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Examining Minimum Information Requirements for Electronic Aeronautical Charts

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16. Abstract

The purpose of this research was to identify a set of minimum information elements for user- configurable electronic aeronautical charts. The concept examined in this study is that pilots brief with a fixed chart but then fly with a user-configurable aeronautical chart, which may not include all the information elements that were briefed. We conducted a survey to identify a set of minimum information element requirements for this operational concept. We invited 1,351 transport, commuter, military, and general aviation pilots to participate; 326 responded (a 24% response rate), but only 267 pilots met the inclusion criteria. Of these, 229 pilots completed the survey (60 air transport pilots, 60 commuter pilots, 60 general aviation pilots and 49 military pilots).

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List of Abbreviations

ARP	Aerospace Recommended Practice
ATA	Air Transport Association
FAA	Federal Aviation Administration
GPS	Global Positioning System
IAP	Instrument Approach Procedure
ICAO	International Civil Aviation Organization
IFR	Instrument Flight Rules
NOS	National Ocean Service
SID	Standard Instrument Departure
SME	Subject Matter Expert
STAR	Standard Terminal Arrival Route
US DOT	United States Department of Transportation
VFR	Visual Flight Rules

Executive Summary

The purpose of this research was to identify a set of minimum information elements for user-configurable electronic aeronautical charts. The concept examined in this study is that pilots brief with a fixed chart but then fly with a user-configurable aeronautical chart, which may not include all the information elements that were briefed. We conducted a survey to identify a set of minimum information element requirements for this operational concept. We invited 1,351 transport, commuter, military, and general aviation pilots to participate; 326 responded (a 24% response rate), but only 267 pilots met the inclusion criteria. Of these, 229 pilots completed the survey (60 air transport pilots, 60 commuter pilots, 60 general aviation pilots and 49 military pilots).

The survey was comprised of lists of information elements shown on four types of aeronautical charts: 1) Instrument Approach Procedure (IAP), 2) Enroute Instrument Flight Rules (IFR), 3) Standard Terminal Arrival Route (STAR), and 4) Standard Instrument Departure (SID). There were a total of 427 information elements across charts, so to prevent survey fatigue, we divided the information elements into two surveys. The first survey included information elements on IAP/Enroute IFR charts (221 information elements), and the second survey included information elements from SID/STAR charts (206 information elements).

For each survey, participants were instructed to rate the importance of information elements for a new charting concept, which uses customizable electronic charts that are interactive and customized to display only information elements needed to execute the procedure. Participants were instructed that for this charting concept, they would first brief the procedure using a fixed chart showing all the information elements, but then fly with a customized electronic chart, which may or may not include all the information elements that were briefed. Additionally, the instructions emphasized that the customizable electronic chart would show only the information relevant to the procedure being flown.

Participants were given a list of information elements and asked to rate the importance of each information element when using a customizable electronic chart while executing the procedure and not on the frequency of use. Ratings were made along a scale with four options for level of importance, with an additional option for participants who did not know the information element:

- 1 = Required to be displayed continuously for the safe and successful execution of the instrument flight procedure;
- 2 = Displayed initially, but can be removed and recalled for reference, as needed;
- 3 = Not displayed initially, but can be displayed manually for reference, as needed;
- 4 = Not required to execute the procedure;
- Don’t know/Unsure.

We analyzed the data using one-way chi-square tests and consulted with subject matter experts to identify a criticality level for each information element. Based on this analysis, we were able to categorize 85% of the information elements across all four chart types. (The ratings for each information element are shown in Tables 4 – 7 by chart type). We then developed prototype charts to visualize what the concept might look like.

Introduction

Aeronautical charting has evolved with changes in display mediums, display technology, expanded use of the Global Positioning System (GPS), and increased information processing capabilities. The term "aeronautical chart" refers to a map used to provide air navigation information for pilots, much like a road map for drivers. The aeronautical chart shows information such as navigation routes or airways, navigation aids, airspace boundaries, topographic features, and airports. Pilots are required to fly with aeronautical charts; they typically use the chart to brief the procedure as part of flight planning, and may then put the chart away until they need to execute the procedure.

Much like maps that have evolved from paper to electronic media, the aeronautical chart has evolved from paper to electronic format. There are three types of electronic charts: raster, vector, and electronic data-driven. Raster charts are electronic images of paper charts, so a raster chart will show the exact same information as its paper counterpart. Own-aircraft position may be displayed on aeronautical raster charts only if the chart is georeferenced. Vector charts look similar to raster charts, but the information elements are mathematically encoded in a database. This encoding allows functionality such as resizing of symbols and text when the pilot zooms in (or out) or when information is filtered. A vector chart is computer generated, so it may not look the same as a paper chart. Finally, electronic data-driven charts may be user-configurable so that information elements can be added or removed via a manual or automatic decluttering capability. This third type of charting is the focus of this research.

With each evolution, the usability of the aeronautical chart needs to be considered, as many of the human factors considerations have remained the same regardless of display medium (e.g., display clutter, readability/legibility, symbology, to name a few). As electronic charts become integrated into flight decks, the design of the electronic chart may diverge depending on the manufacturer's design philosophy. For example, the electronic chart symbology can become more specific to the task at hand, using manual or automatic decluttering methodologies that are customizable by the pilot, and the chart can be integrated with other map information. An example of what this type of chart might look like is shown in Figure 1.

Figure 1

Example of a customizable chart integrated with other charting information.

The purpose of this paper is to discuss the human factors considerations applicable to the design of electronic aeronautical charts. The Federal Aviation Administration (FAA) was interested in understanding whether a minimum set of information elements could be defined for these customizable electronic charts. We start by reviewing past research on the design of aeronautical charts and then highlight some of the recurring human factors issues addressed in each evolution.

Previous Research on Aeronautical Chart Design

Research in aeronautical chart design has focused primarily on methods for improving visual search. In the 1990s, researchers at the United States Department of Transportation (US DOT) Volpe National Transportation Systems Center ("Volpe Center") conducted a series of studies to improve the design layout of Instrument Approach Procedure (IAP) charts.[1]

The research studies examined different formatting techniques for presenting heading information (Multer et al., 1991), different layouts for presenting frequency information (Multer

[1] An IAP chart shows pilots the information needed to descend and land when they are flying using the instruments on the flight deck. Note that this in contrast to flying under Visual Flight Rules (VFR) in which a pilot operates an aircraft in clear weather conditions.

et al., 1991), use of text or graphical icons for finding missed approach instructions (Osborne & Huntley, 1992), and different layouts for planning and executing an approach or missed approach (Blomberg et al.,1995; Osborne et al., 1995).

Multer et al. (1991) examined ways to facilitate visual search on IAPs by evaluating different formatting for heading information (such as font size, bolding, and highlighting), as well as different layouts for frequency information. Airline pilots were asked to identify the heading on a number of fictional IAPs as quickly as possible. In the first study, the text on charts varied in terms of font size and highlighting method (plain type, bold type, boxed, or reverse video). The results showed an interaction between font size and highlighting; when text was bolded or boxed, response time decreased as font size increased, but when text was presented using reverse video, there was no impact of font size.

In the second study, four different spatial layouts were used for showing frequency information – two were based on existing US chart provider designs, the third was a boxed layout used in Canada, and the fourth was a new two-column layout. The results showed that the use of a boxed format and the two column layout, which used space to organize text placement, facilitated search relative to the one-column format used by US chart providers.

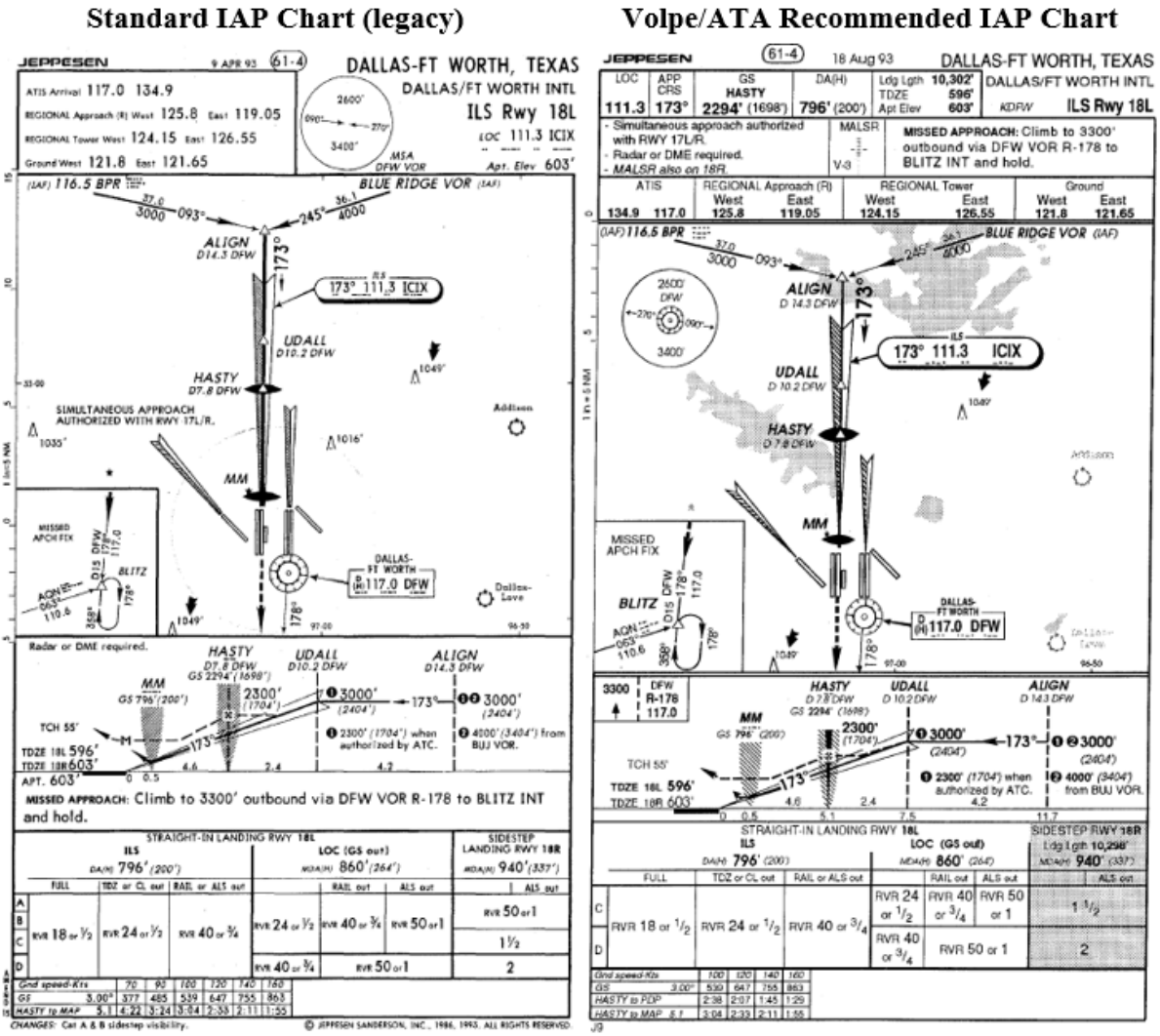
Osborne and Huntley (1992) examined whether the use of text or graphical icons could help pilots retrieve missed approach instructions. Pilots were asked to read information from National Ocean Service (NOS) IAP charts shown at one of three information density levels: low, medium, and high. Pilot comprehension speed, measured by the number of glances needed for pilots to read and verbally repeat the instructions, were recorded. Overall, pilots identified information more quickly and accurately when there was a low level of information density, and the slowest with a high level of information presented. Pilots expressed preference for icon information rather than text, but thought that some icons needed clarification.

The US DOT Volpe Center also collaborated with the Air Transport Association (ATA) Chart and Data Display Working Group to provide guidance on pilot information requirements. As part of this collaboration, Blomberg et al. (1995) compared a standard IAP chart design with two new prototype charts, as shown in Figure 2. Pilots completed a series of tasks used to obtain feedback about the charts. First, they were asked to fly 10 simulated approaches using one of the

prototype charts and the standard chart and then debriefed about their experiences. Second, pilots were shown a different prototype chart and asked for their opinions, but they did not fly with this chart. Third, pilots ranked the three charts on their perceived usefulness for executing an approach. Finally, pilots were asked to assume that s/he was responsible for making a purchase decision to be used by all pilots working for his/her airline. Findings showed that despite pilots' concerns with accepting a new chart design, pilots had a higher preference for the Volpe/ATA prototype chart.

Figure 2

Comparison of Standard IAP Chart and Volpe/ATA Recommended IAP Chart (Excerpted from Blomberg et al., 1995).

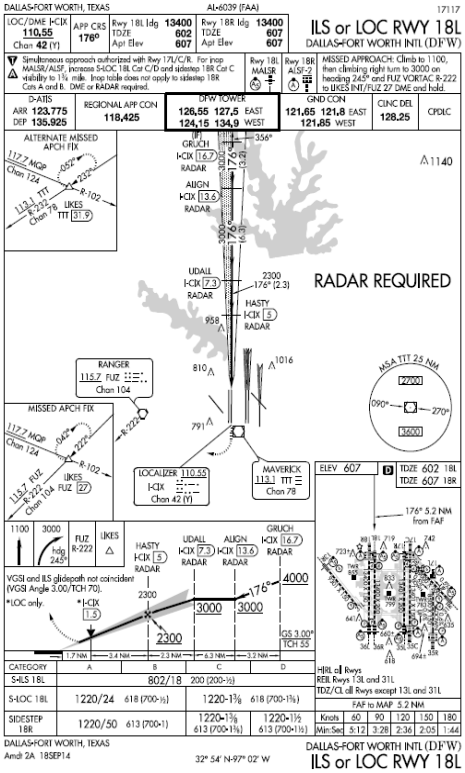


The chart evaluated by Blomberg et al. (1995) was refined during field testing and subject matter expert reviews, as shown in Figure 3. The addition of the briefing strip at the top of the chart was intended to promote briefing as a critical component of flying an approach, and to present the required information in a logical order in one place. A boxed layout was used to show heading and frequency information and graphical icons were added to depict missed approach information.

Osborne et al. (1995) evaluated the usability of this new prototype IAP chart by asking pilots to fly approaches in a simulator. Pilots used a standard IAP chart or the Volpe IAP prototype. During the flight, pilots were asked questions that required him/her to search for information located on the chart. Pilots found information much faster on the Volpe prototype chart than on the standard IAP chart, particularly when that information was located in the briefing strip. Additionally, pilots' accuracy did not differ between questions using the standard and prototype charts. The recommended IAP chart was adopted by Jeppesen and also had a marked influence on design of the current FAA IAP chart.

Figure 3

Current FAA IAP Chart (Adapted from Blomberg et al., 1995).



Decluttering

Figure 3 also shows the level of detail and high information density on aeronautical charts. This may lead to the perception of "clutter," which has the consequences of slowing visual search, increasing memory load, and negatively impacting position awareness (Moacdieh & Sarter, 2015). The costs of clutter are seen most heavily in visual search (Teichner & Mocharnuk, 1979), but may also be reflected in information readout, when an information element is found but cannot be discriminated because other information elements are in close spatial proximity. Visual search often occurs serially, in which each item is examined until the "target" information element is found. The more information that is on the search space, the longer it will take until the "target" is found. General techniques to filter attention may facilitate information search as a result of the preattentive nature of information processing (e.g., by color or intensity). One can discriminate color and intensity relatively early and automatically, so unique colors or intensity differences can produce "automatic" detection, sometimes described as a "pop-out" effect (Treisman, 1988; Treisman & Gelade, 1980; Yantis, 1993). That is, different color and intensity makes it easier to locate and focus attention on information elements, and reduces distraction created by other information elements.

Another series of research studies has focused on reducing clutter on aeronautical charts by removing information elements that may not be critical or relevant for the current task. In particular, groups of information elements on the display could be "decluttered" (i.e., hidden) so that they do not interfere with task performance. Several pilot surveys have been conducted to develop concepts for organizing and layering information, so that information elements can be added or removed. Hansman and Mykityshyn (1995a) addressed this topic for instrument approach charts, Yeh and Chandra (2003) for surface moving maps, and Schvaneveldt et al. (2001) for flying in general. Collectively, the results showed that "critical" information elements differed depending on the phase of flight.

Hofer et al. (1993) applied decluttering in high information density paper approach charts, and noted that the ability to retrieve "decluttered" information must be considered in the chart design. Hansman and Mykityshyn (1995b) reported that pilots were interested in the ability to declutter information but were concerned about the ability to retrieve the suppressed

information when needed. Additionally, if information is not visible, the pilot may not remember it is available and fail to consider the information when it is relevant.

Butchibabu and Hansman (2012) conducted a review of several aeronautical charts to understand whether each information element contributed to operational issues. The results indicated that charts that depicted more flight paths resulted in more operational issues than charts with fewer flight paths, and on those "problematic" charts, each flight path consisted of more information elements per path than on charts with fewer issues. Butchibabu and Hansman then conducted a study to examine whether clutter could be mitigated by reducing the number of flight paths shown on one aeronautical chart, and distributing the information across multiple pages. They asked pilots to find information on both decluttered electronic aeronautical charts as well as the standard chart. The results showed that pilots found the information significantly faster using the decluttered charts, but the information being retrieved was always shown on the electronic chart (i.e., pilots were never asked to find information about a flight path that was on a different decluttered chart than the one displayed).

Stewart et al. (2016) also attempted to simplify the depiction of instrument approach charts by decluttering irrelevant information. Their study focused on the presentation of approach minimums; specifically, the minimum altitude at which the pilot must see the runway or execute a missed approach, and the minimum visibility, which is the lowest visibility authorized for the approach. An approach procedure on an instrument approach chart needs to accommodate multiple users and aircraft types, but this information density increases the likelihood that the pilot could select an incorrect minimum.

Stewart et al. (2016) created prototype charts that showed only approach minima relevant to the specific pilot and specific aircraft type to prevent pilots from selecting incorrect information. Additionally, they added data labels and color coding, which helped clarify the data type to increase the likelihood that pilots would select the correct information. Pilots were able to identify the information they needed on a decluttered prototype chart and standard instrument approach charts faster and made fewer errors with the decluttered chart. However, it is not clear if the improved search time was solely attributable to decluttering or if the other changes also contributed to faster search times.

Establishing Information Requirements

Collectively, the results suggest that decluttering facilitates visual search and reduces errors when combined with other formatting techniques (e.g., by bolding or highlighting). New concepts are being proposed that incorporate aircraft state or information on flight planning to create data-driven charting systems and to integrate aeronautical charting information with a moving map on a single display. We were interested in identifying a minimum set of information elements for such a concept by examining the criticality of the information elements shown on the aeronautical charts.

We started by reviewing SAE Aerospace Recommended Practice (ARP) 5621, *Electronic Display of Aeronautical Information* (SAE International, 2011), which provides a categorization of information elements based on subject matter expert opinion for electronic charts intended to be used as a replacement for paper charts. The SAE Committee considered nine chart types; for each chart type, the Committee identified a set of information elements shown on the charts and discussed the criticality of each information element for presentation on a fixed chart for briefing or a moving map format for flying the procedure. The ratings were based on the following criteria:

- Level 1: information elements that cannot be removed
- Level 2: information elements that should be shown initially but could be removed by pilot action
- Level 3: information elements that do not need to be presented initially and can be manually selected (or deselected).

SAE ARP 5621 provided only a starting point for this research, as the criticality ratings were not validated when that document was published. In 2014, Pepitone et al. conducted a preliminary validation of a subset of the information in SAE ARP 5621. Twenty Honeywell corporate pilots participated in a card-sorting task in which they rated the criticality of the information elements for flying an Instrument Flight Rules (IFR) procedure using three rating levels, similar to the ones used in SAE ARP 5621. Pepitone et al.'s results provided some validation of the SAE ratings; there were some differences, but the study was limited in that the

data reflected the opinions of corporate pilots from one company only, and no statistical analyses were reported.

Therefore, the purpose of this study was to further examine the criticality ratings provided in SAE ARP 5621 to try to identify minimum information requirements for electronic data-driven charts. This study focused on four different chart types- Instrument Approach Procedure (IAP), Enroute IFR, Standard Terminal Arrival Route (STAR), and Standard Instrument Departure (SID). We recruited pilots to participate from four different types of operations – air transport, commuter/business jet, military, and general aviation.

Method

We developed a survey and distributed it to air transport, commuter, military, and general aviation pilots. The inclusion criteria for participation was that pilots needed to have flown IFR in the previous 6 months and use FAA/US Government (military) or Jeppesen charts. A total of 1,351 pilots were invited to participate; 326 responded (24% response rate), but only 267 met the inclusion criteria. Of these, 229 pilots completed the survey (218 male, 10 female, and 1 did not self-identify): 60 air transport pilots, 60 commuter, 60 general aviation, and 49 military pilots. The average age was 45 years (Min = 19; Max = 73). For chart usage, 128 pilots indicated that they primarily used Jeppesen charts, and 101 pilots indicated they primarily used FAA or US Government charts.

Survey Design

We created a list of information elements shown on four types of charts (IAP, Enroute IFR, STAR, and SID). There were a total of 427 information elements, so to prevent survey fatigue, we divided the information elements into two surveys: the first survey included information elements on IAP/Enroute IFR charts (221 information elements), and the second survey included information elements from SID/STAR charts (206 information elements).

When completing a survey, participants were instructed to rate the importance of information elements for a new charting concept, which uses customizable electronic charts that are interactive and customized to display only information elements needed to execute the procedure. Participants were instructed that for this charting concept they would first brief the procedure using a fixed chart showing all the information elements, but then fly with an

electronic chart, which may or may not include all the information elements that were briefed. Additionally, the instructions emphasized that the customizable electronic chart would show only the information relevant to the procedure being flown.

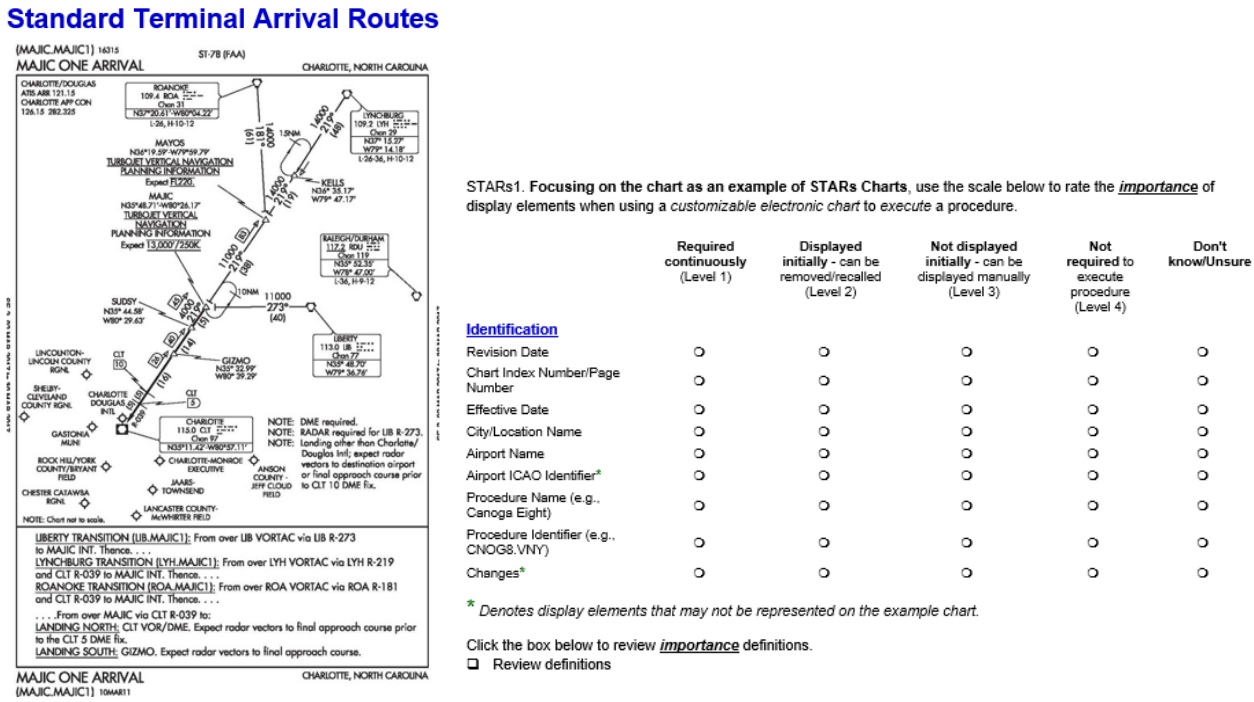
Participants were given a list of information elements and asked to rate each information element individually with respect to how the information element would be used operationally when executing the procedure. Pilots were not asked to rate the information element based on the frequency of use. Ratings were made along a scale with four levels of importance options with an additional option level for participants who did not know the information element.

- 1 = Required to be displayed continuously for the safe and successful execution of the instrument flight procedure.
- 2 = Displayed initially, but can be removed and recalled for reference, as needed.
- 3 = Not displayed initially, but can be displayed manually for reference, as needed.
- 4 = Not required to execute the procedure.
- Don’t know/Unsure

To help with the task, participants were shown charts that depicted the information elements being rated (see Figure 4). Because the symbology for each chart type may differ depending on the chart provider, participants were shown charts designed by the chart provider the participant used most (i.e., FAA/US Government charts or Jeppesen charts). However, not all information elements being rated were depicted on the charts; these information elements were denoted by an asterisk in the survey.

Figure 4

Example of STAR survey with response options.



Note. Left panel shows the example aeronautical chart. Right panel shows the information element names to be rated.

Procedure

Participants were randomly assigned to either the IAP/Enroute IFR survey or the SID/STAR survey; 114 pilots completed the IAP/Enroute IFR survey, and 115 completed the SID/STAR survey. The number of participants by pilot type are shown in Table 1. The median time to complete the IAP/Enroute IFR survey was 38.5 minutes; the median time to complete the SID/STAR was 28.9 minutes. Pilots who completed a survey were compensated for their time.

Table 1

Distribution of Participants by Pilot Type

Pilot Type	IAP/IFR Participants	SID/STAR Participants
Air Transport	30	30
Commercial	30	30
General Aviation	30	30
Military	24	25

Data Analysis

Step 1: Chi-Square Test

We conducted a series of one-way chi-squares for each information element to determine pilot ratings of importance ($p < 0.05$). The following questions were used to guide the analysis.

1. Did the majority of pilots feel that the information element should be displayed on the chart to successfully execute the procedure?
   This was examined using a chi-square test to compare the total number of pilots who chose responses 1, 2, or 3 to the number of pilots who chose response 4 (not required to execute the procedure).
   - If the number of pilots who responded 1, 2, or 3 was significantly greater than the number of pilots who responded 4 ($p < 0.05$), then we asked question 2.
   - If the number of pilots who responded 4 was significantly greater than the number of pilots who responded 1, 2, or 3 ($p < 0.05$), then we concluded that pilots did not feel they needed the information element to execute the procedure. No further comparisons were conducted.
2. Did the majority of pilots feel that the information element should be displayed at all times?
   This was examined using two chi-square tests: (1) we compared the number of pilots who chose response 1 to the number of pilots who chose response 2, and (2) we compared the number of pilots who chose response 1 to the number of pilots who chose response 3.
   - If the number of pilots who chose response 1 was significantly greater than the number of pilots who chose responses 2 or 3 ($p < 0.05$), then the majority of pilots felt that the information element should be displayed at all times.
   - If the number of pilots who chose response 2 was significantly greater than the number of pilots who chose response 1 ($p < 0.05$), then the majority of pilots felt that the information should be displayed initially.
   - If the number of pilots who chose response 3 was significantly greater than the number of pilots who chose response 1 ($p < 0.05$), then the majority of pilots felt that the information element did not need to be displayed initially.
   - If the analysis was not significant ($p > 0.05$), then we concluded that there was no preference for whether it needed to be displayed at all times (not yet determined).
3. For pilots who felt information elements were not required to be displayed at all times, did the majority of pilots feel that the information element should be displayed initially?
   This was examined using chi-square tests comparing the number of pilots who chose response 2 to the number of pilots who chose response 3.

- If the number of pilots who chose response 2 was significantly greater than the number of pilots who chose 3 ($p < 0.05$), then we concluded that the information element should be displayed initially.
- If the number of pilots who responded 3 was significantly greater than the number of pilots who responded 2 ($p < 0.05$), then we concluded that the information element did not need to be displayed initially.
- If the analysis was not significant ($p > 0.05$), then we concluded that the information element should be displayed part of the time, but that there was no preference for whether it needed to be displayed initially (not yet determined).

For each of these analyses we performed the Bonferroni correction on a subset of the information elements and found that the significance of the results were unchanged. We do not report those numbers here.

From this analysis, we were able to categorize 237 of the 427 information elements, as shown in Table 2 below.

Table 2
Chi-Square Analysis Categorization

Information Element Importance Level	Number of Information Elements
Level 1 (Displayed at all times)	135
Level 2 (Displayed initially; can be toggled off/on)	87
Level 3 (Not displayed initially, can be toggled on/off)	15
Level 4 (Not displayed at all)	0
Not Yet Determined	190

Step 2: Combined Subject Matter Expert Review + Analysis

For the remaining 190 information elements that could not be categorized in Step 1 (Not Yet Determined), we requested feedback from two subject matter experts (SMEs), conducted an additional chi-square analysis, and looked for agreement in the two data sources.

SME Review: We recruited two SMEs to review the survey ratings: one SME primarily used FAA charts and the other primarily used Jeppesen charts. Both pilot SMEs provided their feedback voluntarily without monetary compensation.

We provided each SME individually with the preliminary survey results from Step 1 and asked them to review the categorization of the information elements to determine if the survey ratings were consistent with their operational use of the information elements. We also asked the SMEs to review the information elements that did not clearly fall into one category (Not Yet Determined) and provide a category recommendation based on the information element's relationship with other information elements. For example, some information elements may need to be displayed together (e.g., airport identifier and airport symbol), but were rated as different levels of importance.

One SME focused his review on the information elements (n=190) that could not be placed in a category through the chi-square analysis conducted in Step 1. That SME provided his recommendation between those levels based on the perceived relationship of the specific information element with other information elements at the same level. The second SME was presented with the same task, but rather than focus on the information elements that were classified as "Not Yet Determined," he also reviewed information elements that had already been categorized based on significance.

Analysis: We conducted a second chi-square analysis focused on the two importance levels with the highest ratings and reduced the level of significance from $p < 0.05$ to $p < 0.10$ (marginal significance) to see if we could classify the remaining items in conjunction with the feedback from the SMEs.

We utilized a flow chart to collectively look at SME feedback, the second chi-square analysis, and pilot categorization to determine a majority agreement across the sources. Through this method, we were able to classify an additional 127 of the 190 previously undetermined information elements.

Results

A total of 364 information elements were assigned an importance level (see Table 3), leaving 63 information elements not yet determined. These information elements that were classified as "not yet determined" did not have a majority of agreement among the sources of data. The chi-square analysis results are shown in Appendix A.

Table 3

Number of Information Elements by Importance Level

Information Element Importance Level	Number of Information Elements
Level 1 (Displayed at all times)	173
Level 2 (Displayed initially; can be toggled off/on)	156
Level 3 (Not displayed initially, can be toggled on/off)	34
Level 4 (Not displayed at all)	1
Not Yet Determined	63

The results of our survey are presented in Tables 4 – 7. Table 4 shows the ratings for IAP charts, Table 5 presents Enroute IFR chart ratings, Table 6 shows the ratings for SID charts, and Table 7 displays the ratings for STAR charts. We show our results in comparison to SAE ARP 5621 (SAE International, 2011) and Pepitone et al. (2014) as a reference to the previous efforts aimed at identifying information element importance. We discuss these comparisons in detail further below. The information elements in the SAE ARP 5621 that are marked with an asterisk indicate the information element would be considered a Level 1 if the information element appeared on the pilot's planned route.

Table 4

Survey Results for Instrument Approach Procedure (IAP) Charts

Chart Type	Information Category	Information Element	SAE ARP 5621 (2011)	Pepitone et al. (2014)	Current Survey
IAP	Communications	Approach Frequency	2	1	Not Yet Determined
IAP	Communications	ATIS Arrival Frequency	3	-	2
IAP	Communications	ATIS Departure Frequency	3	-	2
IAP	Communications	Clearance Frequency	3	-	2
IAP	Communications	Departure Control Frequency	3	-	2
IAP	Communications	Ground Frequency	2	2	2
IAP	Communications	Helicopter Frequency	1	3,4	3
IAP	Communications	Tower Frequency	1	1	1
IAP	Geography	Contour Interval Legend	3	-	Not Yet Determined
IAP	Geography	Cultural Features	3	-	2
IAP	Geography	Highest Reference Point (within neat lines)	2	2	Not Yet Determined

Chart Type	Information Category	Information Element	SAE ARP 5621 (2011)	Pepitone et al. (2014)	Current Survey
IAP	Geography	International Boundaries (higher criticality where appropriate)	2	2	2
IAP	Geography	Magnetic Variations	3	-	3
IAP	Geography	Neat Lines (i.e., the lines which separate the chart from the margins)	3	-	2
IAP	Geography	Parallels and Meridians	3	-	3
IAP	Geography	Range	1	4	2
IAP	Geography	Spot Elevations	2	2	Not Yet Determined
IAP	Geography	Terrain Contour Elevations	2	2	1
IAP	Geography	Terrain Contours	2	3	1
IAP	Geography	Visual Landmark Label (when not required for navigation)	2	2	3
IAP	Geography	Visual Landmarks (when not required for navigation)	2	4	2
IAP	Geography	Water Features	2	-	2
IAP	Holding Pattern	Holding Pattern Altitude	1	1.2	1
IAP	Holding Pattern	Holding Pattern Courses	2	1	1
IAP	Holding Pattern	Holding Pattern Depiction	1	1	1
IAP	Holding Pattern	Holding Pattern Leg Length	2	2	2
IAP	Holding Pattern	Holding Pattern Speed	2	2	2
IAP	Holding Pattern	Holding Pattern Time	2	1	2
IAP	Identification	Airport Elevation	1	1	1
IAP	Identification	Airport ICAO Identifier	1	1	1
IAP	Identification	Airport Name	1	1	1
IAP	Identification	Changes	3	-	1
IAP	Identification	Chart Index Number/Page Number	3	-	2
IAP	Identification	City/Location Name	-	2,4	2
IAP	Identification	Effective Date	3	-	2
IAP	Identification	Procedure Name	1	1	1
IAP	Identification	Revision Date	3	-	2
IAP	Landing Minimums	CAT I Decision Altitude (DA)	1	1	1
IAP	Landing Minimums	CAT II Decision Altitude (DA)	2	1	1
IAP	Landing Minimums	CAT II Radio Altimeter (RA)	1	1	1
IAP	Landing Minimums	Decision Height (DH)	2	1	1
IAP	Landing Minimums	Height Above Airport (HAA)	2	1	1
IAP	Landing Minimums	Minimum Descent Altitude (MDA)	1	1	1
IAP	Landing Minimums	Minimum Descent Height (MDH)	2	1	1
IAP	Landing Minimums	Visibility Requirement	1	1	1
IAP	Minimum Area/Sector Altitudes	Minimum Radar Altitudes and Sectors	3	-	2

Chart Type	Information Category	Information Element	SAE ARP 5621 (2011)	Pepitone et al. (2014)	Current Survey
IAP	Minimum Area/Sector Altitudes	MSA Distance when other than 25nm	2	2	2
IAP	Minimum Area/Sector Altitudes	MSA Minimum Altitudes	2	2	1
IAP	Minimum Area/Sector Altitudes	MSA Reference Point/Center	2	2	2
IAP	Minimum Area/Sector Altitudes	MSA Sector Radials	2	2,3	2
IAP	Missed Approach	Distance From FAF to MAP	1	1	2
IAP	Missed Approach	Fix Name/Identifier at MAP	1	1	1
IAP	Missed Approach	Location of MAP	1	1	1
IAP	Missed Approach	Missed Approach Holding Pattern	3	-	1
IAP	Missed Approach	Missed Approach Instructions	3	-	1
IAP	Missed Approach	Name of Missed Approach Holding Fix	3	-	1
IAP	Missed Approach	Time From FAF to MAP	1	1	Not Yet Determined
IAP	Navaids in the Vicinity of the Procedure	DME Availability	3	-	2
IAP	Navaids in the Vicinity of the Procedure	Navaid Class	3	-	3
IAP	Navaids in the Vicinity of the Procedure	Navaid Frequency	2	3	Not Yet Determined
IAP	Navaids in the Vicinity of the Procedure	Navaid Identifier	1	3	2
IAP	Navaids in the Vicinity of the Procedure	Navaid Latitude/Longitude	3	-	3
IAP	Navaids in the Vicinity of the Procedure	Navaid Morse Code	3	-	Not Yet Determined
IAP	Navaids in the Vicinity of the Procedure	Navaid Name	2	3	2
IAP	Navaids in the Vicinity of the Procedure	Navaid Symbol	1	1	Not Yet Determined
IAP	Navigation	All appropriate navaid symbols	1	1	1
IAP	Navigation	FAF (e.g., Maltese Cross)	1	1	1
IAP	Navigation	FAF Crossing Altitude (MSL) (HAT)	1	1	1
IAP	Navigation	FIR/UIR Boundaries	3	-	2
IAP	Navigation	Fix Altitude	1	1	1
IAP	Navigation	Fix Formation	1	1	1
IAP	Navigation	Fix Name/Identifier	1	1	1
IAP	Navigation	Fix Symbol	1	1	1
IAP	Navigation	General Notes	2	3,4	2
IAP	Navigation	Glide Slope Angle	2	1	2
IAP	Navigation	GS Intercept Altitude (Above Airport) (QFE)	1	1	1
IAP	Navigation	GS Intercept Altitude (MSL)	1	1	1

Chart Type	Information Category	Information Element	SAE ARP 5621 (2011)	Pepitone et al. (2014)	Current Survey
IAP	Navigation	Lead Radial	1	1	1
IAP	Navigation	Localizer Magnetic Course	1	1	1
IAP	Navigation	Procedural Data Notes	2	2	2
IAP	Navigation	Procedure Magnetic Course	1	1	1
IAP	Navigation	Procedure Track	1	1	1
IAP	Navigation	Procedure Track Altitude	1	1	1
IAP	Navigation	Procedure Track Mileage	1	1	1
IAP	Navigation	Procedure Turn Altitude	1	2	1
IAP	Navigation	Procedure Turn Distance Limit	1	1	1
IAP	Navigation	Procedure Turn Outbound Course	1	1	1
IAP	Navigation	Prohibited, Restricted and Danger Airspace Graphic	1	3	1
IAP	Navigation	Prohibited, Restricted and Danger Airspace Label	3	-	1
IAP	Navigation	Prohibited, Restricted and Danger Airspace Narrative	3	-	2
IAP	Navigation	Rate of Descent (feet per minute)	2	2	2
IAP	Navigation	Special Use Airspace - Other	2	3	2
IAP	Navigation	Step-Down Fix Altitude	1	1	1
IAP	Navigation	Step-Down Fix Formation	1	1	1
IAP	Navigation	Terminal Arrival Area (TAA)	2	1	2
IAP	Navigation	Threshold Crossing Height	2	2	2
IAP	Navigation	Transition Altitude	2	2	2
IAP	Navigation	Transition Level	2	2	2
IAP	Navigation	VNAV Angle	2	1	2
IAP	Navigation	VNAV Intercept Altitude (Above Airport) (QFE)	1	1,2	1
IAP	Navigation	VNAV Intercept Altitude (MSL)	1	1	1
IAP	Navigation Aids	Localizer for Intersection Formations	1	1	2
IAP	Navigation Aids	Localizer Frequency	1	1	1
IAP	Navigation Aids	Localizer Front Course for Back Course Approaches	1	1	Not Yet Determined
IAP	Navigation Aids	Localizer Identifier	-	1	2
IAP	Navigation Aids	Localizer Morse Code	-	2,3	Not Yet Determined
IAP	Navigation Aids	Marker Beacon Labels (i.e., OM,MM,IM)	1	1	2
IAP	Navigation Aids	Marker Beacon Symbols	1	2	2
IAP	Navigation Aids	Primary Approach Localizer Symbol	1	1	2
IAP	Navigation Aids	Simultaneous Parallel Localizer Symbol	-	2	2
IAP	Navigation Aids	WAAS/SBAS -LAAS/GBAS Channel	1	2	2

Chart Type	Information Category	Information Element	SAE ARP 5621 (2011)	Pepitone et al. (2014)	Current Survey
IAP	Obstacles	Obstacle Heights and related datum	2	3	1
IAP	Obstacles	Obstacle Symbols and Elevation	2	-	1
IAP	Primary Airport	Glide Path Intercept Point	3	-	1
IAP	Primary Airport	Landing Runway Number	1	1	1
IAP	Primary Airport	Other Runway Numbers	3	-	2
IAP	Primary Airport	Runway Layouts	1	1	1
IAP	Primary Airport	Runway Location in Profile View	1	1	1
IAP	Primary Airport	Straight-in Landing Runway Length	3	-	Not Yet Determined
IAP	Primary Airport	TDZE/Threshold Elevation for Landing Runway	1	1	1
IAP	Procedure Navaid	DME Availability	3	-	2
IAP	Procedure Navaid	Navaid Class	3	-	3
IAP	Procedure Navaid	Navaid Frequency	2	1	1
IAP	Procedure Navaid	Navaid Identifier	1	2	2
IAP	Procedure Navaid	Navaid Latitude/Longitude	3	-	3
IAP	Procedure Navaid	Navaid Morse Code	3	-	Not Yet Determined
IAP	Procedure Navaid	Navaid Name	2	-	1
IAP	Procedure Navaid	Navaid Symbol	2	3	1
IAP	Secondary Airports	IFR Airports in Plan View	-	3	2
IAP	Secondary Airports	Source Doc-Runway Layouts and Name	-	3	Not Yet Determined
IAP	Secondary Airports	VFR Airports within Specified Distance of the Approach Track	-	3	Not Yet Determined

Table 5

Survey Results for Enroute Instrument Flight Rules (IFR) Charts

Chart Type	Information Category	Information Element	SAE ARP 5621 (2011)	Pepitone et al. (2014)	Current Survey
IFR	Airport Information	Airport Attributes if for IFR use	2	-	2
IFR	Airport Information	Airport Attributes if for VFR use	3	-	2
IFR	Airport Information	Airport Identifier if for IFR use	2	-	1
IFR	Airport Information	Airport Identifier if for VFR use	3	-	2
IFR	Airport Information	Airport Symbol if for IFR use (includes suitable symbol type)	2	-	1
IFR	Airport Information	Airport Symbol if for VFR use (includes suitable symbol type)	3	-	1
IFR	Airport Information	Airspace Class Boundaries	2	-	1
IFR	Airport Information	Airspace Class Name of Call Sign	2	-	2

Chart Type	Information Category	Information Element	SAE ARP 5621 (2011)	Pepitone et al. (2014)	Current Survey
IFR	Airport Information	Airspace Class Type	2	-	Not Yet Determined
IFR	Airport Information	FIR/UIR Vertical Limits	2	-	Not Yet Determined
IFR	Airport Information	Terminal Control Area (TMA) Boundaries	2	-	2
IFR	Airport Information	Unit Providing Approach Control Service	2	-	2
IFR	Airspace Boundaries	Air Defense Identification Zones (ADIZ)	1	-	1
IFR	Airspace Boundaries	Airspace Class Notes	2	-	2
IFR	Airspace Boundaries	Airspace Class Vertical Limits	2	-	2
IFR	Airspace Boundaries	Airway Designator	2*	-	1
IFR	Airspace Boundaries	Altimeter Setting Regions (i.e., lowest ALT for QNH)	2	-	2
IFR	Airspace Boundaries	Computer Navigation Fix (CNF) and ID	2*	-	2
IFR	Airspace Boundaries	Control Zone (CTR) Boundaries	2	-	2
IFR	Airspace Boundaries	CTR Vertical Limits	2	-	Not Yet Determined
IFR	Airspace Boundaries	FIR/UIR Boundaries	1	-	Not Yet Determined
IFR	Airspace Boundaries	Holding Pattern restrictions	2*	-	2
IFR	Airspace Boundaries	ID of FIR/UIR	2	-	2
IFR	Airspace Boundaries	Indication of Areas of RNP, RVSM, MNPS, etc., Requirements	2	-	2
IFR	Airspace Boundaries	Indication of MEA Change at Segment End	2	-	2
IFR	Airspace Boundaries	Indication of MET Report Required	2*	-	2
IFR	Airspace Boundaries	Indication of one-way airways	2*	-	1
IFR	Airspace Boundaries	Intersection, Waypoint, or Fix Coordinates	2	-	3
IFR	Airspace Boundaries	Intersection, Waypoint, or Fix ID of VOR, FREQ, MAG BRG	2*	-	1
IFR	Airspace Boundaries	Intersection, Waypoint, or Fix Symbol	2*	-	1
IFR	Airspace Boundaries	Minimum Reception Altitude (MRA)	2*	-	2
IFR	Airspace Boundaries	Name of CTR	2	-	2
IFR	Airspace Boundaries	Name of FIR/UIR	2	-	2
IFR	Airspace Boundaries	Name of TMA	2	-	2
IFR	Airspace Boundaries	Procedural Data Notes	2*	-	2
IFR	Airspace Boundaries	Segment Mileages	2*	-	Not Yet Determined
IFR	Airspace Boundaries	Segment MORA	2*	-	2
IFR	Airspace Boundaries	Segment Upper Limit or MAA	2*	-	2

Chart Type	Information Category	Information Element	SAE ARP 5621 (2011)	Pepitone et al. (2014)	Current Survey
IFR	Airspace Boundaries	Special Use Airspace - Other - Boundaries	2	-	Not Yet Determined
IFR	Airspace Boundaries	Special Use Airspace - Prohibited, Restricted, Danger Boundaries	2	-	1
IFR	Airspace Boundaries	Special Use Airspace ID and Vertical limits	2	-	1
IFR	Airspace Boundaries	Time Zone Boundaries	3	-	3
IFR	Airspace Boundaries	TMA Vertical Limits	2	-	2
IFR	Airspace Boundaries	Unit Providing Area Control Service	2	-	2
IFR	Airspace Boundaries	Unit Providing Service	2	-	2
IFR	Airways	Airway Magnetic Course	2*	-	1
IFR	Airways	Airway Symbol (center line)	2*	-	1
IFR	Airways	Fix Formation bearing, frequency, ID of Remote Navaid	2*	-	2
IFR	Airways	General Notes	2	-	2
IFR	Airways	Holding Patterns	2*	-	1
IFR	Airways	Indication of compulsory reporting	2*	-	1
IFR	Airways	Intersection, Waypoint, or Fix Distance from Reference DME	2*	-	1
IFR	Airways	Intersection, Waypoint, or Fix Name	2*	-	1
IFR	Airways	Minimum Crossing Altitude (MCA)	2*	-	1
IFR	Airways	Segment Minimum Cruising Level or MEA	2*	-	1
IFR	Airways	Segment MOCA	2*	-	Not Yet Determined
IFR	Airways	Times of one-way direction	2*	-	2
IFR	Airways	Total Distance Between Navaids	2	-	Not Yet Determined
IFR	Airways	Transition Text	2*	-	2
IFR	Airways	VOR Change Over Point with Distances	2*	-	Not Yet Determined
IFR	Communications	Call and Frequencies of In-Flight Weather Stations	2	-	3
IFR	Communications	Company Specific Frequencies (tailored communications)	2	-	3
IFR	Communications	FIR/UIR, Control, ARTCC, etc., Frequency Boxes	2	-	2
IFR	Communications	Graphical Portrayal of Radio Frequency Sector Boundaries	2	-	2
IFR	Communications	Voice Frequencies associated with Navaid Facility Boxes	2	-	2
IFR	Geography	Contour Interval Legend	3	-	Not Yet Determined
IFR	Geography	Indication of Area Chart Coverage	3	-	2
IFR	Geography	International Boundaries (higher criticality where appropriate)	2	-	1

Chart Type	Information Category	Information Element	SAE ARP 5621 (2011)	Pepitone et al. (2014)	Current Survey
IFR	Geography	Parallels and Meridians	1	-	2
IFR	Geography	Range	1	-	2
IFR	Geography	Spot Elevations	3	-	2
IFR	Geography	Terrain Contour Elevations	3	-	2
IFR	Geography	Terrain Contours	3	-	2
IFR	Geography	Water Features	2	-	2
IFR	Identification	Chart Description (e.g., High, Low, etc.)	3	-	2
IFR	Identification	Revision Date (i.e., Start and Finish)	3	-	2
IFR	Minimum Area/Sector Altitudes	Area Minimum Altitudes - OROCA, Sector Altitudes (Grid MORA Outside of US)	1	-	1
IFR	Navigation Aids	Broadcast Stations or Marine Beacons	3	-	3
IFR	Navigation Aids	DME Antenna Elevation	3	-	3
IFR	Navigation Aids	Indication of True North Navaids	2	-	3
IFR	Navigation Aids	Navaid Class (e.g., H, T, and L)	3	-	3
IFR	Navigation Aids	Navaid Coordinates	3	-	3
IFR	Navigation Aids	Navaid Frequency	2*	-	1
IFR	Navigation Aids	Navaid Identifier	2*	-	1
IFR	Navigation Aids	Navaid Morse Code	2	-	2
IFR	Navigation Aids	Navaid Name	2*	-	1
IFR	Navigation Aids	Navaid Station Declination	3	-	3
IFR	Navigation Aids	Navaid Symbol	1	-	1
IFR	Navigation Aids	Notes on Navaid Operational Status	2	-	2
IFR	Obstacle	Obstacle Symbols and Elevation (e.g., man-made, exceptionally high)	3	-	1

Table 6

Survey Results for Standard Instrument Departure (SID) Charts

Chart Type	Information Category	Information Element	SAE ARP 5621 (2011)	Pepitone et al. (2014)	Current Survey
SID	Airport Information	Airport Elevation	1	1	1
SID	Airport Information	Distances from airport to first fix on SID	3	-	1
SID	Airport Information	Other Airport Elevations	2	4	Not Yet Determined
SID	Airport Information	Other Airport Names	2	3	Not Yet Determined
SID	Airport Information	Other Airport Symbols	2	3	2
SID	Airport Information	Runway Layout	1	2	1

Chart Type	Information Category	Information Element	SAE ARP 5621 (2011)	Pepitone et al. (2014)	Current Survey
SID	Communications	Communications Boundaries	2	3	2
SID	Communications	Departure Control Frequency	2	2	1
SID	Communications	Lost Comm Procedure	2	4	2
SID	Communications	Lost Comm Procedure Outline Lines	2	3	2
SID	Communications	Transponder Setting where appropriate	2	2,3	2
SID	Course Definition	Heading	1	1	1
SID	Course Definition	MEA/MOCA	1	3	1
SID	Course Definition	Radial	1	1	1
SID	Course Definition	Segment Mileages	2	1,2	1
SID	Course Definition	Track	1	1	1
SID	Course Definition	VOR Change Over Point	2	2,3	2
SID	Geography	Contour Interval Legend	3	-	Not Yet Determined
SID	Geography	Cultural Features	3	-	Not Yet Determined
SID	Geography	Highest Reference Point (within neat lines)	2	3	1
SID	Geography	International Boundaries (higher criticality where appropriate)	2	3	2
SID	Geography	Neat Lines (i.e., the lines which separate the chart from the margins)	3	-	2
SID	Geography	Parallels and Meridians	2	3	3
SID	Geography	Parallels and Meridians with AMAs, OROCAs, MORAs	2	-	Not Yet Determined
SID	Geography	Range	1	2	Not Yet Determined
SID	Geography	Spot Elevations	2	2	1
SID	Geography	Terrain Contour Elevations	2	2	1
SID	Geography	Terrain Contours	2	2	1
SID	Geography	Water Features	3	-	Not Yet Determined
SID	Holding Pattern	Holding Pattern Altitude	1	1	1
SID	Holding Pattern	Holding Pattern Courses	2	2	1
SID	Holding Pattern	Holding Pattern Depiction	1	2	1
SID	Holding Pattern	Holding Pattern Leg Length	2	2	1
SID	Holding Pattern	Holding Pattern Speed	2	2	2
SID	Holding Pattern	Holding Pattern Time	2	2,3	2
SID	Identification	Airport ICAO Identifier	1	1	1
SID	Identification	Airport Name	1	1	1
SID	Identification	Changes	3	-	2
SID	Identification	Chart Index Number/Page Number	3	-	2
SID	Identification	City/Location Name	2	3	Not Yet Determined

Chart Type	Information Category	Information Element	SAE ARP 5621 (2011)	Pepitone et al. (2014)	Current Survey
SID	Identification	DP Type (e.g., Pilot Nav, Vector, Noise, Obstacle)	2	1,2,3,4	2
SID	Identification	Effective Date	3	-	2
SID	Identification	Procedure Identifier (e.g., CNOG8.VNY+A42)	2	1	1
SID	Identification	Procedure Name (e.g., Canoga Eight)	1	1	1
SID	Identification	Revision Date	3	-	2
SID	Instrument Procedure Courses/Tracks	Identifier (i.e., CNOG8.AVE)	1	-	1
SID	Instrument Procedure Courses/Tracks	Symbol (e.g., line style, etc.)	1	-	1
SID	Intersection /Fixes on Procedure	Identifier	1	1	1
SID	Intersection /Fixes on Procedure	Latitude/Longitudes	3	-	3
SID	Intersection /Fixes on Procedure	MRA	3	-	2
SID	Intersection /Fixes on Procedure	Names	2	1	1
SID	Intersection /Fixes on Procedure	Symbol	1	2	1
SID	Minimum Area/Sector Altitudes	AMA, OROCA, or grid MORA where established	2	3	2
SID	Minimum Area/Sector Altitudes	Minimum Radar Altitudes and Sectors	3	-	1
SID	Minimum Area/Sector Altitudes	MSA Distance when other than 25nm	2	3	2
SID	Minimum Area/Sector Altitudes	MSA Minimum Altitudes	2	2	1
SID	Minimum Area/Sector Altitudes	MSA Reference Point/Center	2	2,3	Not Yet Determined
SID	Minimum Area/Sector Altitudes	MSA Sector Radials	2	3	1
SID	Navaid Used to Form Fixes	DME Availability (Text information)	3	-	2
SID	Navaid Used to Form Fixes	DME Distances that form fixes	2	1,3	1
SID	Navaid Used to Form Fixes	Navaid Class	3	-	3
SID	Navaid Used to Form Fixes	Navaid Frequency/Channel	2	1	1
SID	Navaid Used to Form Fixes	Navaid Identifier	1	1	1
SID	Navaid Used to Form Fixes	Navaid Latitude/Longitude	3	-	3
SID	Navaid Used to Form Fixes	Navaid Morse Code	2	3	Not Yet Determined
SID	Navaid Used to Form Fixes	Navaid Name	2	1	1

Chart Type	Information Category	Information Element	SAE ARP 5621 (2011)	Pepitone et al. (2014)	Current Survey
SID	Navaid Used to Form Fixes	Navaid Radials/Bearings that form fixes	2	1	1
SID	Navaid Used to Form Fixes	Navaid Symbol	1	1,2	1
SID	Navaid Used to Form Leg of Procedure	DME Availability (Text information)	3	-	2
SID	Navaid Used to Form Leg of Procedure	Navaid Class	3	-	3
SID	Navaid Used to Form Leg of Procedure	Navaid Frequency/Channel	2	1	1
SID	Navaid Used to Form Leg of Procedure	Navaid Identifier	1	2	1
SID	Navaid Used to Form Leg of Procedure	Navaid Latitude/Longitude	3	-	3
SID	Navaid Used to Form Leg of Procedure	Navaid Morse Code	2	3	Not Yet Determined
SID	Navaid Used to Form Leg of Procedure	Navaid Name	2	1	1
SID	Navaid Used to Form Leg of Procedure	Navaid Symbol	1	1	1
SID	Navigation	FIR/UIR Boundaries	3	-	2
SID	Navigation	Prohibited, Restricted and Danger Airspace Graphic	1	-	1
SID	Navigation	Prohibited, Restricted and Danger Airspace Label	3	-	1
SID	Navigation	Prohibited, Restricted and Danger Airspace Narrative	3	-	2
SID	Navigation	Special Use Airspace - Other	2	-	Not Yet Determined
SID	Navigation	Transition Altitude	2	-	1
SID	Obstacle	Obstacle Symbols and Elevation	3	-	1
SID	Textual Information	Climb Gradient - ATC	1	4	2
SID	Textual Information	Climb Gradient - Obstacle	1	4	Not Yet Determined
SID	Textual Information	Crossing Altitude Restrictions	1	2	1
SID	Textual Information	General Notes	2	4	2
SID	Textual Information	Noise Abatement	2	4	2
SID	Textual Information	Notes	2	4	2
SID	Textual Information	Performance limitations (e.g., bank limits)	2	4	2
SID	Textual Information	Procedural Data Notes	2	3	2
SID	Textual Information	Runway departure text	1	4	Not Yet Determined
SID	Textual Information	Speed restrictions	1	2,3	1
SID	Textual Information	Text-Only Procedures	1	3	2
SID	Textual Information	Transition Name	1	1	1
SID	Textual Information	Transition Text	3	-	2

Chart Type	Information Category	Information Element	SAE ARP 5621 (2011)	Pepitone et al. (2014)	Current Survey
SID	Transitions	Transition Course - Magnetic Values	1	2	Not Yet Determined
SID	Transitions	Transition Course notes (e.g., DME required)	2	2,3	2
SID	Transitions	Transition Courses computer codes	2	1	2
SID	Transitions	Transition Courses depiction	1	1	1
SID	Transitions	Transition Courses -MEAs, MOCAs	2	2,3	Not Yet Determined
SID	Transitions	Transition Courses -segment mileages	2	1	Not Yet Determined
SID	Transitions	Transition Text	1	2,3	2

Table 7

Survey Results for Standard Terminal Arrival Route (STAR) Charts

Chart Type	Information Category	Information Element	SAE ARP 5621 (2011)	Pepitone et al. (2014)	Current Survey
STAR	Airport Information	Distances from last STAR fix to airport	3	-	Not Yet Determined
STAR	Airport Information	Other Airport Elevations	3	-	3
STAR	Airport Information	Other Airport Names	2	3	2
STAR	Airport Information	Other Airport Symbols	2	3	2
STAR	Airport Information	Primary Airport elevation	1	1	1
STAR	Airport Information	Primary Airport Runway Layout	1	1,3	1
STAR	Airport Information	Primary Airport Shaded Area	2	2,3	1
STAR	Communications	ACARS - D - ATIS, TWIP	3	-	2
STAR	Communications	Approach Control (Arrival)	2	2	Not Yet Determined
STAR	Communications	ATIS Arrival Frequency	2	1	2
STAR	Communications	Communications Boundaries	2	3	Not Yet Determined
STAR	Communications	Lost Comm Procedure	2	2,3	3
STAR	Communications	Lost Comm Procedure Outline Lines	2	3	2
STAR	Communications	Transponder Setting where appropriate	2	2	2
STAR	Course Definition	Heading	1	1	1
STAR	Course Definition	MEA/MOCA	2	3	1
STAR	Course Definition	Radial	1	1	1
STAR	Course Definition	Segment Mileages	1	1,2,3	1
STAR	Course Definition	Track	1	1	1
STAR	Course Definition	VOR Change Over Points	2	-	Not Yet Determined
STAR	Geography	Contour Interval Legend	2	2,4	3

Chart Type	Information Category	Information Element	SAE ARP 5621 (2011)	Pepitone et al. (2014)	Current Survey
STAR	Geography	Cultural Features	3	-	Not Yet Determined
STAR	Geography	Highest Reference Point (within neat lines)	2	-	1
STAR	Geography	International Boundaries (higher criticality where appropriate)	2	-	Not Yet Determined
STAR	Geography	Neat Lines (i.e., the lines which separate the chart from the margins)	3	-	Not Yet Determined
STAR	Geography	Parallels and Meridians	3	-	3
STAR	Geography	Parallels and Meridians with AMAs, OROCAs, MORAs	2	-	3
STAR	Geography	Range	-	3	1
STAR	Geography	Spot Elevations	2	-	1
STAR	Geography	Terrain Contour Elevations	2	2	Not Yet Determined
STAR	Geography	Terrain Contours	2	2	1
STAR	Geography	Water Features	3	-	Not Yet Determined
STAR	Holding Pattern	Holding Pattern Altitude	1	3	1
STAR	Holding Pattern	Holding Pattern Courses	2	1	1
STAR	Holding Pattern	Holding Pattern Depiction	1	1	1
STAR	Holding Pattern	Holding Pattern Leg Length	2	3	1
STAR	Holding Pattern	Holding Pattern Speed	2	2	2
STAR	Holding Pattern	Holding Pattern Time	2	2,3	2
STAR	Identification	Airport ICAO Identifier	1	1	1
STAR	Identification	Airport Name	1	1	Not Yet Determined
STAR	Identification	Changes	3	-	2
STAR	Identification	Chart Index Number/Page Number	3	-	4
STAR	Identification	City/Location Name	2	3	2
STAR	Identification	Effective Date	3	-	2
STAR	Identification	Procedure Identifier (e.g., CNOG8.VNY)	2	1	1
STAR	Identification	Procedure Name (e.g., Canoga Eight)	1	1	1
STAR	Identification	Revision Date	3	-	2
STAR	Instrument Procedure Courses/Tracks	Identifier (i.e., CNOG8.AVE)	1	1	1
STAR	Instrument Procedure Courses/Tracks	Symbol (e.g., line style, etc.)	1	1	1
STAR	Intersection /Fixes on Procedure	Identifier	1	1	1
STAR	Intersection /Fixes on Procedure	Latitude/Longitudes	3	-	3
STAR	Intersection /Fixes on Procedure	MRA	3	-	Not Yet Determined

Chart Type	Information Category	Information Element	SAE ARP 5621 (2011)	Pepitone et al. (2014)	Current Survey
STAR	Intersection /Fixes on Procedure	Names	2	1	1
STAR	Intersection /Fixes on Procedure	Symbol	1	2	1
STAR	Minimum Area/Sector Altitudes	AMA, OROCA, or grid MORA where established	2	3	Not Yet Determined
STAR	Minimum Area/Sector Altitudes	Minimum Radar Altitudes and Sectors	3	-	Not Yet Determined
STAR	Minimum Area/Sector Altitudes	MSA Distance when other than 25nm	2	2	Not Yet Determined
STAR	Minimum Area/Sector Altitudes	MSA Minimum Altitudes	2	-	1
STAR	Minimum Area/Sector Altitudes	MSA Reference Point/Center	2	2	Not Yet Determined
STAR	Minimum Area/Sector Altitudes	MSA Sector Radials	2	-	Not Yet Determined
STAR	Navaid Used to Form Fixes	DME Availability (Text information)	3	-	2
STAR	Navaid Used to Form Fixes	DME Distances that form fixes	2	1	1
STAR	Navaid Used to Form Fixes	Navaid Class	3	-	3
STAR	Navaid Used to Form Fixes	Navaid Frequency/Channel	2	1,2	1
STAR	Navaid Used to Form Fixes	Navaid Identifier	1	2	1
STAR	Navaid Used to Form Fixes	Navaid Latitude/Longitude	3	-	3
STAR	Navaid Used to Form Fixes	Navaid Morse Code	2	3	Not Yet Determined
STAR	Navaid Used to Form Fixes	Navaid Name	2	1	1
STAR	Navaid Used to Form Fixes	Navaid Radials/Bearings that form fixes	2	3	1
STAR	Navaid Used to Form Fixes	Navaid Symbol	1	1,2	1
STAR	Navaid Used to Form Leg of Procedure	DME Availability (Text information)	3	-	2
STAR	Navaid Used to Form Leg of Procedure	Navaid Class	3	-	3
STAR	Navaid Used to Form Leg of Procedure	Navaid Frequency/Channel	2	1	1
STAR	Navaid Used to Form Leg of Procedure	Navaid Identifier	1	2	1
STAR	Navaid Used to Form Leg of Procedure	Navaid Latitude/Longitude	3	-	3
STAR	Navaid Used to Form Leg of Procedure	Navaid Morse Code	2	3	2
STAR	Navaid Used to Form Leg of Procedure	Navaid Name	2	2	1

Chart Type	Information Category	Information Element	SAE ARP 5621 (2011)	Pepitone et al. (2014)	Current Survey
STAR	Navaid Used to Form Leg of Procedure	Navaid Symbol	1	2	1
STAR	Navigation	FIR/UIR Boundaries	3	-	Not Yet Determined
STAR	Navigation	Prohibited, Restricted and Danger Airspace Graphic	1	3	1
STAR	Navigation	Prohibited, Restricted and Danger Airspace Label	3	-	Not Yet Determined
STAR	Navigation	Prohibited, Restricted and Danger Airspace Narrative	3	-	2
STAR	Navigation	Special Use Airspace - Other	2	2	2
STAR	Navigation	Transition Level	2	2	2
STAR	Obstacle	Obstacle Symbols and Elevation	3	-	1
STAR	Textual Information	Crossing Altitude Restrictions	1	1	1
STAR	Textual Information	General Notes	2	4	2
STAR	Textual Information	Noise Abatement	2	3	2
STAR	Textual Information	Notes	2	4	2
STAR	Textual Information	Performance limitations (e.g., bank limits)	2	3	2
STAR	Textual Information	Procedural Data Notes	2	3,4	2
STAR	Textual Information	Runway arrival text	1	2	2
STAR	Textual Information	Speed restrictions	1	1,2	1
STAR	Textual Information	Text-Only Procedures	1	4	2
STAR	Textual Information	Transition Text	3	-	2
STAR	Transitions	Transition Course - Magnetic Values	1	1	Not Yet Determined
STAR	Transitions	Transition Course notes (e.g., DME required)	2	3	2
STAR	Transitions	Transition Courses - MEAs, MOCAs	2	3	Not Yet Determined
STAR	Transitions	Transition Courses - segment mileages	2	1	Not Yet Determined
STAR	Transitions	Transition Courses computer codes	2	3	2
STAR	Transitions	Transition Courses Depiction	1	1	1
STAR	Transitions	Transition Name	1	1	1
STAR	Transitions	Transition Text	1	3,4	2

Discussion

The purpose of this study was to further examine the criticality ratings provided in SAE ARP 5621 (SAE International, 2011) to try to identify minimum information requirements for electronic data-driven charts. This study focused on four different chart types and included pilots

from four different types of operations. We made several attempts to classify the information elements identified as "not yet determined." In reviewing the chi-square analyses, we noticed that there were differences in the pilot populations classifying the information element – for example, an information element that was identified as level 1 (displayed at all times) for air transport and military pilots may have been identified as level 2 (displayed initially; can be toggled off/on) by general aviation and commuter pilots. We did not pursue these individual differences, however, because we believed that the design of aeronautical charts needed to be achieved in a pilot-agnostic fashion. That is, we should not be defining one minimum set of information elements for air transport operations and another set for general aviation operations, as the same pilot could fly both types of operations and the lack of consistency in the same aeronautical charting application could induce error.

We compared the results of our survey to those ratings in SAE ARP 5621 (SAE International, 2011) and in Pepitone et al. (2014). We conducted two comparisons. The first examined the number of information elements with the same rating across all three sources – our survey, SAE ARP 5621, and Pepitone et al. Because Pepitone et al. did not address IFR/Enroute charts in their study, we did not make this comparison for that chart type. In examining the ratings across all the aeronautical chart types addressed in our study, the ratings matched across all three sources for 33% of the information elements. A breakdown by chart type is shown in Table 8. The second column of Table 8 shows the number of information elements included in the comparisons for each aeronautical chart type, and the third column shows the number of information elements matching across all three sources. We excluded all 63 information elements identified as "Not Yet Determined" from this comparison, because we could not classify those information elements.

The second comparison examined the agreement between our ratings and *either* SAE ARP 5261 (SAE International, 2011) *or* Pepitone et al. (2014). A comparison of the ratings across all aeronautical chart types identified that 40% of the information element ratings matched one of the two sources (see the fourth column of Table 8).

Table 8

Comparison of Information Element Ratings: Results

Chart Type	Total Number of Information Elements	Number of Information Elements included in Analysis*	All Sources in Agreement	Agreement with SAE ARP 5261 (2011) OR Pepitone et al. (2014)	Total Matching One Source or More
Instrument Approach Procedure (IAP)	131	117	51 (44%)	29 (25%)	80 (68%)
Standard Instrument Departure (SID)	103	86	20 (23%)	39 (45%)	59 (69%)
Standard Terminal Arrival Route (STAR)	103	81	22 (27%)	35 (43%)	57 (70%)
Enroute (IFR)	90	80	N/A***	43 (54%)	43 (54%)
TOTAL	**427**	**364**	**93 (33%)***	**146 (40%)**	**239 (66%)**

*Only 284 information elements were included in the "All Sources" comparison. This number excludes the information elements identified as "Not Yet Determined" (n=63) and the information elements on Enroute (IFR) charts (n=80), since these charts were not addressed by Pepitone et al. (2014).

In total, ratings for approximately 66% of information elements matched the ratings in SAE ARP 5261 (SAE International, 2011) and/or Pepitone et al. (2014), leaving 34% of information elements for which there was no match.

As one way to describe the results, we developed prototype charts based on the determined level of importance for each information element to show a pictographic representation of the findings. We also wanted to see if any of the "Not Yet Determined"-information elements could be classified during the prototype chart development process due to its relationship with other information elements. The levels of importance for the information elements were distinguished by color to show which information elements could be added/removed as required. Figure 5 presents examples of each layer for a STAR chart. Figure 5(a) shows a cross-section of the STAR for Bellingham, Washington; this image depicts *all* the information shown on that cross-

section of the aeronautical chart. Figure 5 (b) shows the information elements identified as level 1 (displayed at all times). A comparison of Figure 5 (a) to (b) shows that procedure notes on the right side of the chart and the arrival route description at the bottom of the chart were removed.

Figure 5 (c) shows a combination of the level 1 and level 2 information elements; these are the information elements that need to be displayed at all times and those displayed initially but that can be toggled on/off. Finally, Figure 5 (d) shows the level 1 and level 3 information elements (information elements that do not need to be presented initially and can be manually selected).

Figure 6, Figure 7, and Figure 8 are examples of other chart types (IFR, SID, IAP, respectively). Image (a) within each Figure 6-8 chart example represents a cross-section of that particular chart type and shows all the information elements within that cross-section. Image (b) of each figure shows information elements identified as Level 1 (displayed at all times). Image (c) shows information elements identified as Level 1 (displayed at all time) and Level 2 (displayed initially, but can be toggled off/on). Image (d), when applicable, shows information elements identified as Level 1 (displayed at all times) and Level 3 (not displayed initially, but can be toggled on/off). For the IAP (Figure 7) and SID (Figure 8) example charts, there were no Level 3 information elements depicted on that particular cross-section of the chart.

The prototype charts stimulated discussions about whether additional information within a level could be decluttered – e.g., information that was classified as Level 1 (Displayed at all times) but that may not be relevant to the actual procedure being flown. Additionally, we wanted to consider whether these depictions were consistent with other concepts being proposed for electronic aeronautical charts. There are many approaches for decluttering that may be considered by criticality: decluttering by route, by aircraft equipage, time, phase of flight, etc. Each of these approaches introduces different considerations, but in general, there should be a way to convey to the flightcrew or pilot that the status of the decluttering, and a means must be provided for the pilot or flightcrew to recall/retrieve the information that was decluttered.

Figure 5

Mock-up example of Standard Terminal Arrival Route (STAR) Chart. (a) Full chart, (b) Information elements that are displayed at all times (Level 1 only), (c) information elements displayed at all times (Level 1) and those displayed initially but that can be toggled on/off (Level 2), and (d) information elements displayed at all times (Level 1) and those that don't need to be presented initially and can be manually selected (Level 3).

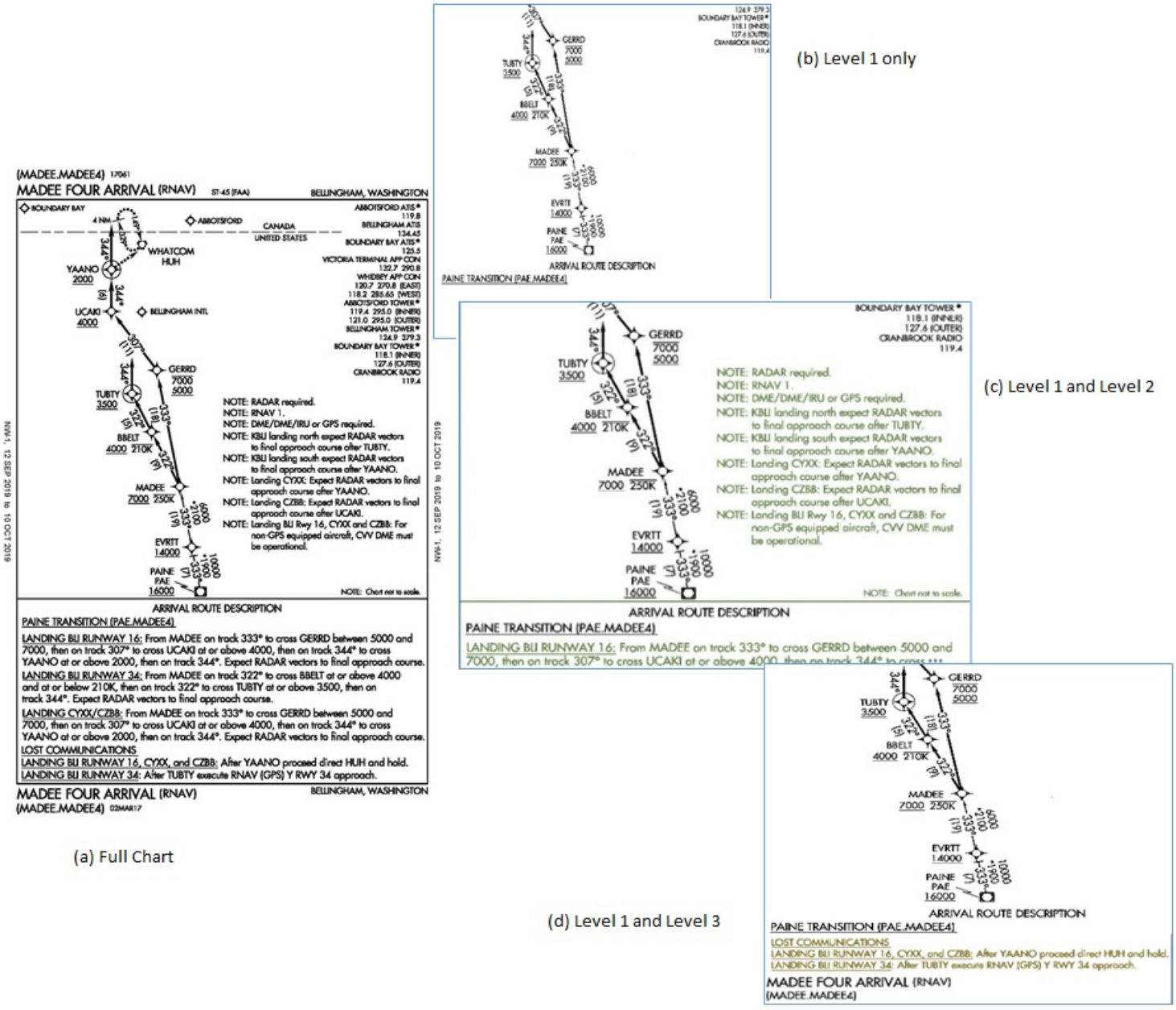


Figure 6

Mock-up example of Enroute Instrument Flight Rule (IFR) Chart. (a) Full chart, (b) Information elements that are displayed at all times (Level 1 only), (c) information elements displayed at all times (Level 1) and those displayed initially but that can be toggled on/off (Level 2), and (d) information elements displayed at all times (Level 1) and those that don't need to be presented initially and can be manually selected (Level 3).

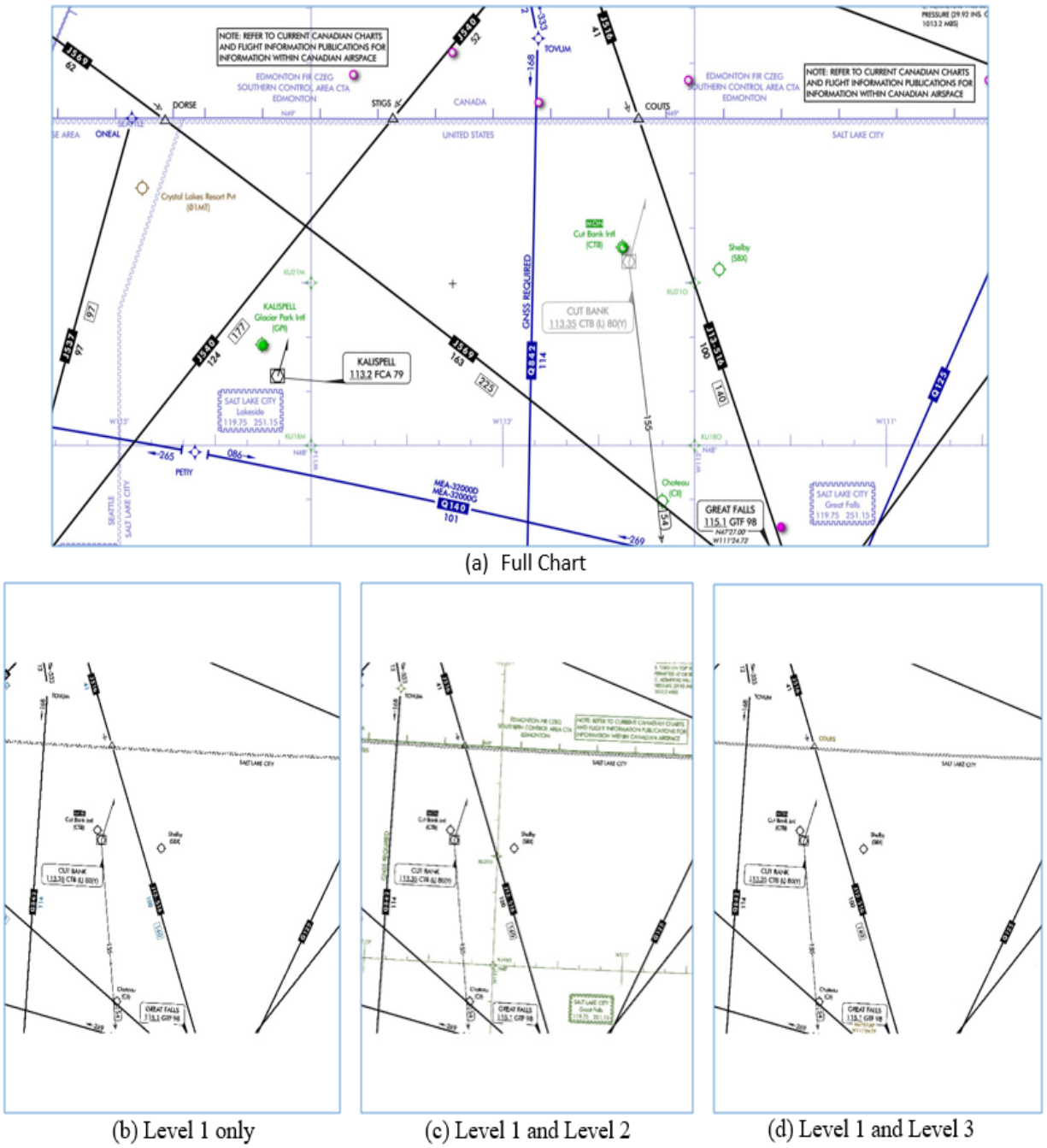
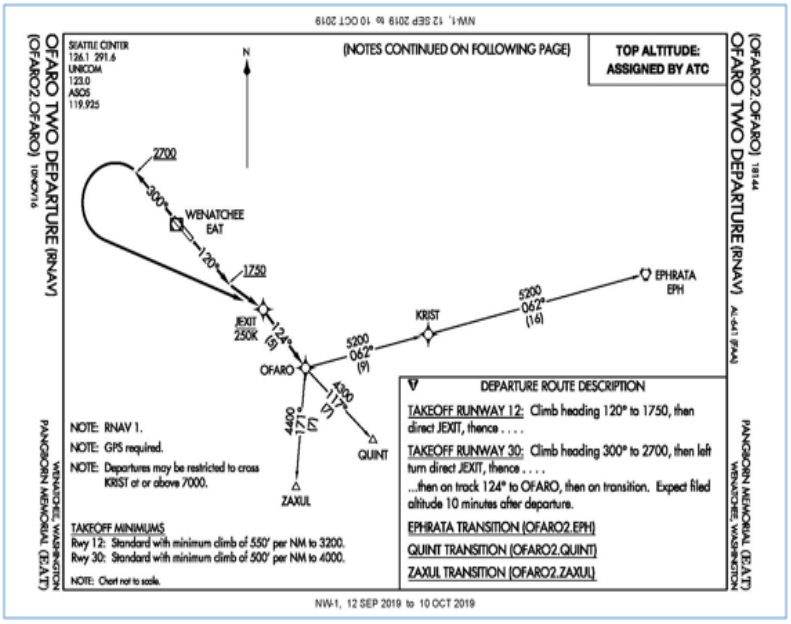
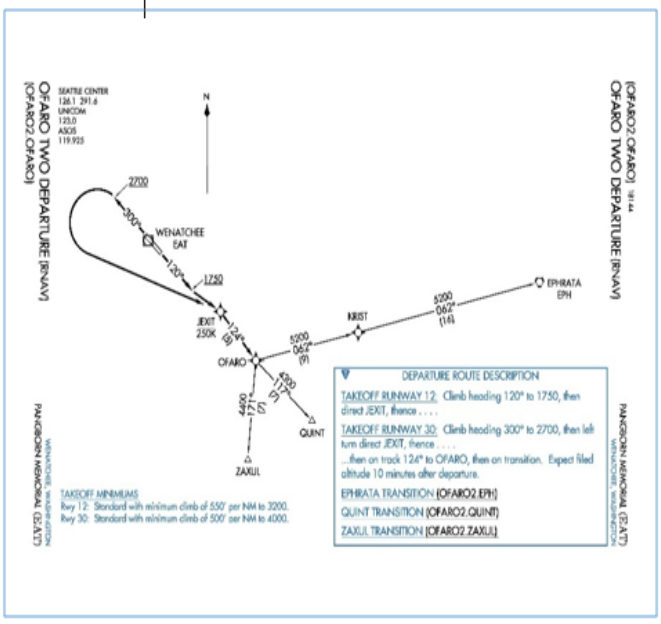


Figure 7

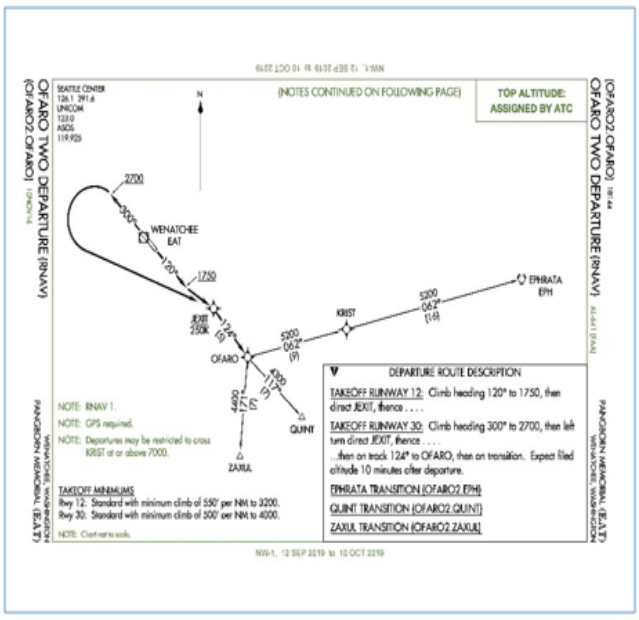
Mock-up example of Standard Instrument Departure (SID) Chart. (a) Full chart, (b) Information elements that are displayed at all times (Level 1 only), and (c) information elements displayed at all times (Level 1) and those displayed initially but that can be toggled on/off (Level 2). There were no Level 3 information elements displayed on this specific procedure.



(a) Full Chart



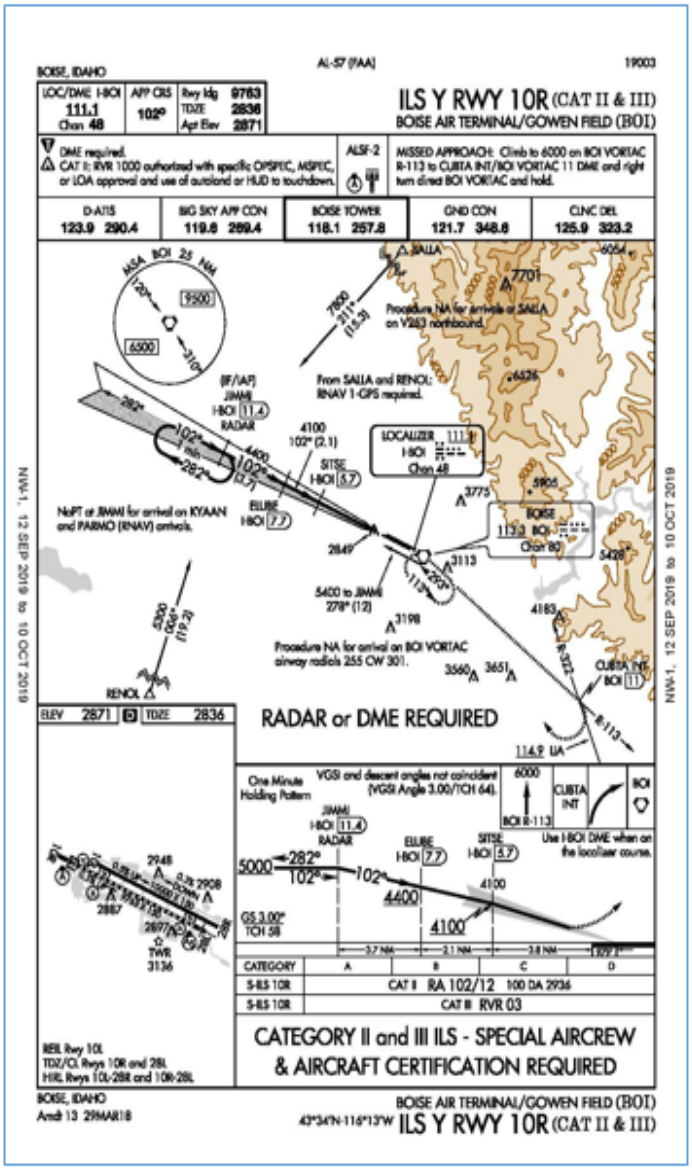
(b) Level 1 Only



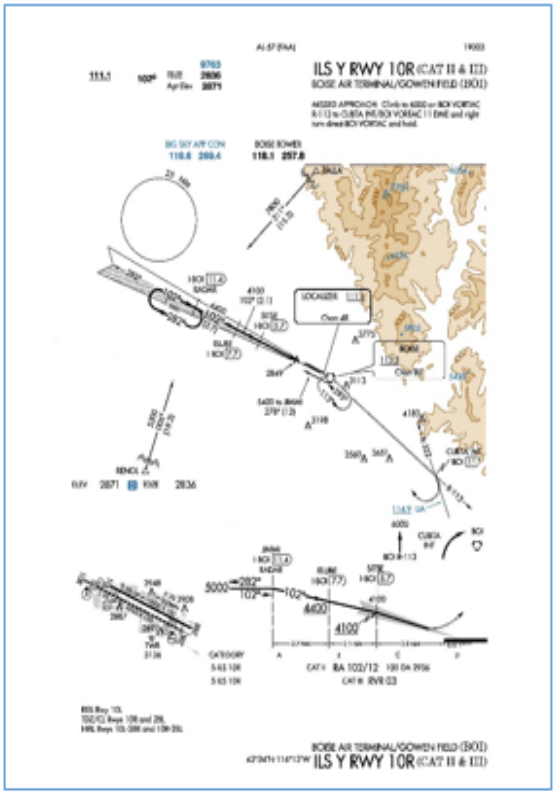
(b) Level 1 and Level 2

Figure 8

Mock-up example of Instrument Approach Procedure (IAP) Chart. (a) Full chart, (b) Information elements that are displayed at all times (Level 1 only), and (c) information elements displayed at all times (Level 1) and those displayed initially but that can be toggled on/off (Level 2). There were no Level 3 information elements displayed on this specific procedure.

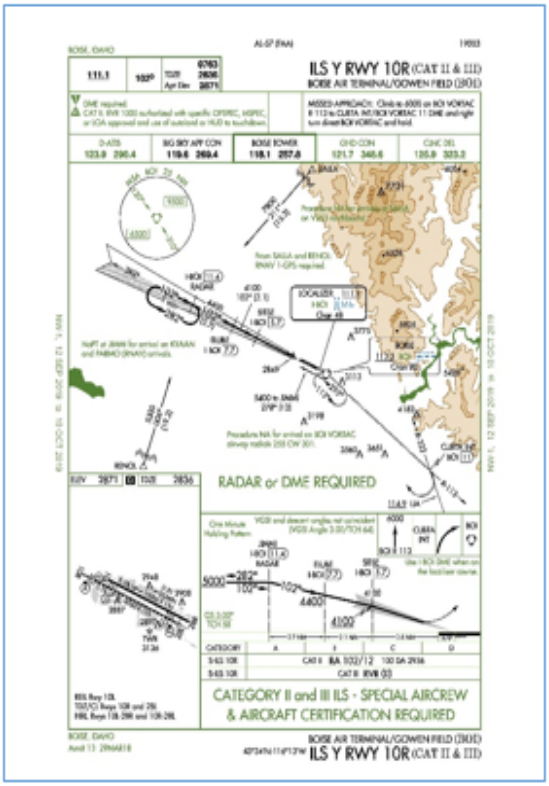


(a) Full Chart



(b) Level 1 only

(c) Level 1 and Level2



Conclusions

The purpose of this study was to identify a set of minimum information elements for user-configurable electronic aeronautical charts. The results are only a first step in identifying critical information elements for configurable electronic charts. The methodology for this study used a survey framework, but additional research is needed to validate the survey findings due to the following limitations. First, the results only reflect pilot opinions; we have not had pilots "fly" with the prototype charts yet. Second, there was no common definition for each information element across end users, and the sample charts we provided did not contain all the information elements. Third, the criticality of an information element may vary depending on the manufacturer's intended function. This research focused on scenarios in which pilots brief with a fixed chart and fly with a reconfigurable electronic chart, but they always have access to the fixed chart. As flight deck systems become more integrated, it is conceivable that the charting application may be combined with a moving map-type avionics system as a replacement for the aeronautical chart. Such a configuration would require a re-evaluation of the criticality of information elements as well as other human factors considerations.

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Appendix A

Chi-Square Results

Summary: Below is the table of chi-square results for individual information elements. Q1, Q2, and Q3 correspond to the questions in the data analysis section and are addressed by the Yes/No in each cell. An asterisk (*) indicates that the results of the chi-square analysis was significant. We performed the Bonferroni correction on a subset of the information elements and found that the significance of the results were unchanged. We do not report those numbers here.

Chart Type	Information Category	Information Element	Q1: Should it be displayed to execute procedure?	Q2: Displayed at all times?	Q3: Displayed Initially?	Importance Level
IAP	Identification	Revision Date	Yes x^2 (1, N = 106) = 29.58*	No x^2 (1, N = 81) = 62.23*	Yes x^2 (1, N = 76) = 10.32*	2
IAP	Identification	Chart Index Number/Page Number	Yes x^2 (1, N = 106) = 8.49*	No x^2 (1, N = 68) = 46.12*	Yes x^2 (1, N = 62) = 4.13*	2
IAP	Identification	Effective Date	Yes x^2 (1, N = 106) = 43.62*	No x^2 (1, N = 87) = 57.94*	Yes x^2 (1, N = 79) = 15.51*	2
IAP	Identification	City/Location Name	Yes x^2 (1, N = 106) = 73.06*	No x^2 (1, N = 97) = 12.63*	Yes x^2 (1, N = 66) = 37.88*	2
IAP	Identification	Airport Name	Yes x^2 (1, N = 106) = 83.36*	No preference x^2 (1, N = 100) = 0.16		1
IAP	Identification	Airport ICAO Identifier	Yes x^2 (1, N = 104) = 88.62*	Yes x^2 (1, N = 100) = 4.84*		1
IAP	Identification	Procedure Name	Yes x^2 (1, N = 106) = 102.04*	Yes x^2 (1, N = 105) = 30.94*		1
IAP	Identification	Airport Elevation	Yes x^2 (1, N = 106) = 102.04*	Yes x^2 (1, N = 105) = 26.75*		1
IAP	Identification	Changes	Yes x^2 (1, N = 94) = 28.77*	No x^2 (1, N = 73) = 30.26*	Yes x^2 (1, N = 60) = 6.67*	1
IAP	Geography	Neat Lines (i.e., the lines which separate the chart from the margins)	Yes x^2 (1, N = 101) = 36.84*	No preference x^2 (1, N = 81) = 1.00		2

Chart Type	Information Category	Information Element	Q1: Should it be displayed to execute procedure?	Q2: Displayed at all times?	Q3: Displayed Initially?	Importance Level
IAP	Geography	Magnetic Variation	Yes x^2 (1, N = 106) = 23.58*	No x^2 (1, N = 78) = 66.46*	No x^2 (1, N = 75) = 16.33*	3
IAP	Geography	Cultural Features	Yes x^2 (1, N = 93) = 48.27*	No x^2 (1, N = 80) = 11.25*	Yes x^2 (1, N = 55) = 4.09*	2
IAP	Geography	Parallels and Meridians	Yes x^2 (1, N = 103) = 14.77*	No x^2 (1, N = 71) = 55.90*	No x^2 (1, N = 67) = 14.34*	3
IAP	Geography	Range	Yes x^2 (1, N = 98) = 62.08*	No x^2 (1, N = 88) = 10.23*	No preference x^2 (1, N = 59) = 2.86	2
IAP	Geography	Water Features	Yes x^2 (1, N = 105) = 68.81*	No x^2 (1, N = 95) = 12.89*	Yes x^2 (1, N = 65) = 4.45*	2
IAP	Geography	Terrain Contours	Yes x^2 (1, N = 106) = 102.04*	Yes x^2 (1, N = 105) = 5.95*		1
IAP	Geography	Terrain Contour Elevations	Yes x^2 (1, N = 106) = 102.04*	No preference x^2 (1, N = 105) = 0.77		1
IAP	Geography	Contour Interval Legend	Yes x^2 (1, N = 104) = 71.12*	No x^2 (1, N = 95) = 41.78*	No preference x^2 (1, N = 79) = 2.85	Not Yet Determined
IAP	Geography	Spot Elevations	Yes x^2 (1, N = 101) = 97.04*	No preference x^2 (1, N = 100) = 0.36		Not Yet Determined
IAP	Geography	Highest Reference Point (within neat lines)	Yes x^2 (1, N = 106) = 98.15*	No preference x^2 (1, N = 104) = 1.38		Not Yet Determined
IAP	Geography	International Boundaries (higher criticality where appropriate)	Yes x^2 (1, N = 104) = 77.88*	No x^2 (1, N = 97) = 5.45*	Yes x^2 (1, N = 60) = 6.67*	2
IAP	Geography	Visual Landmarks (when not required for navigation)	Yes x^2 (1, N = 106) = 76.42*	No x^2 (1, N = 98) = 55.88*	No preference x^2 (1, N = 86) = 0.42	2
IAP	Geography	Visual Landmark Label (when not required for navigation)	Yes x^2 (1, N = 106) = 76.42*	No x^2 (1, N = 98) = 55.88*	No preference x^2 (1, N = 86) = 0.74	3
IAP	Obstacles	Obstacle Symbols and Elevation	Yes x^2 (1, N = 105) = 101.04*	No preference x^2 (1, N = 104) = 2.46		1

Chart Type	Information Category	Information Element	Q1: Should it be displayed to execute procedure?	Q2: Displayed at all times?	Q3: Displayed Initially?	Importance Level
IAP	Obstacles	Obstacle Heights and related datum	Yes x^2 (1, N = 103) = 95.16*	No preference x^2 (1, N = 101) = 0.49		1
IAP	Minimum Area/Sector Altitudes	MSA Reference Point/Center	Yes x^2 (1, N = 106) = 106.00*	No x^2 (1, N = 106) = 6.38*	Yes x^2 (1, N = 66) = 32.06*	2
IAP	Minimum Area/Sector Altitudes	MSA Distance when other than 25nm	Yes x^2 (1, N = 105) = 101.04*	No x^2 (1, N = 104) = 15.38*	Yes x^2 (1, N = 72) = 29.39*	2
IAP	Minimum Area/Sector Altitudes	MSA Sector Radials	Yes x^2 (1, N = 105) = 105.00*	No x^2 (1, N = 105) = 8.01*	Yes x^2 (1, N = 67) = 27.60*	2
IAP	Minimum Area/Sector Altitudes	MSA Minimum Altitudes	Yes x^2 (1, N = 105) = 105.00*	No preference x^2 (1, N = 105) = 0.09		1
IAP	Minimum Area/Sector Altitudes	Minimum Radar Altitudes and Sectors	Yes x^2 (1, N = 104) = 88.62*	No x^2 (1, N = 100) = 12.96*	Yes x^2 (1, N = 68) = 11.53*	2
IAP	Primary Airport	Runway Layouts	Yes x^2 (1, N = 106) = 102.04*	Yes x^2 (1, N = 105) = 10.37*		1
IAP	Primary Airport	Landing Runway Number	Yes x^2 (1, N = 106) = 98.15*	Yes x^2 (1, N = 104) = 41.88*		1
IAP	Primary Airport	Other Runway Numbers	Yes x^2 (1, N = 105) = 85.95*	No x^2 (1, N = 100) = 29.16*	Yes x^2 (1, N = 77) = 24.01*	2
IAP	Primary Airport	Straight-in Landing Runway Length	Yes x^2 (1, N = 105) = 97.15*	No preference x^2 (1, N = 103) = 0.01		Not Yet Determined
IAP	Primary Airport	TDZE/Threshold Elevation for Landing Runway	Yes x^2 (1, N = 106) = 106.00*	Yes x^2 (1, N = 106) = 15.09*		1
IAP	Primary Airport	Glide Path Intercept Point	Yes x^2 (1, N = 106) = 106.00*	Yes x^2 (1, N = 106) = 27.51*		1
IAP	Primary Airport	Runway Location in Profile View	Yes x^2 (1, N = 105) = 105.00*	Yes x^2 (1, N = 105) = 13.04*		1
IAP	Secondary Airports	Source Doc - Runway Layouts and Name	Yes x^2 (1, N = 95) = 69.06*	No x^2 (1, N = 88) = 65.64*	No preference x^2 (1, N = 82) = 2.39	Not Yet Determined
IAP	Secondary Airports	IFR Airports in Plan View	Yes x^2 (1, N = 102) = 65.92*	No x^2 (1, N = 92) = 47.35*	Yes x^2 (1, N = 79) = 7.91*	2

Chart Type	Information Category	Information Element	Q1: Should it be displayed to execute procedure?	Q2: Displayed at all times?	Q3: Displayed Initially?	Importance Level
IAP	Secondary Airports	VFR Airports within Specified Distance of the Approach Track	Yes x^2 (1, N = 102) = 50.82*	No x^2 (1, N = 87) = 54.72*	No preference x^2 (1, N = 78) = 0.00	Not Yet Determined
IAP	Navigation	FIR/UIR Boundaries	Yes x^2 (1, N = 93) = 40.01*	No x^2 (1, N = 77) = 26.30*	No preference x^2 (1, N = 61) = 1.33	2
IAP	Navigation	Terminal Arrival Area (TAA)	Yes x^2 (1, N = 97) = 57.99*	No x^2 (1, N = 86) = 36.47*	Yes x^2 (1, N = 71) = 7.45*	2
IAP	Navigation	Prohibited, Restricted and Danger Airspace Graphic	Yes x^2 (1, N = 106) = 98.15*	Yes x^2 (1, N = 104) = 8.65*		1
IAP	Navigation	Prohibited, Restricted and Danger Airspace Label	Yes x^2 (1, N = 106) = 86.94*	No preference x^2 (1, N = 101) = 1.67		1
IAP	Navigation	Prohibited, Restricted and Danger Airspace Narrative	Yes x^2 (1, N = 106) = 83.36*	No x^2 (1, N = 100) = 27.04*	No preference x^2 (1, N = 76) = 2.58	2
IAP	Navigation	Special Use Airspace - Other	Yes x^2 (1, N = 106) = 76.42*	No x^2 (1, N = 98) = 39.22*	Yes x^2 (1, N = 80) = 22.05*	2
IAP	Navigation	General Notes	Yes x^2 (1, N = 102) = 75.92*	No x^2 (1, N = 95) = 91.04*	Yes x^2 (1, N = 94) = 7.19*	2
IAP	Navigation	Procedural Data Notes	Yes x^2 (1, N = 104) = 88.62*	No x^2 (1, N = 100) = 67.24*	Yes x^2 (1, N = 91) = 18.47*	2
IAP	Navigation	Transition Level	Yes x^2 (1, N = 102) = 86.63*	No x^2 (1, N = 98) = 16.33*	Yes x^2 (1, N = 69) = 12.19*	2
IAP	Navigation	Transition Altitude	Yes x^2 (1, N = 102) = 86.63*	No x^2 (1, N = 98) = 18.00*	Yes x^2 (1, N = 70) = 14.63*	2
IAP	Navigation	Fix Symbol	Yes x^2 (1, N = 106) = 106.00*	Yes x^2 (1, N = 106) = 54.49*		1
IAP	Navigation	Fix Name/Identifier	Yes x^2 (1, N = 106) = 106.00*	Yes x^2 (1, N = 106) = 63.43*		1

Chart Type	Information Category	Information Element	Q1: Should it be displayed to execute procedure?	Q2: Displayed at all times?	Q3: Displayed Initially?	Importance Level
IAP	Navigation	Fix Altitude	Yes x^2 (1, N = 106) = 106.00*	Yes x^2 (1, N = 106) = 69.77*		1
IAP	Navigation	Step-Down Fix Altitude	Yes x^2 (1, N = 106) = 106.00*	Yes x^2 (1, N = 106) = 69.77*		1
IAP	Navigation	Step-Down Fix Formation	Yes x^2 (1, N = 97) = 97.00*	Yes x^2 (1, N = 97) = 17.33*		1
IAP	Navigation	Fix Formation	Yes x^2 (1, N = 95) = 95.00*	Yes x^2 (1, N = 95) = 4.64*		1
IAP	Navigation	All appropriate navaid symbols	Yes x^2 (1, N = 106) = 106.00*	Yes x^2 (1, N = 106) = 13.62*		1
IAP	Navigation	Lead Radial	Yes x^2 (1, N = 105) = 97.15*	No preference x^2 (1, N = 103) = 0.48		1
IAP	Navigation	Localizer Magnetic Course	Yes x^2 (1, N = 106) = 106.00*	Yes x^2 (1, N = 106) = 43.62*		1
IAP	Navigation	FAF (e.g., Maltese Cross)	Yes x^2 (1, N = 106) = 106.00*	Yes x^2 (1, N = 106) = 83.36*		1
IAP	Navigation	GS Intercept Altitude (MSL)	Yes x^2 (1, N = 105) = 105.00*	Yes x^2 (1, N = 105) = 50.75*		1
IAP	Navigation	Glide Slope Angle	Yes x^2 (1, N = 105) = 101.04*	No x^2 (1, N = 104) = 12.46*	Yes x^2 (1, N = 70) = 35.71*	2
IAP	Navigation	VNAV Intercept Altitude (MSL)	Yes x^2 (1, N = 104) = 104.00*	Yes x^2 (1, N = 104) = 13.88*		1
IAP	Navigation	FAF Crossing Altitude (MSL) (HAT)	Yes x^2 (1, N = 106) = 98.15*	Yes x^2 (1, N = 104) = 58.50*		1
IAP	Navigation	GS Intercept Altitude (Above Airport) (QFE)	Yes x^2 (1, N = 104) = 81.38*	Yes x^2 (1, N = 98) = 6.90*		1
IAP	Navigation	VNAV Intercept Altitude (Above Airport) (QFE)	Yes x^2 (1, N = 103) = 80.40*	No preference x^2 (1, N = 97) = 0.51		1
IAP	Navigation	VNAV Angle	Yes x^2 (1, N = 105) = 97.15*	No x^2 (1, N = 103) = 23.31*	Yes x^2 (1, N = 76) = 32.89*	2

Chart Type	Information Category	Information Element	Q1: Should it be displayed to execute procedure?	Q2: Displayed at all times?	Q3: Displayed Initially?	Importance Level
IAP	Navigation	Rate of Descent (feet per minute)	Yes x^2 (1, N = 106) = 98.15*	No x^2 (1, N = 104) = 52.65*	Yes x^2 (1, N = 89) = 20.78*	2
IAP	Navigation	Threshold Crossing Height	Yes x^2 (1, N = 106) = 90.60*	No x^2 (1, N = 102) = 14.16*	Yes x^2 (1, N = 70) = 16.51*	2
IAP	Navigation Aids	Localizer Frequency	Yes x^2 (1, N = 106) = 106.00*	No preference x^2 (1, N = 106) = 0.60		1
IAP	Navigation Aids	Localizer Identifier	Yes x^2 (1, N = 106) = 98.15*	No x^2 (1, N = 104) = 6.50*	Yes x^2 (1, N = 65) = 33.98*	2
IAP	Navigation Aids	Localizer Morse Code	Yes x^2 (1, N = 105) = 82.37*	No x^2 (1, N = 99) = 45.34*	No preference x^2 (1, N = 83) = 2.71	Not Yet Determined
IAP	Navigation Aids	Primary Approach Localizer Symbol	Yes x^2 (1, N = 101) = 85.63*	No preference x^2 (1, N = 97) = 0.84		2
IAP	Navigation Aids	Simultaneous Parallel Localizer Symbol	Yes x^2 (1, N = 101) = 85.63*	No x^2 (1, N = 97) = 35.89*	Yes x^2 (1, N = 78) = 18.51*	2
IAP	Navigation Aids	Localizer for Intersection Formations	Yes x^2 (1, N = 93) = 81.39*	No x^2 (1, N = 90) = 17.78*	Yes x^2 (1, N = 65) = 31.15*	2
IAP	Navigation Aids	Localizer Front Course for Back Course Approaches	Yes x^2 (1, N = 104) = 81.38*	No preference x^2 (1, N = 98) = 3.31	Yes x^2 (1, N = 58) = 24.90*	Not Yet Determined
IAP	Navigation Aids	WAAS/SBAS - LAAS/GBAS Channel	Yes x^2 (1, N = 93) = 54.20*	No x^2 (1, N = 82) = 32.98*	Yes x^2 (1, N = 67) = 6.58*	2
IAP	Navigation Aids	Marker Beacon Symbols	Yes x^2 (1, N = 106) = 76.42*	No x^2 (1, N = 98) = 19.76*	Yes x^2 (1, N = 71) = 17.25*	2
IAP	Navigation Aids	Marker Beacon Labels (i.e., OM,MM,IM)	Yes x^2 (1, N = 106) = 79.85*	No x^2 (1, N = 99) = 30.56*	Yes x^2 (1, N = 77) = 6.87*	2
IAP	Procedure Navaid	Navaid Symbol	Yes x^2 (1, N = 106) = 106.00*	Yes x^2 (1, N = 106) = 10.91*		1
IAP	Procedure Navaid	Navaid Name	Yes x^2 (1, N = 106) = 106.00*	No preference x^2 (1, N = 106) = 1.36		1

Chart Type	Information Category	Information Element	Q1: Should it be displayed to execute procedure?	Q2: Displayed at all times?	Q3: Displayed Initially?	Importance Level
IAP	Procedure Navaid	Navaid Identifier	Yes x^2 (1, N = 106) = 106.00*	No preference x^2 (1, N = 106) = 0.60		2
IAP	Procedure Navaid	Navaid Frequency	Yes x^2 (1, N = 106) = 106.00*	No preference x^2 (1, N = 106) = 0.94		1
IAP	Procedure Navaid	Navaid Morse Code	Yes x^2 (1, N = 106) = 69.77*	No x^2 (1, N = 96) = 57.04*	No preference x^2 (1, N = 85) = 0.01	Not Yet Determined
IAP	Procedure Navaid	DME Availability	Yes x^2 (1, N = 106) = 86.94*	No x^2 (1, N = 101) = 13.55*	Yes x^2 (1, N = 69) = 29.35*	2
IAP	Procedure Navaid	Navaid Class	Yes x^2 (1, N = 105) = 42.75*	No x^2 (1, N = 86) = 60.28*	No preference x^2 (1, N = 79) = 3.66	3
IAP	Procedure Navaid	Navaid Latitude/Longitude	Yes x^2 (1, N = 106) = 10.91*	No x^2 (1, N = 70) = 58.51*	No x^2 (1, N = 67) = 14.34*	3
IAP	Landing Minimums	Minimum Descent Altitude (MDA)	Yes x^2 (1, N = 106) = 106.00*	Yes x^2 (1, N = 106) = 66.57*		1
IAP	Landing Minimums	Minimum Descent Height (MDH)	Yes x^2 (1, N = 106) = 106.00*	Yes x^2 (1, N = 106) = 41.09*		1
IAP	Landing Minimums	Height Above Airport (HAA)	Yes x^2 (1, N = 105) = 101.04*	No preference x^2 (1, N = 104) = 0.04		1
IAP	Landing Minimums	CAT I Decision Altitude (DA)	Yes x^2 (1, N = 104) = 104.00*	Yes x^2 (1, N = 104) = 52.65*		1
IAP	Landing Minimums	CAT II Decision Altitude (DA)	Yes x^2 (1, N = 103) = 103.00*	Yes x^2 (1, N = 103) = 25.25*		1
IAP	Landing Minimums	Decision Height (DH)	Yes x^2 (1, N = 105) = 105.00*	Yes x^2 (1, N = 105) = 62.49*		1
IAP	Landing Minimums	CAT II Radio Altimeter (RA)	Yes x^2 (1, N = 98) = 98.00*	Yes x^2 (1, N = 98) = 5.88*		1
IAP	Landing Minimums	Visibility Requirement	Yes x^2 (1, N = 106) = 102.04*	No preference x^2 (1, N = 105) = 0.01		1
IAP	Missed Approach	Missed Approach Instructions	Yes x^2 (1, N = 106) = 106.00*	Yes x^2 (1, N = 106) = 13.62*		1

Chart Type	Information Category	Information Element	Q1: Should it be displayed to execute procedure?	Q2: Displayed at all times?	Q3: Displayed Initially?	Importance Level
IAP	Missed Approach	Name of Missed Approach Holding Fix	Yes x^2 (1, N = 106) = 106.00*	Yes x^2 (1, N = 106) = 4.57*		1
IAP	Missed Approach	Missed Approach Holding Pattern	Yes x^2 (1, N = 105) = 105.00*	No preference x^2 (1, N = 105) = 3.44		1
IAP	Missed Approach	Location of MAP	Yes x^2 (1, N = 106) = 102.04*	Yes x^2 (1, N = 105) = 24.77*		1
IAP	Missed Approach	Time From FAF to MAP	Yes x^2 (1, N = 106) = 94.34*	No x^2 (1, N = 103) = 14.77*	Yes x^2 (1, N = 71) = 8.80*	Not Yet Determined
IAP	Missed Approach	Distance From FAF to MAP	Yes x^2 (1, N = 106) = 98.15*	No x^2 (1, N = 104) = 3.85*	Yes x^2 (1, N = 62) = 14.52*	2
IAP	Missed Approach	Fix Name/Identifier at MAP	Yes x^2 (1, N = 106) = 98.15*	No preference x^2 (1, N = 104) = 3.12		1
IAP	Holding Pattern	Holding Pattern Depiction	Yes x^2 (1, N = 106) = 106.00*	No preference x^2 (1, N = 106) = 2.42		1
IAP	Holding Pattern	Holding Pattern Courses	Yes x^2 (1, N = 106) = 102.04*	No preference x^2 (1, N = 105) = 0.24		1
IAP	Holding Pattern	Holding Pattern Leg Length	Yes x^2 (1, N = 106) = 102.04*	No x^2 (1, N = 105) = 6.94*	Yes x^2 (1, N = 66) = 13.64*	2
IAP	Holding Pattern	Holding Pattern Time	Yes x^2 (1, N = 106) = 98.15*	No x^2 (1, N = 104) = 12.46*	Yes x^2 (1, N = 70) = 11.20*	2
IAP	Holding Pattern	Holding Pattern Speed	Yes x^2 (1, N = 106) = 94.34*	No x^2 (1, N = 103) = 27.27*	Yes x^2 (1, N = 78) = 13.13*	2
IAP	Holding Pattern	Holding Pattern Altitude	Yes x^2 (1, N = 106) = 102.04*	No preference x^2 (1, N = 105) = 0.47		1
IAP	Communications	ATIS Arrival Frequency	Yes x^2 (1, N = 106) = 102.04*	No x^2 (1, N = 105) = 45.34*	Yes x^2 (1, N = 87) = 15.74*	2
IAP	Communications	Departure Control Frequency	Yes x^2 (1, N = 106) = 86.94*	No x^2 (1, N = 101) = 16.64*	Yes x^2 (1, N = 71) = 13.54*	2
IAP	Communications	Tower Frequency	Yes x^2 (1, N = 106) = 106.00*	Yes x^2 (1, N = 106) = 6.38*		1

Chart Type	Information Category	Information Element	Q1: Should it be displayed to execute procedure?	Q2: Displayed at all times?	Q3: Displayed Initially?	Importance Level
IAP	Communications	Ground Frequency	Yes x^2 (1, N = 106) = 98.15*	No preference x^2 (1, N = 104) = 0.62		2
IAP	Communications	Approach Frequency	Yes x^2 (1, N = 106) = 94.34*	No preference x^2 (1, N = 103) = 0.01		Not Yet Determined
IAP	Communications	Clearance Frequency	Yes x^2 (1, N = 106) = 66.57*	No x^2 (1, N = 95) = 44.47*	Yes x^2 (1, N = 80) = 4.05*	2
IAP	Communications	ATIS Departure Frequency	Yes x^2 (1, N = 106) = 66.57*	No x^2 (1, N = 95) = 47.25*	No preference x^2 (1, N = 81) = 2.78	2
IAP	Communications	Helicopter Frequency	Yes x^2 (1, N = 92) = 25.04*	No x^2 (1, N = 70) = 51.43*	No x^2 (1, N = 65) = 5.55*	3
IAP	Navigation	Procedure Track	Yes x^2 (1, N = 105) = 105.00*	Yes x^2 (1, N = 105) = 40.24*		1
IAP	Navigation	Procedure Magnetic Course	Yes x^2 (1, N = 104) = 100.04*	Yes x^2 (1, N = 103) = 11.89*		1
IAP	Navigation	Procedure Track Altitude	Yes x^2 (1, N = 105) = 105.00*	Yes x^2 (1, N = 105) = 26.75*		1
IAP	Navigation	Procedure Track Mileage	Yes x^2 (1, N = 105) = 101.04*	No preference x^2 (1, N = 104) = 0.96		1
IAP	Navigation	Procedure Turn Outbound Course	Yes x^2 (1, N = 106) = 106.00*	Yes x^2 (1, N = 106) = 8.49*		1
IAP	Navigation	Procedure Turn Altitude	Yes x^2 (1, N = 105) = 105.00*	Yes x^2 (1, N = 105) = 21.04*		1
IAP	Navigation	Procedure Turn Distance Limit	Yes x^2 (1, N = 105) = 105.00*	No preference x^2 (1, N = 105) = 2.14		1
IAP	Navaids in the Vicinity of the Procedure	Navaid Symbol	Yes x^2 (1, N = 106) = 94.34*	No preference x^2 (1, N = 103) = 0.79		Not Yet Determined
IAP	Navaids in the Vicinity of the Procedure	Navaid Name	Yes x^2 (1, N = 106) = 90.60*	No x^2 (1, N = 102) = 11.33*	Yes x^2 (1, N = 68) = 19.06*	2
IAP	Navaids in the Vicinity of the Procedure	Navaid Identifier	Yes x^2 (1, N = 105) = 97.15*	No x^2 (1, N = 103) = 13.29*	Yes x^2 (1, N = 70) = 9.66*	2

Chart Type	Information Category	Information Element	Q1: Should it be displayed to execute procedure?	Q2: Displayed at all times?	Q3: Displayed Initially?	Importance Level
IAP	Navaids in the Vicinity of the Procedure	Navaid Frequency	Yes x^2 (1, N = 106) = 94.34*	No x^2 (1, N = 103) = 14.77*	Yes x^2 (1, N = 71) = 8.80*	Not Yet Determined
IAP	Navaids in the Vicinity of the Procedure	Navaid Morse Code	Yes x^2 (1, N = 106) = 51.66*	No x^2 (1, N = 90) = 71.11*	No preference x^2 (1, N = 85) = 0.58	Not Yet Determined
IAP	Navaids in the Vicinity of the Procedure	DME Availability	Yes x^2 (1, N = 105) = 78.87*	No x^2 (1, N = 98) = 62.08*	Yes x^2 (1, N = 88) = 10.23*	2
IAP	Navaids in the Vicinity of the Procedure	Navaid Class	Yes x^2 (1, N = 106) = 29.58*	No x^2 (1, N = 81) = 65.79*	No preference x^2 (1, N = 77) = 2.19	3
IAP	Navaids in the Vicinity of the Procedure	Navaid Latitude/Longitude	Yes x^2 (1, N = 106) = 12.23*	No x^2 (1, N = 71) = 67.06*	No x^2 (1, N = 70) = 8.23*	3
IFR	Identification	Revision Date (i.e., Start and Finish)	Yes x^2 (1, N = 106) = 83.36*	No x^2 (1, N = 100) = 64.00*	Yes x^2 (1, N = 90) = 14.40*	2
IFR	Identification	Chart Description (e.g., High, Low, etc.)	Yes x^2 (1, N = 106) = 83.36*	No x^2 (1, N = 100) = 16.00*	Yes x^2 (1, N = 70) = 32.91*	2
IFR	Geography	Range	Yes x^2 (1, N = 103) = 83.97*	No x^2 (1, N = 98) = 16.33*	Yes x^2 (1, N = 69) = 15.78*	2
IFR	Geography	Indication of Area Chart Coverage	Yes x^2 (1, N = 104) = 84.96*	No x^2 (1, N = 99) = 37.59*	Yes x^2 (1, N = 80) = 22.05*	2
IFR	Geography	Parallels and Meridians	Yes x^2 (1, N = 102) = 75.92*	No x^2 (1, N = 95) = 39.17*	Yes x^2 (1, N = 78) = 5.13*	2
IFR	Geography	Water Features	Yes x^2 (1, N = 106) = 79.85*	No x^2 (1, N = 99) = 11.00*	Yes x^2 (1, N = 66) = 17.52*	2
IFR	Geography	Contour Interval Legend	Yes x^2 (1, N = 106) = 76.42*	No x^2 (1, N = 98) = 47.18*	No preference x^2 (1, N = 83) = 2.04	2
IFR	Geography	Spot Elevations	Yes x^2 (1, N = 104) = 88.62*	No x^2 (1, N = 100) = 5.76*	Yes x^2 (1, N = 62) = 14.52*	2
IFR	Obstacle	Obstacle Symbols and Elevation (e.g., man made, exceptionally high)	Yes x^2 (1, N = 106) = 102.04*	No preference x^2 (1, N = 105) = 0.01		1

Chart Type	Information Category	Information Element	Q1: Should it be displayed to execute procedure?	Q2: Displayed at all times?	Q3: Displayed Initially?	Importance Level
IFR	Minimum Area/Sector Altitudes	Area Minimum Altitudes - OROCA, Sector Altitudes (Grid MORA Outside of US)	Yes x^2 (1, N = 106) = 106.00*	No preference x^2 (1, N = 106) = 0.34		1
IFR	Communications	Graphical Portrayal of Radio Frequency Sector Boundaries	Yes x^2 (1, N = 106) = 106.00*	No x^2 (1, N = 106) = 16.64*	Yes x^2 (1, N = 74) = 5.41*	2
IFR	Communications	Voice Frequencies associated with Navaid Facility Boxes	Yes x^2 (1, N = 105) = 101.04*	No x^2 (1, N = 104) = 26.00*	No preference x^2 (1, N = 78) = 0.21	2
IFR	Communications	FIR/UIR, Control, ARTCC, etc., Frequency Boxes	Yes x^2 (1, N = 104) = 100.04*	No x^2 (1, N = 103) = 7.08*	No preference x^2 (1, N = 65) = 3.46	2
IFR	Communications	Call and Frequencies of In-Flight Weather Stations	Yes x^2 (1, N = 105) = 89.61*	No x^2 (1, N = 101) = 44.45*	No x^2 (1, N = 84) = 10.71*	3
IFR	Communications	Company Specific Frequencies (tailored communications)	Yes x^2 (1, N = 102) = 56.63*	No x^2 (1, N = 89) = 66.62*	No preference x^2 (1, N = 83) = 2.71	3
IFR	Airspace Boundaries	Unit Providing Area Control Service	Yes x^2 (1, N = 102) = 98.04*	No x^2 (1, N = 101) = 15.06*	Yes x^2 (1, N = 70) = 4.63*	2
IFR	Airspace Boundaries	Control Zone (CTR) Boundaries	Yes x^2 (1, N = 103) = 95.16*	No x^2 (1, N = 101) = 8.33*	Yes x^2 (1, N = 65) = 6.78*	2
IFR	Airspace Boundaries	Name of CTR	Yes x^2 (1, N = 104) = 84.96*	No x^2 (1, N = 99) = 13.83*	Yes x^2 (1, N = 68) = 9.94*	2
IFR	Airspace Boundaries	CTR Vertical Limits	Yes x^2 (1, N = 101) = 81.99*	No x^2 (1, N = 96) = 32.67*	No preference x^2 (1, N = 76) = 1.32	Not Yet Determined
IFR	Airspace Boundaries	Airspace Class Vertical Limits	Yes x^2 (1, N = 104) = 84.96*	No x^2 (1, N = 99) = 30.56*	No preference x^2 (1, N = 77) = 2.19	2
IFR	Airspace Boundaries	Airspace Class Notes	Yes x^2 (1, N = 104) = 88.62*	No x^2 (1, N = 100) = 88.36*	No preference x^2 (1, N = 97) = 2.32	2

Chart Type	Information Category	Information Element	Q1: Should it be displayed to execute procedure?	Q2: Displayed at all times?	Q3: Displayed Initially?	Importance Level
IFR	Airspace Boundaries	FIR/UIR Boundaries	Yes x^2 (1, N = 101) = 93.16*	No x^2 (1, N = 99) = 5.34*	Yes x^2 (1, N = 61) = 13.79*	Not Yet Determined
IFR	Airspace Boundaries	Name of FIR/UIR	Yes x^2 (1, N = 101) = 93.16*	No x^2 (1, N = 99) = 18.68*	Yes x^2 (1, N = 71) = 13.54*	2
IFR	Airspace Boundaries	ID of FIR/UIR	Yes x^2 (1, N = 101) = 93.16*	No x^2 (1, N = 99) = 28.37*	Yes x^2 (1, N = 76) = 6.37*	2
IFR	Airspace Boundaries	Unit Providing Service	Yes x^2 (1, N = 99) = 91.16*	No x^2 (1, N = 97) = 46.28*	Yes x^2 (1, N = 82) = 9.56*	2
IFR	Airspace Boundaries	Name of TMA	Yes x^2 (1, N = 84) = 76.19*	No x^2 (1, N = 82) = 43.90*	Yes x^2 (1, N = 71) = 4.07*	2
IFR	Airspace Boundaries	TMA Vertical Limits	Yes x^2 (1, N = 84) = 76.19*	No x^2 (1, N = 82) = 49.95*	Yes x^2 (1, N = 73) = 3.96*	2
IFR	Airspace Boundaries	Special Use Airspace - Prohibited, Restricted, Danger Boundaries	Yes x^2 (1, N = 106) = 106.00*	Yes x^2 (1, N = 106) = 9.66*		1
IFR	Airspace Boundaries	Special Use Airspace ID and Vertical limits	Yes x^2 (1, N = 106) = 106.00*	No preference x^2 (1, N = 106) = 2.42		1
IFR	Airspace Boundaries	Special Use Airspace - Other - Boundaries	Yes x^2 (1, N = 105) = 101.04*	No x^2 (1, N = 104) = 7.54*	Yes x^2 (1, N = 66) = 26.73*	Not Yet Determined
IFR	Airspace Boundaries	Air Defense Identification Zones (ADIZ)	Yes x^2 (1, N = 106) = 98.15*	No preference x^2 (1, N = 104) = 0.62		1
IFR	Airspace Boundaries	Altimeter Setting Regions (i.e., lowest ALT for QNH)	Yes x^2 (1, N = 103) = 87.62*	No x^2 (1, N = 99) = 18.68*	Yes x^2 (1, N = 71) = 8.80*	2
IFR	Airspace Boundaries	Indication of Areas of RNP, RVSM, MNPS, etc., Requirements	Yes x^2 (1, N = 100) = 92.16*	No x^2 (1, N = 98) = 29.76*	Yes x^2 (1, N = 76) = 10.32*	2
IFR	Airspace Boundaries	Time Zone Boundaries	Yes x^2 (1, N = 106) = 41.09*	No x^2 (1, N = 86) = 53.77*	No preference x^2 (1, N = 77) = 2.19	3

Chart Type	Information Category	Information Element	Q1: Should it be displayed to execute procedure?	Q2: Displayed at all times?	Q3: Displayed Initially?	Importance Level
IFR	Airspace Boundaries	Airway Designator	Yes x^2 (1, N = 104) = 104.00*	No preference x^2 (1, N = 104) = 1.38		1
IFR	Airspace Boundaries	Indication of one-way airways	Yes x^2 (1, N = 106) = 102.04*	No preference x^2 (1, N = 105) = 1.15		1
IFR	Airspace Boundaries	Segment Mileages	Yes x^2 (1, N = 106) = 102.04*	No preference x^2 (1, N = 105) = 0.77		Not Yet Determined
IFR	Airspace Boundaries	Segment Upper Limit or MAA	Yes x^2 (1, N = 101) = 93.16*	No x^2 (1, N = 99) = 24.25*	Yes x^2 (1, N = 74) = 26.16*	2
IFR	Airspace Boundaries	Indication of MEA Change at Segment End	Yes x^2 (1, N = 104) = 96.15*	No preference x^2 (1, N = 102) = 0.98		2
IFR	Airspace Boundaries	Segment MORA	Yes x^2 (1, N = 99) = 91.16*	No x^2 (1, N = 97) = 5.45*	Yes x^2 (1, N = 60) = 19.27*	2
IFR	Airspace Boundaries	Holding Pattern restrictions	Yes x^2 (1, N = 106) = 98.15*	No x^2 (1, N = 104) = 15.38*	Yes x^2 (1, N = 72) = 24.50*	2
IFR	Airspace Boundaries	Intersection, Waypoint, or Fix Symbol	Yes x^2 (1, N = 105) = 105.00*	Yes x^2 (1, N = 105) = 19.29*		1
IFR	Airspace Boundaries	Intersection, Waypoint, or Fix ID of VOR, FREQ, MAG BRG	Yes x^2 (1, N = 105) = 101.04*	Yes x^2 (1, N = 104) = 4.65*		1
IFR	Airspace Boundaries	Intersection, Waypoint, or Fix Coordinates	Yes x^2 (1, N = 106) = 76.42*	No x^2 (1, N = 98) = 41.80*	No preference x^2 (1, N = 81) = 2.09	3
IFR	Airspace Boundaries	Indication of MET Report Required	Yes x^2 (1, N = 91) = 65.15*	No x^2 (1, N = 84) = 3.86*	Yes x^2 (1, N = 51) = 5.67*	2
IFR	Airspace Boundaries	Minimum Reception Altitude (MRA)	Yes x^2 (1, N = 106) = 98.15*	No x^2 (1, N = 104) = 16.96*	Yes x^2 (1, N = 73) = 14.92*	2
IFR	Airspace Boundaries	Computer Navigation Fix (CNF) and ID	Yes x^2 (1, N = 92) = 84.17*	No x^2 (1, N = 90) = 17.78*	Yes x^2 (1, N = 65) = 16.75*	2
IFR	Airspace Boundaries	Procedural Data Notes	Yes x^2 (1, N = 101) = 93.16*	No x^2 (1, N = 99) = 83.65*	Yes x^2 (1, N = 95) = 6.58*	2

Chart Type	Information Category	Information Element	Q1: Should it be displayed to execute procedure?	Q2: Displayed at all times?	Q3: Displayed Initially?	Importance Level
IFR	Airways	Airway Symbol (center line)	Yes x^2 (1, N = 105) = 105.00*	Yes x^2 (1, N = 105) = 45.34*		1
IFR	Airways	Airway Magnetic Course	Yes x^2 (1, N = 106) = 98.15*	Yes x^2 (1, N = 104) = 18.62*		1
IFR	Airways	Times of one-way direction	Yes x^2 (1, N = 105) = 97.15*	No x^2 (1, N = 103) = 17.95*	Yes x^2 (1, N = 73) = 30.26*	2
IFR	Airways	Total Distance Between Navaids	Yes x^2 (1, N = 106) = 102.04*	No preference x^2 (1, N = 105) = 0.01		Not Yet Determined
IFR	Airways	Segment Minimum Cruising Level or MEA	Yes x^2 (1, N = 105) = 105.00*	No preference x^2 (1, N = 105) = 3.44		1
IFR	Airways	Segment MOCA	Yes x^2 (1, N = 106) = 106.00*	No preference x^2 (1, N = 106) = 0.94		Not Yet Determined
IFR	Airways	Holding Patterns	Yes x^2 (1, N = 106) = 102.04*	No preference x^2 (1, N = 105) = 1.15		1
IFR	Airways	VOR Change Over Point with Distances	Yes x^2 (1, N = 105) = 89.61*	No preference x^2 (1, N = 101) = 0.09		Not Yet Determined
IFR	Airways	Intersection, Waypoint, or Fix Name	Yes x^2 (1, N = 105) = 105.00*	Yes x^2 (1, N = 105) = 22.87*		1
IFR	Airways	Intersection, Waypoint, or Fix Distance from Reference DME	Yes x^2 (1, N = 106) = 106.00*	No preference x^2 (1, N = 106) = 3.77		1
IFR	Airways	Indication of compulsory reporting	Yes x^2 (1, N = 104) = 100.04*	Yes x^2 (1, N = 103) = 31.54*		1
IFR	Airways	Fix Formation bearing, frequency, ID of Remote Navaid	Yes x^2 (1, N = 100) = 96.04*	No x^2 (1, N = 99) = 6.31*	Yes x^2 (1, N = 62) = 31.23*	2
IFR	Airways	Minimum Crossing Altitude (MCA)	Yes x^2 (1, N = 105) = 97.15*	Yes x^2 (1, N = 103) = 9.33*		1
IFR	Airways	Transition Text	Yes x^2 (1, N = 96) = 84.38*	No x^2 (1, N = 93) = 63.75*	Yes x^2 (1, N = 85) = 12.81*	2

Chart Type	Information Category	Information Element	Q1: Should it be displayed to execute procedure?	Q2: Displayed at all times?	Q3: Displayed Initially?	Importance Level
IFR	Airways	General Notes	Yes x^2 (1, N = 103) = 87.62*	No x^2 (1, N = 99) = 87.36*	No preference x^2 (1, N = 96) = 2.67	2
IFR	Navigation Aids	Navaid Symbol	Yes x^2 (1, N = 106) = 106.00*	Yes x^2 (1, N = 106) = 36.26*		1
IFR	Navigation Aids	Navaid Name	Yes x^2 (1, N = 106) = 106.00*	Yes x^2 (1, N = 106) = 4.57*		1
IFR	Navigation Aids	Navaid Identifier	Yes x^2 (1, N = 106) = 106.00*	No preference x^2 (1, N = 106) = 3.77		1
IFR	Navigation Aids	Navaid Frequency	Yes x^2 (1, N = 106) = 102.04*	No preference x^2 (1, N = 105) = 2.75		1
IFR	Navigation Aids	Navaid Coordinates	Yes x^2 (1, N = 104) = 58.50*	No x^2 (1, N = 91) = 58.56*	No preference x^2 (1, N = 82) = 2.39	3
IFR	Navigation Aids	Navaid Class (e.g., H, T, and L)	Yes x^2 (1, N = 105) = 59.44*	No x^2 (1, N = 92) = 69.57*	No preference x^2 (1, N = 86) = 2.28	3
IFR	Navigation Aids	Navaid Station Declination	Yes x^2 (1, N = 97) = 54.94*	No x^2 (1, N = 85) = 81.05*	No x^2 (1, N = 84) = 3.86*	3
IFR	Navigation Aids	DME Antenna Elevation	Yes x^2 (1, N = 102) = 20.75*	No x^2 (1, N = 74) = 66.22*	No x^2 (1, N = 72) = 9.39*	3
IFR	Navigation Aids	Indication of True North Navaids	Yes x^2 (1, N = 103) = 54.61*	No x^2 (1, N = 89) = 36.51*	No preference x^2 (1, N = 73) = 0.12	3
IFR	Navigation Aids	Notes on Navaid Operational Status	Yes x^2 (1, N = 106) = 79.85*	No x^2 (1, N = 99) = 87.36*	No preference x^2 (1, N = 96) = 0.38	2
IFR	Navigation Aids	Broadcast Stations or Marine Beacons	Yes x^2 (1, N = 101) = 47.14*	No x^2 (1, N = 85) = 81.05*	No x^2 (1, N = 84) = 5.76*	3
IFR	Airport Information	Airport Symbol if for IFR use (includes suitable symbol type)	Yes x^2 (1, N = 106) = 106.00*	Yes x^2 (1, N = 106) = 8.49*		1
IFR	Airport Information	Airport Identifier if for IFR use	Yes x^2 (1, N = 106) = 106.00*	Yes x^2 (1, N = 106) = 8.49*		1

Chart Type	Information Category	Information Element	Q1: Should it be displayed to execute procedure?	Q2: Displayed at all times?	Q3: Displayed Initially?	Importance Level
IFR	Airport Information	Airport Attributes if for IFR use	Yes x^2 (1, N = 106) = 106.00*	No x^2 (1, N = 106) = 18.26*	Yes x^2 (1, N = 75) = 7.05*	2
IFR	Airport Information	Airport Symbol if for VFR use (includes suitable symbol type)	Yes x^2 (1, N = 105) = 85.95*	No x^2 (1, N = 100) = 23.04*	No preference x^2 (1, N = 74) = 1.35	2
IFR	Airport Information	Airport Identifier if for VFR use	Yes x^2 (1, N = 104) = 88.62*	No x^2 (1, N = 100) = 25.00*	No preference x^2 (1, N = 75) = 1.08	2
IFR	Airspace Boundaries	Unit Providing Approach Control Service	Yes x^2 (1, N = 105) = 97.15*	No x^2 (1, N = 103) = 17.95*	Yes x^2 (1, N = 73) = 18.75*	2
IFR	Airspace Boundaries	Airspace Class Boundaries	Yes x^2 (1, N = 106) = 94.34*	No preference x^2 (1, N = 103) = 1.17		1
IFR	Airspace Boundaries	Airspace Class Type	Yes x^2 (1, N = 106) = 98.15*	No preference x^2 (1, N = 104) = 1.88		Not Yet Determined
IFR	Airspace Boundaries	Airspace Class Name or Call Sign	Yes x^2 (1, N = 106) = 98.15*	No x^2 (1, N = 104) = 7.54*	Yes x^2 (1, N = 66) = 32.06*	2
IFR	Airspace Boundaries	FIR/UIR Vertical Limits	Yes x^2 (1, N = 101) = 93.16*	No x^2 (1, N = 99) = 28.37*	Yes x^2 (1, N = 76) = 23.21*	Not Yet Determined
IFR	Airspace Boundaries	Terminal Control Area (TMA) Boundaries	Yes x^2 (1, N = 105) = 97.15*	No x^2 (1, N = 103) = 17.95*	Yes x^2 (1, N = 73) = 11.52*	2
IFR	Geography	International Boundaries (higher criticality where appropriate)	Yes x^2 (1, N = 103) = 95.16*	No preference x^2 (1, N = 101) = 0.01		1
IFR	Geography	Terrain Contour Elevations	Yes x^2 (1, N = 106) = 86.94*	No x^2 (1, N = 101) = 9.51*	Yes x^2 (1, N = 66) = 17.52*	2
IFR	Geography	Terrain Contours	Yes x^2 (1, N = 104) = 88.62*	No x^2 (1, N = 100) = 9.00*	Yes x^2 (1, N = 65) = 16.75*	2
IFR	Navigation Aids	Navaid Morse Code	Yes x^2 (1, N = 105) = 59.44*	No x^2 (1, N = 92) = 59.52*	No x^2 (1, N = 83) = 5.31*	2

Chart Type	Information Category	Information Element	Q1: Should it be displayed to execute procedure?	Q2: Displayed at all times?	Q3: Displayed Initially?	Importance Level
IFR	Airport Information	Airport Attributes if for VFR use	Yes x^2 (1, N = 104) = 67.85*	No x^2 (1, N = 94) = 75.06*	No preference x^2 (1, N = 89) = 1.90	Not Yet Determined
STAR	Identification	Revision Date	Yes x^2 (1, N = 110) = 20.95*	No x^2 (1, N = 79) = 50.24*	Yes x^2 (1, N = 71) = 4.07*	2
STAR	Identification	Chart Index Number/Page Number	No preference x^2 (1, N = 108) = 3.00			4
STAR	Identification	Effective Date	Yes x^2 (1, N = 110) = 42.04*	No x^2 (1, N = 89) = 47.47*	Yes x^2 (1, N = 77) = 10.92*	2
STAR	Identification	City/Location Name	Yes x^2 (1, N = 110) = 76.95*	No x^2 (1, N = 101) = 6.19*	Yes x^2 (1, N = 63) = 21.73*	2
STAR	Identification	Airport Name	Yes x^2 (1, N = 110) = 90.91*	No preference x^2 (1, N = 105) = 1.15		Not Yet Determined
STAR	Identification	Airport ICAO Identifier	Yes x^2 (1, N = 110) = 102.15*	Yes x^2 (1, N = 108) = 9.48*		1
STAR	Identification	Procedure Name (e.g., Canoga Eight)	Yes x^2 (1, N = 110) = 110.00*	Yes x^2 (1, N = 110) = 19.24*		1
STAR	Identification	Procedure Identifier (e.g., CNOG8.VNY)	Yes x^2 (1, N = 110) = 106.04*	No preference x^2 (1, N = 109) = 2.65		1
STAR	Identification	Changes	Yes x^2 (1, N = 100) = 40.96*	No x^2 (1, N = 82) = 43.90*	Yes x^2 (1, N = 71) = 10.27*	2
STAR	Geography	Range	Yes x^2 (1, N = 98) = 82.65*	No preference x^2 (1, N = 94) = 0.04		1
STAR	Geography	Neat Lines (i.e., the lines which separate the chart from the margins)	Yes x^2 (1, N = 105) = 24.77*	No x^2 (1, N = 78) = 7.38*	No preference x^2 (1, N = 51) = 1.59	Not Yet Determined
STAR	Geography	Parallels and Meridians with AMAs, OROCAs, MORAs	Yes x^2 (1, N = 104) = 74.46*	No x^2 (1, N = 96) = 18.38*	No preference x^2 (1, N = 69) = 0.13	3
STAR	Geography	Parallels and Meridians	Yes x^2 (1, N = 103) = 36.13*	No x^2 (1, N = 82) = 46.88*	No preference x^2 (1, N = 72) = 2.72	3

Chart Type	Information Category	Information Element	Q1: Should it be displayed to execute procedure?	Q2: Displayed at all times?	Q3: Displayed Initially?	Importance Level
STAR	Geography	Water Features	Yes x^2 (1, N = 110) = 61.13*	No x^2 (1, N = 96) = 26.04*	No preference x^2 (1, N = 73) = 0.67	Not Yet Determined
STAR	Geography	Cultural Features	Yes x^2 (1, N = 106) = 29.58*	No x^2 (1, N = 81) = 32.11*	No preference x^2 (1, N = 66) = 0.06	Not Yet Determined
STAR	Geography	Terrain Contours	Yes x^2 (1, N = 109) = 101.15*	No preference x^2 (1, N = 107) = 2.10		1
STAR	Geography	Terrain Contour Elevations	Yes x^2 (1, N = 110) = 102.15*	No preference x^2 (1, N = 108) = 1.33		Not Yet Determined
STAR	Geography	Contour Interval Legend	Yes x^2 (1, N = 108) = 85.33*	No x^2 (1, N = 102) = 50.82*	No preference x^2 (1, N = 87) = 0.93	3
STAR	Geography	Spot Elevations	Yes x^2 (1, N = 108) = 92.59*	No preference x^2 (1, N = 104) = 0.04		1
STAR	Geography	Highest Reference Point (within neat lines)	Yes x^2 (1, N = 109) = 101.15*	Yes x^2 (1, N = 107) = 4.12*		1
STAR	Geography	International Boundaries (higher criticality where appropriate)	Yes x^2 (1, N = 107) = 95.34*	No x^2 (1, N = 104) = 7.54*	Yes x^2 (1, N = 66) = 13.64*	Not Yet Determined
STAR	Obstacle	Obstacle Symbols and Elevation	Yes x^2 (1, N = 107) = 107.00*	Yes x^2 (1, N = 107) = 7.86*		1
STAR	Minimum Area/Sector Altitudes	MSA Reference Point/Center	Yes x^2 (1, N = 110) = 98.33*	No preference x^2 (1, N = 107) = 0.23		Not Yet Determined
STAR	Minimum Area/Sector Altitudes	MSA Distance when other than 25nm	Yes x^2 (1, N = 110) = 102.15*	No preference x^2 (1, N = 108) = 2.37		Not Yet Determined
STAR	Minimum Area/Sector Altitudes	MSA Sector Radials	Yes x^2 (1, N = 109) = 109.00*	No preference x^2 (1, N = 109) = 2.65		Not Yet Determined
STAR	Minimum Area/Sector Altitudes	MSA Minimum Altitudes	Yes x^2 (1, N = 109) = 109.00*	Yes x^2 (1, N = 109) = 5.73*		1
STAR	Minimum Area/Sector Altitudes	Minimum Radar Altitudes and Sectors	Yes x^2 (1, N = 110) = 110.00*	No x^2 (1, N = 110) = 8.18*	Yes x^2 (1, N = 70) = 4.63*	2

Chart Type	Information Category	Information Element	Q1: Should it be displayed to execute procedure?	Q2: Displayed at all times?	Q3: Displayed Initially?	Importance Level
STAR	Minimum Area/Sector Altitudes	AMA, OROCA, or grid MORA where established	Yes x^2 (1, N = 104) = 88.62*	No x^2 (1, N = 100) = 6.76*	No preference x^2 (1, N = 63) = 1.92	Not Yet Determined
STAR	Navigation	FIR/UIR Boundaries	Yes x^2 (1, N = 94) = 55.15*	No x^2 (1, N = 83) = 33.84*	No preference x^2 (1, N = 68) = 0.53	Not Yet Determined
STAR	Navigation	Prohibited, Restricted and Danger Airspace Graphic	Yes x^2 (1, N = 110) = 110.00*	Yes x^2 (1, N = 110) = 4.40*		1
STAR	Navigation	Prohibited, Restricted and Danger Airspace Label	Yes x^2 (1, N = 109) = 109.00*	No x^2 (1, N = 109) = 5.73*	Yes x^2 (1, N = 67) = 12.55*	Not Yet Determined
STAR	Navigation	Prohibited, Restricted and Danger Airspace Narrative	Yes x^2 (1, N = 110) = 90.91*	No x^2 (1, N = 105) = 40.24*	No preference x^2 (1, N = 85) = 0.95	2
STAR	Navigation	Special Use Airspace - Other	Yes x^2 (1, N = 109) = 93.59*	No x^2 (1, N = 105) = 26.75*	Yes x^2 (1, N = 79) = 15.51*	2
STAR	Navigation	Transition Level	Yes x^2 (1, N = 104) = 81.38*	No x^2 (1, N = 98) = 8.00*	Yes x^2 (1, N = 63) = 21.73*	2
STAR	Airport Information	Primary Airport Shaded Area	Yes x^2 (1, N = 108) = 92.59*	Yes x^2 (1, N = 104) = 6.50*		1
STAR	Airport Information	Primary Airport elevation	Yes x^2 (1, N = 110) = 87.31*	No preference x^2 (1, N = 104) = 3.12		1
STAR	Airport Information	Primary Airport Runway Layout	Yes x^2 (1, N = 110) = 98.33*	Yes x^2 (1, N = 107) = 20.64*		1
STAR	Airport Information	Other Airport Symbols	Yes x^2 (1, N = 108) = 88.93*	No x^2 (1, N = 103) = 43.58*	Yes x^2 (1, N = 85) = 14.41*	2
STAR	Airport Information	Other Airport Names	Yes x^2 (1, N = 109) = 72.67*	No x^2 (1, N = 99) = 53.83*	Yes x^2 (1, N = 86) = 4.65*	2
STAR	Airport Information	Other Airport Elevations	Yes x^2 (1, N = 108) = 50.70*	No x^2 (1, N = 91) = 61.81*	No preference x^2 (1, N = 83) = 0.11	3
STAR	Airport Information	Distances from last STAR fix to airport	Yes x^2 (1, N = 110) = 98.33*	No preference x^2 (1, N = 107) = 0.46		Not Yet Determined

Chart Type	Information Category	Information Element	Q1: Should it be displayed to execute procedure?	Q2: Displayed at all times?	Q3: Displayed Initially?	Importance Level
STAR	Navaid Used to Form Leg of Procedure	Navaid Symbol	Yes x^2 (1, N = 109) = 109.00*	Yes x^2 (1, N = 109) = 36.41*		1
STAR	Navaid Used to Form Leg of Procedure	Navaid Name	Yes x^2 (1, N = 110) = 110.00*	Yes x^2 (1, N = 110) = 14.55*		1
STAR	Navaid Used to Form Leg of Procedure	Navaid Identifier	Yes x^2 (1, N = 109) = 105.04*	Yes x^2 (1, N = 108) = 27.00*		1
STAR	Navaid Used to Form Leg of Procedure	Navaid Frequency/Channel	Yes x^2 (1, N = 110) = 106.04*	Yes x^2 (1, N = 109) = 27.75*		1
STAR	Navaid Used to Form Leg of Procedure	Navaid Morse Code	Yes x^2 (1, N = 109) = 82.80*	No x^2 (1, N = 102) = 50.82*	Yes x^2 (1, N = 87) = 4.15*	2
STAR	Navaid Used to Form Leg of Procedure	DME Availability (Text information)	Yes x^2 (1, N = 109) = 97.33*	No x^2 (1, N = 106) = 15.09*	Yes x^2 (1, N = 73) = 7.25*	2
STAR	Navaid Used to Form Leg of Procedure	Navaid Class	Yes x^2 (1, N = 108) = 53.48*	No x^2 (1, N = 92) = 69.57*	No preference x^2 (1, N = 86) = 0.42	3
STAR	Navaid Used to Form Leg of Procedure	Navaid Latitude/Longitude	Yes x^2 (1, N = 109) = 22.03*	No x^2 (1, N = 79) = 53.48*	No x^2 (1, N = 72) = 10.89*	3
STAR	Navaid Used to Form Fixes	Navaid Symbol	Yes x^2 (1, N = 110) = 98.33*	Yes x^2 (1, N = 107) = 17.28*		1
STAR	Navaid Used to Form Fixes	Navaid Name	Yes x^2 (1, N = 110) = 98.33*	Yes x^2 (1, N = 107) = 6.81*		1
STAR	Navaid Used to Form Fixes	Navaid Identifier	Yes x^2 (1, N = 110) = 98.33*	Yes x^2 (1, N = 107) = 30.36*		1
STAR	Navaid Used to Form Fixes	Navaid Frequency/Channel	Yes x^2 (1, N = 109) = 101.15*	Yes x^2 (1, N = 107) = 24.31*		1
STAR	Navaid Used to Form Fixes	Navaid Morse Code	Yes x^2 (1, N = 110) = 70.40*	No x^2 (1, N = 99) = 50.92*	No preference x^2 (1, N = 85) = 2.65	Not Yet Determined
STAR	Navaid Used to Form Fixes	DME Availability (Text information)	Yes x^2 (1, N = 109) = 79.35*	No x^2 (1, N = 101) = 18.31*	No preference x^2 (1, N = 72) = 0.89	2
STAR	Navaid Used to Form Fixes	Navaid Class	Yes x^2 (1, N = 107) = 37.09*	No x^2 (1, N = 85) = 52.81*	No preference x^2 (1, N = 76) = 1.89	3

Chart Type	Information Category	Information Element	Q1: Should it be displayed to execute procedure?	Q2: Displayed at all times?	Q3: Displayed Initially?	Importance Level
STAR	Navaid Used to Form Fixes	Navaid Latitude/Longitude	Yes x^2 (1, N = 110) = 20.95*	No x^2 (1, N = 79) = 53.48*	No x^2 (1, N = 72) = 5.56*	3
STAR	Navaid Used to Form Fixes	Navaid Radials/Bearings that form fixes	Yes x^2 (1, N = 110) = 102.15*	No preference x^2 (1, N = 108) = 1.81		1
STAR	Navaid Used to Form Fixes	DME Distances that form fixes	Yes x^2 (1, N = 108) = 104.04*	Yes x^2 (1, N = 107) = 10.18*		1
STAR	Instrument Procedure Courses/Tracks	Symbol (e.g., line style, etc.)	Yes x^2 (1, N = 105) = 101.04*	Yes x^2 (1, N = 104) = 36.96*		1
STAR	Instrument Procedure Courses/Tracks	Identifier (i.e., CNOG8.AVE)	Yes x^2 (1, N = 106) = 106.00*	Yes x^2 (1, N = 106) = 8.49*		1
STAR	Course Definition	Heading	Yes x^2 (1, N = 109) = 105.04*	Yes x^2 (1, N = 108) = 59.26*		1
STAR	Course Definition	Track	Yes x^2 (1, N = 108) = 108.00*	Yes x^2 (1, N = 108) = 59.26*		1
STAR	Course Definition	Radial	Yes x^2 (1, N = 109) = 109.00*	Yes x^2 (1, N = 109) = 69.44*		1
STAR	Course Definition	Segment Mileages	Yes x^2 (1, N = 110) = 106.04*	Yes x^2 (1, N = 109) = 23.86*		1
STAR	Course Definition	MEA/MOCA	Yes x^2 (1, N = 110) = 98.33*	No preference x^2 (1, N = 107) = 0.76		1
STAR	Course Definition	VOR Change Over Points	Yes x^2 (1, N = 110) = 94.58*	No preference x^2 (1, N = 106) = 0.04		Not Yet Determined
STAR	Holding Pattern	Holding Pattern Depiction	Yes x^2 (1, N = 110) = 110.00*	Yes x^2 (1, N = 110) = 11.78*		1
STAR	Holding Pattern	Holding Pattern Courses	Yes x^2 (1, N = 110) = 110.00*	Yes x^2 (1, N = 110) = 6.15*		1
STAR	Holding Pattern	Holding Pattern Leg Length	Yes x^2 (1, N = 110) = 110.00*	No preference x^2 (1, N = 110) = 0.04		1
STAR	Holding Pattern	Holding Pattern Time	Yes x^2 (1, N = 110) = 102.15*	No x^2 (1, N = 108) = 14.81*	Yes x^2 (1, N = 74) = 10.59*	2

Chart Type	Information Category	Information Element	Q1: Should it be displayed to execute procedure?	Q2: Displayed at all times?	Q3: Displayed Initially?	Importance Level
STAR	Holding Pattern	Holding Pattern Speed	Yes x^2 (1, N = 110) = 102.15*	No x^2 (1, N = 108) = 25.04*	Yes x^2 (1, N = 80) = 11.25*	2
STAR	Holding Pattern	Holding Pattern Altitude	Yes x^2 (1, N = 110) = 106.04*	No preference x^2 (1, N = 109) = 1.55		1
STAR	Transitions	Transition Courses Depiction	Yes x^2 (1, N = 109) = 109.00*	Yes x^2 (1, N = 109) = 9.99*		1
STAR	Transitions	Transition Name	Yes x^2 (1, N = 109) = 109.00*	No preference x^2 (1, N = 109) = 2.06		1
STAR	Transitions	Transition Courses computer codes	Yes x^2 (1, N = 97) = 78.03*	No x^2 (1, N = 92) = 36.57*	Yes x^2 (1, N = 75) = 11.21*	2
STAR	Transitions	Transition Course - Magnetic Values	Yes x^2 (1, N = 106) = 98.15*	No preference x^2 (1, N = 104) = 0.04		Not Yet Determined
STAR	Transitions	Transition Courses - MEAs, MOCAs	Yes x^2 (1, N = 109) = 101.15*	No preference x^2 (1, N = 107) = 1.58		Not Yet Determined
STAR	Transitions	Transition Courses - segment milages	Yes x^2 (1, N = 109) = 109.00*	No preference x^2 (1, N = 109) = 0.01		Not Yet Determined
STAR	Transitions	Transition Course notes (e.g., DME required)	Yes x^2 (1, N = 109) = 101.15*	No x^2 (1, N = 107) = 10.18*	Yes x^2 (1, N = 70) = 18.51*	2
STAR	Transitions	Transition Text	Yes x^2 (1, N = 109) = 93.59*	No x^2 (1, N = 105) = 22.87*	Yes x^2 (1, N = 77) = 21.83*	2
STAR	Intersection/Fixes on Procedure	Symbol	Yes x^2 (1, N = 110) = 110.00*	Yes x^2 (1, N = 110) = 44.55*		1
STAR	Intersection/Fixes on Procedure	Names	Yes x^2 (1, N = 110) = 110.00*	Yes x^2 (1, N = 110) = 24.58*		1
STAR	Intersection/Fixes on Procedure	Identifier	Yes x^2 (1, N = 108) = 108.00*	Yes x^2 (1, N = 108) = 19.59*		1
STAR	Intersection/Fixes on Procedure	Latitude/Longitudes	Yes x^2 (1, N = 109) = 41.18*	No x^2 (1, N = 88) = 49.50*	No preference x^2 (1, N = 77) = 0.32	3
STAR	Intersection/Fixes on Procedure	MRA	Yes x^2 (1, N = 104) = 77.88*	No x^2 (1, N = 97) = 22.77*	No preference x^2 (1, N = 72) = 2.72	Not Yet Determined

Chart Type	Information Category	Information Element	Q1: Should it be displayed to execute procedure?	Q2: Displayed at all times?	Q3: Displayed Initially?	Importance Level
STAR	Textual Information	Runway arrival text	Yes x^2 (1, N = 110) = 106.04*	No preference x^2 (1, N = 109) = 3.31		2
STAR	Textual Information	Transition Text	Yes x^2 (1, N = 110) = 102.15*	No x^2 (1, N = 108) = 9.48*	Yes x^2 (1, N = 70) = 14.63*	2
STAR	Textual Information	Notes	Yes x^2 (1, N = 105) = 89.61*	No x^2 (1, N = 101) = 64.96*	Yes x^2 (1, N = 91) = 15.04*	2
STAR	Textual Information	Noise Abatement	Yes x^2 (1, N = 110) = 83.78*	No x^2 (1, N = 103) = 63.70*	Yes x^2 (1, N = 92) = 11.13*	2
STAR	Textual Information	Performance limitations (e.g., bank limits)	Yes x^2 (1, N = 109) = 97.33*	No x^2 (1, N = 106) = 13.62*	Yes x^2 (1, N = 72) = 8.00*	2
STAR	Textual Information	Text-Only Procedures	Yes x^2 (1, N = 109) = 97.33*	No x^2 (1, N = 106) = 27.51*	Yes x^2 (1, N = 80) = 7.20*	2
STAR	Textual Information	General Notes	Yes x^2 (1, N = 107) = 87.93*	No x^2 (1, N = 102) = 72.51*	No preference x^2 (1, N = 94) = 2.72	2
STAR	Textual Information	Procedural Data Notes	Yes x^2 (1, N = 107) = 87.93*	No x^2 (1, N = 102) = 35.29*	No preference x^2 (1, N = 81) = 2.09	2
STAR	Textual Information	Crossing Altitude Restrictions	Yes x^2 (1, N = 110) = 110.00*	Yes x^2 (1, N = 110) = 32.73*		1
STAR	Textual Information	Speed restrictions	Yes x^2 (1, N = 110) = 110.00*	Yes x^2 (1, N = 110) = 22.73*		1
STAR	Communications	ATIS Arrival Frequency	Yes x^2 (1, N = 110) = 106.04*	No preference x^2 (1, N = 109) = 3.31		2
STAR	Communications	ACARS-D - ATIS, TWIP	Yes x^2 (1, N = 99) = 91.16*	No x^2 (1, N = 97) = 12.63*	Yes x^2 (1, N = 66) = 11.88*	2
STAR	Communications	Approach Control (Arrival)	Yes x^2 (1, N = 110) = 106.04*	No preference x^2 (1, N = 109) = 0.74		Not Yet Determined
STAR	Communications	Communications Boundaries	Yes x^2 (1, N = 108) = 81.81*	No x^2 (1, N = 101) = 41.83*	No preference x^2 (1, N = 83) = 2.71	Not Yet Determined
STAR	Communications	Lost Comm Procedure	Yes x^2 (1, N = 109) = 105.04*	No x^2 (1, N = 108) = 31.15*	No preference x^2 (1, N = 83) = 0.01	3

Chart Type	Information Category	Information Element	Q1: Should it be displayed to execute procedure?	Q2: Displayed at all times?	Q3: Displayed Initially?	Importance Level
STAR	Communications	Lost Comm Procedure Outline Lines	Yes x^2 (1, N = 109) = 101.15*	No x^2 (1, N = 107) = 39.49*	No preference x^2 (1, N = 86) = 0.19	2
STAR	Communications	Transponder Setting where appropriate	Yes x^2 (1, N = 104) = 92.35*	No x^2 (1, N = 101) = 23.77*	No preference x^2 (1, N = 75) = 2.25	2
SID	Identification	Revision Date	Yes x^2 (1, N = 110) = 39.60*	No x^2 (1, N = 88) = 46.55*	Yes x^2 (1, N = 76) = 8.89*	2
SID	Identification	Chart Index Number/Page Number	Yes x^2 (1, N = 110) = 32.73*	No x^2 (1, N = 85) = 25.99*	Yes x^2 (1, N = 66) = 6.06*	2
SID	Identification	Effective Date	Yes x^2 (1, N = 109) = 51.61*	No x^2 (1, N = 92) = 34.09*	Yes x^2 (1, N = 74) = 28.59*	2
SID	Identification	City/Location Name	Yes x^2 (1, N = 110) = 98.33*	No preference x^2 (1, N = 107) = 0.08		Not Yet Determined
SID	Identification	Airport Name	Yes x^2 (1, N = 110) = 106.04*	Yes x^2 (1, N = 109) = 11.24*		1
SID	Identification	Airport ICAO Identifier	Yes x^2 (1, N = 110) = 106.04*	Yes x^2 (1, N = 109) = 27.75*		1
SID	Identification	Procedure Name (e.g., Canoga Eight)	Yes x^2 (1, N = 110) = 106.04*	Yes x^2 (1, N = 109) = 18.58*		1
SID	Identification	Procedure Identifier (e.g., CNOG8.VNY+A42)	Yes x^2 (1, N = 110) = 102.15*	No preference x^2 (1, N = 108) = 3.70		1
SID	Identification	DP Type (e.g., Pilot Nav, Vector, Noise, Obstacle)	Yes x^2 (1, N = 110) = 87.31*	No x^2 (1, N = 104) = 7.54*	Yes x^2 (1, N = 66) = 44.18*	2
SID	Identification	Changes	Yes x^2 (1, N = 106) = 57.40*	No x^2 (1, N = 92) = 56.35*	Yes x^2 (1, N = 82) = 4.88*	2
SID	Geography	Range	Yes x^2 (1, N = 101) = 78.43*	No preference x^2 (1, N = 95) = 0.09		Not Yet Determined
SID	Geography	Neat Lines (i.e., the lines which separate the chart from the margins)	Yes x^2 (1, N = 106) = 46.23*	No x^2 (1, N = 88) = 5.50*	Yes x^2 (1, N = 55) = 11.36*	2

Chart Type	Information Category	Information Element	Q1: Should it be displayed to execute procedure?	Q2: Displayed at all times?	Q3: Displayed Initially?	Importance Level
SID	Geography	Parallels and Meridians with AMAs, OROCAs, MORAs	Yes x^2 (1, N = 104) = 77.88*	No x^2 (1, N = 97) = 26.81*	No Preference x^2 (1, N = 74) = 0.22	Not Yet Determined
SID	Geography	Parallels and Meridians	Yes x^2 (1, N = 102) = 59.65*	No x^2 (1, N = 90) = 45.51*	No Preference x^2 (1, N = 77) = 1.05	3
SID	Geography	Water Features	Yes x^2 (1, N = 110) = 80.33*	No x^2 (1, N = 102) = 20.75*	No Preference x^2 (1, N = 74) = 2.65	Not Yet Determined
SID	Geography	Cultural Features	Yes x^2 (1, N = 106) = 51.66*	No x^2 (1, N = 90) = 32.40*	No Preference x^2 (1, N = 72) = 0.50	Not Yet Determined
SID	Geography	Terrain Contours	Yes x^2 (1, N = 110) = 98.33*	No preference x^2 (1, N = 107) = 0.76		1
SID	Geography	Terrain Contour Elevations	Yes x^2 (1, N = 110) = 102.15*	No preference x^2 (1, N = 108) = 0.33		1
SID	Geography	Contour Interval Legend	Yes x^2 (1, N = 108) = 78.37*	No x^2 (1, N = 100) = 33.64*	No Preference x^2 (1, N = 79) = 0.11	Not Yet Determined
SID	Geography	Spot Elevations	Yes x^2 (1, N = 108) = 88.93*	No preference x^2 (1, N = 103) = 1.17		1
SID	Geography	Highest Reference Point (within neat lines)	Yes x^2 (1, N = 110) = 106.04*	Yes x^2 (1, N = 109) = 6.69*		1
SID	Geography	International Boundaries (higher criticality where appropriate)	Yes x^2 (1, N = 106) = 94.34*	No x^2 (1, N = 103) = 19.66*	Yes x^2 (1, N = 74) = 5.41*	2
SID	Obstacle	Obstacle Symbols and Elevation	Yes x^2 (1, N = 109) = 109.00*	Yes x^2 (1, N = 109) = 8.82*		1
SID	Minimum Area/Sector Altitudes	MSA Reference Point/Center	Yes x^2 (1, N = 109) = 101.15*	No preference x^2 (1, N = 107) = 0.46		Not Yet Determined
SID	Minimum Area/Sector Altitudes	MSA Distance when other than 25nm	Yes x^2 (1, N = 109) = 101.15*	No preference x^2 (1, N = 107) = 3.37		2
SID	Minimum Area/Sector Altitudes	MSA Sector Radials	Yes x^2 (1, N = 109) = 109.00*	No preference x^2 (1, N = 109) = 0.23		1

Chart Type	Information Category	Information Element	Q1: Should it be displayed to execute procedure?	Q2: Displayed at all times?	Q3: Displayed Initially?	Importance Level
SID	Minimum Area/Sector Altitudes	MSA Minimum Altitudes	Yes x^2 (1, N = 110) = 110.00*	No preference x^2 (1, N = 110) = 3.64		1
SID	Minimum Area/Sector Altitudes	Minimum Radar Altitudes and Sectors	Yes x^2 (1, N = 109) = 101.15*	No preference x^2 (1, N = 107) = 0.46		1
SID	Minimum Area/Sector Altitudes	AMA, OROCA, or grid MORA where established	Yes x^2 (1, N = 103) = 83.97*	No x^2 (1, N = 98) = 16.33*	Yes x^2 (1, N = 69) = 6.39*	2
SID	Navigation	FIR/UIR Boundaries	Yes x^2 (1, N = 94) = 64.72*	No x^2 (1, N = 86) = 22.51*	Yes x^2 (1, N = 65) = 5.55*	2
SID	Navigation	Prohibited, Restricted and Danger Airspace Graphic	Yes x^2 (1, N = 110) = 110.00*	Yes x^2 (1, N = 110) = 10.51*		1
SID	Navigation	Prohibited, Restricted and Danger Airspace Label	Yes x^2 (1, N = 110) = 110.00*	No preference x^2 (1, N = 110) = 0.58		1
SID	Navigation	Prohibited, Restricted and Danger Airspace Narrative	Yes x^2 (1, N = 109) = 105.04*	No x^2 (1, N = 108) = 31.15*	Yes x^2 (1, N = 83) = 5.31*	2
SID	Navigation	Special Use Airspace - Other	Yes x^2 (1, N = 110) = 102.15*	No x^2 (1, N = 108) = 13.37*	Yes x^2 (1, N = 73) = 14.92*	Not Yet Determined
SID	Navigation	Transition Altitude	Yes x^2 (1, N = 108) = 104.04*	No preference x^2 (1, N = 107) = 0.08		1
SID	Airport Information	Runway Layout	Yes x^2 (1, N = 108) = 100.15*	Yes x^2 (1, N = 106) = 29.58*		1
SID	Airport Information	Airport Elevation	Yes x^2 (1, N = 110) = 98.33*	Yes x^2 (1, N = 107) = 8.98*		1
SID	Airport Information	Other Airport Symbols	Yes x^2 (1, N = 109) = 93.59*	No x^2 (1, N = 105) = 22.87*	Yes x^2 (1, N = 77) = 19.75*	2
SID	Airport Information	Other Airport Names	Yes x^2 (1, N = 109) = 89.92*	No x^2 (1, N = 104) = 30.15*	No Preference x^2 (1, N = 80) = 3.20	Not Yet Determined
SID	Airport Information	Other Airport Elevations	Yes x^2 (1, N = 109) = 75.97*	No x^2 (1, N = 100) = 49.00*	No Preference x^2 (1, N = 85) = 1.99	Not Yet Determined

Chart Type	Information Category	Information Element	Q1: Should it be displayed to execute procedure?	Q2: Displayed at all times?	Q3: Displayed Initially?	Importance Level
SID	Airport Information	Distances from airport to first fix on SID	Yes x^2 (1, N = 110) = 102.15*	No preference x^2 (1, N = 108) = 3.00		1
SID	Navaid Used to Form Leg of Procedure	Navaid Symbol	Yes x^2 (1, N = 110) = 106.04*	Yes x^2 (1, N = 109) = 41.18*		1
SID	Navaid Used to Form Leg of Procedure	Navaid Name	Yes x^2 (1, N = 110) = 110.00*	Yes x^2 (1, N = 110) = 14.55*		1
SID	Navaid Used to Form Leg of Procedure	Navaid Identifier	Yes x^2 (1, N = 110) = 110.00*	Yes x^2 (1, N = 110) = 34.95*		1
SID	Navaid Used to Form Leg of Procedure	Navaid Frequency/Channel	Yes x^2 (1, N = 110) = 110.00*	Yes x^2 (1, N = 110) = 16.04*		1
SID	Navaid Used to Form Leg of Procedure	Navaid Morse Code	Yes x^2 (1, N = 110) = 76.95*	No x^2 (1, N = 101) = 55.69*	No Preference x^2 (1, N = 88) = 0.73	Not Yet Determined
SID	Navaid Used to Form Leg of Procedure	DME Availability (Text information)	Yes x^2 (1, N = 110) = 80.33*	No x^2 (1, N = 102) = 20.75*	No Preference x^2 (1, N = 74) = 1.95	2
SID	Navaid Used to Form Leg of Procedure	Navaid Class	Yes x^2 (1, N = 109) = 54.39*	No x^2 (1, N = 93) = 60.48*	No Preference x^2 (1, N = 84) = 1.71	3
SID	Navaid Used to Form Leg of Procedure	Navaid Latitude/Longitude	Yes x^2 (1, N = 110) = 37.24*	No x^2 (1, N = 87) = 57.94*	No x^2 (1, N = 79) = 10.65*	3
SID	Navaid Used to Form Fixes	Navaid Symbol	Yes x^2 (1, N = 110) = 110.00*	Yes x^2 (1, N = 110) = 34.95*		1
SID	Navaid Used to Form Fixes	Navaid Name	Yes x^2 (1, N = 110) = 110.00*	Yes x^2 (1, N = 110) = 10.51*		1
SID	Navaid Used to Form Fixes	Navaid Identifier	Yes x^2 (1, N = 110) = 110.00*	Yes x^2 (1, N = 110) = 30.58*		1
SID	Navaid Used to Form Fixes	Navaid Frequency/Channel	Yes x^2 (1, N = 109) = 105.04*	Yes x^2 (1, N = 108) = 23.15*		1
SID	Navaid Used to Form Fixes	Navaid Morse Code	Yes x^2 (1, N = 110) = 70.40*	No x^2 (1, N = 99) = 53.83*	No Preference x^2 (1, N = 86) = 0.05	Not Yet Determined
SID	Navaid Used to Form Fixes	DME Availability (Text information)	Yes x^2 (1, N = 110) = 76.95*	No x^2 (1, N = 101) = 27.81*	No Preference x^2 (1, N = 77) = 1.57	2

Chart Type	Information Category	Information Element	Q1: Should it be displayed to execute procedure?	Q2: Displayed at all times?	Q3: Displayed Initially?	Importance Level
SID	Navaid Used to Form Fixes	Navaid Class	Yes x^2 (1, N = 109) = 48.89*	No x^2 (1, N = 91) = 61.81*	No Preference x^2 (1, N = 83) = 1.46	3
SID	Navaid Used to Form Fixes	Navaid Latitude/Longitude	Yes x^2 (1, N = 109) = 41.18*	No x^2 (1, N = 88) = 65.64*	No x^2 (1, N = 82) = 4.88*	3
SID	Navaid Used to Form Fixes	Navaid Radials/Bearings that form fixes	Yes x^2 (1, N = 110) = 110.00*	No preference x^2 (1, N = 110) = 0.91		1
SID	Navaid Used to Form Fixes	DME Distances that form fixes	Yes x^2 (1, N = 109) = 105.04*	Yes x^2 (1, N = 108) = 6.26*		1
SID	Instrument Procedure Courses/Tracks	Symbol (e.g., line style, etc.)	Yes x^2 (1, N = 108) = 108.00*	Yes x^2 (1, N = 108) = 37.93*		1
SID	Instrument Procedure Courses/Tracks	Identifier (i.e., CNOG8.AVE)	Yes x^2 (1, N = 109) = 105.04*	Yes x^2 (1, N = 108) = 23.15*		1
SID	Course Definition	Heading	Yes x^2 (1, N = 109) = 109.00*	Yes x^2 (1, N = 109) = 63.20*		1
SID	Course Definition	Track	Yes x^2 (1, N = 109) = 109.00*	Yes x^2 (1, N = 109) = 63.20*		1
SID	Course Definition	Radial	Yes x^2 (1, N = 110) = 110.00*	Yes x^2 (1, N = 110) = 58.18*		1
SID	Course Definition	Segment Mileages	Yes x^2 (1, N = 110) = 110.00*	Yes x^2 (1, N = 110) = 20.95*		1
SID	Course Definition	MEA/MOCA	Yes x^2 (1, N = 110) = 102.15*	No preference x^2 (1, N = 108) = 0.04		1
SID	Course Definition	VOR Change Over Points	Yes x^2 (1, N = 110) = 87.31*	No preference x^2 (1, N = 104) = 3.12		2
SID	Holding Pattern	Holding Pattern Depiction	Yes x^2 (1, N = 110) = 110.00*	Yes x^2 (1, N = 110) = 20.95*		1
SID	Holding Pattern	Holding Pattern Courses	Yes x^2 (1, N = 110) = 110.00*	Yes x^2 (1, N = 110) = 5.24*		1
SID	Holding Pattern	Holding Pattern Leg Length	Yes x^2 (1, N = 110) = 110.00*	No preference x^2 (1, N = 110) = 0.04		1

Chart Type	Information Category	Information Element	Q1: Should it be displayed to execute procedure?	Q2: Displayed at all times?	Q3: Displayed Initially?	Importance Level
SID	Holding Pattern	Holding Pattern Time	Yes x^2 (1, N = 110) = 102.15*	No x^2 (1, N = 108) = 19.59*	Yes x^2 (1, N = 77) = 12.48*	2
SID	Holding Pattern	Holding Pattern Speed	Yes x^2 (1, N = 110) = 98.33*	No x^2 (1, N = 107) = 24.31*	Yes x^2 (1, N = 79) = 13.78*	2
SID	Holding Pattern	Holding Pattern Altitude	Yes x^2 (1, N = 110) = 102.15*	No preference x^2 (1, N = 108) = 1.33		1
SID	Transitions	Transition Courses depiction	Yes x^2 (1, N = 109) = 109.00*	Yes x^2 (1, N = 109) = 23.86*		1
SID	Transitions	Transition Name	Yes x^2 (1, N = 108) = 108.00*	Yes x^2 (1, N = 108) = 12.00*		1
SID	Transitions	Transition Courses computer codes	Yes x^2 (1, N = 104) = 84.96*	No x^2 (1, N = 99) = 26.27*	Yes x^2 (1, N = 75) = 7.05*	2
SID	Transitions	Transition Course - Magnetic Values	Yes x^2 (1, N = 107) = 103.04*	No preference x^2 (1, N = 106) = 0.15		Not Yet Determined
SID	Transitions	Transition Courses - MEAs, MOCAs	Yes x^2 (1, N = 108) = 96.33*	No preference x^2 (1, N = 105) = 2.75		Not Yet Determined
SID	Transitions	Transition Courses - segment milages	Yes x^2 (1, N = 108) = 104.04*	No preference x^2 (1, N = 107) = 0.46		Not Yet Determined
SID	Transitions	Transition Course notes (e.g., DME required)	Yes x^2 (1, N = 107) = 99.15*	No x^2 (1, N = 105) = 24.77*	Yes x^2 (1, N = 78) = 14.82*	2
SID	Transitions	Transition Text	Yes x^2 (1, N = 108) = 85.33*	No x^2 (1, N = 102) = 48.04*	Yes x^2 (1, N = 86) = 22.51*	2
SID	Intersection/ Fixes on Procedure	Symbol	Yes x^2 (1, N = 110) = 110.00*	Yes x^2 (1, N = 110) = 58.18*		1
SID	Intersection/ Fixes on Procedure	Names	Yes x^2 (1, N = 109) = 109.00*	Yes x^2 (1, N = 109) = 25.77*		1
SID	Intersection/ Fixes on Procedure	Identifier	Yes x^2 (1, N = 109) = 109.00*	Yes x^2 (1, N = 109) = 29.81*		1
SID	Intersection/ Fixes on Procedure	Latitude/Longitudes	Yes x^2 (1, N = 110) = 47.13*	No x^2 (1, N = 91) = 49.33*	No x^2 (1, N = 79) = 6.70*	3

Chart Type	Information Category	Information Element	Q1: Should it be displayed to execute procedure?	Q2: Displayed at all times?	Q3: Displayed Initially?	Importance Level
SID	Intersection/ Fixes on Procedure	MRA	Yes x^2 (1, N = 109) = 79.35*	No x^2 (1, N = 101) = 21.87*	No Preference x^2 (1, N = 74) = 1.95	2
SID	Textual Information	Runway departure text	Yes x^2 (1, N = 109) = 109.00*	No preference x^2 (1, N = 109) = 2.65		Not Yet Determined
SID	Textual Information	Climb Gradient - ATC	Yes x^2 (1, N = 110) = 106.04*	No x^2 (1, N = 109) = 4.05*	Yes x^2 (1, N = 65) = 31.15*	2
SID	Textual Information	Climb Gradient - Obstacle	Yes x^2 (1, N = 110) = 106.04*	No preference x^2 (1, N = 109) = 0.08		Not Yet Determined
SID	Textual Information	Transition Text	Yes x^2 (1, N = 109) = 101.15*	No x^2 (1, N = 107) = 17.28*	Yes x^2 (1, N = 75) = 32.01*	2
SID	Textual Information	Notes	Yes x^2 (1, N = 106) = 94.34*	No x^2 (1, N = 103) = 73.49*	Yes x^2 (1, N = 95) = 29.57*	2
SID	Textual Information	Noise Abatement	Yes x^2 (1, N = 110) = 94.58*	No x^2 (1, N = 106) = 54.49*	Yes x^2 (1, N = 91) = 26.38*	2
SID	Textual Information	Performance limitations (e.g., bank limits)	Yes x^2 (1, N = 110) = 98.33*	No x^2 (1, N = 107) = 7.86*	Yes x^2 (1, N = 68) = 11.53*	2
SID	Textual Information	Text-Only Procedures	Yes x^2 (1, N = 110) = 102.15*	No x^2 (1, N = 108) = 23.15*	Yes x^2 (1, N = 79) = 15.51*	2
SID	Textual Information	General Notes	Yes x^2 (1, N = 110) = 94.58*	No x^2 (1, N = 106) = 73.06*	Yes x^2 (1, N = 97) = 5.45*	2
SID	Textual Information	Procedural Data Notes	Yes x^2 (1, N = 109) = 101.15*	No x^2 (1, N = 107) = 55.41*	Yes x^2 (1, N = 92) = 7.35*	2
SID	Textual Information	Crossing Altitude Restrictions	Yes x^2 (1, N = 110) = 106.04*	Yes x^2 (1, N = 109) = 22.03*		1
SID	Textual Information	Speed restrictions	Yes x^2 (1, N = 110) = 106.04*	Yes x^2 (1, N = 109) = 16.96*		1
SID	Communications	Departure Control Frequency	Yes x^2 (1, N = 110) = 110.00*	Yes x^2 (1, N = 110) = 13.13*		1
SID	Communications	Communications Boundaries	Yes x^2 (1, N = 110) = 94.58*	No x^2 (1, N = 106) = 25.51*	Yes x^2 (1, N = 79) = 7.91*	2

Chart Type	Information Category	Information Element	Q1: Should it be displayed to execute procedure?	Q2: Displayed at all times?	Q3: Displayed Initially?	Importance Level
SID	Communications	Lost Comm Procedure	Yes x^2 (1, N = 110) = 110.00*	No x^2 (1, N = 110) = 26.51*	No Preference x^2 (1, N = 82) = 0.44	2
SID	Communications	Lost Comm Procedure Outline Lines	Yes x^2 (1, N = 110) = 106.04*	No x^2 (1, N = 109) = 38.76*	No Preference x^2 (1, N = 87) = 0.29	2
SID	Communications	Transponder Setting where appropriate	Yes x^2 (1, N = 108) = 88.93*	No x^2 (1, N = 103) = 23.31*	Yes x^2 (1, N = 76) = 23.21*	2