ALASKA LEGISLATURE COMMITTEE FILES 1983-1984 8672

2331 SHESS SB 114

2331

hours in type." The decision was made to gather similar data from all the respondents who were in management positions, consequently with the approval of the AASF board, the eight questions which follow were added to the questionnaire while the original management questions were deleted.

The eight questions which were asked of management respondents are presented with comments on the findings. The questions and comments are followed by a summary of the recommendations of the AATC research team regarding management training. Also a plan is suggested to encourage insurance underwriters to discriminate among operators, thereby rewarding the safer operators with discounts while surcharging those operators whose accident record is contributing to the overall higher insurance costs in Alaska.

What qualifications do you require when hiring? (total hrs, Alaska hrs, etc.)

Many operators volunteered information on their minimum requirements for employment. They perceived these minimums as representing the reason their air taxi service was safer. Many managers said that the insurance company sets the minimum standards. Although the range of responses indicate considerable variability, the typical operator requires 1,000 to 1,500 hours total time and from 250 to 500 hours in Alaska.

How do you check on a pilots background?

Operators claimed that their pilots were safer because of the high initial qualifications and experience level required. However, many managers said the only way they checked on a pilot's background was by reviewing log books and resumes. Some operators complained that they were unable to get accident/violation records from the FAA. It appeared to the researchers that few operators did a very complete pre-employment check. Because a pilot's accident violation record was usually not discovered, some pilots could go for many years drifting from one operator to another having one or two accidents or mishaps, then moving on.

Many operators claimed that they called previous employers when doing a pre-employment check. However, one operator said he had employed over 150 pilots at various times in his air taxi service and reported he received only one call from another operator checking on a former employee's background.

Several respondents suggested that a significant step toward reducing the high accident rate in Alaska would be to have a readily accessible source of information regarding a pilot's flight experience and employment record. Hopefully this would not only eliminate careless pilots from the employment pool, but would also encourage pilots who are dedicated to the aviation industry to maintain a professional attitude.

How do you train a new pilot?

Managers' responses to this question varied widely. Few operators had well structured, systematic initial and recurrent training programs. Some had the new pilot read the company operations manual, then fly as a co-pilot on one of the multi-engine aircraft for a year or more. Most gave a check ride and had the pilot observe on a flight or two, then fly a few revenue flights with a check airman, after which no further training was provided. Most training as reported by the pilots was either trial-and-error or on-the-job.

On the average, how much time and money do you spend on training a new pilot?

The responses were very diverse due to the type of flying done and equipment used. Our examination of the responses revealed that air taxi operators spent two to three days, which included a local flight check and sometimes a trip check with an experienced pilot on a typical route. Some operators reported that the estimated cost of the initial training process was about $1,500 to $2,500, however most respondents were unable to quantify their response to this question.

How often is it necessary to have a pilot fly into unfamiliar territory? How do you brief a pilot about unfamiliar territory?

Most operators reported that pilots were frequently required to fly to areas they had never flown into before. Although some operators provided a detailed briefing before the flight many pilots reported that they received no briefing and had to rely on their own resources to learn how to avoid problems.

Because of a pilot's need to fly into unfamiliar and difficult areas without structured route checks, a training program must emphasize contour map reading skills and pilotage. For example, a pilot should be trained to read a contour map with enough proficiency that he can determine the lowest altitude he can fly in a mountain pass and still make a 180° turn, while maintaining adequate terrain clearance on each side of the aircraft.

How are pilots paid? (hourly, monthly, etc.) How much?

In the early interviews several of the larger operators stated that they were able to obtain the best pilots because they paid a good salary, plus an hourly rate, in addition to a generous per diem and a good benefit program. Other operators, however reported that they paid an hourly rate only for the hours flown. Interviews with pilots revealed that many of the operators who paid an hourly rate only paid for the time between takeoff and touchdown. A few operators paid an hourly rate but specified the time for each route. Still others paid the pilot a commission for the revenue generated on each flight. Some operators used a combination of the above remuneration plans.

Pilots reported that they believed a relationship existed between safe operating practices and pay plans. Some of the implications are:

1. Turnover. Pilots who are adequately remunerated tend to remain with an operator longer, thereby reducing training costs and the potential for accidents through familiarity with routes and equipment.
2. Hurry-up syndrome. Pilots paid on a block-to-block basis may enhance their hourly rate by taking many shortcuts. Likewise, pilots paid only for the time between take-off and touchdown may short cut the preflight planning, inspection, loading and engine warmup hurrying to become airborne.
3. Coercion. Although operators did not report paying their pilots only if the trip was completed, a few pay their pilots on a commission basis. This encourages pilots to press on to complete a trip even when the weather is below operational minimums indicating that the successful completion of the trip may be in doubt.

Several operators suggested that there is a definite relationship between the method by which pilots are remunerated and the safety of an operation.

When pilots are out on a flight, how do you keep informed of their location and/or changes in their route?

Some operators providing hunting and fishing services reported they installed elaborate and expensive company communication systems. However, many on-demand charter operators did not have a formal means of keeping informed of the flight's progress after dispatch. The operators not maintaining a continuous communications contact need to ensure that the pilots they dispatch are highly experienced for the flight being conducted. Operators without company communication systems frequently availed themselves of the Federal Government Flight Plan system when flights were operated within range of FAA radio facilities. Many operations were conducted by notifying company personnel of the intended route to be taken, estimates of time enroute, anticipated delays at each airport, etc., so overdue flights could be searched for using the information provided by the pilot. Changes made enroute were sometimes reported by the microwave telephone system when radio contacts were not possible.

Management Factors Affecting Safety

From the beginning of this project many Alaskan aviators reported the belief that the principal problem of air taxi safety in Alaska was not limited to piloting skills. Respondents reported case after case of some managers creating unsafe conditions through shortsighted attempts to increase profits. This attitude could have resulted in the high accident rate previously reported in the National Transportation Safety Board Study "Air Taxi Safety in Alaska". In this study many of the accidents were attributed to the "Bush Pilot Syndrome". The research team discovered that this "Bush Pilot Syndrome" seemed to be more prevalent in some companies. Other companies had considerably fewer accidents. The question which faced the research team was, "What factors differentiate among companies with higher accident rates compared with those with a lower accident rate?" The answer to this question seems to validate the fact that management is ultimately responsible for everything that happens in its organization. The management factors identified as those affecting the safety of an operation included; operational control, accounting procedures, and personnel practices.

1. Operational Control

When the interviewers asked questions regarding go/no go criteria, the responses were often vague and ill defined. Standard procedures were often poorly defined.

Even though Federal Air Regulations and operating manuals may specify limits, standards, and go/no go criteria, enforcement was frequently non-existant. Sometimes pilots were rewarded for "getting through", although company or federal regulations prohibited the dispatch or continuation of the flight.

Some managers expressed a need for training in the techniques of setting standards and ensuring compliance from their personnel. An effective training program must include a heavy emphasis on management psychology. Managers must be trained to avoid unwittingly pushing pilots into attempting flights beyond the capability of the pilot or the aircraft. Managers must learn to cope with passenger pressure; passengers who want to go anyway or go because other pilots have or passengers who tell the operator or pilot how to fly.

Finally, managers must be aware of the self-imposed pressures placed on pilots or pressure from other pilots in the company. An example of this pressure manifests itself when an incapable, inexperienced pilot attempts to duplicate the skill level of a senior pilot who has acquired his expertise over many years of flying in the local area.

In short the manager must learn to define standards and enforce them.

2. Accounting Procedures

Accounting procedures employed by Alaskan air taxi operators seemed to be very diverse. Many operators began their flying operation with minimal assets and equipment. After only a short time in business, the requirements and demands of the Alaskan economy necessitated increased flights, and many operators expanded their businesses to include sizeable airplane fleets. Some operators, however, personally attempted to handle the accounting and financial tasks, though their expertise was mainly in the cockpit. Others who hired professional accountants seemed to fare better. Good management discouraged the cost-cutting efforts employed by some operators who were inexperienced in accounting practices. This false economy sometimes contributed to the cause of accidents; less frequent maintenance inspections, employing less skilled pilots, etc.

Successful managers constantly reviewed the price and cost structure within their organization, adjusting prices to ensure a profitable venture, rather than employ the haphazard "guess-timates" or quick fixes used by other operators attempting to remain competitive. For example aircraft overloading is frequently done by some operators to accommodate customer requests in order to be looked upon favorably for future business. Unfortunately, these operators who gave away "the company store" paid the price for their benevolence by incurring increased operating costs, higher maintenance costs, reduced number of flights etc., reducing the company's profitability.

As profits decreased, some operators reacted by postponing or neglecting maintenance, reducing or eliminating training, hiring the least qualified personnel, and taking trips in weather conditions which were below minimums. These attempts to reduce costs often resulted in accidents which add even more costs to the operation and the cycle goes on in a continuing downward spiral. Management training must be designed to prepare the manager to include all of the costs of the operation into the price of the services offered. Managers must know how to maintain a continuous cost review. They must learn what the hidden costs of having an accident are and that it is more profitable to have an accident-free air taxi business than to pay the price of an unsafe operation.

3. Personnel Practices

A frequently cited reason for the cause of an accident is "pilot error". If there is any validity to this statement, then the solution to the problem lies in an operator's personnel practices. There seem to be several factors which a manager needs to be trained to consider in developing his personnel policies; how to set standards, how to verify previous employment, how to provide training, and how to establish salary and benefits programs which enhance safety.

The first step in the development of an effective personnel policy is a definition of the job to be performed. Following this, minimum job related standards need to be set for the personnel hired for the job. These standards need to be job related and realistically measurable. New employees are then selected based on the flying skills needed to perform the job.

The AATC researchers asked what qualifications were required when hiring a new pilot. Nearly always the answer was limited to a minimum number of hours total flying time and a minimum number of hours of flying in Alaska. The researchers seldom discovered a discriminating categorization of the various types of flying related to required job skills. For example, flying touch-and-go's at Merrill Field with an occasional cross-country trip with a student to Talkeetna or Birchwood is hardly the kind of Alaskan experience appropriate to prepare one to fly to Anaktuvuk Pass.

Several times during this research the interviewers heard the comment that it was not possible to get accident/violation information from the FAA, therefore operators were forced to hire pilots without a thorough background check of the new employees. As previously reported some operators stated that they seldom received calls or correspondence concerning former employees. This leads one to believe that few background checks are in fact being made.

When operators were asked how they check on an employee's qualifications most responded that they limited their checks to a review of the applicant's resume and a look at the log book. Managers need training which will prepare them to conduct a thorough background search of new employees to ensure that the qualifications which they are seeking are in fact possessed by the applicant. Then, if the applicant's experience and qualifications are not congruent with the tasks to be performed on the job, an initial training program must be provided. The training must address all deficiencies in a pilot's preparation and the beginning and ending competencies should be documented. If the operator does not have enough demand for such a rigorous training program, then he or she might use a special training program which is designed to prepare pilots to fly in Alaska. Having identified the pilot and provided the appropriate training, the operator needs to provide adequate compensation.

In many interviews and discussions the research team had with pilots and managers in Alaska, a factor emerged which may have an indirect but significant effect on safety. Some respondents related tales of pilots going into the bush to fly as professionals and living in "boxes" (truck bodies without windows or plumbing), eating crackers and soda pop as the major source of nutrition, and living without proper facilities for bathing or sanitation. The result of this was a gradual deterioration in self-image and morale which translated into poor operating practices often resulting in accidents. One way of addressing this problem, which seems to have worked for some bush operators, is to include accommodations and benefits in the remuneration package. Furthermore, to pay pilots as little as possible or to pay them based on the revenue produced (commission) or to pay an hourly rate from take-off to touchdown or even block to block may be more expensive than paying a base salary plus per flight hour. As previously discussed, these pay plans encourage the pilot to either cut corners or leave to seek a "better paying job". The cost to the operator for this turnover is quite expensive.

Management Training

Although AATC has the capability to organize and conduct the training which would be appropriate for an air taxi management training course or courses, it seems that this phase of the training could be conducted by the Community College system. Existing business management courses would need some modification to focus them directly on the requirements of the air taxi operation in Alaska. These requirements have been identified by AATC and we are willing to work with the Alaska Community Colleges and the Alaskan Aviation Safety Foundation to develop the curriculum. In order for an air taxi management training course to be approved, it is recommended that the ongoing evaluation of the training process be monitored by the AASF acting as a technical advisory committee.

Professional Certification

How then can the public and insurance underwriters presently differentiate between safe and unsafe operators; between those who should pay lower insurance rates and those whose rates should be higher? The answer to that question is that they can't. Many passengers with whom we spoke lauded air taxi operations whose operation and safety record was appalling. Insurance underwriters have stated that they are thoroughly frustrated in their attempts to gather valid data on the companies they are asked to insure. This lack of information has led us to conclude that a certification process be established which will rate operators according to verifiable standards.

Having recognized that there are factors which differentiate between safe and unsafe operators, the question arises, how does one tell which is which? A possible answer might be to regard any FAA 135 certificated operator as safe, but this certification only ensures that the applicant has met minimum standards. Furthermore, some FAA personnel exclaim that they fear to fly with some of the certificated operators. In one interview an FAA inspector was asked, "What kind of clothing do you think I should wear when I go to interview in the bush?" He responded by saying "If I were you I wouldn't fly with the bush operators, they're sloppy pilots and their equipment is poorly maintained and dirty. I won't fly with them."

Many professions have recognized that the attainment of the minimum standard to perform a job is not enough. These professionals have established a means to certify those who elect to excel in their calling. Accountants can become Certified Public Accountants, life insurance agents can become Certified Life Underwriters, real estate agents can become Realtors, surgeons can become elected to fellowship in the American College of Surgeons. If a similar process was implemented to recognize the safest operators in Alaska's air taxi industry, many factors would need to be considered. Certainly this certification should be voluntary and no operator should be required to participate. When an operator requests that the air taxi company be certified the following factors need to be examined:

° The safety record of the operator for the past three years based on the ratio between the number of hours flown and accident frequency and severity statistics.

° The quality of training provided for:

°° Management
°° Maintenance personnel
°° Pilots
°° Support personnel
°°° Dispatchers
°°° Loadmasters
°°° Ticket agents

° The successful completion of both periodic and spot assessments by an impartial evaluation panel using a validated checklist.

° Professional membership in a recognized air carrier trade association.

Conclusion

As discussed in detail in this part, the problem of safety in Alaskan aviation is multi-faceted. Consequently, there is no easy solution; no quick fix, no panacea. The solution will require that those operators whose pilots are having accidents will have to face an economic penalty which will either force them to increase the safety of their operation or cease flying.

The evidence clearly indicates that it is possible for an air taxi operator to fly safely in Alaska. Operators were identified who set and enforced standards, didn't push pilots, and made a profit while paying their pilots adequately. They maintained their aircraft to above minimum standards and provided personnel with excellent training.

The next step in improving the safety of air taxi operations in Alaska is to train personnel in the aviation business in those techniques which have resulted in safe and profitable air taxi operations. The proposal to validate the techniques reported in this first phase, develop the curriculum for conducting the training and produce a sample training program is described in Section H.

SECTION F

TRAINING OBJECTIVES, INFORMATION COLLECTED, and QUESTION TYPES

The first part of this section contains the training objectives synthesized from the Alaskan pilot interviews and the unvalidated information relevant to these objectives. The information collected for a specific subject area, such as landing on snow, is presented first and is followed by the training objectives addressing that subject area. The last part, Question Types, describes the types of questions referenced in the training objectives and includes a sample training scenario.

Training Objectives

The following Alaskan aviation training objectives serve as the basis for further development of an Alaskan aviation training program. These objectives were synthesized from information gathered in 177 interviews with Alaskan pilots, mechanics and air taxi operators and reflect their views on what a pilot needs to know to fly safely in Alaska. As development of the training program continues these objectives will be expande . Enabling objectives (skills and knowledge the student must learn to satisfy a complex objective such as demonstrating pass flying techniques) will be identified and standards for successful mastery of the training objectives will become more specific.

An objective describes three things: an observable student behavior, the conditions under which the behavior is performed, and minimum standards of performance. Examples of observable student behaviors are: choosing the correct response to a multiple-choice question, stating to the instructor the cues used in making a decision, or demonstrating a technique such as a short or soft field landing. The conditions of an objective describe the relevant aspects of the environment in which the performance of the objective is demonstrated. Any materials or aids the student may use (charts, calculator, etc.) are described, as is the nature of the testing situation, i.e., a multiple-choice test or in a simulated operational environment. The standard of performance of an objective specifies the quality and/or quantity of the behavior performed. At this stage the Alaskan objectives defining aviation training requirements are subject to qualitative standards (instructor judgement), however, as the lesson content is defined, instructor guides will be detailed enough to standardize the instructors' evaluation of student performance. Also, as the curriculum (the sequence of instructional events) is developed, appropriate performance standards become more apparent and will be incorporated into the training system.

Objectives define the type of test used by stating the student behavior required and describing the conditions under which performance is measured. By knowing the types of tests planned, guidelines can be established for selecting the most appropriate media for presenting information and testing performance.

Unvalidated Information Collected From Alaskan Interviews

The following pages contain information relevant to a particular subject matter such as weather, followed by the training objectives addressing that area. This information has been collected from the Alaskan pilot interviews conducted by the AATC research team and is not yet validated. There may be techniques included here that are not safe, several techniques that contradict each other, and incorrect information. However, regardless of the validity of the specific techniques and information collected, a need for training in that area is indicated. AATC proposes to validate and expand this initial data base of Alaskan pilot knowledge and techniques with the aid of experienced Alaskan pilots in the next phase of training program development.

Unvalidated Information Collected On Weather Sources, Interpretation, Trends, Etc.

NOTE: The information presented here represents only the unvalidated information collected from the initial Alaskan interviews. In the next phase of training program development selected Alaskan pilots will be used to validate and expand this preliminary data about weather sources, interpretation and trends.

General Weather Information

Turbulence is indicated by swirls of snow, dust, etc. and by lenticular cloud formations.

Observe how the clouds cling to the mountains. Rising, stretched clouds indicate improving conditions. If clouds are slowly increasing in density conditions are generally worsening.

Check the weather from three to four hours back and try to determine the trend.

When the weather is bad on the high pressure side it may be O.K. on the low pressure side.

With a low over the Gulf of Alaska there are east winds and low visibility at the east end of the passes. The reverse is true with west winds.

Look for severe turbulence when there is low pressure on one side of the hill, high pressure on the other side and a wide temperature difference.

Winds always blow down a glacier.

Blowing snow from the top of the mountain indicates strong winds at altitude, from 30-50 knots.

To check turbulence check the wind direction and velocity in relation to terrain features.

Keep a weather log. Make weather notes (winds, temperature, barometer pressure) and do your own forecasting.

To judge icing you can judge humidity by the size and density of the water drops on your windscreen.

Study satellite pictures to determine trends.

A williwaw is where the wind goes up a valley and hits the surface of a hill causing a downdraft on the other side.

Cold air over a glacier creates sinking air and can cause large sink rates.

Use surrounding area weather and weather trends, and consider the season.

Look at the dew point spread. If there is any fog in the area and the temperature/dew point is close, don't go.

Watch trends in the weather and the stability of the weather mass (movement). If there is a short time between periods of bad weather, don't go.

If wind is from offshore to onshore there will always be a downdraft.

Check weather several hours in advance to check trends. Verify the forecast with the actual weather at takeoff.

Consider the wind flows which can indicate where things get plugged up.

Low pressure on one side of a pass and high pressure on the other side create severe turbulence in the pass.

Alaska has a low icing level, 4,000 to 5,000 feet even in the summer.

Northeast circular air flow dumps warm, moist air on the 55th parallel and creates weather as it moves west and southwest.

Ground fog blows up a glacier.

Area Specific Weather Information

Anytime the winds are from west to east through the northern half of the chain, turbulence will be present.

The ice alleys in the Fall and Spring are past Anchorage, down the Knik Arm and through Lake Clark Pass. Also east from Anchorage down Turnagain Arm to Cordova and Valdez.

On the Alaska Peninsula west/southwest winds crossing the mountains create severe turbulence on the downwind side of the mountains.

Look for temperature and pressure differences at Fairbanks.

Look at Mt. Susitna. The position of the clouds on the mountain can predict conditions for Lake Clark and Merrill Passes.

In the Alaska Range, if the upper air flow is from the north the valley winds are influenced by the glaciers and are 180 degrees to the upper winds.

There are wind shears on the glaciers at Valdez. There are winds from Workman's Glacier and from the south. They are worst from 12 PM to 2 PM but O.K. at 4 PM.

Nuka Bay, southwest of Seward. Northerly wind coming off the Harding Ice Field can create severe turbulence.

Yukon Flats has an inversion fog. There is a tremendous amount of ice in an inversion fog.

There are strange optical illusions on the North Slope; inverted mountains and things at lower altitude seem higher.

With 2500 foot tops over the North Slope the ice crystals will go to the ground.

On the Alaska Peninsula winds cause a venturi effect. Fly out over the water.

Valdez - Weather usually clears up on the north side of the glaciers (Chugach Mts.).

Cordova - Downdrafts are common. To predict turbulence, know the wind direction and velocity. Look at the funnel necks in the hills.

Cordova - Check Kodiak. If Kodiak is bad, Cordova will be bad in 24 hours. Weather can be good at Kodiak but not at Cordova.

Cordova - With a southeast wind you can expect rain or snow.

You can expect a cloud ridge from Icy Cape to Hinchinbrook Islands. The tops increase to 10 thousand feet at Yakutat to 18 thousand feet over Hinchinbrook then drop to 6 thousand feet over Whittier. The clouds are broken over Prince William Sound producing a layered effect.

Whittier has williwaws you can see on the water.

Kotzebue - A north wind blowing for a few days causes fog over the water. A south wind blows it back onto land.

When Lake Clark, Merrill and Rainy Passes are closed Windy Pass will be open and vice-versa.

Savoonga - 80% of the time the wind is from the north and weather is terrible. If wind is from the south, weather on the runway should be O.K. Savoonga usually has a 10-15 knot crosswind.

When flying from Nome to Anchorage you usually have a headwind so you will be low on fuel.

Aleutian Chain - Windward side has low visibility with fog. The other side is usually better but not always.

Aleutian Chain - With a northwest wind the Bering side is IFR and the Pacific side is VFR. Reverse is true with a wind shift.

Illiamna, Alaska Peninsula, Kodiak, Bruin Bay - Turbulence to 10-12,000 feet with low visibility and high winds.

In the Kuskokwim area wind shears are not prevalent.

Bethel is a bad weather area where pilots should not fly when the weather is below 500 feet and 2 miles.

Nelson Island - Low, rolling terrain without vegetation. A pilot can fly into the ground without ever seeing it.

Bethel - Slick runway with a crosswind is a common condition.

Kuskokwim - Mirages are common due to large temperature inversions.

Weather Information

Sources

Big River Lakes has a log cabin with a H.F. radio.

Finger Lakes (National Weather Service)

Channel (Frequency) 122.9

Marine weather - 156.25

Kotzebue Flight Service Station

Gulkana - Paul Goodrich

Automated weather stations in Girdwood and Moose Pass give temperature and wind direction and velocity

Dept. of Highways

Lockheed weather service in Canada

Universal Weather is a private weather service

Ask postmaster at Red Devil

Call Healy for Windy Pass weather information

Contract observer at Minchumina that you can call direct

There is an observer at Chelatna Lake Lodge

N.W.S. broadcast on Marine Band 162.55 VHF (FM)

Use the watchman at the Salmon canneries

Peggy Dyson is a Marine Weather radio operator in Kodiak

Cape Yakataga has a weather station

There is an AMOS at Middleton Island but the reports are not always complete

Alascom communication company

Indian Mountain remote, you can talk to Bettles

Barter Island

Call postmaster in Eagle

Southeast Canadian Marine Weather forecast

Observers in Noorvuik and Selawig

Contract weather service at Anchorage International

Valdez Airlines has good pilot reports

Forest Service has F.M. Motorola in St. Petersburg area

Common pilot frequency is 122.9

In Bethel the local operators have H.F. radios. They get better weather information than from the F.S.S.

When going to Marshall check the weather at Bethel, St. Mary's and Aniak

Techniques

If you get on the weather briefer's case they will get weather reports from places like Aniak.

ATC can vector pilots around turbulence in Anchorage. They know where the winds are coming from.

From Nome Shishmaref call to Ten City and phone Teller. Ask the F.S.S. to call you if weather moves in.

Call the customer on H.F. radio to get destination weather

On a pipeline crew change we have the crew on the pipeline call us the weather.

SSB radio is a must on the coast. You should know the locations of the fishing boats.

Use center frequency in an emergency - no one listens to 121.5

When you request weather information from a village consider how long it has been since the last flight in.

Weather Training Objectives

Given weather information for a specific area, indicate if potentially hazardous weather conditions are present and describe such conditions.
Hazardous weather conditions must be identified, and descriptions must agree with established grading standards as contained in the instructor test guide.

Predict the weather conditions for a specific area, given weather information and applicable charts for that area.
Prediction of weather conditions must be accomplished in accordance with the grading standards contained in the instructor test guide.

With a slide, photo or drawing of a specific geographic area as seen from an aircraft cockpit, indicate if potentially hazardous weather conditions exist; describe such conditions and describe the cues used to recognize the conditions.
Identification of hazardous weather indications must be made without error and descriptions of conditions and cues must meet established grading standards as contained in the instructor test guide.

Describe the sources of weather information at departure, enroute and at the destination, given a flight plan and a description of available communications equipment.
The description of sources must agree with established grading standards containing the list of sources specific to the area.

Demonstrate correct use of communications equipment (HF radio SSB, VHF, etc) and correct communications procedures given communciations equipment and a list of sources to contact.
All equipment demonstrations and communications procedures must meet established grading standards which reflect I.C.A.O standards.

Simulate contacting weather sources designated by the instructor and requesting weather information when given communications equipment(HF, SSB and VHF radios).
All equipment use must be accomplished correctly and the weather information received must satisfy instructor judgement and meet grading standards as contained in the instructor test guide.

Given a description of actual weather conditions and a series of PIREPS describing those conditions choose the PIREP that most accurately describes the weather conditions given.
Accomplish in accordance with grading standards as contained in the instructor test guide.

From a sequence of weather reports describe any trends indicated by the reports and the possible effects on weather in a specified area.
Identification of trends and description of effects must meet grading standards as contained in the instructor test guide and satisfy instructor judgement.

Unvalidated Information Collected on Gravel Bar, Lake, Tundra, Mud and Sandbar Evaluation, Landing and Takeoff

NOTE: Information presented here represents only the unvalidated information collected from the initial Alaskan interviews. In the next phase of training program development, selected Alaskan pilots will be used to validate and expand this preliminary data about gravel bars, lakes, tundra, mud and sandbar evaluation, landing and takeoff.

Gravel Bar

Keep the strut fully extended with back pressure to keep the prop out of the gravel and to provide clearance during breakup.

Roll one wheel on the surface. Fly off and look at the track to see if it fills with water. If it does, don't land.

Look for ditches that might have been cut by streams. Be able to judge the size of the rocks.

The rounded end of a gravel bar points upstream.

Gravel can have soft, wet, sandy areas.

Heavy braking on gravel can cause tail damage.

Use slow acceleration when the gravel is large (3/4 - 1 1/2 inches)

Lakes

Time a lake by flying over at 80 knots and counting the number of seconds.

Use a checklist.
1. How to get out of the area.
2. How to beach and unbeach the aircraft alone.
3. Figure out the touchdown point.
4. Look for obstructions.
5. Land close to the beaching point.

Put a fuel cache at a large lake. Go into the small lake empty and ferry passengers and cargo out. Refuel at the large lake.

Land empty and takeoff before loading passengers. This will prepare you for a full takeoff and let you know if you can get out.

Polaroid glasses are dangerous to use.

On short lakes you need to shuttle the loads. Takeoff with a partial load; if it flies easily go back and get more.

On glassy lakes find a wind pattern. This is O.K. for large lakes but difficult on small lakes.

Look at the lake for the glassy spot which is the left side. This will tell you the wind direction.

At dusk you can see your navigation lights on the water. Use this to estimate your height above the water and set up a 100-150 F.P.M. sink rate.

Use a fishhook turn to gain speed to get on the step.

Tundra

Determine the underlying base. If it is dirt, stay off. A volcanic base is best.

If the tundra is underlined with dark soil it's probably permafrost. This has an uneven surface and results in rough landings.

Land on a nearby gravel bar and walk out over the tundra to check it out.

Consider the soil drainage. Look at the greenness of the vegetation which indicates the amount of water near the surface. If it is wet stay off.

Be aware that tundra has big tussocks which make for a rough landing.

Look for dry spots in the tundra. Check the surface with a pass and then look at the tracks for water.

Check the rate at which the aircraft slows to determine if the tundra is bunching under the tires. Don't hit the brakes.

Mud

Stay away from dark grey mud without vegetation. It is like quicksand.

Mud flats are hard to read. The water level varies and the aircraft can sink if you don't learn how to read them.

Land in the water first and taxi up on the mud.

Wheels can kick up mud on the wings adding extra weight.

Sandbars

Roll one wheel on the surface. Fly off and look at the track to see if it fills with water if it does, don't land.

Look for vegetation. Land where there is a medium amount.

Turn downhill when landing using momentum and gravity.

Sandbars may be narrower upriver.

Sandbars change day to day. Fly over at 25 feet. If you're not sure, do it again. If you have to make three passes don't land.

Wet sand could be solid but not necessarily. Stick to known areas and use animal tracks for information.

Color is important but not always a reliable indication.

Sandbars are difficult because they are too short, too rough and the approach ends are dangerous.

On short sandbars take off light at first and shuttle the stuff out.

Objectives for Evaluation of Landing on and Takeoff from Gravel Bars, Lakes, Tundra, Mud and Sandbars

Given multiple choice questions on evaluating, landing on and taking off from:

- gravel bars
- lakes
- tundra
- mud
- sandbars

Choose the response which best answers the question. Accomplish in accordance with established grading standards as contained in the instructor test guide.

Presented with incomplete statements regarding evaluating, landing on and taking off from:

gravel bars
lakes
tundra
mud
sandbars

Write the response which best completes the statement.
The responses written must meet established grading standards as contained in the instructor test guide and satisfy instructor judgement.

Given statements concerning evaluating, landing on and taking off from:

gravel bars
lakes
tundra
mud
sandbars

Indicate whether the statements are true or false and briefly explain why.
Accomplish the true/false indications without error. Explanations must meet established grading standards as contained in the instructor test guide and satisfy instructor judgement.

Presented with a slide, photo or drawing of:

a gravel bar
a lake
tundra
mud
or a sandbar

and given weather conditions and aircraft type and configuration; state if the area shown is suitable for landing and takeoff; describe the cues used to determine suitability; recall common hazards and describe appropriate landing and takeoff techniques. All decisions must be made without error and all descriptions must meet established grading standards as contained in the instructor test guide.

In a simulated operational environment with a scene of:

a gravel bar
a lake
tundra
mud
or a sandbar

state whether the area is suitable for landing and takeoff, describe the cues used to determine suitability, and demonstrate appropriate landing and takeoff techniques specific to the type aircraft simulated if it is determined the area is suitable. All decisions must be made without error, all descriptions must meet established grading standards as contained in the instructor test guide and all demonstrations must satisfy instructor judgement.

Unvalidated Information Collected On Ice Evaluation and Landing

NOTE: The information presented here represents only the unvalidated information collected from the initial Alaskan interviews. In the next phase of training program development selected Alaskan pilots will be used to validate and expand this preliminary data about ice evaluation and landing.

Evaluation

Rotten ice has water on it and is pitted. Check the air temperature and how long it was at or below freezing.

Use an ice auger and ruler to measure the thickness of the ice.

To check the thickness of the ice throw out a rock or brick. If it doesn't go through the ice you can land with tundra tires.

Sea ice has leads where water leaks through the ice. When you land don't stop, go around and look for water in the tracks.

With fresh water ice, land along the shore in the fall and the middle during the spring. Don't rely on throwing out bricks, rocks, etc.

Stay away from beaver lodges. Look out for snow drifts and sloughs (may be warm water). Wear Bausch and Lomb shooting glasses.

Look at the color of the ice, should be clear and blue.

Hard to perceive depth, like a glassy water landing. You can hit ridges you can't see.

In the spring ice is rotten. Don't land.

With sea ice don't land on grey ice, land on white ice. Drag the strip a time or two.

After dragging a strip and landing, walk out the landing area to learn to read ice and snow.

On ice leads look for busted ice on the edges to determine thickness of new ice.

Consider local temperatures to figure out how fast the ice will freeze. You need 4 to 6 inches to land.

Beware of snow covered lakes. Snow insulates and the ice thickness grows more slowly.

Fresh water ice is brittle at 3 inches. Make a test hole in clear ice, you need about 4 inches.

With unfamiliar sea ice you need good weather (sunshine and shadow). Look at the type of ice and the surface.

In an open lead don't land on the dark lead.

On pack ice the drift pattern on the snow is mixed because ice floats around and gets variable winds.

On sea ice look for pressure cracks caused by the tides.

Leads can be a smooth place to land but it's hard to evaluate the ice thickness.

Drop a rock from 50 feet.. You will get spider cracks in 6 inch ice.

Landing

After landing don't shut down, wait and see if the ice will support the aircraft.

On skis land with wheels down if possible to have some braking control.

Saltwater ice is rubbery, you need about five inches and must be moving when you hit it.

With a glare ice landing with a crosswind, touch down and let the aircraft slide down the runway sideways, you have no longitudinal control.

Ice Evaluation and Landing Objectives

Presented with multiple-choice questions concerning evaluating and landing on ice, choose the response from those provided that best answers the question.
Accompiish in accordance with established grading standards as contained in the instructor test guide.

Write the response which best completes the incomplete statement given regarding evaluating and landing on ice.
Responses must meet established grading standards as contained in the instructor test guide and satisfy instructor judgement.

Given statements regarding evaluating and landing on ice, indicate whether the statements are true or false and briefly explain why.
Accomplish true/false indications without error. Explanations must meet grading standards as contained in the instructor test guide and satisfy instructor judgement.

Presented with a slide, photo or drawing of an ice landing area and given weather conditions and aircraft type and configuration, state if the area shown is suitable for landing and takeoff, describe the cues used to determine suitability, recall common hazards and describe landing and takeoff techniques appropriate for the given conditions.
All decisions must be made without error and all descriptions must meet established grading standards as contained in the instructor test guide and satisfy instructor judgement.

In a simulated operational environment with a scene of an ice landing area, state whether the area is suitable for landing and takeoff, describe the cues used to determine suitability, and demonstrate appropriate landing techniques specific to the type aircraft simulated if determined the area is suitable.
All decisions must be made without error, all descriptions must meet established grading standards as contained in the instructor test guide and all demonstrations must satisfy instructor judgement.

Unvalidated Information Collected On Beach Evaluation, Landing And Takeoff

NOTE: The information presented here represents only the unvalidated information collected from the initial Alaskan interviews. In the next phase of training program development selected Alaskan pilots will be used to validate and expand this preliminary data about beach evaluation, landing and takeoff.

Evaluation

Look for hard ripples just above the tide line. Dunes and vegetation indicate soft sand. A lack of vegetation can indicate hard sand.

Roll one wheel on the surface. Fly off and look at tracks to see if they fill with water. If they do, don't land.

Look out for rocks and fishing lines (indicated by floats in the water).

Drag the beach. Make a touch-and-go and look for overflow.

The beach should be free of debris. An inside beach protected from the surf is best.

Offshore at 100 feet altitude look 90 degrees at beach to evaluate slope and surface.

Consult a tide table book. From the tide action you can determine the condition of the beach (amount of debris, etc.).

Look out for beach lines. Fishermen's lines hold nets across the beach and are sometimes hard to see.

If the slope is steep, stay away. Get close to the shore, an onshore wind is best.

Bounce the tires into the sand at high speed, go around and check the displacement of the sand.

Look for swells in the sand.

Wind on a beach is important. Avoid crosswinds.

If beach is scalloped don't land. This is difficult because most beaches are sloping and scalloped.

Look for a beach with some rock in it. This indicates some firmness.

Test the beach with rollout rather than impact on beach. Impact area may be O.K. but not rollout area.

Landing

Make a smooth touchdown near the water line.

Land on wet sand, the water cut will be shallower.

Turn downhill using momentum and gravity when landing.

Never touch the brakes on a beach. Fly in a tailwheel aircraft if you use brakes.

Keep the aircraft straight. Turn upslope, not down.

Takeoff

Let 1/2 of the air out of the tires on a soft beach. Aircraft is much easier to taxi and get speed for takeoff.

Beach Evaluation, Landing and Takeoff Objectives

Presented with multiple-choice questions concerning evaluating, landing on or taking off from beaches, choose the response from those provided that best answers the question.
Accomplish in accordance with grading standards as contained in the instructor test guide.

Write the response which best completes the incomplete statement given regarding evaluating, landing on or taking off from beaches.
Responses must meet established grading standards as contained in the instructor test guide and satisfy instructor judgement.

Given statements concerning evaluating, landing on or taking off from beaches, indicate whether the statements are true or false and briefly explain why.

Accomplish true/false indications without error. Explanations must meet grading standards as contained in the instructor test guide and satisfy instructor judgement.

Presented with a slide, photo or drawing of a beach and given weather conditions and aircraft type and configuration, state if the area shown is suitable for landing and takeoff, describe the cues used to determine suitability, recall common hazards and describe landing and takeoff techniques that are appropriate for the given conditions.
All decisions must be made without error and all descriptions must meet established grading standards as contained in the instructor test guide and satisfy instructor judgement.

In a simulated operational environment with a scene of a beach state whether the area is suitable for landing and takeoff, describe the cues used to determine suitability, and demonstrate appropriate landing and takeoff techniques specific to the type aircraft simulated if determined the area is suitable.
All decisions must be made without error, all descriptions must meet established grading standards as contained in the instructor test guide and all demonstrations must satisfy instructor judgement.

Unvalidated Information Collected On Snow Evaluation, Landing And Takeoff

NOTE: The information presented here represents only the unvalidated information collected from the initial Alaskan interviews. In the next phase of training program development selected Alaskan pilots will be used to validate and expand this preliminary data about snow evaluation, landing and takeoff.

Evaluation and Aids to Depth Perception

To aid your depth perception have the airport operator cut evergreen boughs and stick them in the snow along the runway.

Throw out weighted garbage bags to provide ground references.

Drag a ski through the surface to see if the tracks fill with water. If they do, don't land.

Use animal tracks for snow depth information.

Bausch and Lomb shooting glasses are helpful, you can see ridges and berms.

Throw out your jacket to provide depth perception

Operations on unlevel ground are a problem in winter and summer but in the winter snow makes it seem level.

Make sure the vegetation is not the tops of four foot trees instead of Caribou grass.

Recommended snow depths for operation on wheels:
6" if dry, 3" if slushy
5" if soft, 2" if slushy
2-3" if soft, 2" if slushy
axle depth
3" maximum depth
5" maximum depth

With Aerodyne skis you can land with wheels down and stop fairly rapidly in 1 1/2 to 2 inches of snow

5" of snow with large tires; 2" in C-206

Landing lights at night pick up greater detail in the snow than a daylight landing.

Objects on snow give only depth perception and no information on surface roughness. You need sunlight for contrast.

Snow Landing

On wheels touchdown midway at 50 knots, when the tail comes up use full throttle and pull stick back until you are stopped.

Snow Takeoff

On snow the aircraft will skip off the high spots.

Wet, slushy snow is difficult to takeoff from.

Pack down the snow with empty weight touch-and-go's.

Taxi up and back the full length of the runway to check it out and to leave tracks to follow.

Checkout the entire runway and takeoff area.

To lift off from slush, drop an extra 10 degrees of flap.

On wheels in deep snow with heavy weight and a short field accelerate to the end of the runway, pull on full flaps and pitch the nose to where the aircraft neither climbs nor sinks but accelerates. As it accelerates bleed off flaps until airspeed and flap configuration permit a normal climb.

Snow Evaluation, Depth Perception Aids, Landing and Takeoff Objectives

Choose the response that best answers the multiple-choice questions presented on snow evaluation, depth perception and landing and takeoff techniques.
Accomplish in accordance with established grading standards as contained in the instructor test guide.

Presented with incomplete statements regarding snow evaluation, depth perception aids and landing and takeoff techniques write the response which best completes the statement.
Responses must meet established grading standards as contained in the instructor test guide and satisfy instructor judgement.

Given statements concerning snow evaluation, depth perception aids and landing and takeoff techniques indicate whether the statements are true or false and briefly explain why.

Accomplish true/false indications without error. Explanations must meet established grading standards as contained in the instructor test guide and satisfy instructor judgement.

State if the area shown is suitable for landing and takeoff, describe the cues used to determine suitability, recall common hazards and describe landing and takeoff techniques that are appropriate, when presented with a slide, photo or drawing of a snow landing area and given weather conditions and aircraft type and configuration.
All decisions must be made without error and all descriptions must meet established grading standards as contained in the instructor test guide.

In a simulated operational environment with a scene of a snow landing area state whether the area is suitable for landing and takeoff, describe the cues used to determine suitability, and demonstrate appropriate landing and takeoff techniques specific to the type aircraft simulated if determined the area is suitable.
All decisions must be made without error, all descriptions must meet established grading standards as contained in the instructor test guide and all demonstrations must satisfy instructor judgement.

Unvalidated Information Collected on Flight Techniques in Adverse Weather

NOTE: The information presented here represents only the unvalidated information collected from the initial Alaskan interviews. In the next phase of training program development, selected Alaskan pilots will be used to validate and expand this preliminary data about flight techniques in adverse weather.

Whiteout/Lack of Depth Perception

Avoid large, snow-covered lakes. You won't have any reference points. Detour around to keep ground reference points.

When glacier flying in a whiteout use the best climb angle for a possible impact.

If you have navigation equipment stay 1000 feet AGL and go IFR. If not, try to follow the willows on a creek.

If you are following a river and you get into bad weather don't turn such that only the river is in sight. If it is snow covered you will be in a whiteout.

In blowing snow you can see straight down but not forward. Turn into the wind, look down, slow down, and land.

Whiteouts are partially caused by light conditions. Doing a 180 turn may get you into one behind you.

Whiteouts don't engulf or envelope you. Do a 180 turn or continue on instruments holding heading and altitude.

You need good instruments, radar altimeters, good navigational aids, to really fly in whiteout areas.

When you're over water and a whiteout occurs the open water beyond the ice pack can look like clouds. You need instruments.

Procedure for a whiteout.

1. Go on instruments, quit looking outside.
2. Maintain heading and climb straight ahead.
3. Get 500 feet above obstructions, then level.
4. Do a standard rate 180 turn back to where you came from. Don't climb and turn at the same time, this induces vertigo.

Don't use flat approaches in whiteout conditions. Use a steep approach.

Turbulence

Get low to avoid turbulence. Surface friction softens the turbulence.

Experienced pilots go out from land two to three miles, get low over the water and slip in under the turbulence (200 to 300 feet).

Slow to VA and ride it out while maintaining attitude.

A lower altitude over the water means smoother air.

Fly offshore to get into smoother air.

Icing

Use flaps and full power so ice won't build up on the bottom of the aircraft and add weight. Keep the ice on the leading edges.

A cue to icing is decaying airspeed.

In the interior icing occurs in layers. Find an altitude without ice and request it for enroute. This is not true for the Anchorage area.

The important thing about icing is not to get to the point where the aircraft stalls. Land while you still have control.

Go to METO to keep ice from forming on wing bottom and fuselage. Use speed, not flaps.

With the temperature at -40 degrees, clear air and your airspeed below 115 you can pick up frost. Add full power and pick up speed to get rid of ice.

Around Kotzebue when ice builds up on the wing, climb while you can. Don't descend, the air layers are stratified in the winter.

In a C-207 the windshield ices up first. Watch the rate of build-up.

Miscellaneous

When pushing the weather always stay far enough from the clouds to make a 180 turn.

VFR flying in bad weather is flying a boundary; river, valley, coastline, mountain, etc.

Fly away from the boundary a distance equal to the turn radius of the aircraft, then you can do a 180 to land.

Don't fly over the landmark. If you have to turn you may lose it and get lost.

Never mix turbulence with low visibility. One or the other is O.K. but not both.

Always expect the weather to go down and have a way out planned.

Figure the visibility by checking the time it takes to fly to a point in front of the aircraft.

Flight Techniques in Adverse Weather Objectives

Given multiple-choice questions concerning flight techniques in adverse weather conditions such as whiteouts, turbulence, icing and various miscellaneous conditions, choose the response which best answers the question.
Accomplish in accordance with established grading standards as contained in the instructor test guide.

Write the response which best completes an incomplete statement regarding flight techniques in adverse weather conditions such as whiteouts, turbulence, icing and various miscellaneous conditions.
Responses must meet established grading standards as contained in the instructor test guide and satisfy instructor judgement.

Indicate whether statements regarding flight techniques in adverse weather conditions such as whiteouts, turbulence, icing and various miscellaneous conditions are true or false and briefly explain why.
True/false indications must be accomplished without error and explanations must meet established grading standards and satisfy instructor judgement.

Given a description of the piloting actions and techniques, applicable flight information such as current altitude, airspeed, etc., and aircraft type and configuration, during an encounter with adverse weather conditions, such as whiteouts, turbulence and icing, identify the incorrect actions taken and/or techniques used, if any, and describe, if applicable, the correct actions and or techniques.

All identifications of incorrect actions and/or techniques must be accomplished without error and descriptions of correct actions and/or techniques must meet established grading standards and satisfy instruction judgement.

During a flight scenario in a simulated operational environment demonstrate correct actions and/or techniques when encountering adverse weather conditions such as whiteouts, turbulence and icing.

All actions and/or techniques demonstrated must meet established grading standards as contained in the instructor test guide and satisfy instructor judgement.

Unvalidated Information Collected on Navigation/Pilotage Techniques

> NOTE: The information presented here represents only the unvalidated information collected from the initial Alaskan interviews. In the next phase of training program development selected Alaskan pilots will be used to validate and expand this preliminary data about navigation/pilotage techniques.

Fly with your finger on the map. Turn the map as you fly.

When you're lost, follow a water source downstream. It is easier to be found on a river than on tundra. Try to intercept a large river.

Watch the drainages as you fly along.

Fly with the map folded and placed up by the windshield. You can also put the map on the passenger's lap.

Constantly orient the map to the direction in which you are flying.

Always keep informed of your location by the time/speed/distance so you can let down if radio navigation fails.

On a nice day look at the map so on a lousy day you will know where you are.

When you're in strange terrain use a sectional constantly.

On the North Slope the wind blows 50 or 230 degrees. The ridges in the snow are perpendicular to the wind direction and can be used for a navigational aid.

Know the drainage you're in. If the weather gets bad go downstream. Sweepers face downstream, drift piles are on the upstream side.

Line up the aircraft visually then set the directional gyro to zero to keep the heading. Keep the directional gyro set to zero.

Learn to read sectionals for shore line and relief contours.

Nap of earth flying is important and also what heading to fly.

The rounded end of a gravel bar points upstream.

Leave room to turn around by flying offshore. When you can't see the shoreline do a 180 or land if possible.

Fly 50 feet off the water on a clear day to recognize the shoreline from that altitude and check the checkpoints.

Use marine charts to locate checkpoints.

Know what heading will keep you out of the rocks on a climbout.

On the North Slope you should have a radio altimeter.

You don't know how high you are over a glacier unless you monitor your altimeter.

If a pilot uses a sectional it tends to destroy the customer's confidence. Know where you are without a map.

When boundary flying, fly off to one side of the river or road. Stay close enough so you can make a turn over it.

Use a 1:63,000 geological map.

Turn toward the shore if the weather goes bad. Verify the compass and directional gyro heading. If your visual reference is lost the heading is 180 degrees from the original.

Always know where the closest available alternate landing spot is throughout the flight.

Learn to scan your instruments while glancing outside.

Know the water shed. When the weather gets bad the river is the last thing to go out of sight.

Pilots should mark on their maps features which are not printed on the maps.

Look at the drift pattern on the snow at the North Slope. Prevailing winds are 60 degrees at Barrow and 90 degrees at Prudhoe Bay. Bethel also has 90 degree prevailing wind.

When flying GCA's watch for any variation in the attitude of the aircraft.

Altimeter errors can be caused by cold weather or low pressure due to a venturi effect.

Carry a book with the distance radial and MEA for each village enroute.

You can call DEW line stations for radar coverage on 126.2. They can give emergency location and heading information.

Managers should have new pilots make up a map with distance, heading and minimum altitude manager is willing to fly at night.

When carrying a mass of ferrous materials be sure to do a compass check on the runway before takeoff.

Swing the compass in any aircraft you have not flown before. Know the precession rate of the directional gyro.

Mark up sectionals to become familiar with headings relative to prominent landmarks.

Don't use the autopilot if you're alone. You can get sleepy and have an accident.

When going to a village on the shore approach at an angle so you know which way to turn on arrival.

Pull away from the hillside and then turn toward it to turn around so you don't lose it as a visual reference.

Navigation/Pilotage Objectives

Choose the correct answer from those provided when presented with multiple-choice questions regarding various navigation/pilotage techniques.
Accomplish in accordance with established grading standards as contained in the instructor test guide.

Presented with incomplete statements concerning navigation/pilotage techniques write the response which best completes the statement.
Responses must meet established grading standards as contained in the instructor test guide and satisfy instructor judgement.

Given a scenario which includes applicable aircraft and weather information and describes pilot actions and techniques applicable to navigation/pilotage identify and describe the incorrect actions taken and/or techniques used, if any, and describe if applicable, the correct actions and/or techniques.
All identifications of incorrect actions and/or techniques must be accomplished without error and descriptions of correct actions and/or techniques must meet established grading standards, as contained in the instructor test guide and satisfy instructor judgement.

During a flight scenario in a simulated operational environment demonstrate various navigation/pilotage techniques as required. All techniques demonstrated must meet established grading standards contained in the instructor test guide and satisfy instructor judgement.

Unvalidated Information Collected on Mountain Flying and General and Specific Pass Flying

NOTE: The information presented here represents only the unvalidated information collected from the initial Alaskan interviews. In the next phase of training program development, selected Alaskan pilots will be used to validate and expand this preliminary data about mountain flying and general and specific pass flying.

Mountain Flying Techniques

Don't cross perpendicular to a ridgeline. Fly parallel to look over and cross at a 45 degree angle.

Don't climb out of a downdraft. You will stall when you hit the updraft.

Don't stay on the windward side of a mountain.

An aft center of gravity is important because it raises the stall speed.

Learn to identify lenticular clouds. Look at the aircraft crab angle and blowing snow. Always fly the upwind side of the mountain.

To figure out the updrafts in a valley, fly on the sunny side.

If mountains begin to sink behind the mountain in front of you, you will hit that mountain. If the mountains behind are rising you will clear it.

Cornices on a mountain point toward the downwind side.

General Pass Flying

In a pass when the wind is on the left, fly on the right side so you can turn around into the wind.

Reduce your airspeed.

Fly the center of the pass. Start your turn slow and add full power once started.

Fly on the right side. Airspeed should be about 80 Knots with about 20 degrees of flaps. Turn on your landing lights.

Always leave yourself enough room for a 180 turn.

Don't go where you can't turn around. Slow down with flaps and be configured before your entry into the pass.

If a downdraft keeps you close to the ground in a pass you may not be able to outclimb rising terrain.

Avoid wind velocities greater than 30 knots.

How thick is the cloud layer? Is it rising as the ground rises or will it trap me up ahead?

Fly boundary on updraft side of canyon. Go slow so you can turn with a tight radius into the wind.

Approach at an angle so you have to make the minimum turn to get out.

Look at the length of the pass, the wind direction (through or across), ceiling and visibility and any combinations of these factors. Also look at the landing possibilities.

Use 10 degrees of flaps, fly slow and use the right side. Do 180 turns into the wind. Plan to go to the lift side.

Stay on the right side and make a diving left turn.

Fly by the pass at a 90 degree angle to see through. Passes are usually short and you can make a visual check.

A wingover is the best maneuver for a turnaround.

Slow to maneuvering speed usually. Best rate of climb or lower is suggested.

Follow the updraft side. Do a 180 turn if not visual.

Upwind side is less turbulent.

Check the winds aloft and the surface winds. Look for blowing snow, dust and turbulence.

Fly the right side, slow down, use flaps and make level turns.

Ride the windward side of the pass and turn into the wind.

Select one side. Smooth air can be on either side, not always on the right side.

Fly past for a look through and start a 180 turn. When into the turn look down the pass. If it isn't clear finish the 180 and get out.

You should be able to see through the pass and should have a 500 foot bottom.

Anticipate downdrafts by looking for lenticular clouds.

Fly the upwind side so you can turn into the wind.

Know the terrain VFR before going through. Have the charts handy for immediate reference.

Use the right side for traffic reasons. Have your lights on. You should have two miles visibility. Use common radio frequencies.

Don't go if the winds are greater than 25 knots.

When you have a ceiling problem you probably won't have an air-flow problem.

When winds are perpendicular to the pass there will be severe turbulence.

When winds are going through the pass, head or tail winds will be O. K.

Turbulence depends on the angle of the wind relative to the pass. A head or tail wind is best. A 25 knot or greater wind across the pass creates severe turbulence.

Low pressure on one side of the pass and high pressure on the other side creates severe turbulence in the pass.

Specific Passes

Lake Clark Pass

Coming from either end when you reach the glacier if the clouds are on the deck turn around. If you can get past there the rest of the pass will be open.

Talk to Kenai radio to determine pass conditions.

The position of clouds on Mt. Susitna can help to predict the condition of Lake Clark Pass.

You need a 1200 foot ceiling.

You should have a 3500 foot minimum ceiling.

You need the ability to see through far enough to turn around. Make sure you have enough altitude to lose altitude in a turn.

The glacier dumps air into the pass. Watch for warm, moist air from either direction to be able to predict fog.

It's hard to identify the entrance. Weather is bad when the glacier spills air down. There are several 90 degree turns.

Never enter until you can see the far end.

Get a weather briefing at Big River Lakes. There is a narrow, five mile long spot on the north end; if you can't see through it do a 180.

Always turn to the east to avoid turning up the wrong pass.

Portage Pass

High and low fronts working together create wind funnels through a venturi effect resulting in roll turbulence.

Get weather information from lodge at Pontilla Lake. You should have a minimum of 5000 foot MSL clouds. Check the temperature and its duration at Farewell.

Rainy Pass

Rainy Pass is all white in the winter. You must look carefully for cues.

Rainy is the longest and most confusing pass.

When flying from east to west look for the fault line that marks the pass entrance.

Ptarmigan Pass

Can lead you too far in before you get the cues that tell you to turn around.

Merrill Pass

If Rainy and Lake Clark are down, Merrill should be down.

The position of the clouds on Mt. Susitna can predict Merrill.

At a point beyond the bend if you can see the cleavage saddle you can go through.

You need a 4500 foot ceiling.

2000 foot minimum ceiling.

From west to east you are going uphill in a whiteout condition.

Windy Pass

Call Healy for weather.

If Talkeetna is MVFR, conditions are suspect.

If you can see the hills south of Windy from the Denali Airport you can go through.

With a west wind the two valleys feeding the pass create severe turbulence.

Broad Pass

You get clouds to the deck where airway V 436 crosses the Anchorage Highway. There is a contract weather observer at Chelatna Lake Lodge.

Anaktuvuk Pass

A wide, flat pass. You can turn around anywhere in it.

Difficult to turn around in some spots. Whiteout conditions in winter, no vegetation.

It can be windy. Check the pressure gradients. If the temperature is dropping 5 degrees/1000 feet it will be smooth, 2 degrees/1000 feet it will be rough.

If the stratus layer is rough underneath the air will be rough.

Use the updrafts to get through.

Call Anaktuvuk Pass Village and Bettles to check the weather. If it is bad turn around before Hunt Fork.

Check Deadhorse, Umiat and Bettles. If any are low check for PIREPS.

Look for two old runways on the Anaktuvuk River so that you don't go up the Chandeilar River.

The river forks several times in the pass. You must be very familiar with the pass. Look for worn snowmobile tracks.

When Barter Island, Umiat and Deadhorse are down, Anaktuvuk will be questionable.

Isabell Pass

If dust is not blowing it's not too bad. Watch for upslope clouds

Atigun Pass (Dietrich)

You must be able to see thru and it has a 90 degree dogleg. Plan a 360 degree turn to the left before going through.

It is usually marginal, not VFR or IFR. You can get conflicting reports from Chandler and Atigun. Check carefully.

The summit in the middle past Dietrich Camp is 5000 + feet.

In the absence of weather information from the North Slope you should have 2000 feet between the pass base and the ceiling.

Buskin Pass

It must be VFR with a 180 turn possibility.

You must be able to see through the pass.

Check for wind/turbulence. You must be able to see through.

Sheakin Pass

It must be VFR with a 180 turn possibility.

Spirdon Pass

It must be VFR with a 180 turn possibility.

Sheratin Pass

You must be able to see through.

Check for wind/turbulence and be able to see through.

Kalsim Pass

It is a VFR pass. You must see through before entering. With a 3000 to 4000 foot cloud deck it's O. K. to go through.

Wolverine Glacier

It is 15 miles east of Moose Pass. Make a visual check and you must be able to see the other side.

You can have low clouds on one end from Prince William Sound.

Resurrection Pass

You should have a 2500 foot minimum ceiling.

Rocky Bay Pass

If you're below 800 feet you won't get through. Expect a 30 to 35 knot wind, downdrafts and turbulence.

White Pass

It must be visual. There can be a whiteout in the bowl of the pass.

Guilbeau Pass

Do a 360 at the Y in the river at the pass entrance. Then go up to the left turn and do a 360, you are now committed.

Chickaloon Pass

It is not straight. Ask for Gulkana and Palmer weather. If they are down don't go. Can get weather information at Snowshoe Lake.

There can be fog at the north end down to the ground. Going to Anchorage after Matanuska Glacier you're O.K. It can be bad between Snowshoe Lake and the glacier.

It is unpredictable due to the distance between Palmer and Gulkana FSS. The weather in between is often bad.

Howard Pass

It is used going from Kotzebue to the North Slope. Look for standing lenticulars (wind from each direction).

Thorn River Pass

It is a VFR only pass.

Harris River Pass

VFR only.

You need 700 foot or better ceiling and three to four miles visibility for Harris River Pass. In case of trouble do a 180 or land in the lake.

Twelve Mile Arm Pass

VFR only.

Check where you came from. Check the visibility to get out or get through.

Dog Salmon Pass

VFR only.

Hydaberg Pass

You must be able to see through.

Check where you came from. Check the visibility to get out or get through.

Hollis Pass

Check where you came from. Check the visibility to get out or get through.

Follow the roads. Fog/turbulence are typical conditions.

Goodman Pass

From the west through Goodman look for a rectangular lake.

Duncan Pass

You need 1000 foot ceiling and two mile visibility. Winds of 25 knots are no problem. East winds at 35-40 knots create severe turbulence.

Petersburg Creek Pass

Should have 1000 foot ceiling and two mile visibility. Twenty-five knot winds are no problem. East winds at 35-40 knots create severe turbulence.

Wrangell Narrow

Should have 1000 foot ceiling and two mile visibility. Twenty-five knot winds are no problem. East winds at 35-40 knots create severe turbulence.

Helms Bay Pass

Check it out visually. It can be windy and turbulent.

Passes Up the Copper River

Passes are short and can be windy and turbulent. They must be VFR, be ready for an early 180.

Red Dog Pass

A combination of Noalak, Kivilina, Pt. Hope and Pt. Lay weather predicts the weather.

Mosquito Pass

If clouds are below 2000 feet or the winds from the northeast exceed 20 knots, go around the coast.

You should have unrestricted visibility and a ceiling of 1500 feet MSL to get through. You can do a 180 anywhere in the pass if you're not below 1500 feet.

Passes to Nelson Bay

You must know the winds. Don't go broadside; line up and be able to see through. There is no room for a 180 once you're in the pass.

Harendeen Pass

You must know the winds. Don't go broadside; line up and be able to see through. There is no room for a 180 once you're in the pass.

Chignik Pass

You must know the winds. Don't go broadside; line up and be able to see through. There is no room for a 180 once you're in the pass.

Mountain Flying and General and Specific Pass Flying Objectives

Given multiple-choice questions on mountain flying and general and specific pass flying techniques choose the response from those provided that best answers the question.
Accomplish in accordance with established grading standards as contained in the instructor test guide.

Presented with statements regarding mountain flying and general and specific pass flying techniques indicate whether the statements are true or false and briefly explain why.
True/false indications must be accomplished without error and explanations must meet established grading standards as contained in the instructor test guide and satisfy instructor judgement.

Identify the incorrect actions and/or techniques used, if any, and describe, if applicable, the correct actions and/or techniques when presented with a description of a scenario involving pilot actions and techniques with respect to mountain flying and general and specific pass flying. Applicable aircraft and weather information will be given if required.
Identification of incorrect actions and/or techniques must be accomplished without error. Descriptions of correct actions and/or techniques must meet established grading standards as contained in the instructor test guide and satisfy instructor judgement.

In a simulated operational environment demonstrate appropriate mountain flying and general and specific pass flying techniques.
All demonstrations must meet established grading standards as contained in the instructor test guide and satisfy instructor judgement.

Unvalidated Information Collected on Area Specific Flight Techniques

NOTE: The information presented here represents only the unvalidated information collected from the initial Alaskan interviews. In the next phase of training program development selected Alaskan pilots will be used to validate and expand this preliminary data about area specific flight techniques.

Area Specific Flight Techniques

Mt. McKinley

When going from the park to Mt. McKinley if the winds aloft above 12,000 feet are greater than 15 knots out of the southeast or winds aloft above 18,000 feet are 25 knots it's O.K. to go.

For general operations don't go if the clouds are within 100 feet of the 6,250 foot peak west of the airport or if lenticular clouds are present.

Dutch Harbor

When you hit turbulence at Dutch Harbor go to your alternate. Don't push it.

Bethel

When in snow climb to 1,000 feet and fly out of snow area on instruments. You can clear all terrain at 1,000 feet.

Valdez

Go to Johnston VOR. Let down on a heading of 300 to the water and run VFR to Valdez. TV camera shows visibility in narrows.

Cordova

Thirteen mile airport. Go east on airway V319 to Forat intersection, make a 180 left and intercept the ILS (aligned with Katat intersection).

North Slope

Don't take off unless you are ready to go IFR.

There are large, sudden barometric changes. You should have a radio altimeter and a slaved compass.

Kotzebue

When flying from Kotzebue to Barrow, if icing exists climb over Kotzebue. If you get ice, land at Kotzebue, if not go on to Barrow.

If you're going from Kotzebue to Anchorage and Merrill Pass or Rainy Pass is blocked divert to Windy Pass. Windy has roads, railroad and airports.

White Mountain

The frozen river is better than the airport. At breakup look for the black spot which is a cue that it's too soft to land.

Cook Inlet

The weather is better in the middle rather than the edges. You can fly VFR down the center when the shore is below minimums.

Shishmaref

Go north over the runway as low as possible and set the altimeter to zero. Fly north for one minute and do a procedure turn over the icepack. Return south to the city descending until the altimeter reads zero and look for the black spot that is the village.

Alaska Peninsula

Fly the breakers and look for contrast to determine wind patterns.

Follow the beach on the west shore. It is a landable beach and is straighter.

The west side is easier to fly. Danger is in a head-on crash.

You can encounter severe turbulence on the leeward side of the mountains.

On the eastern side you have low ceilings and no beaches on which to land. It's safe in a twin, but not single engine.

Kuskokwim River Area

There is poor visibility after heavy snow falls. You must have VFR on local rivers with willows for a reference.

East of the Kuskokwim is mountainous and you need to know where you are; west is flat and you need not be as cautious.

Most of the flying is done below 1500 feet AGL.

Alaska Range

Going west through the passes check Sparrevohn weather. If weather is O.K. you can enter.

Area Specific Flight Techniques Objectives

Choose the correct response when presented with multiple-choice questions on area specific flight techniques.
Accomplish in accordance with established grading standards as contained in the instructor test guide.

Given incomplete statements on area specific flight techniques write the response which best completes the statement.
Responses must meet established grading standards as contained in the instructor test guide and satisfy instructor judgement.

Given a scenario which includes applicable aircraft and weather information and describes pilot actions and techniques applicable to area specific flight techniques indicate the incorrect actions taken and techniques used, if any, and describe, if applicable, the correct actions and/or techniques.
All indications of incorrect actions and/or techniques must be accomplished without error. Descriptions of correct actions and/or techniques must meet established grading standards as contained in the instructor test guide and satisfy instructor judgement.

Unvalidated Information Collected on Fuel Management and Handling

NOTE: The information presented here represents only the unvalidated information collected from the initial Alaskan interviews. In the next phase of training program development, selected Alaskan pilots will be used to validate and expand this preliminary data about fuel management and handling.

Fuel Management and Handling

Always have a two-hour fuel reserve. Airports may be closed and alternates are far away.

Refuel at 1/2 tanks to avoid low fuel problems.

Fuel additives can solve problem of ice in fuel.

Never take off without full tanks.

In Kotzebue carry enough fuel for a round trip.

When flying the chain refuel at Cold Bay for extra fuel when weather is marginal at further destination.

Pay attention to your fuel supply. Fuel availability gets scarce in the winter and many operators run out.

The aircraft should have a dipstick on the cap to check fuel level before each flight. Gages are not accurate.

Pilot should make a dipstick to check partially filled tanks.

Check your own tanks. Fuel service personnel may not fill the tanks completely.

Use a flashlight to check turbine fuel.

Fuel filtering components must match. Fuel flow must match fuel filter.

After standing a fuel barrel on end, wait one hour for each foot of fuel. Never use a barrel with a broken seal.

Fuel Management and Handling Objectives

Choose the correct answer from those provided when presented with multiple-choice questions regarding fuel management and handling.

Accomplish in accordance with established grading standards as contained in the instructor test guide.

Given true/false statements concerning fuel management and handling indicate whether the statements are true or false and briefly explain why.

True/false indications must be accomplished without error and explanations must meet established grading standards as contained in the instructor test guide and satisfy instructor judgement.

Unvalidated Information Collected on Cold Weather Operatic

NOTE: The information presented here represents only the unvalidated information collected from the initial Alaskan interviews. In the next phase of training program development selected Alaskan pilots will be used to validate and expand this preliminary data about cold weather operation.

When you're in a village without heat, drain the oil while warm, drape a sleeping bag over the engine and use a catalytic heater. Warm the oil and battery, turn the prop several times and then start the engine.

If you are down, don't try to heat the aircraft with a fire. Wait for help.

On letdown slowly enrichen the mixture on leaving altitude. Slowly reduce the power (keep above 18") and to slow the aircraft bring the props back further (keep in the green).

Thaw the engine and use synthetic oil. Sometimes you can't use wing covers due to high winds. Thaw the engine controls.

Button snaps on fuel bladders can loosen. With the cap off it can suck up the bladder and indicate full tanks.

Pitot heat covers get blown off. Pitot heat must be on early to prevent freezeup.

An oil pressure drop after takeoff is common; don't panic. Check oil temperature for normal operation; the pressure will rise.

Pump up the tires to 50 to 60 PSI to tighten tires on the rim. Don't use windshield covers, they can scratch the windshield.

Don't cycle the prop on runup, it is already in low pitch. Sometimes it won't go into low after cycling.

Sometimes you have oil gage problems in the capillary tubes. Fill the tubes with diesel fuel to correct the problem.

Cold Weather Operation Objectives

Presented with multiple-choice questions on cold weather operations choose the response which best answers the question.

Accomplish in accordance with established grading standards as contained in the instructor test guide.

Given statements regarding cold weather operations, indicate whether the statements are true or false and briefly explain why. Accomplish true/false indications without error. Explanations must meet established grading standards as contained in the instructor test guide and satisfy instructor judgement.

Question Types

The remainder of this section describes the types of evaluative activities referenced by the objectives. The different test questions a student would encounter, such as multiple-choice or incomplete statement, are described as more evaluative activities like a flight scenario. Actually a complex training situation which emphasizes judgment and decision-making can be based on fairly simple evaluative activities. It is the structure of the scenario and the situation the student responds to that serves to emphasize sophisticated cognitive skills.

Multiple-Choice Questions

Multiple-choice questions require the student to choose the correct response to the question from a list of possible answers. Multiple-choice tests are easy to score because there is no chance for ambiguity in the student's answer.

Multiple-choice questions with feedback allow students to check their comprehension as they learn new information. In a testing situation multiple-choice questions are used to ensure that students understand the material before moving into complex, demanding test situations such as equipment usage or actual demonstration of skills. This results in better utilization of expensive training devices.

Multiple-choice questions are adaptable to a variety of media for both presentation and evaluation including workbooks, sound/slide programs with a programmable slide carrel, and computer assisted instruction (CAI).

A possible disadvantage of multiple-choice questions is that the student does not have to recall the correct answer from memory. Often the student recognizes, rather than remembers, the correct answer. This would be a disadvantage only when the nature of the information to be learned requires that the student be able to recall it from memory without aid. In this case other types of test items can be used or the student be made aware that information evaluated at one point by multiple-choice questions will later be tested in a manner that requires answering from memory.

Open-Ended - No Graphics

Some objectives utilize different types of open-ended questions to measure performance of the objectives. An open-ended question presents information to the student and requires the student to supply the answer. These open-ended questions do not require any type of graphics such as photos or drawings. Objectives utilizing open-ended questions with graphics are discussed separately as different student skills and behaviors are required, as well as different media.

Several types of open-ended questions without graphics are utilized by the objectives. These question types include:

True/False statements with explanation
Incomplete statements
Decision making based on information presented

True/False statements with an explanation present a statement which the student must identify as true or false. The student is then required (if appropriate) to write a brief explanation of why the statement is either true or false. The explanation of why a statement is true or false allows the instructor to see the reasoning behind the student's answer; it is possible that a student could correctly identify a statement as true or false, yet be mistaken in the reasons for doing so.

Incomplete statements require students to complete the partial statement(s) presented to them. The expected answer is brief, only a few words, to aid in scoring the question. Allowing longer answers results in ambiguities and makes scoring more difficult.

The third type of open-ended question without graphics utilized by the training objectives requires the student to describe their decision in response to information presented. This information can be in the form of weather information or a description of a flight scenario. The student's answer will be required to be detailed enough so the instructor can check the reasoning behind the decision made.

These types of open-ended questions have the advantage of forcing the student to recall the correct answers from memory. Except for the information presented there are no cues within the question that help the student recognize a correct answer, as in multiple-choice questions. The student must also explain the answers given or decisions reached which allow the instructor the opportunity to check the student's reasoning. This prevents a student from reaching a correct decision by using faulty reasoning. These types of questions are also a relatively inexpensive means of student evaluation since no graphics are required. The media most suitable for presenting the information needed by the student to master these objectives covers a wide range, workbooks, classroom lecture/seminar, sound/slide lessons or CAI. For evaluating performance of these objectives a written test is most appropriate due to the diversity of possible answers. Although a sophisticated CAI program can also be used, an instructor with in-depth knowledge of the material being tested is needed to resolve ambiguities that can arise in the answers given and to answer any questions the student may have. These question types can also be used by the student in a self-test format when learning new material.

Open-Ended Questions with Graphics

These objectives utilize open-ended questions which are similar to the open-ended questions discussed previously but which require graphics such as photos or drawings and also demand a different type of behavior from the student when mastery of the objective is being evaluated. The purpose of these objectives is to train the student to recognize and discriminate important visual cues. When the student is learning new information the graphics are used to point out and define these cues and when the student is tested, graphics are used to determine if the student can recognize and describe the cues in the graphics used.

These questions have the advantage of being able to actually show visual cues to the student rather than just describing them. Of course, learning and testing materials are also more expensive to produce due to the need for graphics. There is also a wide range in the price of the graphics used, from artist drawings to actual videotape footage. Open-ended questions with graphics can be used with several types of media including workbooks, sound/slide or videotape. For student self-study and self-test, workbooks would be the most appropriate media although slides and videotape could also be made available. In a testing situation the student could view a slide or videotape presentation and write the answers which would be later graded by an instructor or point out and verbally describe the cues to the instructor. Some of the objectives also require the student to recall from memory common hazards specific to a particular landing surface.

Objectives Utilizing Actual Equipment Use and A Simulated Operational Environment

These objectives require the student to use equipment, such as flight controls, to perform tasks in a simulated operational environment. This kind of objective is referred to as a "hands-on" objective because the student actually uses equipment and operates in a simulated flight environment. The purpose is to allow the student an opportunity to actually put to use the skills and knowledge learned in mastering the "classroom" type of objectives encountered in earlier phases of the training program.

The term "simulated operational environment" covers a range of devices with differing capabilities. In deciding what configuration would be most effective and efficient in terms of cost and training, the requirements of the training objectives need to be specified in detail. As the development of the training program continues, inputs from experienced Alaskan pilots will serve to specify precisely what the requirements are for training students in the performance of these hands-on objectives and for evaluating their performance.

Whatever form the simulated operational environment may take, it is a fact that the instructors working with and evaluating student performance in such a device will need to be extremely knowledgable and well trained. Detailed instructor guides are necessary to use such equipment most effectively and efficiently and to standardize instruction and evaluation.

The availability of sophisticated simulation equipment lags behind the availability of courseware such as workbooks, sound/slide programs, etc. This requires planning for an interim training program utilizing all available courseware until training hardware is available.

Training Scenarios

The tasks a pilot must accomplish to fly an aircraft comprise a complex, highly structured hierarchy of many interrelated skills and knowledge. Therefore, during training the student should at some point be placed in a situation which allows practice, performance and evaluation of those combined techniques, skills and knowledge as they occur and are needed in the real-world job environment. The goal is not to train the identified objectives wholly in isolation from each other but rather introduce each content area to the student and ensure the subject matter is mastered before bringing the student into a situation whereby the job performance tasks can be demonstrated by the student and evaluated by the instructor. These situations are comprised of many objectives previously mastered in the earlier phases of training and integrates these objectives into as near a real job situation as possible.

For purposes of the present study and the further development of an Alaskan aviation training program such a structured presentation of interrelated training objectives will be called a training scenario. These training scenarios will be selected from training objectives reflecting as closely as possible the actual demands placed upon Alaskan aviators in the performance of their duties.

A training scenario which affords the student an opportunity to actually use the skills and techniques necessary for job performance requires the use of sophisticated training equipment in order to simulate the job environment as closely as possible. Although such equipment can represent a major part of the total cost for a training program, past experience has shown that the use of aircraft simulation is much less expensive than the costs associated with the use of actual aircraft for training purposes.

The use of aircraft simulation has traditionally been associated with the training of maneuver-oriented procedures, such as a Category II approach or emergency procedures like an engine fire. The goal of an Alaskan aviation training program should be to train procedures that are unique to the Alaskan environment. Pilots in Alaska have a need for training with an emphasis on decision making skills, as well as training in following procedures. The main idea is that in most cases the decision an Alaskan pilot makes precedes and may dictate procedural operations. In the face of deteriorating weather a pilot may elect to continue at a different altitude, do a 180° turn and head back, or attempt to land at an alternate airport. It is assumed that a pilot can execute any of these maneuvers. What is crucial is which action the pilot decides to take and when he or she decides to take that action.

There is training using aircraft simulation that places emphasis on decision-making rather than procedure practice. The term used to describe such training is Line Oriented Flight Training (LOFT).

A NASA/Industry workshop, Guidelines For Line Oriented Flight Training, was held at NASA-Ames Research Center, Moffett Field, California on January 13-15, 1981. To quote from the proceedings of this workshop; "Line Oriented Flight Training (LOFT) is a developing training technology which synthesizes high fidelity aircraft simulation and high fidelity flight operational simulation to provide realistic, dynamic pilot training in a simulated line environment." The technology available today makes it possible to train, not just systems knowledge, operating skills or aircraft handling skills, but also decision-making skills. The simulated environment makes it possible for pilots to exercise these higher-order skills in a controlled, safe environment in ways that were previously accomplished only in actual aircraft operation.

The following definitions of LOFT, quoted from the workshop proceedings, illustrate its applicability for pilot training in Alaska that emphasizes the application of decision-making skills.

> LOFT is the application of line operations simulation to pilot training programs. LOFT is a combination of high fidelity aircraft simulation and high fidelity flight operation simulation.
>
> LOFT involves simulated real-world incidents unfolding in real time. Similarly, the consequences of pilot decisions and actions during a LOFT scenario will accrue and impact the remainder of the trip in a realistic manner.
>
> LOFT is casebook training. Some problems have no single, acceptable solution - handling them is a matter of judgement. LOFT is training in judgement and decision-making.
>
> LOFT is training. LOFT is a learning experience in which errors will probably be made, not a checking program in which errors are not acceptable.

The following pages present a sample LOFT scenario. The training objectives covered by the scenario are listed afterwards.

Sample Scenario

<u>General</u>

Single-engine float equipped aircraft (Cessna 185).

Flight from Lake Hood thru Lake Clark Pass to Illiamna Lake.

Four Passengers with hunting/fishing equipment request the charter.

Note: Pilot has option to ferry two passengers in two trips.

<u>Weather</u>

Takeoff - 1100' overcast, 5 mi. visibility, wind light and variable, temperature = 72°F, dewpoint = 68, barometric pressure 29.98.

Enroute - Weather information available from Kenai radio, and Big River Lakes. Pilot will encounter patchy fog which increases as flight progresses.
Lake Clark Pass - marginal visibility which decreases as flight continues thru pass.

NOTE: Difficulty of 180° maneuver dependent on aircraft gross weight.

<u>Preflight</u>

Before Cockpit Check - Pilot should verbally describe pre-flight activities. If not indicated that floats are to be checked, takeoff will be slow due to water in floats.

Cockpit Check - ADF inoperative.

<u>Takeoff</u> - Takeoff capability determined by passengers and baggage load accepted by pilot and whether floats were indicated to be checked for water.

Engine overheat approaches red line on climbout if plane is over gross weight.

<u>Enroute</u> - Pilot should contact enroute weather sources (Kenai, Big River Lakes) for information about Lake Clark Pass.
Decreasing visibility as flight continues through Lake Clark Pass.

<u>Landing</u> - Lake Illiamna - bright setting sun - glassy water.

Objectives Covered In Scenario:

Inflight adverse weather

Takeoff techniques

Enroute weather sources

Communications equipment usage

Weather prediction

Weather knowledge

Enroute navigation techniques

General pass flying techniques

Lake Clark Pass flying techniques

Go/No Go Criteria for Lake Clark Pass

Area specific flight techniques

Takeoff from lake techniques

Landing on lake techniques

Judgement of PIREP accuracy

SECTION G

COURSEWARE AND MEDIA DESCRIPTIONS

The purpose of this section is to describe the different types of instructional media that may be appropriate for presenting the information necessary for mastery of the training objectives and for evaluating student performance. A full range of training media, from workbooks to flight simulators, is presented.

Courseware

The term "courseware" refers to all printed materials and audio-visual programs required for a training system. Printed materials typically include; student workbooks, student test materials, student course guides, and instructor guides.

Student workbooks are printed training materials with supplementary maps, drawings, photos, etc. arranged to cover information relevant to the training objectives. Self-tests with answers are included to enable the student to check his/her comprehension of the material. The workbook becomes the property of the student and can serve as a useful reference and source of information after completion of the training program.

Student test materials include all written tests to be completed by students for purposes of evaluating their mastery of training objectives. Tests may also be used to evaluate student entry-level skills and to allow students credit for certain segments of the training program.

Student course guides explain the philosophy and structure of the training program's curriculum, student responsibilities for completing training, the goals and objectives for each segment of the program and a description of the purpose and use of learning aids and training devices available to the student. The course guide serves to orient the student and provide an overall view of the training program as well as informing the student of what is expected to successfully complete the course.

Instructor guides cover the entire range of instructor activities from classroom lecture to simulated flight scenarios. They provide the instructor with guidelines, objectives and evaluative criteria for all learning and testing activities and are tailored to specific course requirements. These guides ensure the effective integration of courseware materials, instructional strategies and student activities. They also function to standardize instruction and evaluation, making it possible to identify areas of the curriculum not meeting the objectives of the training program.

The materials produced for sound/slide programs are in 35mm slide format for visual presentation and 1/4 inch cassette tape for the audio portions. The slides and audio tapes are packaged in carousels and binders. The approximate 1982 cost for a sound/slide program of 160 slides and narration is $40,000. This represents the cost for producing the original program. Making copies of the original for distribution in the training system results in a much lower per unit cost.

Audio-Visual Training Equipment - Technical Description

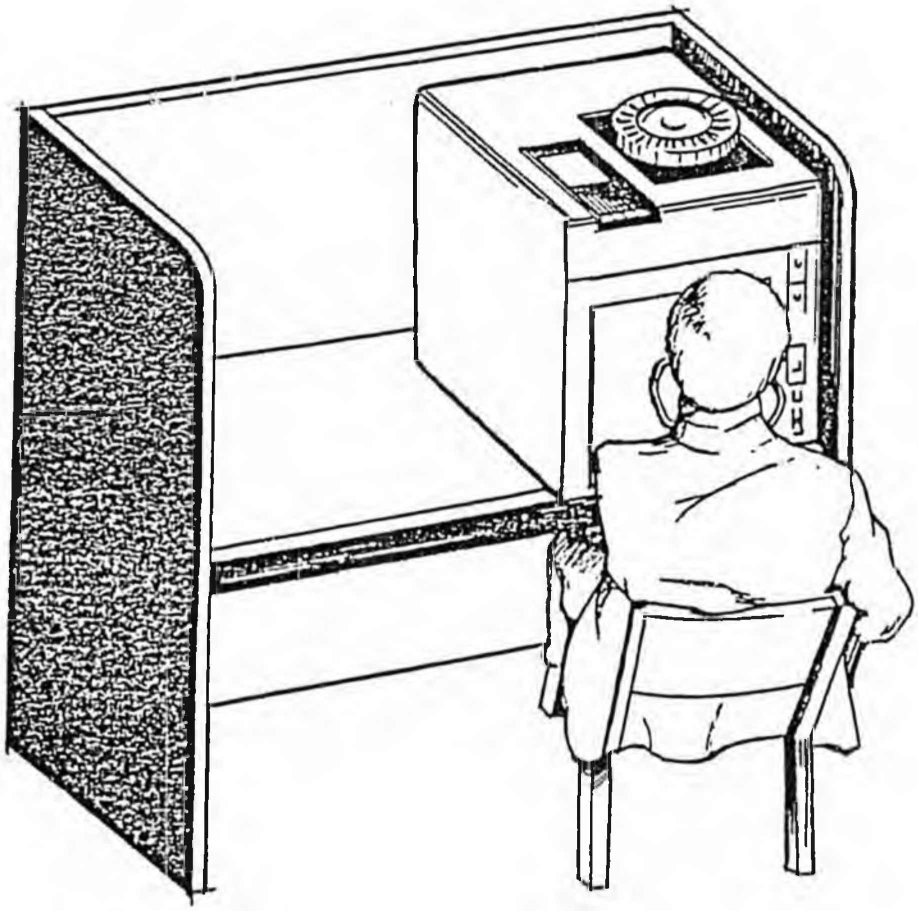
One objective of a training program designed by AATC is to integrate instructional media to provide a learning environment that is both cost and training effective. In addition to audio-visual programs for classroom use, audio-visual media can be used in a learning carrel for effective self-paced, individualized learning. Each student uses audio-visual media at an individual pace to accommodate differences in learning rates.

Learning Carrels

The learning carrel pictured in Figure G-1 is based on an AATC design. The carrels provide student desk space and house audio- visual media for individualized instruction. The approximate 1982 price for a learning carrel is $1,000.

Minicarrel Programmed Learning Unit

The Minicarrel is manufactured at our facilities and is installed in the learning carrel. The unit 1982 costs about $1,500 and is a sturdy, compact sound/slide presentation device that uses standard industrial components and plug-in electronic packages to ensure reliability and maintainability. The Minicarrel has a 13" x 13" rigid screen and accepts both horizontal and vertical slides. A reliable Kodak slide projector with an 80 or 140 slide carousel tray is used to generate an image on front surface mirrors for maximum image quality. The audiotape player has separate audio and cue tracks for maximum operational reliability.



LEARNING CARREL

Figure G-1

Dual headsets for student and instructor use are provided. The student is presented with multiple choice questions during the audiovisual presentations, and uses the built-in responder to select an answer. The student receives immediate correct/incorrect feedback following selection of an answer (Figure G-2). The Minicarrel unit can be provided by AATC for installation in the learning carrels.

Videotape

Videotape is another audio visual media that could be utilized in an Alaskan aviation program if further refinement and specification of the training objectives reveal a need for videotape and justify the cost of producing videotape. Videotape programs can be either "smart" or "dumb". A smart videotape program has the capability of interacting with the student, for example, branching to different program segments based on input from the learner. Most smart videotape programs utilize a separate microcomputer to accept student input and control program execution. A dumb videotape program merely presents audio-visual information to the student and provides little capability for interaction. It is estimated that the cost of producing videotape would be about twice that of sound/slide programs.

Videodisc

Optical videodisc technology has both advantages and disadvantages in comparison with videotape. A single videodisc has the capacity to store 54,000 color pictures. Any single frame or sequence of frames can be located by the videodisc player in less than five seconds; single frames can be selected and stepping through single frames is possible. With videotape, access time to find a sequence of frames can take from 20 to 100 seconds, it is expensive and difficult to freeze single frames, and almost impossible to step through single frames. Videotapes are editable but current videodisc technology does not allow for editing.

Videodiscs are easily interfaced with many popular microcomputers. Highly interactive and effective instruction can be

MINICARREL PROGRAMMED LEARNING UNIT

Figure G-2

designed using a videodisc under the control of the student and the computer. An industrial/educational videodisc player, a micro-computer and all the necessary hardware can be purchased in 1982 for about $5,000. However, the cost of producing a videodisc is many times that. Also, because of the cost of producing a videodisc master and the inability to edit videodisc material, certain applications do not lend themselves to this technology. Only after the content of the lesson to be taught is well defined and it is determined that the content is not subject to sudden change is videodisc a media to be considered. The technology is progressing very rapidly, however, and many changes will take place in the next few years which might make videodisc technology highly responsive to the needs of an Alaskan aviation program.

Computer Assisted Instruction and Computer Managed Instruction

Computer assisted instruction, or CAI, is the use of computers in a tutorial role; computers are used to deliver instruction and instructional content. Different types of learning activities such as drill and practice, simulations, problem solving exercises, and games can be presented via CAI. The computer can control a variety of media for the presentation of information. Through the appropriate interface a computer can control audio, slides, videotape or videodisc. A computer can select a slide or videoframe to be shown and, through the use of audio or text, describe pertinent details the student should learn to identify. In an evaluative role a CAI lesson can display information and elicit input from the learner by displaying a slide and presenting a multiple-choice question for the student to answer. This type of evaluative activity within a lesson is designed to provide the learner a means of assessing comprehension of the material presented. An actual test of the student's understanding, the results of which may dictate progress through a curriculum or prescribe remedial activities, is more the function of computer managed instruction.

Computer managed instruction, or CMI, refers to the role of the computer in managing the events which comprise a curriculum. This role encompasses lesson management and sequencing, managing and recording testing activities and prescription of remedial activities. A CMI system is actually a bookkeeping system; it keeps track of and records the result of various activities.

There are many computer systems available which are designed for CAI/CMI applications. Micro-computers costing as little as $300 can be used in some applications while more sophisticated learning programs might require equipment and software costing thousands of dollars. With the authoring systems and languages now available it is possible to program complex problem-solving scenarios which can develop and enhance a student's decision-making skills.

It follows from the definitions presented that computers can serve two different functions in an Alaskan aviation training program: as a means of presenting instruction and as a means of managing the educational activities that make up the training program.

The role that CAI and/or CMI could play in an Alaskan aviation training program is difficult to specify at this time. Two important factors need further investigation. One factor is the instructional requirements of the training objectives; that is, defining what is required to present the information to be learned. These requirements can then be matched against the capabilities of various instructional media and constraints within the training program to determine the most learning and cost effective media. The second factor needing investigation is those program constraints mentioned above that serve as input in the process of selecting instructional media. Program constraints can include operating cost limitations, the costs that customers are capable of paying and/or willing to pay for instruction and the availability of qualified instructors.

All of these have considerable impact on the media chosen for presenting information, evaluating performance, and managing and recording the instructional events within a curriculum.

Flight Simulation

Training equipment with the capability of flight simulation and visual scene representation is needed to meet the training requirements of some objectives identified by the study defining Alaskan aviation training requirements and to provide the means for conducting LOFT type training exercises which address the majority of objectives covered in earlier phases of the training program. A flight simulator would be designed to train pilots in those aspects of flying that are crucial for safe operations in the Alaskan environment. This training device would require a state-of-the-art day/dusk/night computer generated imagery (CGI) system to represent features of the Alaskan terrain and weather conditions as required by the training objectives.

As the requirements for training those objectives needing flight simulation are identified and better defined, existing hardware can be matched with these requirements to provide the most cost and training effective devices.

The following pages describe a flight simulator and the support AATC offers in its design, installation and use. The CT-5 Image Generation System is described after the simulator description. The price for one simulator and visual system as described would be from $7,000,000 to $10,000,000 at 1982 prices.

AATC can provide the services, facilities, and materials necessary to accomplish the fabrication of a flight simulator and can advise on the facilities required for installation and operation. The supplies/services that can be provided include: instructor handbooks, maintenance data, acceptance test procedure (ATP), facilities requirement, progress status report, delivery plan, training for instructors and training for maintenance/operation. The instructor handbook, maintenance data and acceptance test procedure are described in the following sections.

The instructor handbook serves as a guide to the use of the flight simulator. The handbook provides information relative to the capabilities and limitations of the flight simulator, the scope of simulation, and the degree of monitoring and performance evaluation provided. It also provides the instructor with information necessary for the complete operation of the device. The instructor handbook is divided into two volumes as follows:

1. Volume I, Operation and Utilization Instructions.

   Volume I enables the instructor to familiarize newly-assigned instructors with the basic intent, description of instructor controls, operation of controls, display pages, and operational procedures. This volume will also provide procedures for placing the equipment in a power on/power off condition and boarding procedures.

2. Volume II, Flight Simulator Description and Characteristics.

   Volume II contains a functional description of the flight simulator, its operation parameters, performance features, performance tolerances, and a list of modified, simulated, and non-functional systems. In addition, the volume also describes the function of the equipment controls and indicators other than those assigned to the instructor, excluding vendor equipment. Reference is made to applicable vendor manuals for these control/indicator functions.

Maintenance data is as follows:

1. System Schematics (Engineering Sketches) and assembly schematics manual. A brief system description is included for each major flight simulator system i.e., motion system, display system, COMM/NAV system, flight system, etc.

2. Commercial equipment vendor manuals i.e., display system, computer/peripherals, power supplies, etc.

3. Facility Report

4. Acceptance Test Procedure (ATP) Report.
   The Acceptance Test Procedure (ATP) consists of system tests by sections (action vs. result) which verifies the simulation of a flight simulator representing the aircraft.

The ATP is generated by the manufacturer reflecting the data applicable to the design per contract and submitted to the customer for review. The ATP will be the document used for preliminary and final acceptance of the flight simulator.

The flight simulator consists of the following major components:

(a) Simulated Cockpit area for the pilot station only.

(b) Instructor Station area consisting of an instructor console with two Sander's (Graphic 7) CRT monitors, or equivalent, an instructor control panel with functional controls, and an alphanumeric keyboard.

(c) A 6-degree of freedom motion system (programmed for 6-degrees of freedom) consisting of a motion platform, motion control cabinet, and associated hydraulic power supply.

(d) Real-time Input/Output (I/O) System consisting of a floor located I/O cabinet and an on-board located I/O cabinet.

(e) Digital Computer Complex consisting of:

   1) One (1) SEL Model 2520 32/7780 and one (1) SEL Model 32/37 computers with (1) Megabyte MOS Memory, or equivalent.

2) 300 CPM card reader Qty (1)

3) 80 Megabyte Moving Head Disc Qty (1)

4) Mag tape unit (75 IPS, 9 TRK, 800/1600 BPI) Qty (1) including cabinet

5) 600 LPM Line Printer Qty (1)

6) CRT Terminal, Hazeltine Model 1520, or equivalent, Qty (1)

7) SEL HSD's For: Sander's Graphic 7, or equivalent

(f) Graphic Display System, Qty (1) including (2) Monochrome CRT Display Monitors.

(g) Cockpit Air Conditioning Unit; Thermostatically controlled.

(h) Analog Control Loading System

(i) Power Distribution Cabinet

(j) Aural Cue System

The flight simulator(s) to be furnished can be configured to reflect whatever aircraft is appropriate. For an Alaskan aviation program the aircraft simulated could be a specific or generic single engine and/or a specific or generic twin engine aircraft. The CT-5 Image Generation System has the capability of providing visuals for several simulators so that one CT-5 system could provide visual simulation for a single-engine simulator cockpit and a twin-engine simulator cockpit (though not simultaneously). The flight simulator can enable training in all aspects of flying the represented aircraft and provide the type of scenarios needed to train pilot judgement and decision making.

The aircraft cockpit and instructor station are mounted on the 6-DOF motion system which is powered by a self-contained, externally located, hydraulic power supply located outside the flight simulator room to minimize distractions. The platform for the cockpit and instructor station is mounted on the hydraulic actuators and contains the components for the control loading system.

The instructor console contains the controls, displays, and indicators used by the instructor to set up and control the training problem, introduce malfunctions, monitor trainee actions and responses, and evaluate trainee responses and performances. Two graphic CRT displays are mounted in the consoles. A function control panel and a keyboard consisting of dedicated function keys provides control over the trainer systems, such as computer, motion, communication, aural cue, mission control, setting initial conditions and other parameters, and procedures.

The instructor's CRT system consists of a graphic display system. The system is configured with two CRT displays for instructor viewing. These CRT's are controlled via a standard keyboard.

The instructor can set up and control training problems via the CRT's and keyboard. CRT pages are provided to enable the instructor to accomplish the required display/control tasks.

The CRT page types that allow the instructor to implement the various training features are:

(1) Initial Conditions - An index page with subsidiary pages each containing data for an initial condition set.

(2) Enroute Conditions - One page listing the parameters pertinent to the flight condition.

(3) Manual Malfunction - An index page and many subsidiary pages. The index page lists the subsidiary pages of manually inserted malfunctions and CB/fuse failures. The subsidiary pages contain a listing of all malfunctions or CB/fuse failures by categories. Through these pages, the instructor is able to activate or deactivate any malfunction or failure.

(4) Systems - Four alphanumeric pages describing the status of aircraft systems. The first page is devoted to the fuel; the second page is devoted to the engines and propellers; the third page is devoted to the electrical system and the fourth page is devoted to the hydraulic, air conditioning, and pressurization systems (some systems may not be appropriate for the aircraft simulated).

(5) Procedure Monitor - Several index pages and an appropriate number of subsidiary pages, each of which list the specific procedures associated with normal and emergency situations. Such pages display the sequence of student actions in response to the procedure.

AATC can submit a delivery plan for meeting the requirements of this description. The plan may be prepared based on the selected manufacturer's own format but will include as a minimum the following major milestones:

(1) Data requirement dates.

(2) Hardware preliminary design review, at manufacturer's site. This consists of one (1) day. Customer personnel will be invited to participate in the review.

(3) Computer equipment and peripherals delivery.

(4) Final hardware design review at manufacturer's site. This consists of one (1) day and is conducted as status report at assembly directory level. Customer personnel will be invited to participate in the review.

(5) Software design review at manufacturer's site, consisting of a status board on a block diagram. Customer personnel will be invited to participate in the review.

(6) Completion of hardware assembly.

(7) Completion of in-house checkout.

(8) Completion of in-house acceptance checkout.

(9) Teardown - pack

(10) Completion of installation

(11) Completion of site acceptance

(12) Completion dates for maintenance data

(13) Completion date for facility report (on-site survey required)

IMAGE GENERATION SYSTEM

The Image Generation (IG) System that at this time best meets the requirements of the Alaskan aviation training objectives is a standard, three channel, Evans & Sutherland (E&S) CT-5 Image Generator. The basic elements of the IG System are a general purpose computer system, special purpose image processor hardware, and supporting software and data bases. Inputs to the