



# AERONAUTICAL SURVEYS & INSTRUMENT FLIGHT PROCEDURES

Current as of  
November 2012

## ALASKA AVIATION SYSTEM PLAN UPDATE

Prepared for:  
State of Alaska  
Department of  
Transportation &  
Public Facilities  
Division of  
Statewide Aviation  
4111 Aviation Drive  
Anchorage, Alaska  
99502

Prepared by:  
DOWL HKM  
4041 B Street  
Anchorage, Alaska  
99503  
(907) 562-2000

### Contents:

Introduction	1
Who Is Involved?	1
Aeronautical Surveys	2
Instrument Flight Procedures	3
WAAS	4



## INTRODUCTION

In the interest of creating a safer and more reliable aviation system, the Alaska Department of Transportation & Public Facilities, through the Alaska Aviation System Plan, is developing a prioritized list of airports recommended to receive aeronautical surveys and new or improved instrument flight procedures (IFPs). Aeronautical surveys and instrument flight procedures are two distinct matters that, as discussed

in the context of this fact sheet, integrate to create greater safety, reliability, and efficiency at airports. Information gathered from aeronautical surveys contributes to a wide number of aviation applications, one of which is the development of IFPs. Similarly, IFPs make use of aeronautical survey data, but there are many additional elements involved in the creation of an IFP.

This fact sheet will briefly outline:

- ◆ The primary parties involved in aeronautical surveys and IFP development in Alaska,
- ◆ The definition and applications of aeronautical surveys, and
- ◆ The definition and applications of IFPs.



## WHO IS INVOLVED?

**Alaska Department of Transportation & Public Facilities (DOT&PF):** Alaska DOT&PF's role is to evaluate the system of airports for IFP needs; conduct aeronautical surveys; operate, maintain and improve airports; and coordinate with the FAA, other agencies, and stakeholders.  
Contact: Jessica Della Croce, 907-269-0728, [jessica.dellacroce@alaska.gov](mailto:jessica.dellacroce@alaska.gov)

**Federal Aviation Administration (FAA) Airports District Office (ADO):** The ADO is responsible for administering the Airport Improvement Program (AIP) grants to fund aeronautical surveys when surveys are required for completion of capital improvement projects.  
Contact: Gabriel Mahns, 907-271-3665, [gabriel.mahns@faa.gov](mailto:gabriel.mahns@faa.gov)

**FAA Navigation Services:** Navigation Services has been the primary provider of funding for Wide Area Augmentation System (WAAS) surveys and WAAS-capable flight procedure development and publishing. The WAAS Program Office has historically procured airport obstruction surveys for runways which are promising candidates for subsequent WAAS-capable instrument flight procedure development.  
Contact: JoAnn Y. Ford, 202-493-4704, [JoAnn.Y.Ford@faa.gov](mailto:JoAnn.Y.Ford@faa.gov)

**National Geodetic Survey (NGS):** NGS is contracted by the FAA to validate and verify survey data provided by contracted surveyors is compliant with FAA specifications. NGS validates and verifies data collected for surveys funded

through both the AIP and the WAAS Program Office.  
Contact: Mark Howard 301-713-2685, [mark.howard@noaa.gov](mailto:mark.howard@noaa.gov)

**Regional Airspace Procedures Team (RAPT):** Composed of FAA Divisions of Airports, Flight Procedures, Flight Standards, and Air Traffic Control, this group reviews requests for IFPs and approves or denies them for development. If approved, the group then recommends the IFP to the FAA's Oklahoma City office for design, flight inspection, and publication.  
Contact: Kyle Christiansen, 907-271-5187, [kyle.r.christiansen@faa.gov](mailto:kyle.r.christiansen@faa.gov)



*The FAA refers to any survey related to airports or surrounding areas as an aeronautical survey.*

*Surveys support a wide variety of aviation applications including planning, design, engineering, and construction of airport improvement projects and the development of airport approach and departure instrument flight procedures.*

## AERONAUTICAL SURVEYS

**What is an Aeronautical Survey?** The FAA refers to any survey related to airports or surrounding areas as an aeronautical survey. There are many types of aeronautical surveys which serve a variety of end purposes. An aeronautical survey gathers safety critical and navigation data as well as data not critical to navigation but necessary for planning, design and construction of airport improvement projects.

Aeronautical surveys have been performed by NOAA's National Geodetic Survey (NGS) since the 1920s, but the NGS survey requirements have evolved.

The FAA has published geospatial Advisory Circulars (ACs) 105/5300-16, -17, and -18 guiding the collection of survey data for airports. There are eight (8) types of aeronautical surveys defined in Table 2.1 of AC 105/5300-18, ranging from small construction projects on landside to full-scale airport mapping databases or Aeronautical Surveys that are funded through the AIP. The FAA currently requires surveys be conducted according to standards set forth in the geospatial ACs for all obstruction surveys to develop new or change existing instrument flight procedures with any project changing

safety-critical data including runway end position and NAVAIDS. The FAA is requiring aeronautical surveys compliant with the geospatial ACs be incorporated into all projects at Primary airports and certain Non-Primary airports by 2015.

Alaska is currently receiving funding to complete approximately five (5) stand-alone surveys per year in addition to surveys being conducted through other capital improvement projects. Surveys conducted using AIP funds must be programmed appropriately with all other airport capital improvement investments.

**What is Aeronautical Survey information used for?** Surveys support a wide variety of aviation applications. Airport sponsors and the FAA use survey information in support of planning, design, engineering, and construction of airport improvement projects. The FAA additionally uses survey information

to establish airport approach and departure instrument flight procedures, determine takeoff weights, and update aeronautical publications. Aeronautical surveys are an important source of quality assured high-accuracy survey data used in the development of FAA's Next Generation Air Transportation

System (NextGen). The FAA is transitioning an airspace navigational system founded primarily on ground-based navigational equipment to this future NextGen system founded primarily on satellite-based navigational technologies.

**What is a WAAS Survey?** A WAAS survey is a type of aeronautical survey that gathers safety critical data needed to develop specific WAAS-enabled flight procedures. WAAS surveys are much less expensive than full aeronautical surveys since the purpose of the survey is focused and the scope of data gathered is less than that prescribed by the geospatial ACs. These surveys focus on

documenting Global Positioning System (GPS) coordinates of the runway and obstructions on and around the airport, especially obstructions along extended runway centerlines. FAA's Office of Navigation Services has been the primary provider of funding for WAAS surveys and the subsequently developed IFPs. The number of surveys funded through the WAAS Program is predicated

upon the amount of funding provided by Congress. This funding is expected to expire in 2014. Although the WAAS surveys are not conducted by the State of Alaska and do not impact the AIP funding, the State has a role in helping the WAAS Program Office identify runway ends to survey and consider for IFP development.

**Where are we today?** As of March 1, 2012 the following surveys have been completed in the State of Alaska:

- ◆ 27 Airports with WAAS Surveys
- ◆ 107 Airports with Aeronautical Surveys

Alaska DOT&PF continues to ensure all regional hub airports have current survey data and is also working to ensure that any airport with an improvement project includes a survey when practical. DOT&PF is currently working with the FAA and other

stakeholders to prioritize all other airports for surveys in support of IFP development and airport planning, design, and construction.

## INSTRUMENT FLIGHT PROCEDURES

**What is an Instrument Flight Procedure (IFP)?** An instrument flight procedure (IFP) is a series of predetermined maneuvers for the instrument-supported guidance of an aircraft in low-visibility conditions from initial approach to landing or to a point from which landing may be made visually. Simply stated, these procedures allow a pilot to safely guide the aircraft to the runway when the weather conditions do not allow for a

landing under visual flight rules (VFR). Instrument flight procedures enhance safety, efficiency, and reliability of access to airports. Some of Alaska's airports are currently accessible only under Visual Meteorological Conditions (i.e., good weather), which restricts access when weather systems create reduced visibility. Making these airports accessible under Instrument Meteorological Conditions through the development

of instrument flight procedures improves the safety and reliability of access.

Aeronautical surveys are a critical first step in providing airports with approved flight IFPs and lower weather minimums that create a safer and more reliable aircraft operating environment. The airport users depend on access to runways in inclement weather and benefit greatly when flight procedures are improved.



*Weather minimums in the context of instrument flight procedures define:*

*Visibility – horizontal distance,*

*and*

*Minimum descent altitude or cloud ceiling – vertical distance*

### **What are weather minimums?**

Weather minimums are the lowest visibility conditions under which an aircraft may be flown under visual flight rules (VFR). VFR flight is based on the principle of being able to “see and avoid.” Weather minimums in the context of instrument flight procedures define:

- ◆ Visibility – horizontal distance, and
- ◆ Minimum descent altitude or cloud ceiling – vertical distance.

The lower the minimums, the more likely the airport can be accessed during inclement weather conditions with instruments on board the aircraft. Many elements interact to create the lowest possible minimums – elements such as weather information, terrain, communications, avionics (navigational equipment in the cockpit), airfield characteristics, and airfield lighting. The lowest minimums may be achieved where the obstacle environ-

ment is benign (i.e., no obstacles) and the airport infrastructure requirements are met (per AC 150/5340-1 and AC 150/5300-13). Through the Next Generation Air Transportation System (NextGen) technology, lower minimums can be achieved without the need for expensive ground equipment, allowing Alaskan airports to achieve lower minimums and improved instrument flight procedures.

## WIDE AREA AUGMENTATION SYSTEM (WAAS)

**What is WAAS?** WAAS is an extremely accurate navigation system developed for civil aviation. WAAS is a combination of equipment installed on the ground, in orbit, and in an aircraft, which allows accurate GPS-based navigation during all phases of flight. Unlike traditional ground-based navigation aids, WAAS covers nearly all of

the National Airspace System (NAS). WAAS has the potential to provide horizontal and vertical navigation for approach operations at nearly any qualifying airport.

Aircraft using WAAS-capable receivers can access runways in poor weather conditions with minimums as low as 200 feet.

Generally, runways must be at least 60 feet wide, 3200 feet long, and designated as instrument runways before they will be considered viable candidates for a WAAS survey and IFP development. However, waivers can be granted, on a case by case basis, for some runways not meeting these requirements.

*WAAS is an extremely accurate navigation system developed for civil aviation.*

*WAAS has the potential to provide horizontal and vertical navigation for approach operations at nearly any airport.*

**What are the aviation benefits of WAAS?** The WAAS allows GPS to be used as a primary means of navigation from take-off through Category I precision-like approach. The WAAS broadcast message improves GPS signal accuracy from 100 meters to approximately 7 meters.

The benefits of WAAS to civil aviation are substantial. WAAS improves the efficiency of aviation operations due to enabling:

- ◆ Increased safety
- ◆ Greater capacity:
  - Reduced minimums, allowing for operations in greater range of weather
  - Improved routing
  - Reduced aircraft separation standards which allow increased capacity in a given airspace without increased risk
- ◆ Significant government cost savings :
  - No navigational equipment on the airport
  - Elimination of maintenance costs associated with older, more expensive ground-based navigation aids
- ◆ Near precision approach capability to certain runways
- ◆ Reduced and simplified equipment on board aircraft

**What are LPV and LP approach procedures?** Localizer Performance with Vertical guidance (LPV) and Localizer Performance (LP) approach procedures are specific types of instrument flight procedures that rely on the WAAS and on board receivers.

The LPV approach procedure provides both vertical and hori-

zontal guidance to the pilot. From a pilot's viewpoint, an LPV approach is operationally equivalent to a Category I ILS approach (a precision approach using instruments on board the aircraft and ground-based navigational equipment on the airport). An LPV approach procedure can provide a minimum descent altitude as low as 200 feet.

The LP approach procedure is a non-precision approach with lateral guidance but without vertical guidance. LP approach procedures will provide the lowest possible minimum descent altitude (MDA) at airports where obstructions and/or infrastructure prevent an LPV procedure. An LP approach procedure can provide a minimum descent altitude as low as 300 feet.



**Where is WAAS available in Alaska?** The following two figures depict LPV and LP coverage areas in the state of Alas-

ka. The yellow colored areas on the map depict where coverage is available. As shown, airports nearly anywhere in Alaska are potentially able to make use of WAAS capabilities.

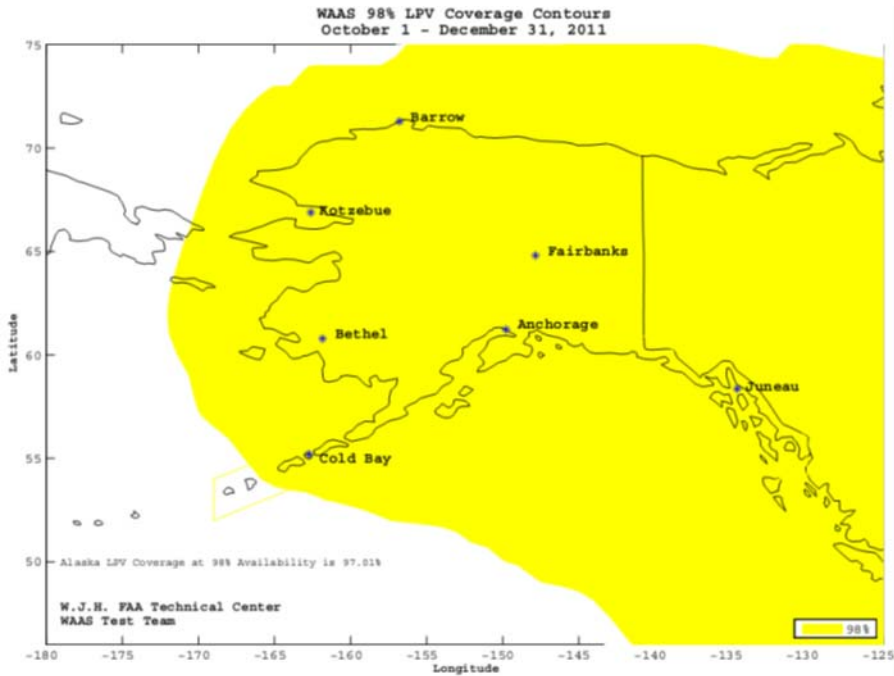


Figure 1: LPV Coverage Map

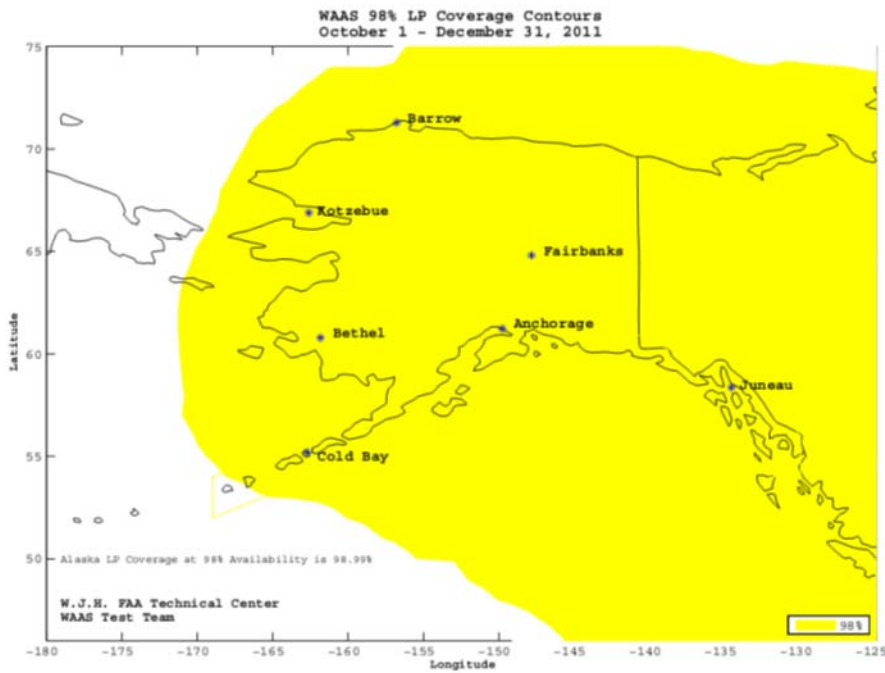


Figure 2: LP Coverage Map

The Localizer Performance with Vertical guidance (LPV) approach procedure provides both vertical and horizontal guidance to the pilot. An LPV approach procedure can provide a minimum descent altitude as low as 200 feet.

The Localizer Performance (LP) approach procedure is a non-precision approach with lateral guidance but without vertical guidance. An LP approach procedure can provide a minimum descent altitude as low as 300 feet.

Instrument flight procedures and the lowest possible minimums are affected by:

Obstacle penetrations in the glide slope

Airfield characteristics  
-Runway length  
-Runway width  
-Parallel taxiway

Approach lighting

Runway lighting and markings

Survey and airport airspace analysis

A certified altimeter source

**What is required of an airport to support LPV and LP approach procedures?**

In addition to showing desired instrument runway designation on an approved Airport Layout Plan (ALP), there are infrastructure and airport environment requirements for LPV and LP approach procedures. These requirements are defined in AC150/5300-13 tables A16-1B and A16-1C, respectively. The

specific requirements for a given approach procedure depend on the minimums. In summary, these approach procedures and the lowest possible minimums are affected by:

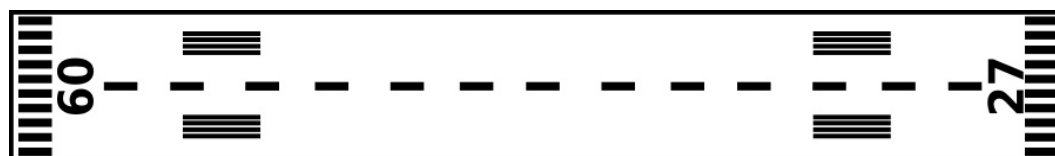
- ◆ Obstacle penetrations in the glide slope
- ◆ Airfield characteristics
  - Runway length (at least 3200 feet, with some exceptions)

- Runway width (at least 60 feet)
- Parallel taxiway
- ◆ Approach lighting
- ◆ Runway lighting and markings
- ◆ Survey and airport airspace analysis based on AC150/5300-18
- ◆ A certified altimeter source

**What is required of an aircraft to use LPV and LP approach procedures?**

Both LPV and LP approach procedures utilize WAAS signals therefore a WAAS-capable receiver must be installed on board the aircraft to fly the

approach. The WAAS avionics must be approved for LPV and LP to fly both approach procedures.



**How do you request an instrument flight procedure?**

Once the appropriate data is collected, the airport sponsor, state aviation authority, user group or user must submit an official request for development of the IFP to the FAA. An application, which can be retrieved from the FAA web page at <http://aeronav.faa.gov/index.asp?xml=aeronav/PIT/ifpform>, must be completed

and submitted to the RAPT for review. This review incorporates FAA Divisions of Airports, Flight Procedures, Flight Standards, and Air Traffic Control to provide a single coordinated review of the request. Once approved by the RAPT, the priority for publication is established and the procedure development scheduled. With the request, including the current survey and the RAPT's schedule

recommendation, the package is sent to the FAA's flight procedures group located in Oklahoma City. Here, the procedure is designed, checked, and handed off for flight inspection. After successful flight inspection, the procedure is scheduled for charting in the next available cycle. This process typically takes 12 to 18 months for completion.

**Where are we today?** As of November 7, 2012 the following WAAS-capable flight procedures have been developed in the State of Alaska:

- ◆ 61 LPV Approach Flight Procedures
- ◆ 19 LP Approach Flight Procedures

Alaska DOT&PF continues to ensure all regional hub airports have instrument flight procedures with the lowest possible minimums. DOT&PF is currently working with the FAA and airport users to prioritize all other airports for surveys to support

instrument flight procedure development and to recommend those with current survey data for LPV and LP approach procedure development.