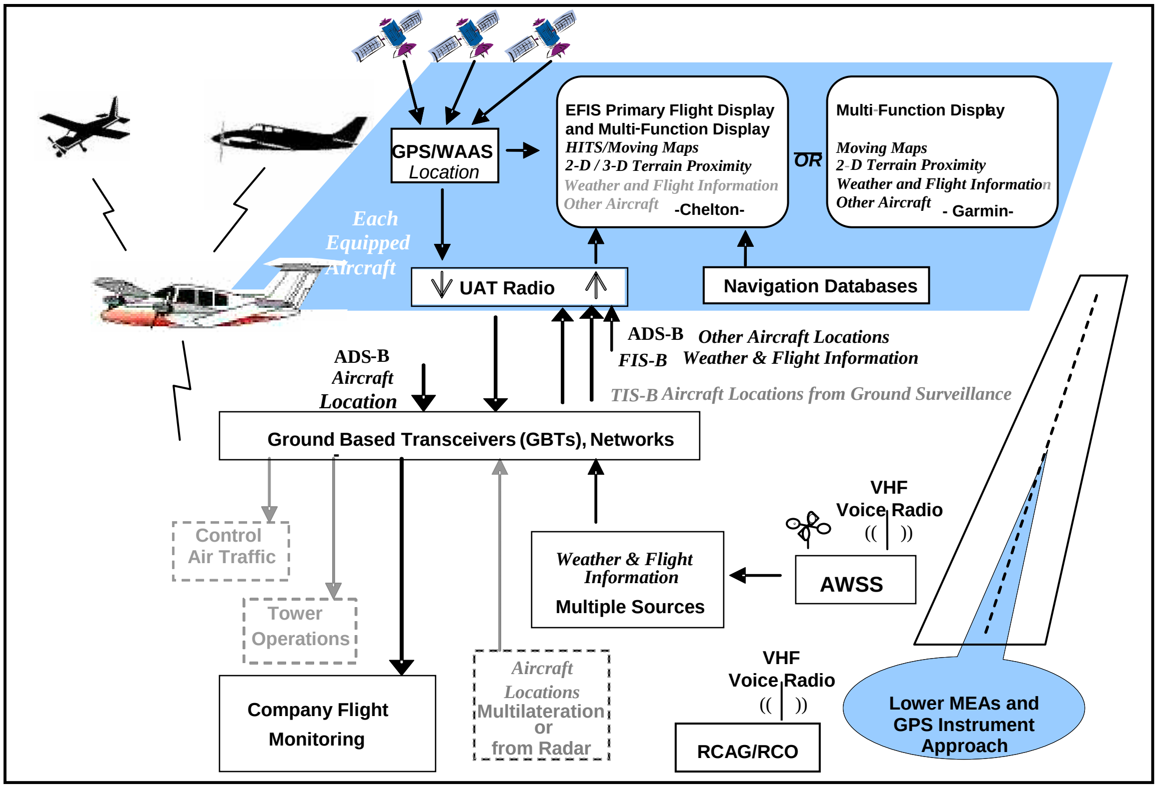


Figure 2.2-1. Capstone Phase II Systems and Capabilities

Capabilities Not Operational in 2005 Are Gray

2.3 Ground Infrastructure

The ground system will expand the Capstone Phase I data link infrastructure into Southeast Alaska. It consists of the ATC automation within Anchorage ARTCC and new remote GBT sites. It will expand ATC surveillance for radar-like-services and provide weather information to the cockpit and tracking data to enable flight following for commercial operators and FAA AFSS specialists. Communication sites and weather reporting sites are discussed in following sections. A multilateration surveillance system may be installed later in Juneau, supplementing ADS-B in the terminal area for aircraft that have transponders but not ADS-B. Surveillance of these non-Capstone aircraft could then be provided to controllers, and with TIS-B, could also be provided to Capstone-equipped pilots. Surface surveillance (including vehicles) was evaluated in Juneau and may be included in future programs.

2.3.1 Voice Communications

Communications enhancements include new RCAGs to fill ATC communication gaps, enable new RNAV operations, and lower many minimum enroute altitudes. Initial communications improvements to support Capstone Phase II are shown in Figure 2.3-1 and will include a new RCAG facility at the south end of Stephens Passage for direct pilot-controller voice contact and at Mt. Robert Barron for improvements along Lynn Canal and over Icy Bay. Flight Service support will also be improved with the installation of an RCO radio in the same vicinity. Further communications improvements are expected as needs are documented.[3]

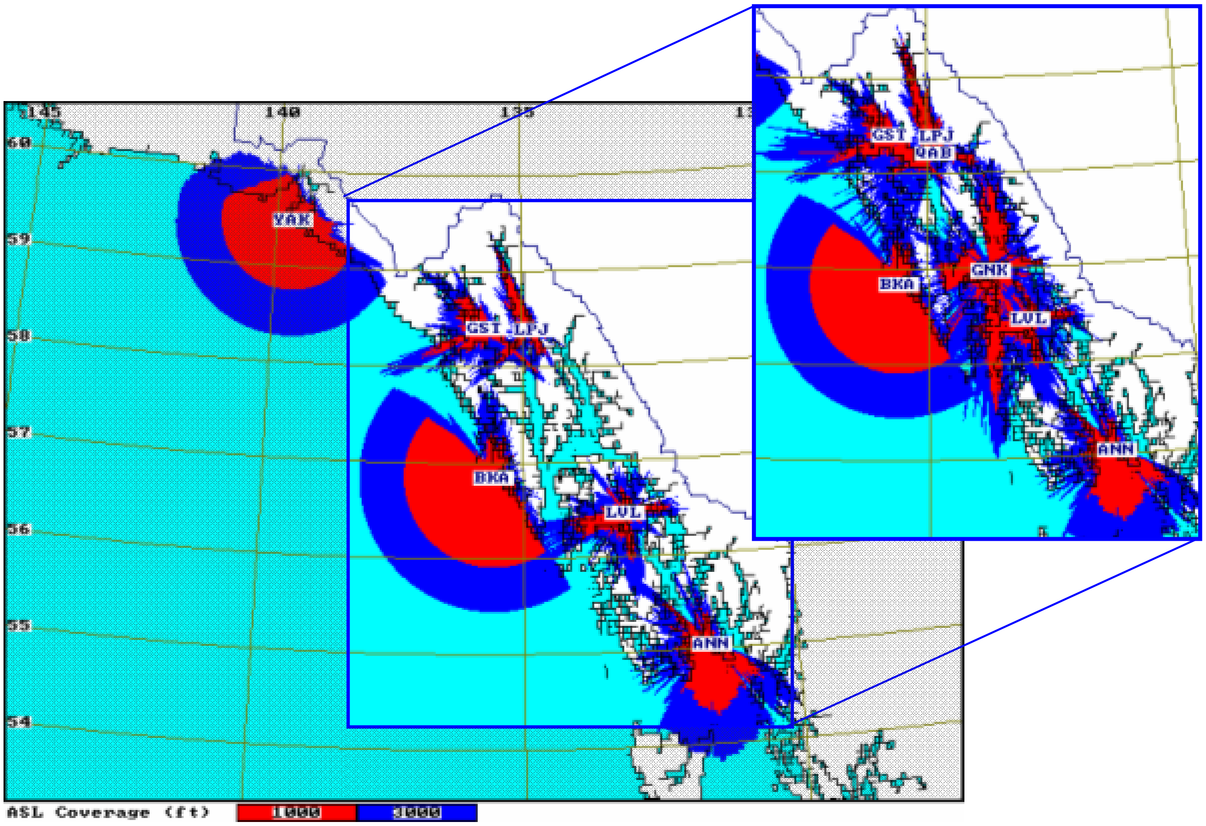


Figure 2.3-1. Voice Communications Coverage Before Capstone, with Inset Showing Coverage Improvement by Capstone Phase II

2.3.2 Ground Based Transceivers, and ATC and Broadcast Services

New GBT sites have been chosen to provide surveillance coverage (Figure 2.3-2) at, around, and between the key airports with new GPS approaches. Capstone is also choosing other sites to create and expand a low altitude RNAV route structure in Southeast Alaska. Initially, 14 sites have been identified. Surveillance data will be linked back to the MicroEARTS automation system at Anchorage ARTCC. The data will be used for ATC and distributed to other users including air carrier operations centers (AOCs) and local operators, via the ETMS system, and Aviation Flight Service Station (AFSS) for flight following. FIS-B (and eventually, TIS-B) will also be available via the Capstone Communications Control Server (CCCS) via the GBTs. FIS-B weather and other NAS data will be uplinked in Southeast Alaska as it is the Bethel, YK Delta area.

2.3.3 Automated Weather Observation Sites

Commercial air carriers need weather observations for destination airports before performing an instrument approach. Observations are also useful inputs to the overall weather picture because additional sites improve the accuracy and detail of weather forecasts in the region. New Automated Weather Sensor

---

[3] Current and future voice communications coverage in the Cordova area was not available at the time of this report and is not shown in Figure 2.3-1.

System (AWSS) sites will be installed and report weather conditions including temperature, dew point, wind, altimeter setting, visibility, sky condition, and precipitation. The weather reports from these sites will be available by phone, over radio on aviation frequencies and, once connected to the national weather collection system, can be extracted from other weather data at AFSS, other NAS systems, and over the internet or via FIS-B.

2.3.4 Other Infrastructure Changes Supporting Capstone Phase II

Situational awareness displays are planned for the Juneau air traffic control tower and the AFSS. Surveillance data derived from the ground system will be used to feed new “BRITE”-like displays in the Juneau ATCT cab. The AFSS will also receive a flight following or flight plan monitoring capability. When suitable for integration with ADS-B, a multilateration installation is planned for Juneau to increase the number of “participating aircraft” for surveillance in the area and provide another data feed for TIS-B. Multilateration will identify/locate targets in the terminal area and on the ground at Juneau airport.

2.4 Airspace

To provide RNAV services, Capstone is developing an end-to-end (airport-to-airport) RNAV airspace structure. This dictates changes in both the enroute and the approach/departure airspace structures. The Capstone enroute initiative is providing RNAV/GPS MEAs that are significantly lower than the conventional MEAs that exist in Southeast Alaska. The MEAs in Southeast Alaska are often limited by line-of-sight issues with navaids and/or communications sites that are blocked by terrain. Using satellite navigation allows for lower MEAs, but not lower than the Minimum Obstruction Clearance Altitude (MOCA), on existing Victor and Colored airways in Southeast Alaska. Satellite navigation allows RNAV/GPS routes to be established in areas that optimize flight efficiency not based on the location of ground based navaids. The initial approach/departure procedure changes are in effect between Juneau and the airports of Hoonah, Gustavus, and Haines. Based on user/operator input and acceptance, this will expand to other city-pairs, for instance, from Ketchikan. Figure 2.4-1 depicts an IFR Enroute Low Altitude chart showing new GPS MEAs identified as “G” altitudes.

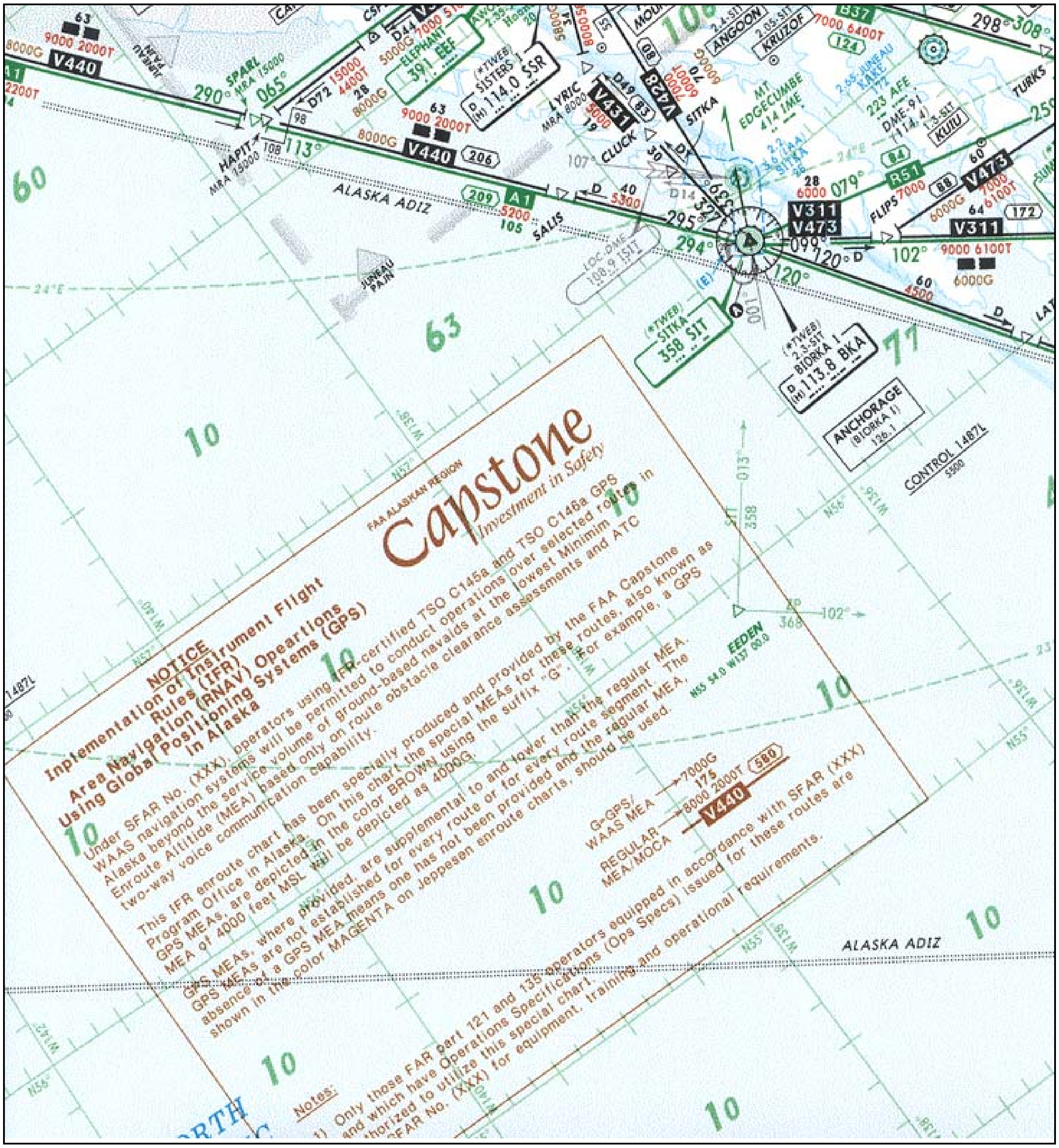


Figure 2.4-1. IFR Enroute Low Altitude Chart Showing New GPS Altitudes

Figure 2.4-2 shows how Hoonah, Haines, Juneau, Gustavus departure and approach RNAV procedures (including holding procedures and fixes) are being modified or created to provide a low altitude IFR structure in SE Alaska. New procedures have been published as Special (or Public, as appropriate) procedures.

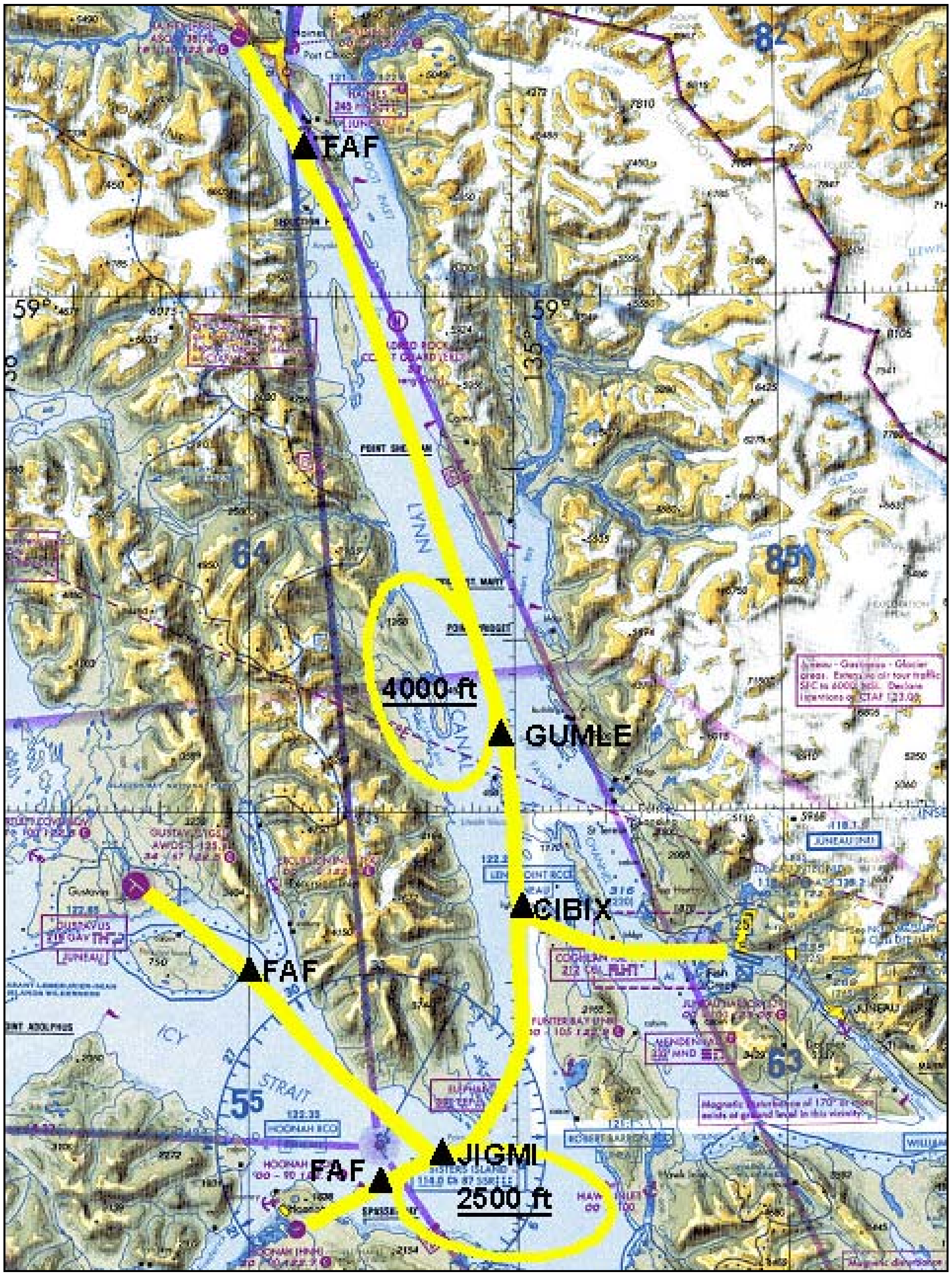


Figure 2.4-2. Depiction of Initial Departure and Approach RNAV Structure

2.5 Aircraft Systems

Installation of government-provided avionics began in 2003 for planned equipage of up to 200 commercially operated aircraft (estimated 150 fixed-wing and 50 rotor-wing) in and around Southeast Alaska. The intent of the Phase II avionics is to increase pilot situational awareness and increase navigational performance during IFR and VFR operations. A description of the avionics is provided below. The avionics package will include the following functions, in stages:

Stage 1 (initial avionics – Primary Flight and Navigation Displays)

- Primary flight display functions, including heading, pitch and roll attitude, airspeed, vertical speed, etc., as well as flight path.
- Display 3-dimensional views of terrain. The system will include terrain alerting and warning system (TAWS) that meets TSO-151a, Class B.
- Navigation display functions using GPS/WAAS including position, course, waypoints and fixes, groundspeed, etc.

Stage 2 (full avionics to operate air-to-air and with ground system – Universal Access Transceiver)

- ADS-B air-to-air traffic targets along with TIS-B targets (when TIS-B becomes available) on a multi-function navigation display and primary flight display when appropriate. Traffic warnings will also be provided.
- Display FIS-B information (text and graphics).

Chelton Flight Systems (formerly Sierra Flight systems) was selected to provide their EFIS-2000 Primary Flight Display (PFD) (Figure 2.5-1), its Navigation Display (Figure 2.5-2), and supporting avionics. Garmin-AT Corporation was selected to provide their MX-20 Multifunction Display (Figure 2.5-3) with supporting avionics, which is often the choice of helicopter operators to better meet their special operational requirements at lower workloads. Both avionics sets include GPS-WAAS receivers. Garmin has also been selected to provide a stand-alone UAT ADS-B system which will be used with both types of avionics. The Capstone program will oversee integration of these systems with the ground system and provide avionics units to individual aircraft operators. Installation of these avionics is covered under a multiple make, model, and series FAA Supplemental Type Certificate (STC).

Figure 2.5-1. Chelton EFIS-2000 Primary Flight Display

Figure 2.5-2. Chelton Navigation Display

Figure 2.5-3. Garmin MX-20 Multi-Function Display

3 Capstone Phase II Progress

The Phase II Capstone Program has accomplished some important milestones since beginning in 2002. New MEA routes and RNAV Approach and Departure procedures have been certified for a number of airports. Aircraft equipment installations are progressing. Communications, AWSS and GBT ground infrastructure installations are continuing.

However, by spring 2006 some of the most important of the planned capabilities of the program have not been realized; completion of these continues to be delayed. The following points are important to understanding these delays and the current status of the program.

1. In April 2002 contracts for Phase II avionics were let to Chelton for an EFIS/PFD/MFD subsystem and to Avidyne for a UAT subsystem. The contract with Avidyne was terminated by the FAA and a subsequent contract for the UAT subsystem was then made with Garmin AT (who had built the avionics for Phase I). This need for a second contract resulted in a 21 month delay in the original plans for the delivery of the airborne UAT subsystem.

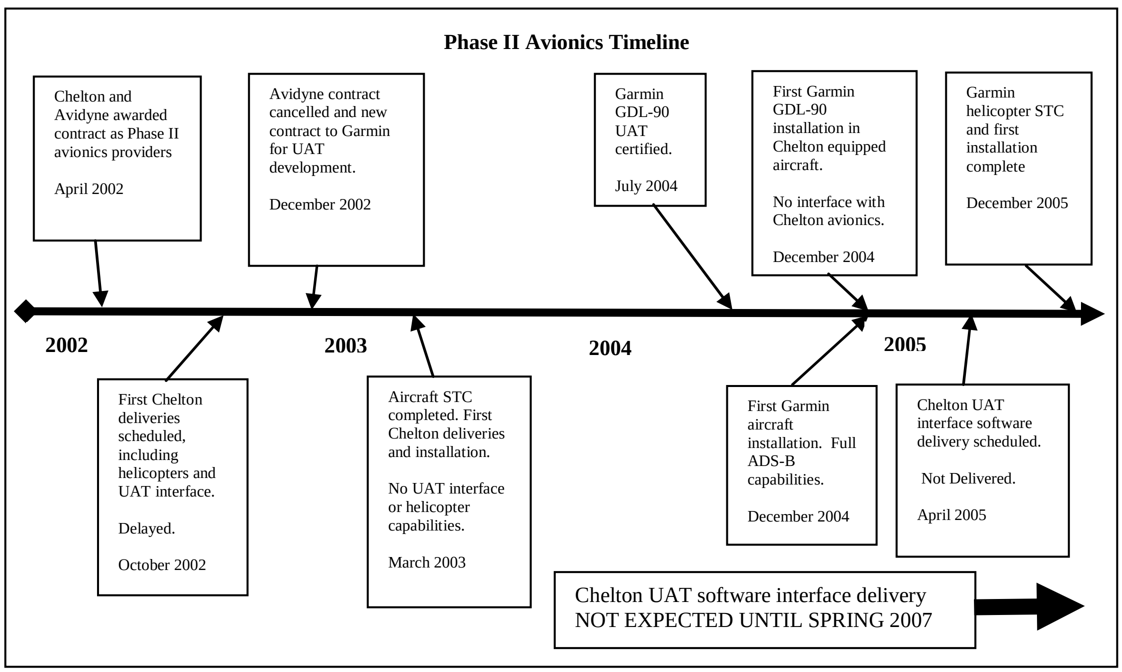


Figure 3.0-1 Avionics Development Timeline

2. Capstone's original plan was to offer the operators options on 4 levels of equipage: 1) standalone ADS-B system only, 2) standalone ADS-B system and a navigation display, 3) standalone ADS-B system, a navigation display, and a primary flight display, and 4) standalone ADS-B system and a navigation display, a primary flight display, and a secondary GPS/WAAS navigator. Chelton did not initially offer a navigation display system without the PFD, this became available in 2003, but no operators have ordered that configuration. After numerous delays and technical difficulties with Chelton avionics, and after the desire by helicopter and VFR operators for a less complex system, Capstone let another contract with Garmin AT to provide an avionics alternative that would more closely resemble Capstone Phase I and provide for a less complex system. The numerous delays and technical difficulties with the Chelton avionics as well as the need for a second contract to provide an alternative to Chelton avionics, has resulted in significant delays in the delivery of avionics for SE. By the end of 2004, under pressure from the Capstone office Chelton

implemented a complete hardware change in AHRS and GPS sensors as well as numerous EFIS software, installation manual, and flight manual supplement changes.

3. Capstone's plan was to use the new MOPS-compliant UAT data link that was defined post-Phase 1 to provide ADS-B and related broadcast services. This meant that new GBTs and airborne UATs needed to be specified, developed, and procured. Standards development progressed as predicted; however, it took longer then expected to produce new certified UAT avionics and to specify and deliver new GBTs. This delayed GBT certification by approximately 2 years.
4. Chelton's implementation of the UAT interface and the processing on broadcast services information within the Chelton avionics was contracted for completion in 2002 and has not yet been delivered. The result is few of Capstone's air-ground capabilities and none of the air-air, and ground-air broadcast services capabilities are in place for Chelton equipped aircraft. The aircraft equipped with the Chelton EFIS/PFD/MFD subsystem are not able to receive information from the UAT data link and so are not able to display ADS-B traffic or FIS-B weather. As an interim measure, Capstone has installed Garmin UAT subsystems configured for transmit-only in these Chelton equipped aircraft, without interconnecting them with the Chelton avionics. These aircraft can be "seen" by other fully configured Capstone equipped aircraft and the FAA ground system, but they can't receive or interpret the data link themselves.

Progress continued during 2005 in the Capstone Phase II Program. Developing infrastructure for such a complex aviation system is a multi-year task. Progress has been slower than anticipated on certification of the GBTs, weather stations and other elements. Aircraft modification is now progressing at a reasonable pace with 62% of the scheduled aircraft modifications either fully (Garmin) or partially (Chelton) completed. The following subsections present progress of the various program elements attained by 2005.

3.1 Voice Communications

The RCAG sites at Gunnuk Mountain and Robert Baron were serviceable after certification in 2004. Construction continues on the final scheduled RCAG site at Cape Spencer, not yet completed by the end of 2005.

3.2 Ground Based Transceivers

Construction was completed on ten GBTs in 2005 and the remaining four GBTs are anticipated for completion in 2006. The ten completed GBTs are now on a developmental network providing FIS-B and CRABs data for flight monitoring. ADS-B ATC surveillance is not yet available on any of the GBTs at the end of 2005. Figure 3.2-1 shows the locations and serviceability. Certification was anticipated in 2004 but the testing and the certification was still ongoing at the end of 2005. Final testing and certification necessary for these GBTs to be on the operational network was expected to be complete by summer 2005, but is not complete to date. The full benefits of the Capstone program cannot be realized until this certification is complete and the units are brought online on the operational network.

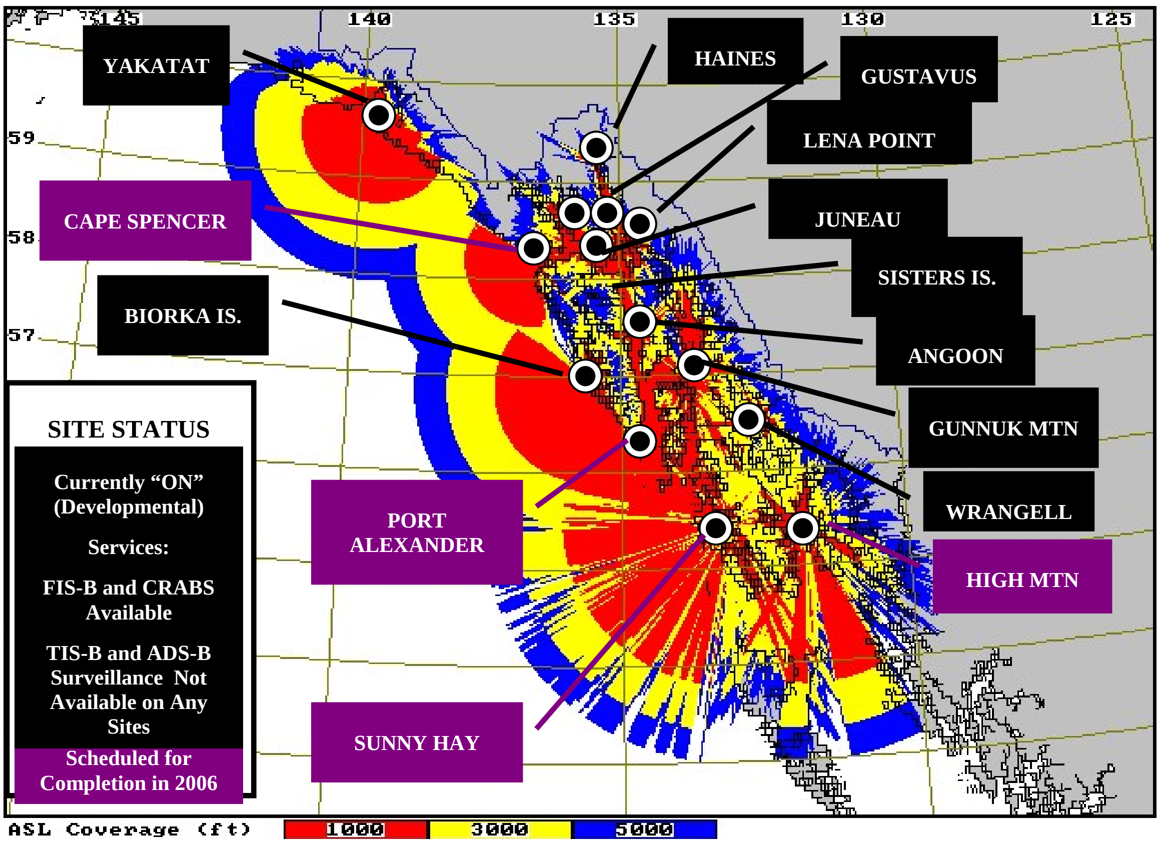


Figure 3.2-1. GBT Locations and Status in Southeast Alaska

3.3 Automated Weather Observation Stations

Hoonah currently has an operating AWSS that has been added by the Phase II program in 2005. There are now a total of 18 weather observation stations in the Southeast Alaska Phase II area. Figure 3.3-1 depicts the current operational stations.

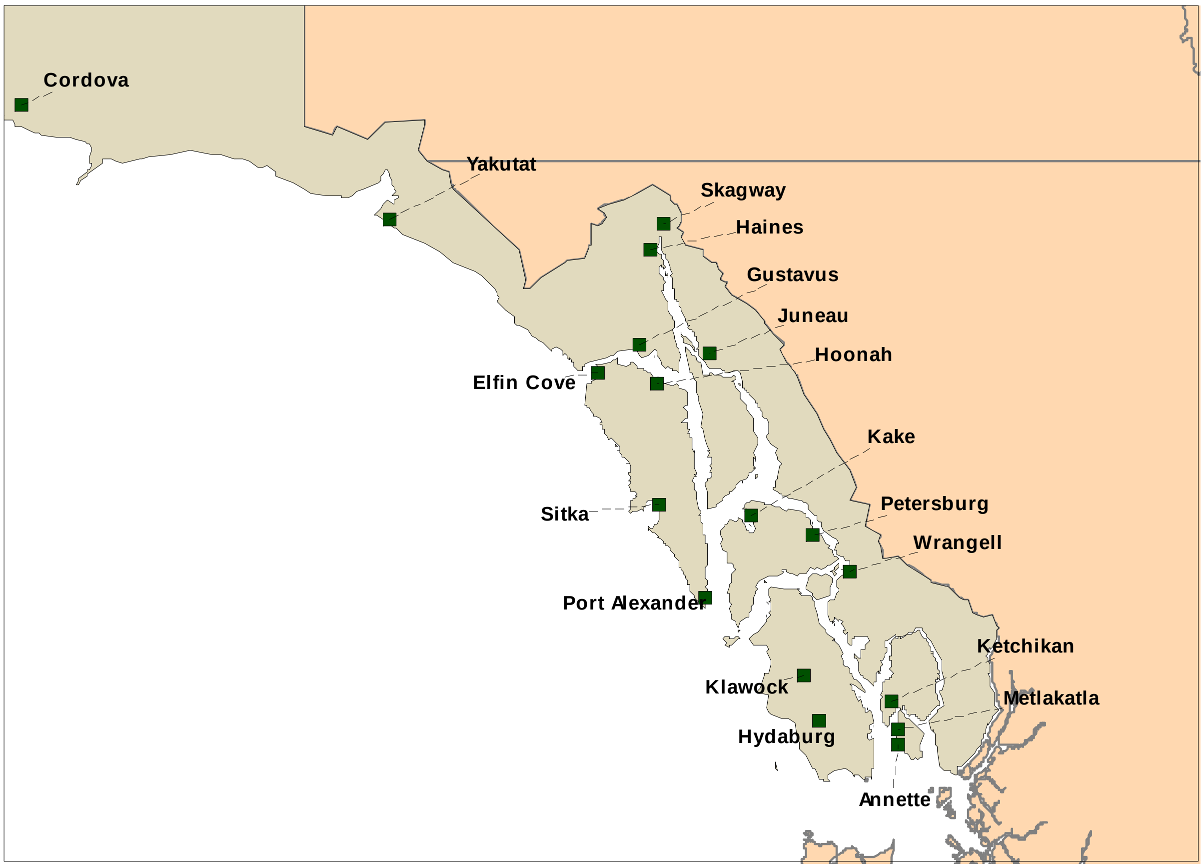


Figure 3.3-1. Southeast Alaska Weather Reporting Facilities

3.4 Tower Displays

The new displays have not been installed as of the end of 2005. They are planned for installation after ADS-B surveillance becomes available.

3.5 Airspace

Capstone Phase II accomplished a number of airspace "firsts" since the start of the program. The initial year saw the first commercial use of a GPS/WAAS navigation system and the first commercial use of airspace optimization, providing access to airspace that would otherwise be inaccessible with conventional avionics. Stand-alone GPS Approaches and Departures were developed, flight tested and approved for Gustavus, Haines, Hoonah and Juneau in 2003. Lower Minimum Enroute Altitudes were developed and approved for over 1,500 miles of airspace in Southeast Alaska.

The FAA issued SFAR No. 97, allowing the use of GPS/WAAS systems for the enroute portion of flights on routes in Alaska outside the operational service volume of ground based navigation aids. Highway In The Sky (HITS) synthetic flight path guidance was separately certified as part of the new avionics package. This provides a series of target boxes that the pilot can use to navigate in lateral and vertical dimensions along departure, enroute or arrival paths.

In 2004, the FAA certified 19 new RNAV Approach/Departure Procedures at Angoon, Juneau, Kake, Ketchican, Klawock, Petersburg, Sitka and Wrangell. They also certified four special four RNAV routes, known as R2010, R2015, R2020 and R2025.

In 2005 operators began using the previously certified RNAV approaches and departures. No new RNAV Approach/Departure Procedures were certified in the Phase II area but 18 other procedures were certified across Alaska.

3.6 Aircraft Systems

A total of 47 aircraft installations were completed in 2005 bringing the total Capstone Phase II aircraft equipped to 109. The 2005 installations included 17 Chelton, 27 Garmin and 3 aircraft that were converted from Chelton to Garmin. It should be noted that ERA Aviation is self-equipping with Chelton and has completed 12 installations. ERA is not included in the equipage or operational sections of this report as they do not operate intra-Southeast Alaska, a criterion of the analysis in this report.

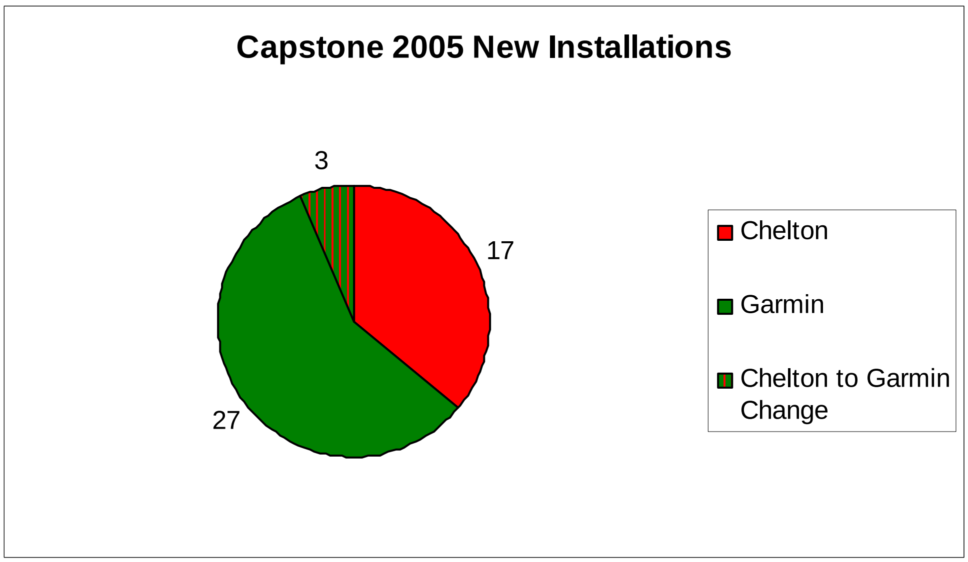


Figure 3.6-1. Aircraft Equipped with Capstone Phase II Avionics in 2005

The Chelton installations are only partially complete. All Chelton equipment is installed with the exception of connectivity with the Universal Access Transceiver (UAT). Chelton has not completed the necessary interface between their system and the UAT. Phase II Chelton operators will see essentially three levels of service. Level I provided the basic features of the Chelton avionics, such as "Highway-In-The-Sky" guidance, terrain and warning system (TAWS B or C) and navigation information, modified periodically for safety or performance enhancements. Level II, with the GDL-90/UAT installed in a stand-alone mode, is providing a down-link of data from the aircraft. This downlink can be received and used by Garmin aircraft for situational awareness and by the ground system for flight following (and eventually for Air Traffic Control). Level III offers a full system capability and adds a direct interface between the Chelton avionics and the UAT; it will provide the pilot with uplink information (FIS-B weather and other information, and potentially, air traffic data from ground surveillance systems). This new interface will also provide the pilot/operator with air traffic information from other aircraft for display on the Chelton avionics. It is now expected that modifications to Level III will be started by mid-summer 2007.

Figure 3.6-2 shows the progress of the installations. Only 4 of the 109 equipped aircraft, belonging to the University of Alaska Anchorage (1 Chelton) and Civil Air Patrol (3 Garmin), were non-commercial. The rest were Part 135. Of the 109 equipped aircraft, 8 are IFR capable. There are 97 Class 0 (single engine, piston), 7 Class 1 (twin engine piston) while 5 are Class 4 turbine powered aircraft. The Supplemental Type Certificate for helicopter installations was completed in 2005 and the first helicopter (Class 3) was being modified and tested at the end of the year. The majority of aircraft equipage for Capstone Phase II takes place during the winter months as it is the “off” tourist season.

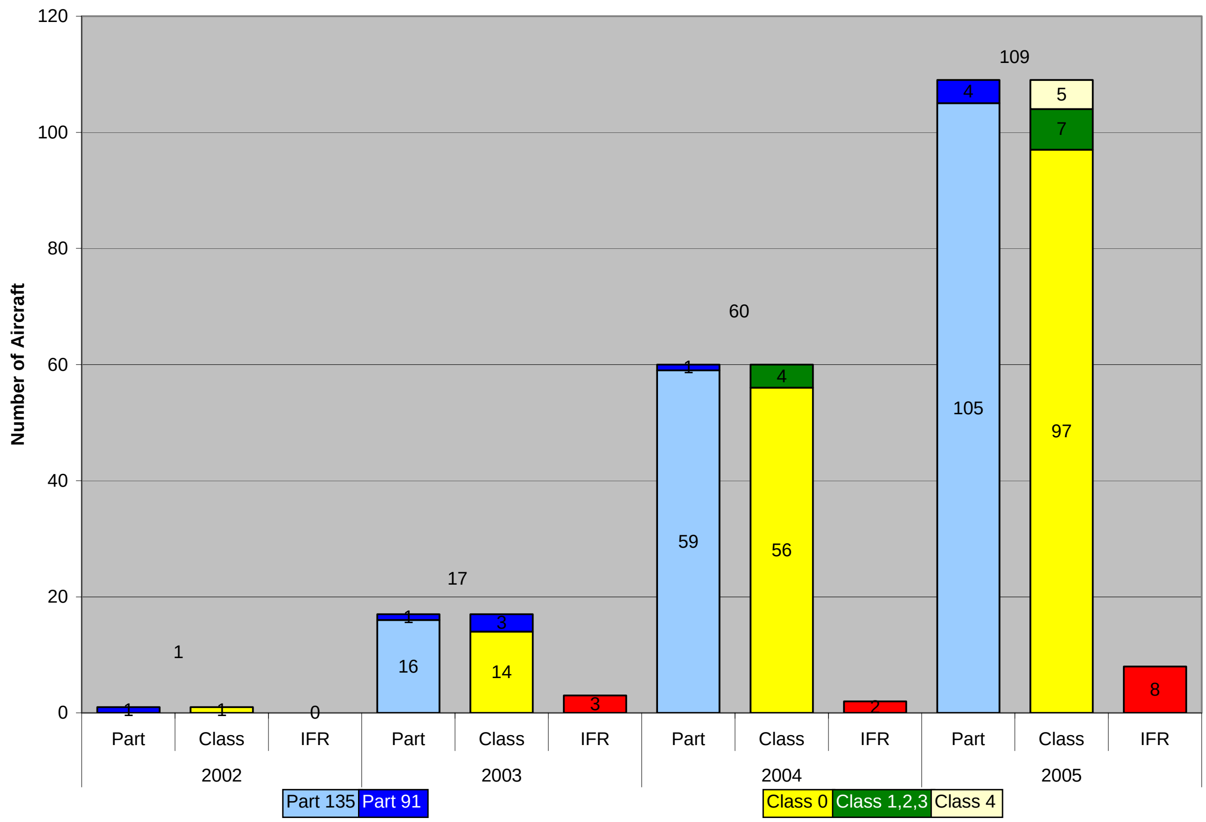


Figure 3.6-2. Cumulative Partially or Fully Equipped Aircraft Through 2005

The Southeast Alaska commercial fleet currently comprises 188 aircraft. Of those, it is expected that 164 will be equipped with Phase II avionics by the Capstone Program. Therefore, at the end of 2005, 56% of the aircraft commercial fleet was equipped and 62% of those expected to be equipped had been modified. Two aircraft that were previously equipped have been removed from the fleet due to accidents. Figure 3.7-3 shows the fleet distribution at the end of 2005.

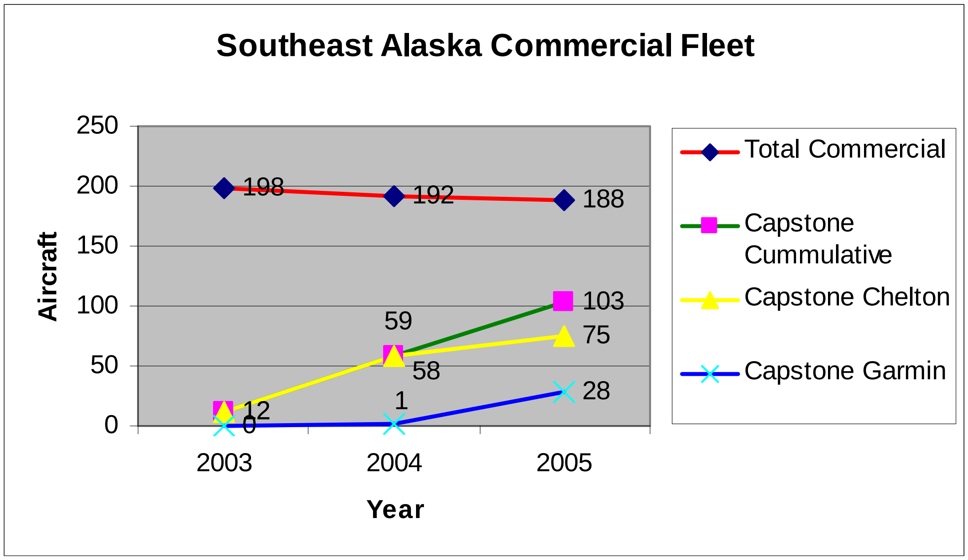


Figure 3.6-3. Commercial Operating Fleet Through 2005

3.7 Equipment Reliability

A number of the operators and pilots previously expressed concern with the reliability of the Chelton equipment package. The three primary reasons for this concern were the lack of certified repair stations available in Southeast Alaska, the turnaround times for units sent for repair and an opinion by the FAA that software updates must be done by a certified repair station. It was also noted that there are still only two air data computer/pilot static test sets available in the entire region.

Systems reliability data on the Capstone Phase II equipment is not available. An effective aircraft and component reliability program requires an operator to have a number of aircraft of the same type (general 6-8 aircraft minimum) and a capable, full-time records or engineering department. The diverse fleet mix and number of small operators in the Southeast Alaska make this impractical, and reliability programs are not required by the FAA for small Part-135 operators. Therefore, data such as Mean Time Between Failure (MTBF) and other data that could be used to quantify reliability of the system are not available. The only quantitative data available on the reliability of Capstone avionics is from the manufacturer concerning components that have been returned for repair.

Chelton had 233 units returned to the manufacturer during 2005. Slow Turnaround times were noted in the last year's report for the Chelton avionics. A review of this year's data indicates a significant improvement in 2005. Air Data Computers and Integrated Display Units are key elements of the Chelton system and had the highest removal rates of the components for reasons other than updating. Figure 3.8-1 shows that during 2005, 39 ADCs had been removed for specific failures and another 22 were sent back to undergo evaluation. This does not include a problem found with the altitude sensor in the ADC requiring <u>all</u> ADCs to be returned for modification. Twenty-six IDUs required repair and 8 were sent for testing.

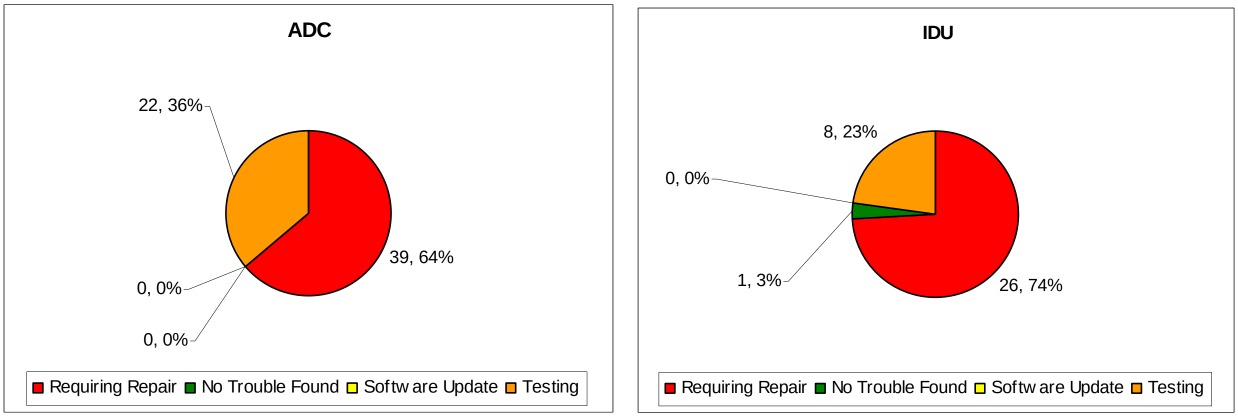


Figure 3.8-1. Chelton Air Data Computer and Integrated Display Unit Repair Data - 2005

Garmin system components generated very few returns to the manufacturer as can be seen in Figure 3.8-2. A total of 13 units were returned and of those only 3 required repair, 5 were sent in due to operator error and the remaining were for software updates. The GNX 480 and MX 20 each had one unit requiring repair.

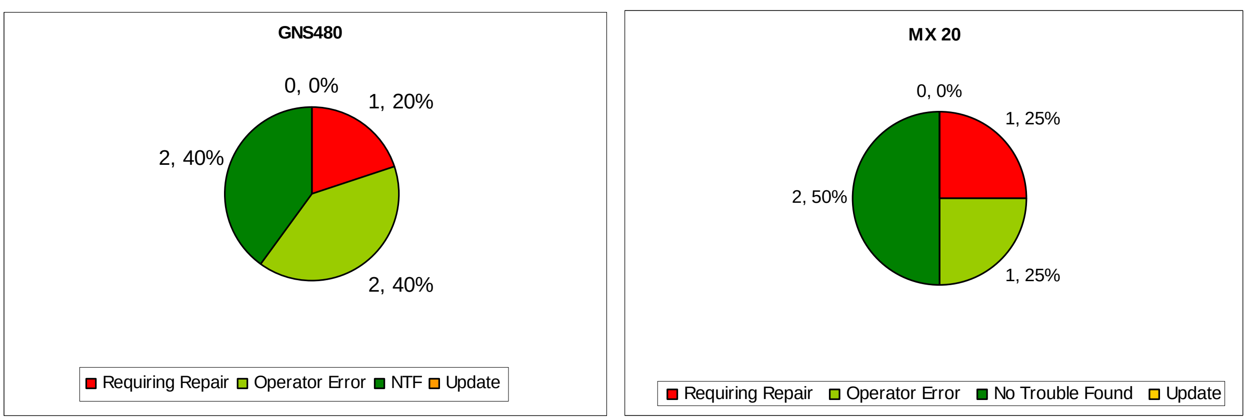


Figure 3.8-2. Garmin Repair Data - 2005

A Master Minimum Equipment List (MMEL) was developed and approved. Six aircraft now have an FAA approved Minimum Equipment List. The operators may not see significant benefit from adapting the MMEL since most of the items in the MMEL still require repair within one day.

Limited reliability and lack of adequate test equipment create an economic impact on the operator. Aircraft that are not operating for maintenance or parts reasons do not generate revenue and significantly impact customer satisfaction. An operator or pilot might consider not documenting malfunctions or failures if they know the aircraft may be grounded for any period of time. This would increase the safety risk of pilots flying with an aircraft that does not meet its airworthiness requirements.

3.8 Phase II Operator Training

The University of Alaska Anchorage (UAA) provides initial Capstone training for pilots using a "train-the-trainer" approach. UAA has an agreement with the FAA Capstone office to provide initial training to the air carriers' trainers on the operation and use of the Capstone system. UAA's training program provides each operator with an 8400.10 (Air Carrier Inspector Handbook) compliant training program. The training program outlines ground training, flight training and checking, and recordkeeping. Beginning in spring of 2003, UAA provided initial training for each of the operators. UAA timed the training to coincide as closely as possible to the delivery of a carrier's first Capstone-equipped aircraft. The typical operator had two people receiving 16 hours of classroom training with the avionics training device.

In 2004 UAA also entered into an agreement with the FAA to train key maintenance personnel on the Chelton Phase II system. The training focuses on field maintenance with an emphasis on troubleshooting, removing and replacing inoperative components, and updating software. Four maintenance technicians attended the one Chelton maintenance training class that was conducted in 2005. No Garmin maintenance training had been conducted by year end 2005.

Nine pilot training classes were held during 2005. Six of those classes were for Garmin initial training and one was for Chelton initial training. Twenty-two Garmin and four Chelton pilots attended these classes. Four pilots attended classes on special routes and airports. UAA had trained 67 company pilot trainers by the end of 2005. Figure 3.9-1 depicts cumulative training UAA has accomplished by the end of 2005.

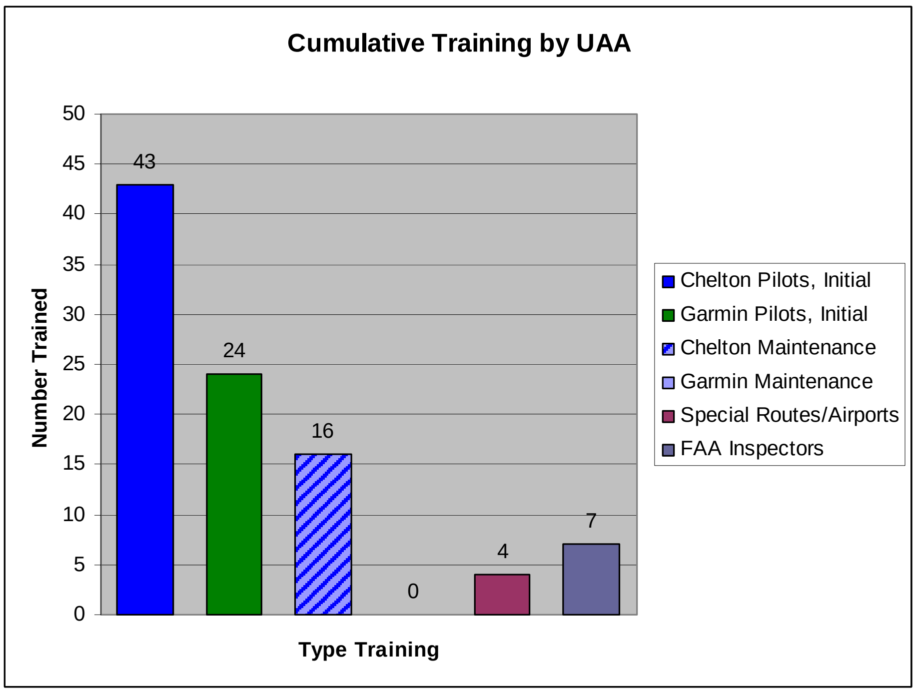


Figure 3.9-1. Cumulative Training Accomplished by UAA

A survey of the pilots who have attended the UAA Capstone II training indicates that the quality of the training received is more than adequate. Fifty percent or the respondents felt that it was excellent, 37 percent thought it was good and none felt that it was less than adequate or poor. The pilots' opinion of the quality of the recurrent training was lower with only 25 percent feeling that it was excellent, 60 percent good and no one felt it was less than adequate or poor. Thirty-five percent did not respond to the recurrent question in the survey since most of the Garmin pilots had not gone through recurrent training yet. Figure 3.9-2 shows the breakout of the responses to the survey. The pilots overwhelmingly (80%) indicated that they would not make changes to the training programs. Though small in number, simulators were mentioned or an integral part of the most common recommended change. Simulators are available but during the preparation for the summer season when many new pilots are brought in, the number of simulators is insufficient. Some comments from the survey:

"More Simulators"

"A training simulator module"

"More ground training"

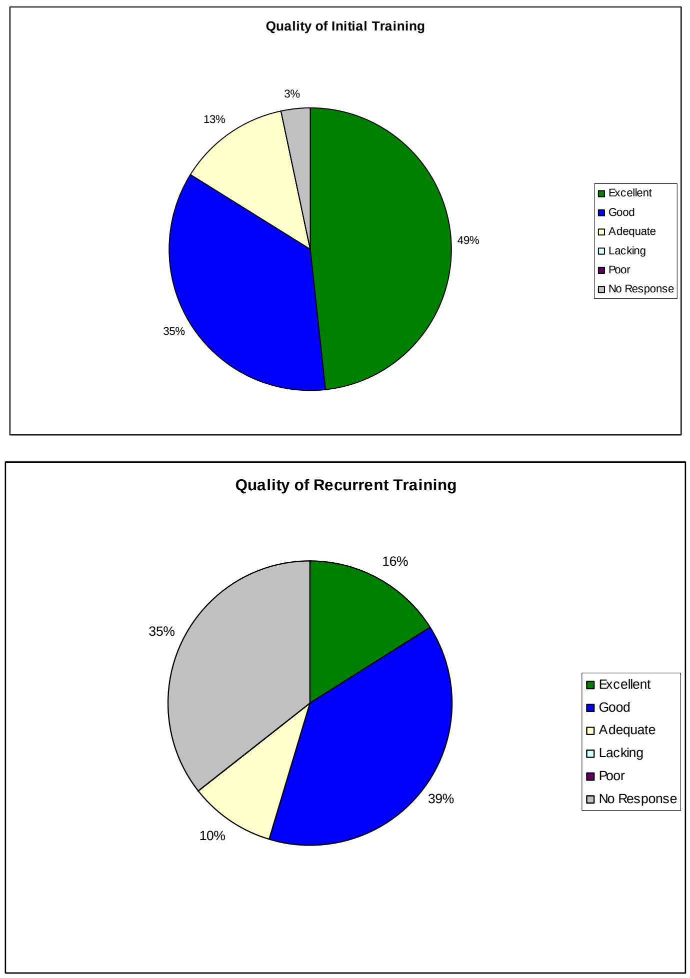


Figure 3.9-2. Quality of Capstone Training - Pilot Ratings

4 Operator Survey Results

4.1 Airline Management's Viewpoint

Interviews in the Capstone Phase II area, notably Juneau and Ketchikan, point to definite improvements in safety programs as well as the safety culture and posture of organizations. Figure 4.1-1 shows that 77% of all surveyed reported changes in their programs and a similar result came from discussions about their safety culture and posture. Several of the organizations employed less than five pilots and, therefore, did not accomplish the "formal program change documents" that were discussed in the survey. They all, however, discussed the improved safety posture inherent in the new technology.

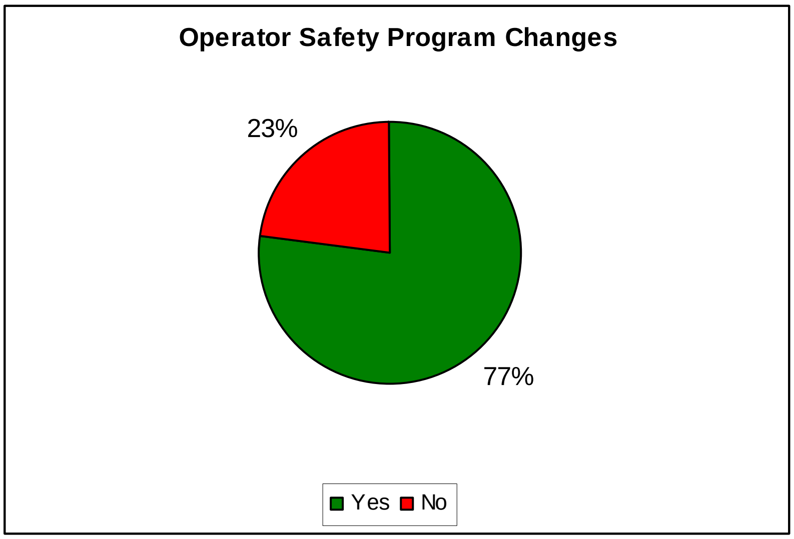


Figure 4.1-1. Operator Changes to Safety Programs

Along with Capstone, several individuals discussed the overall improvement in Alaska aviation safety through the synergistic interface of Capstone, the Medallion Foundation, Alaska Weather Cams, and other recent FAA and industry sponsored programs in Alaska. Many of the measurable changes to formal safety programs came from participation in the Medallion Foundation program.

One of the key disappointments to management is the current inability of both air and ground equipment to better "paint" traffic. This comes as a direct result of the incomplete integration of the Chelton equipment into the system and the lack of effective GBT coverage in most of the Phase II area.

Economic impacts, for the most part, are intuited by management but at this point, have not been measured by most operators. Figure 4.1-2 shows that 50% managers noted improvements, 7% noted deterioration, and 43% noted no change in operating economics due to Capstone. On the plus side was the availability of more direct routing and the ability to determine flight level winds. When taken advantage of, both can lead to fuel saving. However, the operators do not have historical databases to compare with Capstone equipment results.

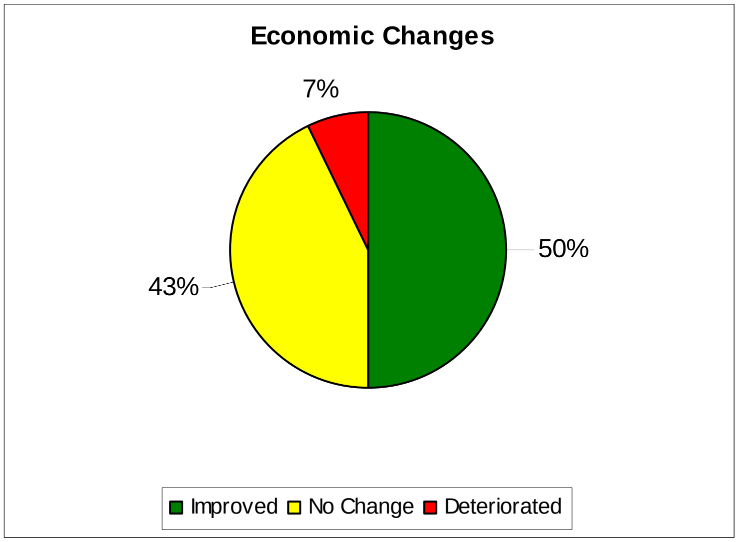


Figure 4.1-2. Airline Management's Opinion on Economic Impact

The training required to prepare newly hired pilots and to keep all pilots current in Capstone equipment operations was noted by some as having a negative impact upon the economics of their operation. This, however, is said to more than offset the improvement in safety. Though, not yet a factor, the economic impact of maintaining the equipment in the future is of concern.

The Capstone II area is spread over the wide area of Southeast Alaska. When asked about the communications between themselves and the FAA Capstone Program, 84% rated communications between the two as good or excellent. This is primarily on the weight of efforts of the technical experts in Juneau, led by Mr. Jimmy Wright.

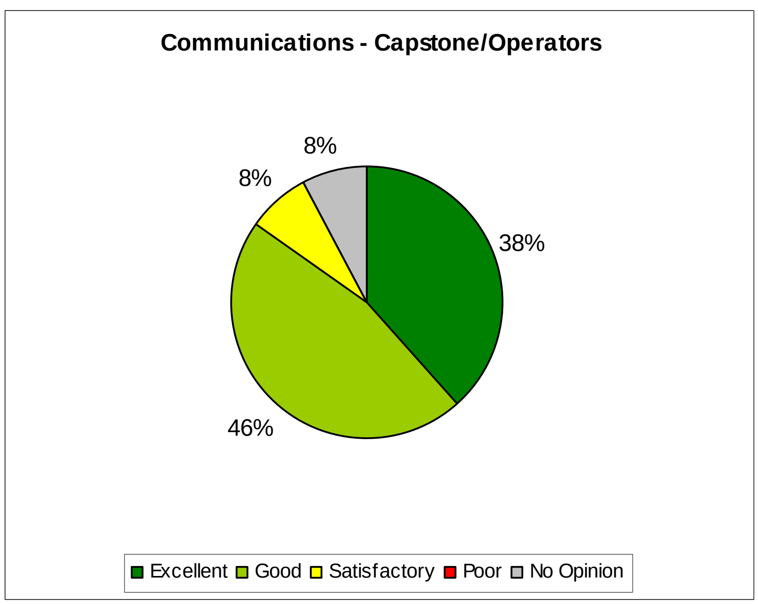


Figure 4.1-3. Airline Management's Opinion on Communications With FAA

Prior to Mr. Wright's efforts, operators rated communications lower. Of continuing concern is the lack of visibility of Alaska Capstone Program Office representatives and a perceived lack of availability of this staff to assist with the resolution of questions.

Operators report near universal agreement that the Capstone systems offer the potential for a long term and significant improvement in Safety for flight in the Southeast. They express disappointment that the ability to display traffic, both in the cockpit and on ground systems, has not matured at a faster rate. Some of the specific comments follow (a complete listing may be found in Appendix D, 8.4.1):

> "*Capstone is the only POSITIVE, PROACTIVE FAA PROGRAM in my aviation career – it is a refreshing change."*
>
> *"Phase II systems are probably "overkill" for a VFR operator"*
>
> *"Experiences with this new program are shared among the "competing" organizations as we try to make it work. The result is a safer working environment for all and happier customers."*

Specific comments about technical and procedural issues were provided to the Capstone office during the course of the survey, and are included in the referenced Appendix.

Training for the Capstone program was universally accepted as good to excellent. Of particular notice was the use of table top simulators as training aids. The only concern voiced was the burden of training being placed on one individual, Mr. Leonard Kirk of the University of Alaska.

Dispatch and Flight Following

Dispatch and flight following surveys were notable for a lack of information due to the Dispatchers having a lack of training and knowledge of what capabilities are available to them . The Juneau area had some GBT coverage and a mixture of Chelton and Garmin aircraft. Without resolution to the Chelton integration issues, only the Garmin and those Chelton aircraft with a UAT could be displayed on the available flight following systems. Ketchikan had the same mixed fleet problems and also lacked any significant GBT coverage for most of 2005. This resulted in almost no flight following coverage.

Most dispatchers and flight followers were not able to comment on their use of flight following, as it was unavailable until near the end of 2005. Those that have flight following systems in their organizations have observed operations in other areas – specifically the Phase I area – but have not developed clear pictures of how they would integrate the capability into their operations.

Figure 4.1-4 depicts the Dispatchers opinion of potential uses of the flight following capability. The information that is important to the flight followers, several emphasized that they were conducting primarily only short duration, VFR operations and survey items such as alternate airport selection, rerouting, and fuel/load planning were at the bottom of their priority list. With some of the operators having only a single or very few pilots, all of the dispatch/flight following concerns fall upon the individual, self-dispatching pilot and the value of the organizational flight following capability is diminished.

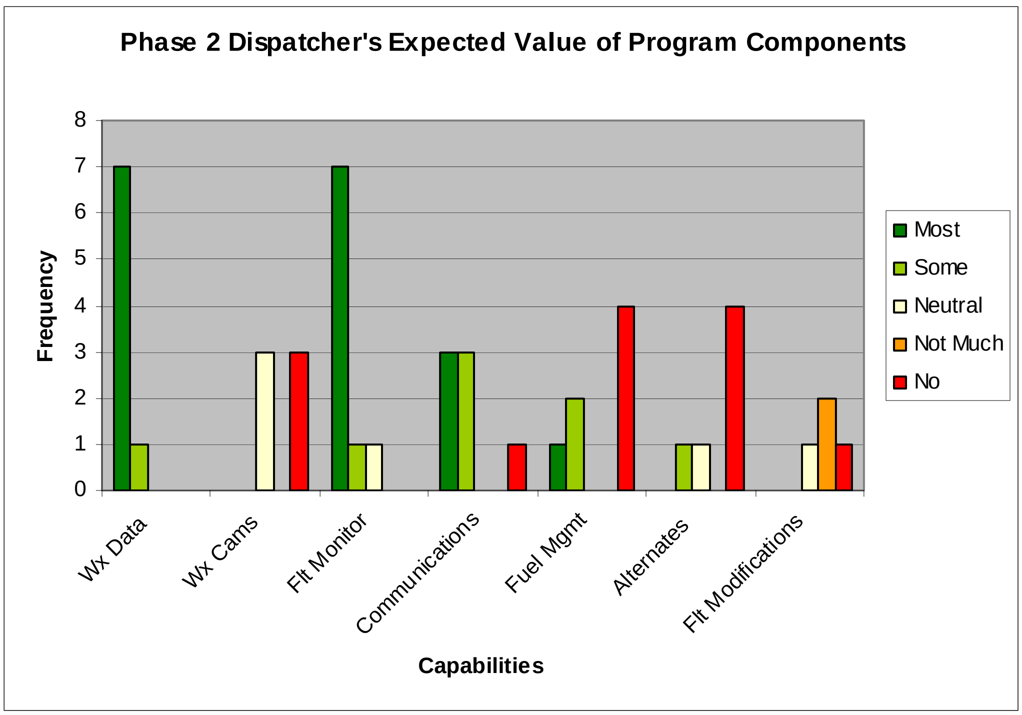
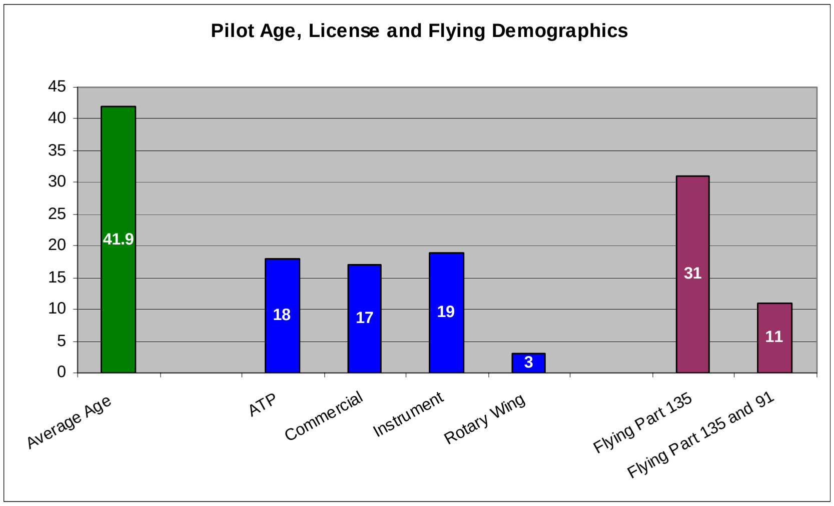
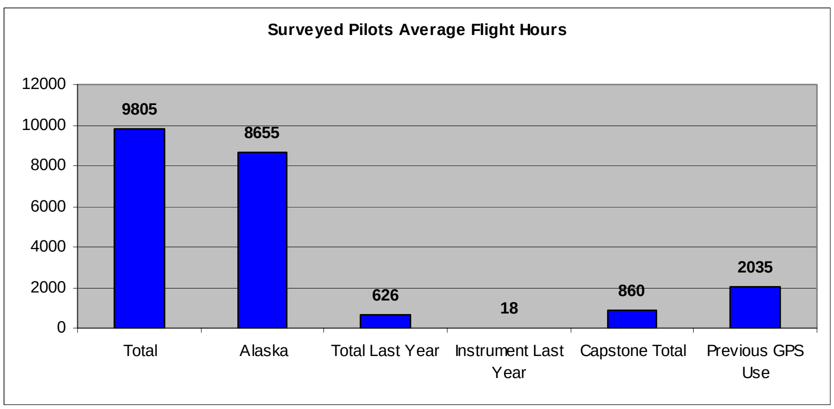


Figure 4.1-4. Dispatcher's Value of Information

4.2 Pilot Surveys

Pilots operating Capstone-equipped aircraft were surveyed in winter of 2005/2006. Many of the pilots that operate in Southeast Alaska leave the area during the winter months when the tourist season ends. In the future, a portion of the interviews will be conducted prior to the end of season to capture a wider range of pilot age, experience and opinions. Thirty-one pilots were interviewed. Thirteen of these pilots currently operate Chelton equipped aircraft, 9 pilots operate Garmin equipped aircraft and 9 pilots that have experience operating both systems. The following graphs in Figure 4.2-1 provide the demographics of the survey group.





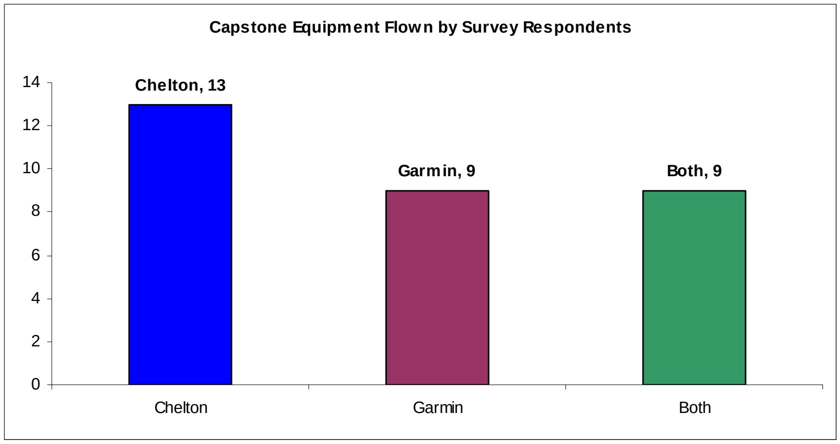


Figure 4.2-1. Surveyed Pilots Demographics

The responses provided in Figure 4.2-2 are indicative of pilots' perceptions of the hazards encountered in Southeast Alaska. As the Capstone Phase II program matures and pilots gain experience with equipment use this data will be monitored for changes. The questions are based the frequency that pilots encounter specific hazards that Capstone equipment is designed to provide improvements.

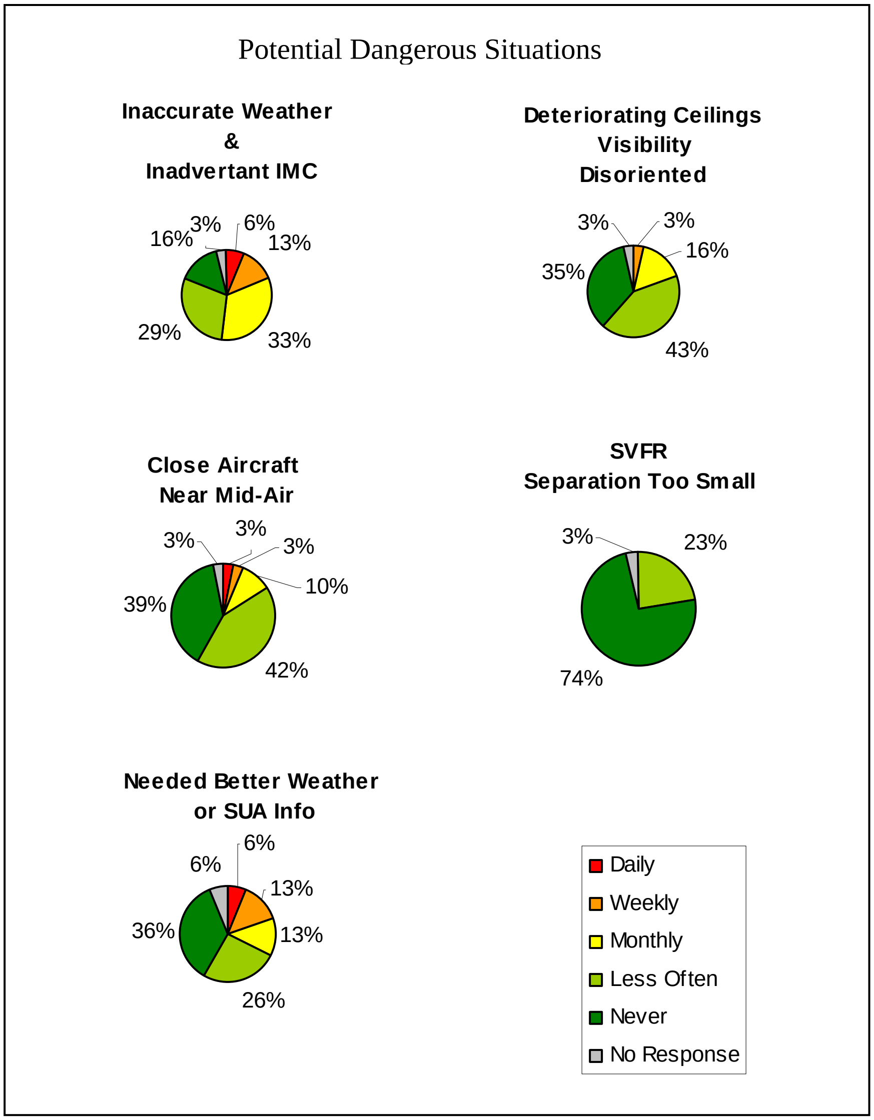


Figure 4.2-2. Pilot-Reported Frequencies of Problems Potentially Addressed By Capstone Phase II

The pilots surveyed were asked how often the aircraft were IFR certified and what percentage of their time was spent flying IFR. The results, shown in Figure 4.2-3 below, indicate that 87% of the aircraft operated by the surveyed pilots are not IFR certified and 94% of the pilots spend less than 10% of their time flying IFR. As will be seen in the survey data, this impacts the pilot use, usefulness, usability and the pilot's perspective on system benefits.

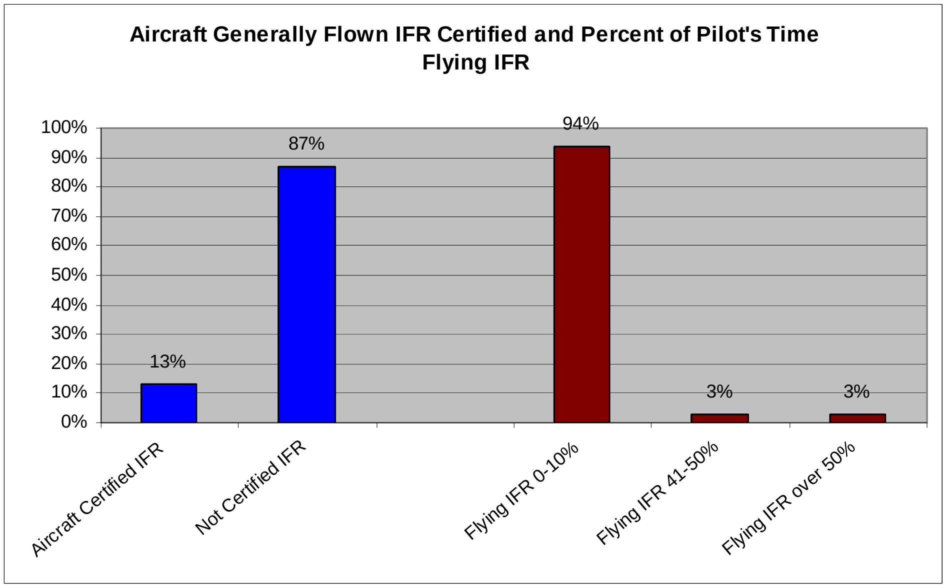


Figure 4.2-3. IFR Certification and Flight Time

Use, Usefulness and Usability

Surveys in 2005 and the winter of 2006 asked pilots how often they use the capabilities of Capstone Phase II avionics and ground systems, how easy that capability is to use (relative to other avionics they are familiar with), and how useful they find the capability to be. Pilot responses are summarized in the array of pie charts in Figure 4.2.4. The responses indicate the initial capabilities of the Capstone Phase II program are relevant to pilots' perceived needs, that pilots use the capabilities to varying degrees, and that the usability and usefulness of Capstone are regarded favorably. The pilots were not surveyed for responses to the Traffic and weather functions during the survey this year since Chelton does not currently have those capabilities and the Garmin users were only able to see the Chelton aircraft for part of the year. Traffic and weather will be included in next year's analysis. A key issue with all Chelton users is the lack of a traffic display.

"No traffic yet"

"Need to make traffic show up on the MFD"

With the ground infrastructure incomplete, the Chelton equipment only partially installed and 2005 being the first year of operating experience for the Garmin pilots, the responses for some functions are not likely to be indicative of a fully operational system.

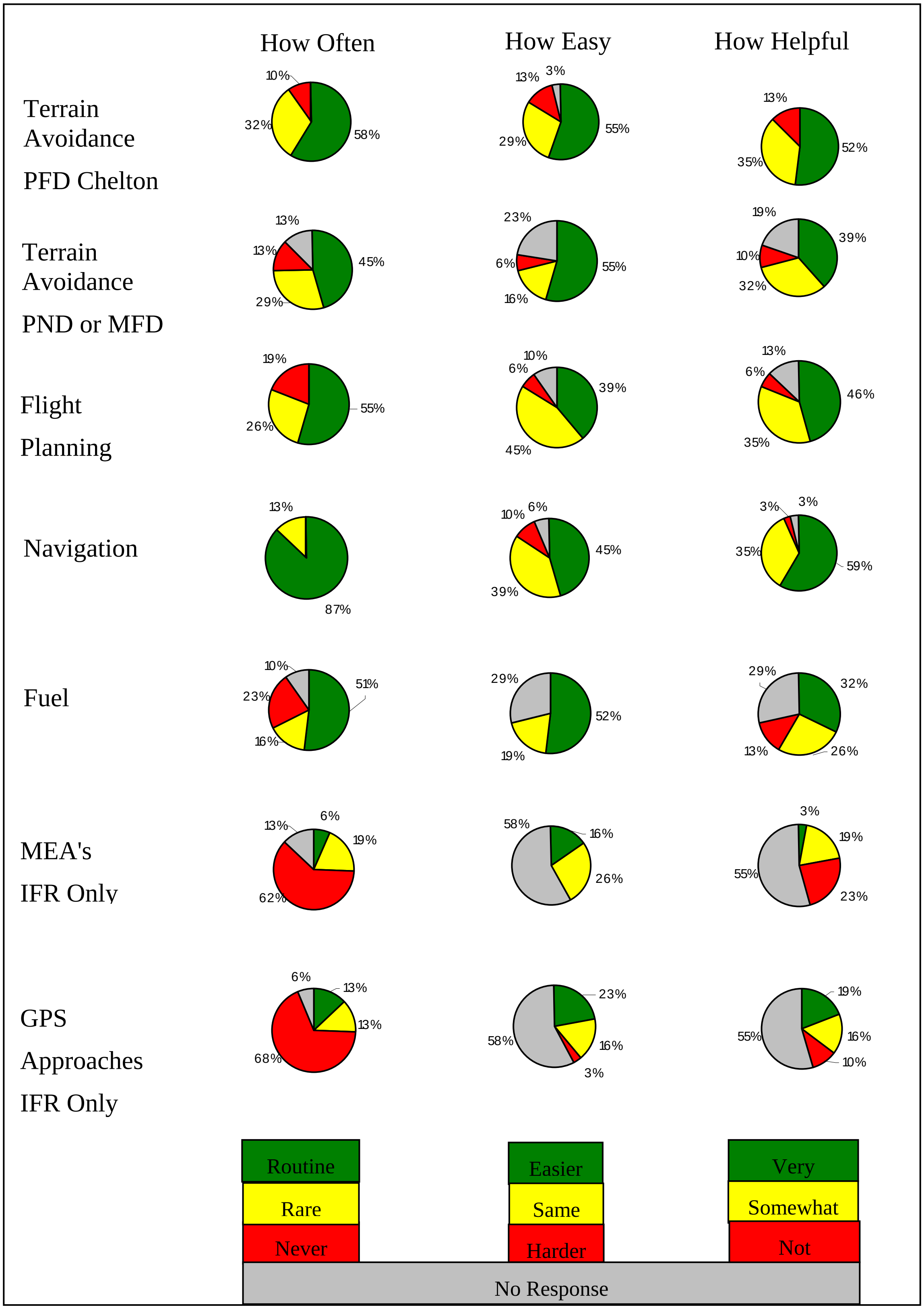


Figure 4.2-4. Frequency of Use, Ease of Use, and Usefulness of Capstone Capabilities

The navigation element of the Capstone system by all 3 pilot groups rated as the most often used. One-hundred percent of the Garmin pilots stated that they used the navigation function regularly while 89% of those pilots operating both systems and 77% of the Chelton pilots used it regularly. None of the pilots in any of the groups stated that they never used the system. Ninety-two percent of all pilots rated the system as easier or the same as other navigation systems. Although the navigation elements show a high degree of use, they also result in issues from the pilots:

> "*Need a more detailed map, including Canada"*

> *"PND – terrain features grainy – could use improvement"*

Terrain avoidance, on the PFD or PND, was highly rated by the pilots for use, usefulness and usability by all 3 groups. The Chelton users seemed to prefer the PND (54%) over the PFD (46%). Terrain avoidance was rated as easy to use almost equally by all groups. Nearly half Chelton and Garmin users rated terrain avoidance as very helpful whereas the "both" user group rated the PFD (45%) and the PND (22%) as very helpful. While terrain avoidance rated high in all areas, it also elicited numerous comments relative to the accuracy and format of displayed information.

> *"It changes range when near terrain and overlays red and yellow making the nearest terrain harder to see and therefore more dangerous."*

> *"The lack of detail on the MX20 is sorely lacking; many islands, shorelines, etc. are inaccurate, missing, or displaced (sometimes a half mile or more)."*

> *"There is no coverage for Canada or the lower 48 states; We do a considerable amount of work in Canada and an occasional trip to Washington State."*

> *"Poor graphics"*

> *"Terrain inaccuracy"*

The flight planning function was equally rated by pilots of all 3 groups with 56% stating that they regularly use the system. Fifty-six percent of the Chelton users found flight planning to be very helpful while only 33% of the Garmin users and 45% of the users of both systems rated it very helpful.

Chelton pilots and pilots of "both" types use fuel planning with 77% and 56%, respectively, routinely using the system with 62% of the Chelton pilots considering it very helpful. The Garmin system does not provide as sophisticated a system for fuel planning and use and therefore it was rated very low with only 11% regularly using the system and none rating it as very helpful.

Both MEA and GPS approach use were universally rated low by all pilots in all groups. One hundred percent of the Garmin pilots stated they never or rarely use GPS approaches and 89% rarely or never use MEAs (the remaining 11% did not respond to the question). Chelton faired little better with only 23% routinely using GPS approaches and 8% using MEAs routinely. Only 11% of the pilots experienced with both systems selected routine use of GPS approaches and MEA.

The Highway in the Sky (HITS) is a feature that is only on the Chelton system. Sixty-two percent of the pilots routinely use HITS, 77% stated that it was easy to use and 52% stated that it was useful. Some pilots see HITS as unnecessary in the "VFR" flying environment of Southeast Alaska. For those flying "IFR" in VMC it has been described as "great". Similarly, some pilots stated that they turned the HITS off when flying VFR, regardless of type of flight plan, as it is too distracting.

A key element that degraded use in many cases, primarily for the early moments of a flight, is the requirement for a stationary warm up period. As many of the pilots operate from floats, it is simply not possible to remain stationary after start, and this introduces errors into the system.

> "*Having to wait for it to warm up takes too long!"*

Several responded to the survey question concerning any "situation in which you can directly attribute your use of the Capstone equipment to the prevention of an accident or incident." This is one example:

> *"Yes, snow storms closed in behind and in front of me & the training & my knowledge of the Capstone prevented an incident. The skyways, flight plans, min alt, and many other features allowed me to conclude the flight safely."*

Capstone Program Benefits

Figure 4.2-5 indicates how pilots responded to questions concerning several areas of potential Capstone benefit. The responses noted must be tempered by several facts relative to operations in Southeast Alaska.

- Only a limited number of the twenty-six 135 Capstone operators use IFR certified aircraft
- The lead operation for most operators is day VFR, tourist, flight-seeing
- Chelton, used exclusively by 15 of the 26 operators and in part by 2 of the operators, has not integrated traffic or weather information into its cockpit display.
- GBT density and certifications in the area are at an early stage of development and the mountainous terrain limits reception in many areas.

Seventy-six percent of the pilots found No Benefit or did not respond concerning safer operations at remote airports having new instrument approach procedures. Over 80% of the pilots either found that the availability of new IFR approaches did not result in fewer cancellations or simply did not respond. Their VFR operating environment and VFR certified aircraft make the use of IFR, GPS approaches unnecessary and, except in emergency situations, they fly VFR.

When weather deteriorates, 55% rate Capstone as a Major benefit, and 23% rate it as a Significant Benefit when flying in minimum VFR conditions. The responses indicating a potentially less safe operation are mostly concerned with the "comfort factor" gained through the new equipment:

> *"A less experienced pilot might exceed his or her limits in hopes of getting the flight accomplished"*

Over 85% of the Chelton pilots see either No Benefit or did not respond concerning near mid-air collision avoidance benefits from the Capstone program. This is a direct result of the Chelton system's inability to display traffic in the cockpit at this time. The Garmin pilot's responses rated near mid-air benefits highly with 66% seeing at least Some Benefit. A number of pilots stated that this benefit could not be fully achieved until all aircraft had the traffic capability in the cockpit. Taxi and traffic information responses are again tied to traffic information in the cockpit. Without the display, it is either of no use (74%) or not considered for a response (17%).

Weather information is not getting into the cockpit, as 94% of the responses indicate no value or no response to questions concerning useful weather information. This benefit should improve as additional GBTs are certified and FIS-B data is more readily available. SVFR improvements have not been appreciably noted. Over 60% either rated this as No Benefit or did not respond. Controllers are not currently using Capstone information for aircraft location information, so information sharing between the pilot and the controller has resulted in no noticeable improvement for SVFR.

The ability to reroute and divert flights is rated positively by 58%. As GBTs come on line and organizations make more use their flight following capabilities, reroute and divert capability becomes easier.

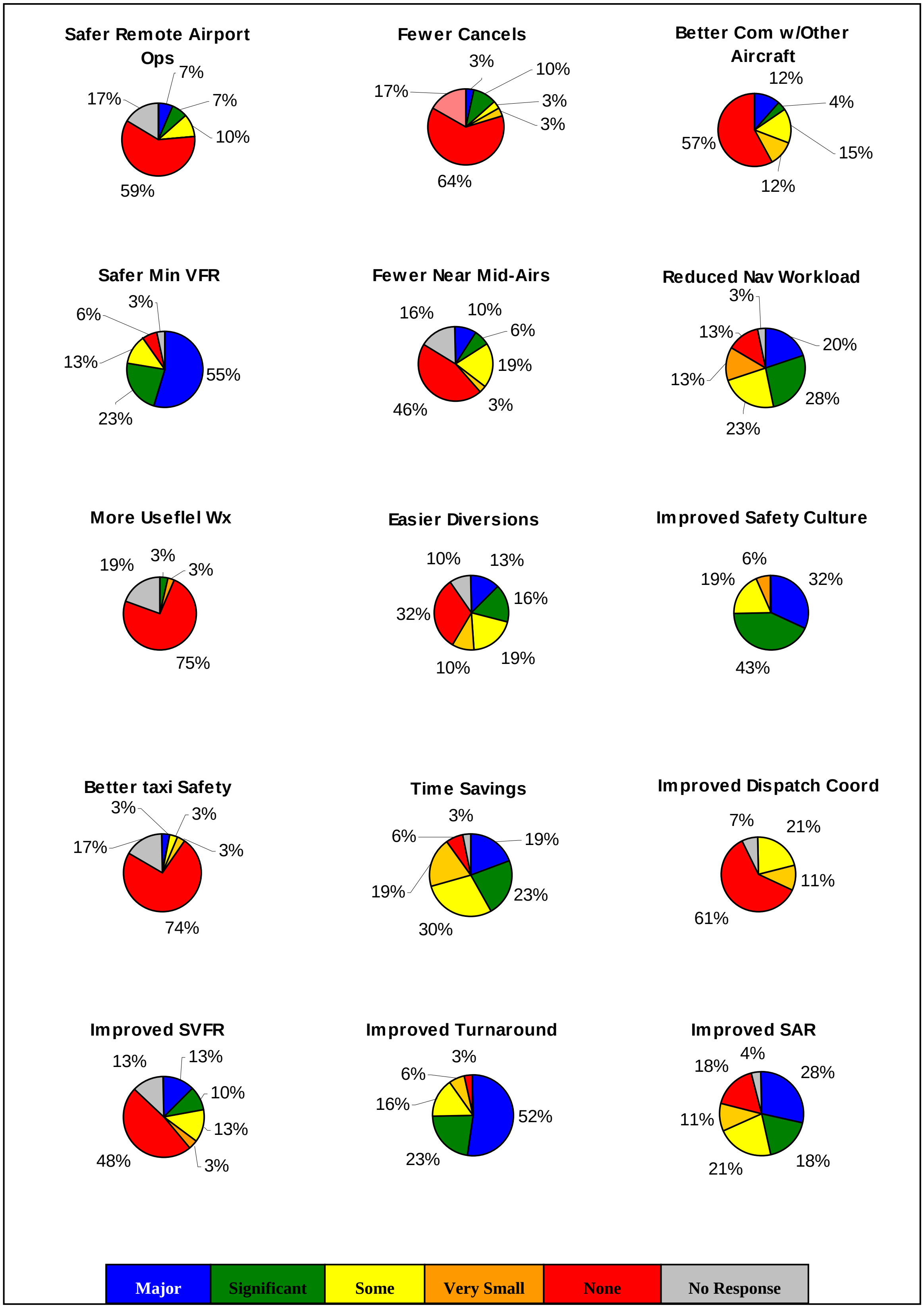


Figure 4.2-5. Pilot's View of Capstone Program Benefits

Pilots nearly unanimously rated time savings as a benefit from more direct flight routes: 20% Major Benefit, 23% Significant Benefit, 30% Some Benefit, and 19% Very Small Benefit. The key detractor to direct flight in the Southeast is the terrain, with numerous narrow, mountain lined passages. Terrain Awareness is one of the two highest rated benefits of Capstone. Fifty-two percent rated the area as a Major Benefit, while 23% rated it as Significant. For the 3% that rated it as no benefit, system accuracy may be the key reason:

> *"Accuracy of the graphics programs may cause problems (e.g. Baranof eastern shoreline is off by up to 200 yards)"*

Surprisingly, many view the Search and Rescue capability as a Capstone benefit: 28% Major, 18% Significant and 21% Some. Garmin pilots perceive it as even a greater benefit with 56% rating it as Major, 11% Significant and 22% Some. Most see it as a potential benefit, rather than a current benefit. Without a current, radar-like service, it is still difficult to determine where an aircraft may have "gone off a screen".

Pilots have not yet seen any benefit in plane-to-plane communications derived from traffic displays – as noted Chelton does not yet have traffic in the cockpit and only 8% of the Chelton pilots considered it as Some Benefit. Thirty-three percent of the Garmin pilots rated this benefit as Major or Some. Over all the pilot groups, fifty-seven percent noted No Benefit, and another 12 percent reported only a Very Small Benefit.

The navigation workload has been reduced for all but 16% of the responding pilots: 20% Major Benefit, 28% Significant Benefit, 23% Some Benefit, and 13% a Very Small Benefit. This reduced navigation load allows for more attention to primary flying tasks.

Collaboration with dispatch concerning mission continuation is rated fairly low, with 61% seeing No Benefit and 7% not responding. No one reported this as a Major Benefit. Two primary reasons for this are:

- The flight following systems in the Southeast are in their infancy and the companies' policies have not evolved yet to facilitate coordination between pilots and flight followers for these situations.
- Many of the companies are small operations with low pilot manning only and no Dispatch/flight following function for them to coordinate with.

The bottom line for benefits is in the area of improved safety culture. Pilots unanimously believe that Capstone is a benefit: 32% Major, 43% Significant, 19% Some and 6% Very Small. There were no surveys that indicated "No benefit" or who failed to rate this element. One comment helps sum this area up:

> *"The passengers feel safer."*

5 Other Phase II Safety Programs/Impacts

5.1 Changes in Operations Associated with Capstone

Most of the Southeast operators are small companies certified under Part-135 and their required quality assurance programs and records keeping are more limited than Part-121 operators. Using surveys provides some indication of improvements in the general safety structure of the operators, as shown in Figure 5.1-1. Sixty-two percent of the respondents indicated they have revised their Operations or Policy Manual and had conducted a safety audit or review. Forty-six percent have set or revised safety goals, implemented an accident/incident reporting program and have developed a new safety program or appointed a Safety Officer. Only 23% had written a new employee safety letter.

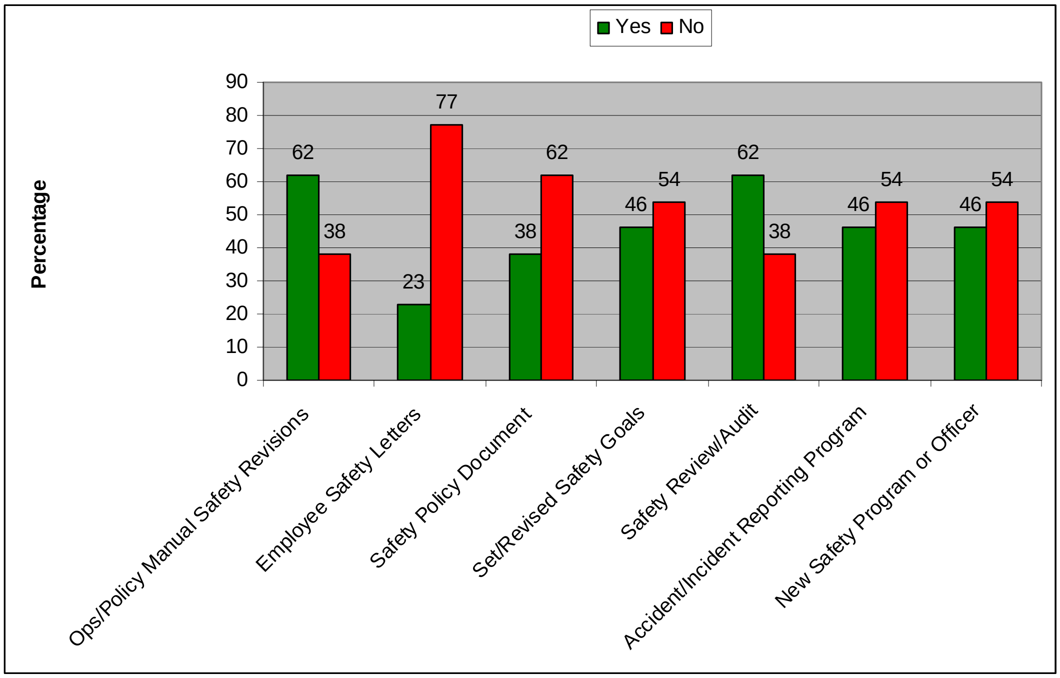


Figure 5.1-1. Changes to Safety Posture or Awareness

5.2 Medallion Program

The Medallion Foundation, created in 2001, is one of the more important flight safety programs in Alaska. Although program membership is voluntary, the prestige that comes with earning a Medallion Shield has proven to be a powerful incentive for many Alaska carriers to join. To earn the shield, air carriers must complete the entire program and satisfy the five program goals (Stars) designed to increase safety awareness and improve safety practices. At the end of 2005, the Medallion Program has enrolled only eight of the 26 Southeast operators and only four of those operators have achieved even one of the five Stars necessary to obtain a Shield. Operators with at least one Star were responsible for only 39% of Part-135 operations Non-Medallion members and those members who have yet to earn a single Star conducted 61% of the operations in Southeast Alaska.

Figure 5.1-2 shows the number of operators that have earned Medallion Stars for meeting some of the program goals and the percentage of aircraft and flight operations by number of Stars and non-Medallion operators.

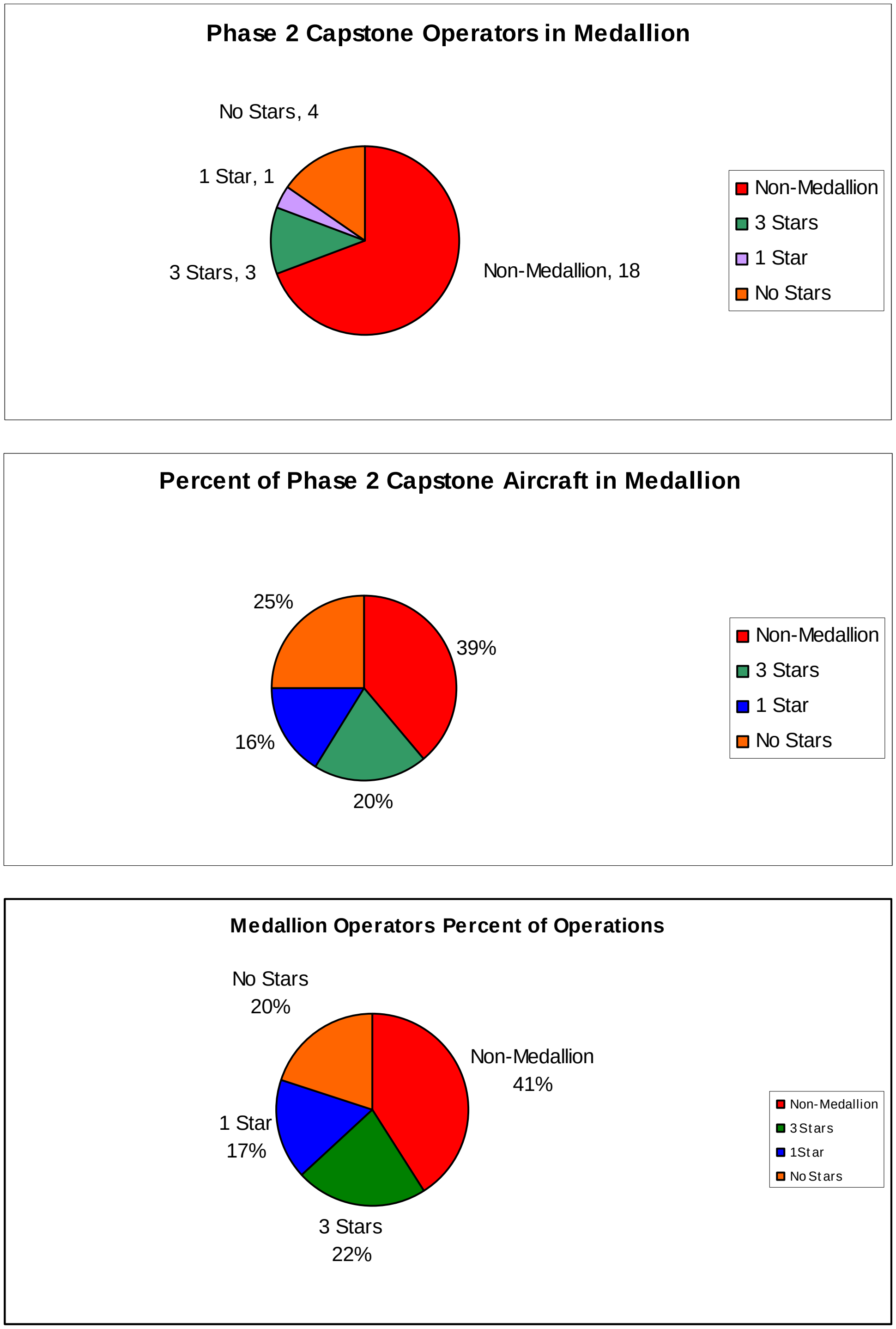


Figure 5.1-2. Impact of Medallion Program

6 Aviation Safety

This section characterizes numbers and rates of accidents in SE Alaska. First, it classifies accidents in 2005 and in the 2002-2005 Capstone period and compares types of accidents between Capstone-equipped and non-equipped aircraft. Second, it compares overall accident rates between commercial aircraft in SE Alaska and other parts of Alaska. It also compares overall accident rates between aircraft prior to equipage and after equipage. The final analysis compares accident counts between operator and operation types before and during the Capstone period.

6.1 Transition Period

There is a transition period from calendar year (CY) 2003 through CY 2005 that is after the designated project baseline but before implementation has reached a point where any significant benefit could be realized. During this period, only a limited number of aircraft were modified (and these only partially completed) and the supporting ground infrastructure was not yet available. Some benefit could be expected due to improved GPS-WAAS and avionics capabilities, new route structures and additional training received by pilots, but there is insufficient data at this point to provide any meaning analysis.

As reflected in Table 6.1-1, there is a reduction in the annual rate of accidents in each overall statistical category. It should be noted that numerous factors can have an effect on reducing or increasing annual accident rates such as weather conditions, other safety initiatives, or a general emphasis on safety by pilots and companies. A number of factors can contribute to the accident reductions in the Phase II area and it is too early to determine Capstone's contribution to accident reductions in Southeast Alaska. From 2003 through 2005, there were an additional 30 accidents within SE Alaska. Figure 1.4-2 shows the categorization of these accidents.

Table 6.1-1. Baseline Period 1990-2002 and Phase II Period 2003-2005

Summary Period	1990-2002	2003-2005
Total Accidents	179	30
Average Per Year	13.8	10.0
Total Fatal Accidents	41	6
Average Per Year	3.2	2.0
Total Accidents FAR Part 135/121	69	14
Average Per Year	5.3	4.7
Total Accidents FAR Part 91/133	110	15
Average Per Year	8.5	5.0
Total Fatal Accidents FAR Part 135/121	20	1
Average Per Year	1.5	0.3
Total Fatal Accidents FAR Part 91/133	19	5
Average Per Year	1.5	1.7

Capstone avionics, training and information are efforts to help pilots avoid CFIT accidents, collisions between aircraft, and some accidents where flight information is a factor. From 1990 through 2002 during the baseline period and from 2003-2005 during the Phase II transition period in Southeast Alaska about 19 percent, or 40 of the total 209 accidents, are from causes specifically targeted by Capstone Phase II. These might have been prevented if the Capstone program had been in place. These causes are highlighted in the figure with a dark band. Also highlighted are fuel management (categorized as 'Fuel') accidents which the new avionics may help in preventing. Even though equipage of Capstone avionics is still in progress and full capabilities are not available, early indications appear promising when comparing the baseline period of 1990-2002 and the initial Phase II period of 2003-2005.

Categories of the 47 ***fatal*** accidents in Southeast Alaska during the same periods are shown in Figures 6.1-1 and 6.1-2. These figures indicate that Capstone could potentially have prevented a much larger fraction of the accidents that were fatal than the non-fatal ones. Nearly half of 47 fatal accidents are from causes specifically targeted by Capstone Phase II and were due to causes that Capstone avionics, training, and data are intended to address. The largest share of fatal accidents is identified as Controlled Flight Into Terrain (CFIT) accidents, operating either in cruise flight or on approach or departure.

The primary causes of the overall accidents and the primary causes of fatal accidents had very different percentages. Many accidents which occurred during takeoff, landing, or have a primary cause identified as mechanical, did not have associated fatalities. For example, between 1990 and 2005 there were 55 accidents categorized as 'Landing' with only 1 having fatalities. By contrast there were 29 accidents categorized as 'Navigation' (sub-categorized as CFIT or TCF) with 17 accidents having fatalities and there were 6 Mid-Air collisions with 2 suffering fatalities. It is the goal of the Capstone Phase II to address these serious accidents.

Overall accident reduction is cautiously expected in the Phase II area once the avionics equipage and ground infrastructure reach targeted levels. Based on the summary report of the Capstone Phase I area[4] reflecting a 50% reduction in accidents from 2000-2005, it is hoped to see accident reductions in the Phase II area while recognizing differences in the nature of flight operations and other environment factors between the two regions.

[4] The Safety Impact of Capstone Phase 1. Summary Report through 2003.
May 2004 University of Alaska Anchorage, MITRE Corp. Center for Advance Aviation System Development

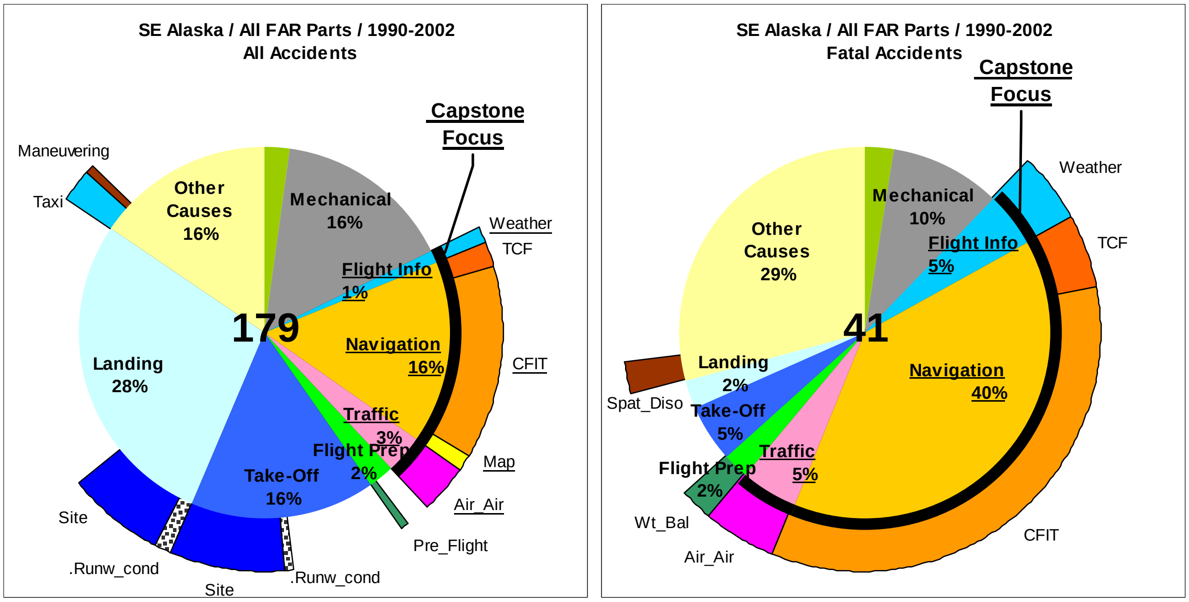


Figure 1.4-1. Accidents in SE Alaska, by Category, 1990-2002

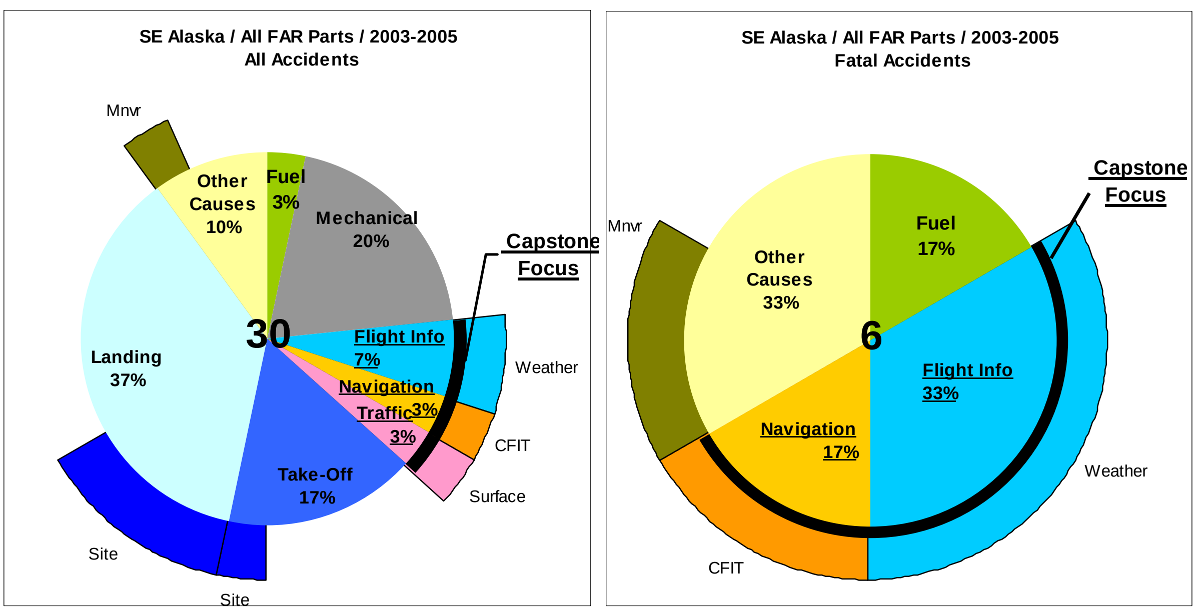


Figure 1.4-2. Accidents in the SE Alaska, by Category, 2003-2005

6.2 Accidents in 2005

The left side of Figure 6.2-1 shows the accident categories of SE Alaska Part-135 aircraft involved in accidents in 2005. The right side of the figure shows all Part-135 accidents in SE Alaska since Capstone implementation began there.

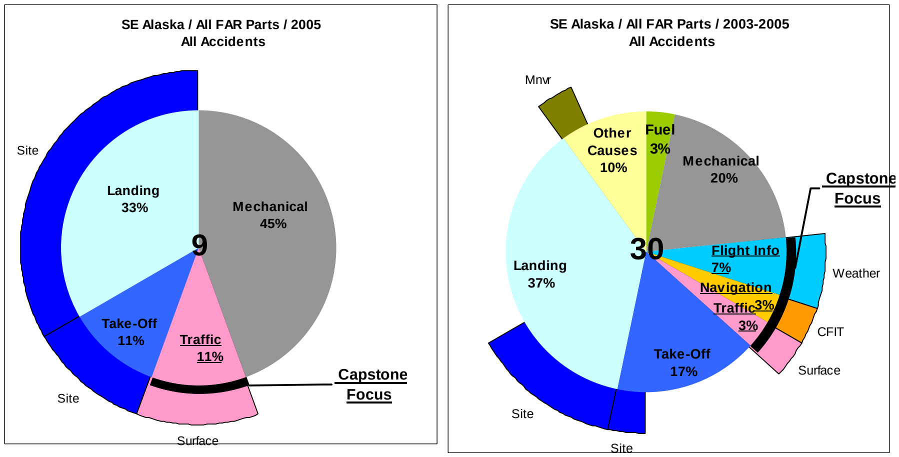


Figure 6.2-1 Categories of Accidents in 2005 and Since Capstone Implementation in SE Alaska

Figure 6.2-2 shows accident categories for Capstone non-equipped and equipped aircraft since 2003. The breakdown of accidents by major category is essentially similar and within the levels of variation one should expect for this number of occurrences. Details of the Capstone equipped accidents can be found in Section 8.1, Appendix A.

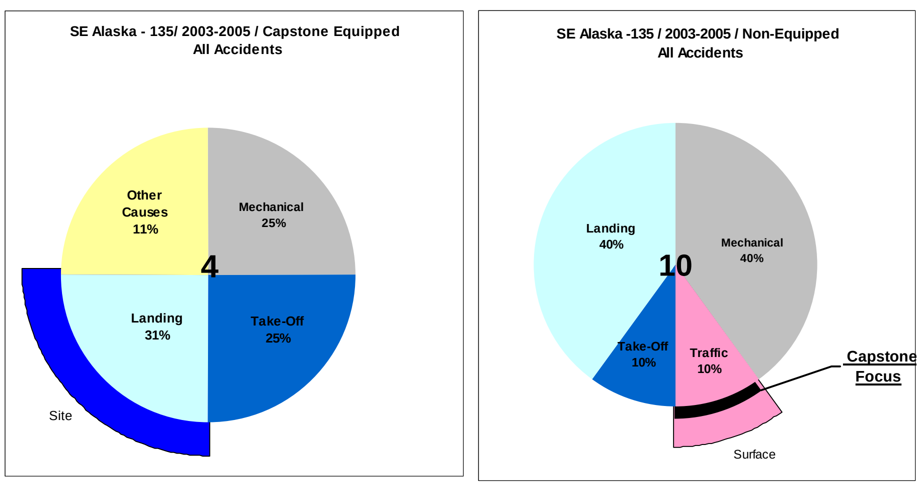


Figure 6.2-2 Categories of Accidents by Non-Equipped and Capstone-Equipped Aircraft 2002-2005

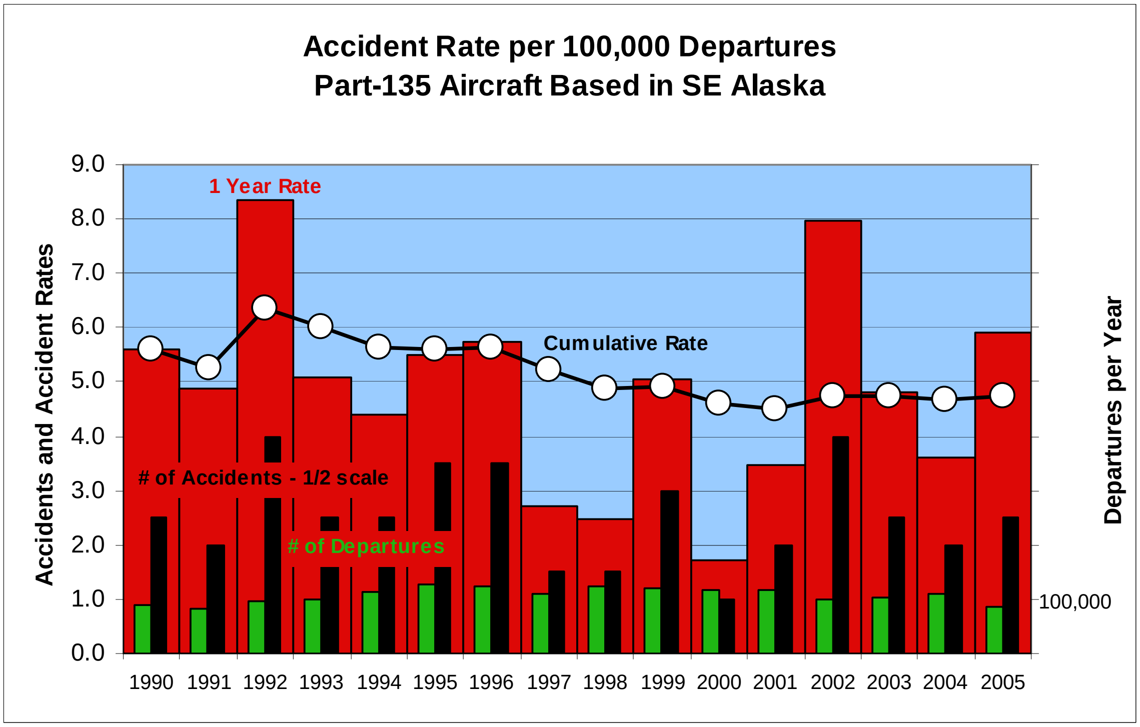
There are two types of Capstone equipage in SE Alaska. One set of equipment is similar to that in Phase 1 where the cockpit has a terrain database, surveillance of similarly equipped aircraft, and weather information provided by ground based transceivers. The second set of Capstone equipment provides only terrain warning and in some cases transmits the aircraft position that aircraft with the first set of equipment can receive and process. It should be noted that all four accidents of equipped aircraft happened to aircraft with the second set of Capstone equipment.

6.3 Comparison of SE Alaska Accident Rates to Other Parts of Alaska

The count of accidents in Alaska is determined from NTSB accident reports. However, to estimate an accident rate, one needs to estimate either the number of flight hours or the number of departures or operations that are conducted each year in Alaska. This latter piece of information is not as straight forward to obtain as it is in the Lower 48. To be consistent with the reporting of accident rates in Phase 1 of the Capstone program, the accident rate will be in terms of accidents per 100,000 departures. The current and historical operations data and the methods by which we estimate historical operations counts are described in Section 8.2, Appendix B.

Figure 6.3-1 shows departure count, accident count and accidents per 100,000 departures for Part-135 and Part-121 aircraft in SE Alaska and for all other flights in Alaska. The scales for accident rates (the wide red bars) is the same in both the upper and lower sections of the figure, indicating that over time the accident rate within SE Alaska is comparable to the rate for other parts of Alaska. From year to year, the accident rate in SE Alaska is also much more variable than in the remainder of Alaska.

The continuous curve (black line with white dots) on each chart represents the cumulative total rate of accidents per departure from 1990 through 2005. After the first few years, the cumulative accident rates for the other parts of Alaska have been relatively stable with a slight downturn in the last few years. In SE Alaska the accident rate was generally trending downward until 2002, after which it has become relatively stable. These later years are those in which Capstone equipped aircraft have begun populating SE Alaska.



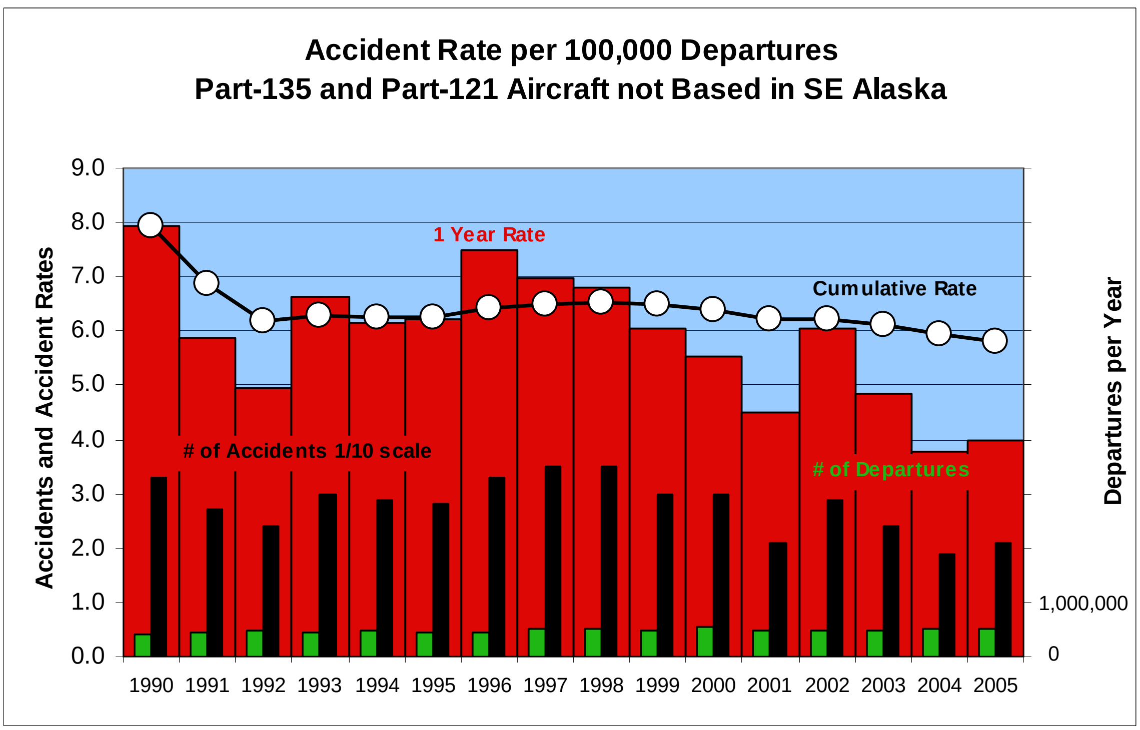


Figure 6.3-1. Accident Rates for SE Alaska Part-135 Aircraft and Those Based Elsewhere in Alaska

6.4 Comparison of Accident Rates Before, During, and After Equipage/Start of Services

The relative stability of Part-135 accident rates in SE Alaska since 1993 extends through the end of 2005 with an accident rate of approximately 4.8 accidents per 100,000 departures. A time magnified view from 1999 through December 2005 (using daily data) is shown in Figure 6.4-1. The black line represents the cumulative accident rate for all Part-135 and Part-121 accidents for aircraft based in SE Alaska. The red line represents the cumulative accident rate for all unequipped aircraft while the blue line represents the cumulative accident rate of the Capstone-equipped aircraft. For the equipped aircraft fleet there were essentially no operations prior to 2003. The first Capstone-equipped aircraft accident in SE Alaska was on September 20, 2004. This was followed with another equipped accident of September 28, 2004 which caused an accident rate for equipped aircraft about double that of the general population. The other two equipped accidents also happened about a week apart in April 2005 causing the accident rate to soar.

The blue curve is obviously more erratic because the accidents are averaged over fewer operations than the red and black lines. The only observation about the equipped accident rate is that the shape and height of the curve are accentuated by the few number of Capstone-equipped operations in the year 2005 and that it is very quickly approaching the overall accident rate in SE Alaska as the percentage of operations of Part-135 aircraft that are equipped has exceeded 70% by the end of 2005.

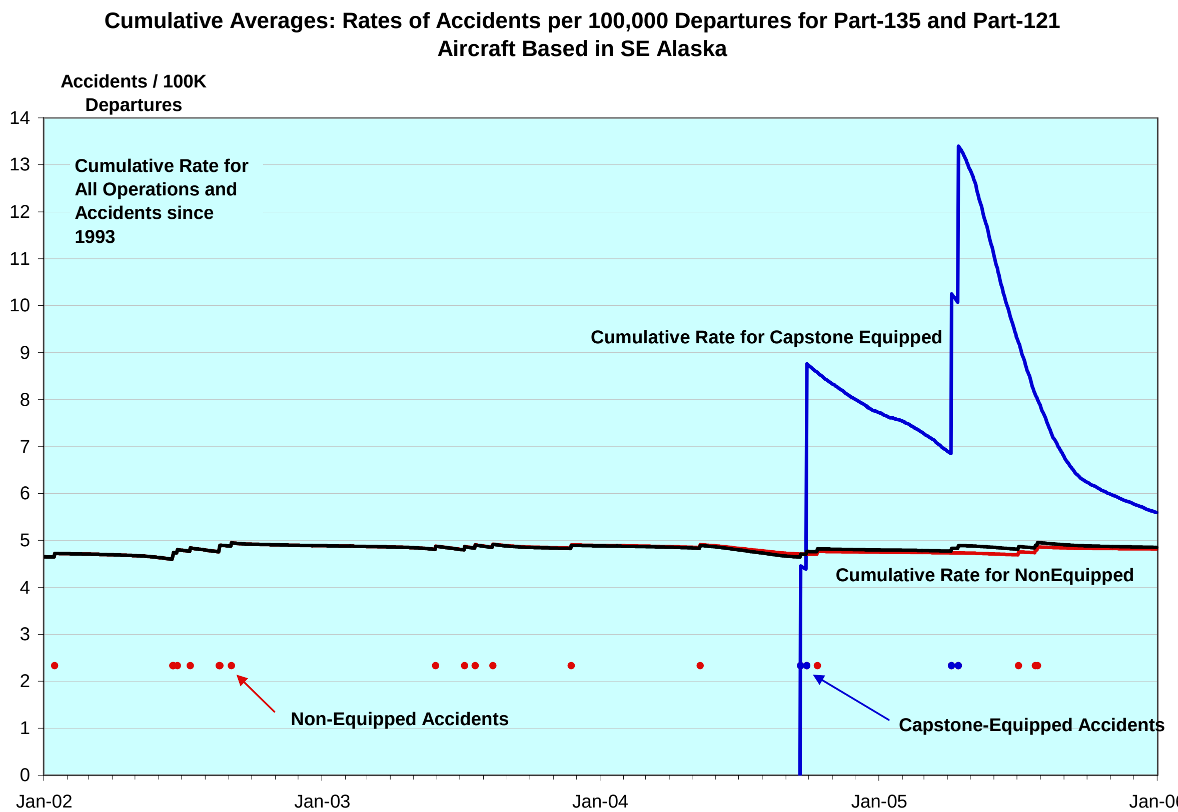


Figure 6.4-1 Relative Accident Rates for SE Alaska Commercial Aircraft
<u>With</u> and <u>Without</u> Capstone Avionics

6.5 Comparison of Accident Rates Between Operator and Operations Types

Public aviation transport in SE Alaska relies on three major carrier types: Part-121 Air Transport operations which fly larger more capable aircraft with multiple crew members and have comparatively few accidents; Part-135 Commuter operators whose operations include at least some scheduled service; and, Part-135 Charters who are not scheduled. Reporting requirements (and hence, available operations data) are very different between the two Part-135 types.

Accident percentages for scheduled commuters and unscheduled charters are comparable. Figure 6.5-1 shows the variation of the percentage of accidents by charters and commuters over time. In any given year in SE Alaska there are only between 2 and 8 accidents by Part-135 operators. Thus, of the 81 Part-135 accidents over the time period between 1990 and 2005, 37 have happened to charter operators and 44 have happened to commuter operators.

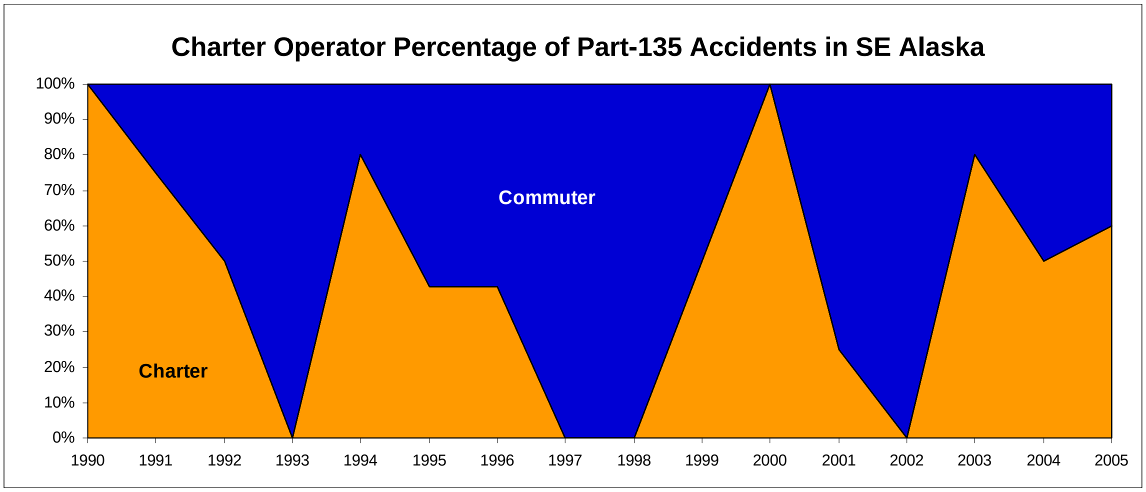


Figure 6.5-1 Relative Percent of Accidents for Scheduled/Unscheduled Operators in SE Alaska

Both types of Part-135 operators use non-revenue flights to ferry or position aircraft and to test or train. In addition, commuter operators often fly unscheduled as well as scheduled flights. Figures 6.5-2 and 6.5-3 show the breakdown of historical and Capstone-era accidents for these operations types.

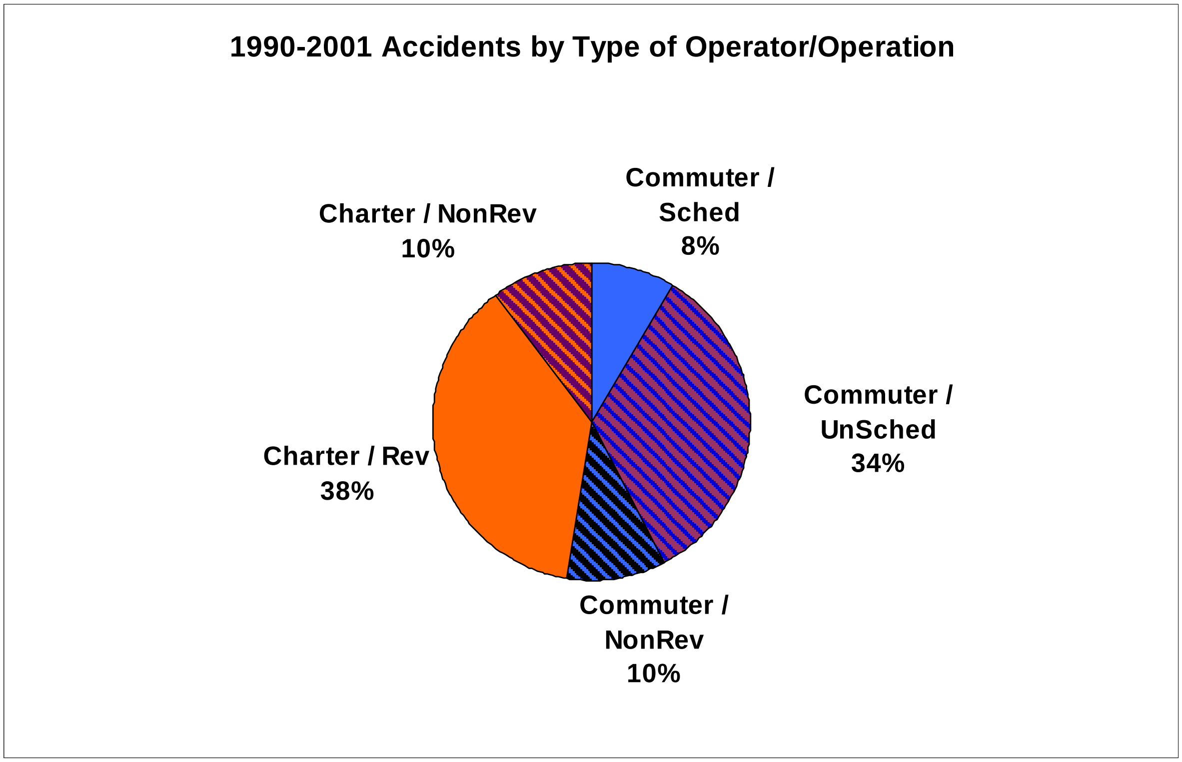


Figure 6.5-2 Historical Proportions of Accidents by Operator/Operations Types in SE Alaska

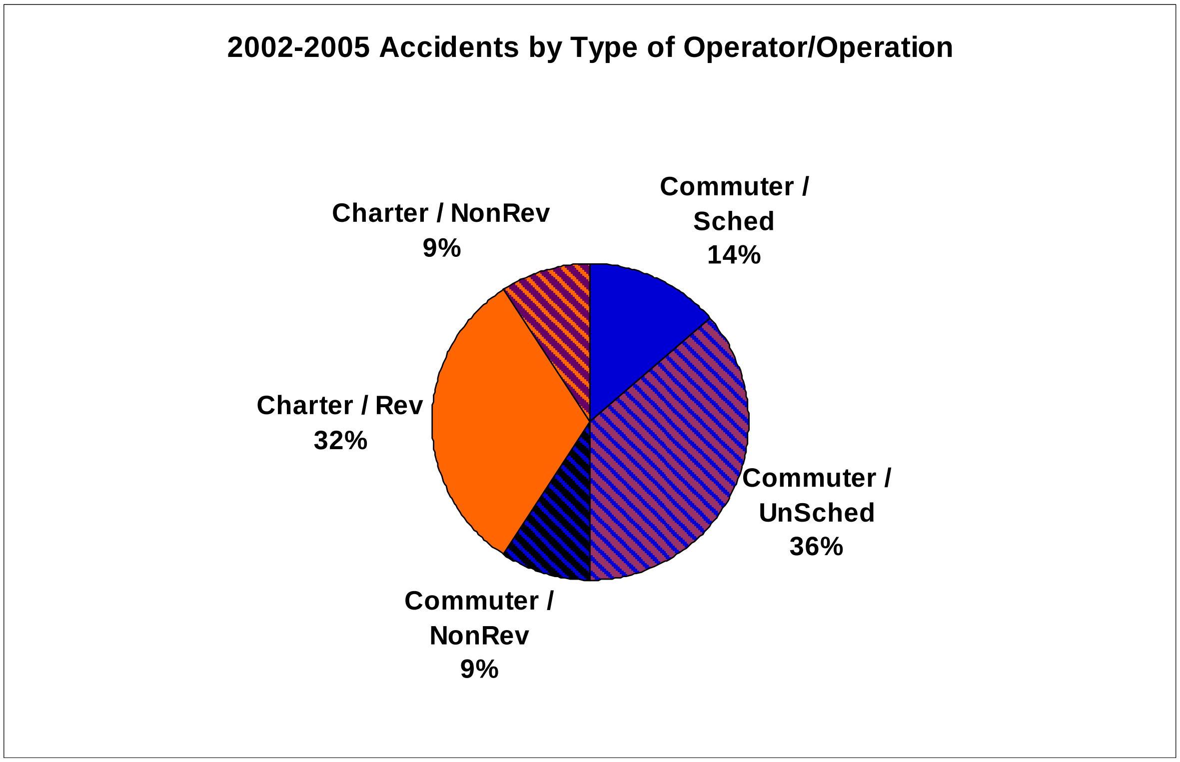


Figure 6.5-3 Proportions of Accidents by Operator/Operations Type Since Capstone Implementation in SE Alaska

7 Conclusions

During 2005, the Capstone Phase II program progressed with sufficient GBTs operating on the developmental network to provide services to the first fully equipped Garmin aircraft. Helicopters will be added in 2006 as the STC is now complete and installations were beginning at the end of 2005. Garmin UATs were added to the Chelton equipped aircraft to allow the fully equipped Garmin aircraft the benefit of “seeing” all equipped aircraft traffic. Chelton software for interfacing with the UATs was not completed in 2005 and this prevents the program from achieving the full benefits of the Capstone avionics. As discussed in the report, there are a number of challenges facing the program and 2006 will be an important year in determining Capstone Phase II success.

8 Appendices

8.1 Appendix A: Capstone Equipped Aircraft Accidents

Table 8.1-1 below summarizes the accidents involving Capstone equipped aircraft in SE Alaska from 1990 through 2005. The tables are separated into Capstone equipped aircraft, accidents since the start of the Capstone program to non-equipped aircraft and pre-Capstone program aircraft accidents.

The NTSB accident narratives for these accidents follow the table.

Cause category explanations are listed below, with the abbreviations used in the table in parentheses.

Mechanical Engine failure, inoperable control surfaces, failed landing gear, propeller or shaft failure.

Navigation Usually Controlled Flight into Terrain (CFIT) while en route, most often associated with reduced visibility. CFIT also occurs in nominal VFR conditions when “flat light” on snow-covered ground prevents recognition of terrain. Terrain Clearance Floor (TCF) warnings are a Terrain Awareness and Warning System (TAWS) function planned for Capstone Phase 2 that addresses the 20%-30% of CFIT accidents on approach or departure. These are addressed by Capstone Phase 2 avionics. Rarely, accidents are due to disorientation, which can be addressed by a GPS-map display.

Traffic Usually mid-air collisions or near mid-air collisions (NMACs) between aircraft. Also includes accidents from last-moment avoidance of other aircraft and from jet blast on airport surface.

Flight Information (Weather, Ice, IMC)
Usually inadequate weather information, especially icing, but also visibility; rarely convective weather. (Surface winds contributing to take-off or landing accidents have been included under take-off or landing rather than here.) Occasionally, lack of information on changes in procedures or facility status.

Fuel Usually fuel exhaustion. Occasionally, failure to switch fuel tanks.

Flight Preparation
Failure to ensure cargo is tied-down and within the aircraft’s weight and balance limits. Failure to check fuel for the presence of water. Rare in the lower 48 but significant in Alaska is failure to remove ice or snow from the aircraft – often resulting in serious or fatal accidents.

Take-off and **Landing**
Failure to maintain control (especially in wind), improper airspeed, or inadequate care near vehicles or obstacles. Alaska also includes unusually high numbers of accidents due to poor **runway conditions**, hazards at off-runway sites such as beaches and gravel bars, and submerged obstacles struck by float-planes.

Other Includes unusual causes such as bird strikes or collisions with ground vehicles.

Table 8.1-1 Accidents Involving Capstone Equipped Aircraft in SE Alaska Flying Under Part-135 or Part-121 from 2003 through 2005

NTSB Report Number	Date	Injury Level	Cause
ANC04FAMS2	9/20/2004	Fatal	Other
ANC04CA119	9/28/2004	None	Takeoff
ANC05LA055	4/6/2005	None	Mechanical
ANC05CA059	4/15/2005	None	Landing - Site

Note: All of the above listed Capstone equipped aircraft accidents were Chelton equipped and therefore do not have full Capstone capabilities.

ANC04FAMS2

HISTORY OF FLIGHT

On September 20, 2004, at 1035 Alaska daylight time, an amphibious float-equipped de Havilland DHC-2 airplane, N712TS, departed the Sitka Rocky Gutierrez Airport, Sitka, Alaska, for a remote lodge located near the Warm Springs Bay Seaplane Base, Baranof, Alaska. The airplane did not arrive at the lodge, and was reported overdue at 1335. The airplane is missing and is presumed to have crashed about 1115 Alaska daylight time. The airplane was being operated as a visual flight rules (VFR) on-demand passenger flight under Title 14, CFR Part 135, when the accident occurred. The airplane was operated by Harris Aircraft Services, Inc., Sitka. The commercial certificated pilot and the 4 passengers are presumed to have received fatal injuries. Visual meteorological conditions prevailed, and a VFR flight plan was filed.

The chief pilot for the operator reported that the accident flight was the second of two company airplanes that were transporting passengers to and from the Warm Springs Lodge, located on the east side of Baranof Island. The chief pilot indicated that when flights cannot fly directly from east to west, over the center of the island to Baranof, they typically follow one of two routes around the north end of the island. One route follows the shoreline via Salisbury Sound, Peril Strait, Rose Channel, Deadman Reach, Rodman Bay, Hanus Bay, Portage Arm along Chatham Strait, and Waterfall Cove to Warm Springs Bay. The second route cuts overland from Rose Channel, through a low pass along Adams Creek, to Rodman Bay. The second route cuts off the shoreline around the Duffield Peninsula, located at the north end of Baranof Island.

The accident airplane pilot telephoned the Federal Aviation Administration (FAA) Sitka Flight Service Station (FSS) at 0618, and inquired about the weather conditions for the day by stating, in part: "Could I just know what the weather is doing outside, and the terminal [forecast] for the day, and maybe the coastal and inside waters." The flight service station specialist replied, "Right now, it's still too dark to look out the window, but the ASOS is reporting wind out of the east at 16 [knots], gusts to 23 [knots]; visibility 3 [statute miles]; few clouds at 3,000, ceiling 3,600 overcast in rain and mist; temperature 11 [degrees C], dew point 9 [degrees C]; altimeter 29.75, and we have a pretty good storm blowing outside, and basically we got a low pressure system that's moving onshore throughout the day with conditions deteriorating as the day goes on. You know on the inside, and it's already started here, so far nobody's IFR, it's just rain and wind and turbulence."

The pilot stated, "Oh just (unintelligible), is it gonna be worse on the inside? I'm heading over to Warm Springs this morning." The FSS specialist replied, "I don't have any observations over there, but it sounds like it's still Okay on the inside. I'm looking at Kake (Alaska) and they've got visibility ten [miles] and it's not raining there yet. They are reporting 100 [feet] scattered and they do have wind already; wind out of the southeast at 12 [knots] gusting to 19 [knots], and that usually, Kake doesn't report a whole lot of wind." The specialist continued by stating, "But like I said, no (unintelligible) conditions you know. Visibility, at least on the inside so far has been Okay, and the clouds have been Okay, it's just the rain and the wind. It's already picked up on the inside, and it's just forecast to get worse throughout the day."

The pilot commented, "Yeah, I knew it was, I just was trying to make sure the forecast hadn't changed. Actually, last night when I called, the forecast was actually for it to, the visibility, to pick up and the rain to die down late morning. Is that still the case, or is it gonna get worse?" The specialist replied, "For the Sitka terminal forecast, they have visibility dropping down to 4 [miles] at 0600 and then picking back up to better than 6 [miles] at 1100, and then it's dropping back down to 3 [miles] after 1600, but the wind and the rain are supposed to stick around all day."

The pilot said, "Okay, are they gonna increase?" The specialist replied, "Yes, by 1600 they have wind out of the south at 25 [knots], gusting to 40 [knots], with wind shear at 2,000 [feet]." The pilot inquired, "What do they report for after 1100?" The reply was, "Wind. After 1100 at Sitka, wind 110 [degrees] at 15 [knots]. Visibility greater than 6 [miles] in rain; 1,000 [feet] scattered, ceiling 2,500 broken, 3,500 overcast." The briefing was concluded at 0621.

About 0745, Sitka FSS personnel reported that the pilot received an over-the-counter abbreviated weather briefing at the flight service station. In a written statement, the FSS specialist reported that he provided the accident airplane pilot with radar and satellite image loops, the forecast for coastal and inside waters, the Aviation Routine Weather Reports (METAR) for Kake, and a pilot report for the Kake area, received at the FSS at 0802. The FSS specialist also reported that during the pilot's visit, the operator called the pilot on his cell phone, and the pilot commented over the phone, "Conditions are getting worse on the inside, around Kake." The briefing was concluded about 0815.

The chief pilot reported that the first company airplane, N60TF, departed Sitka, located on the west side of Baranof Island, at 0930 and followed the shoreline to Rose Channel, overland via Adams Creek to Rodman Bay, and then along the shoreline via Portage Arm and the Chatham Strait to Baranof, located on the east side of the island. The chief pilot said that the first airplane transited Adams Creek about 1,200 to 1,500 feet msl. The summit of the pass is about 500 feet msl. After the first airplane arrived at the Warm Springs Lodge, the pilot asked the lodge owner to telephone Harris Aircraft Services and provide a weather report of the conditions along the route. The weather report to the operator included comments of low ceilings near Salisbury Sound, and from Hidden Falls to Warm Springs, and fog along the shoreline near Deadman Reach, which is located at the north end of the island. After loading passengers at the lodge, N60TF departed for a return flight to Sitka via Adams Creek.

At 0949, the accident airplane pilot again telephoned the Sitka FSS. He asked the FSS specialist to notify him if the first company airplane (N60TF) called with a pilot report. The FSS specialist agreed to call, and he provided the pilot with additional weather data by stating, "I got an updated terminal forecast if you want me to read it to you now." The pilot agreed, and the specialist stated, in part: "Yeah, they changed their mind about that whole 1100 thing...What I've got is wind, 120 [degrees] at 16 [knots], gusts 24 [knots]; visibility, 3 [miles] in rain and mist; 2,500 scattered, ceiling 3,500 overcast; and between now and 1200, occasional visibility greater than 6 [miles] in light rain; ceiling 2,500 broken; and then after 1500, wind picking up again to 160 [degrees] at 25 [knots], gusts 40 [knots]; visibility, 3 [miles] in rain and mist; ceiling, 1,200 broken, 2,500 overcast, with the wind shear at 2,000 [feet], wind 170 [degrees] at 50 [knots]."

At 1010, Sitka FSS personnel telephoned the operator and relayed a pilot report to the accident pilot from N60TF by stating, "Just got a call from Ron (the pilot of N60TF); could barely hear him; I'm not sure, I think he's on the edge of my range there. He said Peril Strait, ceilings 1,000 [feet]; visibility, 8 [miles]; wind, 140 [degrees] at 40 [knots], gusts higher; and Salisbury Sound, flight visibility got down to 2 [miles]...It looks like conditions have improved since then, but it looks like they're going back down soon...Conditions change pretty, pretty rapidly, going up and down." The accident pilot confirmed with the specialist that N60TF was still on his way to Warm Springs Lodge, and confirmed the pilot report of the visibility of 2 miles at Salisbury Sound.

At 1024, the accident airplane pilot telephoned the Sitka FSS at the specialist's request, and was provided with another pilot report from N60TF, in which the FSS specialist stated, "Yeah, Ron just called me from Chatham Strait; he said ceilings down to 500 to 200 [feet]; visibility, 2 [miles] and still wind out of the southeast at 35 to 40 [knots]." The accident pilot asked, "But he's still going (unintelligible)? He didn't say if he was coming back or not?" The specialist replied, "I don't know it's...no, he didn't say if he was coming back or not...I can barely hear him and he can barely hear me...so it's kinda, I just grab things as I go."

At 1034, the accident airplane pilot radioed the Sitka FSS, reporting that he was taxiing for departure. He was provided with a local airport advisory which included the reported winds as 15 knots, gusts to 22 knots. He filed a VFR flight plan from Sitka to Warm Springs to Sitka, which included 2 hours en route, with 2 hours and 45 minutes of fuel. The pilot then departed at 1035. It is unknown if the pilot followed the first airplane's route by transiting overland via Adams Creek, or if the pilot followed the shoreline around the north end of the island via Deadman Reach. The operator reported that the normal flight time from Sitka to Baranof is about 50 minutes.

At 1212, the operator telephoned the Sitka FSS to inquire if the accident airplane had been heard from, to which the reply was "negative." The operator inquired about the accident airplane's estimated time of arrival (ETA), and was told 1235. At 1236, the operator called the Sitka FSS and extended the accident airplane's flight plan by one hour.

When N60TF returned to Sitka, the pilot was notified that the accident airplane had not arrived at Baranof. The first airplane's pilot loaded additional passengers and departed for Warm Springs Lodge, again transiting the north end of Baranof Island via Adams Creek. He unloaded and loaded additional passengers, and returned to Sitka via the shoreline along Deadman Reach. No sign of the missing airplane was observed,

The terrain around the Sitka area is characterized by steep mountainous island terrain, numerous ocean channels, and an extensive shoreline, containing small coves and bays. The area frequently has low ceilings and reduced visibility due to rain, fog, and mist. Baranof Island is one of several barrier islands between the north Pacific Ocean and mainland Alaska. The western coastal portion of Baranof Island is exposed to open ocean. The eastern coastal portion of the island is adjacent to the Chatham Strait, which separates the island from several inner islands. The area of operations for the accident airplane has no low-level radar coverage, intermittent radio communications, and limited weather reporting capability.

Kake, Alaska, is located 31 nautical miles east of Baranof, across the Chatham Strait and Frederick Sound, on the west coast of Kupreanof Island.

PERSONNEL INFORMATION

Pilot Information

The pilot held a commercial pilot certificate with airplane single-engine land, single-engine sea, multiengine land, and instrument airplane ratings. The most recent second-class medical certificate was issued to the pilot on September 2, 2003, and contained no limitations.

According to the operator, the pilot was hired in January, 2004, having flown in the Ketchikan, Alaska, area, during the previous summer. The operator reported that the pilot's total aeronautical experience consisted of about 2,878 hours, of which, about 500 hours were accrued in the accident airplane make and model. In the preceding 90 and 30 days prior to the accident, the operator reported that the pilot accrued 280 and 100 hours respectively.

The pilot was provided with training on the use of the airplane's Capstone avionics equipment by the operator. The operator was provided with an avionics training device by Capstone program personnel.

Company Information

According to the company's Operations Manual, under Operational Control, the manual states that aircraft may not be released for a flight at any location unless there is agreement about the parameters of the flight with the pilot-in-command, and any of the following: Director of operations; chief pilot; or trained individuals granted the authority by the director of operations. Under Revenue Flights - Remote Locations, the company manual states that operational control is delegated to the pilot-in-command under the authority of the director of operations.

AIRCRAFT INFORMATION

The operator reported that the airplane had accumulated a total time in service of 16,155 hours. The most recent 100 hour inspection was completed on September 1, 2004, 20 hours before the accident.

The accident airplane was equipped with avionics hardware provided by the FAA's Capstone Phase II program. This equipment included an electronic primary flight display, and an electronic multifunction display. The airplane did not have a universal access transceiver (UAT), which would have provided position reporting data via an automatic dependant surveillance broadcast (ADS-B) signal. The airplane still retained pilot/static instruments, including airspeed indicators, altimeter, and attitude indicator.

Terrain and moving map information, coupled to the airplane's GPS position data, is one of several visual display options on the multifunction display that is available to the pilot. Wind vector and velocity information can be displayed on the multifunction display. The airplane's position can be displayed in relation to its location over the terrain, and may include bearing and distance information to selected points. The terrain display has color shading depicting areas of terrain that are black (2,000 feet below the aircraft), green (between 2,000 and 700 feet below the aircraft), yellow (between 700 and 300 feet below the aircraft), and red (at or within 300 feet of the aircraft). The Capstone equipment incorporates an integrated auditory system that provides visual and auditory warnings, cautions, and advisories to the pilot. The Capstone equipment has a terrain awareness and warning system (TAWS) that provides warnings and alerts to the pilot about hazardous terrain.

METEOROLOGICAL INFORMATION

An area forecast, issued on September 20, 2004, at 0545, and valid until 2400, included a synopsis, which stated, in part: A 990 millibar low over the Kennedy Entrance to Cook Inlet, will move northeast to the eastern interior of Alaska by the end of the reporting period. An associated occluded front approaching the southwest central gulf coast, will move northeast to the Alaska/Canada border from Yakutat, Alaska, south, by the end of the reporting period. AIRMET Sierra, for IFR conditions and mountain obscuration, is valid until 1200. Mountains occasionally obscured in clouds, and in precipitation. No change.

The forecast for central southeast Alaska, valid until 1800, stated, in part: AIRMET for mountain obscuration. Mountains occasionally obscured in clouds, and in precipitation. No change. Clouds and weather, 2,500 feet scattered, 4,000 feet broken, 9,000 feet overcast, increasing layers to 25,000 feet. Occasionally, 2,500 feet broken to overcast, increasing layers to 25,000 feet; visibility, 5 statute miles in light rain. Outlook, valid from 1800 to 1200 on September 21, marginal VFR conditions with ceilings due to rain. Turbulence, none significant. Icing and freezing level, AIRMET for icing. Occasional moderate rime icing from 5,000 to 12,000 feet. Freezing level, 5,000 feet, no change.

The closest official weather observation station is Sitka, Alaska. A terminal forecast for Sitka, issued at 0951, and valid from 1000 on September 20 until 1000 on September 21, was reporting, in part: Wind, 110 degrees (true) at 15 knots, gusts to 25 knots, visibility, 1 statute mile in rain and mist; clouds and sky condition, 2,500 feet overcast. Temporary conditions from 1000 to 1400, visibility 4 statute miles in light rain; 2,500 feet overcast, 3,500 broken. From 1400, wind 160 degrees (true) at 25 knots, gusts to 40 knots; visibility, 3 statute miles in rain and mist; 1,200 feet broken, 2,500 feet overcast; low level wind shear from 020 degrees to 170 degrees at 50 knots. From 2200, wind 200 degrees (true) at 15 knots, gusts to 25 knots; visibility 1 statute mile in rain and mist; 1,500 feet broken. From 0100 on September 21, wind 210 degrees (true) at 17 knots; visibility 4 statute miles in light rain showers; 1,500 feet broken, 4,000 feet overcast.

At 0925 when the first company airplane, N60TF, departed Sitka, a special weather observation was reporting, in part: Wind, 100 degrees (true) at 19 knots, gusts to 24 knots; visibility, 1 1/2 statute miles in light rain and mist; clouds and sky condition, 2,900 feet overcast; temperature 54 degrees F, dew point, 50 degrees F; altimeter, 29.69 in Hg; remarks, peak wind 110 degrees at 26 knots. At 0933, a special weather observation was reporting, in part, an increase in the visibility to 3 statute miles in light rain and mist.

At 0953, a METAR at Sitka was reporting, in part: Wind, 110 degrees (true) at 16 knots, gusts to 23 knots; visibility, 3 statute miles in rain and mist; clouds and sky condition, 2,700 feet overcast;

temperature, 54 degrees F; dew point, 52 degrees F; altimeter, 29.69 inHg.

At 1035, when the accident airplane departed Sitka, the airport advisory provided by the Sitka FSS included: "Wind, 090 degrees at 15 knots, gusts to 22 knots, favoring runway 11."

At 1053, after the accident airplane departed Sitka, a METAR was reporting in part: Wind, 110 degrees (true) at 14 knots, gusts to 20 knots; visibility, 3 statute miles in light rain and mist; clouds and sky condition, 2,300 feet overcast; temperature, 55 degrees F; dew point, 52 degrees F; altimeter, 29.68 inHg.

At 1036, an automated weather observation for Kake was reporting, in part: Wind, 130 degrees (true) at 13 knots, gusts to 18 knots; visibility, 5 statute miles; clouds and sky condition, 1,800 feet overcast; temperature, 46 degrees F; dew point, 43 degrees F; altimeter, 29.83 inHg.

At 1053, an automated weather observation for Kake was reporting, in part: Wind, 130 degrees (true) at 12 knots, gusts to 19 knots; visibility, 5 statute miles; clouds and sky condition, 1,800 feet overcast; temperature, 48 degrees F; dew point, 45 degrees F; altimeter, 29.82 inHg.

At 0802, a pilot report from a Hughes 500 helicopter, about 10 miles south of Kake, was reporting winds, 045 degrees at 20 knots, gusts to 30 knots; visibility, 5 statute miles in rain and fog; ceiling, 1,200 feet msl; remarks, between Petersburg, Alaska, and Hamilton Bay, Alaska, isolated fog.

COMMUNICATIONS

Review of the air to ground radio communications transcripts maintained by the FAA at the Sitka FSS, revealed that the airplane successfully communicated with the position of Inflight 2. A transcript of the air to ground communications between the airplane and Sitka FSS is included in the public docket of this accident.

The FAA reported that two area remote communications outlets (RCOs), Finger Mountain, located about 35 miles north-northwest of Sitka, and Angoon, located about 38 miles north-northeast of Sitka, were in reduced service status due to weak transmissions from the Sitka FSS radio. These RCOs provide radio coverage north of Baranof Island.

No emergency transmitter locator (ELT) signal was received by search personnel.

SEARCH AND RESCUE

Company personnel began search operations about 1241. At 1330, the operator notified Sitka FSS personnel that the accident airplane was overdue. The airplane was declared overdue at 1335.

Search and rescue personnel from the U.S. Coast Guard, Air Station Sitka, surface vessels, aerial and ground search volunteers, and company personnel, participated in search operations. The accident airplane was reportedly observed transiting Salisbury Sound, outbound from Sitka. Additionally, a "de Havilland sounding" airplane was heard about 1100 in the area of Emmons

Island, located in Peril Strait, between Baranof Island and Hichagof Island, north of Deadman Reach. This airplane was not observed due to low ceilings. The official search was suspended by Coast Guard personnel on September 29, 2004.

ANC04CA119

On September 28, 2004, about 1745 Alaska daylight time, a Piper PA-28-181 airplane, N3002T, sustained substantial damage when it collided with the runway and damaged the left wing and landing gear, following a premature liftoff and uncontrolled descent at the Haines Airport, Haines, Alaska. The airplane was being operated by L A B Flying Service Inc., Haines, as a visual flight rules (VFR) positioning flight under Title 14, CFR Part 91, when the accident occurred. The commercial pilot and sole passenger were not injured. Visual meteorological conditions prevailed, and company VFR flight following procedures were in effect. The flight was bound for Juneau, Alaska.

In a written statement to the National Transportation Safety Board (NTSB) investigator-in-charge (IIC) received October 14, the pilot wrote that during the takeoff roll, "the aircraft rapidly and prematurely became airborne and began to yaw right. Then just as quickly, it began to descend rapidly, while continuing to yaw." He reported that the airplane bounced and became airborne again. He said he continued to climb to about 1,200 feet, where he noticed damage to the top of the left wing. He reported he elected to fly the airplane to Juneau, where maintenance and other services were available. About 10 miles from the departure airport, he reported the left main landing gear separated from the airplane. Attached by only the hydraulic brake line, the gear leg began beating on the fuselage and wing. He said he returned to the departure airport and landed. The pilot said that during takeoff the winds were variable from 070 degrees to 130 degrees at 15-20 knots, with gusts from 25-30 knots. He said company policy calls for 10 degrees flaps for all takeoffs, but he wrote, "that may not be the best procedure for light weight, high wind takeoffs." He further wrote that there were no known mechanical anomalies with the airplane prior to the accident.

During a telephone conversation with the NTSB IIC on September 29, the FAA airworthiness inspector who examined the airplane, said during the bounced takeoff the left main landing gear attachments were sheered from the wing spar, and that during the subsequent emergency landing the outboard left wing section and aileron were damaged.

ANC05LA055

On April 6, 2005, about 1435 Alaska daylight time, a twin-engine Britten-Norman BN-2A Islander airplane, N29884, sustained substantial damage following a main landing gear component failure and subsequent loss of control while landing at the Klawock Airport, Klawock, Alaska. The flight was conducted under Title 14, CFR Part 135, as a scheduled domestic passenger flight operated by LAB Flying Service, Haines, Alaska, as Flight 609. The airline transport certificated pilot and the two passengers were not injured. Visual meteorological conditions prevailed, and VFR company flight following procedures were in effect. The accident flight originated at the Ketchikan Airport, Ketchikan, Alaska, about 1400.

During a telephone conversation with the National Transportation Safety Board (NTSB) investigator-in-charge (IIC), on April 7, the pilot reported that during the landing roll on runway 02, he noted a significant airframe vibration, and a pronounced rumbling noise as the airplane slowed. He said that as he applied the brakes, the airplane veered to the left, and he was unable to keep the airplane on the runway surface. The airplane continued off the left side of the runway, and the nose of the airplane struck a drainage ditch. The airplane sustained substantial damage to the fuselage.

During a post-accident inspection, maintenance personnel discovered a broken landing gear oleo attachment bracket on the left main landing gear strut assembly.

The accident airplane's broken landing gear oleo attachment bracket, part number NB-40-0075, is the subject of a repetitive inspection procedure outlined in the Federal Aviation Administrations (FAA) airworthiness directive (AD) 2002-02-11, which allows two methods of compliance; the part may be replaced or the bracket must be inspected more frequently. The manufacturer has changed the design of the oleo attachment bracket which is made of aluminum alloy. The newly designed oleo attachment bracket, part number NB-40-0479 is made of steel. Installation of the newly designed, steel oleo attachment bracket significantly reduces the number of repetitive inspections required. Operators that elect to utilize the old style aluminum alloy oleo attachment brackets are required to conduct recurring inspections every 500 hours, or every 1,200 landings, which ever occurs first.

According to an FAA airworthiness inspector from the Juneau Flight Standards District Office (FSDO), who inspected the accident airplane's maintenance records, the aluminum alloy oleo attachment brackets were last inspected about 101.0 hours, and 218 landings before the accident. The FAA inspector noted that there was a substantial accumulation of dirt, grease, and oil on and around the broken oleo attachment bracket. The FAA inspector said that during the last main landing gear overhaul, the operator elected to install the old style aluminum alloy oleo attachment brackets, primarily due to the cost of the new style steel oleo attachment brackets.

ANC05CA059

On April 15, 2005, about 0800 Alaska daylight time, a wheel-equipped Cessna U206E airplane, N9417G, sustained substantial damage when it nosed down during the landing roll on a beach, about 60 miles northwest of Yakutat, Alaska. The airplane was being operated by Air Juneau Inc, dba Yakutat Coastal Airlines, Yakutat, as a visual flight rules (VFR) positioning flight under Title14, CFR Part 91, when the accident occurred. The solo commercial pilot was not injured. Visual meteorological conditions prevailed, and company VFR flight following procedures were in effect.

During a telephone conversation with the National Transportation Safety Board (NTSB) investigator-in-charge (IIC) on April 18, the pilot said he was en route to a remote strip when he decided to land on a beach and pick up mail. He said he had landed on the beach hundreds of times over the years, but this time during the landing roll the nose wheel dug into soft sand, and the airplane nosed down. He said the left wing struck the ground, and received structural damage. The pilot said there were no known pre-accident mechanical anomalies with the airplane.

8.2 Appendix B: Summarized Operating Data Tables

The operational data used in this report comes from several sources. These sources are the Department of Transportation's T-100 data bank, and the FAA's Air Traffic Activity Data System (ATADS).

The detailed origin and destination data within the SE Alaska comes from the Department of Transportation's Bureau of Transportation Statistics Air Carrier Statistics data. This is also known as the T-100 data bank. The T-100 data bank contains domestic and international airline market and segment data on certificated air carriers. The U.S. air carriers report monthly air carrier traffic information using Form T-100. Foreign carriers having at least one point of service in the United States or one of its territories report monthly air carrier traffic information using Form T-100(f). This report has used the domestic segment reports. In Alaska only those operators with any scheduled operations are required to file monthly T-100 reports. This means that a charter operator operating under FAR Part-135 with no scheduled operations is not required to file a T-100 report.

The ATADS is the official FAA source of historical air traffic operations for center, airport, instrument and approach counts. Daily, monthly and annual counts are available by facility, state, region, or nationally. In Alaska there is one center (the Anchorage Center) and 8 airports that are covered by ATADS. Operation counts at the other 600+ airports and seaplane bases are not reported.

The following tables and figures are presented as examples of the data that can be retrieved from these databases. Table 8.2-1 is from the T-100 database listing the numbers of commercial flights between the SE Alaska airports in 2005. Only those origin-destination pairs with more than 52 flights in a year are listed. Table 8.2-2 lists the number of commercial departures from the SE Alaska airports in 2005.

From the ATADS database one can retrieve data on tower counts and instrument operations. Table 8.2-3 shows the 2005 tower counts for the eight airports in Alaska that report these counts. Table 8.2-4 shows the number of instrument operations in 2005 at the six towers and one TRACON that conducts instrument approaches.

For completeness, Appendix 8, Table 8.5-1 lists the SE Alaska airport codes.

In the analysis performed in this report, it was necessary to estimate the level of Part-135 traffic from 1990 through 2005. The same method used in Capstone Phase 1 was use here to make these estimates, namely the total level of traffic within SE Alaska was based on the air taxi operations counted at Juneau, the only airport in SE Alaska that counts and reports operations. To estimate the traffic levels for the rest of the state of Alaska the same method was used except the air taxi operation reports from the other seven airports in the state were used. The scaling factor for the SE Alaska Part 135 traffic was based on the comparison between T100 and ATADS data in 2002 and 2003 and was found to be 1.13. For the rest of the state, the factor was 3.57. Table 8.2-5 shows the ATADS air taxi operations from the eight reporting airports for the years 1990 through 2005. Table 8.2.-6 shows the derived number of departures for SE Alaska and for the rest of the state over the same time period.

Table 8.2-1 Flights Between SE Alaska Airports by Scheduled Operators in 2005

Airport 1	Airport 2	Flights
AGN	JNU	1972
AGN	TKE	480
CDV	YAK	853
CGA	HYL	229
CGA	KTB	246
CGA	KTN	1830
ELV	JNU	430
ELV	PEC	233
EXI	JNU	471
FNR	JNU	118
GST	HNS	225
GST	JNU	2580
GST	SGY	318
HNH	JNU	6175
HNS	JNU	7882
HNS	SGY	4318
HWI	JNU	172
HYL	KTB	539
HYL	KTN	342
JNU	JNU	73
JNU	KAE	1888
JNU	KTN	1027
JNU	PEC	845
JNU	PSG	815
JNU	SGY	5297
JNU	SIT	2696
JNU	TKE	1131
JNU	YAK	766
KTB	KTN	446
KTN	KWF	461
KTN	MTM	382
KTN	SIT	1649
KTN	WRG	984
PSG	WRG	972
SGY	SGY	180

Table 8.2-2 Departures from SE Alaska Airports by Scheduled Operators in 2005

Airport	Departures
JNU	20691
KTN	7503
HNS	6238
SGY	4934
HNH	3218
MTM	2904
SIT	2541
CGA	1888
CDV	1746
GST	1555
KTB	1342
AGN	1235
YAK	1045
PSG	1033
WRG	994
KAE	979
HYL	970
TKE	817
KWF	585
PEC	546
ELV	335
KCC	305
A57	255
EXI	245
KPB	180
KXA	155
HYG	140
HWI	95
FNR	65
KBE	50
A43	38
CYT	21
BQV	11
CYM	11
A29	3
A67	2
A69	2
A70	2
CKU	2
ANN	1

Table 8.2-3 Alaska Tower Counts (2005)

Airport	AirCarrier	Air Taxi	GA	Military	Local GA	Local Military	Totals
ADQ	1,460	15,429	1,382	2,528	1,471	11,588	33,858
AKN	1,472	26,755	7,555	609	898	1,323	38,612
ANC	133,314	87,761	82,274	5,982	6,895	16	316,242
BET	3,732	89,405	7,372	216	3,085	14	103,824
ENA	656	19,708	11,142	467	15,472	6,380	53,825
FAI	15,287	40,973	26,774	1,187	28,367	172	112,760
JNU	9,369	74,860	12,633	516	7,386	404	105,168
MRI	0	15,080	73,762	103	101,607	264	190,816
Totals	165,290	369,971	222,894	11,608	165,181	20,161	955,105

Table 8.2-4 Alaska Instrument Operations (2005)

	PRIMARY				SECONDARY				OVERFLIGHTS				
	AC	AT	GA	MIL	AC	AT	GA	MIL	AC	AT	GA	MIL	TOTAL
A11	134,180	66,788	21,439	2,987	795	19,022	51,894	24,621	3	50	827	101	322,707
ADQ	1,393	4,411	418	1,148	0	0	0	0	0	0	0	0	7,370
AKN	1,433	5,939	539	388	0	0	0	0	0	0	0	0	8,299
BET	3,621	7,645	420	120	0	0	0	0	0	0	0	0	11,806
ENA	145	6,113	676	276	0	0	0	0	0	0	0	0	7,210
FAI	15,462	40,876	22,051	1,063	237	3,855	5,397	17,806	6	93	180	248	107,274
JNU	9,245	1,297	991	142	0	0	0	0	0	0	0	0	11,675
Totals	**165,479**	**133,069**	**46,534**	**6,124**	**1,032**	**22,877**	**57,291**	**42,427**	**9**	**143**	**1,007**	**349**	**476,341**

Table 8.2-5 Air Taxi Operations at the Eight Reporting Airports in Alaska: 1990-2005

Sum of ATAXI	LOCID								
	ADQ	AKN	ANC	BET	ENA	FAI	JNU	MRI	Grand Total
1990	21,814	25,782	63,978	43,976	43,509	21,909	78,876	12,436	312,280
1991	19,839	27,240	80,246	47,602	48,390	21,458	72,406	12,618	329,799
1992	25,476	31,062	80,611	56,635	44,573	22,861	84,712	11,194	357,124
1993	25,208	23,860	67,822	68,908	35,600	20,119	87,023	12,682	341,222
1994	21,257	24,569	70,455	81,245	34,161	22,120	100,544	11,351	365,702
1995	18,174	22,842	69,606	74,961	32,865	23,213	112,718	11,284	365,663
1996	14,500	20,997	79,451	70,022	29,420	23,078	108,013	10,117	355,598
1997	13,787	22,314	97,398	77,609	34,460	25,836	97,989	10,370	379,763
1998	16,133	21,019	85,916	97,059	29,875	28,049	107,807	10,412	396,270
1999	14,311	19,562	82,222	104,521	23,989	24,986	104,994	9,236	383,821
2000	7,794	20,248	90,885	130,398	24,034	21,856	103,375	9,418	408,008
2001	9,273	19,114	87,952	93,381	20,541	21,092	102,121	10,627	364,101
2002	10,051	16,740	85,743	91,597	15,474	39,545	88,815	10,381	358,346
2003	11,998	18,105	76,601	100,013	16,371	42,840	91,643	12,935	370,506
2004	13,031	18,851	84,458	89,876	17,411	43,159	98,040	14,877	379,703
2005	15,429	26,755	87,761	89,405	19,708	40,831	74,860	15,080	369,829
Grand Total	258,075	359,060	1,291,105	1,317,208	470,381	442,952	1,513,936	185,018	5,837,735

Table 8.2-6 Estimated Air Taxi Departures in SE Alaska and in the Rest of the State

	SE Alaska	Rest of State
1990	89,295	416,123
1991	81,971	458,891
1992	95,902	485,668
1993	98,518	453,197
1994	113,826	472,735
1995	127,608	450,961
1996	122,281	441,405
1997	110,933	502,359
1998	122,048	514,284
1999	118,863	497,105
2000	117,031	543,113
2001	115,611	467,069
2002	100,547	480,531
2003	103,749	497,169
2004	110,991	502,161
2005	84,749	525,883

8.3 Appendix C: Participating Operator and Aircraft Tables

Commercial Aircraft List

Chelton

Operator	Type	"N" Number
Air Excursions	PA32	15950
Air Excursions	PA32	8200M
Air Excursions	PA32	8908N
Air Excursions	PA32	8991N
Air Sitka	C185	1999U
Alaska Fly n' Fish Charters	C206	8419Q
Alaska Seaplanes Service/Inian	C180	7687K
Alaska Seaplanes Service/Inian	DHC-2	60077
Alaska Seaplanes Service/Inian	DHC-2	4794C
Alaska Seaplanes Service/Inian	DHC-2	777DH
Alaska Seaplanes Service/Inian	DHC-2	9794C
Fiord Flying Service	C206	206GT
Harris Aircraft Services, Inc REMOVED CRASHED	DHC-2	712TS
Harris Aircraft Services, Inc	PA-31	200SJ
Harris Aircraft Services, Inc	PA-31	3590N
LAB Flying Service	BN2A	29884

Chelton

Operator	Type	"N" Number
LAB Flying Service	H-250	6314V
LAB Flying Service	PA28	3699M
LAB Flying Service	PA28-180	31602
LAB Flying Service	PA28-180	44681
LAB Flying Service	PA28-181	3002T
LAB Flying Service	PA31-350	54732
LAB Flying Service	PA31-350	3523Y
LAB Flying Service	PA32-300	4485X
LAB Flying Service	PA32-300	54KA
LAB Flying Service	PA32-300	6117J
LAB Flying Service	PA32-300	666EB
LAB Flying Service	PA32-300	8127Q
LAB Flying Service	PA32R-300	8493C
LAB Flying Service	PA34T-200	7333L
Pacific Airways	DHC-2	12UA
Pacific Airways	DHC-2	264P
Pacific Airways	DHC-2	9290Z
Pacific Airways	DHC-2	94DC
Promech	DHC-3T	270PA

Chelton

Operator	Type	"N" Number
Promech	DHC-3T	342KA
Promech	DHC-3T	409PA
Promech	DHC-3T	959PA
Scott Air	C206	206Q
Skagway Air Service	PA-28-181	2937X
Skagway Air Service	PA-32	31589
Skagway Air Service	PA-32	40698
Skagway Air Service	PA-32	1132Q
Skagway Air Service	PA-32	2112Z
Skagway Air Service	PA-32	2884M
Skagway Air Service	PA-32	8127K
Skagway Air Service	PA-32-301	8216T
Venture Travel dba Taquan Air REMOVED CRASHED	C206	51AK
Venture Travel dba Taquan Air	DHC-2	37756
Venture Travel dba Taquan Air	DHC-2	67667
Venture Travel dba Taquan Air	DHC-2	67673
Venture Travel dba Taquan Air	DHC-2	67676
Venture Travel dba Taquan Air	DHC-2	68010
Venture Travel dba Taquan Air	DHC-2	1018A

Chelton

Operator	Type	"N" Number
Venture Travel dba Taquan Air	DHC-2	5160G
Ward Air Inc.	C310	767RR
Ward Air Inc.	DH-2	62355
Ward Air Inc.	DH-2	62357
Ward Air Inc.	DHC-2	62353
Ward Air Inc.	DHC-3	63354
Ward Air Inc.	DHC-3	93356
Wings Airways	DHC-2	90AK
Wings Airways	DHC-2	91AK
Wings Airways	DHC-3	336AK
Wings Airways	DHC-3	337AK
Wings Airways	DHC-3	338AK
Wings Airways	DHC-3	339AK
Wings of Alaska (Alaska Juneau Aeronautics)	C207	39AK
Wings of Alaska (Alaska Juneau Aeronautics)	C207	62AK
Wings of Alaska (Alaska Juneau Aeronautics)	C207	96AK
Wings of Alaska (Alaska Juneau Aeronautics)	C208	331AK
Wings of Alaska (Alaska Juneau Aeronautics)	C208	332AK
Wings of Alaska (Alaska Juneau Aeronautics)	DHC-2	47AK
Wings of Alaska (Alaska Juneau Aeronautics)	DHC-2	92AK
Yakutat Coastal Airlines	C206	9417G

Chelton

Operator	Type	"N" Number
Yakutat Coastal Airlines	C210	310DC
Yakutat Coastal Airlines	DHC-2	95DG

Garmin

Operator	Type	"N" Number
Alaska Wilderness Air	C206	206GA
Alaska Wilderness Air	DHC-2	269AW
Carlin Air	DHC-2	471PM
Copper River Air Taxi	C180	4141J
Copper River Air Taxi	C206G	5371U
Cordova Air Service, Inc	C206	206F
Cordova Air Service, Inc	C206	5428U
Cordova Air Service, Inc	C206	756DU
Cordova Air Service, Inc	C206	756VC
Cordova Air Service, Inc	DHC-2	218GB
Family Air Tours	C185	185BF
Harris Aircraft Services, Inc	C185	6590E
Harris Aircraft Services, Inc	DHC-2	60TF
Hunter Air	C180	889WT
LAB Flying Service	PA32	2897X
Misty Fjords Air	DHC-2	7336
Promech	DHC-2	64397
Promech	DHC-2	1108Q
Promech	DHC-2	4787C
Seawind Aviation	DHC-2	345KA
Southeast Aviation/Snow Mountain Enterprises	DHC-2	340KA
Southeast Aviation/Snow	DHC-2	82SF

Garmin

Operator	Type	"N" Number
Mountain Enterprises		
Southeast Aviation/Snow Mountain Enterprises	DHC-2	9279Z
Sunrise Aviation Inc.	BE36	9468Q
Sunrise Aviation Inc.	C206 amb	50159
Tal Air	C210	3715Y
Ward Air Inc.	C206	756VN
Wings of Alaska (Alaska Juneau Aeronautics)	C206	53AK

8.4 Appendix D: Airline Surveys

8.4.1 D.1 Management Surveys

Survey Date: __*Winter 2005 - 2006*____

Operator: ___*Composite*_______

Interviewee's Position: ____ Owner, _____ Gen. Mgr, _____Chief Pilot,

Other ________________ (title)

Equipment: _*6*_ Chelton, _*5*_ Garmin, __*2*_ Both

The following is are Interview questions to (1) determine the changes in Safety Posture (or Safety Culture) at the Capstone operators and (2) more general questions for the operators and customers regarding improvements overall, such as economic, business practices, etc, since the start of the Capstone Program.

These questions will be used in the annual report for Capstone Phase 2. The questions are both quantitative and qualitative. The intended use in the final report is show the impact of the Capstone program on groups other than the pilots, if the "improved" access provided by Capstone has been beneficial and if the Operators have improved their safety processes during the program.

The questions should be asked with an open mind to the answers provided. Additional questions may be asked to further define the questions or gather additional information. The questioner should attempt to get anecdotes and examples, if possible, to support the responses. Please be attentive to other potential questions or for additional areas that we should explore.

Questions for Senior Management (the Owner/General Manager/Chief Pilot)

1. Since the start of the Capstone Program, has your company made changes to its overall programs, procedures or operations to distinctly improve safety awareness or safety programs? (Yes/No) _*Y8/N5*___
   - *In conjunction with joining the Medallion Program, began regular risk assessments for flights. Situational Awareness is up. Gives a way to "return".*
   - *Capstone and Medallion Programs have enhanced*
   - *Yes, but not just due to Capstone. Capstone does make the operations safer.*
   - *Good already*
   - *Because of participation in Medallion (3 stars complete)*
   - *Retained what we had. Don't let the system take you to an unsafe area. The "magic box" heightens awareness*

2. Since the start of the Capstone Program, has your company revised, issued or done any of the following for the purpose of improving safety or safety awareness? (Yes/No)

a. *Y8/N5* Operations or Policy Manual Revisions regarding safety
b. *Y3/N10* All employee (or all specific group) safety letters
c. *Y5/N8* Written a safety policy document
d. *Y6/N6* Set or revised safety goals
e. *Y8/N5* Conducted a safety review or audit
f. *Y6/N7* Established a hazard, accident or incident reporting program
g. *Y6/N7* Developed a specific safety program or assigned a Safety Officer

- *Things have been updated to incorporate Capstone equipment additions*
- *Program was in place prior to Capstone. Medallion and Capstone expanded the programs*
- *Safety went from a passive to an active program. Added Safety Officer*
- *Had a strong safety program prior to Capstone*
- *Done in conjunction with Medallion Program*
- *Working on safety star*
- *Medallion participant*
- *In own head*

3. In your opinion, has the company's Safety Posture or Safety Culture changed during the Capstone Program? (Yes/No)_*Y10/N3*__. Please describe those changes.

- *New equipment provides an improved confidence level, a greater passenger comfort level, and better situational awareness.*
- *We have always been safety conscious and conservative.*
- *Preflight discussions and assessments added*
- *More weather analysis*
- *Provides better situational awareness and an alternative to inadvertent IMC*
- *The Capstone equipment adds a substantial safety factor*
- *Capstone added new tools to our Safety tool box*
- *From old style bush flying to new style bush flying*
- *Better situational awareness*
- *Less hesitation/confusion with deteriorating weather – takes guess work out*
- *Better info available (routes, info, frequencies, etc)*
- *Having the new equipment on board made things safer*
- *Joining Medallion*
- *Raised some of our weather operating minimums*
- *How flights are approached has changed*
- *Equipment changed safety by its presence*

- *New VFR to inadvertent IFR safety procedures. (how to get out)*
- *More safety conscious*
- *Don't push limits just because you have a fancy panel.*
- *The new equipment helps*
- *Seeing other traffic is great*
- *Capstone –if used right – helps, if used wrong, it can put you in a bind*
- *Always leave yourself an out*
- *Use it right*
- *Still think the same*
- *Not going in any worse weather*
- *Improves safety as long as other aircraft are on the display*

4. Has Capstone changed or improved the economics of your operation?
    a. _*6*__ No Change
    b. _*7*__ Improved
    c. _____ Deteriorated

Please provide any comments regarding those economic changes.
- *More direct routings*
- *Finer tuning of fuel flows*
- *Very small loss of revenue generating capability due to weight of Capstone equipment*
- *Looking forward to Weather, traffic, etc. into the cockpit.*
- *It has opened up new airports for our operations, with approaches, etc.*
- *Minimal improvement at this time*
- *Web Cams help monitor enroute weather*
- *Wind info helps find better altitude*
- *Economics deteriorated with loss of load capability to weight of equipment*
- *Has allowed completion of trips not previously accomplished*
- *Direct routings may save up to 10 minutes a day, saving fuel. However, this is hard to quantify*
- *Taking most direct route*
- *More dollars to train*
- *A lot safer to have terrain awareness with changeable weather*
- *More straight lines*
- *Less guess work on where to go*
- *When we are able to see locations, it will help scheduling*
- *Helped on insurance*

5. Please provide any comments you wish regarding changes in the company that have had an impact on safety during the Capstone program.

- *The installation of the equipment alone improved the safety posture*
- *We began participation with the Medallion program.*

- *New equipment is a revolution in safety in itself*
- *We will maintain an active safety program through Medallion Foundation and Capstone*
- *Preflight discussions and assessments added*
- *More weather analysis*
- *Provides better situational awareness and an alternative to inadvertent IMC*
- *Increased capability to checkout the new pilots in the local area (with the change in the local environment to seasonal flying, turnover in pilots is increasing)*
- *New avionics have improved safety picture*
- *We already had a good safety record and program*
- *Joined Medallion*
- *A lot safer to have terrain awareness with changeable weather*
- *New pilots "over confident" with the tool can go too far and need to be reigned in. ("I can get there because I have Capstone syndrome")*
- *Pilots have become more safety conscious*
- *Before we were holding on the ground while others were flying – now we are more liberal with the weather.*
- *If you need Capstone as the sole means to get from "A" to "B" you need to reevaluate your life goals.*
- *The system can now get you into a no win situation*
- *Just because you can does not mean you should*
- *One man ops – I have my set standards.*
- *Capstone screen helps – a good tool*

6. Please provide your opinion on the adequacy of communications and information flow between the Capstone Office and the Operators. (Excellent *5*, Good *6*, Minimum Satisfactory *1*, Poor, No Opinion *1*) Do you have any comments regarding communications?

- *Minimal prior to the hire of Jimmy Wright – now excellent*
- *Jimmy "works his but off" to keep things going.*
- *Someone always available.*
- *Jimmy very busy, but responsive.*
- *Things were poor before the arrival of Jimmy Wright, better now.*
- *Jimmy Wright doing a good job.*
- *Good*
- *From start of install through today has been a 100% effort by the Capstone people*
- *Generally good*
- *Time line changes not well managed or communicated*
- *Jimmy Wright a big help, responsive*
- *Jimmy Wright & co need more resources – working hard (excellent) but need more resources to respond*
- *Doing an awesome job with limited resources*

- *Don't hear from Sue Gardner*
- *Web site a problem – it is better on CrayolaCrayon.com.*
- *When I call, I get a good response*
- *Jimmy Wright always checking on us – good!*
- *Asked questions that have never been answered*

7. Please provide any comments you wish regarding the Capstone program.

- *Some unexpected and unexplained loss of GPS – short duration*
- *Delay of initialization results in additional fuel costs while we wait.*
- *Conversion to IFR capable aircraft not necessarily cost effective in this area due to ice problems. More effective to go VFR at lower altitudes and keep out of the ice.*
- *Experiences with this new program are shared among the "competing" organizations as we try to make it work. The result is a safer working environment for all and happier customers.*
- *GPS provides a huge difference in capability*
- *The total Capstone effort provides a needed improvement in safety.*
- *Awesome capability.*
- *First innovative program from the FAA in my life time.*
- *Makes us more competitive with other transportation systems and operators.*
- *Spool up time affects performance of systems. With float planes, movement starts with engine start. This adversely affects Capstone equipment performance. System draws a lot of power, making the alternative (keeping equipment powered during stops) impractical.*
- *Information flow for program has been OK.*
- *Do not like the fact that, when you are in a turn in close proximity to terrain, you get an automatic scale change. E.g. 2 ½ or 5 mile scale goes automatically to 1 mile, eliminating situational awareness. Difficult to continue "terrain avoidance" when the "ways out" are eliminated from the view.*
- *The installations were not well thought out. The initial installation was completed, and then new things were added. Some of the original installs eliminated "space" required for follow-ons. Pre planning could have solved part of this problem.*
- *When will we get the traffic picture in the cockpit – we are 3 ½ years into the program?*
- *Inaccurate shore and surface depictions on screens make it difficult or impossible to rely on the systems. E.g. shore lines inaccurate, islands missing, islands shown as single island, land bridges where none really exists.*
- *To enhance safety, Capstone systems should not be mixed within a single operator.*
- *Medallion Foundation participation requires operators to participate in the Capstone Program in those areas where it is offered. The Medallion Foundation simulator (membership requires use) is not Capstone equipped. This is a disconnect that needs to be fixed – this would be a plus for both programs.*
- *A GBT is needed to cover the TAKU area.*
- *Occasionally we encounter systems that indicate constant "barrel rolls" in the aircraft equipment – probably due to the lack of warm up time*
- *Over the past 30 years have been associated with three major accidents, including loss of life. Capstone would have prevented all three.*
- *Some political issues as we go along – e.g. asking the operators to participate in this developmental (test) program and then wading in to ground their aircraft for items such as dust on a cooling fan.*
- *Capstone is a test program; we joined to help the effort – to help find out what works and what does not. We are still commercial operators and did not sign up to be grounded for our efforts.*

- *Capstone is the only POSITIVE, PROACTIVE FAA PROGRAM in my aviation career – it is a refreshing change.*
- *Phase II systems are probably "overkill" for a VFR operator*
- *Equipment will be expensive to maintain, but we probably will not go back to the previous configuration*
- *The ability to see other traffic in the cockpit – when that capability comes – will be a major improvement and the most valuable to us.*
- *Capstone is the way of the future*
- *Training and use to proficiency will help keep the operator (pilot) out of trouble.*
- *Amazed at progress in such a short time.*
- *Great program*
- *Need better look at graphics. Sitting in the water and the screen shows the aircraft on land. Custom map 1/8 to ¼ mile off. The fix to this problem removed a lot of details (e.g. shore lines. Islands, etc.)*
- *Garmin has Chelton beat hands down, but still not great.*
- *System gets a 10 for situational awareness*
- *I do not agree with the apparent push/concept of buying newer aircraft with the associated newer capabilities. The aircraft we are operating now are capable of doing the jobs – newer alternatives are not.*
- *One problem with details on data cards fixed was returned to original configuration as it was a more minor problem.*
- *Increased safety with aircraft to aircraft info – e.g. coming around the point with MVFR and knowing where to look (if they are transmitting). Before you were blind – adds a layer of safety.*
- *Map added benefit, but we've been here long enough to know our own way around.*
- *Being a test bed, one would assume that the systems had gone through some sort of approval process and that the process was fast – perhaps too fast. We're apprehensive about going into the weather without "legacy systems" working, because of items that go "off" when they are needed to be on.*
- *Fuel flow does not work*
- *It will be nice to get the bugs worked out*
- *Would like to see ground stations accelerated – have been talking about for 2 years – be nice to have.*
- *Am in the process of computerizing all my activities – would like to have data feed integrated from Capstone so I don't have to have multiple programs and multiple sources. (i.e. would like to have the data direct into my software since flight explorer does not appear to meet my needs)*
- *My contractor would make the software available for other small operators and more useable by us in out VFR operations*
- *Garmin was what our pilots wanted – Chelton is "Star Wars" and overboard*
- *I see a big push for IFR operations – I do not agree with this agenda. The environment, training and equipment costs will kill operations.*
- *Great evolution for situational awareness.*
- *The economy here is on the bottom – can not afford an IFR base*
- *With ice and other weather, we do not want to be in the clouds*
- *Is system going to be used for enforcement? (this concern has lessened recently, but still there)*
- *Can't we all just get along – need more cooperation between the different stake holders (FAA HQ, ATC, FSDO, Capstone, etc)*
- *D.C. does not know what Alaska is or does – the State is Huge with geographic and environmental requirements. The FAA needs more idea of what operators do and what the different weather and terrain impacts do.*
- *Garmin good thing is traffic*
- *Chelton good thing is graphics.*

- *Would use weather cams if there more of them*
- *We need GBTs here as much as any other place (e.g. Juneau)*
- *Fear of "Big Brother" slows acceptance of capability – it is still a concern. As a result many turn off GDL 90 to keep from being seen.*
- *Benefits of the system have gone a long way to outweigh the fear*
- *Wind info is great.*
- *System installation has negative impact on systems already in place – working the issue with the techs*
- *Need Canada data. When we leave the US, the screen goes blank. Many of the operators here go into Canada or down through Canada to Washington.*
- *If you get into trouble, Capstone is a good help – but you should probably not be there in the first place*
- *Not a substitute for good judgment*
- *Great program*
- *Equipment, if used properly, is great*
- *Screen goes blank in Canada – not a good feeling when you didn't expect it*
- *When working it is great*
- *When tracks are available it is good*
- *We were told to take our VOR and glide slope out because it would be handled by the Garmin. We did and capabilities in the Garmin were then disabled because "they were not a part of the Capstone program" this left us without the VOR/ILS capability.*

Senior Management - Training:

1. Do you feel the Capstone initial training your pilots received was adequate to allow them to fully utilize the equipment?

- *Absolutely*
- *Absolutely – simulator a big part.*
- *Yes*
- *Yes, however proficiency is only gained through flying the system.*
- *A flight module would be useful for initial training.*
- *Program training as good as could be expected.*
- *Mixing systems within a carrier created problems for training and proficiency – vast difference in switchology and functions.*
- *Absolutely*
- *Hands on Sim was great*
- *Yes*
- *Yes*
- *Yes*
- *Yes – fast and furious*
- *Kirk is over worked – why aren't there more instructors?*

- *The training program should be stand alone – as presented in initial training. The FAA wants it dissected and absorbed into individual programs (operations manuals). Why can it not be retained as a stand alone as presented vs. dissection and reabsorbtion? It is good as originally presented.*
- *Can UAA work training packages so that would meet FAA requirements and be stand alone?*
- *Yes*
- *Leonard is good*
- *Real good*
- *Leonard great*
- *Sims a nice deal*
- *Yes*

2. Based on your experience, do you foresee any changes to your pilot training program? If so, what?

- *Takes longer to train up new pilots, costing more.*
- *Sims hard to get hold of.*
- *More requirements for recurrent training.*
- *Some changes in recurrency training.*
- *Changes as we add new approaches and GPS airways.*
- *Add to recurrency training.*
- *Planning 2 training sims per year with Medallion Foundation, but need their equipment to catch up to Capstone.*
- *Recurrency training blocks added to account for Capstone – having two systems complicates training*
- *Inadvertent IMC training change to get back to VMC or onto an instrument approach*
- *Added Capstone specific training for new pilots*
- *Added time for Medallion and Capstone*
- *Chelton equipment is desired on the Medallion Sims*
- *Revised to include Capstone.*
- *Capstone incorporated into training manual.*
- *Add flight training for Capstone*
- *No – I'm the only pilot*

3. Do others, such as dispatchers or station agents receive training on the Capstone Program? If so, what portions?

- *Only minimal informal training on how to turn CRABS on.*

- *We have only had the system installed for 3 weeks.*
- *No*
- *Informal training on CRABS.*
- *Maintenance training on systems.*
- *CRABS for flight followers*
- *Some but not much*
- *Yes – all*
- *No*
- *No*
- *Not yet, but will happen when we have ability to track*

4. Overall, how do you rate the effectiveness of your training program? (Excellent *5*, Good *3*, Minimum Satisfactory, Poor, No Opinion *4*)

- *Problem with Spring recurrent training due to low availability of simulators (only one) Could use additional simulator resources during April and May*
- *Second system a challenge*

Questions for Dispatchers

Much of this info "to be determined", only had system 3 weeks

Though FAA Capstone office has been notified, we still do not have a working flight following system - CRABS or commercial. So, Capstone has no impact on our dispatch or flight following capability. We do occasionally get information with assistance from our competitors and their systems.

Now do risk assessments as part of Medallion Program

We do not have capability yet

When we see information on screens, it may be better

Don't paint aircraft, so do not use

Not available yet here

N/A at this point

1. Has the Capstone Program, both air and ground improvements, changed your process for dispatching or releasing flights? (Yes/No) __*Y1/N8*_______

2. If yes, please note on the appropriate line for areas "N" for No Change, "I" for Improved and with a "D" for Deteriorated.

a. _____ Weather data
b. _____ Weather Cams
c. _____ Flight Monitoring/Flight Following
d. _____ Communication with other aircraft that are in the area of your aircraft dispatch
e. _____ Fuel or load planning
f. _____ Selecting Alternate Airports
g. _____ Re-dispatch or flight modifications
h. _____ Other, Please describe.

- *On observed potential traffic conflicts*
- *Observe passages that other aircraft are turning around in – notify own pilots so that they can modify routes before the fact)*
- *Keep out stations informed on progress of missions – e.g. headwinds delaying arrival*

3. Please rank the following by the importance to you in the dispatch operation. *(These questions answered without benefit of Capstone product 1=high importance, 5 = low importance)*
   a. *1=7/2= 1*_____ Weather data
   b. *3=3/5=3*__ ___ Weather Cams
   c. *1=7/2=1/3=1*__ Flight Monitoring/Flight Following
   d. *1=3/2=2/5=1*__ Communication with other aircraft that are in the area of your aircraft dispatch
   e. *1=1/2=1/5=4*__ Fuel or load planning
   f. *2=1/3=1/5=4*__ Selecting Alternate Airports
   g. *3=1/4=2/5=1*__ Re-dispatch or flight modifications
   h. _____ Other, As described above.

4. How often does someone in you're company spend time using Flight Monitoring? (circle all that apply)
   a. Flight Monitoring is never or rarely used.
   b. Flight Monitoring is used only in certain weather conditions
   c. Flight Monitoring is used for flights to particular locations
   d. Flight Monitoring is used for most flights, but there are occasions it is not used. (If there are particular times/places it is not used, what are these?)
   e. Flight Monitoring is used for all or nearly all flights *2*
   f. Other (explain)

- *New System "TBD"*
- *Main dispatch in village without internet connectivity – limits usefulness*
- *Overall system requires greater GBT coverage to make it useful.*

5. Of the potential kinds of benefits of Flight Monitoring listed below, which if any has your company found to be significant? (circle all that apply)
   a. Safety through situational awareness *7*
   b. Economically improved rerouting, chartering *3*
   c. Crew monitoring and management *4*

d. Station Agent awareness of arrivals *7*
e. No particular benefit
f. Other (explain)

- *CRABS system easier to use.*
- *Question concerning CRABS use by outlying stations was answered on the spot.*
- *Love it – use it for all flights.*
- *Not available, but useful if had*
- *Don't have reference point yet, we'll see when we get the capability*

6. Who in your organization frequently uses flight monitoring? (circle all that apply)
   a. Owner/Senior Management *3*
   b. Dispatch/Flight Follower *3*
   c. Station Agents *1*
   d. Flight Crews on the ground *3*
   e. Other (explain)

- *Depends upon capability actually available. TBD*

7. Has use of Flight Monitoring significantly changed Safety Awareness or decision-making in your organization? (Circle one. If yes, please describe how.)
   a. No significant changes *1*
   b. Yes – Safety awareness or decision-making have deteriorated. (How?)
   c. Yes – Safety awareness or decision-making have improved. (How?) *1*

- *Too new to our organization.*
- *Should become more useful as more GBTs come on line.*
- *Able to warn pilots of problems observed ahead.*

8. Are there notable stories involving flight monitoring that you would be willing to relate? If so, please do…

- *Our ramp staff enjoys watching arrivals until they turn final corner to parking spot before going outside with baggage carts.*
- *Often, we observe significant altitude deviations on aircraft that we are flight following, with no real explanations on what is causing this.*

- *Occasionally we encounter systems that indicate constant "barrel rolls" in the aircraft equipment – probably due to the lack of warm up time*
- *The capability of Capstone assisted with the completion of a mission to aid a stranded flyer. In deteriorating weather conditions, safely returned to home base*

9. Please provide any comments you wish regarding changes in Dispatch or Flight Following during the Capstone Program.

- *Like what I've seen so far.*
- *When will we get the ADSB so we can see others?*
- *Capstone provides our first capability to flight follow. Radio flight following (our previous method) was very limited.*
- *Capstone is great!*
- *CRABS gave us the first capability to flight follow.*
- *Looking forward to getting capability*
- *Search and rescue potential is great – knowing where accident is will save lives.*
- *When will we see traffic on Chelton?*
- *Will there be a GBT to allow us info/vis in Misty Fjord?*
- *May be valuable when we get it*
- *Medallion driven, but needed to be done*
- *Added dispatchers for summer load*
- *Capstone adds a safety margin*
- *Want it – can't comment now*
- *Like to see system to evaluate*
- *System for flight following was loaded on our computer, but no training or information was ever provided for operating them. We only have a requirement for flight following in the summer, so it has had no significant impact yet. Also, the GBT coverage is low at this time. Need more info and training to use and or evaluate its usefulness.*

Dispatchers - Training:

Ground Systems not available

1. Have you received any training on the Capstone Program and the equipment installed in the aircraft? If so, what type of training (e.g., classroom, desktop simulators, in-flight)?

- *No, and only informal on the CRABS equipment*
- *No*
- *No formal training on ground systems (CRABS) either.*

- *No*
- *No*
- *No*

2. If you did received training, what would you like to see changed?
   - *Too many gaps in coverage to be relied upon for flight following*

3. Do you feel that joint training with pilots would be beneficial? Yes *4* No *3*

4. If you received training on the Capstone program, how would you rate that training? (Excellent, Good, Minimum Satisfactory, Poor, No Opinion)

   ____
   ____
   ____

8.4.2 D.2 Pilot Surveys

Phase 2 Capstone Follow-up Module– Pilots

Conducted by UAA Community and Technical College

Thank you for agreeing to complete this survey! The purpose of gathering this information is to evaluate the effectiveness of the FAA's Capstone Program in improving safety. Results will be published only in aggregate form; your individual answers will be kept confidential, and not released in any form that they could be identified as yours. **All information you have provided is confidential and cannot be used for enforcement purposes.**

CPRepeat. Have you completed this survey before?

No➔ Yes: When? ________________

Demog1. Are you Male Female

Demog2. How old are you: __*41.29*_________

Demog3. Please check below all the pilot ratings that you hold:

Commercial	*17*	ATP	*18*
Instrument	*19*	Rotary Wing	*3*

Please check below all the FAR parts under which you ***routinely*** fly:

Part 91 *11* Part 121 *0*

Part 135 *31* Other (specify) __________

FltHrTot. Please estimate your ***total*** flight time: __9805_______hours

FltHrAk. How many hours have you flown in ***Alaska***: __*8655*_______hours

FltHrYr: How many hours have you flown ***in the last 12 months***? __*626*_hours?

FltHrIFR. How many ***instrument*** hours have you flown in the last 12 months? _*18*____

FltHrCap. About how many hours have you flown ***Capstone-equipped aircraft?***

__*860*__hours

FltHrGPS About how many hours had you flown using other GPS equipment for aerial navigation before Capstone? Hours ? _____*2035*___________________.

CapEqpt 1 Were those hours mostly with handheld GPS devices or panel mounted GPS devices?
(Handheld Panel)

19 *12*

CapEqpt 2 Did the GPS device include a moving map? (Yes, No)

24 *7*

CapEqpt3. Do you use Chelton or Garmin Avionics?

Chelton *12* Both *9*

Garmin *9* Neither

No Response *1*

CapEqpt 4. Are the aircraft you generally fly certified for IFR?

Yes *4*

No 27

CapEqpt 5. If Yes to above, estimate the percentage of time that you fly IFR:

0-10% *27* 11-20%

21-30% 31-40%

41-50% *1* Greater than 50% *1*

CP1. Have you received formal training to use the Capstone equipment? (Include all training, initial, recurrent, etc.)

No➔ **Skip to Question CP3**

Yes *30*

No Response *1*

CP1 (a)

If you have received formal training on the Capstone equipment, how would you rate the **quality** of the initial training? (excellent, good, adequate, lacking in some areas, poor)

(No response – 1) 15 11 4 0 0

If you have received formal training on the Capstone equipment, how would you rate the **quality** of the recurrent training? (excellent, good, adequate, lacking in some areas, poor)

(No Response – 11) 5 12 3 0 0

If you received formal training on the Capstone equipment, how would you rate the amount of time spent during initial training? (too much, just right, not enough)

(No Response – 1) 4 23 1

If you received formal recurrent training on the Capstone equipment, how would you rate the amount of time spent recurrent training? (too much, just right, not enough)

(No Response – 11) 2 18 0

What changes would you like to see in your training program?

- *More structure to the lessons*
- *Be able to adjust training times to student ability*
- *No recurring training yet*
- *More simulators*
- *A training simulator module*
- *Training program is satisfactory*
- *Can't think of any*
- *More in depth training on setting up an approach on the Garmin system*
- *Shorter initial training ground time and recurrent*
- *More useful focus on IFR procedures (setting up SID, STAR, and approach)*
- *More approaches to a landing in zero/zero*
- *More ground training*
- *Have the training suited appropriately for VFR only or IFR only, not combined*
- *Training is adequate*

CP1 (b)

Do you ever train with non-pilot employees of your company, e.g., dispatchers, station agents, etc? If yes, please rate the effectiveness of that training on your ability to work with these employees? (positive effect, no effect, negative effect)

- *Do not train with non-pilot employees*
- *No effect expected to training with other employees*
- *Expects no benefit to training with non-pilots*
- *No training with non-pilots and does not expect benefit to doing so.*
- *No training with others and no perceived benefit*
- *No effect if training with non-pilots*
- *No effect if Capstone training with other employees*
- *Training with other employees would have a positive effect*
- *No effect from training with non-pilots*
- *Training with other employees may bring positive effect*
- *Positive effect from training with non-pilot employees*
- *Have not trained with non-pilots and do not foresee any advantage*
- *See no effect from training with non-pilots*
- *Sees no potential benefit from training with non-pilots*
- *Does not train with non-pilots but foresees positive effect if done*
- *Thinks training would have a positive effect*
- Sees no effect from training with non-pilots

If you do not train with non-pilot employees, do you feel that such training would improve your ability to work more effectively with them? (positive effect, no effect, negative effect)

CP2. For each type of Capstone training, please write how many hours you received and check who provided the training.

Type of Training **<u>INITIAL</u>**	**Hours**	**Training was taught by**		
		UAA personnel	**Someone in your company**	**Someone else (please specify)**
a. Classroom no simulator		1	2	3__________________
b. Classroom with desktop Capstone simulator		1	2	3_________________
c. Flight or Capstone-equipped flight simulator (C-208)		1	2	3_________________

Type of Training **<u>RECURRENT</u>**	**Hours**	Training was taught by		
		UAA personnel	**Someone in your company**	**Someone else (please specify)**
a. Classroom no simulator		1	2	3__________________
b. Classroom with desktop Capstone simulator		1	2	3_________________
c. Flight or Capstone-equipped flight simulator (C-208)		1	2	3_________________

- *More flight training with use of Capstone in A/C with "what if issues" and use of Capstone on terrain avoidance*
- *Operations systems upgrades*

CP2 (a)

If you have been with the company since the inception of the Capstone training program, has the training program changed since the first training program was conducted? (Yes, No, Don't Know)

If Yes, in what way?

- *Training has shifted to be able to emphasize areas of training that fit our operation*

- *No changes in training program since inception*
- *Yes – increase in the number of differences training associated with software upgrades.*
- *Many changes in training to incorporate bugs, timers, AHRS Batt, fuel flow, etc. Plus WAAS has been activated*

Regardless of your time with the company, what changes would you like to see made to your Capstone training program? (Circle More, Less or No Changes)

More *3*/Less *3*/No Changes *18*	Total training hours
More *5*/Less *0*/No Changes *22*	Use of desktop trainers
More *6*/Less *1*/No Changes *19*	In-flight training
More *4*/Less *1*/No Changes *20*	Line experience with an instructor pilot

CP2 (b) How would you rate the quality of the training materials/manuals you used during your Capstone training? (excellent, good, adequate, lacking in some areas, poor)

11 15 3 2 0

CP2 (c) Have you ever experienced a situation in which you can directly attribute your use of the Capstone equipment to the prevention of an accident or incident? Did the training you received adequately prepare you for this situation? Please describe the situation and the features you used.

- *Yes, along with hands on in the aircraft. I got into a fog bank. After executing my 180 degree turn, it had gone down to the water, so I climbed and headed for what I knew was clear weather. Used the whole system – situational awareness on the navcom and primary display for the attitude, airspeed, and altitude.*
- *Yes, snow storms closed in behind and in front of me & the training & my knowledge of the Capstone prevented an incident. The skyways, flight plans, min alt, and many other features allowed me to conclude the flight safely.*
- *Yes – unintended flight into imc conditions*
- *I think the additional safety margin provided by Capstone has kept difficult situations from developing into an accident or incident. There was a time coming out of runway 5 at Hunnah that the weather made continuing VFR impossible and I did not think it was safe to turn back so I went IFR and used Capstone to miss terrain and nearest VOR feature to get me to Sisters without overloading me stress wise*
- *Probably – a 180 degree in a sudden snow storm after training and use of system (familiarity) made a precarious situation seem routine.*
- *I would not trust the accuracy of the garmin equipment in the event of inadvertent IMC. The traffic function is however very useful*
- *No*
- *Didn't fly to a bad situation – to rely on system to get out of a bad wx issue*
- *Comfort factor with systems is awesome*
- *It helps in Spacial Orientation also the split screen feature*
- *I got stuck in snow in Hanes. I used the moving mad to start my turn from base to final. The runway was right where my PFD and MFD said it would be. Vis had dropped to ¾ with blowing snow.*

CP3. How useful is each feature of the Capstone equipment?

- *Don't have traffic*
- *Need to make traffic show up on the MFD*
- *ADS-B not installed*
- *No ADS-B yet*

	Very useful	**Somewhat useful**	**Not useful**
GPS	*29*	*2*	*0*
MFD	*23*	*4*	*0*
ADS-B	*13*	*6*	*1*
PFD	*22*	*4*	*1*
PND	*19*	*5*	*0*
HITS(Chelton User only)	*10*	*9*	*2*
Fwd Looking Terrain	*19*	*5*	*3*
TAWS	*16*	*7*	*4*
Fuel	*12*	*6*	*7*

CP4.For each of the functions of Capstone avionics listed below, please tell us how often you use that feature, how easy it is to use, and how helpful it is to you.

	CP4_1**. How often** do you use this feature?	CP4_2. Compared to other avionics you use, **how easy** is this feature to use?	CP4_3**. How helpful** has this feature been to you as a pilot?
a. Terrain Avoidance - PFD	*18* Routinely *10* Rarely *3* Never	*17* Easier *9* About the same *4* Harder	*17* Not helpful *11* Somewhat helpful *3* Very Helpful
b. Terrain Avoidance - PND	*14* Routinely *9* Rarely *4* Never	*17* Easier *5* About the same *2* Harder	*12* Not helpful *10* Somewhat helpful *3* Very Helpful
c. Flight Planning	*17* Routinely	*12* Easier	*14* Not helpful

	8 Rarely 6 Never	15 About the same 2 Harder	12 Somewhat helpful 2 Very Helpful
d. Navigation	27 Routinely 4 Rarely 0 Never	14 Easier 12 About the same 3 Harder	1 Not helpful 11 Somewhat helpful 18 Very Helpful
e. HITS(Chelton Users Only)	11 Routinely 6 Rarely 6 Never	15 Easier 3 About the same 2 Harder	3 Not helpful 6 Somewhat helpful 11 Very Helpful
f. Fuel	16 Routinely 5 Rarely 7 Never	16 Easier 6 About the same 0 Harder	4 Not helpful 8 Somewhat helpful 10 Very Helpful
g. MEA's	2 Routinely 6 Rarely 19 Never	5 Easier 8 About the same 0 Harder	7 Not helpful 6 Somewhat helpful 1 Very Helpful
h. GPS approaches	4 Routinely 4 Rarely 21 Never	7 Easier 5 About the same 1 Harder	3 Not helpful 5 Somewhat helpful 6 Very Helpful

- *Only do VFR operations*

CP5. What functions do you like best about Capstone avionics? Why?

- *The PFD + PND – very helpful easy to use!*
- *Programmed flight plans, skyway, fuel, terrain, flight path marker*
- *Flight path marker and how you can use it to avoid terrain and vertically navigate to a waypoint by just waiting until the waypoint is 3 degrees below the horizon then put the flight path marker on the waypoint*
- *TAWS, HITS, GPWS, Synthetic Vision*
- *GPS, Terrain, ADS-B traffic when installed, flight following function*
- *So far it has proven to be very reliable, good data base, and fairly intuitive to use.*
- *Radio works well – traffic feature is excellent*
- *Moving map*
- *GPS moving map, wind components, fuel, Terrain info*
- *Situational awareness*
- *Chelton ease of getting info and accuracy*
- *Chelton Superior to Garmin, TAWS –automatic PFD/MFD – better than Garmin, E6B features on MFD screen, MFD user waypoint on screen*
- *Garmin Traffic display (cool), Holding instructions on GNS 480 good feature*
- *It was easy to learn and train others to use.*
- *The display offers a wealth of information at your disposal*

- *Very nice*
- *The whole works is exceptional*
- *Terrain situational Awareness*
- *HITS, 3rd reference to new course excellent*
- *Nav database, dps enroute and approaches*
- *IFR operations, HITS, ease of use of Chelton System*
- *Terrain and map functions; we fly in mountainous terrain with low visibility*
- *Moving map and traffic display*
- *I like the big map*
- *The terrain avoidance feature*
- *The weather features*
- *The ability to monitor 2 frequencies at once*
- *I like that if I did go IFR in southeast Alaska, I could get home or to an alternate*
- *I like the speed tapes, alt tapes, etc. The display is well integrated.*
- *The efficiency of planning time enroute, etc.*
- *Ability and ease of use as opposed to paper charts*
- *Supplement pilotage in poor weather*
- *Windspeed and direction layout of PFD makes it very easy to see what the wind is doing and if the forecasts were right*
- *PFD layout is very easy to read*
- *GPS*
- *PFD, wind info, PND, OAT*
- *MFD - Moving map display*
- *Being able to see other aircraft on the Garmin system*

CP6. What do you dislike the most about Capstone avionics? Why?

- *Having to wait for it to warm up takes too long!*
- *Can't think of any thing*
- *No traffic yet*
- *Initialization time*
- *No anti-theft protection*
- *LON during and terrain going away when in a mountain pass which blocks GPS satellites. Terrain should still appear in dead reckoning mode.*
- *Don't like the auto-zoom feature on MFD*
- *Equipment changes. i.e. replacing the AHRs and ADCs due to equipment flaws. PFD flickering. Delays in having ADS-b available for traffic awareness, etc.*
- *It changes range when near terrain and overlays red and yellow making the nearest terrain harder to see and therefore more dangerous.*
- *Terrain feature – inaccuracy of moving map (Garmin)*
- *Terrain inaccuracy*
- *Poor graphics up close*
- *Garmin too much pushing and turning of buttons and lack of accuracy*
- *Garmin – bad, junk graphics on MX 20*
- *MX20 no user waypoints*
- *Not easy to update altimeter on Garmin*
- *Poor graphics*
- *Graphic resolution*
- *Slow to acquire and you need to move*

- *No ADS-B with Chelton. If we would have had ADS-B back when supposed to be installed, would have found missing Aircraft!*
- *It sometimes indicates movement about the aircraft axis that is not happening.*
- *High workload*
- *The lack of detail on the MX20 is sorely lacking; many islands, shorelines, etc. are either inaccurate, missing, or displaced (sometimes a half mile or more).*
- *There is no coverage for Canada or the lower 48 states; We do a considerable amount of work in Canada and an occasional trip to Washington State*
- *The flight planning, GPS direct and VFR approaches will all take you into a hill if you actually followed the course just one time*
- *Its ability to "suck you in"; sometimes I turn from the map function to the HSI function so I don't fixate on the moving map.*
- *It takes time to boot up and I can't move*
- Slow to come up
- *Inconsistencies – spool up times too long*
- *Nothing that I dislike, just ignore functions that I don't use*

CP7. What features would you like to see changed on the PFD and/or PND? Why?

- *PND – terrain features grainy – could use improvement*
- *Nothing*
- *Traffic*
- *More vertical navigation intelligence. I would like to create a flight plan where the avionics automatically provided the transition from the flight plan to the VFR approach including vertical navigation extending back from the approach into the flight plan.*
- *Get rid of auto-zoom on MFD*
- *Range ring scale default deactivated when close to terrain*
- *I would like to see the CDI available on the PFD and better resolution on the MFD*
- *More accurate data base – more dependable MFD*
- *None on Chelton*
- *Chelton – a user waypoint list instead of a nearest waypoint + list feature*
- *A separate button to list all user waypoints in data base that the operator has generated*
- *PFD water displayed would be neat*
- *Traffic would be great (Chelton)*
- *What is a PFD & PND?*
- *Better Graphics resolution (VFR Operations)*
- *Greater low level detail in PFD terrain*
- *More detailed map, including Canada*
- *See CP6*
- *Realistic terrain based HITS and GPS courses*
- *None at this time*
- *Make the PFD able to show the MFD display*
- *Traffic*
- *On the PND, I would like to see a better map that shows lakes and the names of lakes, rivers, and other landmarks*
- *Better graphics – closer tolerances*

CP8. Are there additional features you would like to see?

- *No*
- *Can't think of anything*
- *Traffic*
- *There needs to be a way for the pilot to easily modify a flight plan, while in the air, to account for the runway of choice. Flying a flight plan to the airport results in me having to perform my own navigation to get on a VFR approach. Need an easy way to say "go direct from where I am to X distance out on the VFR approach" and have it provide horizontal and vertical nav.*
- *ESPN*
- *Chelton – user waypoint list added for easy access of operator, because not all 135 operators use VOR/NDB fixes to navigate to/from*
- *Satellite radio that can be piped through our headsets*
- *Hope it works when SAR is needed*
- *ADS-B with Chelton in operation*
- *Traffic*
- *Traffic*
- *It would be nice to be able to scroll through all user waypoints*
- *Include track back*
- *Less start up functions (Garmin)*

RLS1. Are you familiar with the capabilities of "Radar-Like Services" available for Capstone-equipped aircraft?

No ➔ *describe with standard definition, below and skip RLS2*

Yes

Capstone's ADS-B transmits the aircraft's location to ground stations, which forward it to Air Traffic Control computers. Those computers display the locations along with aircraft locations from radar and transponders. This allows controllers to provide flight-following and surveillance-based separation services.

RLS2. Do you know how to obtain those services?

No (Skip to CP8)

Yes

RLS3. On how many flights in the last 12 months have you requested radar-like services?

- *Not here yet*
- *10 requests in the lower 48. 90% received requested service*
- *Don't have the service yet*

RLS3b. On how many of these flights have you received the requested radar-like services?

P8. What benefits have you experienced from the Capstone program?

- *Traffic and weather are not yet available.*

	No Benefit	Very Small Benefit	Some Benefit	Signifi-cant Benefit	A Major Benefit
a. Fewer cancelled flights due to new instrument approaches at remote airports	*19*	*1*	*1*	*3*	*1*
b. Safer operations at remote airports due to new instrument approaches	*18*	*0*	*3*	*2*	*2*
c. Safer flying in minimum legal VFR conditions	*2*	*0*	*3*	*7*	*17*
d. Fewer near mid-air collisions	*14*	*1*	*6*	*2*	*3*
e. More useful weather information	*23*	*1*	*0*	*1*	*0*
f. Better knowledge of other aircraft and ground vehicle locations when taxiing	*22*	*1*	*1*	*0*	*1*
g. Improved SVFR procedures due to better pilot and controller knowledge of aircraft locations	*15*	*1*	*4*	*3*	*4*
h. Easier in-flight diversions or re-routes	*10*	*3*	*6*	*5*	*4*
i. Time savings from more direct flight routes	*2*	*6*	*9*	*7*	*6*
j. Improved terrain awareness for pilots	*1*	*2*	*5*	*7*	*16*
k. Improved search and rescue capabilities	*5*	*3*	*6*	*5*	*8*
l. Better condition information enabled by soliciting info from pilots identified on the traffic display near destination	*15*	*3*	*4*	*1*	*3*
m. Reduced navigation workload, enabling more attention to primary flying tasks	*4*	*4*	*7*	*8*	*6*
n. Improved collaboration with Dispatch on continuation decisions	*17*	*3*	*6*	*0*	*0*
o. Improved overall Safety Culture	*0*	*2*	*6*	*13*	*10*

CP9. If there are other benefits you believe that Capstone provides, please list them.

- *Reduces stress – dispatchers know where aircraft are at all times – when to meet the plane – etc!*
- *Passengers feel safer.*
- *Overall situational awareness*
- *In terms of safety Capstone moving map GPS navigation has benefited more than any other invention.*
- *Fly in straight line – traffic avoidance*
- *More of a comfort factor in marginal weather*
- *Provides other options besides a DF steer if accidental IMC encountered.*
- *I am really sold on the Capstone. I feel much safer in a non-radar VFR only environment*

CP10. What problems have you experienced with the Capstone program?

	No Problem	**Very Small Problem**	**Minor Problem**	**Signifi-cant Problem**	**Major Problem**
a. Less heads-up time	*13*	*8*	*6*	*2*	*1*
b. Heavier workload in the cockpit	*19*	*5*	*3*	*2*	*1*
c. More aircraft flying in the same airspace because they are using GPS point-to-point routing	*18*	*5*	*6*	*0*	*0*
d. More complexity than needed for VFR flight	*18*	*5*	*4*	*1*	*2*

CP11. Please list any other problems you believe that Capstone may cause or add to.

- *If the system goes down and the pilot does not carry a hand held GPS – he/she could potentially have gotten himself in too far to get back out*
- *For better or worse, we are flying in poorer weather and in weather that is more likely to deteriorate than if we didn't have Capstone.*
- *Possibly could lead to pilot complacency in MVFR*
- *The temptation to break VFR rules – trusting Capstone*
- *A less experienced pilot might exceed his or her limits in hopes of getting the flight accomplished*

- *Pilots flying in IMC with VFR aircraft*
- *Accuracy of the graphics programs may cause problems (e.g. Baranof eastern shoreline is off by up to 200 yards*
- *The problem I can see is not having a full understanding of how to operate the A/C system and not be able to access info you want or screen if you don't understand the set up procedure*

CP12. When you fly Part 135, how often is the aircraft Capstone equipped?

Always *21* Usually *9* Sometimes Rarely Never

↓

Skip to Question CP 15, next page

CP14(Rev).How much does the capability of the Capstone equipment help you to make go/no go and diversions or re-routing decisions ?

	Not at all	**A small amount**	**A great deal**	**Don't know**
a. Go/No Go Decisions	*14*	*9*	*7*	*0*
b. Diversions/Re-outing Decisions	*6*	*14*	*9*	*0*

CP15. For what reasons might pilots choose not to use some Capstone equipment?

	Yes	**No**	**Don't Know/ No Opinion**
a. Too distracting	*11*	*17*	*2*
b. Too difficult to use	*8*	*20*	*2*
c. Don't want others watching aircraft location at all times	*17*	*9*	*3*
d. Don't trust equipment to provide reliable information	*15*	*12*	*3*
e. Concerned that equipment might break	*10*	*17*	*2*

CP15b. If you answered yes, above, please explain:

- *Don't like the FAA watching when ceilings are low.*
- *Glide distances sometimes become a problem*
- *Other companies should not have access to our flight info. If others can see that you are "making it through" you lose your economic advantage, so can turn it off to keep the "flyable areas" to yourself. Others can use the system to make reports to FAA on your operations that bring your under scrutiny, even if you are not doing anything wrong (harassment).*
- *Capstone is like 4 wheel drive. It will get you a lot of places, but when it breaks you're stuck that much further out.*
- *Really like to see RLS up and working*
- *I think the special enroute IFR mode of operation should be allowed if redundant equipment is installed and ADS-B is used to avoid other aircraft. I think it would be safer to fly through 10 miles of clouds at 2000 feet than at 500 feet in 2 miles visibility.*
- *Initially the system is distracting for "looking" outside.*
- *Differences in PA verses true or indicated altitude can be misleading on CRABS display*
- *With having to replace ADC, AHRs in all aircraft, one does not feel confident with the reliability of equipment.*
- *As company training pilot, many old timers refuse to embrace anything new. To shift paradigms for these fellows has been a battle.*
- *Flying below minimums*
- *Have had questionable fuel and wind readings on some occasions*
- *Color warning graphics that are in front of the airplane are a complete distraction when VFR in marginal weather*
- *Map display graphics are marginal at best. Lakes that are several miles long and islands & bays that are equally big are sometimes completely left out.*
- *Garmin is inaccurate and the workload to operate is high*
- *Garmin not as user friendly as Chelton*
- *Most pilots who have flown safely for years in Alaska question the new technology and also the financial burden of maintaining this equipment when it becomes outdated.*
- *Self evident. I don't want my secret fishing holes to be found by others.*
- *Pilots and the pax find themselves staring at the dash rather than outside in VFR*
- *Used to get in the airplane and go. Now have to turn on Capstone and set fuel, etc.*
- *People do not need to see my location (FAA). On the other hand, I think this will help with dispatch info, etc. (CRABS).*
- *High workload*
- See CP6
- *"c" I've heard this concern from "old timers"*
- *"d" and "e" I'm still skeptical*
- *Competition with other airlines*
- *It occasionally might have flaws and is new*
- *It's new technology*
- *Some functions require several steps to get started, such as instrument approaches(b)*
- *Some pilots worry about accidentally violating airspace or altitude minimums and being violated (c).*
- *We've all heard of systems giving erroneous position indications*
- *Some installations go off-line every once in a while*
- *Start up time/lack of correct ground position (Garmin)*

CP16. Please list any other reasons you believe pilots might choose not to use some Capstone equipment.

- *There are valid concerns that w/ADS-B that pilots may be violated through flight tracking.*
- *Lack of training to understand systems. Older pilots just don't want to learn new ideas/concepts*
- *Many pilots that fly VFR only and have never experienced IFR hold sour opinion about the benefits of Capstone equipment. They say your head should always be outside the cockpit, not staring at a panel*
- *May turn systems off to violate or if have to violate minimums*
- *They seem to think its too complicated due to not receiving good hands on sim training*
- *Some companies would not like ADS-B, don't want people to know where they are.*
- *The AHRS battery system doesn't seem to shorten startup time*
- *Start up time/lack of correct ground position (Garmin)*
- *Short flight, sunny day, no wind, won't turn it on.*

The next five questions ask about potentially dangerous situations that pilots sometimes encounter. Capstone equipment might be helpful in preventing or coping with these particular problems. Therefore, we're interested in how often pilots encounter these problems. For each situation, think about how often in the last 12 months you've encountered it.

	Daily	**Weekly**	**Monthly**	**Less often than monthly**	**Never**
CP17. How many times during the past year have inaccurate weather forecasts caused you to encounter instrument meteorological conditions when you didn't expect to?	*2*	*4*	*10*	*9*	*5*
CP18. How many times during the past year have deteriorating ceilings or visibility made you unsure of your own position relative to the surrounding terrain?	*0*	*1*	*5*	*13*	*11*
CP19. During the past year, how many times have you unexpectedly seen other aircraft close enough to you that you felt it created a collision hazard?	*1*	*1*	*3*	*13*	*12*
CP 20. During the past year, how many times have you been cleared into SVFR when the separation between aircraft in the pattern made you uncomfortable?	*0*	*0*	*0*	*7*	*23*
CP21. During the past year, how many times might your go/no go or routing decisions have been improved if you would have had access to real time weather or Special Use Airspace status?	*2*	*4*	*4*	*8*	*11*

CP22. How much do you think the Capstone program has affected the safety of flight?

Much less safe	Somewhat less safe	No change in flight safety	Somewhat safer	Much safer
0	*0*	*0*	*13*	*17*

- *less safe in that more planes in direct routes, somewhat safer in terrain avoidance, much safer for weather conditions*

CP23. Please add your comments about the relationship of Capstone to aviation safety, or about the safety challenges of flying in Alaska.

- *I have been flying up here for many years and the GPS idea has saved many lives. With forward looking screen it has improved it that much more!*
- *Capstone has spoiled me to fly anything else*
- *I can't imagine flying in Alaska without it.*
- *Capstone is very helpful to 135 operators. In my opinion flying is 10X safer now in SE AK.*
- *Capstone is the only FAA sponsored program that actually improves safety in my 20+ tears of flying. It is very beg step in a good direction.*
- *The Chelton with traffic capabilities will be the best thing to happen to Alaska Aviation*
- *Hopefully stop CFIT in Alaska. Alaska is not an easy place to fly, but with avionics like Capstone, hopefully, it will make for a safer sky.*
- *All positive – great crew, fine equipment*
- *A generation of pilots computer oriented can end up with their heads in the cockpit more than should be.*
- *Search and rescue – ADSB, how do we look at history to locate a missing aircraft?*
- *I think that for terrain clearance in SE Sitka area. Other aircraft in the area is not as heavy as I found in Kotz and Bethel. So, I am using it mostly for terrain and Nav functions*
- *I like it, however, a friend of mine crashed near Sitka in an aircraft equipped with Capstone. He was flying VFR in low ceilings and vis with high winds. I think it is difficult for a VFR pilot to transition to the gauges in an accidental IMC encounter. I suggest more frequent training rather than more training.*
- *The GBTs are few and far between, at least in southeast Alaska*
- *There is a great potential for increased safety in the Capstone Equipment*
- *Capstone really helps. It does allow you to push your envelope into the IFR, which is not good, but that's the pilot's fault of abusing technology. It does allow for quite safe scud running.*
- *Capstone can be a blessing or a curse, I think depending upon the person using it. If it is used to push the limit too far or "bootleg" IFR that is not good. But if used for supplementing pilotage in VFR, very good. (note, all my Capstone experience has been VFR)*
- *Seems to have improved flight into terrain accidents*
- *System seems overly complex and heavy compared to handheld devices that seem to have a better map, most necessary info, and less weight.*
- *When the whole Capstone system is up and running like designed with the hardware and software problems resolved it should contribute greatly to aviation safety.*

- *Here in the Southeast, the program is still building and headed in the right direction. The more real time features that are added, the better. The use of functions of the equipment will occur over time.*

Thank you for your time. All information you have provided is confidential and cannot be used for enforcement purposes.

8.5 Appendix E: Airport Facilities is SE Alaska

There are 89 airport facilities in SE Alaska. Of these, 24 are airports, 56 are seaplane bases and 9 are heliports. Figure 8.6-1 shows the location of these facilities and Table 8.6-1 lists their names and location.

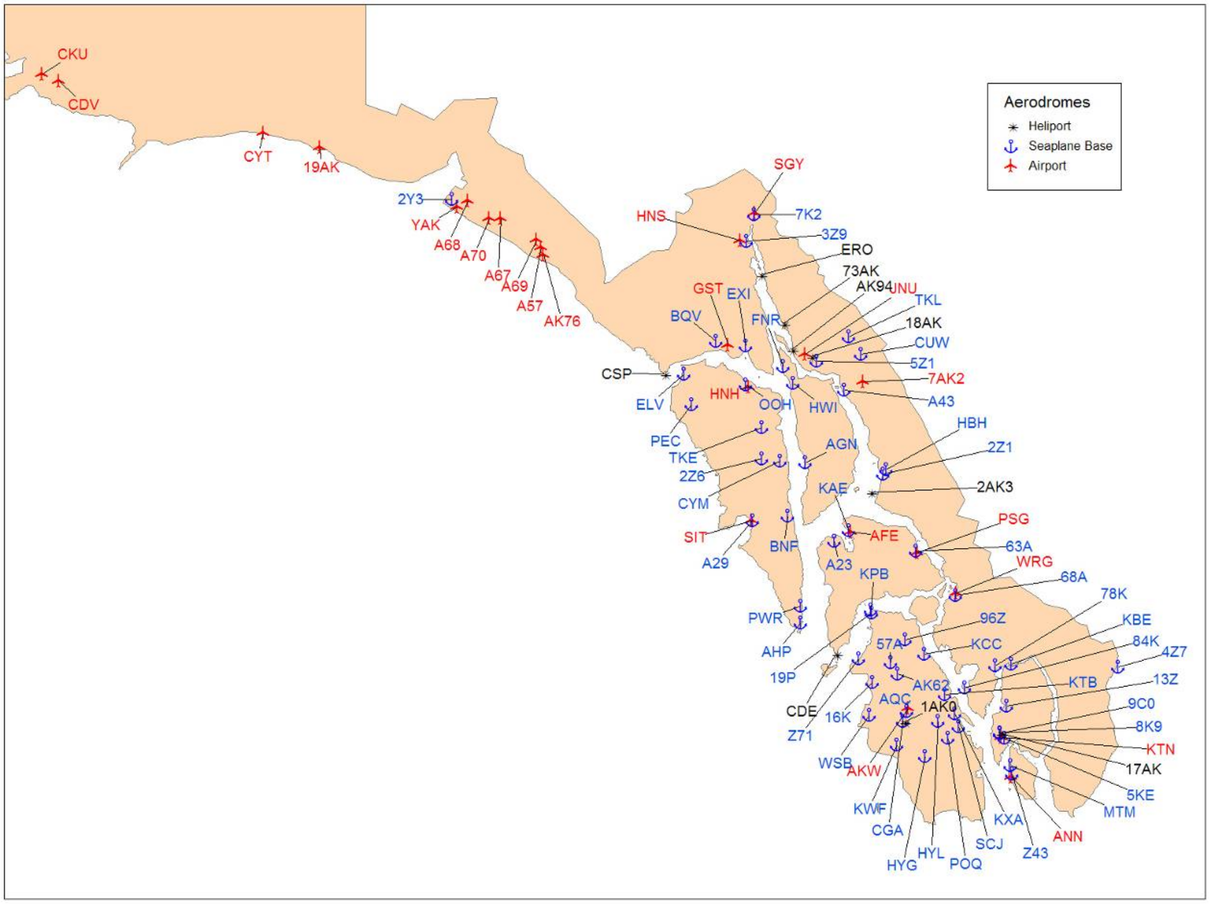


Figure 8.6-1 Airport Facilities in SE Alaska

Table 8.6-1 Airport Facilities in SE Alaska

Location ID	Official Facility Name	Facility Type	Airport Latitude	Airport Longitude
13Z	LORING	SEAPLANE BASE	55.60130583	-131.63668306
16K	PORT ALICE	SEAPLANE BASE	55.78490528	-133.59422361
17AK	KETCHIKAN /TEMSCO H/	HELIPORT	55.38298417	-131.73501833
18AK	NORTH DOUGLAS	HELIPORT	58.33217361	-134.49705333
19AK	ICY BAY	AIRPORT	59.96901889	-141.66177028
19P	PORT PROTECTION	SEAPLANE BASE	56.32880417	-133.61008444
1AK0	CRAIG CG	HELIPORT	55.47522028	-133.14585639
2AK3	FIVE FINGER CG	HELIPORT	57.26993639	-133.63145139
2Y3	YAKUTAT	SEAPLANE BASE	59.56247750	-139.74109944
2Z1	ENTRANCE ISLAND	SEAPLANE BASE	57.41215056	-133.43949889
2Z6	FALSE ISLAND	SEAPLANE BASE	57.53215444	-135.21345111
3Z9	HAINES	SEAPLANE BASE	59.23495111	-135.44071806
4Z7	HYDER	SEAPLANE BASE	55.90331972	-130.00670306
57A	TOKEEN	SEAPLANE BASE	55.93713333	-133.32672139
5KE	KETCHIKAN HARBOR	SEAPLANE BASE	55.34993056	-131.67668611
5Z1	JUNEAU HARBOR	SEAPLANE BASE	58.29888889	-134.40777778
63A	LLOYD R. ROUNDTREE SEAPLANE FACILITY	SEAPLANE BASE	56.81131972	-132.96005667
68A	WRANGELL	SEAPLANE BASE	56.46632500	-132.38001806
73AK	YANKEE COVE	HELIPORT	58.59166667	-134.90000000
78K	YES BAY LODGE	SEAPLANE BASE	55.91630139	-131.80113361
7AK2	SNETTISHAM	AIRPORT	58.13439583	-133.72951306
7K2	SKAGWAY	SEAPLANE BASE	59.44689528	-135.32266333
84K	MEYERS CHUCK	SEAPLANE BASE	55.73963611	-132.25501833
8K9	MURPHYS PULLOUT	SEAPLANE BASE	55.38965028	-131.73807417
96Z	NORTH WHALE	SEAPLANE BASE	56.11631056	-133.12171528
9C0	PENINSULA POINT PULLOUT	SEAPLANE BASE	55.38465056	-131.73835222
A23	SAGINAW	SEAPLANE BASE	56.88633222	-134.15838778
A29	SITKA	SEAPLANE BASE	57.05213778	-135.34620861
A43	TAKU HARBOR	SEAPLANE BASE	58.06911389	-134.01535639
A57	ALSEK RIVER	AIRPORT	59.18720694	-138.43923583
A67	HARLEQUIN LAKE	AIRPORT	59.41443889	-139.02504944
A68	SITUK	AIRPORT	59.55164417	-139.50918778
A69	TANIS MESA	AIRPORT	59.24804194	-138.50367056
A70	DANGEROUS RIVER	AIRPORT	59.41277056	-139.19392750
AFE	KAKE	AIRPORT	56.96136250	-133.91026111
AGN	ANGOON	SEAPLANE BASE	57.50355528	-134.58509389
AHP	PORT ALEXANDER	SEAPLANE BASE	56.24684222	-134.64815389
AK62	NICHIN COVE	SEAPLANE BASE	55.84964278	-133.22782750
AK76	EAST ALSEK RIVER	AIRPORT	59.12609444	-138.40674444
AK94	ALASCOM/COASTAL LENA POINT	HELIPORT	58.39078056	-134.77680000
AKW	KLAWOCK	AIRPORT	55.57923333	-133.07599722
ANN	ANNETTE ISLAND	AIRPORT	55.04243722	-131.57223194
AQC	KLAWOCK	SEAPLANE BASE	55.55465750	-133.10169278
BNF	WARM SPRING BAY	SEAPLANE BASE	57.08882583	-134.83314139
BQV	BARTLETT COVE	SEAPLANE BASE	58.45520778	-135.88517000
CDE	CAPE DECISION C. G.	HELIPORT	56.00211306	-134.13533917
CDV	MERLE K (MUDHOLE) SMITH	AIRPORT	60.49183389	-145.47765028
CGA	CRAIG	SEAPLANE BASE	55.47883139	-133.14780111
CKU	CORDOVA MUNI	AIRPORT	60.54390333	-145.72670417
CSP	CAPE SPENCER C.G.	HELIPORT	58.19906861	-136.63881056
CUW	CUBE COVE	SEAPLANE BASE	58.35000000	-133.76666670
CYM	CHATHAM	SEAPLANE BASE	57.51493833	-134.94621500
CYT	YAKATAGA	AIRPORT	60.08201250	-142.49348528
ELV	ELFIN COVE	SEAPLANE BASE	58.19518417	-136.34739278
ERO	ELDRED ROCK CG	HELIPORT	58.97105861	-135.23738222
EXI	EXCURSION INLET	SEAPLANE BASE	58.42049861	-135.44903278
FNR	FUNTER BAY	SEAPLANE BASE	58.25438583	-134.89790667
GST	GUSTAVUS	AIRPORT	58.42527000	-135.70741000
HBH	HOBART BAY	SEAPLANE BASE	57.45300700	-133.39330800
HNH	HOONAH	AIRPORT	58.09609139	-135.40969750
HNS	HAINES	AIRPORT	59.24382917	-135.52353750
HWI	HAWK INLET	SEAPLANE BASE	58.12744139	-134.75595306
HYG	HYDABURG	SEAPLANE BASE	55.20631611	-132.82831306
HYL	HOLLIS	SEAPLANE BASE	55.48158833	-132.64609417
JNU	JUNEAU INTL	AIRPORT	58.35497222	-134.57627778
KAE	KAKE	SEAPLANE BASE	56.97299639	-133.94561472
KBE	BELL ISLAND HOT SPRINGS	SEAPLANE BASE	55.92907806	-131.57169056
KCC	COFFMAN COVE	SEAPLANE BASE	56.00324444	-132.84196889
KPB	POINT BAKER	SEAPLANE BASE	56.35185972	-133.62258639
KTB	THORNE BAY	SEAPLANE BASE	55.68796194	-132.53667583
KTN	KETCHIKAN INTL	AIRPORT	55.35555556	-131.71375000
KWF	WATERFALL	SEAPLANE BASE	55.29632278	-133.24333583
KXA	KASAAN	SEAPLANE BASE	55.53741389	-132.39751444
MTM	METLAKATLA	SEAPLANE BASE	55.13104528	-131.57806750
OOH	HOONAH	SEAPLANE BASE	58.11215944	-135.45180500
PEC	PELICAN	SEAPLANE BASE	57.95517222	-136.23627333
POQ	POLK INLET	SEAPLANE BASE	55.35000000	-132.50000000
PSG	PETERSBURG JAMES A JOHNSON	AIRPORT	56.80165194	-132.94527806
PWR	PORT WALTER	SEAPLANE BASE	56.38101722	-134.65093111
SCJ	SMITH COVE	SEAPLANE BASE	55.43750000	-132.34166670
SGY	SKAGWAY	AIRPORT	59.46006194	-135.31566361
SIT	SITKA ROCKY GUTIERREZ	AIRPORT	57.04713889	-135.36161111
TKE	TENAKEE	SEAPLANE BASE	57.77965833	-135.21844389
TKL	TAKU LODGE	SEAPLANE BASE	58.48968306	-133.94342111
WRG	WRANGELL	AIRPORT	56.48432583	-132.36982417
WSB	STEAMBOAT BAY	SEAPLANE BASE	55.52963861	-133.64169722
YAK	YAKUTAT	AIRPORT	59.50330556	-139.66025000
Z43	TAMGAS HARBOR	SEAPLANE BASE	55.06799222	-131.55695472
Z71	CAPE POLE	SEAPLANE BASE	55.96629000	-133.79672111

8.6 Acronyms and Abbreviations

ADS-B	Automatic Dependent Surveillance – Broadcast
AFSS	Aeronautical Flight Service Station
AGL	Above Ground Level
ANICS	Alaska NAS Inter-Facility Communications System
AOC	Airline Operational Control
Apaid	A person certified by the National Weather Service (NWS) to provide weather information under the terms of a "per-observation" agreement.
ARTCC	Air Route Traffic Control Center
ASOS	Automated Surface Observing System
ATC	Air Traffic Control
ATD	Aviation Technology Division UAA
AWOS	Automated Weather Observation System
AWSS	Automated Weather Sensor System
CCCS	Capstone Communications Control Server
CDTI	Cockpit Display of Traffic Information
CFIT	Controlled Flight into Terrain
CNS/ATM	Communications, Navigation Surveillance/Air Traffic Management
EFIS	Electronic Flight Information System
ETMS	Enhanced Traffic Management System
FAA	Federal Aviation Administration
FAR	Federal Aviation Regulation
FCWOS	FAA Contract Weather Observation Station
FIS-B	Flight Information Service-Broadcast
FSDO	Flight Standards District Office
GPS	Global Positioning System
GBT	Ground Based Transceiver
HITS	Highway In The Sky (navigation guidance)
IDU	Integrated Display Unit (also Multifunction Display)
IFR	Instrument Flight Rules
LAWRS	Limited Airport Weather Reporting Service
MDA	Minimum Descent Altitude
MEA	Minimum Enroute Altitude
MFD	Multifunction Display (an IDU capable of multiple screens)
MMEL	Master Minimum Equipment List

MOCA	Minimum Obstruction Clearance Altitude
MSL	Mean Sea Level
MTBF	Mean Time Between Failures
NPA	Non-Precision Approach
PAI	Principle Avionics Inspector
PFD	Primary Flight Display
PMI	Principle Maintenance Inspector
POI	Principle Operations Inspector
RCO	Remote Communications Outlets
RCAG	Remote Communications Air Ground Facilities
RNAV	Area Navigation
RNP	Required Navigation Performance
SFAR	Special Federal Aviation Regulation
STAR	Standard Terminal Arrival Routes
STC	Supplemental Type Certificate
SUA	Special Use Airspace
TAWS	Terrain Awareness and Warning System
TCF	(violation of) Terrain Clearance Floor (on approach or departure)
TERPS	United States Standard for Terminal Instrument Procedures (TERPS) (FAA Order 8260.3B)
TIS-B	Traffic Information Service-Broadcast
TSO	Technical Standard Order
UAA	University of Alaska Anchorage
UAT	Universal Access Transceiver
VFR	Visual Flight Rules
VHF	Very High Frequency
VNAV	Vertical Navigation
WAAS	Wide Area Augmentation System
WSO	Weather Service Office