National Geodetic Survey
Aeronautical Survey Program

September 20, 2001

Runway, Stopway, Displaced Threshold
Length Computation

The Runway, Stopway, and Displaced Threshold lengths can be computed using the NGS INVERS3D program. The program is available for download from
http://www.ngs.noaa.gov/TOOLS/Inv_Fwd/Inv_Fwd.html

The following example is provided as a guide. In this example the length for runway 18 - 36 is desired. The surveyed geographic coordinates and orthometric heights for runway ends 18 and 36 are listed below. The geographic coordinates are in degrees, minutes, and seconds to 0.0001 arc seconds. The orthometric height is in feet to 0.001.

END	LATITUDE	LONGITUDE	ORTHOMETRIC HEIGHT (Feet)
18	34 59 13.1814 (N)	89 47 12.9467 (W)	401.220
36	34 58 13.8449 (N)	89 47 12.3657 (W)	394.133

INVERS3D Program

The program requires geodetic coordinates as input, expressed as either: 1) latitude and longitude in degrees, minutes, and seconds or decimal degrees. The program works exclusively on the GRS80 ellipsoid and the units are meters.

The input is as specified in the INVERS3D program except for the prompt for the first and second station ellipsoid heights. At the prompt for ellipsoid height enter the orthometric height in meters.

The runway length is the "mark to mark distance" with the units in meters. In this example the mark to mark distance is 1828.6517 meters or 5999.5015 feet. The length rounded to the nearest foot is 6,000 feet.

The following is the program output.

```
First station : OLV CL END RWY 18
  X =      19454.2080    LAT =  34 59 13.18140 North
  Y =   -5231318.2803    LON =  89 47 12.94670 West
  Z =    3636755.0646    EHT =   122.2920

  Second station : OLV CL END RWY 36
  X =      19472.8381    LAT =  34 58 13.84490 North
  Y =   -5232364.7297    LON =  89 47 12.36570 West
  Z =    3635255.5434    EHT =   120.1320

  Delta height =     -2.1600
  Ellipsoidal distance   =    1828.6156
  Mark to mark distance =     1828.6517
  Forward azimuth from north = 179 32 17.5398
  Back azimuth from north    = 359 32 17.8728

  DX =        18.6301    DN =     -1828.5907
  DY =     -1046.4493    DE =        14.7385
  DZ =     -1499.5212    DU =        -2.4230
```