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National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

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In reply refer to: A-95-138 through -141

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The National Transportation Safety Board has had a longstanding interest concerning aviation safety in Alaska. One segment of Alaska aviation, the air taxi industry, was the subject of a special study published in September 1980.[1] The Safety Board concluded in the study that three factors contributed most to the high air taxi accident rates in Alaska: (1) the "bush syndrome," defined as an attitude of air taxi operators, pilots, and passengers ranging from their casual acceptance of risks to their willingness to take unwarranted risks; (2) inadequate airfield facilities and inadequate communications of airfield conditions; and (3) inadequate weather observations, inadequate communications of the weather information, and insufficient navigation aids.

As a result of the air taxi study, the Safety Board issued safety recommendations to the Federal Aviation Administration (FAA), the State of Alaska, and the Alaska Air Carriers Association (AACA) concerning the planning and development of Alaska's aviation system and infrastructure; weather observation and dissemination of weather information; and regulatory surveillance and operator safety oversight. Actions taken by the recipients in response to the recommendations combined with other safety developments during the 15 years since the Board's 1980 study have brought many improvements to aviation safety in Alaska. Despite the improvements, however, the Safety Board's investigations of aviation accidents in Alaska indicate that the safety issues identified in the 1980 study remain areas of concern.

Flight operations in Alaska are diverse, and they are responsive to the State's challenging aviation environment and its unique air transportation requirements. Some characteristics of Alaska, such as rough terrain, adverse weather, and extreme isolation, increase the risks to safe flight operations. The risks associated with these characteristics can be managed, to varying

[1] National Transportation Safety Board. 1980. Air taxi safety in Alaska. Special Study NTSB-AAS-80-3. Washington, DC.

degrees, by the operating practices of pilots and companies, and by the infrastructure of airports, navigational aids, air traffic control facilities, and weather facilities. The potential for managing the risks associated with aviation in Alaska is particularly high now, because of developments in navigation and communications technologies. The Safety Board conducted its recent study[2] to examine Alaska's current aviation environment and air transportation activities, to identify the associated risk factors and safety deficiencies, and to recommend practical measures for managing the risks to safe flight operations given the reality of Alaska's aviation environment and the potential of new technologies.

The Safety Board's review of commuter airline, air taxi, and general aviation accidents in Alaska highlighted two accident types of major consequence: (1) accidents during takeoff and landing, and (2) accidents related to visual flight into instrument meteorological conditions (IMC). Of the 172 commercial and private aviation accidents that occurred in Alaska during 1993, these two types accounted for 131 (76 percent). Of the 21 accidents that resulted in fatalities, the two types accounted for 9 (43 percent). Although takeoff and landing accidents are relatively frequent in Alaska, few of them result in fatalities; accidents related to visual flight into IMC are less frequent, but they account for a large share of the fatal accidents among commuter airline and air taxi operations in Alaska.

Information obtained through the Safety Board's public forums,[3] surveys of pilots and managers,[4] interviews with aviation personnel, and accident investigations highlighted several factors affecting the safety of operations conducted under visual flight rules (VFR) in Alaska: risk-taking behavior of pilots and operators; operational pressures; pilot decisionmaking; management attitudes; FAA safety programs; flight/duty time limitations; navigational aids; and weather information. The Safety Board examined these factors to identify methods for enhancing the safety of current VFR operations, particularly methods for reducing the occurrence of accidents related to VFR flight into IMC. Improvements made in these areas, plus improvements in the reporting of airport and runway conditions, would benefit all commercial and general aviation operations performed under VFR in Alaska.

Automated Surface Weather Observing Systems

Air taxi pilots interviewed by the Board in 1980 stated that improvements in weather observations were necessary and that only a system based on human observers would be satisfactory; remote automated weather observing systems were considered inadequate to fulfill

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[2] National Transportation Safety Board. 1995. Aviation safety in Alaska. Safety Study NTSB/SS-95/03. Washington, DC.

[3] As part of its study, the Safety Board held public forums on aviation safety in Alaska in Juneau on May 22, 1995, and in Anchorage on May 24 and 25, 1995.

[4] Between March and August 1995, the Safety Board obtained information about aviation operations through structured, on-site interviews of 50 pilots and managers of commercial operations (commuter airlines and air taxis) in Alaska.

the needs of the pilots. Since that time, improvements in remote sensing technology have resulted in the development of automated surface weather observing systems that are capable of observing and reporting basic weather observation elements without manual input. The FAA, the National Weather Service (NWS), and the Department of Defense (DOD) have committed to these systems, and it appears that most or all future expansions of the number of surface weather observing sites in the United States will utilize automated weather observing systems. Further, the FAA and NWS are implementing a national program to convert most existing sites from manual to automated weather observing.[5]

Most automated observations are generated by two systems: (a) the FAA-sponsored automated weather observing system-3 (AWOS), and (b) the NWS, FAA, and DOD-developed automated surface observing system (ASOS). The AWOS reports cloud/ceiling data, sensor-equivalent visibility, temperature, dew point, wind data, altimeter setting, and density altitude. The ASOS reports these elements plus the present weather/restrictions to visibility, such as precipitation type or fog. Currently, 91 civilian AWOS and ASOS[6] are planned for Alaska.[7]

Acceptance of the automated surface weather observing systems by users in Alaska has been mixed. Some operators and pilots who were interviewed expressed appreciation for the coming expansion of the weather observing network. Others expressed dissatisfactions with the accuracies of the existing (AWOS) units' ceiling and visibility determinations and with the systems' reliability. Another complaint expressed by users about automated surface weather observing systems was the absence of remarks concerning the surrounding weather in these systems' reports submitted to the weather observing network. VFR pilots are concerned about weather along the route of flight, and the remarks of distant weather (beyond the airport boundaries) from the surface weather observations taken by human observers are very useful in filling in the "big picture." Pilots consider information such as cumulonimbus clouds, fog banks, mountain obscuration, lenticular and rotor clouds, and other distant weather phenomena crucial in making sound decisions on whether to initiate or to continue flights under VFR conditions.

Because current technology does not allow automated systems to replicate all elements of a manual weather observation, such as the presence of a thunderstorm at an airport, Federal agencies have determined that certain additional weather information relevant to the airport should be added at selected automated weather observing sites. This will be accomplished by maintaining trained weather observers at these sites to oversee the automated observations and to augment the weather elements observed by the automated systems.

An FAA weather specialist stated that the agency currently augments AWOS observations at the six locations in Alaska where AWOS operates during hours that qualified weather observers staff the site. Likewise, the NWS plans to augment the ASOS observations at the 13

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[5] In Alaska, the FAA will continue to conduct manual weather observations at about 20 locations.

[6] An additional 14 military AWOS are operational in Alaska.

[7] FAA Alaskan Region. November 1, 1994. An overview of Alaskan aviation weather system capabilities. [Mimeo].

NWS offices where ASOS has been installed, once the units are commissioned. However, both agencies limit the number and type of weather phenomena that an observer augmenting the AWOS/ASOS can add manually to an automated weather observation.

FAA and NWS national guidelines[8] define information relevant to an airport as weather phenomena occurring within a 5-mile radius of the airport. These guidelines also limit the weather phenomena for manual augmentation of automated weather observations to thunderstorms, tornados, freezing rain, hail, virga (precipitation aloft that evaporates prior to reaching the ground), and volcanic ash. However, according to FAA weather specialists interviewed by the Safety Board, the FAA Alaskan Region currently relies on interim guidelines[9] that allow the weather observer slightly more flexibility in the augmentation process, but do not extend to the full set of operationally significant remarks found in standard manual observations.

NWS specialists interviewed by the Board reported that at designated stations where the NWS has a presence, the agency is planning to report operationally significant aviation information that is not obtained by ASOS by means of a supplementary data observation (SDO).[10] The SDO for an airport is to be included in a separate bulletin rather than attached to the automated observation. Currently, the SDO bulletins are disseminated on internal NWS communications circuits and to some external users, but not to FAA weather briefers or to pilots via the aviation weather data network.

Because automated surface weather observing systems do not provide pilots all of the operationally significant weather information that manual weather observers can provide, it is essential to continue augmenting the automated (AWOS and ASOS) observations with additional information at locations in Alaska where qualified observers are available. Further, the current guidelines defining the number and type of observation elements that may be added to automated weather observations are too restrictive, because they exclude some operationally significant weather phenomena, such as fog banks in the vicinity of an airport. Finally, the dissemination of manually augmented weather information from automated weather observing sites is inadequate because the information is not transmitted within a single weather observation from all automated systems to the aviation weather data network.

The Safety Board believes that at all automated surface weather observing sites in Alaska where currently there are qualified FAA or NWS weather observers (including contract weather observers) on site, the responsible agency should ensure that (1) operationally significant information, including distant weather information, is manually added to automated weather

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[8] (a) NWS Observing Handbook No. 7, Surface Observations. (b) FAA Order 7900.5, Surface Weather Observing.

[9] (a) FAA Observer Handbook (Interim), Automated Weather Observing System (AWOS). (b) Notice 7110.97, Interim Operating Procedures for Surface Automated Weather Observing Systems.

[10] The following elements and remarks pertinent to aviation are among those specified to be included in the SDO: ice crystals, ice fog, blowing snow, snow increasing rapidly, sector visibility, significant cloud types such as rotor and altocumulus standing lenticular, and distant clouds obscuring mountains.

observations until technological progress eliminates the need; and (2) all such information is combined and disseminated in a single aviation weather report.

Graphical Weather Products for Aviation in Alaska

The Alaska Aviation Weather Unit, developed through an NWS initiative, is scheduled to be commissioned early in 1996. The unit will add two additional aviation forecasters during each 8-hour shift and will be responsible for the issuance of all area forecasts and in-flight advisories for the State. Equally important, the unit will produce weather graphics specifically tailored for aviation in Alaska and then disseminate them to AFSS and NWS offices. The graphics products will be designed primarily for the FAA personnel who provide weather briefings to pilots. Proposed graphics products include a composite area forecast, 12- and 24-hour aviation significant weather prognosis charts, Alaska surface map, weather depiction chart, radar chart, winds aloft chart, and satellite pictures specially annotated by NWS personnel.

These graphics will represent a major improvement over currently available products and should result in better pilot weather briefings. Further, the safety benefits of these graphic products can be increased through their wide dissemination on graphics-capable media that reach Alaska's pilots. The Safety Board believes that the NWS, with the assistance of the FAA, should provide Alaska-specific graphical weather products on the NWS's aviation weather program telecast nightly on Alaska public television and the Rural Alaska Television Network, on the Direct User Access Terminal System, on the Internet, and on commercial weather information services that use NWS information.

Video Camera Observations

Remote black and white video cameras have been used for experiments in weather observations in Alaska with varying amounts of success since the late 1970s. As a result of its 1980 study of air taxi safety in Alaska, the Safety Board recommended that the FAA:

> Continue to develop and improve, in cooperation with the National Weather Service, the technology of the television weather observation system in Alaska. (A-80-104)

The FAA tested a closed circuit video camera during the early 1980s at Unalakleet. According to the FAA, the system was unsuccessful because of the lack of contrast in the terrain. The remote video test program was terminated during 1984 except for a unit at Potato Point. On October 9, 1984, the FAA replied to the Safety Board that difficulties with camera resolution and physical location, exacerbated by local terrain and climatological conditions, resulted in unsatisfactory performance of the video weather observation system. The FAA believed that further installations were unwarranted.

Since the test program was terminated, video imaging technology has developed considerably, with better results. The most successful and still ongoing use of video camera technology is at Valdez (Potato Point). Information from the Potato Point images is manually placed in the remarks section of the Cordova hourly weather observation.

The Canadian Atmospheric Environment Service (AES) has successfully used color cameras to provide either supplementary qualitative information for automated weather observation sites or information about specific phenomena, such as fog, at nonairport locations. Calls to the sites where cameras are installed are generally done as needed, although calls may be scheduled. The captured video images are displayed on either a personal computer or a forecaster meteorological workstation. Information from the video images is not attached to weather observations disseminated to pilots, but it is used by forecasters to verify automated observations and to provide supplementary weather information, such as distant weather.

The typical system, consisting of three fixed cameras per site, housing, computers, and installation expenses, costs about $9,000. As of 1995, AES video systems have been installed at about 30 locations across Canada. According to an AES official, 6 additional systems are to be installed in Alberta and Northwest Territories during 1996.

The NWS does not have a national policy concerning the applications of remote video camera technology, and it has no plans to incorporate remote video data into ASOS observations. However, the NWS Western Region has experimented with remote color video cameras at several locations in Utah. The video images have been well-received by Utah weather forecasters and have proven valuable to forecasters in determining precipitation type, visibility, and distant clouds. The NWS Alaska Region expressed its interest in remote video systems and their possible applications in the Alaskan environment. Although the Region has briefly looked at some current technology in cooperation with the regional telephone company, further efforts are hampered because there is no national policy or funding.

Remote color video systems could conceivably be of great benefit in Alaska at selected airports or other locales where, because of terrain features or unique weather phenomena, automated observations are not able to provide the necessary ancillary area weather intelligence. The Safety Board believes that the NWS should evaluate, with the assistance of the FAA, the technical feasibility and aviation safety benefits of remote color video weather observing systems in Alaska.

Mike-in-Hand Weather Updates

In addition to the weather reports that pilots need for preflight planning and decisionmaking, pilots also need updates of recent (near real-time) weather and airport conditions during en route flight. The dissemination by radio of near real-time weather and airport information to pilots in flight is referred to as "mike-in-hand" service. The FAA provides mike-in-hand service at all FSS and FAA contract weather observing facilities in Alaska. In contrast, the NWS has a longstanding national policy that generally prohibits NWS employees from

providing radio service to pilots.[11] In the past when this issue has been raised by users, the agency has stated that its personnel have neither the training nor experience to provide the service. More importantly, the agency was concerned that if employees were given the additional responsibility, there was potential for a conflict of duties; for example, when employees conduct the weather watch during adverse terminal weather conditions, they are required, at times, to be out of the office.

The commissioning of ASOS units and other planned restructuring of weather office duties should relieve NWS employees of many of their routine weather observing duties and allow more time for other tasks. These forthcoming changes in the Alaskan weather program provide the NWS an opportunity to reevaluate its policy. Mike-in-hand capability at the NWS offices would be a means by which pilots could obtain significant terminal area weather information that otherwise would be unavailable.

The safety advantages of providing near real-time weather information to pilots are significant, especially in Alaska, given the current limitations of automated surface weather observing systems. The Safety Board believes that the NWS should revise its current policies to provide mike-in-hand radio service for aviation surface weather information at locations in Alaska where NWS and contract weather observers are sited until automated surface weather observing systems transmit observations of all operationally significant weather phenomena to pilots operating in the terminal area.

Therefore, the National Transportation Safety Board recommends that the National Weather Service:

> Ensure, at all automated surface weather observing sites in Alaska for which the National Weather Service is responsible, and where currently there are qualified NWS weather observers (including contract weather observers) on site, that (1) operationally significant information, including distant weather information, is manually added to automated weather observations until technological progress eliminates the need; and (2) all such information is combined and disseminated in a single aviation weather report. (Class II, Priority Action) (A-95-138)

> Provide, with the assistance of the Federal Aviation Administration, Alaska-specific graphical weather products on the National Weather Service's aviation weather program telecast nightly on Alaska public television and the Rural Alaska Television Network, on the Direct User Access Terminal System, on the Internet, and on commercial weather information services that use NWS information. (Class II, Priority Action) (A-95-139)

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[11] For many years, however, the NWS has informally provided radio service to pilots at St. Paul Island, Alaska, where the agency operates an installation.

Evaluate, with the assistance of the Federal Aviation Administration, the technical feasibility and aviation safety benefits of remote color video weather observing systems in Alaska. (Class II, Priority Action) (A-95-140)

Revise current policies to provide mike-in-hand (near real-time) radio service for aviation weather information at locations in Alaska where National Weather Service and contract personnel are sited until automated surface weather observing systems transmit observations of all operationally significant weather phenomena to pilots operating in the terminal area. (Class II, Priority Action) (A-95-141)

The Safety Board also issued safety recommendations to the Federal Aviation Administration, the United States Postal Service, and the State of Alaska.

The National Transportation Safety Board is an independent Federal agency with the statutory responsibility "...to promote transportation safety by conducting independent accident investigations and by formulating safety improvement recommendations" (Public Law 93-633). The Safety Board is vitally interested in any actions taken as a result of its safety recommendations and would appreciate a response from you regarding action taken or contemplated with respect to the recommendations in this letter. Please refer to Safety Recommendations A-95-138 through -141 in your reply.

Chairman HALL, Vice Chairman FRANCIS, and Members HAMMERSCHMIDT and GOGLIA concurred in these recommendations.

By: Jim Hall
Chairman