Government/Industry
Aeronautical Charting Forum (ACF) 96-02
October 7-10, 1996

1. Opening Remarks

The two day meeting was held at the Headquarters of the Air Line Pilots' Association (ALPA) in Washington, DC. Mr. Lyle Wink, FAA/AFS-440, stood in as the Co-Chair of the ACF and chaired the TERPs portion of the Charting Forum on October 7-8, 1996. Separate minutes of the TERPs meeting will be generated and sent to those participants.

Mr. Dick Powell, FAA/ATA-100, Co-Chair of the ACF, opened the Charting Forum on October 9, 1996 at ALPA headquarters with a thanks to Mr. Tom Young, ALPA, for hosting the forum. Mr. Powell asked participants to fill out the Attendee List and include their e-mail address, as well as filling out the Issue Priority List as each issue is discussed. Minutes of ACF 96-01 were approved. ACF 96-02 attendees are at Attachment 1.

2. DOT/DOC Inspectors General Study of the Office of AC&C

Mr. Dick Powell, FAA/ATA-100, and Captain Terry Laydon, Acting Director, AC&C, briefed the ACF on the joint DOT-DOC IG study. The IGs made a joint recommendation on where the aeronautical charting program of AC&C should be located (i.e., NOS, FAA, NIMA, USGS, separate corporation, etc.). The IGs met with aviation interest groups to get their comments. Mr. Powell noted that the FAA Administrator met with OMB on the issue on October 8, 1996. Capt Laydon stated that the AC&C comments on the study were diametrically opposed to the IG recommendations but that the AC&C comments were not mentioned in the NOS reply to the IG Study. Mr. Powell stated that they too were opposed to the IG recommendations and believed that AC&C should become a Performance Based Organization (PBO) or a government corporation. The FAA felt that the Board of Directors of the new organization should consist of representatives from the FAA, NOS, and some of the members of the ACF. The FAA also noted that the NAPA Study was not considered by the IG Study. Capt Laydon and Mr. Powell both addressed the lack of an IG cost-benefit analysis and statement on how chart prices might be affected. Capt Laydon and Mr. Powell both addressed the need to modify existing legislation to allow AC&C to keep chart revenues for new products and the need for FTE relief from Federal workforce ceilings. Capt Laydon summarized by stating that AC&C would like to stay in the DOC, possibly as a PBO, and barring that, then would hope to stay in NOAA in another Service Agency, or as a third choice, moving over

to the DOT to combine with FAA Aeronautical Information Services, and as a last choice, moving to USGS. Mr. Powell believes that AC&C should become a PBO and that going to USGS is better than splitting up AC&C between FAA and USGS. Mr. Powell and Capt Laydon agreed that the IG Study recommendations would not result in a benefit to either chart users or the U.S. taxpayer. Both asked that ACF members consider the Study recommendations and the data presented by them to the ACF, and take whatever actions they deem appropriate. Mr. Tom Young, ALPA, stated that their concern is with performance across the spectrum (USGS Quads, NOS VFR charts, IFR charts, etc.) and that possibly it would be beneficial to combine all facets of aviation in a single agency. The American Congress on Surveying and Mapping (ACSM) is beginning a study that will give Congress recommendations on how to improve mapping, charting and surveying functions in the U.S. It was recommended that ACF members consult with ACSM to influence the structure and scope of their study. OMB now has the control of this issue and may present this to the Congress when it reconvenes. Questions were raised in the ACF as to why the GAO was not involved in this study.

Action: None, for information only.

3. Situation Awareness for Safety

Mr. Jim McDaniel, FAA/AND-630, briefed on FAA efforts and actions to develop standards for and integration of graphics-based cockpit avionics. In order to arrive at a mature free flight concept, all aircraft will need a minimum equipment package that is integrated and affordable. Many technologies (TCAS,ADS-B,GPS, DataLink, CDTI, real-time weather) are developing in parallel but without integration. The FAA's Situational Awareness for Safety Team's goal is to develop design standards and integration requirements for these technologies. The FAA has asked the RTCA and SAE G-10 to address and develop minimum standards and optimum human factors guidelines for digital terrain databases and electronic cockpit displays. The Information Briefing and Proposed Terms of Reference papers are at Attachment 2. Mr. Ron Bolton, AC&C, noted that to provide the required separations and terrain clearances desired in 'free flight', two areas must be worked further on: Part 77 Data Standards must be tightened up and the government required to provide more accurate and precise terrain/obstruction data; and, different equipment on aircraft sharing the same airspace, i.e., how will 'mixed traffic' be handled in a free flight environment. Another important issue to be resolved is that every aircraft must have the exact same data on board, whether from the same provider or from different providers. This data would possibly be a government-source database provided to user and value-added producer alike.

Action: None, for information only.

4. Controlled Flight Into Terrain (CFIT)
Mr. Dan Hannon, Volpe NTSC, was not able to make it to the ACF.

Action: Mr. Dan Hannon, Volpe NTSC, will brief the status of the CFIT study at the next ACF meeting.

5. SMGCS Charts and Standard Taxi Routes (93-01-024, 93-01-029)
Mr. Steve Lucchesi, FAA/ATA-130, stated that funding for the new products had been approved. Ms. Linda Cushing, AC&C, stated that the contract was being written. Mr. Lucchesi also stated that AC&C had been asked to ascertain the civil user requirements for this publication since AC&C had a better handle on determining user requirements than the FAA. The FAA Orders will need to be updated to ensure that the data is submitted and maintained in a timely manner.

Action: Mr. Steve Lucchesi, ATA-130, will provide a status report on the update of the applicable FAA Orders. Cdr Eric Secretan, AC&C, will report on the civil user requirements for these products.

6. Release of Digital Terrain Elevation Data (DTED) (93-01-028)
Maj Tim Duerson, National Imagery and Mapping Agency (NIMA), briefed that NIMA was writing an MOU to provide DTED to the civil community as follows: worldwide DTED coverage that provides post values every 30 arc seconds (1 km spacing) and high/low/mean values within a 15 arc minute by 15 arc minute square; within 50 NM of an airport post values will be every 15 arc seconds; and, within 6 NM of an airport post values will be every 5 arc seconds. The data would be provided by NIMA to AC&C for public sale. Maj Duerson stated that 7 countries had refused to allow NIMA to release the 30 arc second data over their country. NIMA will attempt to fill in the resulting coverage gaps with other source, probably with Digital Chart of the World (DCW) data. NIMA also wants to limit the distribution of DTED to support only safety-related products. Mr. Tom Young, ALPA, stated that this data is needed especially for ground proximity warning systems. Mr. Jim Nixon, FAA/AFS-420, noted that JPL collected digital terrain data over the State of California on a previous shuttle mission and may be willing to brief the ACF on their product. Maj Duerson briefed that the intent was to release worldwide (minus the 7 countries) DTED at 30 arc seconds over their Internet Website (www.nima.mil).

Action: Maj Tim Duerson, NIMA, will report on the status of the MOU at the next ACF meeting. Mr. Dick Powell, FAA, will contact

JPL for a possible briefing.

7. SmartGlobe Demonstration (Lockheed Martin)
Mr. Marc Tinkelenberg, LOGOS, gave a presentation on an electronic aeronautical charting system, SmartGlobe. SmartGlobe is aimed at supporting the entire production process from processing individual changes to creating and maintaining charting products. KLM is using it to automate their chart generation process, improve the chart quality and consistency between charts as well as standardize hardware and software and data and file exchange formats. The database can store multiple versions of the same data with different effective dates, serving as a historical source as well as providing data for a chart yet to be produced. The system will note the changes to the existing charts and list them as well. This system will also construct a common chart with different data/symbols, tailored to what the airline user requests. The system has taken visual charts from AC&C and NIMA and scanned them, warped them and developed vector layers from them. The system provides AIPs, Sectional charts, IAPs, Enroute charts, Air Traffic Control display information.

Action: None, for information only.

8. Obstruction Chart - Engine Out (92-01-003, 93-01-027)
Mr. Dave Thompson, FAA/ATA-130 and Chair of the EOWG, reported that the EOWG had not met since the last ACF. Ms. Linda Cushing, AC&C, noted that they had finished the MSAW testing to confirm that the DTED data was sufficiently accurate to use for the Engine Out chart. Capt Terry Laydon, AC&C, reported that Mr. Bob Niedermair, AC&C, would represent AC&C on the EOWG. Mr. Dick Powell, FAA/ATA-100, has approved the $12.3K needed to make the software changes for the EOWG.

Action: Mr. Dave Thompson, FAA/ATA-130, will call for a meeting of the EOWG to address two issues: site selection and product suitability; and, will report on the status of the EOWG actions at the next ACF meeting.

9. GPS Charting Working Group (93-01-030)
Ms. Dalia Marin, AC&C, reported that all issues for stand alone GPS approaches had been addressed except two: use of ICAO identifiers; and, orientation in true or magnetic. The FAA database has capability for only 3-letter idents, so software would have to be modified to be able to use ICAO's 4-letter ident. The issue of Mag vs True is pretty much dead because the technology is not there to display in low-end cockpits. In the Air Traffic Control environment, there are too many issues to resolve before a position can be resolved. There are currently

525 stand-alone GPS approaches. The IACC Task Group will address the new TAA prototype at their meeting next week. Effective October 10, 1996, the Texas TPP volume will be divided into two volumes, to accommodate the additional GPS approaches and new Dallas-Ft Worth procedures that caused the single volume to exceed printing limitations.

Action: Ms. Dalia Marin, AC&C, will report on the status of the ICAO identification issue at the next ACF.

10. ICAO Regional Meeting

Mr. David Lewtas, ICAO AIS/MAP, briefed the upcoming ICAO AIS/MAP Regional Meeting, March 23 - April 3, 1998 in Montreal, that will update ICAO Aeronautical chart and database annexes. This will include Annex 15 specs and Annex 4 specs. An Aeronautical Information Specialist Map/Study Group will be established to work the agenda and issues. The ACF was invited to make inputs into this Study Group. The proposed agenda is at Attachment 3. This will remain as an open agenda item until the ICAO Regional meeting, with ACF members making inputs/comments on the ICAO agenda.

Action: All ACF members will consider topics for submission to the ICAO AIS/MAP Regional Meeting.

11. IAP Reformat (92-01-006, 92-01-012, 92-01-013, 92-01-014, 94-01-039, 95-01-065)

Maj Tim Duerson, NIMA, stated that the tri-service FLIP Coordinating Committee (FCC) wants to proceed with the new reformatted IAP and had given NIMA leeway to meet this requirement within funding constraints. Mr. Dick Powell, FAA/ATA-130 noted that a CCP will be sent out on this issue.

Action: Mr. Dick Powell, FAA/ATA-130, will send out a CCP to determine the civil aviation community's desire for reformatted IAPs and will report on the status at the next ACF meeting.

12. Color Contours on IAPs (92-01-011, 92-01-015)

Mr. Dick Powell, FAA/ATA-130, reported that the FAA's CCP had resulted in responses from 8 industry reps and 18 government reps. One (1) industry rep and three (3) government reps nonconcurred with the CCP. Mr. Young volunteered to provide the CFIT viewpoint to those who had nonconcurred. Mr. David Lades, ICAO, asked to be brought into the coordination of the depiction of the contours. Mr. Young noted that the NTSB recommended color contours. Mr. Hall, ALPA, noted that the shaded areas on the Jeppesen and NOS/AC&C should be very similar. The ACF concurred.

Action: Mr. Steve Lucchesi, FAA/ATA-130, will provide Mr. Tom Young, ALPA, with the names of those nonconcurring so that he can provide them more information on this issue. Mr. Tom Young, ALPA, will introduce this as a topic at the next SAE G-10 meeting. Ms. Dalia Marin, AC&C, will provide paper copies of the contour prototypes to Mr. Powell.

13. VFR Charting Recommendations (94-01-040, 94-01-041, 94-01-042, 94-01-043, 95-01-058, 95-02-070, 95-02-071)
Mr. Dave Thompson, FAA/ATA-130, briefed that the IACC had received the Task Group's proposed specifications and would probably approve them at their next meeting. The only change to the original recommendations is that the Class C Airspace depiction would remain as solid magenta, not a dashed blue line as proposed in 94-01-041.

Action: Mr. Dave Thompson, FAA/ATA-130, will brief the status of the implementation of the IACC Specification Changes at the next ACF meeting.

14. Obstruction Data to Support Take-off Performance Calculation (92-01-003)
See paragraph 8.

15. Depicting Communication Frequencies on IAP Charts (92-01-006)
See paragraph 11.

16. Use of Color on IAPs (92-01-011)
See paragraph 12.

17. Warning and Caution Notes on IAPs (92-01-012)
Print Size and Readability of IAPs (92-01-013)
Use of Icons on IAPs (92-01-014)
See paragraph 11.

18. Obstacle and Terrain Contour Depiction on IAPs (92-01-015)
See paragraph 12.

19. Obstruction Data in Digital Form (93-01-027)
See paragraph 8.

20. Terrain Database/Release of DTED (93-01-028)
See paragraph 6.

21. GPS Overlay and GPS Charting (93-01-030)
See paragraph 9.

22. Changes to the Terminal Procedures (94-01-039)
See paragraph 11.

23. Parachute Jumping Areas on VFR Charts (94-01-040)
Class C Airspace on VFR Charts (94-01-041)
Communication Frequencies on VFR Charts (94-01-042)
Class B Airspace on VFR Charts (94-01-043)
Depicting Class C Airspace in blue on VFR Charts (94-01-041) was not approved by the IACC Task Group. See paragraph 13.

24. Charting Permanent Laser Sites (94-02-053)
Mr. Tom Young, ALPA, reported that the SAE G-10 Laser Subcommittee had not formalized what should be charted.

Action: Mr. Tom Young, ALPA, will report on the SAE G-10 efforts at the next ACF meeting.

25. Military Aviation Technology Initiative (95-01-057)
Maj Tim Duerson, NIMA, briefed that NIMA had called for a meeting between FAA, NIMA, and AC&C to discuss their current digital initiatives and the digital database that NIMA is now building and how to interface with AC&C and FAA databases. Mr. Tom Young, ALPA, requested that the SAE G-10 developed symbology be used. Maj Duerson reported that the SAE G-10 symbology had been recommended for use by NIMA.

Action: Maj Tim Duerson, NIMA, will report on the status of NIMA's electronic charting efforts at the next ACF meeting.

26. Visibility of ATC Frequencies on Sectional Charts (95-01-058)
See paragraph 13.

27. Removal of Mountain Pass Symbology (95-01-061)
Cdr Eric Secretan, AC&C, reported that the FAA non-concurred on this IACC Requirement Document because it is standard ICAO symbology, has landmark value, and can be useful in emergency VFR conditions. Pilots should know that the symbol does not imply a safe route through a mountain range. Capt Terry Laydon noted that each pass has specific characteristics and no symbol can adequately depict them. Mr. Dick Powell recommended that the mountain pass elevation be removed since it was used inappropriately by pilots as a safe altitude figure. Mr. John Moore, AC&C, recommended that a dot be added within the pass symbol that indicates the location of the highest elevation within the pass. This would comply with the ICAO symbology. The ACF concurred.

Action: Cdr Eric Secretan, AC&C, will resubmit the IACC RD to reflect the above dot, and report at the next ACF.

28. Conversion of Offshore Reporting Points to Waypoints (95-01-063)
Mr. Jim Nixon recommended that this be included in the new RNAV chart series being developed by the IACC. The ACF concurred.

Action: Closed

29. Equipment Required on Intermediate Segments (95-01-065)
Mr. Jim Nixon, FAA/AFS-420, reported that no work has been done on the development of the icons to depict equipment requirements. It was recommended that this issue be considered with the IAP Reformat. This issue could be handled by a procedure note on the 8260, and when the new RNAV plates are developed then the icons can be developed. The ACF concurred. See paragraph 11.

30. Unnamed Fixes on Charts (95-01-066)
Mr. Charles Branch, AC&C, reported that the names were being provided by NFDC to AC&C. Jeppesen has sent all the points to FAA and AC&C. Mr. Jim Terpstra, Jeppesen, asked when the names would start to show up on the charts. The answer was obtuse, but will probably show up next year. Also, see paragraph 34.

Action: Mr. Bill Moseley, FAA/ATR-110, will report on the status of the conversion effort at the next ACF meeting.

31. GPS Overlay Program (95-02-067)
Mr. Rudy Ruana, Jeppesen, reported that with FAA's concurrence and guidance, only one GPS approach will be published for each runway end. Ms. Dalia Marin, AC&C, reported that very few duplicates existed in the NOS TPP volumes and that these were being worked.

Action: Closed

32. Redundant Verbiage on SIDs/STARs (95-02-068)
Mr. Rudy Ruana, Jeppesen, and Chair of the ACF Working Group on SIDs and STARs, reported that action remains with the FAA General Counsel and Ms. L'Tanya Talley, FAA/ATO-110 to make the changes to the Form 7100.

Action: Ms. L'Tanya Talley, FAA/ATO-110, will coordinate required changes to the Form 7100.

33. Boundary of VFR Terminal Chart on Sectional Charts (95-02-070)

Airspace Change Dates on Sectional Charts (95-02-071)
See paragraph 13.

34. Inoperative Components Table (95-02-075)
Maj Tim Duerson, NIMA, reported that the FLIP Coordinating Committee had not yet considered a common position on the table.

Action: Maj Tim Duerson, NIMA, will coordinate with the Services and provide their common position at the next ACF.

35. Flight Management System Vertical Navigation (FMS VNAV) (96-01-077)
This issue is being worked by the ACF TERPS Group. See their minutes.

36. Adding GPS Waypoints to Charts (96-02-078)
Mr. Terry DePlois, FAA/AVN-160, recommended that some sort of linkage be established between GPS waypoints depicted on GPS SIAPs and those same GPS waypoints depicted on the Enroute charts. This might be done by depicting the terminal waypoint on the enroute chart and vice versa. The ACF agreed unanimously that a waypoint used to transition from the enroute to the terminal structure should not only have a common name but also should be depicted on both enroute and terminal charts. There are several issues (charting GPS waypoints over Navaids, naming conventions) that should be considered along with this topic. It was recommended that an ad hoc committee be established to address all. This committee will, with ACF approval, forward the recommendations to AFS-420 for their action. The issue package and the list of ad hoc members is at Attachment 4.

Action: Mr. Terry DePlois, FAA/AVN-160, will report on the status of the ad hoc committee recommendations at the next ACF.

37. Glide Slope Barb Length on Profile (96-02-079)
Pilots have tried to capture the glide slope outside of the facility service volume because of the way that the glide slope barb is depicted on approach charts. It was recommended that the length of the glide slope barb correspond to the facility service volume. Mr. Tom Young, ALPA, suggested that rather than changing the barb length, a note stating the service volume be added instead. Mr. Rudy Ruana suggested that a statement be added to the AIM to the effect that nothing is guaranteed past glide slope intercept altitude. The issue may be site specific to Los Angeles and the best way to address this is to add a note to the 8260 for Los Angeles. The ACF agreed. Mr. DePlois would still like to have the barb depicted at the correct facility service volume, which would have to be done via an 8260. Mr. John Moore,

AC&C, stated that changing the symbol to a relational one is a human factors issue and may cause more problems than adding a note as dictated by the 8260. Pilots now consider the graphic only as denoting that there is a glide slope. If it were made relational to the service volume, it would take on a completely different meaning. The ACF determined that an 8260 note would be appropriate. The note will only be put on site specific 8260's, and only where there is a known problem.

Action: Mr. Terry DePlois, FAA/AVN-160, will develop a phrase for use on the 8260 that will indicate the facility service volume, and will report on the status of this issue at the next ACF.

38. Naming of SIDS and STARS (96-02-080)
When arriving at a strange airport and a STAR is issued with an unrecognizable name (possibly garbled, mispronounced, or maybe misinterpreted), the pilot often has trouble finding the correct STAR. This creates stress, tension and confusion in the cockpit and between the controller and pilot. Safety is compromised. It is recommended that the STARs be named according to the metropolitan area they serve, followed by a number. Mr. Tom Young, ALPA, felt that this was not an issue and that in any case it could be solved by proper preflight planning. Mr. Pat Gallagher, AA, noted that the proposed renaming convention was in use in Central and South America and was causing numerous problems. Ms. Ann Berns, USAFFSA, noted that the STAR name is derived from the transition feeder fix and that provides an easy method for finding the correct STAR. The ACF disapproved.

Action: Closed

39. Location of STARS in the TPPs (96-02-081)
It was recommended that the STARs be relocated to the front of each metropolitan area and that the approach plates for airports covered by the STARS for that metro area then be grouped alphabetically immediately following the STARs. The ACF felt that regrouping the approach plates for a metropolitan area behind the STARs would completely restructure the TPP volume and how it is currently used. Mr. Steve Lucchesi, FAA, noted that the STARs were placed in the front of the books because of a NAR recommendation. Cdr Eric Secretan, AC&C, recommended that the STARs be grouped in front the TPP volume by area (areas to be alphabetized) and then alphabetically within the area. Mr. Jim Nixon, FAA/AFS-420, concurred with this suggestion.

Action: Mr. Steve Lucchesi, FAA/ATA-130, will research the NAR and bring back the recommendations. Cdr Eric Secretan, AC&C,

will research the viability of his recommendation.

40. Shoreline Vignette on Low Enroute Charts (96-02-082)
It was recommended that on close shoreline inland waters, show just the water area with a 10% green tint without attempting a vignette that gets lighter and darker. A gradient vignette should be limited to wide open shorelines and coastal waters. The ACF disapproved this recommendation because the current vignette scheme is appropriate and desirable.

Action: Closed

41. Procedure Change Flag on IAPs (96-02-083)
It was recommended that a revision date or an icon be placed on the approach chart to indicate that something was changed on the approach plate. The J-date indicates the current plate. The concern is that the indication of a change would cause the price of the TPPs to rise dramatically because the number of changes per cycle would increase from approximately 1,000 to 3,000 (a change to add an icon to the plate and then another change to remove the icon from the plate). Mr. Ron Bolton, AC&C, recommended that a note be added to the TPP explaining what the J-date means.

Action: Cdr Eric Secretan, AC&C, will submit an editorial change to the TPP Front Matter to explain what the J-date means and report on the status at the next ACF. Mr. Jim Nixon, FAA/AFS-420, will coordinate with the 90-x folks to revise the appropriate Advisory Circular.

42. RNAV Approach Plates (96-02-084)
The FAA Satellite Procedures Implementation Team (SPIT) met to develop an approach plate to depict multiple RNAV approaches. The prototype plate, at Attachment 5, includes the TAA (T-concept), and the various types of RNAV approaches on a single plate to a given runway.

Action: Mr. Jim Terpstra, Jeppesen, and Mr. Jim Nixon, FAA/AFS-420, will report on the efforts of the SPIT at the next ACF.

43. Closing Comments
The next meeting will be April 7-10, 1997 at AC&C offices in Silver Spring, Maryland. The TERPS Group will begin their meeting at 1200, April 7, 1997.

Attachments

Aeronautical Charting Forum 96-02 Attendees

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Attachment 1

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Attachment 1

Government/Industry Charting Forum

Information Briefing on Situational Awareness for Safety

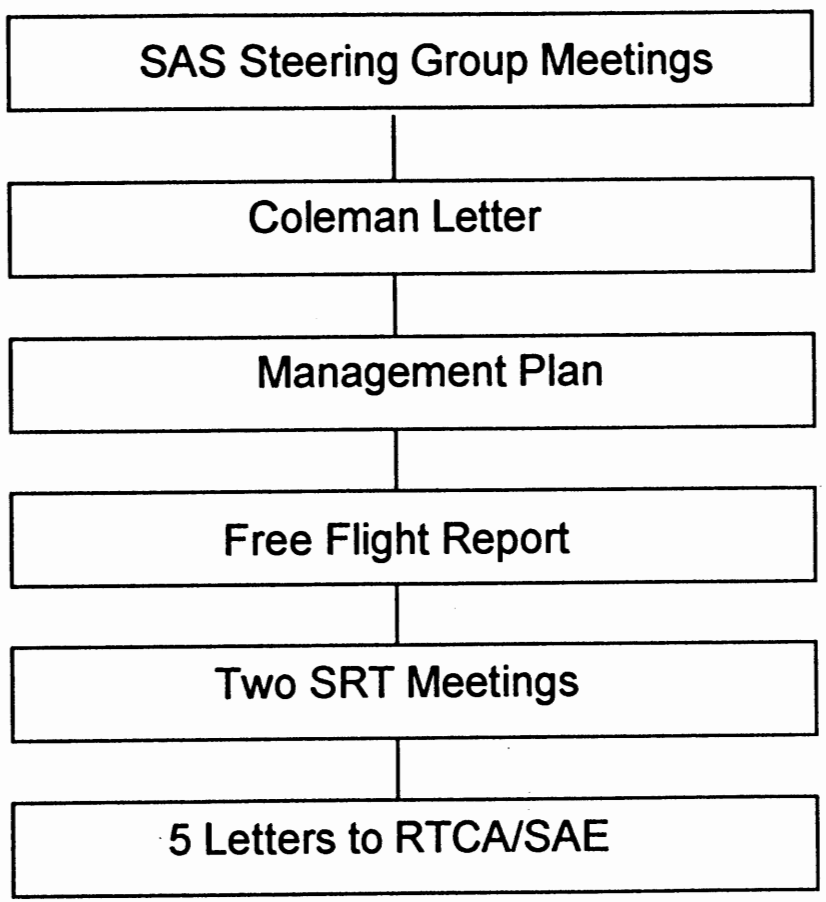
10-9-96

Situational Awareness for Safety

- Situational Awareness for Safety is intended to provide agency leadership in developing affordable, integrated, advanced technology, graphics-based avionics to increase safety through enhanced cockpit situational awareness, and to implement Free Flight. This is to be accomplished primarily through active involvement with avionics providers, jointly-funded avionics technology demonstrations with industry, and a proactive role in developing enabling standards and design guidelines necessary for equipment certification.

- Key user requirement: Need for increased pilot awareness of position, neighboring aircraft, obstacles, terrain, and weather through affordable, next-generation avionics. Integrating multiple capabilities within the physically constrained space available in aircraft cockpits will be critical.

SAS BACKGROUND



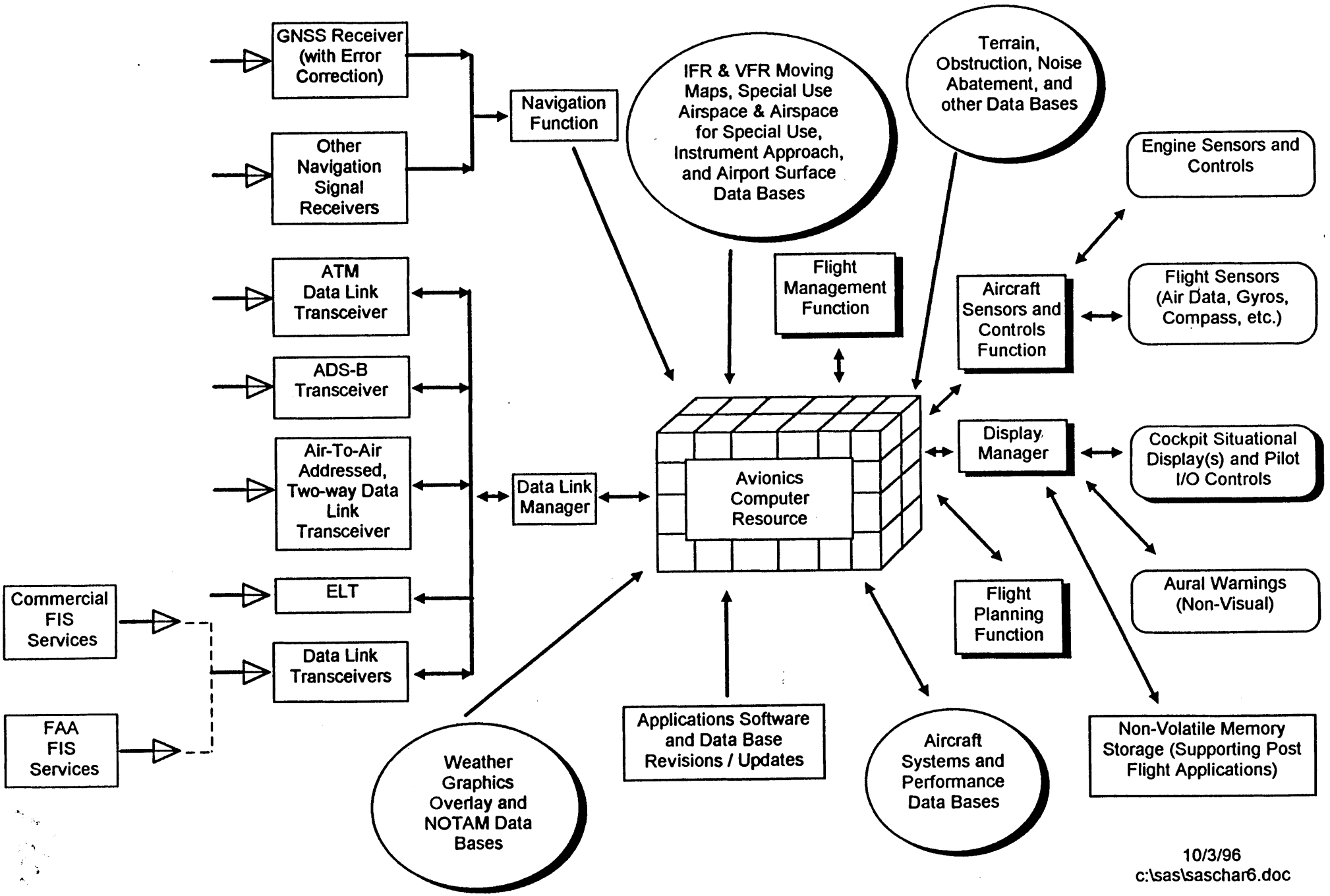
Purpose of the Five Letters

- To identify standards requirements for development and use of advanced, affordable avionics, from an **integrated**, systems perspective.
  - » While the five letters collectively constitute a considerable amount of work, they identify the work the SRT team members felt needs to be done. The SRT envisioned that the public process (not the FAA) will establish priorities for drafting and completing the standards and recommended design practices.
  - » **These advanced avionics are considered to be the cockpit-enabling technologies for Free Flight**. Human factors considerations are pivotal to the successful outcome of these standards-drafting initiatives.
- RTCA develops **minimum** standards.
- SAE develops **optimum** human factors guidelines.

The Five Letters

- **Letter 1: Digital Terrain Data Bases, 7-1-96.**
  To RTCA (Watrous) and SAE G-10 (Connor).
- Letter 2: Flight Information Services.
  To RTCA (Watrous & Murphy), 7-1-96.
  To SAE-G-10 (Connor), 7-26-96.
- **Letter 3: Electronic Cockpit Displays, 7-23-96.**
  To RTCA (Watrous) and SAE G-10 (Connor).
- Letter 4: Digital Computer-based Avionics, 10-7-96.
  To RTCA (Watrous & Patterson)
- Letter 5: Ranked Human Factors Issues Supporting Situational Awareness for Safety, 7-25-96. To SAE G-10 (Connor).

SAS AVIONICS SYSTEM ARCHITECTURE CONCEPT



10/3/96
c:\sas\saschar6.doc

Free Flight Action Plan

(1 of 2)

- Rec. 8: Establish more flexible ground delay program procedures and supporting decision support systems. (FIS)
- Rec. 10: An operational trial in one or more SUA should be conducted to demonstrate how improved information exchange on the status of SUA can improve civil use of SUA's when not being utilized by DOD. (FIS)
- Rec. 11: Develop and implement real-time SUA notification between DOD and FAA, and between FAA and flight planners. A program plan is needed in the near term. (FIS)
- Rec. 12: Streamline the FAA certification process to reduce time and cost for approval and fielding of new and emerging technologies (Williams).

Free Flight Action Plan
(2 of 2)

- Rec. MT-4: Develop and implement technology for the dissemination of weather products and flight information to the cockpit. Development of FIS applications standards should be done in coordination with cockpit traffic display standards (McDaniel).
- Rec. B: Work with the user community to achieve consensus on the role and timing of ADS-B technology in delivering specific near- and long-term benefits.
- Re. 18: FAA should initiate the development of the standards of a cockpit situational awareness display of traffic information (McDaniel).

RTCA Task Force 3
Free Flight Report

- Free Fight report: The Well Equipped Cockpit in the Year 2000.

- Free Fight report: Evaluate and demonstrate the feasibility of the GNSS curvilinear approach and display concept.

Letter 1: Digital Terrain Data Bases Proposed Terms of Reference (Key Points)

- Define GNSS charting coordinate standards for use in advanced avionics applications.
- Define standards for digital terrain, obstruction , noise abatement, and other data bases for use in advanced avionics.
- Define digital charting standards and data bases needed to support GNSS user-preferred approaches (curvilinear approach).
- Define standards for formatting, storage, distribution, and loading of digital data bases.
- Establish requirements for timely retrieval, processing, and displaying of these data.
- Determine display requirements for various aircraft operations.
- Establish requirements for computer/human interface (CHI) and display outputs.

Attach 2

Letter 3: Electronic Cockpit Displays Proposed Terms of Reference (Key Points)

- Develop affordable graphical user interface standards to support multi-tasking and multi-processing of various applications.
- Develop standards for rapid communication of time critical or emergency information.
  - » Workload and clutter are two key issues.
- Develop standards for single and overlay topographical 2-D and 3-D terrain data base displays.
- Develop display recommendations and standards for a "tunnel-in-the-sky" or "pathway-in-the-sky" presentation.
  - » Focus on presenting navigation, terrain, obstruction, and noise abatement data to the pilot in a single display.
- Develop recommendations for common symbology and formatting for textual and graphical navigation overlay displays, including electronic instrument approach charts.

7/1/96

PROPOSED TERMS OF REFERENCE

DIGITAL TERRAIN, OBSTRUCTION, AND NOISE ABATEMENT DATA BASES AND SUPPORTING AVIONICS STANDARDS

1. Define GNSS charting coordinate standards for use in SAS-related applications. (This item deals with establishing geographic coordinate standards. The specific issue is whether the proposed applications should be latitude/longitude/altitude coordinate or Earth-centered, Earth-fixed coordinate based).

2. Define the digital charting standards and data bases needed to support GNSS user preferred approaches. This item also includes appropriate instrument approach and flight management system interface standards needed to define the GNSS curvilinear instrument approach.

   Note: See Page 39, Paragraph 2, of the Final Report of RTCA Task Force 3 Free Flight Implementation report, October 26, 1995, and also, Document RTCA/DO-226, Guidance Material for Evolving Airborne Precision Area Navigation Equipment With Emphasis on MLS, May 25, 1995.

3. Define standards to acquire, develop, certify, and maintain domestic and international digital terrain, obstruction, noise abatement, and perhaps other data base files. Emphasis needs to be given to affordability as a basic design criteria.

   Note: These digital electronic terrain data base libraries are needed to support the following SAS applications: Displays for "2D" and "3D" topographical predictive CFIT avoidance; GNSS user preferred approaches; one-engine inoperative airport specific departure profiles; and high resolution, ground-based simulation for training purposes, and others. Included within the scope of this effort are standards for "2D" and "3D" terrain, obstruction data files, noise sensitive areas, and related overlay presentations, along with airport specific departure obstruction clearance and hazard avoidance data bases.

4. Define a common industry standard for the formatting, storage, distribution, and loading of digital electronic data base files and revisions thereto. While an open industry standard is an important issue, additional issues of vector versus raster format, image compression standards, object oriented layer requirements and other storage/graphical parameters should be considered.

5. Establish minimum avionics data storage, retrieval, and processing requirements for generating timely displays, including file sizes, display update/refresh rates, colors, etc. As part of this effort, establish criticality of this new terrain function in terms of software certification as well as isolation from other software applications.

6. Establish minimum requirements for cockpit and flight deck displays to provide the agreed upon functionality for different types of general aviation and air transport operations under VFR/IFR and VMC/IMC conditions.

7. Establish minimum general aviation cockpit and air carrier flight deck display output formats and computer/human interface requirements.

7/1/96

SUPPLEMENTAL NARRATIVE INFORMATION

DIGITAL TERRAIN, OBSTRUCTION, AND NOISE ABATEMENT DATA BASES AND SUPPORTING AVIONICS STANDARDS

1. A need exists to establish standards for the acquisition, development, certification, distribution, and maintenance of terrain, obstruction, and noise abatement data bases for use in civil aviation. These data bases should be designed to support various avionics software functional applications, along with consideration for future (growth) applications that may be possible with advances in technology. To effect this, operational concepts for each application, in conjunction with an avionics design requirements base line must be established.

2. The proposed terrain, obstruction, noise abatement, (and perhaps other data bases as well) would each contain terrain, cultural, noise abatement footprint data, etc. (Cultural data is defined as terrain high points and man-made obstructions, both necessary to develop obstruction data). Absolute accuracy of dimensional measurements is necessary relative to an agreed upon specific world-wide datum. Consensus is needed as to what would be the most appropriate coordinate system for use in conjunction with these digital data bases, i.e., whether a Earth-centered, Earth-fixed (ECEF) coordinate or latitude/longitude/atitude (LLA) system is best.

3. Relative accuracy of dimensional measurements must be relative to other features or characteristics in the data base, including GNSS data. Data base applications will determine the required data density. Ideally, terrain data should be a non developmental item, although consideration must be given to near-term future data collection initiatives such as the planned Space Shuttle mission (Shuttle Radar Topography Mapper) intended to collect world-wide terrain and obstruction data referenced to the WGS-84 datum. Sources of existing data include: Data from domestic, international, or commercial sources; products already developed and in use by users; and products developed to other standards. Research indicates a need for a common, standardized, man-made obstruction data base. It is recommended that the accuracy parameters associated with the NOAA obstruction data base be considered for possible adoption.

4. Standards need to be reasonable and achievable. In order to establish what is reasonable, it is suggested that a world-wide survey be conducted of United States and foreign State digital terrain and obstruction data bases that may exist, or will exist, in the near future, including NASA's planned Space Shuttle mission. Part of this survey should be to clearly establish what data may be available for civil aviation use without compromising the national security of the various participating States.

5. Establish a process to ensure data base reliability, maintainability, and availability (RMA). To accomplish this task, it is recommended that a joint RTCA and SAE team be formed to create, validate and provide a mechanism to ensure on-going quality assurance for both the terrain and obstruction data base files. The RMA team would also be responsible for the development and coordination of avionics hardware and software specifications to ensure the efficient design of the total system.

6. If deemed appropriate by the committee, creation of a central repository and clearinghouse for terrain, obstruction, and noise abatement data may be necessary. The central repository could accumulate data from various data bases, assign a distinct identifier to an obstruction, assign a horizontal and vertical confidence/ accuracy level to the obstruction, and could then revise the master data base. A recommendation to be considered is that the central repository maintain a matrix containing the source data and accuracy codes used to determine the assigned identifier number. The data file matrix could index the resolution fields, fidelity and accuracy of the data. Due to the volatility of cultural data, it is recommended that three separate data bases, i.e., terrain, cultural and noise abatement, be maintained.

7. It is recommended that an independent team be created to perform verification and validation of the selected data base algorithms. This team might consist of representatives from the proposed RTCA Special Committee and from SAE G-10. The principal output of this activity will be algorithm description documents (ADD's) for all verified algorithms. For national security and proprietary reasons, ADD's would not be a part of the MASPS/MOPS. Non-disclosure agreements would need to be signed by all team members as some verification algorithms would involve proprietary and/or data sensitive to the interests of the participating States.

Att 2

PROPOSED TERMS OF REFERENCE

ELECTRONIC COCKPIT DISPLAY GRAPHICAL USER INTERFACE (GUI), INPUT, OUTPUT, AND SUPPORTING AVIONICS STANDARDS

Human Factors Definition:

1. Definition of pilot tasks in a free flight environment.

2. Definition of specific data required to provide situational awareness for all airspace users.

Graphical User Interface:

1. Develop display recommendations and standards as necessary defining a low-cost, affordable Graphical Use Interface (GUI). This effort would also address recommended or desired computer features such as multi-processing or multi-tasking capabilities needed to annunicate and communicate background data quickly in the event of an abnormal or emergency condition. Workload and clutter are two of the key issues that will need to be addressed along defining the role of expert decision making support software. Activities in this area need to be compatible with the work being done with the Avionics Computer Resource (ACR) under RTCA SC-182, along with coordination with SAE G-10.

   Note: This is a pivotal design standard as it would define, from a human factors perspective, an affordable flight deck and cockpit "work station" for future generation flat panel "glass" cockpit display systems. Such a standard could contribute, over the long-term, to reduced pilot training requirements (from student pilot to ATP) and to improved efficiency of operation through use of ingrained habit patterns.

Attch 2

Input Standards:

1. Establish design recommendations and standards for human-computer interactive controls, e.g., touch screens, keypads, trackballs, thumb controls, and voice actuated modules.

2. Establish standards for voice recognition commands to program and manage multi-function SAS displays, the Flight Management System (FMS), and a lower cost Flight Navigation System (FNS) having less functionality than traditional FMS systems.

3. As part of the above effort, develop voice recognition standards for pilot-to-computer input control functions, including standards for programming (into memory) a "PC" card (or equivalent) to recognize and correct for pilot-specific speech patterns. It is anticipated that voice recognition input functionality could help reduce the need for keypad waypoint insertion and, therefore, reduce waypoint insertion errors due to pilot error.

Output Standards for General Aviation and Air Transport Applications:

1. Establish color application design recommendations and standards for the various functional software applications so that when they are overlaid together, confusion would be minimized.

   Note: This standard would also address inconsistencies across the various vendor product lines.

2. Define VFR and IFR symbology display recommendations and standards for electronic moving map displays. This includes standards for common symbology and formatting for textual and graphical navigation displays, and electronic instrument approach charts.

3. Establish standards for Cockpit Display of Traffic Information (CDTI).

Note: Work is presently underway on this task in RTCA SC-186, WG-3.

4. Establish display recommendations and standards for cockpit moving map displays to enhance situational awareness on the airport surface (runways, taxiways, intersections, gate locations, etc.). Airport surface moving map standards would also include standards for formatting and displaying ADS-B information in the cockpit as well as standardized data-linked taxi clearances, both as overlay presentations.

   Note: Some work on this task is already underway within RTCA in SC-159, WG-4A and WG-4B as well as in SC-186, WG-3.

5. Develop display recommendations and define presentation standards (either singularly or as overlay products) for topographical "2D" and "3D" electronic terrain data base displays. These standards would provide the wherewithal for Controlled Flight Into Terrain (CFIT) and Controlled Flight Toward Terrain (CFTT) protection.

6. Develop display recommendations and define standards for a "tunnel-in-the-sky" or "pathway-in-the-sky" presentation, sometimes referred to as a navigational "channel" or "box-in-space" display. Standards would focus on how best to present en route, terminal, and approach guidance and terrain data to the pilot.

7. Establish recommendations and design standards for communicating (in textual, graphical overlay and synthetic voice format) air traffic clearances and instructions received via data link.

8. Establish display recommendations and standards for displaying textual and graphical weather products, either singularly or as overlay products.

   Note: An FAA advisory circular is needed to teach pilots and dispatchers how to interpret these new in-flight weather products or services.

Attach 2

9. Establish display recommendations and standards for graphical fuel management displays (such as concentric fuel "range rings") which would provide pilots with intuitive information on fuel/range remaining.

10. Establish display recommendations and standards for an electronic "intelligent" checklist that would incorporate expert decision support software.

    Note: The FAA published an advisory circular on this subject on April 24, 1996. The group will need to decide whether further industry guidance is needed.

11. Develop design recommendations and standards for the certification of VFR use only, portable and installed displays, including what would constitute "mission critical" hardware (such as permanently installed ADS-B antenna installations) and critical function application software (such as might be used for air traffic control surveillance purposes), both of which may require more rigorous certification.

12. Develop design recommendations and standards for a VFR-use and an IFR-use certified portable GNSS receiver and display combination (perhaps yoke or knee-pad mounted). Such a device may (at the discretion of the manufacturer) include other SAS functional software applications (such as ADS-B functionality) and, therefore, might be part of a larger-in-function portable system other than just a GNSS hand-held receiver.

Human Factors Design Compendium:

1. SAE G-10 should consider the development of a human factors design guidelines/compendium for use by designers wanting to build SAS-compatible cockpit display systems but who currently lack human factors expertise. This compendium of human factors-related design practices would assist engineers, especially those employed by the smaller manufacturers, in designing advanced SAS-related avionics.

Att. 2

APPENDIX B

PROPOSED AGENDA FOR THE AIS/MAP DIVISIONAL MEETING (1998)

Agenda Item 1: **Aeronautical Data Bases**

1.1: Review and updating of existing Annex 15 specifications, including those related to the elements of the Integrated Aeronautical Information Package, to bring them in line with the operational requirements for the aeronautical data base content, format and provision of data;

1.2: Review the status, role and need for an AIRAC system *vis-a-vis* the future need for on-line provision of electronic aeronautical data; and

1.3: TRUE *vs.* MAG bearings issue

Agenda Item 2. **Aeronautical Charts**

2.1: Review and updating of existing Annex 4 specifications, including chart symbology in order to bring them in line with the operational requirements for the provision of electronic aeronautical charts while taking into account present and future Flight Management System (FMS) requirements;

2.2: Development of new charting specifications required for Global Navigation Satellite System (GNSS)-based operations;

2.3: Provision of electronic terrain and obstacle information to users while taking into account quality assurance; and

2.4: Development of Annex 4 specifications for the depiction of airspace classes on aeronautical charts.

Agenda Item 3: **Exchange of Aeronautical Information**

3.1: Development of operational requirements for the provision of AIS/MAP data in the data link environment;

3.2: Formats and procedures for transfer and protection of electronic aeronautical data; and

3.3: Copyrights and charges for aeronautical data.

Agenda Item 4: **Requirements for AIS/MAP Personnel**

4.1: Development of ICAO training programme for AIS/MAP personnel in order to establish world-wide standard while satisfying their increased responsibility and changed role; and

Atch 3

GPS Waypoint Ad Hoc Committee

Wally Roberts	ALPA	714-498-3456	Fax:	74147.2263@CompuServe.COM
Doug Helton	AOPA	301-695-2212	Fax: 2375	
Terry DePlois	FAA/AVN-160	405-954-0188	Fax: 9530	tdeplois@faa.dot.gov
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Steve Lucchesi	FAA/ATA-130	202-267-9304	Fax: 5322	slucchesi@faa.dot.gov
Jim Nixon	FAA/AFS-440	405-954-5904	Fax: 4809	james.nixon@faa.dot.gov
Rudy Ruana	Jeppesen	202-331-7727	F296-0278	rruana@jeppesen.com
Jim Terpstra	Jeppesen	303-784-4401	Fax: 4111	jimterps@jeppesen.com
Dalia Marin	NOS/AC&C/ACD	301-713-2958	Fax: 4410	dalia.marin@noaa.gov

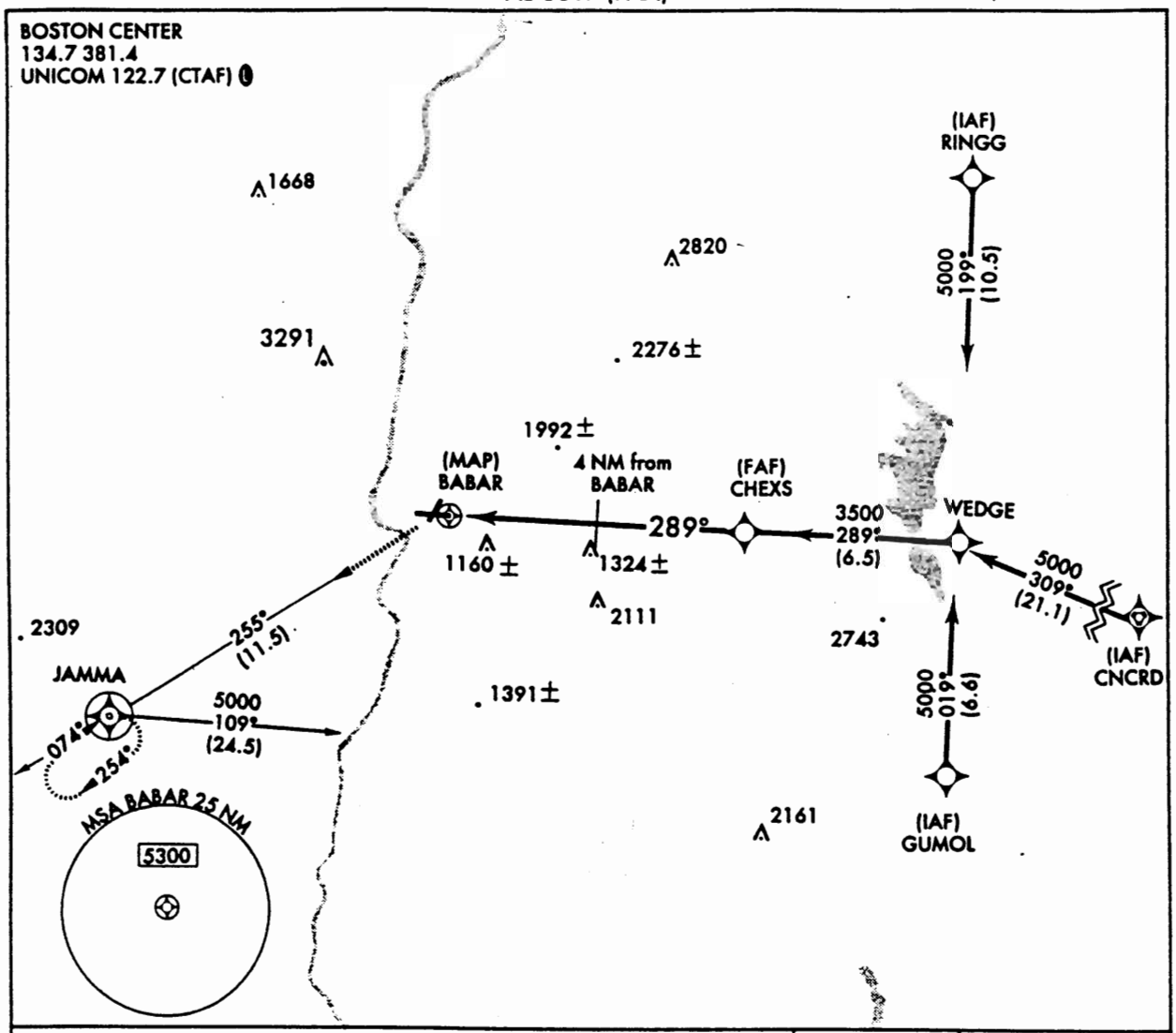
Attachment 4

Orig 95257

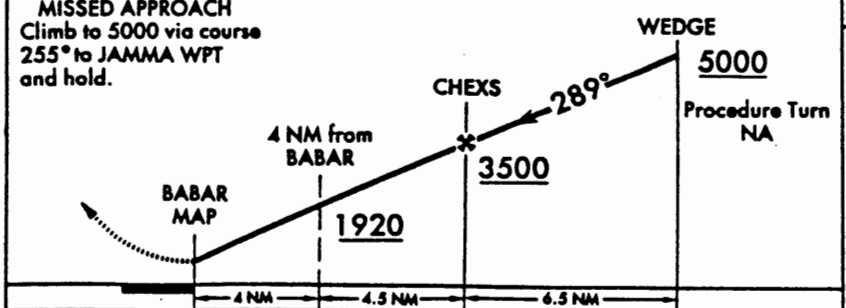
GPS RWY 29

AL-5617 (FAA)

CLAREMONT MUNI (CNH)
CLAREMONT, NEW HAMPSHIRE



MISSED APPROACH
Climb to 5000 via course 255° to JAMMA WPT and hold.



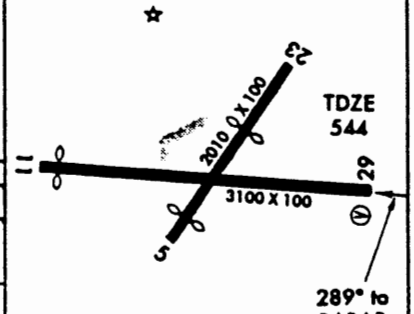
CATEGORY	A	B	C	D
S-29	1420-1 876 (900-1)	1420-1¼ 876 (900-1¼)	NA	
CIRCLING	1420-1 875 (900-1)	1460-1¼ 915 (1000-1¼)	NA	

Obtain local altimeter setting on CTAF; when not received, procedure not authorized.

▽
△NA

ELEV 545

Rwy 5 ldg 1751'
Rwy 23 ldg 1260'
Rwy 11 ldg 2899'



REIL Rwy 29
MIRL Rwy 11-29

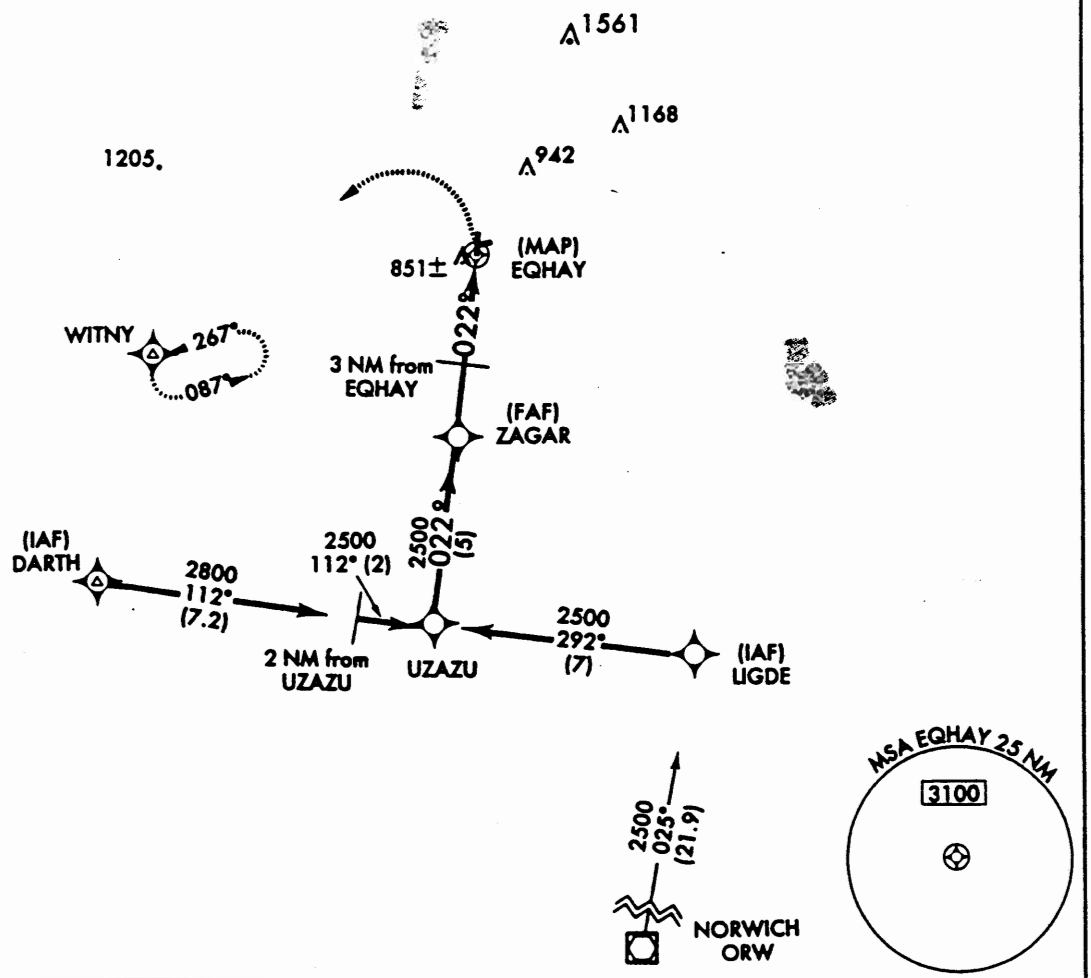
Atch 4

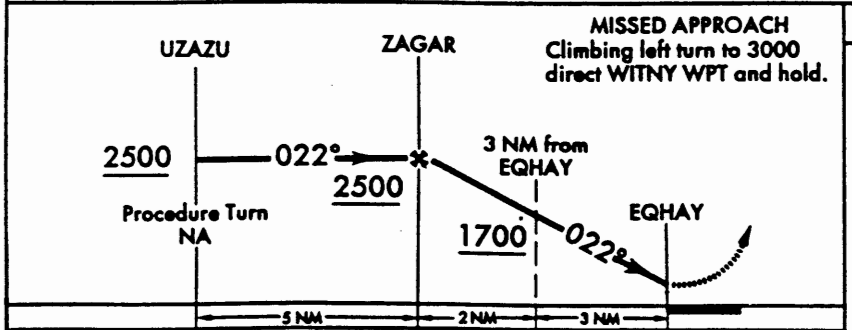
GPS RWY 2

AL-5242 (FAA)

SOUTHBRIDGE MUNI (3B0)
SOUTHBRIDGE, MASSACHUSETTS

BRADLEY APP CON
123.95 348.3
UNICOM 122.8 (CTAF)

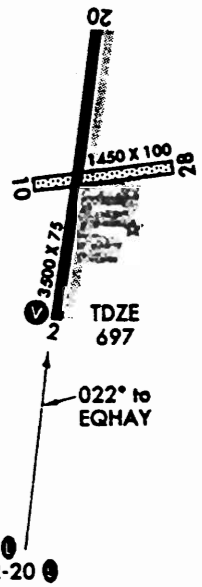




CATEGORY	A	B	C	D
S-2	1180-1 483 (500-1)		1180-1¼ 483 (500-1¼)	NA
CIRCLING	1340-1 643 (700-1)		1340-1¾ 643 (700-1¾)	NA

Use Worcester altimeter setting.
T
NA

ELEV 697



GPS RWY 2

Orig 96228

42°06'N-72°02'W

SOUTHBRIDGE, MASSACHUSETTS
SOUTHBRIDGE MUNI (3B0)

NE-1, 15 AUG 1996

Atch 4

JEPPESEN Oct 1996 (18-1)

WINK, WISC

MASON REGL

RNAV Rwy 18

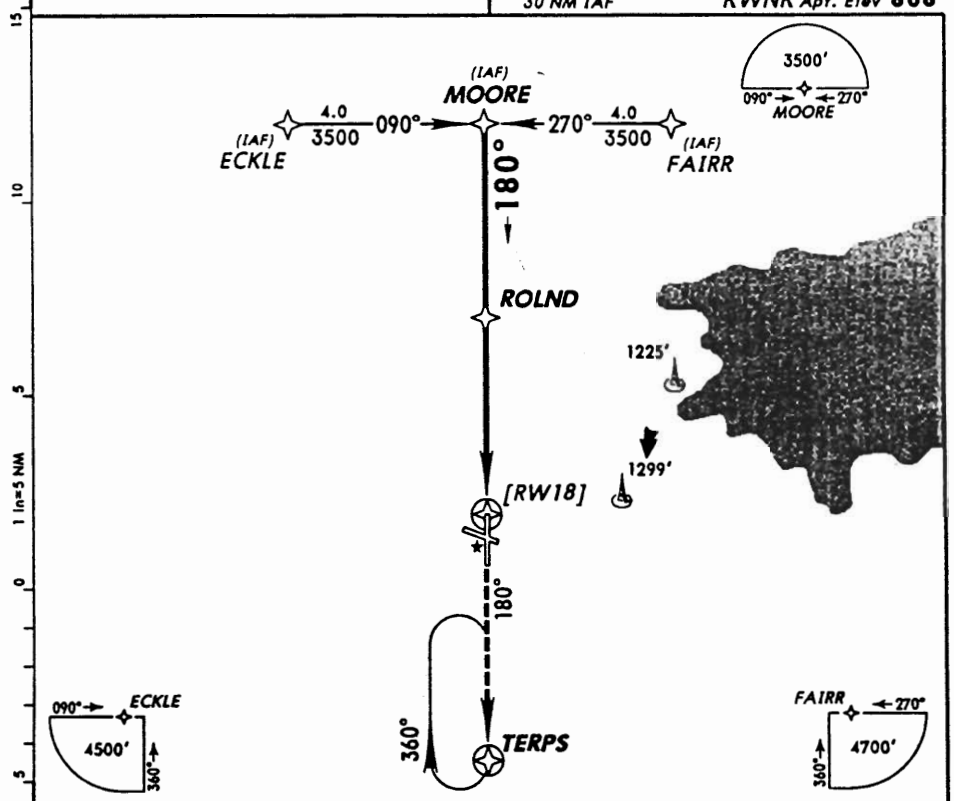
WINK Approach (R) 126.05

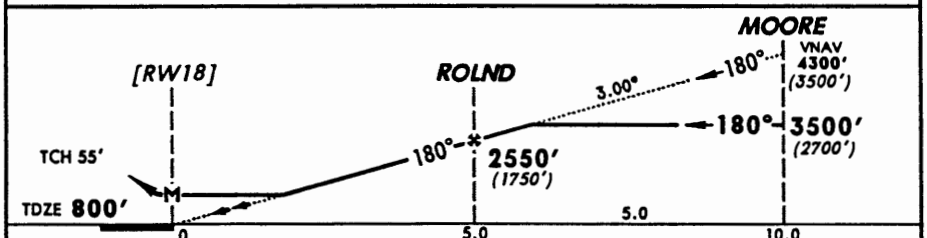
MASON Tower 118.5

Ground 121.7

TAA
30 NM IAF

KWNK Apt. Elev 808'





MISSED APPROACH: Climb to 3000' on course 180° to TERPS and hold.

STRAIGHT-IN LANDING RWY 18											
	RNP .01-LAAS DA(H) 1000'(200')		LNAV + VNAV RNP .01-WAAS DA(H) 1050'(250')		RNP .3 - BARO DA(H) 1100'(300')		LNAV LNAV RNP .3 MDA(H) 1300'(500')		CIRCLE-TO-LAND MDA(H) 1420'(612')	
		ALS out		ALS out		ALS out		ALS out	Max Kts.	
A	1/4	1/2	1/2	3/4	3/4	1	1	1 1/4	90	1
B									120	
C							1 1/4	1 1/2	140	1 1/2
D		3/4		1		1 1/2	1 1/2	1 3/4	165	2

Gnd Speed-Kts	70	90	100	120	140	160
VNAV Angle 3.00°	377	485	539	647	755	862
MAP at [RW18]						

CHANGES: EXAMPLE COPY.

Atch 5

WINK, WISC
MASON REGL

SAMPLE MINIMUMS

STRAIGHT-IN LANDING RWY 18

	RNP .01-LAAS DA(H) 1000'(200')	LNAV + VNAV RNP .01-WAAS DA(H) 1050'(250')	RNP .3 - BARO DA(H) 1100'(300')	LNAV LNAV RNP .3 MDA(H) 1300'(500')
A	1/2	3/4	1	1 1/4
B				
C				1 1/2
D	3/4	1	1 1/2	1 3/4

CIRCLE-TO-LAND MDA(H) 1420'(612')

Max Kts	
90	1 1/4
120	
140	1 1/2
165	2

STRAIGHT-IN LANDING RWY 18

	RNP .01-LAAS		LNAV + VNAV RNP .01-WAAS		RNP .3 - BARO		LNAV LNAV RNP .3	
	With Local Altimeter Setting							
	DA(H) 1000'(200')		DA(H) 1050'(250')		DA(H) 1100'(300')		MDA(H) 1300'(500')	
	With Green Bay Altimeter Setting							
	DA(H) 1100'(300')		DA(H) 1150'(350')		DA(H) 1200'(400')		MDA(H) 1400'(600')	
		ALS out		ALS out		ALS out		ALS out
A	1/4	1/2	1/2	3/4	3/4	1	1	1 1/4
B								
C							1 1/4	1 1/2
D		3/4		1		1 1/2	1 1/2	1 3/4

CIRCLE-TO-LAND

MDA(H) 1420'(612') With Local Altimeter Setting

Max Kts	
90	1
120	
140	1 1/2
165	2

MDA(H) 1520'(712') With Green Bay Altimeter Setting

Max Kts	
90	1
120	
140	1 1/2
165	2

STRAIGHT-IN LANDING RWY 18

	RNP .01-LAAS	LNAV + VNAV RNP .01-WAAS	RNP .3 - BARO	LNAV LNAV RNP .3
	With Local Altimeter Setting			
	DA(H) 1000'(200')	DA(H) 1050'(250')	DA(H) 1100'(300')	MDA(H) 1300'(500')
	With Green Bay Altimeter Setting			
	DA(H) 1100'(300')	DA(H) 1150'(350')	DA(H) 1200'(400')	MDA(H) 1400'(600')
A	1/2	3/4	1	1 1/4
B				
C				1 1/2
D	3/4	1	1 1/2	1 3/4

CIRCLE-TO-LAND

MDA(H) 1420'(612') With Local Altimeter Setting

Max Kts	
90	1 1/4
120	
140	1 1/2
165	2

MDA(H) 1520'(712') With Green Bay Altimeter Setting

Max Kts	
90	1 1/4
120	
140	1 1/2
165	2

CHANGES: EXAMPLE COPY.

Atch 5