

TECHNICAL REPORT DOCUMENTATION PAGE

1. REPORT NO. GMU-TR-2012-06, Revision 2	2. GOVERNMENT ACCESSION NO.	3. RECIPIENT'S CATALOG NO.	
4. TITLE AND SUBTITLE Data Communications Human Factors Task 2: Flight Deck Procedures		5. REPORT DATE May 2013	
		6. PERFORMING ORGANIZATION CODE	
7. AUTHOR(S) Baker, K.M., DiMare, S.K., and Boehm-Davis, D.A.		8. PERFORMING ORGANIZATION REPORT Click here to enter text.	
9. PERFORMING ORGANIZATION NAME AND ADDRESS George Mason University Psychology Department Fairfax, VA 22030		10. WORK UNIT NO.	
		11. CONTRACT OR GRANT NO. DTFAWA-10-A-80031	
12. SPONSORING AGENCY NAME AND ADDRESS Federal Aviation Administration Office of NextGen Human Factors Division 800 Independence Ave, SW Washington, DC 20591		13. TYPE OF REPORT AND PERIOD COVERED Final Report	
		14. SPONSORING AGENCY CODE ANG-C1	
15. SUPPLEMENTARY NOTES FAA Technical Point of Contact: Daniel A. Herschler, 202-267-9853			
16. ABSTRACT This report summarizes two part-task studies addressing flight deck data communication procedures. The purpose of the studies was to evaluate procedures for receiving and reading data comm messages. There is a risk of misunderstanding complex clearances, so the study results could help to reduce this risk. After analyzing three alternatives, our recommendation is to include a requirement for both pilots to read the clearance silently and then one of the pilots should read it aloud and obtain acknowledgement from the other pilot that they concur that it is the correct clearance content.			
17. KEY WORDS data communications; flight deck communications; flight deck procedures		18. DISTRIBUTION STATEMENT Distribution unlimited	
19. SECURITY CLASSIF. (OF THIS REPORT) Unclassified	20. SECURITY CLASSIF. (OF THIS PAGE) Unclassified	21. NO. OF PAGES 85	22. PRICE N/A

Form DOT F 1700.7 (08/72)



Data Communications Human Factors

Task 2: Flight Deck Procedures

Final Report

GMU-TR-2012-06, Revision 2

Kelley M. Baker
Sara K. DiMare
Deborah A. Boehm-Davis

May 2013

George Mason University
Psychology Department
Fairfax, VA 22030



Contents

Executive Summary	4
Introduction.....	5
Study 1.....	7
Method	7
Participants.....	7
Apparatus and Materials	8
Procedure	9
Results.....	11
SPAM Workload and Situation Awareness Data	11
NASA-TLX Data	13
Response Time Data	14
Heads-Down Data.....	15
Procedural Compliance and Flight Deck Discussion Data.....	15
Opinion Surveys.....	18
Discussion: Study 1	19
Study 2.....	20
Method	20
Participants.....	20
Apparatus and Materials	21
Procedure	21
Results.....	22
SPAM Workload and Situation Awareness Data	22
NASA-TLX Data	24
Response Time Data	24
Heads-Down Data.....	25
Procedural Compliance and Flight Deck Discussion Data.....	26
Opinion Surveys.....	27

Discussion: Study 2	28
Conclusions.....	28
Acknowledgements	29
References.....	29
Appendix 1 – Acronym List	33
Appendix 2 – Situation Present Assessment Method (SPAM).....	34
Appendix 3 – NASA-Task Load Index (TLX)	36
Appendix 4 – Procedural Compliance and Flight Deck Discussion Rubric	38
Study 1	38
Practice Flights, No Procedure Given	38
Experimental Flight, Procedure A.....	42
Experimental Flight, Procedure B.....	46
Experimental Flight, Procedure C	50
Study 2	54
Practice Flights, No Procedure Given	54
First Experimental Flight, No Procedure Given	58
Second Experimental Flight, Procedure C	62
Appendix 5 – Data Comm Messages	66
Appendix 6 – Sample Flight Documents.....	67
Study 1	67
First Practice Flight, Flight Release	67
Second Practice Flight, Flight Release	69
First Experimental Flight, Flight Release.....	71
Second Experimental Flight, Flight Release	73
Third Experimental Flight, Flight Release	75
Study 2	77
First Practice Flight, Flight Release	77
Second Practice Flight, Flight Release	79
First Experimental Flight, Flight Release.....	81
Second Experimental Flight, Flight Release	83

Executive Summary

This report summarizes two part-task studies addressing flight deck data communication procedures. This project was funded by the Federal Aviation Administration (FAA) Human Factors Research and Engineering Group (AJP-61), and conducted by George Mason University.

The purpose of the studies was to evaluate procedures for receiving and reading data comm messages. The first study (Study 1) investigated three procedures:

- Procedure A: Pilot Monitoring reads the data comm message aloud.
- Procedure B: Pilot Monitoring reads the data comm message aloud, and then Pilot Flying reads the message silently.
- Procedure C: Pilot Monitoring reads the data comm message silently, and then Pilot Flying reads the message silently.

In the second study (Study 2), participants' behavior in the absence of a specified procedure was compared to their behavior when given a procedure (Procedure C). In both studies, workload, situation awareness, time to respond, time spent heads-down with the FMS/data comm display, and compliance with specified procedures were assessed.

The results of these studies indicate that Procedure A, where the PM reads the data comm message aloud and the PF does not read it, generally led to higher situation awareness, lower subjective workload, and faster data comm response times, though these differences were not significant. Procedure A did result in significantly lower objective workload. However, there is increased risk of error with only one pilot reading the message, and pilots were clearly uncomfortable with this risk. They were also uncomfortable with Procedure C, where both pilots read the message silently. The pilots disliked this procedure because of the lack of verbal coordination. In addition, Procedure C led to the lowest situation awareness and longest response times. Participants strongly preferred Procedure B, where the PM read the message aloud, and then the PF read it silently. In fact, in the absence of any instruction, they were most likely to follow Procedure B. They particularly liked that Procedure B allowed them to "trust but verify." However, Procedure B did not lead to better results in situation awareness, workload, response time, or errors.

The optimal procedure, therefore, is a procedure that leverages elements of both Procedure B and Procedure C. In particular, the procedure should use the independent reading element of Procedure C and the read aloud element of Procedure B. For example, Procedure C could be modified to include the additional step of requiring the PM to state the clearance aloud after both pilots have read silently.

Additional research is needed to further refine procedures for opening and reading data comm messages.

Data Communications – Flight Deck Procedures

Introduction

Over the next decade, the demand for air transportation and other airspace services is expected to grow significantly from today's levels in terms of passenger volume, amount of cargo shipped, and overall number of flights. With respect to air traffic, changes will occur not only in the number of flights but also in the characteristics of those flights. To address this, the Federal Aviation Administration (FAA) is developing the Next Generation Air Transportation System (NextGen), which is a series of transformations designed to increase the capacity, safety, and security of air traffic operations. One major enabling technology of NextGen is data communications (data comm), which is an electronic text-based message-transferring system between aircraft and ground stations.

Data communications are critical to ensuring that data are available to flight deck automation and to providing real-time data to air traffic control (ATC). In certain defined airspace, data communications will be the primary means of communicating clearances, routine communications, and four dimensional trajectory negotiations between ATC and the flight deck. However, voice communications will continue to be used to supplement data communications for time-critical events, tactical situations, and emergencies to augment procedural responses or risk mitigations. Voice communications will also be used to communicate with lesser-equipped aircraft in appropriate airspace.

Switching to data communications as the primary method for communication between the flight crew and ATC will require development of flight deck procedures for interacting with data comm. Since data communications use a different modality from voice communications, current communication procedures will require modification. Issues for data comm procedure development include who should have responsibility for data communications in the flight crew, how using data communications will affect workload on the flight deck, and how to minimize communication errors.

The literature shows great potential for data communications in near and mid-term NextGen applications, yet there are also certain drawbacks that have been observed. For example, although greater efficiency in taxi operations within the terminal environment has been demonstrated (Baik & Trani, 2005), increased transaction time for individual communications has also been observed (Dunbar, McGann, Mackintosh, & Lozito, 2001; McCarley, Talleur, & Steelman-Allen, 2010; McGann, Morrow, Rodvold, & Mackintosh, 1998; Rakas & Yang, 2007). Although data comm is less intrusive within the flight deck, allowing pilots to decide when to go heads-down, this makes it less appropriate for messages that require immediate attention (Andre, Lins, & Wilson, 2003; Helleberg & Wickens, 2001; Latorella, 1998). It is therefore

necessary to determine where procedures can be used to maximize the benefits of data comm, while providing additional support for situations in which data comm is a less suitable communications medium.

One of the distinct benefits of data comm is that it relieves pilots' working memory. Unlike voice communications, which disappear once spoken, data comm messages remain present on the display (Morrow, Lee, & Rodvold, 1993; Navarro & Sikorski, 1999). Research has shown that in both voice and data comm situations, pilots request clarifications more frequently when workload is high. When using voice, pilots must request this clarification from the controller; data comm allows the pilot to refer back to the written message as many times as necessary (Comstock, et al., 2010; Dunbar, et al., 2001; McGann, et al., 1998). These studies have also shown that pilots take advantage of data comm by referring to the display more frequently than they make requests for clarification over voice, perhaps because there is less pressure in not taking up the controller's time.

Harvey, Reynolds, Pacley, Koubek, and Rehmann (2002) found that communication between crew members increased when data comm was used, leading to more clearance-related communications overall, despite less direct pilot-controller contact. Since both pilots were no longer receiving information simultaneously over voice, the researchers found them more likely to discuss clearances and other ATC-related information between themselves. The authors suggest that greater crew communication may lead to better discussion and decision-making, which should lead to reduced errors.

One of the potential drawbacks to data communications is the increased transaction and response times seen in many studies (Dunbar, et al., 2001; McCarley, et al., 2010; McGann, et al., 1998; Rakas & Yang, 2007). However, the increased transaction and response times have also been found to lead to fewer errors, higher consistency in performance, and thus better safety (McCarley, et al., 2010). Ideally, this potential cost could be managed through improved display design (Adams, Murdoch, Consiglio, & Williams, 2007) and procedures that can be used in situations where lengthier transaction and response times are acceptable (Hansman, et al., 1997; Rehmann, 1997).

There is some debate in the literature as to whether data comm reduces or increases pilot workload. Several studies have found that workload increases with data comm usage (Boehm-Davis, Gee, Baker, & Medina-Mora, 2010; Lancaster & Casali, 2008; Prinzel, et al., 2010), while others have shown no difference in workload with the addition of data comm to the flight deck environment (Adams, et al., 2007; Comstock, et al., 2010; Mueller & Lozito, 2008). It is important to note that these studies took place in different environments (i.e., terminal vs. en-route), without a uniform data comm display, and without consistent data comm procedures.

Procedures play an important role in maintaining safe operations, and departing from these procedures is often what leads to communication problems between controller and pilot (Morrow, Rodvold, & Lee, 1994). There is a growing body of research exploring both the advantages and disadvantages to data communications, and research is now needed to develop specific flight deck procedures for handling data comm messages to maximize the system's safety and effectiveness, while managing pilot workload.

The purpose of the studies described here was to evaluate procedures for receiving and reading data comm messages. There are several potential procedures, which are defined by whether one or both pilots are required to read the message, and whether the pilots are required to read aloud or silently. The first study (Study 1) investigated several combinations to identify those procedures that minimize errors without an unacceptable increase in workload or time to respond. In the second study (Study 2), participants' behavior in the absence of a specified procedure was compared to their behavior when given a procedure. Workload, situation awareness, time to respond, time spent heads-down with the FMS/data comm display, and compliance with specified procedures were assessed.

Study 1

Method

Participants

The participants were 38 pilots who had airline experience within the last two years and experience on an aircraft equipped with a flight management system (FMS). The pilots were recruited using ads placed through the Air Line Pilots Association (ALPA), the Southwest Airlines Pilots' Association (SWAPA), the Allied Pilots Association (APA), and other airline contacts. Pilots were paid for their participation in the study.

The pilots were run in pairs, with one serving as captain and Pilot Flying (PF) and the other as first officer and Pilot Monitoring (PM). Where possible, they were assigned to a role consistent with their current flight role. When two captains or two first officers were paired, the roles were assigned randomly. Pilots were not necessarily from the same airline.

Data from one data collection session had to be excluded from analysis due to unintended deviation from the experimental protocol. Of the remaining 36 participants, there were 33 male pilots and 3 female pilots. They had an average age of 41.8 ($SD = 11.8$) and an average of 9,107 hours ($SD = 6,463$) of total flight time, with an average of 162.2 hours ($SD = 97.8$) flown within the last 90 days. There was no significant difference in age or flight experience between the pilots serving as Pilot Flying and Pilot Monitoring in this experiment. Fourteen of the pilots

had experience with Controller Pilot Data Link Communication (CPDLC), and those pilots had an average of 4.9 years ($SD = 4.2$) of CPDLC experience.

Apparatus and Materials

Simulation

The experiment was run using a low fidelity desktop computer-based flight simulator, Aerowinx (Heinlin, 2000). The experimental setup included three linked desktop computers, all running the Windows XP operating system, three traditional computer monitors, a 9-inch touchscreen monitor, and two webcams. Two of the traditional monitors were arranged horizontally in front of the pilot participants, and the touchscreen monitor was situated at desktop level between the two pilots. The webcams were mounted on the top of the monitors and were directed at the pilots' faces. The monitors displayed the Aerowinx flight deck interface, which was a simulated Boeing 747-400 aircraft. The touchscreen monitor displayed a multipurpose control and display unit (MCDU). Through the touchscreen monitor, the MCDU allowed the Pilot Monitoring access to the same features as in a standard flight deck FMS, such as making changes to the route, and allowed pilot participants to communicate with ATC via data comm. The final computer and traditional monitor were used by ATC and were located in a separate room that overlooked the pilots through a one-way mirror.

The ACARS ATC add-in for Aerowinx (Hoppenbrouwers, 2009) was installed to manage data communications between the flight deck and ATC. Pre-formatted messages were sent through this system. These messages were taken from the message set under development by the RTCA, Inc. Special Committee 214 and the EUROCAE Working Group 78 (RTCA SC-214 & EUROCAE WG-78, 2012); this message set is commonly known as the SC-214 message set.

Assessment Tools

Objective workload and situation awareness were assessed throughout each flight using the Situation Present Assessment Method (SPAM, see Appendix 2). In this method, participants are interrupted from their primary task with queries about their situation. When they are initially prompted, they are asked to signal when they are ready to answer a question. The time it takes them to respond to this readiness prompt is a measure of participant workload, with longer times indicating higher workload. When they indicate they are ready for a question, they are given either a multiple choice or short answer question about their situation. They are instructed to answer as quickly and as accurately as possible. The time it takes to respond to the question as well as the response accuracy are used as measures of their situation awareness, with longer response times indicating lower situation awareness.

Subjective workload was assessed at the end of each flight, using the NASA-Task Load Index (NASA-TLX, see Appendix 3). With this measure, participants give a rating for each of six

workload factors (mental demand, physical demand, temporal demand, performance, effort, and frustration). These ratings are then averaged to get an overall workload rating on a 100-point scale, with higher scores indicating higher perceived workload.

Morae Recorder (Version 3.0.0) was used to record the flights. Morae creates a file that captures the participant's screen, the view from the webcam, and all audio, which allows for playback of the session. Recordings of each session were analyzed, and specific events marked to obtain performance-related timing data using Morae Manager (Version 3.0.0).

To capture the amount of time participants spent heads-down with the data comm messages, the webcam recordings were exported from Morae and then decompiled using SC Video Decompiler (Version 6.4.0.2). SC Video Decompiler takes a still image of the video every two seconds. These individual images were then coded based on the participant's gaze.

Throughout the experiments, an observer assessed the participants on how well they complied with the given procedure and the discussion that followed each clearance. The rubric used for this assessment is provided in Appendix 4. Participants were also asked about their opinion of the different procedures in a post-experiment questionnaire administered after the final experimental flight.

Procedure

Task

The participants were asked to fly three flight scenarios. All the scenarios were en route segments of a flight from Lubbock Preston Smith International Airport (KLBB) to Salt Lake City International Airport (KSLC). The scenarios were designed to be equivalent but not identical, with slightly different flight plans and different starting points. Each scenario took approximately 25 minutes to fly. Clearances for these flights were chosen from the SC-214 message set (RTCA SC-214 & EUROCAE WG-78, 2012) and arranged so that each scenario had the same messages; however, the messages were presented in a different order and with different variable values. The clearances used in the scenarios are provided in Appendix 5. Within each flight, severe turbulence was reported by another aircraft in the sector. The turbulence was always relevant to the participants' flight, i.e., reported on the participants' route at their altitude. These events were reported as urgent pilot reports (PIREPs).

Sample Urgent PIREP

PIREP UUA /OV RSK110020 /TM 1618 /FL360 /TP B747 /TB SVR 360-400

Design

The independent variable was data comm procedure, which was a within-subjects variable. The procedures tested are summarized in Table 1. Participants were instructed that the procedures were for opening and reading the data comm messages and that after completing the procedure, they could discuss and respond to the message as they normally would.

Table 1. Study 1 Procedure Descriptions

Procedure Designation	Procedure Description
Procedure A (PM Aloud)	Pilot Monitoring opens the message and reads it aloud.
Procedure B (PM Aloud, PF Silent)	Pilot Monitoring opens the message and reads it aloud. Pilot Flying then reads it silently.
Procedure C (PM Silent, PF Silent)	Pilot Monitoring opens the message and reads it silently. Pilot Flying then reads it silently.

Participants flew three scenarios, using a different procedure in each. Since the scenarios were designed to be equivalent, they were always presented in the same order. The order in which the procedures were presented was counterbalanced across all participants. This resulted in six conditions, where each condition represented a unique order of the three procedures.

Detailed Procedure

Upon arrival, pilots were asked to complete an informed consent form and a demographic questionnaire. They were then provided with training on the simulator, including how to fly using the keyboard and mouse controls, how to send and receive data comm messages, and how to respond to the SPAM question prompts. After completing the training, they flew two practice flights, which were conducted exactly as the experimental flights, except that the pilots were not given any procedures for opening and reading the data comm messages. The pilots were not told that the first two flights were practice flights. The purpose of these flights was to minimize any learning effects with the simulator and data communications. The practice flights were from John F. Kennedy International Airport (JFK) to Washington Dulles International Airport (KIAD), took approximately 15 minutes to fly, and, between them, used the same data comm messages as in the experimental flights. The pilots then flew the three experimental flights from KLBB to KSLC.

Prior to each experimental flight, the experimenter read the data comm procedure for that flight and posted the procedure on the wall over the pilots' desktop as a reminder throughout the flight. The pilots were then provided with the necessary flight materials, including a flight release that depicted their loaded flight plan, weather briefings, and charts such as airport diagrams, instrument approach charts, and en route charts. For sample flight documents, see Appendix 6. The pilots were given as much time as they needed to review the materials, as well as the pre-programmed FMS flight plan. When the pilots indicated that they were ready to fly, the scenario began with the flight already en route.

During the flight, the pilots were interrupted periodically to answer a SPAM question. These questions were delivered on individual laptop computers assigned to each participant. At the end of the flight, the pilots were asked to complete the NASA-TLX, which was also presented on the individual laptop computers. The pilots were then given a short break. These procedures were repeated for each of the flights. When all five flights were completed, the participants were given a survey asking for their opinions about the different procedures, given information on the study, and asked for any additional insights they wanted to provide.

Results

SPAM Workload and Situation Awareness Data

Workload and situation awareness were assessed using SPAM (see Appendix 2). As described earlier, participants were interrupted periodically with a readiness prompt and, once they responded, given either a multiple choice or short answer question about their situation.

Workload

The workload timing data were analyzed using repeated measures analysis of variance, with procedure as a within-subjects independent variable and pilot role (either PF or PM) as a between-subjects independent variable. Workload was significantly lower, indicated by significantly faster readiness prompt response times, with Procedure A than with Procedure B or C ($F(2, 48) = 6.83, p < .05$). Workload response times are summarized by procedure in Table 2, with longer prompt response times indicating higher workload.

Table 2. Study 1 SPAM Workload Response Times by Procedure

Procedure	Average (seconds)	SD
Procedure A (PM Aloud)	5.86	2.23
Procedure B (PM Aloud, PF Silent)	7.53	4.00
Procedure C (PM Silent, PF Silent)	8.83	4.85

Pilots in the PF role had higher response times, indicating greater workload, than those in the PM role (see Table 3), however this difference was not significant.

Table 3. Study 1 SPAM Workload Response Times by Role

Role	Average (seconds)	SD
PF	7.60	4.31
PM	7.22	3.70

Situation Awareness

The situation awareness timing data were analyzed using repeated measures analysis of variance, with procedure as a within-subjects independent variable and pilot role (either PF or PM) as a between-subjects independent variable. On average, participants' question response times were fastest, indicating higher situation awareness, with Procedure A and slowest, indicating lower situation awareness, with Procedure C, though the difference was not significant ($F(2, 48) = .91, p = .41$). Situation awareness response times are summarized in Table 4, with longer question response times indicating lower situation awareness.

Table 4. Study 1 SPAM Situation Awareness Response Times by Procedure

Procedure	Average (seconds)	SD
Procedure A (PM Aloud)	7.71	1.87
Procedure B (PM Aloud, PF Silent)	8.00	2.67
Procedure C (PM Silent, PF Silent)	8.11	1.97

The participants' role on the flight deck was significant at a slightly lower level of significance ($F(1, 24) = 4.23, p = .051$), with the PF having longer response times, indicating lower situation awareness, than the PM (see Table 5).

Table 5. Study 1 SPAM Situation Awareness Response Times by Role

Role	Average (seconds)	SD
PF	8.51	2.59
PM	7.37	1.52

In response to the situation awareness SPAM questions, participants answered over 99% of the questions correctly, which is expected with the SPAM technique since the participants have access to the correct answers. There were five incorrect answers out of a total of 620 questions. These incorrect answers were due to participants excessively rounding their responses to short answer questions, despite being instructed to answer as accurately as possible.

NASA-TLX Data

Workload was also assessed using the NASA-TLX (see Appendix 3). As described earlier, the NASA-TLX provides a subjective assessment of workload across six different workload factors, which are then averaged to get an overall workload rating on a 100-point scale. The NASA-TLX data were analyzed using repeated measures analysis of variance, with procedure as a within-subjects independent variable and pilot role as a between-subjects independent variable. As

with the SPAM workload results, workload was lowest with Procedure A, however the difference in subjective workload across procedures was not significant. Average reported workload for each procedure is shown in Table 6.

Table 6. Study 1 NASA-TLX Subjective Workload by Procedure

Procedure	Average	SD
Procedure A (PM Aloud)	11.44	7.57
Procedure B (PM Aloud, PF Silent)	12.32	8.02
Procedure C (PM Aloud, PF Silent)	11.85	7.27

Workload differences across roles on the flight deck were also not significant. These results are consistent with the SPAM workload results.

Response Time Data

Pilot response time to the data comm messages was examined. Specifically, the time from when the pilots opened the data comm message until they responded to it was analyzed and compared across the different procedures.

The response time data were analyzed using repeated measures analysis of variance, with procedure as a within-subjects independent variable. There was no significant difference in response times across procedures. Response times are summarized in Table 7.

Table 7. Study 1 Data Comm Response Time by Procedure

Procedure	Average (seconds)	SD
Procedure A (PM Aloud)	19.78	7.87
Procedure B (PM Aloud, PF Silent)	22.42	6.71
Procedure C (PM Silent, PF Silent)	23.82	8.62

Heads-Down Data

The percentage of time participants spent heads-down with the MCDU, using either the FMS or data comm functions, was determined using the webcam recordings of the participants' gaze.

The percentage of time spent looking at the MCDU was analyzed two ways. First, a between-subjects analysis of variance with role as the independent variable was conducted, then a second between-subjects analysis of variance, with procedure as the independent variable, was run. The percentage of time spent looking at the MCDU is summarized in Table 8. The results of the first analysis showed that the PM spent a significantly larger percentage of time looking at the MCDU than the PF did ($F(1,24) = 137.88, p < .05$). When procedure was used as the independent variable, however, there was no significant difference across the three procedures. Post hoc analyses revealed no significant interactions between procedure and role.

Table 8. Study 1 Percentage of Time Spent Looking at the MCDU by Procedure and Role

Procedure	PF		PM		Procedure Total	
	Average	SD	Average	SD	Average	SD
Procedure A (PM Aloud)	7.48%	7.04	38.41%	8.09	22.95%	7.57
Procedure B (PM Aloud, PF Silent)	10.68%	7.35	34.84%	8.01	22.76%	7.68
Procedure C (PM Silent, PF Silent)	13.01%	6.6	35.21%	6.24	24.11%	6.42
Role Total	10.39%	7.04	36.15%	7.3		

Procedural Compliance and Flight Deck Discussion Data

Throughout the experiment, an observer assessed the participants on how well they followed the given procedure and how much they discussed each message. In assessing compliance, the observer determined whether the pilots read aloud or silently as required, whether they made any mistakes in reading or understanding the message, and whether they read the complete message. The observer also assessed whether they re-read the message and whether they had to be prompted by the other pilot to read the message. The observer then documented the type of verbalization between the pilots after each message, noting whether it was a discussion of the message, a repetition of the message, or a confirmation (e.g., "okay"). The rubric used for this assessment is provided in Appendix 4.

Compliance

The participants made the most compliance errors with Procedure B, with 82 errors observed (see Table 9). In this procedure, the PM was to read the message aloud, and then the PF was to read it silently. Most of the errors consisted of the PF reading the message silently while the PM was reading the message aloud, rather than waiting for the PM to finish. This type of error results in both pilots being heads-down with the data comm message at the same time. Other errors with Procedure B included the PF reading the message aloud rather than silently or failing to read the message at all. In addition, there were several cases where the PF began executing the clearance after the PM read the message aloud, but before reading it himself.

Table 9. Study 1 Procedure Compliance Errors

Procedure	Number of Errors
Procedure A (PM Aloud)	24
Procedure B (PM Aloud, PF Silent)	82
Procedure C (PM Silent, PF Silent)	68

The fewest compliance errors occurred with Procedure A, with 24 errors observed. In Procedure A, the PM was to read the message aloud. In most cases, the compliance error with Procedure A was a conservative error with the PF reading the message in addition to the PM reading it. There were 68 compliance errors observed with Procedure C. In this procedure, the PM was to read the message silently, and then the PF was to read the message silently. There were two types of compliance errors with this procedure: one of the pilots read the message aloud, or the two pilots read the message concurrently.

In both Procedures B and C, the PF was required to read the message silently. There were six cases where the PF did not appear to read the message; these all occurred with Procedure B. This may be due to the fact that in Procedure B, the PF would have heard the message read aloud and so would have had knowledge of the message without having to read it.

There were eight instances where the PM misread a portion of the clearance while reading the message aloud. Four occurred in Procedure A, two occurred in Procedure B, and two occurred in Procedure C. The two instances in Procedure C occurred with the same PF. His misreading was apparent when he discussed the clearance with the PM after they had both read silently. In both cases, the PM corrected the PF.

There were four instances where the participants appeared to misunderstand the message. In three cases, the participants misunderstood the clearance to “ADJUST SPEED TO [speed] ... AFTER PASSING [position] DESCEND TO [level].” They mistakenly thought they should adjust their speed after they passed the waypoint. In the fourth case, the PM misunderstood an element of the PIREP. He confused the reporting aircraft (A320) as referring to the altitude (FL320). The misunderstandings occurred once each with Procedures A and C and twice with Procedure B.

In Procedures A and B, the PM was equally likely to give an incomplete reading. (Incomplete readings most often occurred when reading the PIREP, where the PM sometimes omitted one or more information elements.) There is no reason to conclude that Procedure A is more prone to erroneous or incomplete readings by the PM than is Procedure B. However, it is important to note that such mistakes are potentially of greater consequence in Procedure A, where the PF is dependent on the PM for knowledge of the message. In a related observation, the PM was more likely to re-read the message aloud in Procedure A than in Procedure B, likely a result of the PF being dependent on the PM for knowledge of the message.

In three cases, the PM had to be prompted by the PF to open the data comm message, once with Procedure A and twice with Procedure B. In nine cases, the PM had to be prompted by the PF to open the second page of a two-page message. This occurred once with Procedure A, three times with Procedure B, and five times with Procedure C.

Responding

Although the procedures did not specify how to reply to a data comm message, the participants were given the global instruction that the PM was to respond to all clearances. In sixteen cases, the participants forgot to send a response to a message; in six of those cases, the participants eventually remembered and sent a response, while in the other ten cases the participants never sent a response. Forgetting to respond occurred most often with Procedure B, followed by Procedure A, and then Procedure C.

Verbalization

Verbalization between the participants was also documented and categorized as: (1) a discussion of the message, (2) a repetition of the message, or (3) a confirmation (e.g., “okay”); these data are summarized in Table 10. Overall, the most verbalization was observed in Procedure C, followed by Procedure A, with Procedure B having the least verbalization. The amount of verbalization categorized as discussion was similar across the three procedures. However, the amount of repetition and confirmation was highest in Procedure C, followed by A. When using Procedure C, the pilots may have felt the need to repeat the message and confirm aloud that they both had the same understanding of the message. Similarly, in Procedure A, although the PM read the message aloud, the PF may have felt the need to repeat or confirm

what he understood the message to be. In Procedure B, the message was read aloud by the PM plus the PF read it silently. This may have reduced the need to repeat or confirm the message.

Table 10. Study 1 Count of Verbalization Type by Procedure

Procedure	Discussion	Repetition	Confirmation	Total
Procedure A (PM Aloud)	87	84	108	279
Procedure B (PM Aloud, PF Silent)	85	71	99	255
Procedure C (PM Silent, PF Silent)	79	90	115	284

Opinion Surveys

At the conclusion of each experimental session, the participants were asked for their opinions of the three procedures. For a summary of participant responses, see Table 11. Participants overwhelmingly preferred Procedure B to Procedures A and C. They liked that the message was read aloud and could be verified by both pilots. They were concerned about the lack of verification by the PF in Procedure A and the lack of verbal confirmation and coordination in Procedure C. The participants considered Procedure C most error-prone, followed by Procedure A; none considered Procedure B to be the most error-prone. Most of the pilots felt that Procedure C was the most demanding, followed by Procedures A and B. Several pilots suggested that a better procedure would be for the PM to read the message aloud, followed by the PF reading the message aloud.

Table 11. Study 1 Opinion Survey Response Summary

Procedure	Which procedure did you prefer?	Which procedure is the most error prone?	Which procedure was the most demanding?
Procedure A (PM Aloud)	14%	39%	5%
Procedure B (PM Aloud, PF Silent)	83%	0%	3%
Procedure C (PM Silent, PF Silent)	3%	61%	92%

Discussion: Study 1

In Study 1, three procedures for opening and reading data comm messages were investigated. In Procedure A, the PM opened the message and read it aloud. In Procedure B, the PM opened the message and read it aloud, then the PF read it silently. In Procedure C, the PM opened the message and read it silently, then the PF read it silently.

By many of the metrics used in this study, Procedure A yielded the best results. Use of Procedure A resulted in the lowest workload for both the SPAM workload measure and the NASA-TLX measure, though the difference was not significant for the NASA-TLX measure. Procedure A also led to the highest situation awareness (though again this did not reach statistical significance), and a medium level of verbalization. Not surprisingly, since only one pilot was required to read the message, Procedure A resulted in the fastest data comm response times. In addition, the fewest compliance errors occurred while implementing Procedure A, and those errors occurred when the PF read the message despite the instruction that he not read the message, a relatively conservative error. The participants, however, did not like Procedure A and felt that it could be error-prone, particularly since only one pilot read the message.

Participants overwhelmingly favored Procedure B. They were comfortable with the fact that the message was announced aloud, which is consistent with current voice operations where ATC clearances are broadcast audibly to the flight deck. In addition, Procedure B allowed them to “trust, but verify,” a concept consistent with their training, where the PF trusted the PM to read the message aloud but also verified the message by reading it silently. However, Procedure B did not yield the best results in most of the metrics used. With Procedure B, participants reported the highest subjective workload as measured by the NASA-TLX, though this trend did not reach significance. The SPAM results with Procedure B showed medium workload levels and medium situation awareness. The participants had moderate data comm response times and the least verbalization. Compliance errors were greatest with Procedure B. Most of the errors occurred when the PF read the message silently concurrently with the PM reading the message aloud, resulting in a potentially dangerous situation where both pilots were looking down at the MCDU at the same time.

Participants strongly disliked Procedure C and provided numerous negative comments regarding its unnatural feel and lack of verbal confirmation and coordination. The SPAM results indicated highest workload and lowest situation awareness with Procedure C, though this trend did not reach significance. The NASA-TLX results showed moderate subjective workload. Procedure C resulted in the longest data comm response times and highest percentage of heads-down time gazing at the MCDU. However, it also resulted in the most verbalization. Much of the additional verbalization was in repetition of the message or confirmatory

verbalization. There were a moderate number of compliance errors with Procedure C, some conservative errors, where one of the pilots read the message aloud, and some potentially dangerous errors, where the two pilots read the message concurrently.

Very few actual mistakes were observed; this may be partly due to the fact that mistakes in silent reading were not observable. However, mistakes were observed during the read aloud portions of Procedures A and B. These included misreading a message, misunderstanding a message, or providing an incomplete reading. It is important to note that Procedure A is less resilient to such mistakes, since only one pilot actually reads the message. In addition, without explicit instruction to discuss the message after reading it, a mistake in reading or understanding a message could also go undetected in Procedure C.

Interestingly, the SPAM results, across procedures, indicated higher workload and lower situation awareness for the PF than the PM. As expected, the PM spent a significantly greater percentage of time heads-down gazing at the MCDU across procedures.

Study 2

Study 2 was conducted to investigate participants' behavior in the absence of a specified procedure. This was done to determine both how participants handled reading data comm messages without a specified procedure and how their performance without a procedure compared to their performance with a prescribed procedure.

Method

Participants

The participants were 12 pilots who had airline experience within the last two years and experience on an aircraft equipped with an FMS. The pilots were recruited using ads placed through ALPA, SWAPA, APA, and other airline contacts. Pilots were paid for their participation in the study.

The pilots were run in pairs, as in Study 1.

There were 11 male pilots and one female pilot. They had an average age of 41.9 ($SD = 10.4$) and an average of 8,812 hours ($SD = 5,874$) of total flight time with an average of 148.8 hours ($SD = 75.8$) flown within the last 90 days. There was no significant difference in age or flight experience between the pilots serving as PF and PM in this experiment. Four of the pilots had experience with CPDLC, and those pilots had an average of 3.0 years ($SD = 2.1$) of CPDLC experience.

Apparatus and Materials

Simulation

The simulation in Study 2 was identical to that in Study 1.

Assessment Tools

The assessment tools in Study 2 were identical to those in Study 1.

Procedure

Task

The task in Study 2 was identical to that described in Study 1 with the exception that there were only two experimental flight scenarios.

Design

The independent variable was data comm procedure, which was a within-subjects variable. The procedures tested are summarized in Table 12. Participants were instructed that the procedures were for opening and reading the data comm messages, and that after completing the procedure, they could discuss and respond to the message as they normally would.

Table 12. Study 2 Procedure Descriptions

Experimental Flight	Procedure Designation	Procedure Description
1	No Procedure	No data comm procedure was given.
2	Procedure C (PM Silent, PF Silent)	Pilot Monitoring opens the message and reads it silently. Pilot Flying then reads it silently.

Since the scenarios were designed to be equivalent, they were always presented in the same order. In addition, the flight in which participants were given Procedure C was always the second experimental flight. This was done to prevent any bias in participant behavior in the flight where no procedure was specified. If some of the participants had been given a procedure in their first flight, they might have been more likely to follow that procedure in the absence of any instructions.

Detailed Procedure

The arrival procedures were identical to those used in Study 1. Upon completion of the practice flights the pilots then flew the two experimental flights from KLBB to KSLC.

Prior to each flight, pilots were provided with the necessary flight materials, including a flight release that depicted their loaded flight plan, weather briefings, and charts such as airport diagrams, instrument approach charts, and en route charts. For sample flight documents, see Appendix 6. The pilots were given as much time as they needed to review the materials, as well as the pre-programmed FMS flight plan. Prior to the second experimental flight, the experimenter read the data comm procedure for that flight and posted the procedure on the wall over the pilots’ desktop as a reminder throughout the flight. When the pilots indicated that they were ready to fly, the scenario began with the flight already en route. As in Study 1, the pilots were interrupted periodically during the flight to answer a SPAM question. At the end of the flight, the pilots were asked to complete the NASA-TLX, and at the end of all four flights, they were given a survey asking for their opinions about the procedure they used in the first experimental flight and the procedure they were told to use in the second experimental flight, given information on the study, and asked for any additional insights they wanted to provide.

Results

SPAM Workload and Situation Awareness Data

As in Study 1, workload and situation awareness were assessed using the Situation Present Assessment Method. The SPAM workload and situation awareness timing data were analyzed using repeated measures analysis of variance, with procedure as a within-subjects independent variable and role as a between-subjects independent variable.

Workload

Workload was higher, indicated by slower readiness prompt response times, with Procedure C than when no procedure was specified (see Table 13), however this difference was not significant.

Table 13. Study 2 SPAM Workload Response Times by Procedure

Procedure	Average (seconds)	SD
Procedure C (PM Silent, PF Silent)	8.87	6.34
No Procedure	7.96	3.64

Pilots in the PF role had higher response times, indicating greater workload, than those in the PM role (see Table 14); again, this difference was not significant.

Table 14. Study 2 SPAM Workload Response Times by Role

Role	Average (seconds)	SD
PF	9.01	4.04
PM	7.82	6.12

Situation Awareness

Situation awareness was significantly higher, indicated by significantly faster question response times, with Procedure C than without a specified procedure ($F(1, 10) = 5.09, p < .05$). Situation awareness response times are summarized in Table 15, with faster response times indicating higher situation awareness.

Table 15. Study 2 SPAM Situation Awareness Response Times by Procedure

Procedure	Average (seconds)	SD
Procedure C (PM Silent, PF Silent)	6.92	1.61
No Procedure	7.65	1.68

The PF had slightly higher situation awareness, indicated by slightly faster question response times, than the PM (see Table 16), but this difference was not significant.

Table 16. Study 2 SPAM Situation Awareness Response Times by Role

Role	Average (seconds)	SD
PF	7.03	1.39
PM	7.55	1.90

In response to the situation awareness SPAM questions, participants answered all of the questions correctly, which is expected with the SPAM technique since the participants have access to the correct answers.

NASA-TLX Data

As in Study 1, the NASA-TLX data were analyzed using repeated measures analysis of variance, with procedure as a within-subjects independent variable and role as a between-subjects independent variable. Subjective workload was higher with Procedure C than with no specified procedure (see Table 17), but not significantly. Workload differences across roles on the flight deck were not significant. These results are consistent with the SPAM workload results.

Table 17. Study 2 NASA-TLX Subjective Workload by Procedure

Procedure	Average	SD
Procedure C (PM Silent, PF Silent)	23.33	12.42
No Procedure	22.64	12.58

Note that the NASA-TLX workload ratings were much higher for Study 2 than Study 1, although the experimental scenarios were the same and the experimental protocol was very similar. The difference in ratings may be due to the use of a different survey interface. All NASA-TLX surveys were conducted via an online survey tool. However, in Study 1, the tool interface used a dropdown menu from which the participants selected a rating, and in Study 2, the tool interface used a slider, with a midpoint starting position, with which the participants set a rating. It may be that it was easier to slide farther horizontally than to select a value farther down the vertical dropdown menu. There is support in the literature for different interfaces resulting in different ratings (e.g., Couper, Tourangeau, Conrad, & Crawford, 2004).

Response Time Data

Pilot response time to the data comm messages was examined. Specifically, the time from when the pilots opened the data comm message until they responded to it was analyzed and compared across the two scenarios.

The response time data were analyzed using repeated measures analysis of variance, with procedure as a within-subjects independent variable. It took significantly longer to respond to a data comm message with Procedure C than when no procedure was specified ($F(1, 5) = 8.32$, $p < .05$). Response times are summarized in Table 18.

Table 18. Study 2 Data Comm Response Time by Procedure

Procedure	Average (seconds)	SD
Procedure C (PM Silent, PF Silent)	32.09	7.81
No Procedure	19.31	6.93

Heads-Down Data

The percentage of time participants spent heads-down with the MCDU, using either the FMS or data comm functions, was determined using the webcam recordings of the participants' gaze.

The percentage of time spent looking at the MCDU was analyzed using repeated measures analysis of variance, with procedure as a within-subjects independent variable and role as a between-subjects independent variable. Participants spent more time looking at the MCDU with Procedure C than with no procedure (see Table 19), however this difference was not significant.

Table 19. Study 2 Percentage of Time Spent Looking at the MCDU by Procedure

Procedure	Average	SD
Procedure C (PM Silent, PF Silent)	26.1%	16.2
No Procedure	24.5%	16.3

The PM spent a significantly larger percentage of time heads-down with the MCDU than the PF did ($F(1, 10) = .346, p < .05$; see Table 20).

Table 20. Study 2 Percentage of Time Spent Looking at the MCDU by Role

Role	Average	SD
PF	14.0%	8.9
PM	36.5%	13.1

Procedural Compliance and Flight Deck Discussion Data

During the first experimental flight, an observer documented how the participants handled opening and reading each message. During the second experimental flight, the observer's assessment was identical to that used in Study 1. The rubric used for this assessment is provided in Appendix 4.

Compliance

In the first experimental flight, the participants were not given specific instructions for opening and reading messages. In all cases, the PM opened the message, and in all but one case, the PM then read the message aloud. Of the six participants in the PF role, four read the message silently (similar to Procedure B from Study 1), one did not read it (similar to Procedure A from Study 1), and one read it aloud.

In the second flight, the participants used Procedure C. They were instructed that the PM was to read the message silently, and then the PF was to read the message silently. There were three types of compliance errors observed with this procedure: the PF read the message aloud, the PF did not read the message, or the two pilots read the message concurrently.

In the first flight, when the PM read the message aloud, there was only one instance where the PM misread a portion of the clearance while reading aloud. In that case, the PF caught the error and asked the PM to re-read the message. There were three instances where the participants appeared to misunderstand the message. These occurred once during the first flight when the participants misunderstood the clearance to "ADJUST SPEED TO [speed] ... AFTER PASSING [position] DESCEND TO [level]," and twice with Procedure C during the second flight, once with the same clearance and once when the PM read the three-letter waypoint identifier correctly but used an incorrect waypoint name.

Also in the first flight, the PM gave an incomplete reading in three cases, each time when reading the PIREP, by omitting one or more information elements. There were four cases where the PM re-read the message aloud, two in the first flight and two in the second flight.

In four cases, the PM had to be prompted by the PF to open the second page of a two-page message. All four cases occurred in the first flight, when no procedure was specified.

Responding

Again, the participants were not told how to reply to a data comm message other than the global instruction that the PM was to respond to all clearances. In four cases, the participants forgot to send a response to a message. In three of those four cases, the participants eventually remembered and sent a response, while in the final case the participants never sent a response. Three of the forgotten responses occurred when no procedure was specified, and one occurred with Procedure C.

Verbalization

Verbalization between the participants was also documented and categorized as: (1) a discussion of the message, (2) a repetition of the message, or (3) a confirmation (e.g., “okay”). Overall, slightly more verbalization was observed in Procedure C (see Table 21). The amount of verbalization categorized as discussion was slightly higher in the first flight, with no procedure, but the amount of repetition was much higher in the second flight, with Procedure C. The amount of confirmation was similar across the two flights. Again, when using Procedure C, the pilots may have felt the need to repeat the message aloud to confirm that they both had the same understanding.

Table 21. Study 2 Count of Verbalization Type by Procedure

Procedure	Discussion	Repetition	Confirmation
Procedure C (PM Silent, PF Silent)	32	43	45
No Procedure	38	28	47

Opinion Surveys

At the conclusion of each experimental session, the participants were asked for their opinions of Procedure C and how it compared to what they chose to do when they were not given a specific procedure to follow. Participants preferred their own procedure (66%) to Procedure C. Most (83%) felt that Procedure C was more demanding. The participants reported that Procedure C was time consuming and felt counter to their standard practice of communicating and working as a team. However, they liked that each pilot independently verified the message and that both pilots were required to read the message.

The pilots were also asked to describe the steps they took when they were not given specific instructions, and why they chose to handle the data comm messages in that manner. The participants whose behavior was similar to Procedure A from Study 1 (i.e., PM read aloud, and PF did not read) stated that they used that procedure because it seemed easiest. One participant stated that it allowed the PM to take the role currently filled by ATC by announcing the message aloud. The participants whose behavior was similar to Procedure B from Study 1 (i.e., PM read aloud, and then PF read silently) stated that their procedure allowed both pilots to understand the message. One participant reported that the procedure they followed was his airline’s current standard operating procedure with CPDLC. Interestingly, the pilots who essentially performed Procedure B, although without instructions, implemented the procedure

as many of the participants in Study 1 did, with the PF reading the message silently while the PM read the message aloud. Again, this resulted in both pilots being heads-down with the data comm message at the same time.

Discussion: Study 2

In Study 2, participants flew two scenarios. In the first, they were not given a procedure for opening and reading data comm messages. In the second, they were instructed to use Procedure C, where the PM opened the message and read it silently, then the PF read it silently.

In the absence of specific instructions, the PM typically opened and read the message aloud. Of the six participants in the PF role, four read the message silently (similar to Procedure B from Study 1), one did not read it (similar to Procedure A from Study 1), and one read it aloud. Participants' procedure of choice in the absence of a set procedure is consistent with the results of Study 1 where the participants strongly preferred Procedure B. In addition, most participants expressed a preference for their own procedure over Procedure C.

Procedure C resulted in significantly higher situation awareness, but also in higher workload, as measured by both SPAM and the NASA-TLX, significantly higher data comm response times, and a somewhat higher percentage of time heads-down gazing at the MCDU. There was slightly more verbalization with Procedure C, and, as in Study 1, the verbalization was more likely to be repetition.

As in Study 1, the SPAM results, across procedures, indicated higher workload for the PF than the PM. The PM again spent a significantly greater percentage of time heads-down gazing at the MCDU across procedures. However, the SPAM results showed slightly higher situation awareness for the PF, which is inconsistent with Study 1.

Conclusions

The results of these studies indicate that Procedure A, where the PM reads the data comm message aloud and the PF does not read it, generally led to higher situation awareness, lower workload, and faster data comm response times. However, there is increased risk of error with only one pilot reading the message, and pilots were clearly uncomfortable with this risk. They were also uncomfortable with Procedure C, where both pilots read the message silently. Procedure C led to the lowest situation awareness and longest response times. In addition, the pilots most disliked this procedure because of the lack of verbal coordination. Participants strongly preferred Procedure B, where the PM read the message aloud, and then the PF read it silently. In fact, in the absence of any instruction, they were most likely to follow Procedure B. They particularly liked that Procedure B allowed them to "trust, but verify." However,

Procedure B did not lead to better results in situation awareness, workload, response time, or errors.

The optimal procedure, therefore, is a procedure that leverages elements of both Procedure B and Procedure C. In particular, the procedure should use the independent reading element of Procedure C and the read aloud element of Procedure B. For example, Procedure C could be modified to include the additional step of requiring the PM to state the clearance aloud after both pilots have read silently. As an alternative, Procedure B could be modified to require the PF to also read aloud, to prevent the pilots from reading concurrently and to increase the chance that the PF would detect a reading error by the PM.

The most often misunderstood data comm message in the two studies was the message “ADJUST SPEED TO [speed] ... AFTER PASSING [position] DESCEND TO [level].” This finding highlights the need for the development of rules for how data comm messages are concatenated.

Additional research is needed to further refine procedures for opening and reading data comm messages. This research should focus on investigating variations of Procedures B and C and using a larger sample size.

Acknowledgements

This project was funded by the FAA Human Factors Research and Engineering Group (AJP-61), and conducted by George Mason University (GMU). The study was overseen by Tom McCloy and Dan Herschler in the AJP-61 office. In addition to the authors, GMU team members included Jane H. Barrow, William Benson, Chia-Hsuan Chang, Simone Erchov, Thomas Huggins, Devon Kelley, Erik T. Nelson, Ryan Olmstead, and M. Ross Thornton. Additional help was provided by Sanja Avramovic and Melissa Smith.

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Appendix 1 – Acronym List

ALPA	Air Line Pilots Association
APA	Allied Pilots Association
ATC	Air Traffic Control
CPDLC	Controller Pilot Data Link Communication
Data Comm	Data Communications
FAA	Federal Aviation Administration
FMS	Flight Management System
GMU	George Mason University
KIAD	Washington Dulles International Airport
KJFK	John F. Kennedy International Airport
KLBB	Lubbock Preston Smith International Airport
KSLC	Salt Lake City International Airport
MCDU	Multipurpose Control and Display Unit
NASA-TLX	NASA-Task Load Index
NextGen	Next Generation Air Transportation System
PF	Pilot Flying
PIREP	Pilot Report
PM	Pilot Monitoring
SPAM	Situation Present Assessment Method
SWAPA	Southwest Airlines Pilots' Association

Appendix 2 – Situation Present Assessment Method (SPAM)

The SPAM (Durso & Dattel, 2004) is an objective assessment of workload and situation awareness. In this method, participants are interrupted from their primary task with queries about their situation. When they are initially prompted, they are asked to signal when they are ready to answer a question. When they indicate readiness for a question, they are given a question about their situation. They are instructed to answer as quickly and as accurately as possible. Both the accuracy of their answer and their response time to the question are measures of their situation awareness. In addition, the time it takes them to indicate readiness for a question is a measure of their workload. A web-based SPAM tool was developed specifically for this study (see Figure 2-1), and presented to participants on a laptop computer. Participants were prompted periodically and either given a multiple choice (see Figure 2-2) or short answer question (see Figure 2-3) about their situation. Both the prompt and question screens were set to time out after 60 seconds of inactivity to prevent interference with a subsequent question.

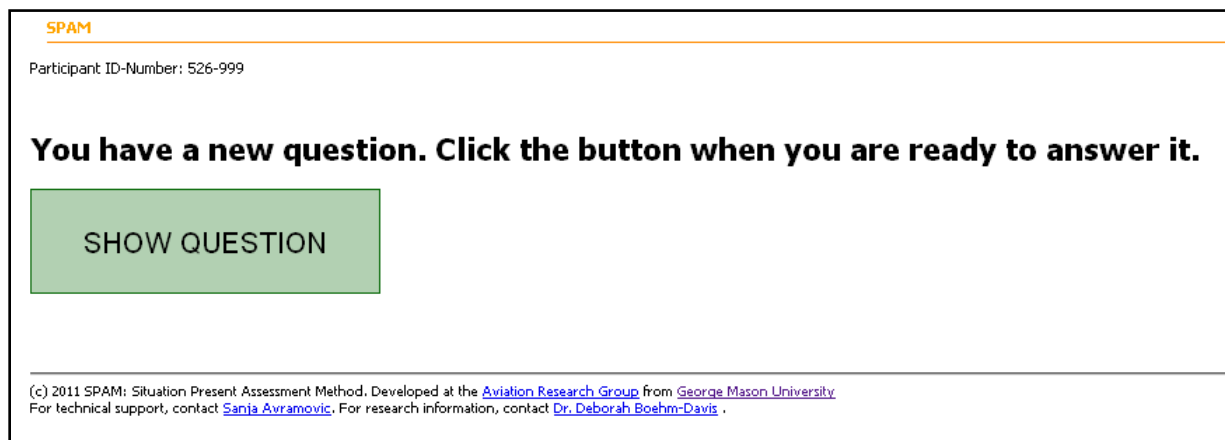


Figure 2-1. SPAM Question Ready Screen

SPAM

What is your current speed? (Choose the closest answer.)

- 300 K
- 260 K
- 290 K
- 360 K

SUBMIT ANSWER

(c) 2011 SPAM: Situation Present Assessment Method. Developed at the [Aviation Research Group](#) from [George Mason University](#). For technical support, contact [Sanja Avramovic](#). For research information, contact [Dr. Deborah Boehm-Davis](#).

Figure 2-2. Sample Multiple Choice SPAM Question

SPAM

How far from Dove Creek (DVC) are you?

SUBMIT ANSWER

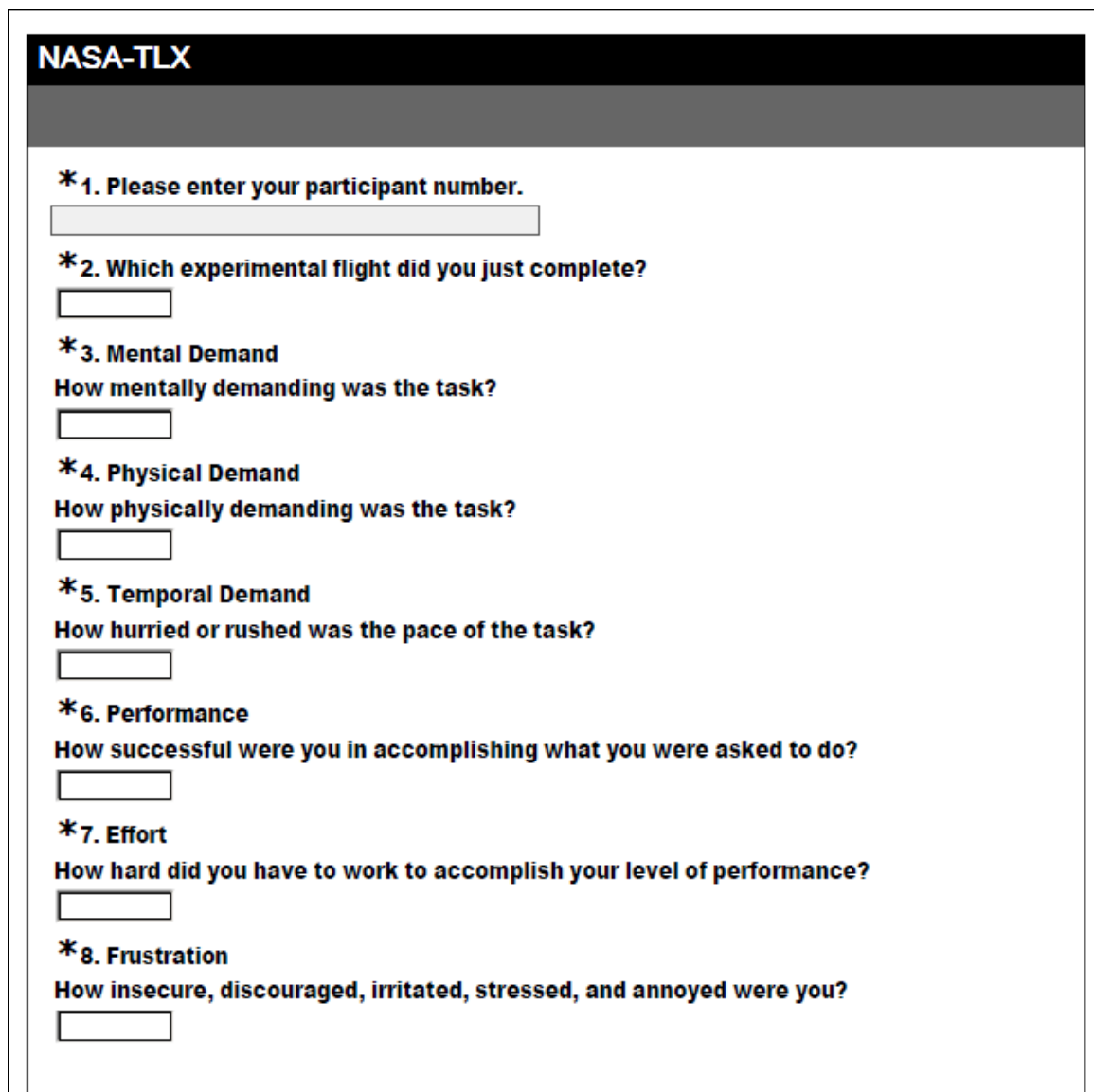
(c) 2011 SPAM: Situation Present Assessment Method. Developed at the [Aviation Research Group](#) from [George Mason University](#). For technical support, contact [Sanja Avramovic](#). For research information, contact [Dr. Deborah Boehm-Davis](#).

Figure 2-3. Sample Short Answer SPAM Question

Appendix 3 – NASA-Task Load Index (TLX)

The NASA-TLX (Hart & Staveland, 1988) is a subjective measurement of workload. With this measure, participants give a rating for each of six workload factors (mental demand, physical demand, temporal demand, performance, effort, and frustration). These ratings are then averaged to get an overall workload rating on a 100-point scale. Higher scores indicate a higher level of perceived workload.

The NASA-TLX was administered using an online survey tool. The survey tool used in Study 1 utilized a drop down menu for each factor and is shown in Figure 3-1. The survey tool used in Study 2 utilized a slide bar for each factor and is shown in Figure 3-2.



NASA-TLX

***1. Please enter your participant number.**

***2. Which experimental flight did you just complete?**

***3. Mental Demand**
How mentally demanding was the task?

***4. Physical Demand**
How physically demanding was the task?

***5. Temporal Demand**
How hurried or rushed was the pace of the task?

***6. Performance**
How successful were you in accomplishing what you were asked to do?

***7. Effort**
How hard did you have to work to accomplish your level of performance?

***8. Frustration**
How insecure, discouraged, irritated, stressed, and annoyed were you?

Figure 3-1. Study 1 NASA-TLX

Qualtrics.com

How physically demanding was the task?

Very Low Very High

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

Physical Demand

Study Completion 0% 100%

Back Next

Figure 3-2. Study 2 NASA-TLX

Appendix 4 – Procedural Compliance and Flight Deck Discussion Rubric

Study 1

Practice Flights, No Procedure Given

Clearance 1		P		
Action		Comments		
<input type="checkbox"/>	PM opened message			
<input type="checkbox"/>	PM read message (if yes, circle one)			
<input type="checkbox"/>	Aloud	Silently		
	<input type="checkbox"/>	Had to be prompted		
	<input type="checkbox"/>	Misread		
	<input type="checkbox"/>	Incomplete reading		
	<input type="checkbox"/>	Reread		
	<input type="checkbox"/>	Was interrupted		
	<input type="checkbox"/>	Resumed after interruption (if yes, circle one)		
	Where stopped	At beginning	Other	
<input type="checkbox"/>	PF read message (if yes, circle one)			
<input type="checkbox"/>	Aloud	Silently		
	<input type="checkbox"/>	Had to be prompted		
	<input type="checkbox"/>	PF read message aloud		
<input type="checkbox"/>	PM and PF discussed (if yes, circle one)			
<input type="checkbox"/>	Relevant	Repeat	Confirmation	Irrelevant
	PF PM	PF PM	PF PM	PF PM
	<input type="checkbox"/>	Requested clarification		
	<input type="checkbox"/>	Misunderstood		

Clearance 2										P
Action					Comments					
<input type="checkbox"/>	PM opened message									
<input type="checkbox"/>	PM read message (if yes, circle one)									
<input type="checkbox"/>	Aloud		Silently							
	<input type="checkbox"/>	Had to be prompted								
	<input type="checkbox"/>	Misread								
	<input type="checkbox"/>	Incomplete reading								
	<input type="checkbox"/>	Reread								
	<input type="checkbox"/>	Was interrupted								
	<input type="checkbox"/>	Resumed after interruption (if yes, circle one)								
<input type="checkbox"/>	Where stopped		At beginning		Other					
<input type="checkbox"/>	PF read message (if yes, circle one)									
<input type="checkbox"/>	Aloud		Silently							
	<input type="checkbox"/>	Had to be prompted								
<input type="checkbox"/>	PF read message aloud									
<input type="checkbox"/>	PM and PF discussed (if yes, circle one)									
<input type="checkbox"/>	Relevant		Repeat		Confirmation		Irrelevant			
	PF	PM	PF	PM	PF	PM	PF	PM		
	<input type="checkbox"/>	Requested clarification								
<input type="checkbox"/>	Misunderstood									

Clearance 3										P
Action					Comments					
<input type="checkbox"/>	PM opened message									
<input type="checkbox"/>	PM read message (if yes, circle one)									
<input type="checkbox"/>	Aloud		Silently							
	<input type="checkbox"/>	Had to be prompted								
	<input type="checkbox"/>	Misread								
	<input type="checkbox"/>	Incomplete reading								
	<input type="checkbox"/>	Reread								
	<input type="checkbox"/>	Was interrupted								
	<input type="checkbox"/>	Resumed after interruption (if yes, circle one)								
<input type="checkbox"/>	Where stopped		At beginning		Other					
<input type="checkbox"/>	PF read message (if yes, circle one)									
<input type="checkbox"/>	Aloud		Silently							
	<input type="checkbox"/>	Had to be prompted								
<input type="checkbox"/>	PF read message aloud									
<input type="checkbox"/>	PM and PF discussed (if yes, circle one)									
<input type="checkbox"/>	Relevant		Repeat		Confirmation		Irrelevant			
	PF	PM	PF	PM	PF	PM	PF	PM		
	<input type="checkbox"/>	Requested clarification								
<input type="checkbox"/>	Misunderstood									

Clearance 4										P
Action					Comments					
<input type="checkbox"/>	PM opened message									
<input type="checkbox"/>	PM read message (if yes, circle one)									
Aloud					Silently					
<input type="checkbox"/>	Had to be prompted									
<input type="checkbox"/>	Misread									
<input type="checkbox"/>	Incomplete reading									
<input type="checkbox"/>	Reread									
<input type="checkbox"/>	Was interrupted									
<input type="checkbox"/>	Resumed after interruption (if yes, circle one)									
Where stopped			At beginning			Other				
<input type="checkbox"/>	PF read message (if yes, circle one)									
Aloud					Silently					
<input type="checkbox"/>	Had to be prompted									
<input type="checkbox"/>	PF read message aloud									
<input type="checkbox"/>	PM and PF discussed (if yes, circle one)									
Relevant		Repeat			Confirmation		Irrelevant			
PF	PM	PF	PM	PF	PM	PF	PM			
<input type="checkbox"/>	Requested clarification									
<input type="checkbox"/>	Misunderstood									

Clearance 5										P
Action					Comments					
<input type="checkbox"/>	PM opened message									
<input type="checkbox"/>	PM read message (if yes, circle one)									
Aloud					Silently					
<input type="checkbox"/>	Had to be prompted									
<input type="checkbox"/>	Misread									
<input type="checkbox"/>	Incomplete reading									
<input type="checkbox"/>	Reread									
<input type="checkbox"/>	Was interrupted									
<input type="checkbox"/>	Resumed after interruption (if yes, circle one)									
Where stopped			At beginning			Other				
<input type="checkbox"/>	PF read message (if yes, circle one)									
Aloud					Silently					
<input type="checkbox"/>	Had to be prompted									
<input type="checkbox"/>	PF read message aloud									
<input type="checkbox"/>	PM and PF discussed (if yes, circle one)									
Relevant		Repeat			Confirmation		Irrelevant			
PF	PM	PF	PM	PF	PM	PF	PM			
<input type="checkbox"/>	Requested clarification									
<input type="checkbox"/>	Misunderstood									

Clearance 6		P	
Action		Comments	
<input type="checkbox"/>	PM opened message		
<input type="checkbox"/>	PM read message (if yes, circle one)		
<input type="checkbox"/>	Aloud	Silently	
	<input type="checkbox"/>	Had to be prompted	
	<input type="checkbox"/>	Misread	
	<input type="checkbox"/>	Incomplete reading	
	<input type="checkbox"/>	Reread	
	<input type="checkbox"/>	Was interrupted	
	<input type="checkbox"/>	Resumed after interruption (if yes, circle one)	
	Where stopped	At beginning	Other
<input type="checkbox"/>	PF read message (if yes, circle one)		
<input type="checkbox"/>	Aloud	Silently	
	<input type="checkbox"/>	Had to be prompted	
	<input type="checkbox"/>	PF read message aloud	
<input type="checkbox"/>	PM and PF discussed (if yes, circle one)		
<input type="checkbox"/>	Relevant	Repeat	Confirmation
	PF PM	PF PM	Irrelevant
			PF PM
	<input type="checkbox"/>	Requested clarification	
<input type="checkbox"/>	Misunderstood		

Clearance 7		P	
Action		Comments	
<input type="checkbox"/>	PM opened message		
<input type="checkbox"/>	PM read message (if yes, circle one)		
<input type="checkbox"/>	Aloud	Silently	
	<input type="checkbox"/>	Had to be prompted	
	<input type="checkbox"/>	Misread	
	<input type="checkbox"/>	Incomplete reading	
	<input type="checkbox"/>	Reread	
	<input type="checkbox"/>	Was interrupted	
	<input type="checkbox"/>	Resumed after interruption (if yes, circle one)	
	Where stopped	At beginning	Other
<input type="checkbox"/>	PF read message (if yes, circle one)		
<input type="checkbox"/>	Aloud	Silently	
	<input type="checkbox"/>	Had to be prompted	
	<input type="checkbox"/>	PF read message aloud	
<input type="checkbox"/>	PM and PF discussed (if yes, circle one)		
<input type="checkbox"/>	Relevant	Repeat	Confirmation
	PF PM	PF PM	Irrelevant
			PF PM
	<input type="checkbox"/>	Requested clarification	
<input type="checkbox"/>	Misunderstood		

Experimental Flight, Procedure A

Clearance 1		A								
Action		Comments								
<input type="checkbox"/>	PM opened message									
<input type="checkbox"/>	PM read message aloud									
<input type="checkbox"/>	<input type="checkbox"/>	Had to be prompted								
	<input type="checkbox"/>	Misread								
	<input type="checkbox"/>	Incomplete reading								
	<input type="checkbox"/>	Reread								
	<input type="checkbox"/>	Was interrupted								
	<input type="checkbox"/>	Resumed after interruption (if yes, circle one)								
	<input type="checkbox"/>	Where stopped	At beginning		Other					
<input type="checkbox"/>	PM and PF discussed (if yes, circle one)									
<input type="checkbox"/>	Relevant	Repeat		Confirmation		Irrelevant				
	PF	PM	PF	PM	PF	PM	PF	PM		
	<input type="checkbox"/>	Requested clarification								
<input type="checkbox"/>	Misunderstood									
<input type="checkbox"/>	Failed to comply with procedure									

Clearance 2		A								
Action		Comments								
<input type="checkbox"/>	PM opened message									
<input type="checkbox"/>	PM read message aloud									
<input type="checkbox"/>	<input type="checkbox"/>	Had to be prompted								
	<input type="checkbox"/>	Misread								
	<input type="checkbox"/>	Incomplete reading								
	<input type="checkbox"/>	Reread								
	<input type="checkbox"/>	Was interrupted								
	<input type="checkbox"/>	Resumed after interruption (if yes, circle one)								
	<input type="checkbox"/>	Where stopped	At beginning		Other					
<input type="checkbox"/>	PM and PF discussed (if yes, circle one)									
<input type="checkbox"/>	Relevant	Repeat		Confirmation		Irrelevant				
	PF	PM	PF	PM	PF	PM	PF	PM		
	<input type="checkbox"/>	Requested clarification								
<input type="checkbox"/>	Misunderstood									
<input type="checkbox"/>	Failed to comply with procedure									

Clearance 3		A		
Action		Comments		
<input type="checkbox"/>	PM opened message			
<input type="checkbox"/>	PM read message aloud			
<input type="checkbox"/>	<input type="checkbox"/> Had to be prompted			
	<input type="checkbox"/> Misread			
	<input type="checkbox"/> Incomplete reading			
	<input type="checkbox"/> Reread			
	<input type="checkbox"/> Was interrupted			
	<input type="checkbox"/> Resumed after interruption (if yes, circle one)			
	Where stopped At beginning Other			
<input type="checkbox"/>	PM and PF discussed (if yes, circle one)			
<input type="checkbox"/>	Relevant	Repeat	Confirmation	Irrelevant
	PF PM	PF PM	PF PM	PF PM
<input type="checkbox"/>	Requested clarification			
<input type="checkbox"/>	Misunderstood			
<input type="checkbox"/>	Failed to comply with procedure			

Clearance 4		A		
Action		Comments		
<input type="checkbox"/>	PM opened message			
<input type="checkbox"/>	PM read message aloud			
<input type="checkbox"/>	<input type="checkbox"/> Had to be prompted			
	<input type="checkbox"/> Misread			
	<input type="checkbox"/> Incomplete reading			
	<input type="checkbox"/> Reread			
	<input type="checkbox"/> Was interrupted			
	<input type="checkbox"/> Resumed after interruption (if yes, circle one)			
	Where stopped At beginning Other			
<input type="checkbox"/>	PM and PF discussed (if yes, circle one)			
<input type="checkbox"/>	Relevant	Repeat	Confirmation	Irrelevant
	PF PM	PF PM	PF PM	PF PM
<input type="checkbox"/>	Requested clarification			
<input type="checkbox"/>	Misunderstood			
<input type="checkbox"/>	Failed to comply with procedure			

Clearance 5		A				
Action		Comments				
<input type="checkbox"/>	PM opened message					
<input type="checkbox"/>	PM read message aloud					
<input type="checkbox"/>	<input type="checkbox"/> Had to be prompted					
	<input type="checkbox"/> Misread					
	<input type="checkbox"/> Incomplete reading					
	<input type="checkbox"/> Reread					
	<input type="checkbox"/> Was interrupted					
	<input type="checkbox"/> Resumed after interruption (if yes, circle one)					
	<input type="checkbox"/> Where stopped At beginning Other					
<input type="checkbox"/>	PM and PF discussed (if yes, circle one)					
<input type="checkbox"/>	Relevant		Repeat	Confirmation	Irrelevant	
	PF	PM	PF	PM	PF	PM
	<input type="checkbox"/> Requested clarification					
<input type="checkbox"/>	Misunderstood					
<input type="checkbox"/>	Failed to comply with procedure					

Clearance 6		A				
Action		Comments				
<input type="checkbox"/>	PM opened message					
<input type="checkbox"/>	PM read message aloud					
<input type="checkbox"/>	<input type="checkbox"/> Had to be prompted					
	<input type="checkbox"/> Misread					
	<input type="checkbox"/> Incomplete reading					
	<input type="checkbox"/> Reread					
	<input type="checkbox"/> Was interrupted					
	<input type="checkbox"/> Resumed after interruption (if yes, circle one)					
	<input type="checkbox"/> Where stopped At beginning Other					
<input type="checkbox"/>	PM and PF discussed (if yes, circle one)					
<input type="checkbox"/>	Relevant		Repeat	Confirmation	Irrelevant	
	PF	PM	PF	PM	PF	PM
	<input type="checkbox"/> Requested clarification					
<input type="checkbox"/>	Misunderstood					
<input type="checkbox"/>	Failed to comply with procedure					

Clearance 7								A	
Action		Comments							
<input type="checkbox"/>	PM opened message								
<input type="checkbox"/>	PM read message aloud								
<input type="checkbox"/>	<input type="checkbox"/>	Had to be prompted							
	<input type="checkbox"/>	Misread							
	<input type="checkbox"/>	Incomplete reading							
	<input type="checkbox"/>	Reread							
	<input type="checkbox"/>	Was interrupted							
	<input type="checkbox"/>	Resumed after interruption (if yes, circle one)							
	<input type="checkbox"/>	Where stopped		At beginning		Other			
<input type="checkbox"/>	PM and PF discussed (if yes, circle one)								
<input type="checkbox"/>	Relevant		Repeat		Confirmation		Irrelevant		
	PF	PM	PF	PM	PF	PM	PF	PM	
	<input type="checkbox"/>	Requested clarification							
<input type="checkbox"/>	Misunderstood								
<input type="checkbox"/>	Failed to comply with procedure								

Experimental Flight, Procedure B

Clearance 1		B		
Action		Comments		
<input type="checkbox"/>	PM opened message			
<input type="checkbox"/>	PM read message aloud			
<input type="checkbox"/>	<input type="checkbox"/> Had to be prompted			
	<input type="checkbox"/> Misread			
	<input type="checkbox"/> Incomplete reading			
	<input type="checkbox"/> Reread			
	<input type="checkbox"/> Was interrupted			
	<input type="checkbox"/> Resumed after interruption (if yes, circle one)			
	Where stopped	At beginning	Other	
<input type="checkbox"/>	PF read message silently			
<input type="checkbox"/>	<input type="checkbox"/> Had to be prompted			
	<input type="checkbox"/> PF read message aloud			
<input type="checkbox"/>	PM and PF discussed (if yes, circle one)			
<input type="checkbox"/>	Relevant	Repeat	Confirmation	Irrelevant
	PF PM	PF PM	PF PM	PF PM
	<input type="checkbox"/> Requested clarification			
	<input type="checkbox"/> Misunderstood			
<input type="checkbox"/>	Failed to comply with procedure			

Clearance 2		B		
Action		Comments		
<input type="checkbox"/>	PM opened message			
<input type="checkbox"/>	PM read message aloud			
<input type="checkbox"/>	<input type="checkbox"/> Had to be prompted			
	<input type="checkbox"/> Misread			
	<input type="checkbox"/> Incomplete reading			
	<input type="checkbox"/> Reread			
	<input type="checkbox"/> Was interrupted			
	<input type="checkbox"/> Resumed after interruption (if yes, circle one)			
	Where stopped	At beginning	Other	
<input type="checkbox"/>	PF read message silently			
<input type="checkbox"/>	<input type="checkbox"/> Had to be prompted			
	<input type="checkbox"/> PF read message aloud			
<input type="checkbox"/>	PM and PF discussed (if yes, circle one)			
<input type="checkbox"/>	Relevant	Repeat	Confirmation	Irrelevant
	PF PM	PF PM	PF PM	PF PM
	<input type="checkbox"/> Requested clarification			
	<input type="checkbox"/> Misunderstood			
<input type="checkbox"/>	Failed to comply with procedure			

Clearance 3		B				
Action		Comments				
<input type="checkbox"/>	PM opened message					
<input type="checkbox"/>	PM read message aloud					
<input type="checkbox"/>	<input type="checkbox"/> Had to be prompted					
	<input type="checkbox"/> Misread					
	<input type="checkbox"/> Incomplete reading					
	<input type="checkbox"/> Reread					
	<input type="checkbox"/> Was interrupted					
	<input type="checkbox"/> Resumed after interruption (if yes, circle one)					
	Where stopped	At beginning	Other			
<input type="checkbox"/>	PF read message silently					
<input type="checkbox"/>	<input type="checkbox"/> Had to be prompted					
	<input type="checkbox"/> PF read message aloud					
<input type="checkbox"/>	PM and PF discussed (if yes, circle one)					
<input type="checkbox"/>	Relevant	Repeat	Confirmation	Irrelevant		
	PF	PM	PF	PM	PF	PM
	<input type="checkbox"/>	Requested clarification				
	<input type="checkbox"/>	Misunderstood				
<input type="checkbox"/>	Failed to comply with procedure					

Clearance 4		B				
Action		Comments				
<input type="checkbox"/>	PM opened message					
<input type="checkbox"/>	PM read message aloud					
<input type="checkbox"/>	<input type="checkbox"/> Had to be prompted					
	<input type="checkbox"/> Misread					
	<input type="checkbox"/> Incomplete reading					
	<input type="checkbox"/> Reread					
	<input type="checkbox"/> Was interrupted					
	<input type="checkbox"/> Resumed after interruption (if yes, circle one)					
	Where stopped	At beginning	Other			
<input type="checkbox"/>	PF read message silently					
<input type="checkbox"/>	<input type="checkbox"/> Had to be prompted					
	<input type="checkbox"/> PF read message aloud					
<input type="checkbox"/>	PM and PF discussed (if yes, circle one)					
<input type="checkbox"/>	Relevant	Repeat	Confirmation	Irrelevant		
	PF	PM	PF	PM	PF	PM
	<input type="checkbox"/>	Requested clarification				
	<input type="checkbox"/>	Misunderstood				
<input type="checkbox"/>	Failed to comply with procedure					

Clearance 5		B
Action		Comments
<input type="checkbox"/>	PM opened message	
<input type="checkbox"/>	PM read message aloud	
<input type="checkbox"/>	Had to be prompted	
<input type="checkbox"/>	Misread	
<input type="checkbox"/>	Incomplete reading	
<input type="checkbox"/>	Reread	
<input type="checkbox"/>	Was interrupted	
<input type="checkbox"/>	Resumed after interruption (if yes, circle one)	
	Where stopped At beginning Other	
<input type="checkbox"/>	PF read message silently	
<input type="checkbox"/>	Had to be prompted	
<input type="checkbox"/>	PF read message aloud	
<input type="checkbox"/>	PM and PF discussed (if yes, circle one)	
	Relevant Repeat Confirmation Irrelevant	
	PF PM PF PM PF PM PF PM	
<input type="checkbox"/>	Requested clarification	
<input type="checkbox"/>	Misunderstood	
<input type="checkbox"/>	Failed to comply with procedure	

Clearance 6		B
Action		Comments
<input type="checkbox"/>	PM opened message	
<input type="checkbox"/>	PM read message aloud	
<input type="checkbox"/>	Had to be prompted	
<input type="checkbox"/>	Misread	
<input type="checkbox"/>	Incomplete reading	
<input type="checkbox"/>	Reread	
<input type="checkbox"/>	Was interrupted	
<input type="checkbox"/>	Resumed after interruption (if yes, circle one)	
	Where stopped At beginning Other	
<input type="checkbox"/>	PF read message silently	
<input type="checkbox"/>	Had to be prompted	
<input type="checkbox"/>	PF read message aloud	
<input type="checkbox"/>	PM and PF discussed (if yes, circle one)	
	Relevant Repeat Confirmation Irrelevant	
	PF PM PF PM PF PM PF PM	
<input type="checkbox"/>	Requested clarification	
<input type="checkbox"/>	Misunderstood	
<input type="checkbox"/>	Failed to comply with procedure	

Clearance 7		B						
Action		Comments						
<input type="checkbox"/>	PM opened message							
<input type="checkbox"/>	PM read message aloud							
<input type="checkbox"/>	<input type="checkbox"/> Had to be prompted							
	<input type="checkbox"/> Misread							
	<input type="checkbox"/> Incomplete reading							
	<input type="checkbox"/> Reread							
	<input type="checkbox"/> Was interrupted							
	<input type="checkbox"/> Resumed after interruption (if yes, circle one)							
	Where stopped	At beginning	Other					
<input type="checkbox"/>	PF read message silently							
<input type="checkbox"/>	<input type="checkbox"/> Had to be prompted							
	<input type="checkbox"/> PF read message aloud							
<input type="checkbox"/>	PM and PF discussed (if yes, circle one)							
<input type="checkbox"/>	Relevant	Repeat	Confirmation	Irrelevant				
	PF	PM	PF	PM	PF	PM	PF	PM
	<input type="checkbox"/>	Requested clarification						
<input type="checkbox"/>	Misunderstood							
<input type="checkbox"/>	Failed to comply with procedure							

Experimental Flight, Procedure C

Clearance 1										C
Action					Comments					
<input type="checkbox"/>	PM opened message									
<input type="checkbox"/>	PM read message silently									
<input type="checkbox"/>	Had to be prompted									
<input type="checkbox"/>	PM read message aloud									
<input type="checkbox"/>	PF read message silently									
<input type="checkbox"/>	Had to be prompted									
<input type="checkbox"/>	PF read message aloud									
<input type="checkbox"/>	PM and PF discussed (if yes, circle one)									
<input type="checkbox"/>	Relevant		Repeat		Confirmation		Irrelevant			
<input type="checkbox"/>	PF	PM	PF	PM	PF	PM	PF	PM		
<input type="checkbox"/>	Requested clarification									
<input type="checkbox"/>	Misunderstood									
<input type="checkbox"/>	Failed to comply with procedure									

Clearance 2										C
Action					Comments					
<input type="checkbox"/>	PM opened message									
<input type="checkbox"/>	PM read message silently									
<input type="checkbox"/>	Had to be prompted									
<input type="checkbox"/>	PM read message aloud									
<input type="checkbox"/>	PF read message silently									
<input type="checkbox"/>	Had to be prompted									
<input type="checkbox"/>	PF read message aloud									
<input type="checkbox"/>	PM and PF discussed (if yes, circle one)									
<input type="checkbox"/>	Relevant		Repeat		Confirmation		Irrelevant			
<input type="checkbox"/>	PF	PM	PF	PM	PF	PM	PF	PM		
<input type="checkbox"/>	Requested clarification									
<input type="checkbox"/>	Misunderstood									
<input type="checkbox"/>	Failed to comply with procedure									

Clearance 3		C							
Action		Comments							
<input type="checkbox"/>	PM opened message								
<input type="checkbox"/>	PM read message silently								
<input type="checkbox"/>	<input type="checkbox"/> Had to be prompted								
	<input type="checkbox"/> PM read message aloud								
<input type="checkbox"/>	PF read message silently								
<input type="checkbox"/>	<input type="checkbox"/> Had to be prompted								
	<input type="checkbox"/> PF read message aloud								
<input type="checkbox"/>	PM and PF discussed (if yes, circle one)								
<input type="checkbox"/>	Relevant	Repeat		Confirmation		Irrelevant			
	PF PM	PF	PM	PF	PM	PF	PM	PF	PM
<input type="checkbox"/>	Requested clarification								
<input type="checkbox"/>	Misunderstood								
<input type="checkbox"/>	Failed to comply with procedure								

Clearance 4		C							
Action		Comments							
<input type="checkbox"/>	PM opened message								
<input type="checkbox"/>	PM read message silently								
<input type="checkbox"/>	<input type="checkbox"/> Had to be prompted								
	<input type="checkbox"/> PM read message aloud								
<input type="checkbox"/>	PF read message silently								
<input type="checkbox"/>	<input type="checkbox"/> Had to be prompted								
	<input type="checkbox"/> PF read message aloud								
<input type="checkbox"/>	PM and PF discussed (if yes, circle one)								
<input type="checkbox"/>	Relevant	Repeat		Confirmation		Irrelevant			
	PF PM	PF	PM	PF	PM	PF	PM	PF	PM
<input type="checkbox"/>	Requested clarification								
<input type="checkbox"/>	Misunderstood								
<input type="checkbox"/>	Failed to comply with procedure								

Clearance 5		C							
Action		Comments							
<input type="checkbox"/>	PM opened message								
<input type="checkbox"/>	PM read message silently								
<input type="checkbox"/>	<input type="checkbox"/> Had to be prompted								
	<input type="checkbox"/> PM read message aloud								
<input type="checkbox"/>	PF read message silently								
<input type="checkbox"/>	<input type="checkbox"/> Had to be prompted								
	<input type="checkbox"/> PF read message aloud								
<input type="checkbox"/>	PM and PF discussed (if yes, circle one)								
<input type="checkbox"/>	Relevant	Repeat		Confirmation		Irrelevant			
	PF PM	PF	PM	PF	PM	PF	PM	PF	PM
<input type="checkbox"/>	Requested clarification								
<input type="checkbox"/>	Misunderstood								
<input type="checkbox"/>	Failed to comply with procedure								

Clearance 6		C							
Action		Comments							
<input type="checkbox"/>	PM opened message								
<input type="checkbox"/>	PM read message silently								
<input type="checkbox"/>	<input type="checkbox"/> Had to be prompted								
	<input type="checkbox"/> PM read message aloud								
<input type="checkbox"/>	PF read message silently								
<input type="checkbox"/>	<input type="checkbox"/> Had to be prompted								
	<input type="checkbox"/> PF read message aloud								
<input type="checkbox"/>	PM and PF discussed (if yes, circle one)								
<input type="checkbox"/>	Relevant	Repeat		Confirmation		Irrelevant			
	PF PM	PF	PM	PF	PM	PF	PM	PF	PM
<input type="checkbox"/>	Requested clarification								
<input type="checkbox"/>	Misunderstood								
<input type="checkbox"/>	Failed to comply with procedure								

Clearance 7						C	
Action		Comments					
<input type="checkbox"/>	PM opened message						
<input type="checkbox"/>	PM read message silently						
<input type="checkbox"/>	Had to be prompted						
	PM read message aloud						
<input type="checkbox"/>	PF read message silently						
<input type="checkbox"/>	Had to be prompted						
	PF read message aloud						
<input type="checkbox"/>	PM and PF discussed (if yes, circle one)						
<input type="checkbox"/>	Relevant	Repeat		Confirmation		Irrelevant	
	PF PM	PF	PM	PF	PM	PF	PM
<input type="checkbox"/>	Requested clarification						
<input type="checkbox"/>	Misunderstood						
<input type="checkbox"/>	Failed to comply with procedure						

Study 2

Practice Flights, No Procedure Given

Clearance 1										P
Action					Comments					
<input type="checkbox"/>	PM opened message									
<input type="checkbox"/>	PM read message (if yes, circle one)									
Aloud					Silently					
<input type="checkbox"/>	Had to be prompted									
<input type="checkbox"/>	Misread									
<input type="checkbox"/>	Incomplete reading									
<input type="checkbox"/>	Reread									
<input type="checkbox"/>	Was interrupted									
<input type="checkbox"/>	Resumed after interruption (if yes, circle one)									
Where stopped					At beginning			Other		
<input type="checkbox"/>	PF read message (if yes, circle one)									
Aloud					Silently					
<input type="checkbox"/>	Had to be prompted									
<input type="checkbox"/>	PF read message aloud									
<input type="checkbox"/>	PM and PF discussed (if yes, circle one)									
Relevant			Repeat			Confirmation		Irrelevant		
PF	PM		PF	PM		PF	PM	PF	PM	
<input type="checkbox"/>	Requested clarification									
<input type="checkbox"/>	Misunderstood									

Clearance 2										P
Action					Comments					
<input type="checkbox"/>	PM opened message									
<input type="checkbox"/>	PM read message (if yes, circle one)									
Aloud					Silently					
<input type="checkbox"/>	Had to be prompted									
<input type="checkbox"/>	Misread									
<input type="checkbox"/>	Incomplete reading									
<input type="checkbox"/>	Reread									
<input type="checkbox"/>	Was interrupted									
<input type="checkbox"/>	Resumed after interruption (if yes, circle one)									
Where stopped			At beginning			Other				
<input type="checkbox"/>	PF read message (if yes, circle one)									
Aloud					Silently					
<input type="checkbox"/>	Had to be prompted									
<input type="checkbox"/>	PF read message aloud									
<input type="checkbox"/>	PM and PF discussed (if yes, circle one)									
Relevant		Repeat			Confirmation		Irrelevant			
PF	PM	PF	PM	PF	PM	PF	PM	PF	PM	
<input type="checkbox"/>	Requested clarification									
<input type="checkbox"/>	Misunderstood									

Clearance 3										P
Action					Comments					
<input type="checkbox"/>	PM opened message									
<input type="checkbox"/>	PM read message (if yes, circle one)									
Aloud					Silently					
<input type="checkbox"/>	Had to be prompted									
<input type="checkbox"/>	Misread									
<input type="checkbox"/>	Incomplete reading									
<input type="checkbox"/>	Reread									
<input type="checkbox"/>	Was interrupted									
<input type="checkbox"/>	Resumed after interruption (if yes, circle one)									
Where stopped			At beginning			Other				
<input type="checkbox"/>	PF read message (if yes, circle one)									
Aloud					Silently					
<input type="checkbox"/>	Had to be prompted									
<input type="checkbox"/>	PF read message aloud									
<input type="checkbox"/>	PM and PF discussed (if yes, circle one)									
Relevant		Repeat			Confirmation		Irrelevant			
PF	PM	PF	PM	PF	PM	PF	PM	PF	PM	
<input type="checkbox"/>	Requested clarification									
<input type="checkbox"/>	Misunderstood									

Clearance 4										P
Action					Comments					
<input type="checkbox"/>	PM opened message									
<input type="checkbox"/>	PM read message (if yes, circle one)									
Aloud					Silently					
<input type="checkbox"/>	Had to be prompted									
<input type="checkbox"/>	Misread									
<input type="checkbox"/>	Incomplete reading									
<input type="checkbox"/>	Reread									
<input type="checkbox"/>	Was interrupted									
<input type="checkbox"/>	Resumed after interruption (if yes, circle one)									
Where stopped			At beginning			Other				
<input type="checkbox"/>	PF read message (if yes, circle one)									
Aloud					Silently					
<input type="checkbox"/>	Had to be prompted									
<input type="checkbox"/>	PF read message aloud									
<input type="checkbox"/>	PM and PF discussed (if yes, circle one)									
Relevant		Repeat			Confirmation		Irrelevant			
PF	PM	PF	PM	PF	PM	PF	PM			
<input type="checkbox"/>	Requested clarification									
<input type="checkbox"/>	Misunderstood									

Clearance 5										P
Action					Comments					
<input type="checkbox"/>	PM opened message									
<input type="checkbox"/>	PM read message (if yes, circle one)									
Aloud					Silently					
<input type="checkbox"/>	Had to be prompted									
<input type="checkbox"/>	Misread									
<input type="checkbox"/>	Incomplete reading									
<input type="checkbox"/>	Reread									
<input type="checkbox"/>	Was interrupted									
<input type="checkbox"/>	Resumed after interruption (if yes, circle one)									
Where stopped			At beginning			Other				
<input type="checkbox"/>	PF read message (if yes, circle one)									
Aloud					Silently					
<input type="checkbox"/>	Had to be prompted									
<input type="checkbox"/>	PF read message aloud									
<input type="checkbox"/>	PM and PF discussed (if yes, circle one)									
Relevant		Repeat			Confirmation		Irrelevant			
PF	PM	PF	PM	PF	PM	PF	PM			
<input type="checkbox"/>	Requested clarification									
<input type="checkbox"/>	Misunderstood									

Clearance 6		P						
Action		Comments						
<input type="checkbox"/>	PM opened message							
<input type="checkbox"/>	PM read message (if yes, circle one)							
<input type="checkbox"/>	Aloud	Silently						
	<input type="checkbox"/>	Had to be prompted						
	<input type="checkbox"/>	Misread						
	<input type="checkbox"/>	Incomplete reading						
	<input type="checkbox"/>	Reread						
	<input type="checkbox"/>	Was interrupted						
	<input type="checkbox"/>	Resumed after interruption (if yes, circle one)						
	Where stopped	At beginning Other						
<input type="checkbox"/>	PF read message (if yes, circle one)							
<input type="checkbox"/>	Aloud	Silently						
	<input type="checkbox"/>	Had to be prompted						
<input type="checkbox"/>	PF read message aloud							
<input type="checkbox"/>	PM and PF discussed (if yes, circle one)							
<input type="checkbox"/>	Relevant	Repeat	Confirmation	Irrelevant				
	PF	PM	PF	PM	PF	PM	PF	PM
	<input type="checkbox"/>	Requested clarification						
	<input type="checkbox"/>	Misunderstood						

Clearance 7		P						
Action		Comments						
<input type="checkbox"/>	PM opened message							
<input type="checkbox"/>	PM read message (if yes, circle one)							
<input type="checkbox"/>	Aloud	Silently						
	<input type="checkbox"/>	Had to be prompted						
	<input type="checkbox"/>	Misread						
	<input type="checkbox"/>	Incomplete reading						
	<input type="checkbox"/>	Reread						
	<input type="checkbox"/>	Was interrupted						
	<input type="checkbox"/>	Resumed after interruption (if yes, circle one)						
	Where stopped	At beginning Other						
<input type="checkbox"/>	PF read message (if yes, circle one)							
<input type="checkbox"/>	Aloud	Silently						
	<input type="checkbox"/>	Had to be prompted						
<input type="checkbox"/>	PF read message aloud							
<input type="checkbox"/>	PM and PF discussed (if yes, circle one)							
<input type="checkbox"/>	Relevant	Repeat	Confirmation	Irrelevant				
	PF	PM	PF	PM	PF	PM	PF	PM
	<input type="checkbox"/>	Requested clarification						
	<input type="checkbox"/>	Misunderstood						

First Experimental Flight, No Procedure Given

Clearance 1 – Turn left heading 260 Due to traffic										No
Action					Comments					
<input type="checkbox"/>	PM opened message									
<input type="checkbox"/>	PM read message (if yes, circle one)									
Aloud					Silently					
<input type="checkbox"/>	Had to be prompted									
<input type="checkbox"/>	Misread									
<input type="checkbox"/>	Incomplete reading				Elements missed?					
<input type="checkbox"/>	Reread									
<input type="checkbox"/>	Was interrupted				By?		Where?			
<input type="checkbox"/>	Resumed after interruption (if yes, circle one)									
Where stopped					At beginning			Other		
<input type="checkbox"/>	PF read message (if yes, circle one)									
Aloud					Silently					
<input type="checkbox"/>	Had to be prompted									
Discussion										
Relevant			Repeat		Confirmation		Irrelevant			
PF	PM	PF	PM	PF	PM	PF	PM	PF	PM	
<input type="checkbox"/>	Requested clarification									
<input type="checkbox"/>	Misunderstood									

Clearance 2 – Proceed direct to RSK Monitor Denver Center 129.7										No
Action					Comments					
<input type="checkbox"/>	PM opened message									
<input type="checkbox"/>	PM read message (if yes, circle one)									
Aloud					Silently					
<input type="checkbox"/>	Had to be prompted									
<input type="checkbox"/>	Misread									
<input type="checkbox"/>	Incomplete reading				Elements missed?					
<input type="checkbox"/>	Reread									
<input type="checkbox"/>	Was interrupted				By?		Where?			
<input type="checkbox"/>	Resumed after interruption (if yes, circle one)									
Where stopped					At beginning			Other		
<input type="checkbox"/>	PF read message (if yes, circle one)									
Aloud					Silently					
<input type="checkbox"/>	Had to be prompted									
Discussion										
Relevant			Repeat		Confirmation		Irrelevant			
PF	PM	PF	PM	PF	PM	PF	PM	PF	PM	
<input type="checkbox"/>	Requested clarification									
<input type="checkbox"/>	Misunderstood									

Clearance 3 – PIREP UUA OV RSK110020 TM1618 FL360 TP B747 TB SVR 360-400										No
Action					Comments					
<input type="checkbox"/>	PM opened message									
<input type="checkbox"/>	PM read message (if yes, circle one)									
Aloud					Silently					
<input type="checkbox"/>	Had to be prompted									
<input type="checkbox"/>	Misread									
<input type="checkbox"/>	Incomplete reading				Elements missed?					
<input type="checkbox"/>	Reread									
<input type="checkbox"/>	Was interrupted				By?		Where?			
<input type="checkbox"/>	Resumed after interruption (if yes, circle one)									
Where stopped					At beginning			Other		
<input type="checkbox"/>	PF read message (if yes, circle one)									
Aloud					Silently					
<input type="checkbox"/>	Had to be prompted									
Discussion										
Relevant			Repeat			Confirmation		Irrelevant		
PF	PM		PF	PM		PF	PM	PF	PM	
<input type="checkbox"/>	Requested clarification									
<input type="checkbox"/>	Misunderstood									

Clearance 4 – Descend to FL340										No
Action					Comments					
<input type="checkbox"/>	PM opened message									
<input type="checkbox"/>	PM read message (if yes, circle one)									
Aloud					Silently					
<input type="checkbox"/>	Had to be prompted									
<input type="checkbox"/>	Misread									
<input type="checkbox"/>	Incomplete reading				Elements missed?					
<input type="checkbox"/>	Reread									
<input type="checkbox"/>	Was interrupted				By?		Where?			
<input type="checkbox"/>	Resumed after interruption (if yes, circle one)									
Where stopped					At beginning			Other		
<input type="checkbox"/>	PF read message (if yes, circle one)									
Aloud					Silently					
<input type="checkbox"/>	Had to be prompted									
Discussion										
Relevant			Repeat			Confirmation		Irrelevant		
PF	PM		PF	PM		PF	PM	PF	PM	
<input type="checkbox"/>	Requested clarification									
<input type="checkbox"/>	Misunderstood									

Clearance 5 – Adjust speed to 300K...After passing RSK descend to FL320										No
Action					Comments					
<input type="checkbox"/>	PM opened message									
<input type="checkbox"/>	PM read message (if yes, circle one)									
Aloud					Silently					
<input type="checkbox"/>	Had to be prompted									
<input type="checkbox"/>	Misread									
<input type="checkbox"/>	Incomplete reading				Elements missed?					
<input type="checkbox"/>	Reread									
<input type="checkbox"/>	Was interrupted				By?		Where?			
<input type="checkbox"/>	Resumed after interruption (if yes, circle one)									
Where stopped					At beginning			Other		
<input type="checkbox"/>	PF read message (if yes, circle one)									
Aloud					Silently					
<input type="checkbox"/>	Had to be prompted									
Discussion										
Relevant			Repeat			Confirmation		Irrelevant		
PF	PM	PF	PM	PF	PM	PF	PM	PF	PM	
<input type="checkbox"/>	Requested clarification									
<input type="checkbox"/>	Misunderstood									

Clearance 6 – Monitor Denver Center 131.3										No
Action					Comments					
<input type="checkbox"/>	PM opened message									
<input type="checkbox"/>	PM read message (if yes, circle one)									
Aloud					Silently					
<input type="checkbox"/>	Had to be prompted									
<input type="checkbox"/>	Misread									
<input type="checkbox"/>	Incomplete reading				Elements missed?					
<input type="checkbox"/>	Reread									
<input type="checkbox"/>	Was interrupted				By?		Where?			
<input type="checkbox"/>	Resumed after interruption (if yes, circle one)									
Where stopped					At beginning			Other		
<input type="checkbox"/>	PF read message (if yes, circle one)									
Aloud					Silently					
<input type="checkbox"/>	Had to be prompted									
Discussion										
Relevant			Repeat			Confirmation		Irrelevant		
PF	PM	PF	PM	PF	PM	PF	PM	PF	PM	
<input type="checkbox"/>	Requested clarification									
<input type="checkbox"/>	Misunderstood									

Clearance 7 – Cross DVC at FL300 at 300K										No
Action					Comments					
<input type="checkbox"/>	PM opened message									
<input type="checkbox"/>	PM read message (if yes, circle one)									
Aloud					Silently					
<input type="checkbox"/>	Had to be prompted									
<input type="checkbox"/>	Misread									
<input type="checkbox"/>	Incomplete reading				Elements missed?					
<input type="checkbox"/>	Reread									
<input type="checkbox"/>	Was interrupted				By?		Where?			
<input type="checkbox"/>	Resumed after interruption (if yes, circle one)									
Where stopped					At beginning			Other		
<input type="checkbox"/>	PF read message (if yes, circle one)									
Aloud					Silently					
<input type="checkbox"/>	Had to be prompted									
Discussion										
Relevant			Repeat			Confirmation			Irrelevant	
PF	PM		PF	PM		PF	PM		PF	PM
<input type="checkbox"/>	Requested clarification									
<input type="checkbox"/>	Misunderstood									

Second Experimental Flight, Procedure C

Clearance 1										C
Action					Comments					
<input type="checkbox"/>	PM opened message									
<input type="checkbox"/>	PM read message silently									
<input type="checkbox"/>	Had to be prompted									
<input type="checkbox"/>	PM read message aloud									
<input type="checkbox"/>	PF read message silently									
<input type="checkbox"/>	Had to be prompted									
<input type="checkbox"/>	PF read message aloud									
<input type="checkbox"/>	PM and PF discussed (if yes, circle one)									
<input type="checkbox"/>	Relevant		Repeat		Confirmation		Irrelevant			
<input type="checkbox"/>	PF	PM	PF	PM	PF	PM	PF	PM		
<input type="checkbox"/>	Requested clarification									
<input type="checkbox"/>	Misunderstood									
<input type="checkbox"/>	Failed to comply with procedure									

Clearance 2										C
Action					Comments					
<input type="checkbox"/>	PM opened message									
<input type="checkbox"/>	PM read message silently									
<input type="checkbox"/>	Had to be prompted									
<input type="checkbox"/>	PM read message aloud									
<input type="checkbox"/>	PF read message silently									
<input type="checkbox"/>	Had to be prompted									
<input type="checkbox"/>	PF read message aloud									
<input type="checkbox"/>	PM and PF discussed (if yes, circle one)									
<input type="checkbox"/>	Relevant		Repeat		Confirmation		Irrelevant			
<input type="checkbox"/>	PF	PM	PF	PM	PF	PM	PF	PM		
<input type="checkbox"/>	Requested clarification									
<input type="checkbox"/>	Misunderstood									
<input type="checkbox"/>	Failed to comply with procedure									

Clearance 3		C							
Action		Comments							
<input type="checkbox"/>	PM opened message								
<input type="checkbox"/>	PM read message silently								
<input type="checkbox"/>	<input type="checkbox"/> Had to be prompted								
	<input type="checkbox"/> PM read message aloud								
<input type="checkbox"/>	PF read message silently								
<input type="checkbox"/>	<input type="checkbox"/> Had to be prompted								
	<input type="checkbox"/> PF read message aloud								
<input type="checkbox"/>	PM and PF discussed (if yes, circle one)								
<input type="checkbox"/>	Relevant	Repeat		Confirmation		Irrelevant			
	PF PM	PF	PM	PF	PM	PF	PM	PF	PM
<input type="checkbox"/>	Requested clarification								
<input type="checkbox"/>	Misunderstood								
<input type="checkbox"/>	Failed to comply with procedure								

Clearance 4		C							
Action		Comments							
<input type="checkbox"/>	PM opened message								
<input type="checkbox"/>	PM read message silently								
<input type="checkbox"/>	<input type="checkbox"/> Had to be prompted								
	<input type="checkbox"/> PM read message aloud								
<input type="checkbox"/>	PF read message silently								
<input type="checkbox"/>	<input type="checkbox"/> Had to be prompted								
	<input type="checkbox"/> PF read message aloud								
<input type="checkbox"/>	PM and PF discussed (if yes, circle one)								
<input type="checkbox"/>	Relevant	Repeat		Confirmation		Irrelevant			
	PF PM	PF	PM	PF	PM	PF	PM	PF	PM
<input type="checkbox"/>	Requested clarification								
<input type="checkbox"/>	Misunderstood								
<input type="checkbox"/>	Failed to comply with procedure								

Clearance 5		C							
Action		Comments							
<input type="checkbox"/>	PM opened message								
<input type="checkbox"/>	PM read message silently								
<input type="checkbox"/>	<input type="checkbox"/> Had to be prompted								
	<input type="checkbox"/> PM read message aloud								
<input type="checkbox"/>	PF read message silently								
<input type="checkbox"/>	<input type="checkbox"/> Had to be prompted								
	<input type="checkbox"/> PF read message aloud								
<input type="checkbox"/>	PM and PF discussed (if yes, circle one)								
<input type="checkbox"/>	Relevant	Repeat		Confirmation		Irrelevant			
	PF PM	PF	PM	PF	PM	PF	PM	PF	PM
<input type="checkbox"/>	Requested clarification								
<input type="checkbox"/>	Misunderstood								
<input type="checkbox"/>	Failed to comply with procedure								

Clearance 6		C							
Action		Comments							
<input type="checkbox"/>	PM opened message								
<input type="checkbox"/>	PM read message silently								
<input type="checkbox"/>	<input type="checkbox"/> Had to be prompted								
	<input type="checkbox"/> PM read message aloud								
<input type="checkbox"/>	PF read message silently								
<input type="checkbox"/>	<input type="checkbox"/> Had to be prompted								
	<input type="checkbox"/> PF read message aloud								
<input type="checkbox"/>	PM and PF discussed (if yes, circle one)								
<input type="checkbox"/>	Relevant	Repeat		Confirmation		Irrelevant			
	PF PM	PF	PM	PF	PM	PF	PM	PF	PM
<input type="checkbox"/>	Requested clarification								
<input type="checkbox"/>	Misunderstood								
<input type="checkbox"/>	Failed to comply with procedure								

Clearance 7						C	
Action		Comments					
<input type="checkbox"/>	PM opened message						
<input type="checkbox"/>	PM read message silently						
<input type="checkbox"/>	Had to be prompted						
	PM read message aloud						
<input type="checkbox"/>	PF read message silently						
<input type="checkbox"/>	Had to be prompted						
	PF read message aloud						
<input type="checkbox"/>	PM and PF discussed (if yes, circle one)						
<input type="checkbox"/>	Relevant	Repeat		Confirmation		Irrelevant	
	PF PM	PF	PM	PF	PM	PF	PM
<input type="checkbox"/>	Requested clarification						
<input type="checkbox"/>	Misunderstood						
<input type="checkbox"/>	Failed to comply with procedure						

Appendix 5 – Data Comm Messages

ADJUST SPEED TO [speed] ... AFTER PASSING [position] DESCEND TO [level]

CROSS [position] AT [level] AT [speed]

DESCEND TO [level]

MONITOR [unit name] [frequency]

PIREP UUA [location] [time] [level] [acft] [range]

PROCEED DIRECT TO [position] MONITOR [unit name] [frequency]

TURN [direction] HEADING [degrees] DUE TO TRAFFIC

Appendix 6 – Sample Flight Documents

Study 1

First Practice Flight, Flight Release

FLIGHT RELEASE

You will begin the scenario 20 NM to RBV, at 16,000 FT and 290 KT. It is currently 1550Z.

Call Sign FLT 1900

WED APR 25 1445Z 2012	DISPATCHER JOE SMITH
VOID AFTER 1845Z	PHONE 1-800-283-3470
AIRCRAFT TAIL NO 36UA	DESK 6

<u>FLT</u>	<u>FROM</u>	<u>TO</u>	<u>ALT</u>
1900	JFK	IAD	NAR

FILED FLIGHT PLAN ROUTE 100 IFR
1900 747/F IAD P1545 FL180
JFK..RBV.ARD.V276.KATVE.V457.HOUTN.LRP..DELRO 2

DEFERRED MAINTENANCE ITEMS EXPIRES

M34-23 WEATHER RADAR INOP APR 30, 2012

DISPATCHERS SIGNATURE

I HAVE VERIFIED THAT ALL REQUIRED AIRCRAFT SEARCHES HAVE BEEN COMPLETED.

CAPTAINS SIGNATURE

SEE AOM 8-3-7 PARA K.2

OPERATION MODES CLIMB 250
 CRUISE 300
 DESCENT 290

BRIEFING GENERATED 25APR12 1515Z UTC
WEATHER BRIEFING FLT 1900 JFK-IAD

ATIS

Washington Dulles International information Sierra 1500Z weather. Wind variable at 3, visibility 5. 2,000 scattered, 3,000 broken, temperature 55, dew-point 46. Altimeter 29.92. ILS runway 19R approach in use. Landing runway 19R. Departure runway 19L. End of information Sierra.

CHECKPT LAT-LONG	DIST (to go)	MC	ALT	OAT	WIND
KJFK N40 38.23 W073 46.4	230	...	...	...	...
RBV N40 13.00 W074 27.5	186	292	160	-20	24310
ARD N40 15.00 W074 54.1	167	297	180	-23	24410
KATVE N40 23.83 W75 41.96	130	250	180	-23	24410
HOUTN N40 19.60 W075 49.1	123	250	180	-23	24411
LRP N40 19.66 W076 18.0	98	250	180	-23	24210
JOANNE N40 02.10 W076 27.6	89	251	160	-19	24210
DELRO N39 57.50 W076 37.4	80	250	160	-19	24212
BINNS N39 46.60 W077 01.3	59	248	140	-15	24211
HYPER N39 40.60 W077 13.8	47	249	110	-9	24110
MULRR N39 38.60 W077 18.2	41	199	100	-6	24410
KIAD N38 56.50 W077 27.3	...	...	...	...	...

Second Practice Flight, Flight Release

FLIGHT RELEASE

You will begin the scenario 15 NM to KATVE, at FL180 and 290 KT. It is currently 1559Z.

Call Sign FLT 1900

WED APR 25 1445Z 2012 DISPATCHER JOE SMITH
VOID AFTER 1845Z PHONE 1-800-283-3470
AIRCRAFT TAIL NO 36UA DESK 6

<u>FLT</u>	<u>FROM</u>	<u>TO</u>	<u>ALT</u>
1900	JFK	IAD	NAR

FILED FLIGHT PLAN ROUTE 100 IFR
1900 747/F IAD P1545 FL180
JFK..RBV.ARD.V276.KATVE.V457.HOUTN.LRP..DELRO 2

<u>DEFERRED MAINTENANCE ITEMS</u>	<u>EXPIRES</u>
M34-23 WEATHER RADAR INOP	APR 30, 2012

DISPATCHERS SIGNATURE

I HAVE VERIFIED THAT ALL REQUIRED AIRCRAFT SEARCHES HAVE BEEN COMPLETED.

CAPTAINS SIGNATURE

SEE AOM 8-3-7 PARA K.2

OPERATION MODES CLIMB 250
 CRUISE 300
 DESCENT 290

BRIEFING GENERATED 25APR12 1515Z UTC
WEATHER BRIEFING FLT 1900 JFK-IAD

ATIS
Washington Dulles International information Golf 1500Z weather. Wind variable at 3, visibility 5. 2,000 scattered, 3,000 broken, temperature 55, dew-point 46. Altimeter 29.92. ILS runway 19R approach in use. Landing runway 19R. Departure runway 19L. End of information Golf.

CHECKPT LAT-LONG	DIST (to go)	MC	ALT	OAT	WIND
KJFK N40 38.23 W073 46.4	230	...	...	...	...
RBV N40 13.00 W074 27.5	186	292	160	-20	24310
ARD N40 15.00 W074 54.1	167	297	180	-23	24410
KATVE N40 23.83 W75 41.96	130	250	180	-23	24410
HOUTN N40 19.60 W075 49.1	123	250	180	-23	24411
LRP N40 19.66 W076 18.0	98	250	180	-23	24210
JOANNE N40 02.10 W076 27.6	89	251	160	-19	24210
DELRO N39 57.50 W076 37.4	80	250	160	-19	24212
BINNS N39 46.60 W077 01.3	59	248	140	-15	24211
HYPER N39 40.60 W077 13.8	47	249	110	-9	24110
MULRR N39 38.60 W077 18.2	41	199	100	-6	24410
KIAD N38 56.50 W077 27.3	...	...	...	...	...

First Experimental Flight, Flight Release

FLIGHT RELEASE

You will begin the scenario 20 NM to TCC, at FL300 and 290 KT. It is currently 1600Z.

Call Sign FLT 1900

WED APR 25 1445Z 2012 DISPATCHER JOE SMITH
VOID AFTER 1845Z PHONE 1-800-283-3470
AIRCRAFT TAIL NO 36UA DESK 6

FLT FROM TO ALT
1900 LBB SLC NAR

FILED FLIGHT PLAN ROUTE 100 IFR
1900 747/F SLC P1545 FL340
LBB..TXO.TCC.CIM.ALS.HBU.JNC.J12.HELPR..LEEHY 3

DEFERRED MAINTENANCE ITEMS EXPIRES

M34-23 WEATHER RADAR INOP APR 30, 2012

DISPATCHERS SIGNATURE

I HAVE VERIFIED THAT ALL REQUIRED AIRCRAFT SEARCHES HAVE BEEN COMPLETED.

CAPTAINS SIGNATURE

SEE AOM 8-3-7 PARA K.2

OPERATION MODES CLIMB 250
 CRUISE 300
 DESCENT 290

BRIEFING GENERATED 25APR12 1445Z UTC
WEATHER BRIEFING FLT 1900 LBB-SLC

ATIS
Salt Lake City International information Papa 1500Z weather. Wind 300 at 10, visibility 3.
2,000 few, 3,000 broken, temperature 51, dew-point 33. Altimeter 29.92. ILS runway 34R
approach in use. Landing runway 34R. Departure runway 34L. End of information Romeo.

CHECKPT LAT-LONG	DIST (to go)	MC	ALT	OAT	WIND
KLBB N33 39.49 W101 49.2	659	...	...	...	...
TXO N35 10.55 W103 35.7	593	309	260	-27	29410
TCC N35 10.55 W103 35.54	537	313	300	-36	29410
CIM N36 29.48 W104 52.32	437	309	340	-45	29310
ALS N37 20.95 W105 48.93	369	309	340	-46	29310
HBU N38 27.13 W107 02.39	281	282	340	-46	29310
JNC N39 03.57 W108 47.5	191	285	300	-38	29310
HELPR N39 45.11 W110 32.5	99	282	200	-20	28512
SPANE N40 07.49 W111 32.5	48	282	160	-12	28411
LEEHY N40 10.40 W111 40.6	41	300	140	-8	28310
BLUPE N40 17.16 W111 49.4	32	308	120	-4	30010
KSLC N40 47.18 W111 58.3	...	...	...	...	...

Second Experimental Flight, Flight Release

FLIGHT RELEASE

You will begin the scenario 120 NM to RSK, at FL360 and 290 KT. It is currently 1615Z.

Call Sign FLT 1900

WED APR 25 1445Z 2012 DISPATCHER JOE SMITH
VOID AFTER 1845Z PHONE 1-800-283-3470
AIRCRAFT TAIL NO 36UA DESK 6

FLT FROM TO ALT
1900 LBB SLC NAR

FILED FLIGHT PLAN ROUTE 100 IFR
1900 747/F SLC P1545 FL360
LBB..TXO.TCC.RSK.DVC.JNC.J12.HELPR..LEEHY 3

DEFERRED MAINTENANCE ITEMS EXPIRES

M34-23 WEATHER RADAR INOP APR 30, 2012

DISPATCHERS SIGNATURE

I HAVE VERIFIED THAT ALL REQUIRED AIRCRAFT SEARCHES HAVE BEEN COMPLETED.

CAPTAINS SIGNATURE

SEE AOM 8-3-7 PARA K.2

OPERATION MODES CLIMB 250
 CRUISE 300
 DESCENT 290

BRIEFING GENERATED 25APR12 1445Z UTC
WEATHER BRIEFING FLT 1900 LBB-SLC

ATIS
Salt Lake City International information Oscar 1500Z weather. Wind 300 at 10, visibility 3.
2,000 few, 3,000 broken, temperature 51, dew-point 33. Altimeter 29.92. ILS runway 34R
approach in use. Landing runway 34R. Departure runway 34L. End of information Papa.

CHECKPT LAT-LONG	DIST (to go)	MC	ALT	OAT	WIND
KLBB N33 39.49 W101 49.2	701	...	...	...	...
TXO N35 10.55 W103 35.7	635	309	260	-27	29410
TCC N35 10.55 W103 35.54	580	282	300	-36	29410
RSK N36 44.90 W108 05.93	341	316	360	-49	29410
DVC N37 48.53 W108 55.88	266	353	360	-50	29310
JNC N39 03.57 W108 47.5	191	285	300	-38	29310
HELPR N39 45.11 W110 32.5	99	282	200	-20	28512
SPANE N40 07.49 W111 32.5	48	282	160	-12	28411
LEEHY N40 10.40 W111 40.6	41	300	140	-8	28310
BLUPE N40 17.16 W111 49.4	32	308	120	-4	30010
KSLC N40 47.18 W111 58.3	...	...	...	...	...

Third Experimental Flight, Flight Release

FLIGHT RELEASE

You will begin the scenario 40 NM to TXO, at FL240 and 290 KT. It is currently 1550Z.

Call Sign FLT 1900

WED APR 25 1445Z 2012 DISPATCHER JOE SMITH
VOID AFTER 1845Z PHONE 1-800-283-3470
AIRCRAFT TAIL NO 36UA DESK 6

<u>FLT</u>	<u>FROM</u>	<u>TO</u>	<u>ALT</u>
1900	LBB	SLC	NAR

FILED FLIGHT PLAN ROUTE 100 IFR
1900 747/F SLC P1545 FL340
LBB..TXO.TCC.J76.FTI.JNC.J12.HELPR..LEEHY 3

DEFERRED MAINTENANCE ITEMS	EXPIRES
M34-23 WEATHER RADAR INOP	APR 30, 2012

DISPATCHERS SIGNATURE

I HAVE VERIFIED THAT ALL REQUIRED AIRCRAFT SEARCHES HAVE BEEN COMPLETED.

CAPTAINS SIGNATURE

SEE AOM 8-3-7 PARA K.2

OPERATION MODES CLIMB 250
 CRUISE 300
 DESCENT 290

BRIEFING GENERATED 25APR12 1515Z UTC
WEATHER BRIEFING FLT 1900 LBB-SLC

ATIS
Salt Lake City International information Romeo 1500Z weather. Wind 300 at 10, visibility 3.
2,000 few, 3,000 broken, temperature 51, dew-point 33. Altimeter 29.92. ILS runway 34R
approach in use. Landing runway 34R. Departure runway 34L. End of information Romeo.

CHECKPT LAT-LONG	DIST (to go)	MC	ALT	OAT	WIND
KLBB N33 39.49 W101 49.2	662	...	...	...	...
TXO N35 10.55 W103 35.7	596	309	260	-27	29410
TCC N35 10.55 W103 35.54	540	282	300	-36	29410
FTI N35 39.45 W105 08.14	459	311	340	-45	29310
JNC N39 03.57 W108 47.5	191	285	300	-38	29310
HELPR N39 45.11 W110 32.5	99	282	200	-20	28512
SPANE N40 07.49 W111 32.5	48	282	160	-12	28411
LEEHY N40 10.40 W111 40.6	41	300	140	-8	28310
BLUPE N40 17.16 W111 49.4	32	308	120	-4	30010
KSLC N40 47.18 W111 58.3	...	...	...	...	...

Study 2

First Practice Flight, Flight Release

FLIGHT RELEASE

You will begin the scenario 20 NM to RBV, at 16,000 FT and 290 KT. It is currently 1550Z.

Call Sign FLT 1900

WED APR 25 1445Z 2012
VOID AFTER 1845Z
AIRCRAFT TAIL NO 36UA

DISPATCHER JOE SMITH
PHONE 1-800-283-3470
DESK 6

<u>FLT</u>	<u>FROM</u>	<u>TO</u>	<u>ALT</u>
1900	JFK	IAD	NAR

FILED FLIGHT PLAN ROUTE 100 IFR
1900 747/F IAD P1545 FL180
JFK..RBV.ARD.V276.KATVE.V457.HOUTN.LRP..DELRO 2

DEFERRED MAINTENANCE ITEMS EXPIRES

M34-23 WEATHER RADAR INOP APR 30, 2012

DISPATCHERS SIGNATURE

I HAVE VERIFIED THAT ALL REQUIRED AIRCRAFT SEARCHES HAVE BEEN COMPLETED.

CAPTAINS SIGNATURE

SEE AOM 8-3-7 PARA K.2

BRIEFING GENERATED 25APR12 1515Z UTC
WEATHER BRIEFING FLT 1900 JFK-IAD

ATIS

Washington Dulles International information Sierra 1500Z weather. Wind variable at 3, visibility 5. 2,000 scattered, 3,000 broken, temperature 55, dew-point 46. Altimeter 29.92. ILS runway 19R approach in use. Landing runway 19R. Departure runway 19L. End of information Sierra.

CHECKPT LAT-LONG	DIST (to go)	MC	ALT	OAT	WIND
KJFK N40 38.23 W073 46.4	230	...	...	...	...
RBV N40 13.00 W074 27.5	186	292	160	-20	24310
ARD N40 15.00 W074 54.1	167	297	180	-23	24410
KATVE N40 23.83 W75 41.96	130	250	180	-23	24410
HOUTN N40 19.60 W075 49.1	123	250	180	-23	24411
LRP N40 19.66 W076 18.0	98	250	180	-23	24210
JOANNE N40 02.10 W076 27.6	89	251	160	-19	24210
DELRO N39 57.50 W076 37.4	80	250	160	-19	24212
BINNS N39 46.60 W077 01.3	59	248	140	-15	24211
HYPER N39 40.60 W077 13.8	47	249	110	-9	24110
MULRR N39 38.60 W077 18.2	41	199	100	-6	24410
KIAD N38 56.50 W077 27.3	...	...	...	...	...

Second Practice Flight, Flight Release

FLIGHT RELEASE

You will begin the scenario 15 NM to KATVE, at FL180 and 290 KT. It is currently 1559Z.

Call Sign FLT 1900

WED APR 25 1445Z 2012
VOID AFTER 1845Z
AIRCRAFT TAIL NO 36UA

DISPATCHER JOE SMITH
PHONE 1-800-283-3470
DESK 6

<u>FLT</u>	<u>FROM</u>	<u>TO</u>	<u>ALT</u>
1900	JFK	IAD	NAR

FILED FLIGHT PLAN ROUTE 100 IFR
1900 747/F IAD P1545 FL180
JFK..RBV.ARD.V276.KATVE.V457.HOUTN.LRP..DELRO 2

<u>DEFERRED MAINTENANCE ITEMS</u>	<u>EXPIRES</u>
M34-23 WEATHER RADAR INOP	APR 30, 2012

DISPATCHERS SIGNATURE

I HAVE VERIFIED THAT ALL REQUIRED AIRCRAFT SEARCHES HAVE BEEN COMPLETED.

CAPTAINS SIGNATURE

SEE AOM 8-3-7 PARA K.2

BRIEFING GENERATED 25APR12 1515Z UTC
WEATHER BRIEFING FLT 1900 JFK-IAD

ATIS
Washington Dulles International information Golf 1500Z weather. Wind variable at 3, visibility 5. 2,000 scattered, 3,000 broken, temperature 55, dew-point 46. Altimeter 29.92. ILS runway 19R approach in use. Landing runway 19R. Departure runway 19L. End of information Golf.

CHECKPT LAT-LONG	DIST (to go)	MC	ALT	OAT	WIND
KJFK N40 38.23 W073 46.4	230	...	...	...	...
RBV N40 13.00 W074 27.5	186	292	160	-20	24310
ARD N40 15.00 W074 54.1	167	297	180	-23	24410
KATVE N40 23.83 W75 41.96	130	250	180	-23	24410
HOUTN N40 19.60 W075 49.1	123	250	180	-23	24411
LRP N40 19.66 W076 18.0	98	250	180	-23	24210
JOANNE N40 02.10 W076 27.6	89	251	160	-19	24210
DELRO N39 57.50 W076 37.4	80	250	160	-19	24212
BINNS N39 46.60 W077 01.3	59	248	140	-15	24211
HYPER N39 40.60 W077 13.8	47	249	110	-9	24110
MULRR N39 38.60 W077 18.2	41	199	100	-6	24410
KIAD N38 56.50 W077 27.3	...	...	...	...	...

First Experimental Flight, Flight Release

FLIGHT RELEASE

You will begin the scenario 120 NM to RSK, at FL360 and 290 KT. It is currently 1615Z.

Call Sign FLT 1900

WED APR 25 1445Z 2012
VOID AFTER 1845Z
AIRCRAFT TAIL NO 36UA

DISPATCHER JOE SMITH
PHONE 1-800-283-3470
DESK 6

<u>FLT</u>	<u>FROM</u>	<u>TO</u>	<u>ALT</u>
1900	LBB	SLC	NAR

FILED FLIGHT PLAN ROUTE 100 IFR
1900 747/F SLC P1545 FL360
LBB..TXO.TCC.RSK.DVC.JNC.J12.HELPR..LEEHY 3

DEFERRED MAINTENANCE ITEMS EXPIRES

M34-23 WEATHER RADAR INOP APR 30, 2012

DISPATCHERS SIGNATURE

I HAVE VERIFIED THAT ALL REQUIRED AIRCRAFT SEARCHES HAVE BEEN COMPLETED.

CAPTAINS SIGNATURE

SEE AOM 8-3-7 PARA K.2

BRIEFING GENERATED 25APR12 1445Z UTC
WEATHER BRIEFING FLT 1900 LBB-SLC

ATIS
Salt Lake City International information Oscar 1500Z weather. Wind 300 at 10, visibility 3.
2,000 few, 3,000 broken, temperature 51, dew-point 33. Altimeter 29.92. ILS runway 34R
approach in use. Landing runway 34R. Departure runway 34L. End of information Papa.

CHECKPT LAT-LONG	DIST (to go)	MC	ALT	OAT	WIND
KLBB N33 39.49 W101 49.2	701	...	...	...	...
TXO N35 10.55 W103 35.7	635	309	260	-27	29410
TCC N35 10.55 W103 35.54	580	282	300	-36	29410
RSK N36 44.90 W108 05.93	341	316	360	-49	29410
DVC N37 48.53 W108 55.88	266	353	360	-50	29310
JNC N39 03.57 W108 47.5	191	285	300	-38	29310
HELPR N39 45.11 W110 32.5	99	282	200	-20	28512
SPANE N40 07.49 W111 32.5	48	282	160	-12	28411
LEEHY N40 10.40 W111 40.6	41	300	140	-8	28310
BLUPE N40 17.16 W111 49.4	32	308	120	-4	30010
KSLC N40 47.18 W111 58.3	...	...	...	...	...

Second Experimental Flight, Flight Release

FLIGHT RELEASE

You will begin the scenario 40 NM to TXO, at FL240 and 290 KT. It is currently 1550Z.

Call Sign FLT 1900

WED APR 25 1445Z 2012
VOID AFTER 1845Z
AIRCRAFT TAIL NO 36UA

DISPATCHER JOE SMITH
PHONE 1-800-283-3470
DESK 6

<u>FLT</u>	<u>FROM</u>	<u>TO</u>	<u>ALT</u>
1900	LBB	SLC	NAR

FILED FLIGHT PLAN ROUTE 100 IFR
1900 747/F SLC P1545 FL340
LBB..TXO.TCC.J76.FTI.JNC.J12.HELPR..LEEHY 3

<u>DEFERRED MAINTENANCE ITEMS</u>	<u>EXPIRES</u>
M34-23 WEATHER RADAR INOP	APR 30, 2012

DISPATCHERS SIGNATURE

I HAVE VERIFIED THAT ALL REQUIRED AIRCRAFT SEARCHES HAVE BEEN COMPLETED.

CAPTAINS SIGNATURE

SEE AOM 8-3-7 PARA K.2

BRIEFING GENERATED 25APR12 1515Z UTC
WEATHER BRIEFING FLT 1900 LBB-SLC

ATIS
Salt Lake City International information Romeo 1500Z weather. Wind 300 at 10, visibility 3.
2,000 few, 3,000 broken, temperature 51, dew-point 33. Altimeter 29.92. ILS runway 34R
approach in use. Landing runway 34R. Departure runway 34L. End of information Romeo.

CHECKPT LAT-LONG	DIST (to go)	MC	ALT	OAT	WIND
KLBB N33 39.49 W101 49.2	662	...	...	...	...
TXO N35 10.55 W103 35.7	596	309	260	-27	29410
TCC N35 10.55 W103 35.54	540	282	300	-36	29410
FTI N35 39.45 W105 08.14	459	311	340	-45	29310
JNC N39 03.57 W108 47.5	191	285	300	-38	29310
HELPR N39 45.11 W110 32.5	99	282	200	-20	28512
SPANE N40 07.49 W111 32.5	48	282	160	-12	28411
LEEHY N40 10.40 W111 40.6	41	300	140	-8	28310
BLUPE N40 17.16 W111 49.4	32	308	120	-4	30010
KSLC N40 47.18 W111 58.3	...	...	...	...	...
