BY ORDER OF THE
SECRETARY OF THE AIR FORCE

AIR FORCE MANUAL 13-215

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Space, Missile, Command, and Control

ATC RADAR MAPS AND ASSOCIATED SYSTEMS

COMPLIANCE WITH THIS PUBLICATION IS MANDATORY

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This manual implements Air Force Policy Directive 13-2, *Air Traffic Control, Airspace, and Range Management*. It defines procedures and responsibilities for constructing radar digital maps and associated software systems for Air Traffic Control (ATC) radars. **Attachment 1** is a glossary of abbreviations and acronyms.

Forward copies of all supplements for this instruction to the Air Force Flight Standards Agency, Director of Operations, Instrument Procedures (AFFSA/XOIP) for approval. For suggested changes to this instruction, use AF Form 847, ***Recommendation for Change of Publication***. Send AF Form 847 through channels to AFFSA/XOIP. AFI 11-215, *Flight Manual Procedures*, will govern processing of AF Forms 847. Maintain and dispose of records created as a result of prescribed processes in accordance with AFMAN 37-139, *Records Disposition Schedule.*

SUMMARY OF REVISIONS

This document is substantially revised and must be completely reviewed. Revisions include clarification of responsibilities; deletion of analog map development criteria; addition of GPA-134 Video Map Generator (VMG) criteria; deletion of Emergency Obstruction Video Map (EOVM) criteria; expansion of Minimum Safe Altitude Warning (MSAW) and Low Altitude Alerting System (LAAS) development instructions.

CHAPTER 1

GENERAL INFORMATION

1.1. Responsibilities.

1.1.1. Chief Controller (CCTLR). Manages ATC radar maps and associated systems. Determines facility mapping and site adaptation requirements and tolerances in accordance with applicable directives.

1.1.2. TERPS. Develops digital video maps, MSAW/LAAS, and Programmable Indicator Data Processor (PIDP) submissions for single-sensor systems in accordance with CCTLR requirements. Provides data as required to assist CATCA/ATCSS develop adaptation, mapping, and MSAW at multi-sensor system locations.

1.1.3. Air Traffic Control Automation (CATCA/ATCSS). Responsible for database administration and implementation of the system adaptation, MSAW, and digital map operational databases for multi-sensor system locations.

1.2. Security Classification. The CCTLR determines the security classification of each map, chart, form, or digital map database stored on electronic media according to DOD 5200.1-R *Information Security Program* and AFI 31-401 *Information Security Program Management*.

1.3. Flight Inspection. The Federal Aviation Administration (FAA) conducts flight inspection of Minimum Safe Altitude Warning (MSAW), Low Altitude Alerting System (LAAS), and radar video maps in accordance with AFMAN 11-225, *United States Standard Flight Inspection Manual*, section 215. MSAW/LAAS checks are associated with the corresponding terminal radar system, therefore new/revised MSAW/LAAS charts **do not** require flight inspection prior to implementation beyond those periodics required for the radar. MSAW/LAAS inspections are a check of the ***system***, not of the adequacy of specific sector/bin altitudes.

NOTE: PIDP systems do not have Approach Path Monitor (APM) capability. MSAW flight inspection at USAF PIDP locations consist of a General Terrain Map (GTM) equivalent check only (no “preflight inspection plans” as outlined in AFMAN 11-225 paragraph 215.2 are required).

CHAPTER 2

DIGITAL MAPS

2.1. AN/GPA-134 Digital Maps. Develop maps using the Video Map Generator (VMG) system software pre-installed on the AN/GPA-134 hardware.

NOTE: Maps for operational use shall be developed on the VMG system laptop computer ONLY. The VMG requires a DOS based operating system environment. You may load the VMG software on another computer for training or familiarization purposes, however the accuracy of any map developed on a computer other than the system laptop cannot be guaranteed. Maps developed on computers other than the VMG system laptop shall not be loaded or used as an operational map.

2.1.1. MAJCOM review and approval is not required for VMG digital **maps**. However, Minimum Vectoring Altitude maps must be developed based on MAJCOM reviewed/approved MVAC data. Additionally, use coordinates obtained from validated sources only, i.e., current airport/NAVAID survey data, NIMA DAFIF/FLIP, FAAO 7350.7 *Location Identifiers*, or FAAO 7400.8, *Special Use Airspace*. Ensure that the horizontal datum is always consistent, i.e., if ASR antenna coordinates are entered in WGS-84, all other coordinates entered during the map build must be WGS-84. Maps will be checked for accuracy by facility personnel prior to use, and the accuracy/adequacy of the overall design will be validated by MAJCOM during Air Traffic Systems Evaluation Program (ATSEP) inspections in accordance with AFI 13-218.

2.1.2. Maintain a historical file for each map developed containing the printouts of the table entry data and all source documentation.

2.1.3. AN/GPA-134 Digital Map Development Instructions

2.1.3.1. Use the ***VMG interface software*** (option 1 on main menu) to create/revise up to 10 digital maps. Facility management will determine specific map content in accordance with applicable directives and operational requirements. Enter symbols to be displayed on a particular map using the applicable table entries (below). For example, if map 01 will show only satellite airports and NAVAIDS, enter the appropriate data in table entries 3, 7 and 8 (entry 3 is always required).

2.1.3.2. Use the Tab key to navigate between fields. Enter "N" or "Enter" to navigate to the next table entry page, "P" to go to the previous page, and "e" to go the last table entry page. Enter "F1" to get help for any field. Certain table entries have drop-down menu's available to define options. Look for the drop down options at the bottom of the screen next to the "Previous" box.

2.1.3.3. All Table entries requiring coordinates will be in the format HDDDMMSSF where H= Hemisphere (N or S for Latitude, E or W for Longitude); D= Degrees; M= minutes; S=seconds; F= fraction of seconds (standard rounding i.e., .44 = .4 and .49 =.5) . For example North latitude 37 degrees, 5 minutes, 45.69 seconds would be entered as N03705457. Use data from authorized sources only in a consistent horizontal datum (see paragraph **2.1.1.**).

2.1.3.4. Table Entry 1. After entering the VMG interface software, the first screen (table entry 1) is information only. Note the comment that all headings (including radials) entered are relative to TRUE North. ***NOTE***: During installation, maintenance enters the appropriate magnetic variation of the ASR antenna in the dipswitch settings. If true headings do not appear to depict the desired courses accurately have maintenance verify dipswitch settings.

2.1.3.5. Table Entry 2. Enter the two-digit map number (i.e., 01 for first map). Choose option “M” to build a new map, or “R” to revise an existing map. ***NOTE***: For new maps, program will display a warning if the user attempts to use the number of an existing map and ask for overwrite confirmation.

2.1.3.6. Table Entry 3. RADAR data.

2.1.3.6.1. Enter the ASR antenna coordinates for the primary airport.

2.1.3.6.2. Enter radar name.

2.1.3.6.3. Enter the commisioned range of the primary radar (confirm with maintenance). ***NOTE***: Do not reduce or adjust range for surveillance approach maps. Digital Map resolution will not be affected by adjusting the range presentation at the radar indicator.

2.1.3.7. Table Entry 4 – 5. Intentionally left blank

2.1.3.8. Table Entry 6. Primary Airports (an airport is considered “primary” for the purpose of VMG development if the user desires runway extended centerlines depicted).

2.1.3.8.1. Enter the airport name.

2.1.3.8.2. Enter the runway identifier.

2.1.3.8.3. Enter approach end threshold coordinates.

2.1.3.8.4. Enter departure end threshold coordinates.

2.1.3.8.5. Enter the distance (nautical miles from approach end threshold) for extended runway centerline. Entry requires three digits (10 NM = 010).

NOTE 1: Runway length is calculated based on AER/DER threshold coordinates and is not required to be entered.

NOTE 2: Entries are not columnated. Use arrow key or cursor to navigate between fields.

NOTE 3: Separate entries are required for each runway desired to be depicted with an extended centerline.

2.1.3.9. Table Entry 7. Secondary airports (no extended centerlines).

2.1.3.9.1. Enter airport name.

2.1.3.9.2. Enter airport reference point

2.1.3.9.3. Enter the symbol desired (see Attachment 4) using the following three-letter codes:

SAP = Secondary airport (circle with directional tabs)
RUN = Runway pattern
HPO = Heliport (circled letter H)

NOTE: Coordinate with ATC Facility management to determine which symbol best meets operational needs for the map being developed

2.1.3.9.4. Enter desired rotation of the map symbol in true azimuth (TRUE AZIMUTH). For example, a satellite airport with runways 8/26 and 10° E magnetic variation. Determine the true azimuth for either runway (i.e 080 ° magnetic + 10° magvar =090° TRUE AZIMUTH). Enter 090.0 in the ROTAT column to orient the symbol with the runway alignment.

2.1.3.10. Table Entry 8. Navigation Aids.

2.1.3.10.1. Enter name of NAVAID to be depicted

2.1.3.10.2. Enter NAVAID coordinates (from authorized sources, see paragraph **2.1.1.**).

2.1.3.10.3. Enter the symbol desired (see attachment 4) using the following three-letter codes:

NAD = NAVAID (circled letter N)
FAP = Final Approach fix (+)
CFX = Course Fix (asterisk)
RNA = RNAV waypoint (circled letter W)

NOTE: Coordinate with ATC Facility management to determine which symbol best meets operational needs for the map being developed.

2.1.3.10.4. Enter Rotation. Defaulted to 360°, and not normally adjusted. If necessary to rotate NAVAID/fix symbol, enter True azimuth (see paragraph **2.1.3.9.4.**).

2.1.3.11. Table Entry 9. Reporting points/fixes.

2.1.3.11.1. Enter the name of the fix

2.1.3.11.2. Enter the coordinates of the fix from approved source (see paragraph **2.1.1.**), or the Offset R-A reference location (see **2.1.3.11.3.** below).

2.1.3.11.3. Enter the Offset R-A (range/azimuth) for fixes based on radial/DME. For example, to depict a fix defined by the TACAN R-260 at 6 DME, first enter the TACAN coordinates in the HDDDMMSSF columns. Next, enter the distance from the TACAN in nautical miles in the Offset R column as “R0006.0”. Finally, convert the 260° radial to True azimuth (270° with a 10° east magnetic variation), and enter in Offset A column as “A0270.0”

2.1.3.11.4. Enter the symbol desired (see attachment 4) using the following three-letter codes:

NAD = NAVAID (circled letter N)
FAP = Final Approach fix (+)
AFX = Airway/course fix (Δ)
VFR = VFR reporting point ( )
RNA = RNAV waypoint (circled letter W)

2.1.3.11.5. Enter Rotation. Defaulted to 360°, and not normally adjusted. If necessary to rotate fix symbol, enter True azimuth (see paragraph 9d). One technique is to rotate fix 90° from the True azimuth of the course along which the fix is located (i.e., TRUE AZIMUTH of final approach course 153° - 90° = 043.0 rotation).

2.1.3.12. Table Entry 10. Obstructions and Permanent Echoes. Depict selected prominent obstructions as directed by Facility Management. ***NOTE***: PE symbols and map alignment “T’s” are not required for digital map alignment, but may be required for radar alignment checks. See appropriate facility directives.

2.1.3.12.1. Enter the name of the obstruction.

2.1.3.12.2. Enter coordinates from approved sources (see paragraph **2.1.1.**), or the Offset R-A reference location (see **2.1.3.11.3.** above).

2.1.3.12.3. Enter Offset Range-Azimuth (see **2.1.3.11.3.**).

2.1.3.12.4. Enter the symbol desired using the following three-digit codes;

OBS = obstruction/permanent echo (^)
FAM = final approach fix or fan marker (asterisk)

2.1.3.12.5. Enter rotation required. Remember that the symbol depiction will default to 360 TRUE AZIMUTH. The open end of the “V” must point towards the ASR antenna. Determine the TRUE AZIMUTH of the obstruction from the ASR antenna (using CONGEO utility or other approved software), and enter the value calculated in the rotation column.

2.1.3.13. Table Entry 11. Radar Handoff Point. Depict Radar Handoff points as directed by Facility Management. Entries are in coordinates, Offset R-A, and Rotation as previously described.

2.1.3.13.1. Enter the symbol desired using the following three-digit codes;

HOP = Handoff point (+)
FAM = Final Approach fix or fan marker (asterisk)

2.1.3.14. Table Entry 12. Scramble Track. Depict as directed by Facility Management. Enter Start/Stop point coordinates obtained from approved sources (see paragraph **2.1.1.**). ***NOTE***: Except for the first entry, Start points will be the previous Stop point.

2.1.3.15. Table Entry 13. Recovery Track. Depict as directed by Facility Management. Enter Start/Stop point coordinates obtained from approved sources (see paragraph **2.1.1.**). ***NOTE***: Except for the first entry, Start points will be the previous Stop point.

2.1.3.16. Table Entry 14. Special Use airspace. Depict as directed by Facility Management. Enter Start/Stop point coordinates obtained from approved sources (see paragraph **2.1.1.**). ***NOTE***: Except for the first entry, Start points will be the previous Stop point. Enter type line desired for the SUA boundary using one of the following 1-digit numerical codes:

1 = Solid line
2 = Dashed line
3 = Dotted line
4 = Dotted/dashed line
5 = Dot “A” Dot dashed line
6 = Dot Dot Dashed line

2.1.3.17. Table Entry 15. Airways and Corridors. Depict as directed by Facility Management. Entries in the same format as Table 14. ***NOTE***: Enter fix/intersection coordinates for Start/Stop points only from valid sources (i.e., FAAO 7350.7, Location Identifiers).

2.1.3.18. Table Entry 16. ADIZ Areas. Depict as directed by Facility Management. Entries in the same format as Table 14, except line type is preset.

2.1.3.19. Table Entry 17. ARTC/Sector Boundaries or Other Unique Airspace Area Limits. Depict airspace boundaries as directed by Facility Management. Entries are in the same format as Table 14. ATC assigned airspace coordinates can usually be found ARTCC/RAPCON LOAs (ensure coordinates are in either NAD-83 or WGS-84). Determine coordinates for RAPCON sectorization boundaries using approved software.

2.1.3.20. Table Entry 18. Topographic/Hydrographic Features. Normally not used.

2.1.3.21. Table Entry 19. Geographic Reference Grid. Normally not used. If "YES" selected, map will depict a grid overlay. Program will prompt for grid line type and text size.

2.1.3.22. Table Entry 20A. Circle. Can depict complete or semi-circles. Primarily used to depict MVA sectors or airspace boundaries defined by radials/arcs (use line feature discussed in item 23 below to connect arcs).

2.1.3.22.1. Enter circle name (i.e., MVA sector 1).

2.1.3.22.2. Enter the coordinates for the circle center or the Offset R-A reference point.

2.1.3.22.3. Enter the amount of offset in five-digit range and true azimuth (see item **2.1.3.11.3.**). If no offset, leave blank.

2.1.3.22.4. Enter the radius in NM, four-digits (i.e., 7 NM = 007.0).

2.1.3.22.5. Enter the arc beginning for semi-circles (arcing clockwise). For complete circles, do not enter arc Begin .

2.1.3.22.6. Enter the arc stop. For complete circles, do not enter arc Stop.

2.1.3.22.7. Enter line type (see drop down menu or item 16 above).

EXAMPLES: *Depict an MVA sector centered on the ASR, 7 NM arc from 150° true azimuth to 335° true azimuth* – Enter the ASR antenna coordinates in HDDDMMSSF format. Leave Offset R-A blank. Enter 007.0 for radius. Enter 150.0 for arc Begin, and 335.0 for arc Stop. Select line type.

Depict a 3 NM isolation buffer centered on TACAN R-270/10 DME – Enter TACAN antenna coordinates in HDDDMMSSF format. Enter R0010.0 for range from reference point. Enter A0280.0 (R-270 corrected to true azimuth). Enter 003.0 for radius. Leave arc Begin and Stop blank, enter line type.

2.1.3.23. Table Entry 20B. Line. Used to depict MVA sectors or airspace boundaries defined by lines originating from a reference point defined in HDDDMMSSF format or Offset from a reference point, to a specified azimuth and distance.

2.1.3.23.1. Enter line name.

2.1.3.23.2. Enter line origination point or offset reference point coordinates in HDDDMMSSF format.

2.1.3.23.3. Enter the amount of offset in five-digit range and true azimuth (see item **2.1.3.11.3.**). If no offset, leave blank.

2.1.3.23.4. For rotation, enter the line's true azimuth from reference point in four-digits.

2.1.3.23.5. Enter the distance from reference point that the line terminates in four-digits. ***NOTE***: When using Offset R-A, enter the distance from the offset point to the line termination, NOT the reference point to line termination. For example, if the line starts offset 7 NM from reference point, and stops at 10 NM, enter 003.0 in distance (10 NM – 7 NM = 3 NM).

2.1.3.23.6. Enter line type (see drop down menu or item 16 above).

EXAMPLES: *Depict a line from the TACAN antenna to R-353/12 DME* – Enter the TACAN antenna coordinates in the HDDDMMSSF format. Leave Offset R-A blank. Enter 350.0 in rotation (R-353 converted to true azimuth). Enter 012.0 in distance, and select line type.

Depict a line offset from the ASR antenna, 050° true azimuth at 10 NM to 050° true azimuth at 25 NM - Enter ASR antenna coordinates in HDDDMMSSF format. Enter R0010.0 for offset range. Enter A0050.0 for offset azimuth. Enter 050.0 for rotation. Enter 015.0 for distance, and select line type.

Depict a line from TACAN R-190/15 DME to TACAN R-230/10 DME – Enter TACAN coordinates in HDDDMMSSF format. Enter R0015.0 for offset range. Enter A0183.0 (R-190 converted to true azimuth) for offset azimuth. Using approved software, determine the true azimuth and distance between the two end points. Enter 321.8 (true az) in rotation, and 009.8 in distance. Select line type.

or

Determine endpoint coordinates using approved software, determining true azimuth and distance between points. Enter one endpoint's coordinates in HDDDMMSSF format. Leave Offset R-A blank. Enter true azimuth between endpoints in rotation, and distance in NM from endpoints in distance. Select line type.

2.1.3.24. Table Entry 20C. Text.

2.1.3.24.1. Enter the alpha-numeric characters to display on the map.

2.1.3.24.2. Enter the coordinates of text location (determined using approved software) or the offset reference point.

2.1.3.24.3. Enter the amount of offset from the reference point in range and true azimuth. If none, leave blank.

2.1.3.24.4. Enter the amount of rotation. Default rotation set to 090° true azimuth. Since radar presentation is oriented to magnetic North, must accommodate for magnetic variation for a horizontal (perpindicular to the floor) text display. For example, a location with 10° West ASR slaved magnetic variation would adjust the rotation to 100.0. (090° true + 10° to convert from true to magnetic)

2.1.3.24.5. Enter text size using the following 9 codes (blanks indicate a gradient between named sizes)

1. Very small size
2.
3. Small size
4.
5. Normal size
6.
7. Large size
8.

9. Very large size

2.1.3.25. Table Entry 20D. Symbol. Allows entry of standard map symbols using coordinates in HDDDMMSSF format. Provided for convenience; symbols identical to those addressed in previous tables. Enter the following symbol identifier as needed:

SAP = Secondary Airports
RUN = Runway Indicator
NAD = Navaids
HOP = Hand off point
FAP = Final approach fix
CFX = Course fix
AFX = Airway/corridor fix
VFR = VFR reporting point
RNA = RNAV waypoint
OBS = Obstruction /permanent echo
HPE = Helipad
HPO = Heliport
FAM = Final Approach fix or Fan Marker

2.1.3.26. Table Entry 20E. Final commands. Option to print help screens. Additionally, option to print table entries for a specific map (include printouts in map documentation package). Also, includes save options. When ready to produce map, enter “Save, go to VMG”.

2.1.3.27. VMG Software entries.

2.1.3.27.1. Select default option “Make a New Map Picture” on Select Job menu.

2.1.3.27.2. Select default option “All data without asking” in Select Objects menu. Program will compile map at this point.

2.1.3.27.3. When completed, “Select Data File” menu will appear. Select “View Map Picture” option to validate map depiction.

2.1.3.27.3.1. Note comment in upper left corner “This is not the PPI Quality”. Depiction on screen and printed version is much poorer quality than the map depicted on radar indicator. Map will appear elongated, however can still be used to verify map orientation and symbol relationship.

2.1.3.27.3.2. Navigation. Use arrows or mouse to move cursor location. Use Home key to move cursor to map center. Lower right corner of screen shows cursor position. Use F8 key to toggle display from XY coordinates in DM (Data mile), NM, and KM (Kilometer) increments, or lat/lon coordinates (most useful for map validation). Escape to exit.

2.1.3.27.3.3. Zoom. Defaulted scale is 1:1 (F1) key. Use F2 – F6 to increase zoom (centered on cursor position).

2.1.3.27.3.4. “Print Map Picture”. Print a copy of each map and file in documentation package.

2.1.3.27.3.5. Select “Map Picture Ready” option to continue loading the map into the VMG software, which takes the user to “Programming” menu. Select “To EEPROM”. Follow prompts to download the map data to the map memory board. Enter “Yes” at each prompt to complete data load. If a red error message window appears, correct the failure and retry.

2.1.3.28. To save time, duplicate maps may be made using the following DOS commands. These duplicae maps will negate the need to reenter data that is common to both the original and duplicate (i.e. ASR coordinates, permanent echoes, etc.) Instructions outlined below are based on the assumption that a complete map was developed and designated map number 01. No other maps exist.

2.1.3.28.1. At VMG software main menu, select option 4 “Exit to DOS”.

2.1.3.28.2. At the C:\ prompt type “CD\VMG34” and hit “ENTER” key. Directory will change to C:\VMG34.

2.1.3.28.3. Type “copy picture.001 picture.002”. Two identical maps are produced, numbered 01and 02.

2.2. DBRITE Digital Maps. For each DBRITE digital map requirement, submit an AF Form 3643 ***Digital Map Request*** to ESC OL-DE/GA 3580 D Ave, Bldg 201W, Tinker AFB OK 73145-9155. Allow sufficient time in planning for and ordering digital maps. After receipt, digital maps are normally completed in 5 duty days per map based upon workload (i.e., a request specifying 5 separate maps would normally take ESC OL-DE 25 duty days to complete). MAJCOM review and approval is not required for DBRITE digital **maps.** However, Minimum Vectoring Altitude maps (if depicted) must be developed based on MAJCOM reviewed/approved MVAC data. Additionally, use coordinates obtained from validated sources only, i.e., current airport/NAVAID survey data, NIMA DAFIF/FLIP, FAAO 7350.7 *Location Identifiers*, or FAAO 7400.8, *Special Use Airspace*. Ensure that the horizontal datum is always consistent, i.e., if ASR antenna coordinates are entered in WGS-84, all other coordinates entered during the map build must be WGS-84. Maps will be checked for accuracy by facility personnel prior to use, and the accuracy/adequacy of the overall design will be validated by MAJCOM during Air Traffic Systems Evaluation Program (ATSEP) inspections in accordance with AFI 13-218.

2.2.1. Properly classify and limit completed AF Forms 3643 to operational needs. Each block must have an entry. If an item does not apply, enter "NA."

2.2.2. Accompany each new map request with a sketch (not necessarily to scale) indicating all desired features to assist ESC OL-DE/GA with map development. Submit maps or drawings from letters of agreement, airway charts, special procedural data, etc., for clarification of requested map depiction. Label all points by number as they appear on the completed AF Form 3643. ***NOTE:*** In order to save memory, to the extent possible, do not duplicate portions of maps that are common to two or more maps; e.g., airspace boundaries. Indicate the magnetic orientation on the sketch (i.e., “T” to show true or “M” to show magnetic North). If magnetic, make the sketch relative to the slaved magnetic variation of the ASR antenna serving the primary airport. All bearings entered on the AF Form 3643 shall be consistent with the sketch (either magnetic or true). When submitting requests for multiple maps, produce a **scale** sketch which is a composite of each map (to include all symbols) to ensure that multiple map selection does not result in data/symbol overlap.

2.2.3. Revised Maps. Use the computer generated printouts furnished by ESC OL-DE/GA or an AF Form 3643 for all revisions or changes to maps. Highlight new data on forms or construction sketches received from ESC OL-DE/GA. On a construction sketch printout, highlight additions in yellow and deletions in blue. If additional space is needed, attach an AF Form 3643 to the computer generated printouts. If transmitted via facsimile, annotate "ADD" or "DELETE" for changes.

2.2.4. Return EPROM chips containing old or outdated data to ESC OL-DE/GA.

2.2.5. AF Form 3643 Completion Instructions

2.2.5.1. Use the most accurate information available to calculate data. Minimum standards are listed below.

2.2.5.1.1. Use the nearest tenth of a mile for distances reported in nautical miles (NM).

2.2.5.1.2. Use the nearest arc second when reporting latitude (LAT) and longitude (LON) coordinates. Approved TERPS automation programs may be used to calculate geodetic coordinates when not available from other sources (i.e., to determine coordinates of an unpublished DME fix).

2.2.5.1.3. Use the nearest tenth of a degree when reporting true or magnetic values.

2.2.5.1.4. Report all elevations as mean sea level (MSL).

2.2.5.1.5. Support Documentation. Provide a composite sketch (not necessarily to scale) depicting all desired features of paragraphs **2.2.5.2.**, **2.2.5.3.**, **2.2.5.4.**, **2.2.5.5.**, **2.2.5.6.** and **2.2.5.7.** below. Provide descriptive labeling (use copies of LOAs, facility or airport documents, etc.) of features to enable the reviewing office to make rapid and complete checks of data.

2.2.5.2. Section 1 General:

2.2.5.2.1. Map Number. Enter the specific map number (1-5) that corresponds to map selection on radar equipment. ESC OL-DE will place maps on the EPROM in ascending order.

2.2.5.2.2. Location. Enter the complete mailing address and DSN telephone number of the assigned unit.

2.2.5.2.3. Three-Letter Identifier (ID). Enter the last three letters of the location ICAO identifier.

2.2.5.2.4. Date. Enter the submission date (dd-mmm-yyyy).

2.2.5.2.5. ASR Location. List the ASR antenna LAT in the top block and LON in the bottom block.

2.2.5.2.6. ASR Magnetic (Mag) Variation (Var). Enter the assigned or slave magnetic variation of the ASR radar source, a number between 0.0 and 180.0, include E or W. Use the variation assigned by commissioning or periodic flight inspections, not the variation specified on aeronautical maps and charts.

2.2.5.2.7. Approval Signatures. The facility chief must sign each form to indicate facility review and concurrence. For changes submitted on ESC OL-DE computer-generated forms, the approving authority should sign next to his or her name.

2.2.5.3. Section 2 Major Airport Data. Depicted by a solid line to indicate the runway(s) layout and includes runway extended centerlines (usually restricted only to primary airport and major satellite(s) with multiple instrument approaches). Make up to *40 entries* using extra AF Forms 3643 as required.

2.2.5.3.1. Airport Name. Enter the airport name, up to *30 characters,* of all airports whose runway layout and extended centerlines require map depiction.

2.2.5.3.2. Runway Number. Runways are considered bi-directional and need only be entered once. Label one end of a runway as the approach end of runway (AER) and the opposite end as the departure end of runway (DER). (For example, label an airport's three runway surfaces as 17-35, 27-09, 21-03). This is information data only. Annotate runway numbers as "L," "R," or "C" if required to identify left, right, and center runway configurations respectively.

2.2.5.3.3. Thresholds. List the LAT in the top block and the LON in the bottom block for the designated AER and DER for each runway surface.

2.2.5.3.4. Extended Runway Centerlines and Fixes:

2.2.5.3.4.1. EEP. Enter the nautical mile value of the desired runway centerline extension end point (EEP) (normally 10 nautical miles (NM) from end of runway) under column AER, DER, or both, as appropriate, in the EEP block. *Types : D=Dashed lines, H=1/2 NM Tip Tail, O=1 NM Tip Tail.*

2.2.5.3.4.2. Fixes. Include any fixes desired along the extended runway centerline by entering the desired nautical mile distance (from the respective threshold) in the fixes block adjacent to the EEP block under the appropriate AER or DER column. *Types : P=Plus sign, A=Asterisk, H=1/2 NM Hash Mark.*

2.2.5.3.4.3. CS. Character Size is not used.

Figure 2.1. Major Airport Data example.

AER					DER				
EEP	FIXES	CS	FIXES	CS	EEP	FIXES	CS	FIXES	CS
10 H	4.4 P		5.8 A		12 D	5.5 H		7.5 P	

NOTE: Approach end indicates a 10 NM ½ NM tiptail runway extension, a plus sign at 4.4 NM, and an asterisk at 5.8 NM. Departure end indicates a 12 NM dashed line runway extension with a ½ NM hash-mark at 5.5 NM and a plus sign at 7.5 NM.

2.2.5.4. Section 3 Secondary Airports/Heliports/NAVAIDS/Fixes/Reporting Points. Provide a composite sketch (not necessarily to scale) depicting all desired features with descriptive labeling. Make up to *60 entries* using extra AF Forms 3643.

2.2.5.4.1. Name. Enter the name of a particular subject for information purposes only, up to *30 characters*. Continue the numerical sequence on additional forms if using more than 24 lines.

2.2.5.4.2. Location. Enter the LAT in the top block and the LON in the bottom block for the origin position of the appropriate subject symbol. Bearing/range with respect to the ASR antenna may be used instead of Lat/Lon.

2.2.5.4.3. Option (OPT). Enter the appropriate map symbol option listed: *4=Secondary Airport, 5=Navaid, 6=Handoff Point/FAF, 7=Airway Fix, 8=VFR Reporting Point, 9=RNAV Waypoint, 11=Helipad, 12=Heliport, 16=FAF/Marker.*

2.2.5.4.4.CS. Character size is not used.

2.2.5.5. Section 4 Information Block. Make up to *10 information blocks (alphanumeric character sets)* per map.

2.2.5.5.1. Data. Include up to three lines of alpha/numerics consisting of a maximum of 10 character positions (including spaces). Justify information on each line by using blank spaces to indicate spacing desired. On line four of the DATA column determine placement of the information block on the map by one of two methods.

2.2.5.5.1.1. “No Offset”. Top left corner of line one, first character of the alpha-numeric set is relative to the specified location.

2.2.5.5.1.2. “Offset”. Center of the character set is oriented by direction (use cardinal compass points , e.g., N, S, E, W, NE, NW, SE, SW) relative to the specified location.

Figure 2.2. Information block (no offset).

GPOINSETT
TO BUT NT
INCLDG 180

Figure 2.3. Information block with North offset.

POINSETT
TO BUT NT
INCLDG 180
G

NOTE: "+" shown to indicate relationship between location specified and alpha-numeric characters. "+" will not be displayed on map.

2.2.5.5.2. Location. Specify the LAT and LON of the top left corner of the information block (Line one, character one). May use bearing/range with respect to ASR antenna instead of lat/lon.

2.2.5.5.3. CS. Enter character size S, M, or L. Small character size is recommended. ***NOTE****: Keep information blocks to the minimum necessary. The facility chief controller determines acceptability of overwriting other critical map symbology or information blocks from the same or other map selections.*

2.2.5.6. Section 5 Obstructions. Obstructions will be depicted by an inverted “V”. Enter the obstruction’s LAT in the top and LON in the bottom portion of the blocks. Bearing/range with respect to the ASR antenna may be used instead of lat/lon. Place the apex of the inverted “V” at the obstacle LAT and LON. Enter the description (Tower, ASR 020/12M; Mtn, ASR 345/8T, etc.) on the composite sketch. Indicate either true or magnetic North by a “T” or “M” on the sketch. Use this area to include permanent echo(s) as desired. CS is not used. Make up to *25 entries* using extra AF Forms 3643.

2.2.5.7. Section 6 Class C/D airspace (AT)/Approach (APCH) Courses/Air Traffic Control Airspace (ATCA)/Special-Use Airspace (SUA)/Air Defense Identification Zone (ADIZ)/Airway-Corridors/Scramble-Recovery Tracks/ and Hydrographic Features. Make up to *250 entries* using extra AF Forms 3643. Sketch each subject with the appropriate header, then letter or number, in sequence, each line or arc segment of that particular item. For fix(es) located along a line or arc segment, place the corresponding fix letter(s) or number(s) from Section 3 adjacent to the segment letter or number. The letter or number sequence on AF Form 3643, describing the subject layout, must agree with that listed on the sketch.

2.2.5.7.1. Segment. Using up to *30 characters* fill in the segment name completely down the left-hand column, then continue in the right-hand column as needed.

2.2.5.7.2. Start. Enter the starting point LAT in the top block and the LON in the bottom block for line or arc segments. Bearing/range with respect to the ASR antenna may be used instead of lat/lon.

2.2.5.7.3. Stop. Enter the stop point LAT in the top block and the LON in the bottom block for line or arc segments. Bearing/range with respect to the ASR antenna may be used instead of lat/lon.

2.2.5.7.4. ARC Origin Point. Enter the LAT and LON for the ARC swing point. Bearing/range with respect to the ASR antenna may be used instead of lat/lon.

2.2.5.7.5. Direction (DIR). Enter the arc direction: clockwise (CW) or counterclockwise (CCW).

NOTES:

1. *If depicting a circle, enter the LAT and LON of the ARC origin point in Block d (ARC origin point block) and the LAT and LON of the radius in Block b (start block) and the same numbers in Block c (stop block). Block e (dir block) may be left blank.*
2. *For arc segments, ensure that the distance between ARC origin point (Block d) and start (Block b) equals the distance between ARC origin point (Block d) and stop (Block c). Ensure that the LAT and LON for combination arc and straight segments provide proper connection to portray requested subject matter.*

2.2.5.7.6. Option (OPT). Enter desired line option number listed: *1=SUA (Solid), 2=Approach Course/Track (Dashed), 3=Approach Course/Track (Dotted), 13=ADIZ Boundary (Dot-Dash, "A"), 14=ATC Airspace (Dot-Dash), 15=Class C/D airspace (Dashed Circle), 17=Airway (Solid), 18=Corridor (Dashed), 19=Drainage/Shoreline (Solid).*

2.2.5.8. Specific Subject Descriptions:

2.2.5.8.1. Approach Courses. For approach courses that do not coincide with the extended runway centerline, use a dashed line (Option 2) or a dotted line (Option 3).

Identify and depict offset instrument approach courses or approach courses to satellite airports that start and stop at a point in space in this section. Specify the description of course segments (ABC R-350/1.5 to ABC R-350/12, CDE *R-250/XYZ* R-150 to CDE *R-25OIXYZ* R-190, HIJ R-340/l0 to HIJ R-020/10, etc.) on the sketch.

2.2.5.8.2. Air Traffic Control Airspace (ATCA). ATCA includes center, RAPCON, facility, sector, etc., airspace boundaries. The ATCA is usually a polygon (multi-sided shape) made up of a series of line segments; therefore, the stop LAT and LON of the first or preceding segment is the start LAT and LON of the next or succeeding segment(s). In an enclosed area, the last LAT or LON entered is the same as the first LAT and LON entered. Depict this area by a series of dots and dashes (Option 14). Enter the name or description of the area only once in the SEGMENT box corresponding to the start of the first boundary defined.

2.2.5.8.3. Special Use Airspace (SUA) Boundaries. SUA includes prohibited, restricted, warning, etc. areas. Enter the SUA identifier (For example, R-6002) on the sketch. See **2.2.5.8.2.** above for enclosure technique. Use solid lines (Option 1).

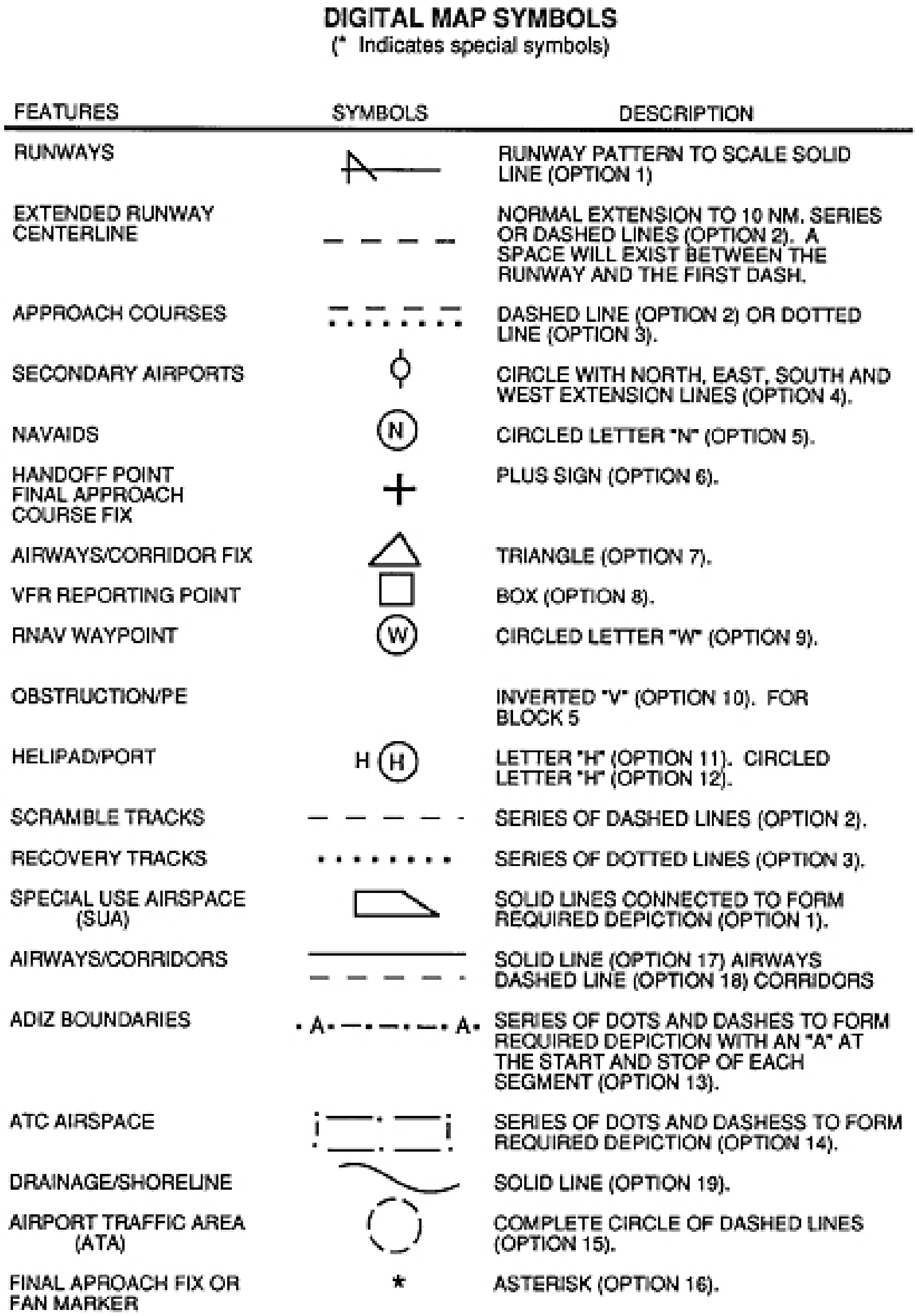
2.2.5.8.4. ADIZ. Enter the name of the ADIZ on the sketch. See 2.2.7.8.2 above for enclosure technique. Depict this item by a series of dots and dashes with an "A" at the start and stop of each line segment (Option 13). Use straight line segments only.

2.2.5.8.5. Airways or Corridors. Enter the name of each airway or corridor on the sketch. Use the name of the airway or corridor structure listed on aeronautical charts, maps, etc. (for example, ABC R-180 and DEF R-360). Use Option 17 for airways and Option 18 for corridors.

2.2.5.8.6. Hydrographic Features. Use straight line and arc segments depicted by solid lines (option 19) to portray representations of these features. Hydrographic features can only consist of straight line segments. If arc segments required, use Option 17.

NOTE: For programming reasons, the computer generated printouts received from ESC OL-DE may list data in a different order from that originally submitted on the AF Forms 3643.

Figure 2.4. Digital map symbology.



DIGITAL MAP SYMBOLS
(* Indicates special symbols)

FEATURES	SYMBOLS	DESCRIPTION
RUNWAYS		RUNWAY PATTERN TO SCALE SOLID LINE (OPTION 1)
EXTENDED RUNWAY CENTERLINE		NORMAL EXTENSION TO 10 NM. SERIES OR DASHED LINES (OPTION 2). A SPACE WILL EXIST BETWEEN THE RUNWAY AND THE FIRST DASH.
APPROACH COURSES		DASHED LINE (OPTION 2) OR DOTTED LINE (OPTION 3).
SECONDARY AIRPORTS		CIRCLE WITH NORTH, EAST, SOUTH AND WEST EXTENSION LINES (OPTION 4).
NAVAIDS	(N)	CIRCLED LETTER "N" (OPTION 5).
HANDOFF POINT FINAL APPROACH COURSE FIX	+	PLUS SIGN (OPTION 6).
AIRWAYS/CORRIDOR FIX		TRIANGLE (OPTION 7).
VFR REPORTING POINT		BOX (OPTION 8).
RNAV WAYPOINT	(W)	CIRCLED LETTER "W" (OPTION 9).
OBSTRUCTION/PE		INVERTED "V" (OPTION 10). FOR BLOCK 5
HELIPAD/PORT	H (H)	LETTER "H" (OPTION 11). CIRCLED LETTER "H" (OPTION 12).
SCRAMBLE TRACKS		SERIES OF DASHED LINES (OPTION 2).
RECOVERY TRACKS		SERIES OF DOTTED LINES (OPTION 3).
SPECIAL USE AIRSPACE (SUA)		SOLID LINES CONNECTED TO FORM REQUIRED DEPICTION (OPTION 1).
AIRWAYS/CORRIDORS		SOLID LINE (OPTION 17) AIRWAYS DASHED LINE (OPTION 18) CORRIDORS
ADIZ BOUNDARIES	· A · — · — · — · A ·	SERIES OF DOTS AND DASHES TO FORM REQUIRED DEPICTION WITH AN "A" AT THE START AND STOP OF EACH SEGMENT (OPTION 13).
ATC AIRSPACE		SERIES OF DOTS AND DASHESS TO FORM REQUIRED DEPICTION (OPTION 14).
DRAINAGE/SHORELINE		SOLID LINE (OPTION 19).
AIRPORT TRAFFIC AREA (ATA)		COMPLETE CIRCLE OF DASHED LINES (OPTION 15).
FINAL APROACH FIX OR FAN MARKER	*	ASTERISK (OPTION 16).

2.3. Micro-EARTS/STARS.

2.3.1. Micro-EARTS: Request map revisions through Air Traffic Control Systems specialists (ATCSS) per local directives.

2.3.2. STARS.

2.3.2.1. Initial map development takes place during the transition from the existing radar system. ESC OL-DE/GA will translate existing GPA-134 VMG formatted maps into STARS format using VMG picture files. All of the standard characters that the VMG software provided are available with STARs maps. Submission will either be via electronic mail, regular mail, or fax

2.3.2.1.1. The point of tangency will be the center of the map. This will normally coincide with the ASR antenna location. If the desired center of the map is not the ASR location, identify the coordinates of the map center and submit along with ASR antenna coordinates.

2.3.2.1.2. Map changeover from VMG format to STARS will normally be a one-for-one swap. Additional maps may be added later as the need arises

2.3.2.1.3. Initial map development will normally take 10 duty days per map based on workload.

2.3.2.2. Revisions: Use of the VMG picture file format for revisions is optional. If not used, submit detailed information in plain text describing map revisions and submit to ESC OL-DE/GA via e-mail, fax, or regular mail.

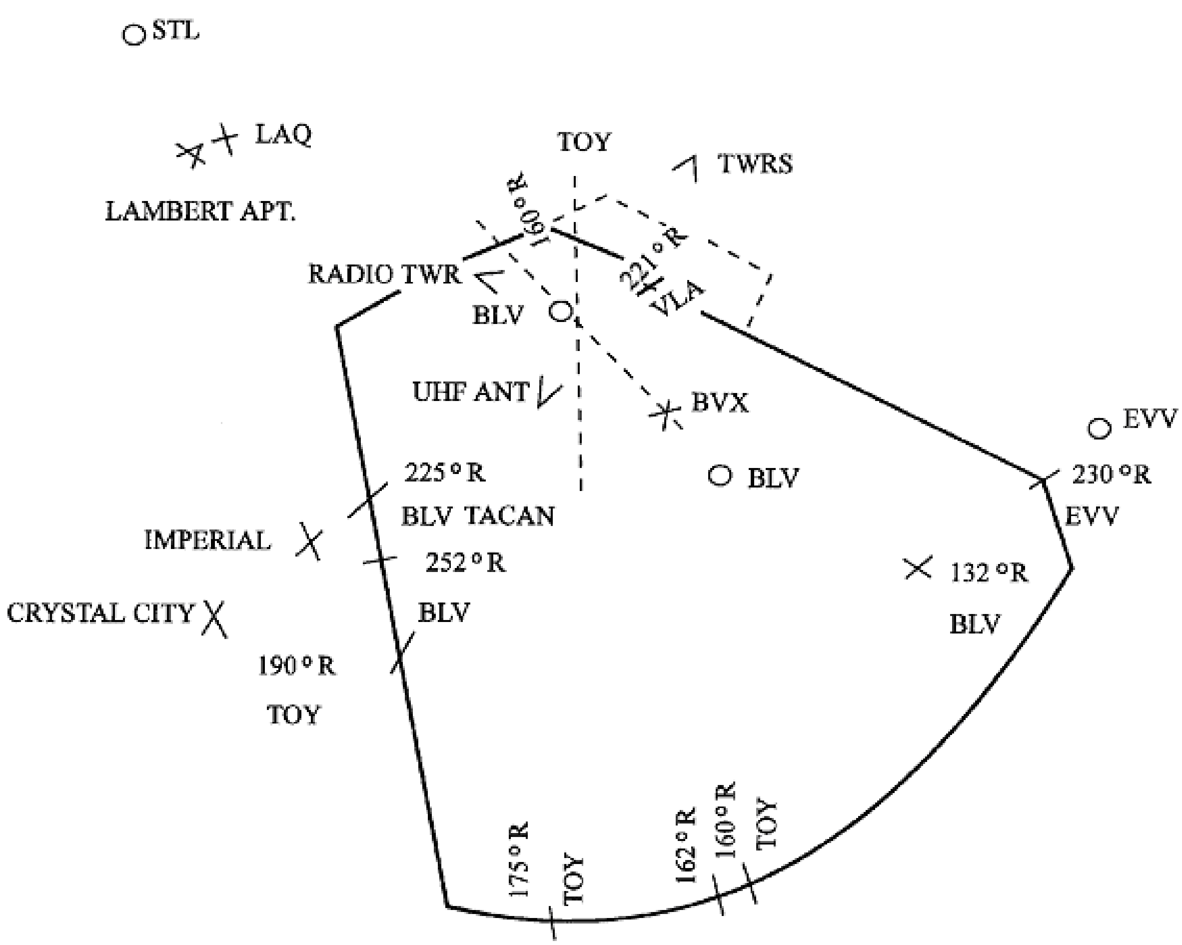
NOTE: Use of GPA-134 VMG picture files will provide a means of viewing maps before they are submitted for implementation.

2.3.2.2.1. Revised map development will normally take 5 duty days per map based on workload

2.3.2.2.2. Use coordinates obtained from validated sources only, i.e., current airport/NAVAID survey data, NIMA DAFIF/FLIP, FAAO 7350.7 *Location Identifiers*, or FAAO 7400.8, *Special Use Airspace*.

NOTE: Submit entries requiring coordinates in the format HDDDMMSSF where H= Hemisphere (N or S for Latitude, E or W for Longitude); D= Degrees; M= minutes; S=seconds; F= fraction of seconds (standard rounding i.e., .44 = .4 and .49 =.5) . For example North latitude 37 degrees, 5 minutes, 45.69 seconds would be entered as N03705457. Use data from authorized sources only in a consistent horizontal datum (see paragraph **2.1.1.**).

Figure 2.5. Sample Digital Map Composite Sketch



CHAPTER 3

MINIMUM SAFE ALTITUDE WARNING (MSAW)

3.1. MSAW Features. The MSAW feature uses visual and aural alarms to alert the controller when a MSAW-protected track is ***at or below*** a predetermined minimum safe altitude. All tracked targets with an operational mode C are automatically processed by MSAW unless the controller specifies a code block or individual track as exempt from MSAW processing. MSAW requires flight inspection prior to implementation IAW AFMAN 11-225 *United States Standard Flight Inspection Manual.*

3.2. Single-Sensor Analog Radars. Submit original and change request packages through the MAJCOM TERPS office in time for receipt by ESC OL-DE/GA at least 30 days prior to the effective date. Address any correspondence concerning MSAW to: ESC OL-DE/GA, 3580 D Ave (Bldg 210W), Tinker AFB OK 73145-9155. Compile PIDP MSAW data on appropriate charts based on processor capability, terrain, and local operating needs. After the data is processed, ESC OL-DE/GA forwards copies of computer-generated 15 and 60 NM charts to the facility. These charts represent the data included as part of the operational program for the facility. The unit and the MAJCOM shall review the printout for accuracy, then sign and date. If changes are required, the MAJCOM shall submit corrections to ESC OL-DE/GA.

3.2.1. **Figure 3.1.** through 3.6 depict a step-by-step build of an MSAW package. **Figure 3.1.** shows the identification of runways, Class C/D airspace, along with final, intermediate and/or initial approach areas out to Descent Point (DP). **Figure 3.2.** identifies general MSAW areas based on Minimum Vectoring Altitude (MVA) sectors. **Figure 3.3.** through **Figure 3.6.** illustrate the azimuth and range identification process. **Table 3.1.** shows the PIDP data chart in the format ESC OL-DE/GA uses to prepare the operational program tapes.

3.2.2. MSAW packages consist of an approach area detail map, a general terrain map, and a completed PIDP MSAW data chart. All MSAW maps shall be centered on the ASR antenna serving the airport for which the MSAW is being developed. All distances are in nautical miles (NM) from the ASR and radials are magnetic, corrected for the ASR antenna's slaved variation.

3.2.3. MSAW coverage shall encompass the facility's assigned ATC airspace to include all areas where the control of IFR aircraft takes place. MSAW General Terrain Map drawings must cleary depict these airspace boundaries.

NOTE: This includes special use airspace where the facility controls IFR aircraft or the facility assumes control over when inactive. Include those areas where agreements with adjacent ATC facilities allow for the control of IFR aircraft beyond normal airspace boundaries.

3.2.3.1. Develop two maps centered on the primary airport's ASR antenna.

3.2.3.1.1. Approach Area Detail Map (normally 0 –15 NM) - defines MSAW circling area and approach courses for the primary airport. Can be larger or smaller if advantageous, but must be large enough to include all approaches out to the applicable descent points (see paragraph **3.2.4.3.**).

3.2.3.1.2. General Terrain Map (normally 15 – 60 NM) - defines all other MSAW areas (i.e., larger, less-detailed MVAC sectors). Extends from the termination of the approach area detail map to the limits defined in paragraph **3.2.3.**

3.2.4. MSAW chart design:

3.2.4.1. Draw all precision/non-precision final approach courses to airports with instrument approach procedures within the facility's assigned airspace (see **Figure 3.1.**).

3.2.4.2. Draw 4 NM circles around the ASR antenna where the PIDP is located and around the airport reference point at identified satellite airports to define the MSAW exempt area for that location (altitude set at zero). This is to eliminate nuisance alarms from aircraft executing precision approaches, which normally descend below the corresponding non-precision MDA 2 – 3 NM from threshold. The exempt area also eliminates unnecessary alarms from aircraft prior to takeoff, conducting low approach/touch and go, and landing on non-precision approaches beyond the MAP.

3.2.4.3. Plot the point on each approach procedure where the aircraft descends below the Minimum Vectoring Altitude (MVA) (see **Figure 3.1.**). This point shall be referred to as the descent point (DP). Determine as follows:

3.2.4.3.1. Start at a point on the final approach course 4 NM from the ASR antenna (or ARP at satellite airports) and work outwards to determine the first published fix with an altitude that is equal to or higher than the MVA.

3.2.4.3.2. From this fix, work inwards towards the MAP using the maximum authorized descent gradient for that segment and type procedure until reaching the MVA.

3.2.4.4. Take the following action regarding the DP:

3.2.4.4.1. When the DP falls inside of the MSAW exempt area (4 NM from ASR/ARP), no further action is required (disgregard the remainder of this paragraph).

3.2.4.4.1.1. When the DP falls outside of the MSAW exempt area in the final segment prior to the Final Approach Fix (FAF):Draw **all** applicable instrument approach procedure final segments, including circling only procedures, (primary areas only) from the MSAW exempt area outward to the DP.

3.2.4.4.1.2. The altitude selected for MSAW processing within the primary final segment trapezoid(s) shall be no more than 100 below the lowest published MDA and shall provide at least 200 feet clearance above terrain and obstructions.

3.2.4.4.2. When DP falls between the FAF and the Intermediate Fix (IF):

3.2.4.4.2.1. Draw **all** applicable final and intermediate segment, including circling only procedures, (primary areas only) from the MSAW exempt area outward to the DP.

3.2.4.4.2.2. The altitude selected for MSAW processing within the primary intermediate segment trapezoid(s) shall be no more than 200 feet below the lowest published FAF crossing altitude and shall provide at least 300 feet clearance above terrain and obstructions. The altitude selected for MSAW processing within the primary final segment trapezoid(s) shall be no more than 100 feet below the lowest published MDA and shall provide at least 200 feet clearance above terrain and obstructions

3.2.4.4.3. When the DP falls between the IF and the Initial Approach Fix (IAF):

3.2.4.4.3.1. Draw all applicable final, intermediate, and initial segments, including circling only procedures, (primary areas only) from the MSAW exempt area outward to the DP.

3.2.4.4.3.2. The altitude selected for MSAW processing within the primary initial segment(s) shall be no more than 300 feet below the lowest published IF crossing altitude and shall provide at least 300 feet clearance above terrain and obstructions. The altitude selected for MSAW processing within the primary intermediate segment trapezoid(s) shall be no more than 200 feet below the lowest published FAF crossing altitude and shall provide at least 300 feet clearance above terrain and obstructions. The altitude selected for MSAW processing within the primary final segment trapezoid(s) shall be no more than 100 feet below the lowest published MDA and shall provide at least 200 feet clearance above terrain and obstructions.

3.2.4.5. For all other areas, the altitude selected shall be no more than 300 ft below the MVA and shall provide a minimum of at least 700 feet above terrain and obstacles (1,700 feet in designated mountainous terrain). ***NOTE***: If two MVA sector altitudes are established IAW AFI 11-230, *Instrument Procedures* paragraph 9.2. due to excessively high floor of controlled airspace, the MSAW sector altitude will be based on the lowest MVA in the sector.

3.2.5. MSAW sector data collection

3.2.5.1. Define the boundaries of each MSAW sector by two radials (start and stop) and by two ranges (start and stop). Depict all MSAW sectors as either pie-shaped, truncated pie-shaped, or circular around a point of origin. Using **Figure 3.3.** and **Figure 3.6.** as an example, draw radials to encompass all areas identified in paragraph **3.2.4.** Each radial originates at the origin (ASR antenna) and extends to the range of the scale being developed (approach area detail or general terrain map). Measure the angle of each radial (magnetic based on ASR slaved variation) and label. Combine radials to include/reduce irregularly shaped areas if necessary (see **3.2.5.3.** Note). Continuous sectors shall not cross 0 degrees or 360 degrees. Split sectors crossing 0 or 360 degrees into two sectors; stop the first sector at 360 degrees, start the second sector at 0 degrees. Radials may be recorded in increments of 0.5 degrees.

3.2.5.2. Using **Figure 3.4.** and **Figure 3.6.** as examples, draw arcs (ranges) from the ASR antenna to encompass those areas identified in paragraph **3.2.4.** Measure to the nearest 0.10 NM distance (see **3.2.5.3.** Note).

3.2.5.3. A total of up to 100 azimuth boundaries and up to 100 range boundaries may be used. As a last resort on some complicated charts, it may be necessary to make compromises to conserve radials/ranges.

NOTE: Compromises should always err on the side of safety. For example, when defining the MSAW exempt area for a satellite airport, the consolidated radials/ranges should not allow for a significant increase in size to the 4 NM radius (i.e., from 4 NM to 4.25 NM). This is to reduce the likelihood of aircraft operations below the MVA without proper MSAW processing. When defining a MSAW sector for a MVA isolation buffer (i.e., 3/5 NM radius from a single prominent obstruction) the combined radials/ranges shall increase the size of the MSAW sectors.

3.2.5.4. Label the MSAW altitude for each sector for transfer to the PIDP MSAW Data chart.

3.2.6. Transfer the range, azimuth, and altitude information to the PIDP DATA CHART (**Table 3.1.**) as follows.

3.2.6.1. Starting with the zero degree radial entered in the upper left corner of the azimuth block, continuing clockwise, enter selected radial from both map scales (Approach Area detail and General Terrain Map) in ascending order. The stop radial for one sector becomes the start radial for the succeeding sector from left to right across the top of the form. On the left side of the chart, starting with zero range, enter each range selected in ascending order down the left side of the chart. The stop range for one sector is the start range for the next top to bottom down the left side of the form. The intersection of each start-stop radials and start-stop ranges represents a sector. For each sector, enter the MSAW processing altitude IAW paragraph **3.2.4.** in hundreds of feet MSL; e.g., 6 =600 ft, 100 = 10,000 ft.

3.3. Multi-Sensor (Mosaic) Digital Radar systems

3.3.1. Micro-EARTS. MSAW parameters are developed during initial site adaptation in accordance with FAA M4.08 ***Standards and Guidelines to Define and Adapt Values for Minimum Safe Altitude Warning (MSAW) and Conflict Alert (CA) Sites Variables***. TERPS personnel shall coordinate with unit ATCSS for revisions, and when making procedural changes to instrument approaches that may affect the APM (i.e., changes to fix crossing altitudes, approach minimums, addition/deletion of step-down fixes, etc.).

3.3.2. STARS. MSAW consists of two detection components, GTMs and APMs. GTM: Within a radius of 55 NM of each ASR Radar site exists a GTM. Each map contains 4,096 bins that are 2 NM in width by 2 NM in length. Each bin contains an assigned altitude that is determined by either the highest terrain or highest obstacle that affects that bin. A value of 500 feet is added to each gin altitude to make up the MSAW bin altitude. When an aircraft is currently below, predicted to be below, or projected to be below the MSAW bin altitude an alarm is generated to the controller's display. GTM's are developed by the National Aeronautical Charting Office (NACO) and distributed on a recurring basis to the applicable OSF. Bin values are increased or decreased as new obstructions or terrain features change.

APM: APM's are designed to provide MSAW protection for aircraft utilizing precision, non-precision, and visual approaches that service airports that contain an ASR. Additionally, some satellite airports containing precision and non-precision approaches within the ASR radar coverage area are adapted with MSAW APM's to select runways. The APM is normally 1 NM wide, either side of the final approach course, or runway heading. An aircraft enters the APM at approximately 5 NM (or FAF) from the approach end of the runway. The APM terminates at approximately 1 NM from the approach end of the runway. An altitude value is determined for each APM at the beginning and at the end. These two values provide MSAW protection as an aircraft descends along the glidepath towards the runway. An MSAW alarm would be generated to the controller's radar display if the aircraft's altitude is below programmed values.

3.3.2.1. The applicable Operations Support Facility (OSF) will develop GTMs and APMs during initial site adaptation. GTM will be constantly updated through the OSF. TERPS personnel shall coordinate with unit ATCSS for revisions, and when making procedural changes to instrument approaches that may affect the APM (i.e., changes to fix crossing altitudes, approach minimums, addition/deletion of step-down fixes, etc.).

3.3.2.2. Local Software Update Procedures: Refer to FAAO 6000.51 **Air Traffic Service Operational Automation Responsibilities**.

Figure 3.1. MSAW/LAAS Package Development - Identification of Runways, Exempt Areas and Instrument Approach Primary Areas.

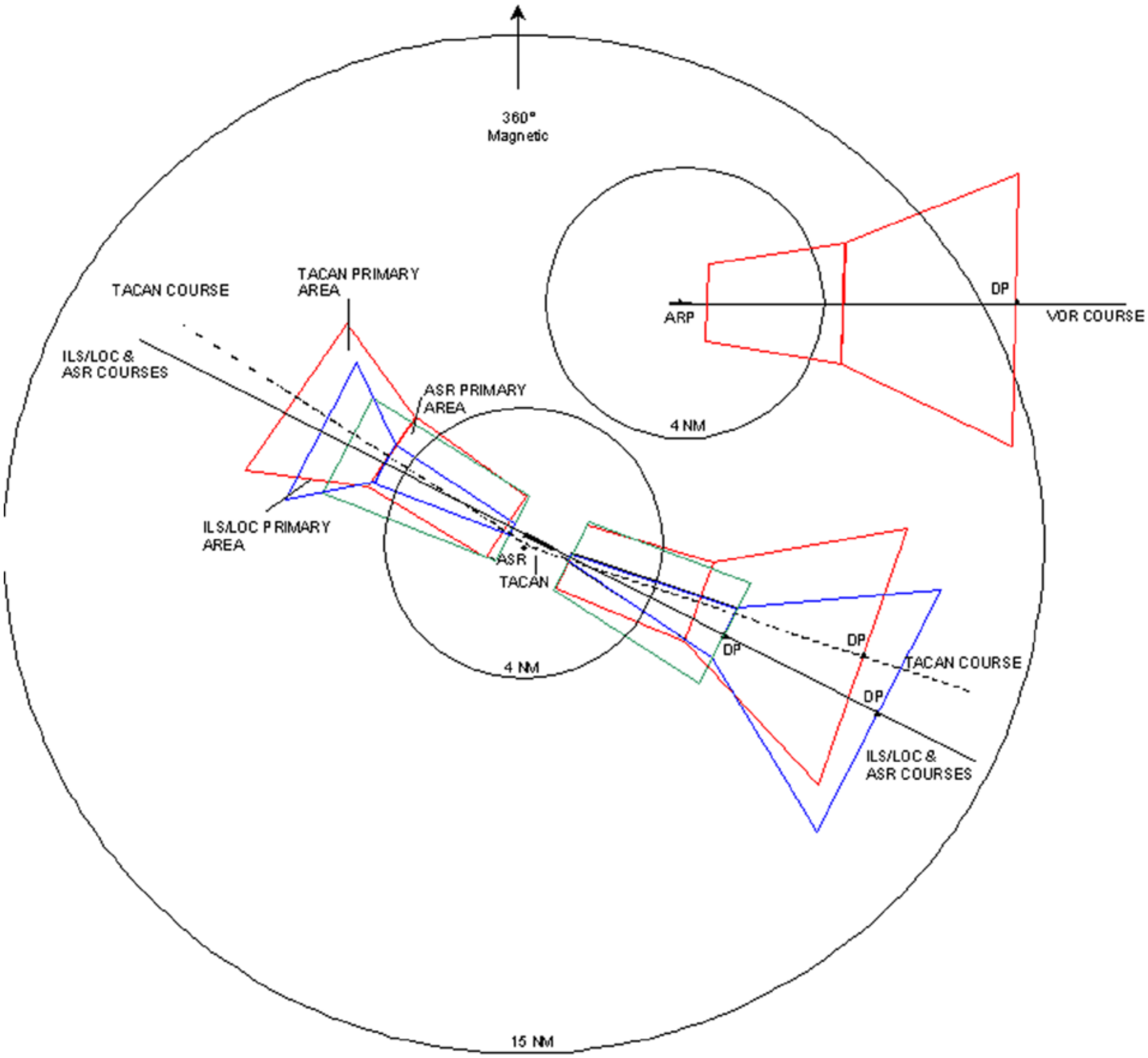


Figure 3.2. Approach Area Detail Map - Identification of MVA sectors.

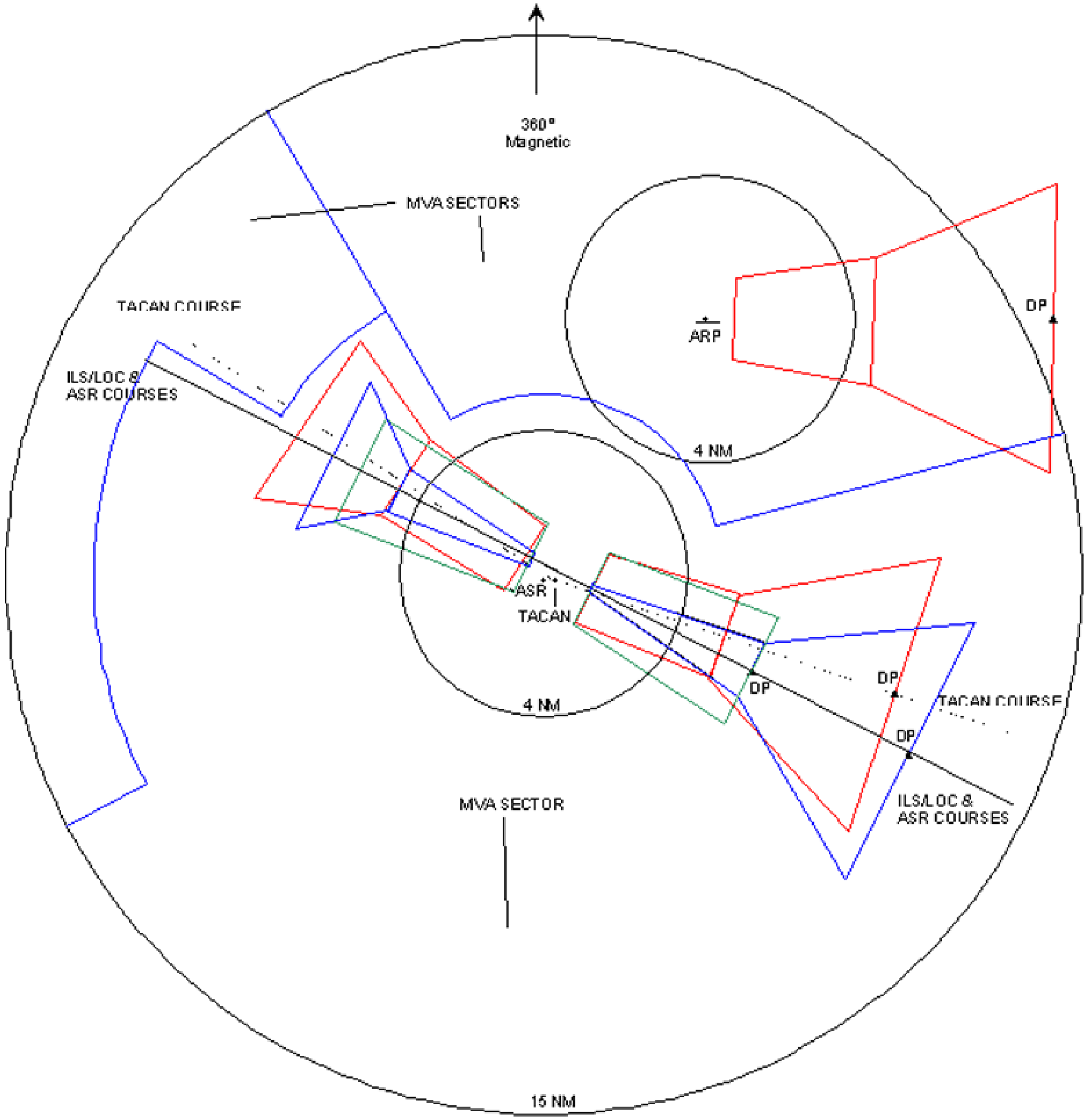


Figure 3.3. Approach Area Detail Map - Plotting Radials.

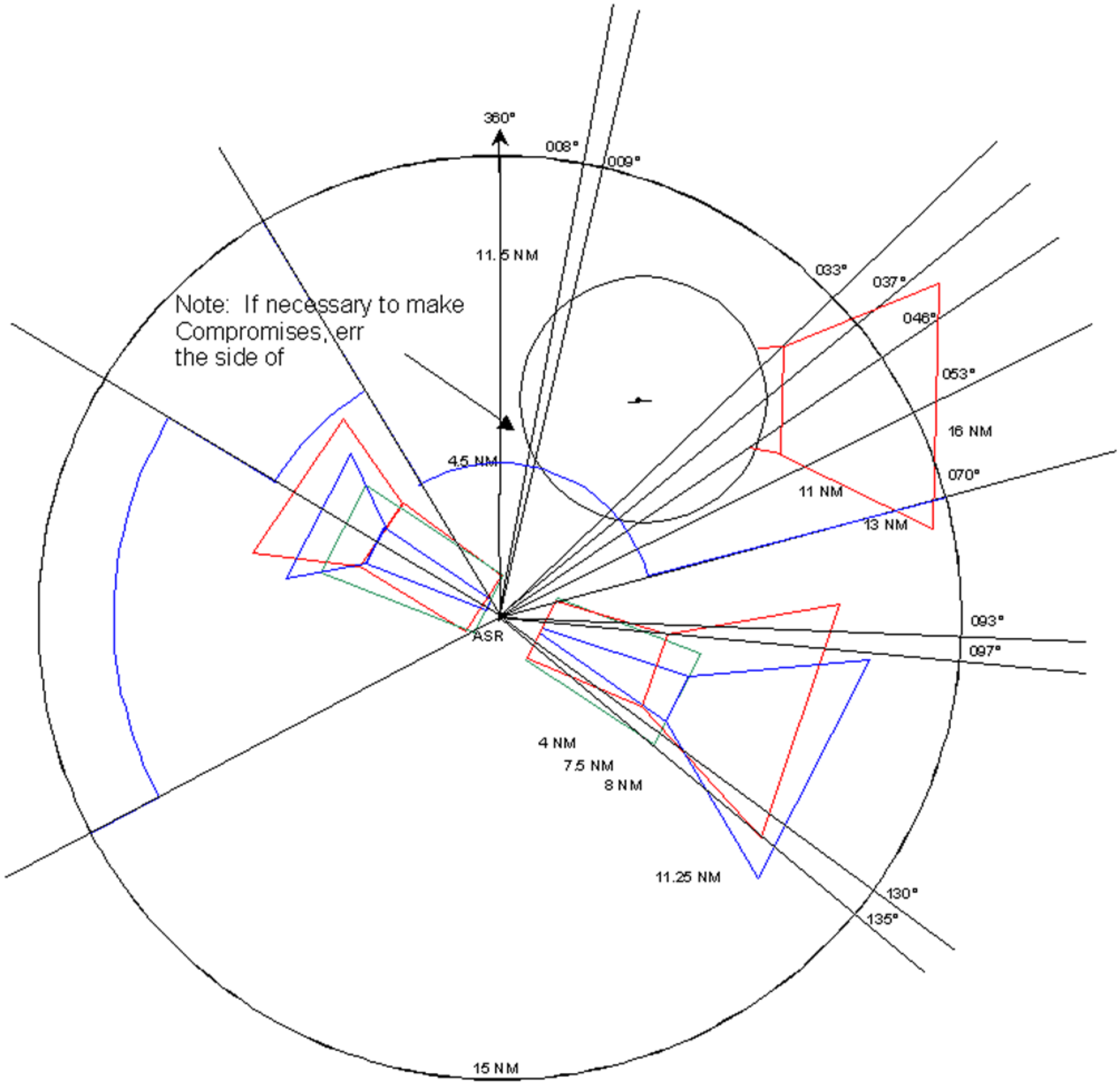


Figure 3.4. Approach Area Detail Map - Plotting Ranges (Arcs).

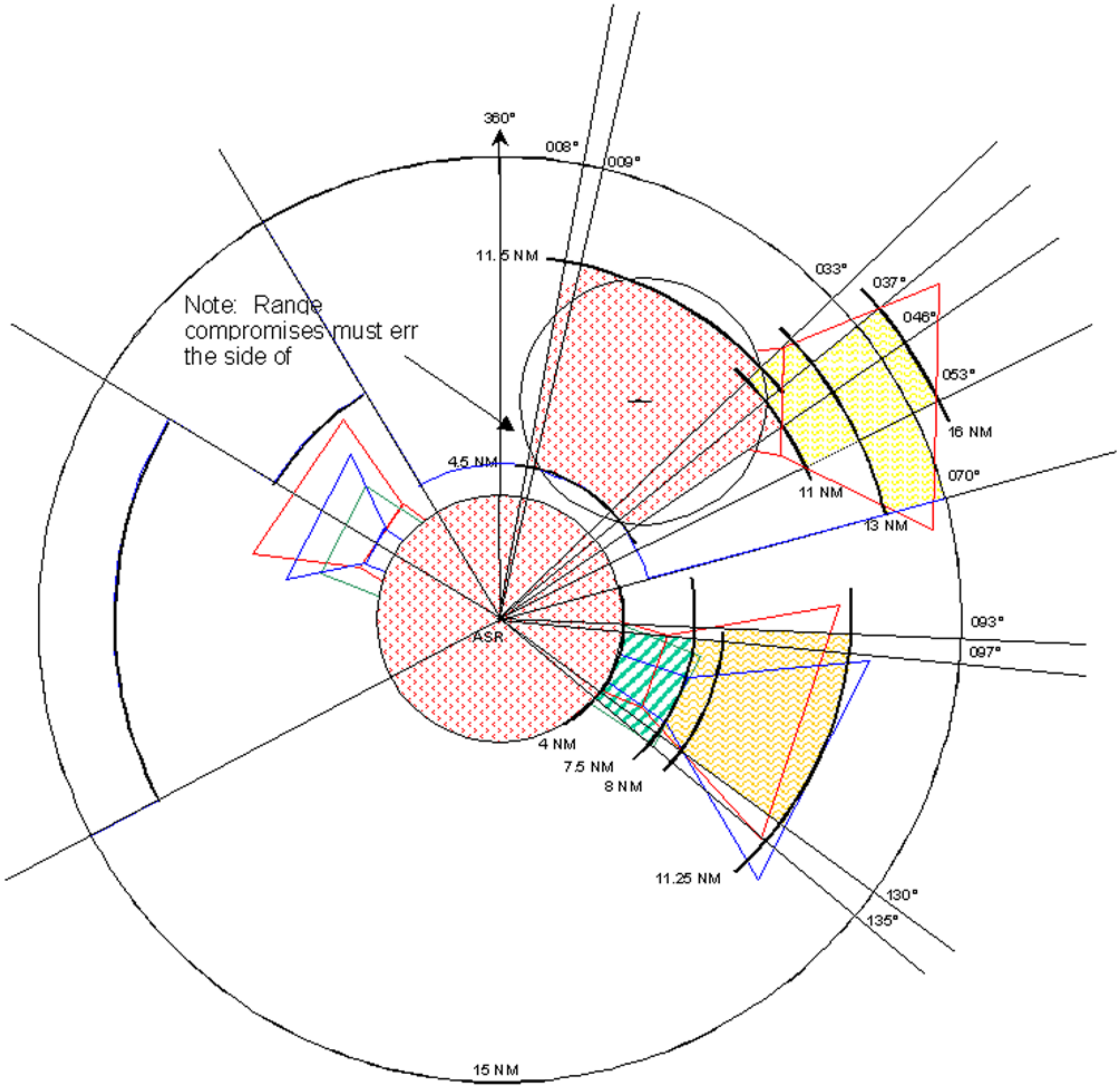


Figure 3.5. General Terrain Map - Depicting ATC Airspace/Area under IFR Control.

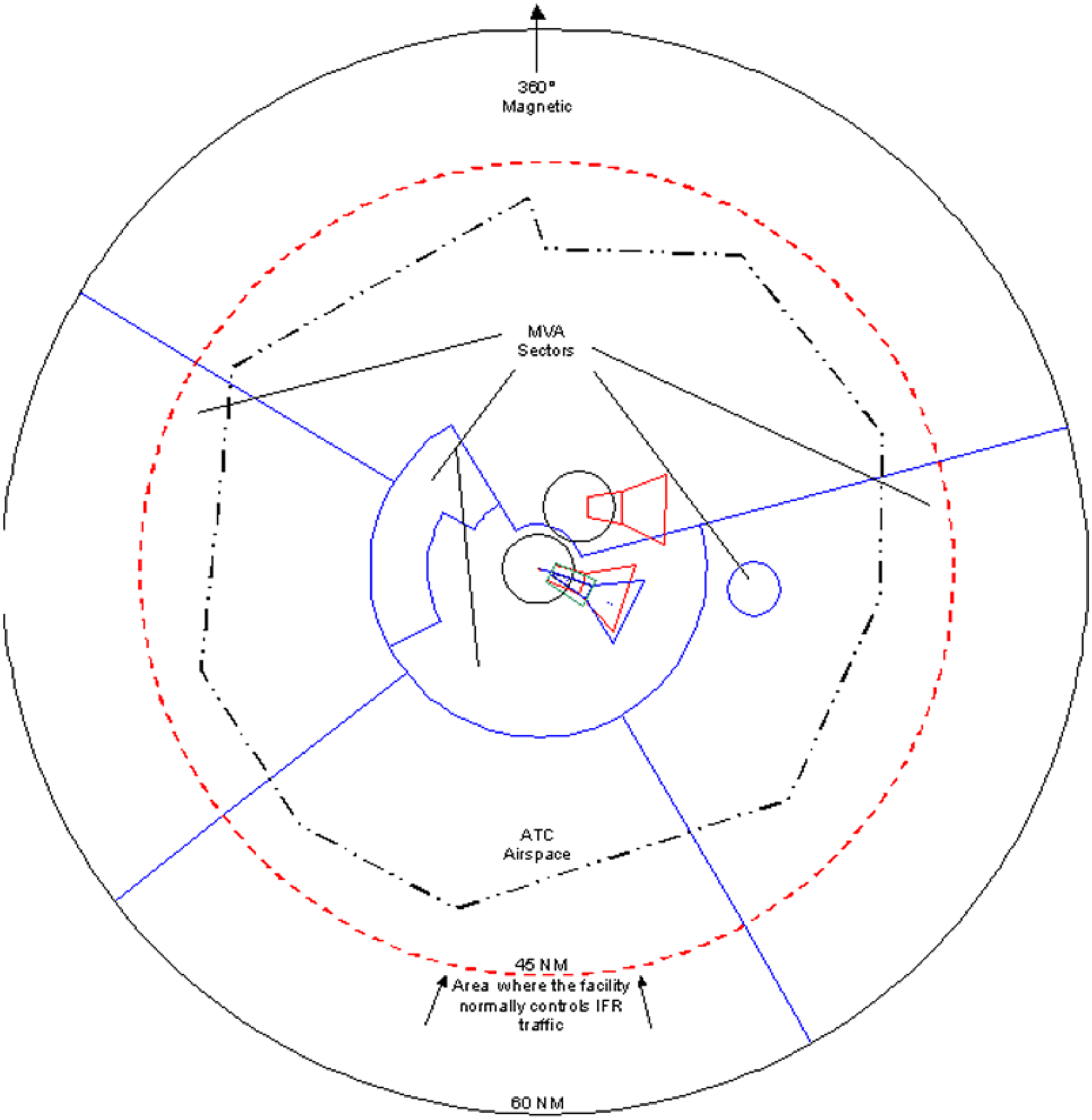


Figure 3.6. General Terrain Map – Plotting Radials and Ranges (Arcs) to Encompass MVA sectors.

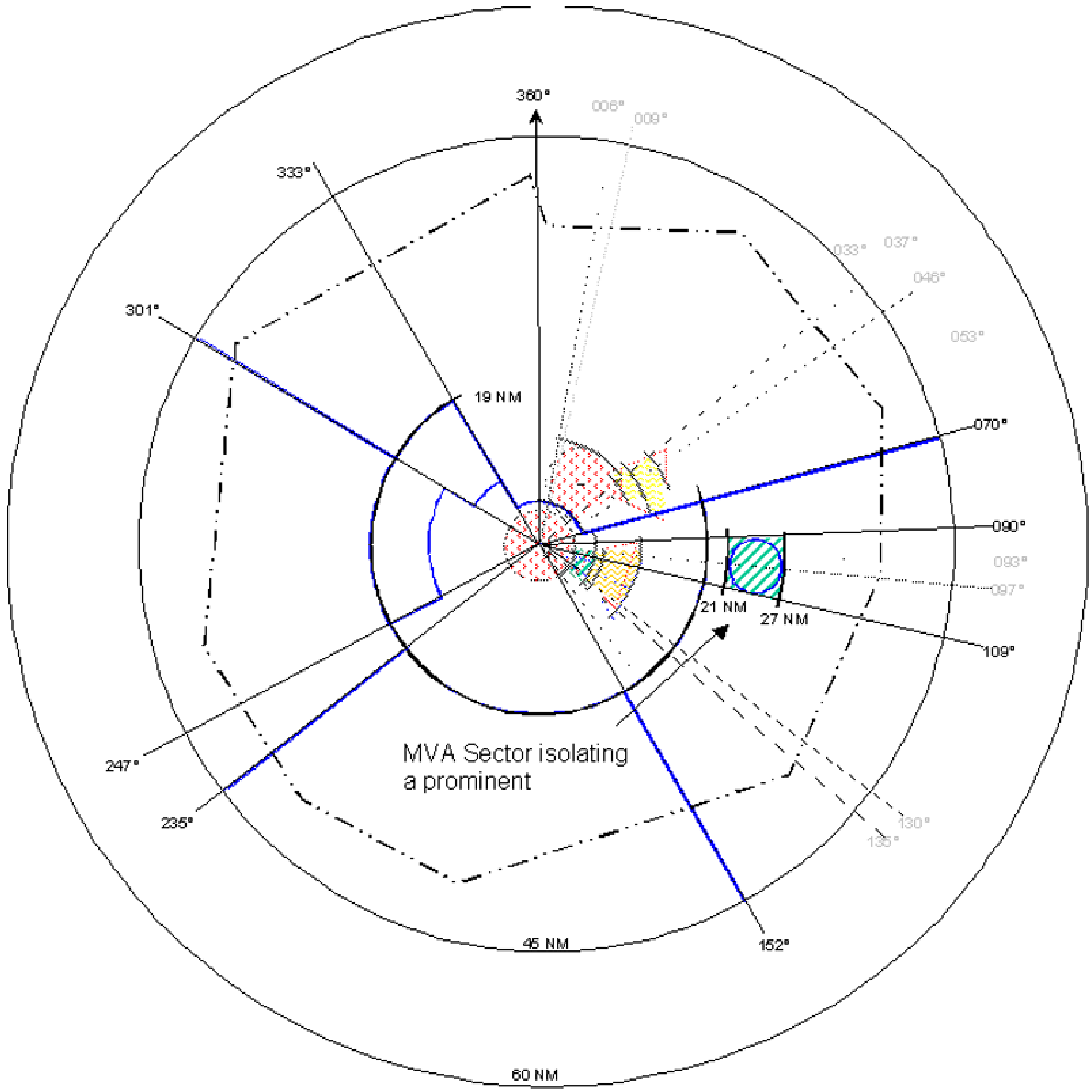


Table 3.1. Sample MSAW Data chart.

PIDP DATA CHART AZIMUTH BASE ____________________ DATE

RANGE

Start Stop	000 014	014 035	035 040	040 052	052 056	056 074	074 081	081 094	094 108	108 132	132 135	135 165	165 186	186 203	203 208	208 214	214 224	224 250	250 265	265 281	281 299	299 324	324 331	331 335	335 350	350 360
0 - 4	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
4 - 6	20	11	11	20	20	20	20	20	20	20	20	20	20	11	11	11	20	20	20	20	20	20	20	20	20	20
6 - 7	20	11	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
7 - 8	20	11	20	20	22	22	22	22	22	20	22	22	20	20	20	7	7	7	20	20	20	32	32	20	20	20
8 - 9	20	11	20	20	22	22	22	22	22	20	22	22	20	20	20	20	7	7	20	22	20	32	32	20	20	20
9 - 12	20	20	20	20	22	22	22	22	22	20	22	22	20	20	20	20	7	7	20	22	20	32	32	20	20	20
12 - 13	20	20	20	20	22	22	22	22	22	20	22	22	20	20	20	20	7	7	22	22	20	32	32	20	20	20
13 - 15	20	20	20	20	22	22	22	22	22	20	20	20	20	20	20	20	7	7	22	22	20	32	20	20	20	20
15 - 25	22	22	22	22	22	21	21	20	20	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22
25 - 28	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	26	22	22	22	22
28 - 31	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	21	22	26	26	26	22	22	22
31 - 32	22	22	22	22	22	22	6	22	22	22	22	22	22	22	22	22	22	22	21	22	26	26	26	22	22	22
32 - 34	22	22	22	22	22	22	6	9	22	22	22	22	22	22	22	22	22	22	21	22	26	26	26	22	22	22
34 - 35	22	22	22	22	22	10	6	9	22	22	22	22	22	23	23	23	22	22	21	22	26	26	26	22	22	22
35 - 36	23	23	22	22	22	10	6	9	22	22	22	22	22	23	23	23	22	22	21	22	26	26	26	22	22	22
36 - 40	23	23	22	22	22	10	6	13	22	22	22	22	22	23	23	23	22	22	21	22	26	26	27	22	22	22
40 - 42	23	23	22	22	22	22	22	13	22	22	22	22	22	23	23	23	22	21	22	26	26	26	27	22	22	22
42 - 45	23	23	22	22	22	22	22	13	13	22	22	22	22	23	23	23	22	22	11	11	26	26	27	22	22	22
45 - 46	23	23	22	22	22	22	22	13	22	22	22	24	22	23	23	23	22	22	11	11	26	26	27	22	22	22
46 - 49	23	23	22	22	22	22	22	13	22	22	22	24	22	23	23	23	23	23	11	11	26	26	27	22	35	22
49 - 50	23	23	22		22	22	22	22	22	22	22	24	22	23	23	22	22	22	11	11	26	26	27	22	35	22
50 - 55	23	23	7	7	7	7	21	21	21	22	22	24	22	23	23	22	22	22	11	11	26	26	27	22	35	22
55 - 60	23	23	7	7	7	7	21	21	21	22	22	24	22	22	22	22	22	22	22	11	11	27	22	22	22	22

CHAPTER 4

LOW ALTITUDE ALERTING SYSTEM (LAAS)

4.1. LAAS Features. The LAAS feature uses visual and aural alarms to alert the controller when a LAAS-protected track is below a predetermined minimum safe altitude (vice at-or-below for MSAW). All tracked targets with an operational mode C are automatically processed by LAAS unless the controller specifies a code block or individual track as exempt from LAAS processing. LAAS requires flight inspection (in accordance with MSAW criteria) prior to implementation IAW AFMAN 11-225,*United States Standard Flight Inspection Manual.*

NOTE: The term LAAS may not be understood to indicate Low Altitude Alerting since it's most often associated with legacy radar systems, and could be easily confused with RNAV Local Area Augmentation System (LAAS). When coordinating flight inspection, ensure that correspondence clearly differentiates between the two by requesting a check of the MSAW-LAAS.

4.2. LAAS Associated with DBRITE: Only develop LAAS for those DBRITEs authorized to provide additional radar functions beyond those normally allowed for certified tower displays (IAW AFI 13-203 and FAAO 7110.65). This is not applicable to DBRITE systems deriving radar/automation data (slaved) from a source with an operational PIDP MSAW or FAA equivalent (i.e., ARTS). These DBRITEs process MSAW data exactly like an indicator of the associated system. Submit original and change request packages through the MAJCOM TERPS office in time for receipt by ESC OL-DE/GA **at least 7 days prior to the effective date**. Address any correspondence concerning DBRITE LAAS to: ESC OL-DE/GA, 3580 D Ave (Bldg 210W), Tinker AFB OK 73145-9155. Compile LAAS data on appropriate charts based on processor capability, terrain, and local operating needs. After the data is processed, ESC OL-DE/GA forwards copies of computer-generated 15 and 60 NM charts to the facility. These charts represent the data included as part of the operational program for the facility. The unit and MAJCOM shall review the printout for accuracy, then sign and date. If changes are required, the MAJCOM shall submit corrections to ESC OL-DE/GA.

4.2.1. DBRITE LAAS packages are developed in the same manner as MSAW, subject to equipment-specific radial/range restrictions (See **Figure 3.1.** through **Figure 3.6.**). **Figure 3.1.** shows the identification of runways, Class C/D airspace, along with final, intermediate and/or initial approach areas out to DP. **Figure 3.2.** identifies general LAAS areas based on assigned airspace and Minimum Vectoring Altitude (MVA) sectors. **Figure 3.3.** through **Figure 3.6.** illustrate the azimuth and range identification process.

4.2.2. LAAS packages consist of an approach area detail map, a general terrain map, and a completed Air Force Form 3646***, DBRITE Low Altitude Alerting System (LAAS) Data Submission Form***. All LAAS maps shall be centered on the ASR antenna serving the airport for which the LAAS is being developed. All distances are in nautical miles (NM) from the ASR and radials are magnetic, corrected for the ASR antenna's slaved variation.

4.2.3. LAAS coverage shall encompass the facility's assigned ATC airspace to include all areas where the control of IFR aircraft takes place. Coverage need not extend beyond 60 NM from the ASR antenna.

NOTE: This includes special use airspace where the facility controls IFR aircraft or the facility assumes control over when inactive. Include those areas where agreements with adjacent ATC facilities allow for the control of IFR aircraft beyond normal airspace boundaries.

4.2.3.1. Develop two maps centered on the primary airport's ASR antenna.

4.2.3.1.1. Approach Area Detail Map - defines LAAS circling area and approach courses for the primary airport. Standard scale is 0-15 NM, however can be larger or smaller if advantageous, but must be large enough to include all approaches out to the applicable descent points (see paragraph **4.2.4.3.**).

4.2.3.1.2. General Terrain Map (normally 15 – 60 NM) - defines all other LAAS areas (i.e., larger, less-detailed MVAC sectors). Extends from the termination of the approach area detail map to the limits of the facilities assigned airspace (not to exceed 60 NM from ASR antenna).

4.2.4. LAAS chart design:

4.2.4.1. Draw all precision/non-precision final approach courses to airports with instrument approach procedures within the facility's assigned airspace (see **Figure 3.1.**).

4.2.4.2. Draw 4 NM circles around the ASR antenna where the PIDP is located and around the airport reference point at identified satellite airports to define the LAAS exempt area for that location (altitude set at zero). This is to eliminate nuisance alarms from aircraft executing precision approaches, which normally descend below the corresponding non-precision MDA 2 – 3 NM from threshold. The exempt area also eliminates unnecessary alarms from aircraft prior to takeoff, conducting low approach/touch and go, and landing on non-precision approaches beyond the MAP.

4.2.4.3. Plot the point on each approach procedure where the aircraft descends below the Minimum Vectoring Altitude (see **Figure 3.1.**) for each instrument approach procedure. This point shall be referred to as the descent point (DP). Determine as follows:

4.2.4.3.1. Start at a point on the final approach course 4 NM from the ASR antenna (or ARP at satellite airports) and work outwards to determine the first published fix with an altitude that is equal to or higher than the MVA.

4.2.4.3.2. From this fix, work inwards towards the MAP using the maximum authorized descent gradient for that segment and type procedure until reaching the MVA.

4.2.4.4. Take the following action regarding the DP

4.2.4.4.1. When the DP falls inside of the LAAS exempt area (4 NM from ASR/ARP), no further action is required (disgregard the remainder of this paragraph).

4.2.4.4.1.1. When the DP falls outside of the LAAS exempt area in the final segment prior to the Final Approach Fix (FAF):Draw **all** applicable instrument approach procedure final segments, including circling only procedures, (primary areas only) from the LAAS exempt area outward to the DP.

4.2.4.4.1.2. The altitude selected for LAAS processing within the primary final segment trapezoid(s) shall be set at the lowest published MDA (nearest 100' increment) and shall provide at least 200 feet clearance above terrain and obstructions.

4.2.4.4.2. When DP falls between the FAF and the Intermediate Fix (IF):

4.2.4.4.2.1. Draw **all** applicable final and intermediate segment, including circling only procedures, (primary areas only) from the Missed Approach Point (MAP) outward to the DP.

4.2.4.4.2.2. The altitude selected for LAAS processing within the primary intermediate segment trapezoid(s) shall be no more than 100 feet below the lowest published FAF crossing altitude and shall provide at least 300 feet clearance above terrain and obstructions. The altitude selected for LAAS processing within the primary final segment trapezoid(s) shall be set at the lowest published MDA (rounded to nearest 100') and shall provide at least 200 feet clearance above terrain and obstructions.

4.2.4.4.3. When the DP falls between the IF and the Initial Approach Fix (IAF):

4.2.4.4.3.1. Draw all applicable final, intermediate, and initial segments, including circling only procedures, (primary areas only) from the Missed Approach Point (MAP) outward to the DP.

4.2.4.4.3.2. The altitude selected for LAAS processing within the primary initial segment trapezoid(s) shall be no more than 200 feet below the lowest published IF crossing altitude and shall provide at least 300 feet clearance above terrain and obstructions. The altitude selected for LAAS processing within the primary intermediate segment trapezoid(s) shall be no more than 100 feet below the lowest published FAF crossing altitude and shall provide at least 300 feet clearance above terrain and obstructions. The altitude selected for LAAS processing within the primary final segment trapezoid(s) shall be set at the lowest published MDA (rounded to nearest 100') and shall provide at least 200 feet clearance above terrain and obstructions.

4.2.4.5. For all other areas, the altitude selected shall be no more than 200 ft below the MVA and shall provide a minimum of at least 700 feet above terrain and obstacles (1,700 feet in designated mountainous terrain). NOTE: If two MVA sector altitudes are established IAW AFI 11-230, Instrument Procedures paragraph 9.2. due to excessively high floor of controlled airspace, the LAAS sector altitude will be based on the lowest MVA in the sector.

4.2.5. LAAS sector data collection

4.2.5.1. Define the boundaries of each LAAS sector by two radials (start and end) and by two ranges (start and end). Depict LAAS sectors as either pie-shaped, truncated pie-shaped, or circular around a point of origin. Using **Figure 3.3.** and **Figure 3.5.** as an example, draw radials to encompass all areas identified in paragraph **4.2.4.** Each radial originates at the ASR antenna and extends to the range of the scale being developed (approach area detail or general terrain map). Measure the angle of each radial (magnetic based on ASR slaved variation) and label. Combine radials to include/reduce irregularly shaped areas if necessary (see **4.2.5.3.** Note). Continuous sectors shall not cross 0 degrees or 360 degrees. Split sectors crossing 0 or 360 degrees into two sectors; stop the first sector at 360 degrees, start the second sector at 0 degrees. Identify a circular area that extends completely around the antenna as beginning and ending on the same azimuth

4.2.5.2. Using **Figure 3.4.** and **Figure 3.6.** as examples, draw arcs (ranges) from the ASR antenna to encompass areas identified in paragraph **4.2.4.** On the Approach area detail map, measure to the nearest .25 NM. On the General Terrain Map, measure to the nearest whole NM distance.

NOTE: Sector end azimuth (radial) must be at least 8 degrees from the start azimuth and specified in 1 degree increments and end range may be no less than 4.0 NM from the start range in no less than .25 (1/4) NM increments. For example, sector start azimuth 000°, end azimuth must be at least 008°. Start range is 000 NM, minimum end range is 004 NM.

4.2.5.3. Up to 128 sectors may be defined using azimuth/ranges start – end combinations. On complicated charts, it may be necessary to make compromises to conserve radials/ranges.

NOTE: To the maximum extent possible based on radial/range limitations, make compromises towards the more critical side without incurring excessive nuisance alarms. For example, when defining the Circling MDA area for a satellite airport, the consolidated radials/ranges should not allow for a significant increase in size to the 4 NM radius (i.e., from 4 NM to 4.25 NM). This is to reduce the likelihood of aircraft operations below the MVA without proper LAAS processing. When defining a LAAS sector for a MVA isolation buffer (i.e., 3/5 NM radius from a single prominent obstruction) the combined radials/ranges shall increase the size of the LAAS sector.

4.2.5.4. Label the LAAS processing altitude for each sector for transfer to the Air Force Form 3646.

4.2.6. AF Form 3646 completion instructions:

4.2.6.1. Section 1 Facility. On the first line, enter the ICAO identifier for the facility. Example: KTIK. On the second line, enter the unit and location. Enter the name and DSN of the person submitting the information. Enter the name and DSN of the person at the MAJCOM level who reviewed the package before forwarding it.

4.2.6.2. Section 2 Date. Enter the unit-level submission date in the format dd-mmm-yyyy.

4.2.6.3. Section 3 Antenna Data. Enter the latitude of the radar antenna to the nearest arc second and indicate N or S latitude. Enter the longitude of the radar antenna of the nearest arc second and indicate W or E longitude. Enter the physical slave angle of the radar antenna to the nearest 1/10 (tenth) degree and indicate antenna rotation east or west.

4.2.6.4. Section 5 Transition Altitude. Enter the transition altitude in hundreds of feet above Mean Sea Level (MSL).

4.2.6.5. Section 6 Baseline Altitude. Enter the lowest altitude above Mean Sea Level which activates LAAS processing. This is the default LAAS processing altitude for areas not otherwise specifically defined. The baseline altitude is the lowest safe altitude for all areas not included in a programmed map segment, or zero if there are expected significant areas where low altitude alert alarms would activate for legitimate reasons, but are not of concern. Remember that, procedurally, entering an altitude equal to or lower than the actual ground elevation in a segment means the LAAS alarm will never activate in that area. Examples are: low altitude training areas and nearby airports not serviced by the facility.

4.2.6.6. Section 7 Segment Data. For ease of future data modification, enter each identified segment in some order. Identify the exact order by segment number on all maps and drawings submitted with the LAAS package. Begin with 001 and proceed sequentially to the system limit of 128.

4.2.6.6.1. Start Azimuth. Enter the segment-starting azimuth (also called the “left” azimuth) in degrees to the nearest degree. The start azimuth is the one the PPI sweep passes first as it rotates from the north in a clockwise direction. Use 360 for due north.

4.2.6.6.2. End Azimuth. Enter the segment-ending azimuth (also called the “right” azimuth) in degrees to the nearest degree. The end azimuth is the azimuth the PPI sweep passes last as it rotates from the north in a clockwise direction. This value must be at least 8 degrees greater than the segment start azimuth. Use 360 for due north.

4.2.6.6.3. Start Range. Enter the segment range closest to the antenna to the nearest 0.25 (quarter) NM.

4.2.6.6.4. End Range. Enter the segment range farthest from the antenna to the nearest 0.25 (quarter) NM. This range must be at least 4 NM greater than the segment start range.

4.2.6.6.5. Segment Altitude. Enter the lowest altitude at which an aircraft may operate without activating the LAAS. Enter this data in hundreds of feet; e.g., enter 2800 as 28. Enter an altitude of 25,500 or above as 255 (the system maximum).

4.3. LAAS Associated with Mobile and Selected Fixed Radar Systems. The following information pertains only to LAAS associated with AN/GSN-12, AN/GPN-20, AN/TPN-19, or AN/MPN-14 radars.

4.3.1. Function. This LAAS feature operates identically to the DBRITE LAAS except that only one code can be inhibited.

4.3.2. Data Submission. Process LAAS packages the MAJCOM TERPS office. Packages include approach area detail and general terrain charts, and a completed LAAS Data Collection Sheet for Mobile and Selected Fixed Radar Systems (**Attachment 1**). After MAJCOM review and approval, take the following action:

4.3.2.1. AN/GSN-12/AN/GPN-20 Fixed facilities (i.e., Aviano AB, Dobbins ARB, Incirlik AB, Soto Cano AB, and Thule AB): Provide approved data to radar maintenance personnel for input into the 980B computer.

4.3.2.2. Mobile facilities (MPN-14K or TPN-19). The MAJCOM TERPS office forwards approved LAAS data to ESC OL-DE/GA, which will produce Programmable Read-Only Memory (PROM) chips. **Submit at least 30 days prior to desired effective date.**

4.3.3. Data Collection and Package Development. Draw LAAS charts for these systems in the same manner as for DBRITE LAAS except chart design must account for different radial/range restrictions based on equipment limitations (see below).

4.3.4. Complete LAAS Data Collection Sheet for Mobile and selected Fixed Radar Systems (**Attachment 1**) as follows:

4.3.4.1. Section 1 Site Name. Enter the ICAO identifier and name for the facility.

4.3.4.2. Section 2 Date. Enter the unit-level submission date in the format dd-mmm-yyyy.

4.3.4.3. Section 3 Magnetic Variation. Enter the physical slave angle of the radar antenna to the nearest 1/10 (tenth) degree and indicate antenna variation east or west.

4.3.4.4. Section 4 Revision. Enter the revision number if known.

4.3.4.5. Section 5 Segment Data. Enter each identified segment in some order. Up to 128 sectors may be defined using azimuth/ranges start – end combinations. On complicated charts, it may be necessary to make compromises to conserve radials/ranges. Identify the exact order by segment number on all maps and drawings submitted with the LAAS package. Begin with 001 and proceed sequentially to the system limit of 128.

4.3.4.5.1. Start Range. Enter the segment range closest to the antenna to the nearest whole NM.

4.3.4.5.2. Stop Range. Enter the segment range farthest from the antenna to the nearest whole NM. This range should be at least 2 NM greater than the segment start range.

4.3.4.5.3. Start Azimuth. Enter the segment-starting azimuth (also called the "left" azimuth) in degrees to the nearest degree. The start azimuth is the one the PPI sweep passes first as it rotates from the north in a clockwise direction. Use 0 degrees for due north.

4.3.4.5.4. Stop Azimuth. Enter the segment ending azimuth (also called the "right" azimuth) in degrees to the nearest degree. The end azimuth is the azimuth the PPI sweep passes last as it rotates from the north in a clockwise direction. This value must be at least 4 degrees greater than the segment start azimuth. Use 360 for due North.

4.3.4.5.5. Segment Altitude. Enter the lowest altitude at which an aircraft may operate without activating the LAAS. Enter this data in hundreds of feet.

4.3.4.5.6. Mode 3A Lockout. Enter codes as code blocks, i.e., 1200-1277, or individual codes.

4.3.4.5.7. Test Cell Target Range. Enter the RABM target range in NM

CHAPTER 5

PROGRAMMABLE INDICATOR DATA PROCESSOR (PIDP)

5.1. PIDP System Adaptation. All PIDP installations use the same standard PIDP computer software program. Before facility delivery, ESC OL-DE/GA adds site unique data to the standard software to optimize the program for use at that facility.

5.1.1. PIDP design criteria The program design criteria for the Programmable Indicator Data Processor (PIDP) provides air traffic controllers the capability to furnish a safe terminal advisory and control service to aircraft arrivals, departures, and over flights. Required items of site unique data ensure achieving this objective. All program magnetic media delivered to each facility include the site unique data, tailoring the standard PIDP software to fit the specific system and area. The following paragraphs detail specific steps for collecting, compiling, recording, and submitting site unique data for the proper functioning of the auto-acquire, terminal-to-terminal hand-off, and reflection discrimination features. For the software to function properly, keep all site unique data accurate. When necessary to change an item of site unique data, , requests the change from ESC OL-DE/GA. Address all correspondence concerning PIDP to: ESC OL-DE/GA, Tinker AFB OK 73145-6340. Process change requests at least 30 days before the change takes effect to allow time for data processing and return delivery of the corrected program. Provide the MAJCOM TERPS office an information copy of all revisions sent directly to ESC OL-DE/GA.

5.1.1.1. Facility Data:

5.1.1.1.1. Basic Site information: ESC OL-DE/GA will provide a work sheet for site unique data with the initial request. Retain a current copy in facility records. The operation of the PIDP software is dependent upon the accuracy of this information. Retain a current copy in facility records. To request a change of site unique data, identify the changed item(s) in a letter or message to ESC OL-DE/GA.

5.1.1.1.2. Auto-acquire/Conflict Alert. Provide coordinates of the facility's designated airspace boundary to ESC OL-DE/GA. After processing the data, ESC OL-DE/GA furnishes a computer-generated map of the airspace, auto-acquire area, and conflict alert boundaries for local review. Auto-acquire is roughly based on a 10 NM boundary around the designated airspace. The conflict alert boundary is by default 10 NM outside of the auto-acquire boundary. ESC OL-DE/GA designs these sectors based on magnetic North, as determined by the ASR site's magnetic variation. The PIDP computer program prevents the auto-acquire/conflict alert functions from operating on aircraft outside the defined boundaries. When changing auto-acquire/conflict alert limits, refer to the sector by number (1-36), and give the new requested range value(s).

5.1.1.2. MSAW Data. Collect MSAW data according to **Chapter 3** of this manual.

5.1.1.3. Terminal-to-Terminal Interface Data Collection:

5.1.1.3.1. The PIDP terminal-to-terminal interface function allows interfacing of one facility with up to eight other automated PIDP or ARTS terminal facilities or non-host centers. Other facilities must interface with the same ARTCC, share a common airspace boundary, and have the software capability. Terminal Radar Service Area (TRSA) hand-offs are an additional option to the standard terminal-to-terminal interface.

5.1.1.3.2. Use the ESC OL-DE/GA provided form (attachment 4) for submitting terminal-to-terminal interface data. Coordinate the necessary data between the terminal facilities involved. Fill in the required data beginning with Terminal Facility Number 1. The computer program uses the facility number and the TRSA alpha character to identify that facility in hand-off processing. Facility reference IDs are the three letter identifiers that the ARTCC computer uses to identify the facilities. Use two fixes (defined by three letter identifiers) for each entry. The first fix is the entry fix and the second is the exit fix. Indicate the type of fix pair (enroute or arrival) on the form. Use enroute fix pairs for over flight routes through the receiving facility's airspace. Use arrival fix pairs for flights that terminate in the receiving facility's airspace. In the case of an arrival type fix pair, the exit fix is the destination airport. Submit data required for the terminal-to-terminal function directly to ESC OL-DE/GA at least 30 days in advance of the effective date.

5.1.1.4. Reflection Data Collection:

5.1.1.4.1. Some locations may experience difficulty with false targets caused by radar reflections. With appropriate additions to the basic software, the PIDP is capable of inhibiting the display of many of these false target reflections. Reflection processing is effective only against true radar reflections and cannot reduce the clutter caused by maladjusted equipment gain time constant (GTC). This clutter is often called "ring-around."

5.1.1.4.2. Facility chief controllers experiencing difficulties with reflections should contact ESC OL-DE/GA for assistance and the necessary forms. Data required includes the code, altitude, the beginning and ending range and azimuth of real targets and the altitude, beginning and ending range and azimuth, and the number of sweeps for the false targets. Track the real and false targets to determine the azimuth and range where real targets begin picking up reflected signals which produce false targets. Define these false target zones; mark the real and false target zones on the radar indicators in grease pencil when the controllers' observations show a pattern. After the zones are clearly defined, make a sketch of the display showing the real and false target zones. Data must be complete and accurate to minimize the possibility of suppressing true targets. The quality of the reflection suppression depends upon the accuracy of the observations and the size of the sample. One or two observations do not form an adequate sample. Conversely, hundreds of samples are not necessary to define reflections off of a building. Twenty to thirty tracks should reasonably define the individual false target zones. Note also that some real target tracks may have more than one false target zone (two or more false target tracks). Record these also. Collect this data with the AN/TPX-42A Interrogator Set operating in normal low power mode, with Defruit and Bracket Video "ON." Observe data from both receivers and transmitters. Set video signal processor settings as shown in the most recent ATCALS Evaluation.

CHARLES F. WALD, Lt Gen, USAF
DCS, Air & Space Operations

ATTACHMENT 1

GLOSSARY OF REFERENCES, AND SUPPORTING INFORMATION

Abbreviations and Acronyms

ADIZ—Air Defense Identification Zone

AER—Approach End of Runway

Aprch—Approach

ARSA—Airport Radar Service Area

ARP—Airport Reference Point

ASR—Airport Surveillance Radar

ATCA—Air Traffic Control Airspace

ATCSS—Air Traffic Control Systems Specialist

AVC—Aeronautical Video Chart

AOF/CC—Airfield Operations Flight Commander

CATCA—Chief Air Traffic Control Automation

CCW—Counterclockwise

CW—Clockwise

DBRITE—Digital Bright Radar Indicator Tower Equipment

DIR—Direction

DME—Distance Measurement Equipment

DOR—Departure End of Runway

DP—Descent Point

EARTS—Enroute Automated Radar Tracking System

EEP—Extension End Point

EOVM—Emergency Obstruction Video Map

FAF—Final Approach Fix

GTM—General Terrain Map

LAAS—Low Altitude Alerting System

LAT—Latitude

LON—Longitude

Mag—Magnetic

MAP—Missed Approach Point

MDA—Minimum Descent Altitude

MSAW—Minimum Safe Altitude Warning

MVA—Minimum Vectoring Altitude

PE—Permanent Echo

RAPCON—Radar Approach Control

STARS—Standard Terminal Automation Replacement System

SUA—Special Use Airspace

Var—Variation

ATTACHMENT 2

LAAS DATA COLLECTION SHEET
FOR MOBILE AND SELECTED FIXED RADAR SYSTEMS

SITE NAME: ______________________________________ DATE: _________________________

MAGNETIC VARIATION ______________ REVISION: _____________________

SECTOR #	RANGE		AZIMUTH		MINIMUM ALTITUDE	MODE 3/A LOCKOUT
	START	STOP	START	STOP		
						TEST CELL TARGET RANGE RABM

ATTACHMENT 3

SITE UNIQUE DATABASE INFORMATION		
BASE:	ICAO:	ORIGINAL SOURCE DATE:

1.Unit Address:	8. Servicing ARTCC:
2. MAJCOM:	9. Servicing Non-Host ARTCC:
3. Field Elevation:	10. Antenna Coordinates (nearest second) Latitude: Longitude:
4. Transition Altitude:	11. Magnetic Variation:
5. Maximum Auto-Acquire Altitude:	12. Type Radar:
6. PIDP Reference ID:	13. PRF: (Circle one) Do you use staggered PRF? YES NO
7. NAS Reference ID:	14. Antenna RPM:

See next page for instructions.

INSTRUCTIONS

This data collection sheet was designed to update our local database. We need all of this information to be updated and verified, then corrected (if needed). This information will remain current in our files until such time that you submit changes to your site data. Please utilize all of your resources to get the most correct information. Consult with radar maintenance personnel for information on your radar. TERPS personnel should be able to provide Latitude/Longitude information. Facility managers should be able to provide PIDP, NAS and ARTCC information. If you do not have a servicing ARTCC, you will not have any PIDP or NAS ID references. Should you experience any difficulty in obtaining this data please call the Air Traffic Systems Support Team at DSN 884-5696.

DEFINITION OF TERMS

1. Unit Address - This should be the address you want the PIDP updated diskettes mailed.

2. MAJCOM - The MAJCOM which your organization is assigned.

3. Field Elevation - Altitude above sea level which represents the field elevation.
Example: 3200 feet MSL, or 54 feet MSL

4. Transition Altitude - The lowest flight level used prior to using standard altitudes.
Example: FL 180

5. Maximum Auto-Acquire Altitude - The highest altitude aircraft will auto-acquire over your airspace.
NOTE: OUR software will automatically add a 1200 foot buffer to the altitude provided.

6. PIDP Reference ID - This is a ARTCC defined 3-letter identifier for your facility. You must have this if you interface with a servicing ARTCC.

7. NAS Reference ID - This is your servicing ARTCC 3-letter identification.

8. Servicing ARTCC - The actual name of the ARTCC which automated handoff will occur.

9. Non-Host ARTCC - This is the name of any ARTCC with which you share boundary airspace, but is not your servicing ARTCC.

10. Antenna Location - Geographical location of the radar antenna.
Example; 51 24 33.00N 122 34 15.00W

11. Magnetic Variation - Example; 5.3W

12. Type of Radar - GPN-20 or GPN-12. Please specify if you operate any other type of radar.

13. PRF - Pulse recurring frequency. How many pulses per second the transmitter emits.

14. Antenna RPM - The rate at which the antenna turns. Rotations per minute.

ATTACHMENT 4

ARTS OR ARSA TERMINAL-TO-TERMINAL INTERFACE			
BASE:	**ICAO:**	**SOURCE DATE:**	
Terminal Facility #1:		**Terminal Facility #2:**	
a. Facility Name:		a. Facility Name:	
b. PIDP Reference ID:		b. PIDP Reference ID:	
c. Antenna Latitude:		c. Antenna Latitude:	
d. Antenna Longitude:		d. Antenna Longitude:	
e. ARSA Fix Pair Data:		e. ARSA Fix Pair Data:	
1. Fix Pair A Data:		1. Fix Pair A Data:	
Entry Fix ID:		Entry Fix ID:	
Exit Fix ID:		Exit Fix ID:	
Arrival/Enroute:		Arrival/Enroute:	
2. Fix Pair B Data:		2. Fix Pair B Data:	
Entry Fix ID:		Entry Fix ID:	
Exit Fix ID:		Exit Fix ID:	
Arrival/Enroute:		Arrival/Enroute:	
3. Fix Pair C Data:		3. Fix Pair C Data:	
Entry Fix ID:		Entry Fix ID:	
Exit Fix ID:		Exit Fix ID:	
Arrival/Enroute:		Arrival/Enroute:	
4. Fix Pair A Data:		4. Fix Pair A Data:	
Entry Fix ID:		Entry Fix ID:	
Exit Fix ID:		Exit Fix ID:	
Arrival/Enroute:		Arrival/Enroute:	
Terminal Facility #3:		**Terminal Facility #4:**	
a. Facility Name:		a. Facility Name:	
b. PIDP Reference ID:		b. PIDP Reference ID:	
c. Antenna Latitude:		c. Antenna Latitude:	
d. Antenna Longitude:		d. Antenna Longitude:	
e. ARSA Fix Pair Data:		e. ARSA Fix Pair Data:	
1. Fix Pair A Data:		1. Fix Pair A Data:	
Entry Fix ID:		Entry Fix ID:	
Exit Fix ID:		Exit Fix ID:	
Arrival/Enroute:		Arrival/Enroute:	
2. Fix Pair B Data:		2. Fix Pair B Data:	
Entry Fix ID:		Entry Fix ID:	
Exit Fix ID:		Exit Fix ID:	
Arrival/Enroute:		Arrival/Enroute:	
3. Fix Pair C Data:		3. Fix Pair C Data:	
Entry Fix ID:		Entry Fix ID:	
Exit Fix ID:		Exit Fix ID:	
Arrival/Enroute:		Arrival/Enroute:	
4. Fix Pair A Data:		4. Fix Pair A Data:	
Entry Fix ID:		Entry Fix ID:	
Exit Fix ID:		Exit Fix ID:	
Arrival/Enroute:		Arrival/Enroute:	

Terminal Facility #5:		**Terminal Facility #6:**	
a. Facility Name::		a. Facility Name	
b. PIDP Reference ID:		b. PIDP Reference ID:	
c. Antenna Latitude:		c. Antenna Latitude:	
d. Antenna Longitude:		d. Antenna Longitude:	
e. ARSA Fix Pair Data:		e. ARSA Fix Pair Data:	
1. Fix Pair A Data:		1. Fix Pair A Data:	
Entry Fix ID:		Entry Fix ID:	
Exit Fix ID:		Exit Fix ID:	
Arrival/Enroute:		Arrival/Enroute:	
2. Fix Pair B Data:		2. Fix Pair B Data:	
Entry Fix ID:		Entry Fix ID:	
Exit Fix ID:		Exit Fix ID:	
Arrival/Enroute:		Arrival/Enroute:	
3. Fix Pair C Data:		3. Fix Pair C Data:	
Entry Fix ID:		Entry Fix ID:	
Exit Fix ID:		Exit Fix ID:	
Arrival/Enroute:		Arrival/Enroute:	
4. Fix Pair A Data:		4. Fix Pair A Data:	
Entry Fix ID:		Entry Fix ID:	
Exit Fix ID:		Exit Fix ID:	
Arrival/Enroute:		Arrival/Enroute:	

INSTRUCTIONS

We need all of this information to be updated and verified, then corrected (if needed). This information will remain current in our files until such time that you submit changes to your site data. Please utilize all of your resources to get the most correct information. PIDP allows for up to eight “Terminal Facilities”, this data collection sheet will hold six. Please attach another page if you have more facilities than the form allows. TERPS personnel should be able to provide Latitude/Longitude information. Facility managers should be able to provide fix pair data and arrival/enroute information. Data System Specialists (DSS) at the ARTS/ARTCC facility should be able to provide adjacent facility terminal information. Should you experience any difficulty in obtaining this data please call the Air Traffic Controller Support Team at DSN 884-5696.

DEFINITION OF TERMS

If you have an adjacent NON-HOST facility, you only have to provide the facility name and PIDP reference identification. All other facility entries must include antenna location and fix pair data (if required).

Facility Name - This should be the terminal facility to which you will make handoff. If the ARTS facility is enhanced to receive field 13 in TI messages, then place a large “E” next to the facility name.

PIDP Reference ID - This is a ARTCC defined 3-letter identifier for the terminal facility. You must have this if you interface with an adjacent ARTS/PIDP.

Antenna Location - Geographical location of the adjacent facility radar antenna.
Example; 51 24 33.00N 122 34 15.00W

Entry Fix ID - Entry fix for one of up to four routes (A through D).

Exit Fix ID - Exit fix for one of up to four routes (A through D).

Arrival/Enroute - This denotes whether the pair data above is for arrival or enroute routes to or through the adjacent facilities airspace.