

Appendix A

Letter from the PI's Branch Head

From: [Arthur, Keith \(LARC-D318\)](#)
To: [Stephens, Chad L. \(LARC-D318\)](#)
Cc: [Prinzel, Lawrence J. \(LARC-D318\)](#); [Holbrook, Jon B. \(LARC-D318\)](#)
Subject: RE: request for BH letter re: support of proposed HC2S research protocol
Date: Tuesday, April 5, 2022 10:40:23 AM

As Head of NASA Langley's Crew Systems and Aviation Operations Branch (D318), I confirm that the proposed "Human Contributions to Safety (HC2S)" flight simulation study is fully funded by the NASA Aeronautics Research Mission Directorate (ARMD). Furthermore, I acknowledge that the proposed research's scientific merit has been assessed and confirmed through an Initial Management Review, the Preliminary Experiment Review, and the Final Experiment Review conducted by management representatives and members of D318. Additionally, I confirm that the potential of the proposed research to meet its intended goals is high.

Keith Arthur

Keith Arthur

Head, Crew Systems and Aviation Operations Branch, NASA Langley Research Center
757-864-8425

Title

Technical Point of Contact (TPOC):

Alternate TPOC: Rania Ghatas

Resource Analyst: Bernita Bond

Organization Code: D318

Notice of Request (NOR)

Support and Subject Request # NORxx-xxx

DATE Submitted: 4/7/2022

TO: Erin Thomas AMA, Inc. B1268A, R1156 MS 152 Email: Erin.E.Thomas@nasa.gov Larc-dl-recruitment@mail.nasa.gov	FROM: Chad Stephens Crew Systems & Aviation Operations Branch B1268A, R1158 MS-152 Email: chad.l.stephens@nasa.gov
CC: Rania Ghatas Crew Systems & Aviation Operations Branch B1268A MS 152 Email: rania.w.ghatas@nasa.gov	Michael Greenwood Research Directorate/TEAMS-3 COR B2102 MS 041 Email: michael.c.greenwood@nasa.gov

SUBJECT: Airline, Corporate, General Aviation Technical Expertise and Test Subject Delivery for TEAMS-3 Contract #80LARC17C0003

TITLE: Notice for TDN#: 04.001.006 entitled "HCS2" SOTERIA Study

a. Description of Work:

Provide 1 pilot and 1 Air Traffic Controller for pre-study scenario check-out sessions; 12 (twelve) flight crews (24 pilots) to support 24 days (two consecutive days for each flight crew) of testing to be used as subjects in NASA Langley's Integrated Flight Deck (IFD) simulator. Day 1 will consist of all flight simulation runs and Day 2 will consist of interviews and follow-up questionnaires related to the flight simulation sessions. The Air Traffic Controller to support 12 days of testing (Day 1 for each flight crew) in addition to days for pre-study scenario check-out sessions to include training and familiarity. The Selection Criteria below describes the necessary specific skills for all pilots and ATC.. The subjects will be primarily involved with:

☒interviews ☐surveys ☐table-top simulation ☒full-mission simulation ☐flight tests ☐workshop

b. Period of Performance: February 1-2, 2022 (pre-study scenario check-out session); April 12-13, 2022 (pre-study scenario check-out session); May 2022 – June 2022 (study data collection sessions), it is requested that Day 2 and Day 1 for flight crews overlap so that up to 4 (four) flight crews can be run in one week (e.g., Crew 1 Day 2 on Tuesday and Crew 2 Day 1 on same Tuesday then Crew 2 Day 2 on Wednesday and Crew 3 Day 1 on same Wednesday, etc.)

c. Number of Subjects: 1 pilot and 1 Air Traffic Controller (for pre-study scenario check-out sessions); 12 (twelve) flight crews totaling 24 pilots for flight simulation study at NASA Langley. Support (non-subject) TRACON Air Traffic Controller also requested (the number contingent on availability to support 12 days of testing + days for flight simulation scenario check-out; anticipated need of 2 controllers for 6 days each but if possible, would prefer 1 TRACON ATC to provide support across 12 days.

d. Delivery Schedule:

Dates:	Time:
February 1-2, 2022 (for flight simulation scenario check-out)	8am-5pm (ET)
April 12-13, 2022 (for flight simulation scenario check-out)	8am-5pm (ET)
May 2, 2022 – June 11, 2022 (for study data collection sessions)	Day 1: 8am-5pm (ET) Day 2: 8am-3pm (ET)

e. Selection Criteria: Pilot selection criteria is (a) American Airlines pilots; (b) pilots participate as part of flight crew with 1 pilot current Captain on B737NG and 1 pilot current F/O on B737NG; (c) currently flying B737NG aircraft; (d) based at DFW, PHL, MIA, CLT, ORF, RIC, DCA, BOS, JFK, or LGA; and (e) preference to be given to those based out of CLT and/or fly to CLT at least once weekly and also (f) preference to be given to local-area (ORF, CLT, RIC, DCA) B737NG American Airlines pilots. ATC selection criteria is (a) current or recently retired (within 2 years) TRACON or ARTCC Air Traffic Controller; and (b) preference provided to local-area TRACON ATC (domiciled local-area and/or RIC or ORF controller) and also (c) preference given to controller with significant post-2016 CLT TRACON experience. Familiarity (self-reported is acceptable) with ARTCC and/or TRACON operations with RNAVs and RNAV Optimal Profile Descents is required. The researchers request to contact possible candidates prior to selection (via telephone) to ensure compatibility with study objectives.

f. Special Instructions or Information:

1. Reimburse for travel expenses, including costs for airfare, accommodations, rental cars (including self-reserved), and miscellaneous expenses.
2. Stipend: \$725 per day for pilots, \$725 per day for ATC
3. Fill-out the appropriate paperwork for badging and allowing non-Langley workers on-site at NASA LaRC. Abide by NASA COVID-19 policy and procedures (https://nasapeople.nasa.gov/coronavirus/NASA_COVID-19_Response_Plan.pdf) and Langley Research Center COVID-19 policy and procedures (<https://larcsof.larc.nasa.gov/>).
4. Deliver subjects to: Lobby, NASA Langley Research Center building 1268A
5. Subject shall be told the following: Area navigation standard terminal arrival route (RNAV STAR) procedures used at major airports are intended to increase predictability and efficiency. These procedures provide vertical, lateral, and speed profiles for aircraft to follow as they descend toward an airport. Analyzing aircraft flight track data for more than 10 million flights into 32 domestic airports revealed that only 12.4% of flights fully complied with the vertical and lateral profiles in the RNAV STARs. Although the finding provides an example in which published procedures were frequently misaligned with normal operations, questions remain with regard to the reasons for the misalignment, and thus how to interpret this finding. Traditional approaches to risk and safety management have focused on what can go wrong, and minimizing unwanted outcomes, such as accidents and incidents, and ill-equipped to enable learning from events such as procedural non-adherences that do not result in reported undesired outcomes, nor to explore whether these non-adherences may, in fact, reflect desired behaviors. An alternative and complementary approach to risk and safety management is to focus on what goes right and identify how successes can also contribute to safety management and assurance. Focusing on the rare cases of failures attributed to human error provides little information about how or why human performance routinely results in safe, successful outcomes. The study shall examine how commercial aircraft pilots anticipate, monitor for, respond to, and learn from routine disturbances during RNAV arrivals into Charlotte Douglas International Airport (KCLT). The research shall help to better inform pilot contributions to commercial aviation safety.

This study will be performed at NASA Langley Research Center, in Hampton, Virginia, in the Integrated Flight Deck (IFD) flight simulator. The IFD is a fixed-base flight simulator that replicates the flight deck of a Boeing 737NG aircraft. You will receive training on the operation of the equipment that you will operate and a briefing on the tasks in which you will participate. You will be allowed time to familiarize yourself with the equipment prior to starting your participation in the study. If you consent to participate in the study, you will be asked to fly approximately 9 simulated approaches into Charlotte Douglas International Airport (KCLT). Each experiment run/flight simulation scenario will last approximately 30 minutes. After each run, you will be asked to fill out questionnaires and participate in question and answer/interview session. During the course of the study, you will provide your impressions and assessments through verbal responses and completing written questionnaires. You will also participate in a debrief consisting of questionnaires, interviews, and knowledge elicitation activities. The duration of your participation will require approximately 8 hours of your time each day, during 2 consecutive days. You may take a break at any time during the 8 hours, though you are encouraged to complete each experiment run/flight simulation scenario before taking a break. Prior to Day 1 of the study, you will be provided with a digital copy of the Informed Consent document for this study, a Privacy Act Notice, and approximately 5 (five) questionnaires/inventories to complete before you arrive on-site for the study. Day 1 of the study will consist of flight simulation runs and Day 2 of the study will consist of a debrief on the flight simulation sessions. You are requested to wear your pilot uniform on Day 1 for the flight simulation runs. On Day 1 during the flight

simulation runs you will be outfitted with a headset to record brain activity and a wristband to record pulse rate. The headset requires the use of electrode paste to detect brain activity and we request that you do not use any hair styling product on Day 1 because it can interfere with proper recording and will need to be rinsed out prior to donning the headset.

g. Technical Point of Contact (TPOC):

Name: Chad Stephens

Email: chad.l.stephens@nasa.gov

Telephone: (757) 864-1547 or (540) 239-7114

Fax: (757) 864-7793

NASAS Badge # (needed to process Visitor Requests): 009-501007

WBS:

Fund Code:

h. Brief Description of Task:

American Airlines B737NG pilots, operating as flight crew in respective roles of Captain and F/O, shall perform RNAV STARs into KCLT in the NASA Langley Research Center Integrated Flight Deck (IFD) B737NG simulator at NASA Langley Research Center, in Hampton, Virginia. Air Traffic Controller to serve as research confederate. The pilots shall provide data on understanding pilot contributions to commercial aviation safety to include quantitative, observer-based, eye tracking and other psychophysiology measures, safety reports, interviews, walkthrough protocols, questionnaires, and scales and inventories.

Contact for Further Information: Chad Stephens (757 864-1547) or Lance Prinzel (757 864-2277) or Jon Holbrook (757 864-9275). Researchers work in Research Directorate, Crew Systems & Aviation Operations (D-318).



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Public Aeronautics Test Assistance Center

+ HOME

+ SEARCH

+ MY EXPERIMENTS

- QUESTIONNAIRES

+ MY ACCOUNT

+ LOGOFF

1. General
Background

2. Contact
Information

3.
Qualifications

4. Flight
Experience

5. Past
Participation

1. General Background

Thank you for your interest in supporting NASA research. Please help us to identify which studies you can help us with.

What kind of aviation professional are you?

Airline

☐

Corporate or Business Jet

☐

General Aviation

☐

Military

☐

Identification

Last Name:

First Name:

M.I.:

Address:

City:

State:

ZIP Code:

Country:

US Citizen:

- ☒ Yes
☐ No

If no, are you a permanent resident alien?

- ☐ Yes
☒ No

Due to NASA base restrictions, all participants must be a US citizen or an Immigrant alien (green card holder). Green card holders will be required to complete additional paperwork prior to participation.

Country of Citizenship if not U.S.A.

Are you a native English speaker?

- ☐ Yes
☐ No

Other language proficiencies:

Gender:

- ☐ Male
☐ Female

Age

Years of Formal Education:

Do you wear corrective lenses?

- ☐ Yes
☐ No

Have you had LASIK or other corrective vision surgery?

- ☐ Yes
☐ No

Would you like to be considered as a participant for future NASA simulator/flight experiments?

- ☐ Yes
☐ No

Previous Page

Next Page

+ USA.gov - The U.S. government's official web portal.
+ Freedom of Information Act
+ Budgets, Strategic Plans and Accountability Reports
+ The President's Management Agenda
+ Privacy Policy and Important Notices
+ Inspector General Hotline
+ Equal Employment Opportunity Data Posted Pursuant to the
No Fear Act
+ Information-Dissemination Priorities and Inventories



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+ Contact NASA
+ NASA Home Page



+ Contact NASA
+ About this site

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+ MULTIMEDIA

+ MISSIONS

+ MY NASA

+ WORK FOR NASA

+ ABOUT LARC

Background Questionnaire

Public Aeronautics Test Assistance Center

+ HOME

+ SEARCH

+ MY EXPERIMENTS

- QUESTIONNAIRES

+ MY ACCOUNT

+ LOGOFF

1. General
Background

2. Contact
Information

3.
Qualifications

4. Flight
Experience

5. Past
Participation

2. Contact Information

Home Phone:

Work Phone:

FAX:

Cell/Other:

Email:

How often do you check this account?

**** Important ****

How much notification time do you typically need?

What is the best way to reach you on short term notice (2 days ahead)?

What is the best way to reach you on urgent notice (day prior to experiment)?

If we are unable to conduct the experiment on the day you arrive, you will still receive compensation for that day.

Previous Page

Next Page

- + USA.gov - The U.S. government's official web portal.
- + Freedom of Information Act
- + Budgets, Strategic Plans and Accountability Reports
- + The President's Management Agenda
- + Privacy Policy and Important Notices
- + Inspector General Hotline
- + Equal Employment Opportunity Data Posted Pursuant to the No Fear Act
- + Information-Dissemination Priorities and Inventories



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Background Questionnaire

Public Aeronautics Test Assistance Center

+ HOME

+ SEARCH

+ MY EXPERIMENTS

- QUESTIONNAIRES

+ MY ACCOUNT

+ LOGOFF

1. General

Background

2. Contact

Information

3.

Qualifications

4. Flight

Experience

5. Past

Participation

3. Qualifications

FAA Classification

Are you currently employed by an FAA Part operator?

- ☐ 91 Operator
- ☐ 121 Operator
- ☐ 107 Operator
- ☐ 135 Operator
- ☐ Other Part Operator
- ☐ No

Military Experience

Are you a current or former military pilot?

- ☐ Yes, currently employed (Active Duty)
- ☐ Yes, currently employed (Reserve/Guard)
- ☐ Former or retired
- ☐ No

Years of military flying:

Date of most recent Military flying:

Business/Corporate Experience

Are you a current or former corporate pilot?

- ☐ Yes, currently employed (full-time)
- ☐ Yes, currently employed (part-time)
- ☐ Former or retired
- ☐ No

Years of business/corporate flying:

Date of most recent Business/Corporate flying:

Current position:

Select position ▼

For what Business/Corporation do you fly (so that we can match crews when required):

What Business/Corporation are you employed by (so that we can match crews when required):

Scheduled Airline Experience

Are you a current or former airline pilot?

- ☐ Yes, currently employed (full-time)
- ☐ Yes, currently employed (reserve)
- ☐ Yes, currently employed (furloughed)
- ☐ Former or retired
- ☐ No

Years of airline flying:

Date of most recent Scheduled Airline flying:

Current position:

What airline do you fly for (so that we can match crews when required):

Private/Recreational Experience

Do you fly for recreation?

- ☐ Yes
- ☐ No

Do you currently own aircraft?

- ☐ Yes
- ☐ No

Have you previously owned aircraft?

- ☐ Yes
- ☐ No

Do you currently rent aircraft?

- ☐ Yes
- ☐ No

Certificate/Ratings:

Do you hold a current and valid:

Private Pilot Certificate?

- ☐ Yes
- ☐ No

Single-Engine Land Rating?

- ☐ Yes
- ☐ No

Multi-Engine Land Rating?

- ☐ Yes
☐ No

Instrument Airplane Rating?

- ☐ Yes
☐ No

Certified Flight Instructor (CFI) Certificate?

- ☐ Yes
☐ No

Instrument Instructor (CFII) Certificate?

- ☐ Yes
☐ No

Commercial Pilot Certificate?

- ☐ Yes
☐ No

Multi-Engine Instructor (MEI) Certificate?

- ☐ Yes
☐ No

Rotorcraft Rating?

- ☐ Yes
☐ No

Instrument Helicopter Rating?

- ☐ Yes
☐ No

Glider Rating?

- ☐ Yes
☐ No

Single-Engine Sea Rating?

- ☐ Yes
☐ No

Multi-Engine Sea Rating?

- ☐ Yes
☐ No

Airline Transport Pilot Certificate?

- ☐ Yes
☐ No

Other Ratings:

Previous Page

Next Page

- + USA.gov - The U.S. government's official web portal.
- + Freedom of Information Act
- + Budgets, Strategic Plans and Accountability Reports
- + The President's Management Agenda
- + Privacy Policy and Important Notices
- + Inspector General Hotline
- + Equal Employment Opportunity Data Posted Pursuant to the No Fear Act
- + Information-Dissemination Priorities and Inventories



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Background Questionnaire

Public Aeronautics Test Assistance Center

1. General
Background

2. Contact
Information

3.
Qualifications

4. Flight
Experience

5. Past
Participation

4. Flight Experience

- Provide your best estimate. Values may be rounded if desired.

General Experience

Total Pilot Flying Hours:

Hours as Pilot-in-Command:

Total Years Flying:

Hours as Second-in-Command:

Hours flown in last 12 months:

Hours Flight Instruction Received:

Date of last Biennial Flight Review (BFR) or Proficiency Check:

Hours Flight Instruction Given:

Date of last Instrument Proficiency Check (IPC) (if applicable):

Cross Country Hours:

International Flight Hours:

Current to fly Instrument Flight Rules (IFR):

+ HOME

+ SEARCH

+ MY EXPERIMENTS

- QUESTIONNAIRES

+ MY ACCOUNT

+ LOGOFF

- ☐ Yes
☐ No

Night Flying Hours:

Actual Instrument Flight Hours:

Multi-Engine, # Years:

Glass Cockpit, # Years:

Types of Glass Cockpits used (check all that apply):

Boeing

☐

Airbus

☐

Honeywell

☐

Rockwell Collins

☐

Garmin

☐

Other

☐

If Other Glass Cockpit, enter type(s):

General Aviation Experience

Single-Engine Land Hours:

Multi-Engine Land Hours:

Rotorcraft Hours:

Glider Hours:

Specific Aircraft Experience:

- Please list the types of aircraft on which you have experience, *beginning with the most recently flown.*

- For each aircraft, please indicate your approximate number of flying and simulator hours.
- If you were type rated on this aircraft, please check the type rated box.
- If you were an Instructor (IP) or a Check Airman (Chk) on any of these aircraft, please check the appropriate box.

Specific Aircraft Experience:

Aircraft Type (Most recent first)	HUD	CDU	FMS	Glass	Hours in Type	Simulator Hours	Type Rated	IP	Chk
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If Aircraft Type is OTHER, list model/type(s):

Experience with Flying Oceanic Routes

On a scale of 0 to 10, rate your level of experience with flying oceanic routes. A rating of 0 corresponds to no experience. A rating of 10 corresponds to very experienced.

0 - no experience ▼

In what oceanic regions have you flown? Please rate your level of experience with flying the specific oceanic regions below. A rating of 1 corresponds to very little experience. A rating of 10 corresponds to very experienced.

North Atlantic Organized Track System (NATOTS)

0 - no experience ▼

Pacific Organized Track System (PACOTS)

0 - no experience ▼

Central East Pacific (CEP)

0 - no experience ▼

South Pacific (SOPAC)

0 - no experience ▼

West Atlantic Route System (WATRS)

0 - no experience ▼

Central Pacific (CENPAC)

Other (Please identify below)

If you indicated that you have experience in region Other above, please identify the region.

What was the approximate date of your last oceanic flight? (MM/DD/YYYY)

Other Experience

Have you ever flown with a HUD?

If yes, month/year:

and number of hours:

Have you ever flown using a Velocity Vector or Flight Path Vector display?

If yes, month/year:

and number of hours:

Experience using a certified GPS system for IFR approaches and procedures?

- ☐ Yes
☐ No

Experience using a Horizontal Situation Indicator (HSI)?

- ☐ Yes
☐ No

Experience using weather information systems?

- ☐ Yes
☐ No

If yes, what type of weather information system used?

and, what display is used for the weather information?

Experience using an Enhanced Vision System (EVS)?

- ☐ Yes
☐ No

Experience using an Enhanced Flight Vision System (EFVS)?

- ☐ Yes
☐ No

Experience using a Synthetic Vision System (SVS)?

- ☐ Yes
☐ No

Do you have a high performance aircraft endorsement?

- ☐ Yes
☐ No

Have you ever been Required Navigation Performance qualified (RNP)?

- ☐ Yes
☐ No

Are you currently using RNP?

- ☐ Yes
☐ No

Special Qualifications (example: PhD Aeronautical Engineering or Experimental Test Pilot School):

Previous Page

Next Page

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+ Freedom of Information Act
+ Budgets, Strategic Plans and Accountability Reports
+ The President's Management Agenda
+ Privacy Policy and Important Notices
+ Inspector General Hotline
+ Equal Employment Opportunity Data Posted Pursuant to the
No Fear Act
+ Information-Dissemination Priorities and Inventories



NASA Official: Anthony Busquets
Curator: E. Thomas
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+ NASA Home Page



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+ MULTIMEDIA

+ MISSIONS

+ MY NASA

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+ ABOUT LARC

Background Questionnaire

Public Aeronautics Test Assistance Center

1. General
Background

2. Contact
Information

3.
Qualifications

4. Flight
Experience

5. Past
Participation

5. Past Participation

- Please list any previous NASA experiment in which you have participated.
- Fill-in as much as you remember.

Past Participation:

When	Researcher	Where	Title/Description of Experiment
<input type="text"/>	<input type="text"/>	<input type="text"/>	Select Experiment ▼
<input type="text"/>	<input type="text"/>	<input type="text"/>	Select Experiment ▼
<input type="text"/>	<input type="text"/>	<input type="text"/>	Select Experiment ▼
<input type="text"/>	<input type="text"/>	<input type="text"/>	Select Experiment ▼
<input type="text"/>	<input type="text"/>	<input type="text"/>	Select Experiment ▼
<input type="text"/>	<input type="text"/>	<input type="text"/>	Select Experiment ▼
<input type="text"/>	<input type="text"/>	<input type="text"/>	Select Experiment ▼
<input type="text"/>	<input type="text"/>	<input type="text"/>	Select Experiment ▼
<input type="text"/>	<input type="text"/>	<input type="text"/>	Select Experiment ▼
<input type="text"/>	<input type="text"/>	<input type="text"/>	Select Experiment ▼

If Title/Description of Experiment is OTHER, list name(s):

All information contained herein will be kept confidential.

Please share your comments about this survey:

AID:

5523

CERTIFICATION. Important: Your application will not be considered without an affirmative response. By entering **YES** in this box I hereby certify that my responses are true and complete to the best of my ability:

Previous Page

Finish

- + Inspector General Hotline
- + Equal Employment Opportunity Data Posted Pursuant to the No Fear Act
- + Information-Dissemination Priorities and Inventories

Please read the below statements about yourself and indicate how well it applies to you by circling the answer to the right from 1 (*does not apply at all*) to 4 (*applies very strongly*). Let me know how true the following characteristics are as they apply to you generally:

Characteristics About You	Does not Apply at All		Applies Very Strongly	
1. I am generous with my friends.	1 Does not apply at all	2 Applies slightly	3 Applies somewhat	4 Applies very strongly
2. I quickly get over and recover from being startled.	1 Does not apply at all	2 Applies slightly	3 Applies somewhat	4 Applies very strongly
3. I enjoy dealing with new and unusual situations.	1 Does not apply at all	2 Applies slightly	3 Applies somewhat	4 Applies very strongly
4. I usually succeed in making a favorable impression on people.	1 Does not apply at all	2 Applies slightly	3 Applies somewhat	4 Applies very strongly
5. I enjoy trying new foods I have never tasted before.	1 Does not apply at all	2 Applies slightly	3 Applies somewhat	4 Applies very strongly
6. I am regarded as a very energetic person.	1 Does not apply at all	2 Applies slightly	3 Applies somewhat	4 Applies very strongly
7. I like to take different paths to familiar places.	1 Does not apply at all	2 Applies slightly	3 Applies somewhat	4 Applies very strongly
8. I am more curious than most people.	1 Does not apply at all	2 Applies slightly	3 Applies somewhat	4 Applies very strongly
9. Most of the people I meet are likable.	1 Does not apply at all	2 Applies slightly	3 Applies somewhat	4 Applies very strongly
10. I usually think carefully about something before acting.	1 Does not apply at all	2 Applies slightly	3 Applies somewhat	4 Applies very strongly
11. I like to do new and different things.	1 Does not apply at all	2 Applies slightly	3 Applies somewhat	4 Applies very strongly
12. My daily life is full of things that keep me interested.	1 Does not apply at all	2 Applies slightly	3 Applies somewhat	4 Applies very strongly
13. I would be willing to describe myself as a pretty "strong" personality.	1 Does not apply at all	2 Applies slightly	3 Applies somewhat	4 Applies very strongly
14. I get over my anger at someone reasonably quickly.	1 Does not apply at all	2 Applies slightly	3 Applies somewhat	4 Applies very strongly

Administrator Instructions: Participants are told that (a) general self-efficacy relates to “one’s estimate of one’s overall ability to perform successfully in a wide variety of achievement situations, or to how confident one is that she or he can perform effectively across different tasks and situations,” and (b) self-esteem relates to “the overall affective evaluation of one’s own worth, value, or importance, or to how one feels about oneself as a person.”

Participant Instructions: Please circle your answer below.

1. I will be able to achieve most of the goals that I set for myself.

Strongly
disagree

Disagree

Neither agree
nor disagree

Agree

Strongly agree

2. When facing difficult tasks, I am certain that I will accomplish them.

Strongly
disagree

Disagree

Neither agree
nor disagree

Agree

Strongly agree

3. In general, I think that I can obtain outcomes that are important to me.

Strongly
disagree

Disagree

Neither agree
nor disagree

Agree

Strongly agree

4. I believe I can succeed at most any endeavor to which I set my mind.

Strongly
disagree

Disagree

Neither agree
nor disagree

Agree

Strongly agree

5. I will be able to successfully overcome many challenges.

Strongly
disagree

Disagree

Neither agree
nor disagree

Agree

Strongly agree

6. I am confident that I can perform effectively on many different tasks.

Strongly
disagree

Disagree

Neither agree
nor disagree

Agree

Strongly agree

7. Compared to other people, I can do most tasks very well.

Strongly
disagree

Disagree

Neither agree
nor disagree

Agree

Strongly agree

8. Even when things are tough, I can perform quite well.

Strongly
disagree

Disagree

Neither agree
nor disagree

Agree

Strongly agree

Administrator Instructions: Participants are to read each statement carefully and circle the response that they feel most accurately describes their experiences. Indicate to the participant that “There are no right or wrong answers.” and to “Please answer honestly and not to skip any statements.”

Participant Instructions: Please circle your answer below.

1. Verbalizing or applying what was previously learned is easy for me.

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
-------------------	----------	----------------------------	-------	----------------

2. I always provide a thorough briefing.

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
-------------------	----------	----------------------------	-------	----------------

3. It is important to me to prioritize actions.

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
-------------------	----------	----------------------------	-------	----------------

4. I always develop contingency plans.

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
-------------------	----------	----------------------------	-------	----------------

5. Monitoring automation is a pilot ability.

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
-------------------	----------	----------------------------	-------	----------------

6. Working together as a team is important to me.

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
-------------------	----------	----------------------------	-------	----------------

7. I always provide my flight crew with new information as I become aware of it.

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
-------------------	----------	----------------------------	-------	----------------

8. I prefer to be the monitoring pilot.

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
-------------------	----------	----------------------------	-------	----------------

9. I tend to be highly aware of the workload of my co-pilot.

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
-------------------	----------	----------------------------	-------	----------------

10. I actively seek out new information.

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
-------------------	----------	----------------------------	-------	----------------

11. Sharing my mental model with my co-pilot is important to me.

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
-------------------	----------	----------------------------	-------	----------------

12. Learning new ways of performing flight tasks is something I am very good at.

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
-------------------	----------	----------------------------	-------	----------------

System Resilience Potential Scale

We are interested in understanding how your “work system” (i.e., the resources, tools, equipment, procedures, and training you are provided) support your ability to achieve, reprioritize, or redirect your goals and actions to sustain safe and successful operations.

For your “work system,” please tell us about the AVAILABILITY and EFFECTIVENESS of each of the policies/procedures listed below:

	My work system includes policies or procedures that support my ability to:	Yes/No	If YES, how effective is this support? (1= very poor, 5=very good)				
1	Detect and track anomalies, surprises, and inconsistencies.	Y / N	1	2	3	4	5
2	Evaluate the plausibility of anomalies, surprises, and inconsistencies.	Y / N	1	2	3	4	5
3	Evaluate data quality/integrity.	Y / N	1	2	3	4	5
4	Use anomalies, surprises, and inconsistencies to form new understandings.	Y / N	1	2	3	4	5
5	Compare different understandings or perspectives.	Y / N	1	2	3	4	5
6	Formulate new goals or reprioritize existing goals.	Y / N	1	2	3	4	5
7	Recognize goal conflicts.	Y / N	1	2	3	4	5
8	Diagnose problems with a plan.	Y / N	1	2	3	4	5
9	Establish common ground with others regarding goals and plans.	Y / N	1	2	3	4	5
10	Shift existing resources to institute a new plan.	Y / N	1	2	3	4	5
11	Acquire new resources to institute a new plan.	Y / N	1	2	3	4	5
12	Direct another’s goals (e.g., teammate, another operator/worker, etc.).	Y / N	1	2	3	4	5
13	Establish new roles and responsibilities within my team.	Y / N	1	2	3	4	5
14	Anticipate what others (e.g., teammates, other operators/workers) will do next.	Y / N	1	2	3	4	5
15	Understand the status of other workers (i.e., whether another person is having trouble).	Y / N	1	2	3	4	5
16	Understand my own status (i.e., whether I am approaching/passing my personal limits).	Y / N	1	2	3	4	5
17	Gauge teamwork quality.	Y / N	1	2	3	4	5

NASA Monitoring v1.0.1

Start of Block: Introduction

This survey focuses on the positive contribution to flight safety that come from the everyday decisions and actions of pilots.

Special instructions:

Throughout the survey we will often ask you about "the last leg that you flew." For these questions, please think of your most recent leg flown and answer the questions based on what you did on this one, most recent leg.

It will likely take you approximately 15-30 minutes.

Click the continue arrow on the bottom right to begin.

End of Block: Introduction

Start of Block: General Info

Q1 On my last leg, the destination airport was:

Q2 I have flown into this destination airport:

- ☐ for the first time on this trip (1)
 - ☐ previously, but not in the last 3 years (2)
 - ☐ a few times in the last 3 years (3)
 - ☐ at least 1-2 prior flights in the last 6 months (4)
-

Appendix H

Q3 Our airframe was a:

Q4 What was most challenging during your last leg?

Q5 What did you do to manage this situation?

End of Block: General Info

Start of Block: Preflight Phase through Cruise



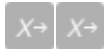
Q6 Sometimes pilots include additional information during a briefing beyond what is standard or in SOPs. During the **preflight briefing**, did you discuss any of the following topics in **greater**

detail than usual, for example, concerning a particular challenge or threat? (Select all that apply)

- ☐ departure weather (1)
 - ☐ weather en route (2)
 - ☐ weather at destination airport (3)
 - ☐ airport navaid or runway conditions (4)
 - ☐ expected airport traffic (5)
 - ☐ fuel planning (6)
 - ☐ minimum equipment list (MEL) items (7)
 - ☐ planned use of automation (8)
 - ☐ knowledge about destination airport from prior flights (9)
 - ☐ additional review of procedures (e.g., engine failure, overweight landing, return to origin) (10)
 - ☐ amount or type of flying experience of flight crew (11)
 - ☐ other or additional details (12)
-
- ☐ no additional detail (13)
-

Q7 In retrospect, did you think the information covered in preflight briefing was:

- ☐ too detailed (1)
- ☐ about right (2)
- ☐ not enough, useful to have addressed more (3)
-



Q8 During **cruise**, before the descent briefing, which of the following did you do? (Select all that apply)

- ☐ spent time discussing arrival, approach, or landing challenges (1)
- ☐ set weather to auto-update (2)
- ☐ reviewed other STARS that ATC might assign (3)
- ☐ performed landing distance calculation for expected runway(s) (4)
- ☐ discussed prior experience with this airport (5)
- ☐ discussed any impact of MEL items (6)
- ☐ other (7) _____
- ☐ none (8)

End of Block: Preflight Phase through Cruise

Start of Block: Descent Briefing and Arrival Phases



Q9 During the **descent briefing**, did you discuss any of the following topics **in greater detail than usual from what is required in SOPs**? (Select all that apply)

- ☐ pilot flying described the way they planned to fly the arrival (e.g., modes, specific gates) (1)
- ☐ discussed how to manage any challenging segments of the STAR (2)
- ☐ discussed when speedbrakes may be necessary (3)
- ☐ discussed possibility of configuring early (4)
- ☐ discussed speed management (5)
- ☐ discussed when non critical tasks should be done (6)
- ☐ discussed weather on descent or at airport (7)
- ☐ discussed possible runway change (8)
- ☐ other (9) _____
- ☐ none (10)

Q10 Were you cleared to fly the STAR that was programmed in your original flight plan?

- ☐ Yes (1)
- ☐ No (2)



Appendix H

Q11 What did you do to assess how your autoflight system would handle your STAR? (Select all that apply)

- ☐ checked that the values in the flight management computer matched values on the chart (1)
 - ☐ checked the flight management computer's predictions (2)
 - ☐ checked whether wind would impact energy management during the STAR (3)
 - ☐ recognized the STAR would not need pilot intervention from prior experience (4)
 - ☐ not applicable (e.g., no STAR planned or not a concern) (5)
-

Q12 What strategies did you use to assess the STAR? (Select all that apply)

- ☐ identified a specific segment of the approach that might be difficult (1)
 - ☐ used a 3-to-1 rule to assess distance from a point on the STAR to the runway (2)
 - ☐ used a 3-to-1 rule to assess some segment(s) of the arrival (3)
 - ☐ considered where in a way point's altitude window the autoflight might fly (4)
 - ☐ observed whether the FMC indicated it would meet all the constraints (5)
 - ☐ information from a display showing vertical profile information (6)
 - ☐ other (7) _____
 - ☐ not applicable (STAR not planned) (8)
-



Q13 If you identified a potential threat or condition that could have made your arrival difficult to comply with, how did you (individually or as a team) manage that? (Select all that apply)

- ☐ made a mental note to personally monitor the threat (1)
- ☐ identified/pointed out a potential threat (2)
- ☐ explicitly suggested monitoring the threat (3)
- ☐ shared a plan to address a potential threat (4)
- ☐ other (5) _____
- ☐ not applicable (6)

Page Break

Appendix H

Q14 Was there anything mentioned in the descent briefing that proved to be particularly helpful?
Describe:

Q15 In retrospect, was there anything additional that you wish you had covered in descent briefing that would have been helpful?



Appendix H

Q16 Did ATC modify your arrival in any of the following ways? (Select all that apply)

- ☐ none -ATC did not modify (1)
- ☐ held you high (2)
- ☐ slowed you down (3)
- ☐ shortened your path (4)
- ☐ assigned a "descend via, except..." (5)
- ☐ took you off and returned you to the same STAR (6)
- ☐ changed to another STAR (7)
- ☐ gave you more than three clearances at once (8)
- ☐ gave you clearances at more than three points in time during your arrival (9)
- ☐ changed to a different runway (10)
- ☐ other (11) _____



Q17 Concerning ATC clearances, we...

- ☐ could comply using the autopilot as programmed without pilot intervention (1)
 - ☐ were able to comply but required speed brakes to make some clearance (2)
 - ☐ knew we would be close, and passed a waypoint with slightly high altitude or speed (3)
 - ☐ knew we could not make the clearance and said we could do speed or altitude but not both (4)
 - ☐ knew we could not make the clearance and said unable (5)
 - ☐ other (6) _____
-



Q18 Did the weather or airport conditions change significantly between what was predicted preflight and what you encountered on descent or at the airport? (Select all that apply)

- ☐ tail wind increased (1)
 - ☐ reduced visibility (2)
 - ☐ convective weather (3)
 - ☐ icing conditions (4)
 - ☐ contaminated runway (5)
 - ☐ other (6) _____
 - ☐ no significant change (7)
-



Q19 Did any of the following impact you? (Select all that apply)

- ☐ frequency congestion (1)
 - ☐ navigation instrument malfunction (2)
 - ☐ unexpected automation behavior (3)
 - ☐ fatigue (4)
 - ☐ traffic separation issues (5)
 - ☐ other noteworthy issues (6)
-



Q20 Did you take any of the following actions to gather information concerning arrival? (Select all that apply)

- ☐ put ACRS WX on auto-update (1)
 - ☐ changed pages on the FMC to check way point restrictions (2)
 - ☐ contacted dispatch for any reason (3)
 - ☐ entered an MCP value to “trick” the FMC to reveal additional information (4)
 - ☐ made other changes to displays to get a more useful view or information What did you change, for what information? (5)
-



Q21 Pilots sometimes enter control changes into the flight management computer (FMC,FMS, the box) or change modes using the Mode Control Panel during their STAR. (Select all that apply)

- ☐ changed a restriction because auto-flight would not meet constraints (1)
- ☐ changed an entry to make it easier to comply with future constraints (2)
- ☐ changed an altitude constraint *window* to a *hard* altitude to constrain automation (3)
- ☐ changed a restriction to accept a clearance from ATC (4)
- ☐ reverted to a lower level of automation during the STAR to meet a constraint (5)
- ☐ other (6) _____
- ☐ not applicable (7)

Q22 During descent, we had a shared monitoring plan with information that was effectively shared. (Select one best response)

- ☐ clearly yes, agree (1)
 - ☐ somewhat agree (2)
 - ☐ somewhat disagree (3)
 - ☐ Not really, I was aware of some gaps or misunderstanding (4)
-

Q23 During descent, the PM: (Select all that apply)

- ☐ reported a concern about making a waypoint (1)
 - ☐ reported a concern about energy management (4)
 - ☐ reported points where PF actions or aircraft state were not as expected (2)
 - ☐ provided positive confirmation of expected actions or states, beyond SOP (3)
-



Q24 At any point on the **arrival or approach**, was the energy state higher than you were comfortable with? (Select one best response)

- ☐ No, not an issue (1)
- ☐ No, but required very close monitoring (2)
- ☐ Somewhat, but resolved quickly (3)
- ☐ Yes, a concern requiring active management (4)

End of Block: Descent Briefing and Arrival Phases

Start of Block: Approach and Landing Phases



Q25 Did you encounter any of the following events during your approach phase? (Select all that apply)

- ☐ ATC changed your approach trajectory (1)
 - ☐ ATC changed your runway (2)
 - ☐ potentially conflicting traffic (3)
 - ☐ wake turbulence (4)
 - ☐ you initiated a go around for any reason (5)
 - ☐ other noteworthy event (6)
-



Q26 Did you fly any part of the approach manually, or at lower levels of automation than standard for your airline?

- ☐ no (1)
- ☐ yes (2)

Display This Question:

If Did you fly any part of the approach manually, or at lower levels of automation than standard for...
= yes



Q26a Why did you choose to do so? (Select all that apply)

- ☐ to accommodate ATC (1)
- ☐ to recover from automation challenges (2)
- ☐ to maintain manual flying skills (3)
- ☐ to achieve required stabilization gates (4)
- ☐ other reason (5) _____



Q27 At approximately what altitude did you disconnect the autoflight?

- ☐ (enter disconnect altitude below) (3)

- ☐ autoflight remained engaged throughout landing (autoland) (2)



Q28 Did you configure flaps or landing gear differently from your normal or standard profile?

- ☐ no, used standard configuration (1)
- ☐ yes (2)

Display This Question:

If Did you configure flaps or landing gear differently from your normal or standard profile? = yes



Appendix H

Q28a Why did you configure flaps or landing gear differently from your normal or standard profile? (Select all that apply)

- ☐ challenging ATC speed assignment (1)
 - ☐ held high by ATC (2)
 - ☐ to avoid weather (3)
 - ☐ unexpected energy state from automation (4)
 - ☐ other (5) _____
-

Q29 Did anything happen during landing that was not routine?

- ☐ yes (1)
 - ☐ no (2)
-

Display This Question:

If Did anything happen during landing that was not routine? = yes

Q29a Describe what happened during landing:

End of Block: Approach and Landing Phases

Start of Block: Overall Assessment

NOTE .

The following questions are regarding your overall assessment of the last leg that you flew.

Q30 Did you gain any useful information by listening to the traffic ahead of you?

- ☐ no, did not listen (1)
- ☐ listened but did not gain useful information (2)
- ☐ yes (3)
-

Display This Question:

If Did you gain any useful information by listening to the traffic ahead of you? = yes



Q30a What useful information did you gain? (Select all that apply)

- ☐ which arrival was in use (1)
- ☐ which runways were in use (2)
- ☐ preparing to flip the airport (3)
- ☐ about turbulence (4)
- ☐ about convective weather (5)
- ☐ possibility of having to hold (6)
- ☐ other (7) _____
-



Q31 Compared to a typical flight, how challenging was your last leg? (Select one best answer)

- ☐ not challenging at all (1)
- ☐ less challenging than typical (2)
- ☐ about typical (3)
- ☐ somewhat more challenging than typical (4)
- ☐ quite a bit more challenging than typical (5)



Q32 In your last leg, did you learn something that might help you on future flights?

- ☐ Yes (1)
- ☐ No (2)

Display This Question:

If In your last leg, did you learn something that might help you on future flights? = Yes

Q32a What did you learn?

Q33 In your last leg, did you encounter something that made this NOT a textbook flight, and you needed to think deeper than just following SOPs to successfully complete the flight?

☐ Yes (1)

☐ No (2)

Display This Question:

If In your last leg, did you encounter something that made this NOT a textbook flight, and you needed... = Yes

Q33a What did you encounter and what did you do?

End of Block: Overall Assessment

Start of Block: Attitude Assessment



Q34 How often do you expect that the automation is not adequate and the aircraft needs pilot intervention to comply with all the constraints?

☐ Never (if original plan was entered correctly) (1)

☐ Only in very exceptional conditions (2)

☐ Rarely (3)

☐ Occasionally (4)

☐ Happens from time to time (5)

Q35 Over your career, what **good strategies, practices, or rules of thumb** have you discovered from operational experience that could help CAs or FOs improve monitoring on the flight deck - that is, tracking flight path compliance and assessing aircraft status? Pick one to tell us.

End of Block: Attitude Assessment

Start of Block: Likert Ratings

Rate your agreement with the following statement about the most recent leg

X→

X→

Q36		Disagree (1)	Somewhat Agree (2)	Agree (3)
Our briefing(s) covered critical monitoring roles. (Q36_1)		<div></div>	<div></div>	<div></div>

X→

X→

Appendix H

Q37

	Rarely (1)	Sometimes (2)	Mostly (3)	Always (4)
We clearly stated critical decisions. (Q37_1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
We had a shared understanding about plans. (Q37_2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I knew what the other pilot was doing. (Q37_3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I could anticipate what the other pilot was about to do next. (Q37_4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I closely monitored the progress of the flight. (Q37_5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I “mentally flew” the aircraft, even when the autopilot, or the other pilot, was controlling it. (Q37_6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I maintained a detailed awareness of our intended flightpath. (Q37_7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



Appendix H

Q38

	Was not up to my usual standard (1)	Was typical for me (2)	Exceeded my usual standard (3)
Overall, I feel that my performance on this leg: (Q38_1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

End of Block: Likert Ratings

Start of Block: Demographics

In this final section, please answer the following questions about yourself.

Q39 I am:

- ☐ Captain (1)
- ☐ First Officer (2)



Q40 On my last leg, I was:

- ☐ Pilot Flying (1)
- ☐ Pilot Monitoring (2)

Q41 Approximately how many flight hours have you logged **with this type of aircraft**?

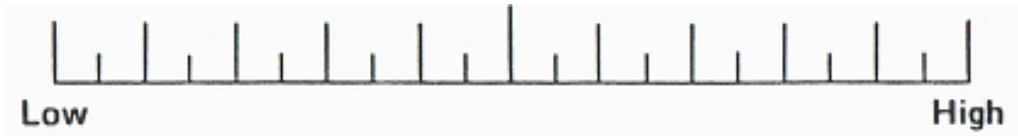
Q42 Approximately how many flight hours have you logged with **your airline**?

End of Block: Demographics

NASA Task Load Index

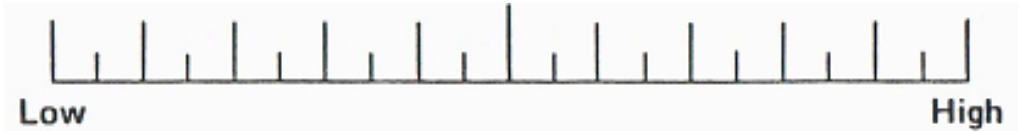
MENTAL DEMAND

How mentally demanding was the task?



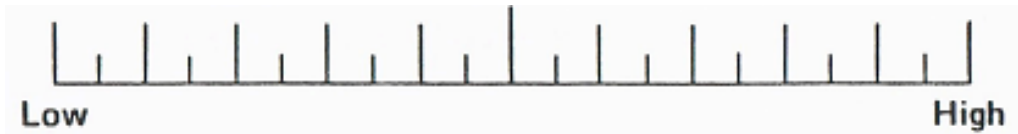
PHYSICAL DEMAND

How physically demanding was the task?



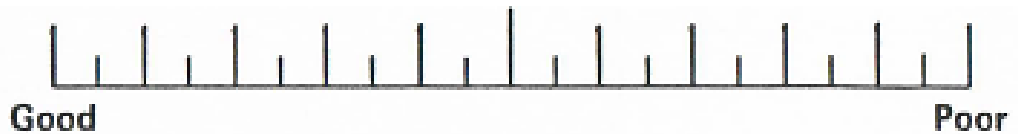
TEMPORAL DEMAND

How hurried or rushed was the pace of the task?



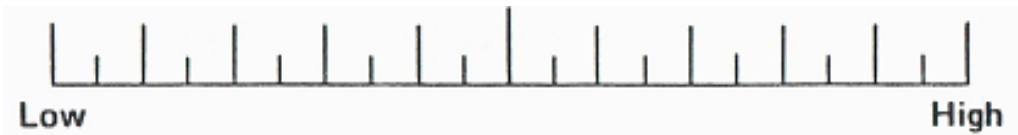
PERFORMANCE

How successful were you in accomplishing what you were asked to do?



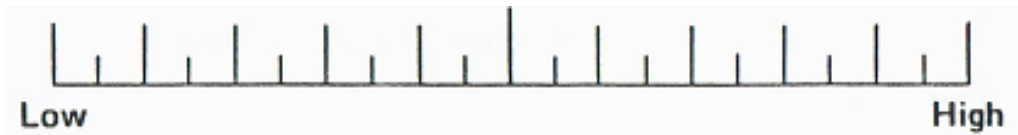
EFFORT

How hard did you have to work to accomplish your level of performance?



FRUSTRATION

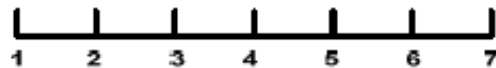
How insecure, discouraged, irritated, stressed, and annoyed were you?



SITUATION AWARENESS RATING TECHNIQUE (SART; Taylor, 1990)

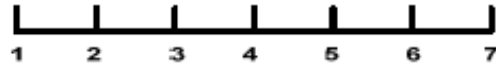
Instability of Situation

How changeable is the situation? Is the situation highly unstable and likely to change suddenly (High) or is it very stable and straightforward (Low)?



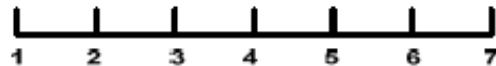
Complexity of Situation

How complicated is the situation? Is it complex with many interrelated components (High) or is it simple and straightforward (Low)?



Variability of Situation

How many variables are changing within the situation? Are there a large number of factors varying (High) or are there very few variables changing (Low)?



Arousal

How aroused are you in the situation? Are you alert and ready for activity (High) or do you have a low degree of alertness (Low)?



Concentration of Attention

How much are you concentrating on the situation? Are you concentrating on many aspects of the situation (High) or focussed on only one (Low)?



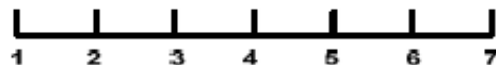
Division of Attention

How much is your attention divided in the situation? Are you concentrating on many aspects of the situation (High) or focussed on only one (Low)?



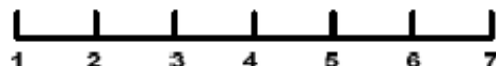
Spare Mental Capacity

How much mental capacity do you have to spare in the situation? Do you have sufficient to attend to many variables (High) or nothing to spare at all (Low)?



Information Quantity

How much information have you gained about the situation? Have you received and understood a great deal of knowledge (High) or very little (Low)?



Familiarity with Situation

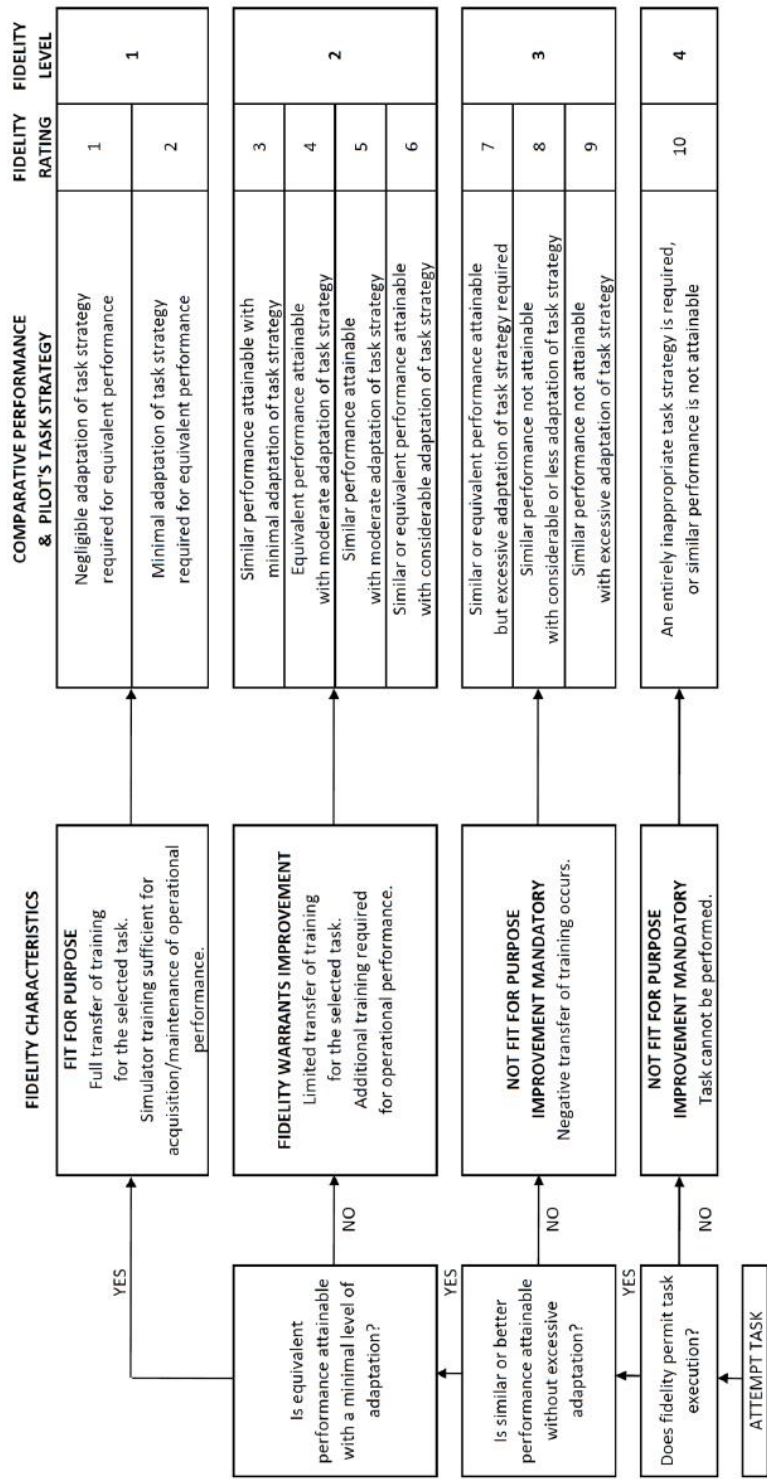
How familiar are you with the situation? Do you have a great deal of relevant experience (High) or is it a new situation (Low)?



Resilient Performance Self-Assessment

Different situations provide opportunities to demonstrate different resilient behaviors. For the scenario you just completed, rate whether you performed the following behaviors, and if so, how successfully you feel you demonstrated that behavior:

	For the scenario I just completed, I...	Performed? Yes/No	If YES, how successfully? (1=very unsuccessful, 5=very successful)				
1	Applied prior knowledge (that I brought with me to the simulation) to solve a problem.	Y / N	1	2	3	4	5
2	Verbally shared prior knowledge/experience with the other crewmember.	Y / N	1	2	3	4	5
3	Heightened my own awareness/focus to prepare for an impending challenging task.	Y / N	1	2	3	4	5
4	Monitored aircraft status in response to a detected anomaly, surprise, or inconsistency.	Y / N	1	2	3	4	5
5	Discussed expected actions before an anticipated challenging task.	Y / N	1	2	3	4	5
6	Developed “what if” scenarios to support a possible change in plan.	Y / N	1	2	3	4	5
7	Gathered information to support a possible change in plan.	Y / N	1	2	3	4	5
8	Identified countermeasures to an identified problem/pressure.	Y / N	1	2	3	4	5
9	Intervened to address or resolve an unwanted condition.	Y / N	1	2	3	4	5
10	Changed automation or system to respond to an unanticipated new pressure.	Y / N	1	2	3	4	5
11	Cross-checked other pilot’s actions, over and above SOP-required cross-checking.	Y / N	1	2	3	4	5
12	Initiated an action to decrease my own or other crewmember’s workload / taskload.	Y / N	1	2	3	4	5
13	Asked external source (e.g., ATC) for input/assistance.	Y / N	1	2	3	4	5
14	Asked other pilot for input/assistance.	Y / N	1	2	3	4	5
15	Managed time effectively to complete tasks.	Y / N	1	2	3	4	5
16	Debriefed what happened after a problem occurred.	Y / N	1	2	3	4	5



After Run 1

After flying the arrival – Threat Mitigations

❖ Please rate [by *circling a number* along each scale] the extents of crew involvement in

- *Planning and general preparation*
- *Communication and coordination*
- *Vigilance and overall monitoring*

that were required for mitigating the following threats, if they became significant factors in the arrival.

☐ **Airport / runway construction**

- Actual amount of planning and preparation required:

1 2 3 4 5 6 7 8 9 10
None Extensive

- Actual amount of crew communication and coordination required:

1 2 3 4 5 6 7 8 9 10
None Extensive

- Actual amount of vigilance and monitoring required:

1 2 3 4 5 6 7 8 9 10
None Extensive

☐ **Clearances / re-routes**

- Actual amount of planning / preparation required:

1 2 3 4 5 6 7 8 9 10
None Extensive

- Actual amount of crew communication / coordination required:

1 2 3 4 5 6 7 8 9 10
None Extensive

- Actual amount of vigilance / monitoring required:

1 2 3 4 5 6 7 8 9 10
None Extensive

☐ **Arrival amendments**

- Actual amount of planning and preparation required:

1 2 3 4 5 6 7 8 9 10
None Extensive

- Actual amount of crew communication and coordination required:

1 2 3 4 5 6 7 8 9 10
None Extensive

- Actual amount of vigilance and monitoring required:

1 2 3 4 5 6 7 8 9 10
None Extensive

Date: _____

Crew # _____

Subject # _____

left seat / right seat

PF / PM

TAFTT / LNDIZ

CB: T –L / L-T

Pre / Post 1 or 2

After flying the arrival – Threat Mitigations

☐ Runway changes

- Actual amount of planning and preparation required:
1 2 3 4 5 6 7 8 9 10
None Extensive
- Actual amount of crew communication and coordination required:
1 2 3 4 5 6 7 8 9 10
None Extensive
- Actual amount of vigilance and monitoring required:
1 2 3 4 5 6 7 8 9 10
None Extensive

☐ Visibility

- Actual amount of planning / preparation required:
1 2 3 4 5 6 7 8 9 10
None Extensive
- Actual amount of crew communication / coordination required:
1 2 3 4 5 6 7 8 9 10
None Extensive
- Actual amount of vigilance / monitoring required:
1 2 3 4 5 6 7 8 9 10
None Extensive

☐ Delays

- Actual amount of planning and preparation required:
1 2 3 4 5 6 7 8 9 10
None Extensive
- Actual amount of crew communication and coordination required:
1 2 3 4 5 6 7 8 9 10
None Extensive
- Actual amount of vigilance and monitoring required:
1 2 3 4 5 6 7 8 9 10
None Extensive

☐ Flight diversions

- Actual amount of planning / preparation required:
1 2 3 4 5 6 7 8 9 10
None Extensive
- Actual amount of crew communication / coordination required:
1 2 3 4 5 6 7 8 9 10
None Extensive
- Actual amount of vigilance / monitoring required:
1 2 3 4 5 6 7 8 9 10
None Extensive

Date: _____

Crew # _____

Subject # _____

left seat / right seat

PF / PM

TAFTT / LNDIZ

CB: T –L / L-T

Pre / Post 1 or 2

Date: _____

Crew # _____

Subject # _____

left seat / right seat

PF / PM

TAFTT / LNDIZ

CB: T –L / L-T

Pre / Post 1 or 2

After flying the arrival – Error Mitigations:

Judgments of actual successfulness in mitigating potential errors

Today's commercial aircrews also employ a number of skills, practices, and strategies – pilot “competencies” -- to help ensure continued safe and efficient flight. Seasoned crews exercise these competencies daily in managing, mitigating, and often even avoiding altogether the commission of errors and mistakes that can occur in the complex and demanding operations required in current-day commercial aviation.

Having just flown this arrival, please take a few moments to think about the aspects of crew competency that you employed in managing, mitigating, and eliminating mistakes and errors that arose in the course of performing your crew-operational duties:

- ☐ Application of procedures
- ☐ Flight-deck automation management of aircraft flight path
- ☐ Manual-control management of aircraft flight path
- ☐ Aviation knowledge
- ☐ Problem solving and decision making
- ☐ Workload management
- ☐ Leadership and teamwork
- ☐ Communication
- ☐ Situation awareness

After flying the arrival – Error Mitigations

- ❖ For each of these crew competency factors, please indicate [by *circling a number* along each scale] how successful you were in managing, mitigating, or eliminating mistakes and errors that arose while flying the arrival.

☐ Application of procedures

- Actual level of success:

1 2 3 4 5 6 7 8 9 10
Not very successful Very successful

☐ Flight-deck automation management of aircraft flight path

- Actual level of success:

1 2 3 4 5 6 7 8 9 10
Not very successful Very successful

☐ Manual-control management of aircraft flight path

- Actual level of success:

1 2 3 4 5 6 7 8 9 10
Not very successful Very successful

☐ Aviation knowledge

- Actual level of success:

1 2 3 4 5 6 7 8 9 10
Not very successful Very successful

☐ Problem solving and decision making

- Actual level of success:

1 2 3 4 5 6 7 8 9 10
Not very successful Very successful

☐ Workload management

- Actual level of success:

1 2 3 4 5 6 7 8 9 10
Not very successful Very successful

☐ Leadership and teamwork

- Actual level of success:

1 2 3 4 5 6 7 8 9 10
Not very successful Very successful

☐ Communication

- Actual level of success:

1 2 3 4 5 6 7 8 9 10
Not very successful Very successful

☐ Situation awareness

- Actual level of success:

1 2 3 4 5 6 7 8 9 10
Not very successful Very successful

Date: _____

Crew # _____

Subject # _____

left seat / right seat

PF / PM

TAFTT / LNDIZ

CB: T –L / L-T

Pre / Post 1 or 2

Prior to Run 2

BOEING TEM CARD

THREATS / MITIGATION				
AIRPORT/RUNWAY	ATC	AIRCRAFT	ADVERSE WEATHER	
Contamination	Clearance/Re-Routes	Systems	Visibility	
Construction	Arr/Dep Amendments	Communication	Deicing	
Signage	Runway Changes	Equipment	Winds	
Hotspots	ATC Errors	MELs	Precipitation	
NOTAMs	Language Difficulty	Automation		
	Nonstandard Phraseology	Performance		
	Radio Congestion			
	Similar Sounding Call Signs			
ENVIRONMENT	AIRLINE/OPS/DISPATCH	OPERATIONAL	GROUND/RAMP/MX	
Terrain	Schedule Pressure	Time Pressure	Handling	
Night	Delays	Missed Approach	Congestion	
Traffic	Paperwork	Flight Diversion	Logbook	
	Crew Scheduling	Unfamiliar Airport	Maintenance Errors	
	Manuals/Charts	Non-normal Conditions		
	FMC Database			
PHYSIOLOGY	CABIN	CREW		
Fatigue	Passengers	Experience		
Stress	Interruptions	Recency		
Hydration	Events/Distractions	First Crew Flight		
Nutrition	Flight Attendants	Mission Familiarity		
ERRORS / MITIGATION				
SKILL-BASED	DECISION-BASED	PERCEPTUAL	CRM	
Application of Procedures	Knowledge	Workload Management	Leadership & Teamwork	
Flight Path - Automation	Problem Solving &	Communication	Communication	
Flight Path - Manual	Decision Making	Situation Awareness	Situation Awareness	

TAKEOFF BRIEFING

THREATS (PM, PF) / MITIGATION BASIC PLAN

- Taxi Path, Runway, Intersection
- Route: Clearance, Flight Plan, FMC RTE crosscheck
- Return to the Airport: Emergency, Takeoff Alternate
- Takeoff Performance: Data Valid, Appropriate for Conditions, Configuration

CONSIDERATIONS

- Specific PM Duties, Noise Abatement, Takeoff Engine Failure Plan
- Review as Needed

APPROACH BRIEFING

THREATS (PM, PF) / MITIGATION BASIC PLAN

- Weather, FMC Programming, NOTAMs
- Flaps, VREF and Bugs, STAR and Routing
- Automation: Approach Mode, Minimums, MCP ALT Handling, Missed Approach, Alternate, Fuel
- Landing Runway, Landing Distance Assessment, Touchdown Point, Exit, Taxi
- Autobrakes

CONSIDERATIONS

- Specific PM duties, Arrival Missed Approach Plan

DEBRIEF

- Safety: Were margins of safety compromised anytime?
- Standards: Were standards, policies, tasks compromised?
- Unresolved Questions: What events prompted questions in pilots' minds that were never adequately answered?
- Opportunities for Improvement: In which areas could pilots have performed at a higher level?

Date: _____

Crew # _____

Subject # _____

left seat / right seat

PF / PM

TAFTT / LNDIZ

CB: T –L / L-T

Pre / Post 1 or 2

Prior to flying the arrival – Threat Mitigations:
Estimating likely involvement levels

Today's commercial aircrews typically face numerous threats to maintaining safe and efficient flight. These threats have many sources: Airport conditions, air traffic control, aircraft systems, weather and other aspects of the environment, the airline's operations and dispatch, flight-operational demands, ground, ramp, and maintenance operations, and behavioral and physiological factors for both passengers and crew members. Anticipating and mitigating these threats are critical aspects of crew ...

Preparing for flying this upcoming arrival, please take a few moments to think about mitigations to these potentially relevant threats:

- ☐ **Airport / runway construction**
- ☐ **Clearances / re-routes**
- ☐ **Arrival amendments**
- ☐ **Runway changes**
- ☐ **Visibility**
- ☐ **Delays**
- ☐ **Flight diversions**

Prior to flying the arrival – Threat Mitigations

❖ Please rate [by *circling a number* along each scale] the extents of crew involvement in

- *Planning and general preparation*
- *Communication and coordination*
- *Vigilance and overall monitoring*

that would likely be required for mitigating the following threats, if they were to become significant factors in the arrival.

☐ Airport / runway construction

- Likely amount of planning and preparation required:

1 2 3 4 5 6 7 8 9 10
None Extensive

- Likely amount of crew communication and coordination required:

1 2 3 4 5 6 7 8 9 10
None Extensive

- Likely amount of vigilance and monitoring required:

1 2 3 4 5 6 7 8 9 10
None Extensive

☐ Clearances / re-routes

- Likely amount of planning / preparation required:

1 2 3 4 5 6 7 8 9 10
None Extensive

- Likely amount of crew communication / coordination required:

1 2 3 4 5 6 7 8 9 10
None Extensive

- Likely amount of vigilance / monitoring required:

1 2 3 4 5 6 7 8 9 10
None Extensive

☐ Arrival amendments

- Likely amount of planning and preparation required:

1 2 3 4 5 6 7 8 9 10
None Extensive

- Likely amount of crew communication and coordination required:

1 2 3 4 5 6 7 8 9 10
None Extensive

- Likely amount of vigilance and monitoring required:

1 2 3 4 5 6 7 8 9 10
None Extensive

Date: _____

Crew # _____

Subject # _____

left seat / right seat

PF / PM

TAFTT / LNDIZ

CB: T –L / L-T

Pre / Post 1 or 2

Prior to flying the arrival – Threat Mitigations

☐ Runway changes

- Likely amount of planning and preparation required:
1 2 3 4 5 6 7 8 9 10
None Extensive
- Likely amount of crew communication and coordination required:
1 2 3 4 5 6 7 8 9 10
None Extensive
- Likely amount of vigilance and monitoring required:
1 2 3 4 5 6 7 8 9 10
None Extensive

☐ Visibility

- Likely amount of planning / preparation required:
1 2 3 4 5 6 7 8 9 10
None Extensive
- Likely amount of crew communication / coordination required:
1 2 3 4 5 6 7 8 9 10
None Extensive
- Likely amount of vigilance / monitoring required:
1 2 3 4 5 6 7 8 9 10
None Extensive

☐ Delays

- Likely amount of planning and preparation required:
1 2 3 4 5 6 7 8 9 10
None Extensive
- Likely amount of crew communication and coordination required:
1 2 3 4 5 6 7 8 9 10
None Extensive
- Likely amount of vigilance and monitoring required:
1 2 3 4 5 6 7 8 9 10
None Extensive

☐ Flight diversions

- Likely amount of planning / preparation required:
1 2 3 4 5 6 7 8 9 10
None Extensive
- Likely amount of crew communication / coordination required:
1 2 3 4 5 6 7 8 9 10
None Extensive
- Likely amount of vigilance / monitoring required:
1 2 3 4 5 6 7 8 9 10
None Extensive

Date: _____

Crew # _____

Subject # _____

left seat / right seat

PF / PM

TAFTT / LNDIZ

CB: T –L / L-T

Pre / Post 1 or 2

Date: _____

Crew # _____

Subject # _____

left seat / right seat

PF / PM

TAFTT / LNDIZ

CB: T-L / L-T

Pre / Post 1 or 2

Prior to flying the arrival – Error Mitigations:

Estimating expected successfulness in mitigating potential errors

Today's commercial aircrews also employ a number of skills, practices, and strategies – pilot “competencies” -- to help ensure continued safe and efficient flight. Seasoned crews exercise these competencies daily in managing, mitigating, and often even avoiding altogether the commission of errors and mistakes that can occur in the complex and demanding operations required in current-day commercial aviation.

Preparing for flying this upcoming arrival, please take a few moments to think about these aspects of crew competency that might be involved in managing, mitigating, and eliminating mistakes and errors that could arise in the course of performing your crew-operational duties:

- ☐ Application of procedures
- ☐ Flight-deck automation management of aircraft flight path
- ☐ Manual-control management of aircraft flight path
- ☐ Aviation knowledge
- ☐ Problem solving and decision making
- ☐ Workload management
- ☐ Leadership and teamwork
- ☐ Communication
- ☐ Situation awareness

Prior to flying the arrival – Error Mitigations

- ❖ For each of these crew competency factors, please estimate [by *circling a number* along each scale] the level of success you anticipate having in managing, mitigating, or eliminating mistakes and errors that may arise while flying the arrival.

☐ Application of procedures

- Anticipated level of success:

1 2 3 4 5 6 7 8 9 10
Not very successful Very successful

☐ Flight-deck automation management of aircraft flight path

- Anticipated level of success:

1 2 3 4 5 6 7 8 9 10
Not very successful Very successful

☐ Manual-control management of aircraft flight path

- Anticipated level of success:

1 2 3 4 5 6 7 8 9 10
Not very successful Very successful

☐ Aviation knowledge

- Anticipated level of success:

1 2 3 4 5 6 7 8 9 10
Not very successful Very successful

☐ Problem solving and decision making

- Anticipated level of success:

1 2 3 4 5 6 7 8 9 10
Not very successful Very successful

☐ Workload management

- Anticipated level of success:

1 2 3 4 5 6 7 8 9 10
Not very successful Very successful

☐ Leadership and teamwork

- Anticipated level of success:

1 2 3 4 5 6 7 8 9 10
Not very successful Very successful

☐ Communication

- Anticipated level of success:

1 2 3 4 5 6 7 8 9 10
Not very successful Very successful

☐ Situation awareness

- Anticipated level of success:

1 2 3 4 5 6 7 8 9 10
Not very successful Very successful

Date: _____

Crew # _____

Subject # _____

left seat / right seat

PF / PM

TAFTT / LNDIZ

CB: T –L / L-T

Pre / Post 1 or 2

After Run 2

BOEING TEM CARD

THREATS / MITIGATION				
AIRPORT/RUNWAY	ATC	AIRCRAFT	ADVERSE WEATHER	
Contamination	Clearance/Re-Routes	Systems	Visibility	
Construction	Arr/Dep Amendments	Communication	Deicing	
Signage	Runway Changes	Equipment	Winds	
Hotspots	ATC Errors	MELs	Precipitation	
NOTAMs	Language Difficulty	Automation		
	Nonstandard Phraseology	Performance		
	Radio Congestion			
	Similar Sounding Call Signs			
ENVIRONMENT	AIRLINE/OPS/DISPATCH	OPERATIONAL	GROUND/RAMP/MX	
Terrain	Schedule Pressure	Time Pressure	Handling	
Night	Delays	Missed Approach	Congestion	
Traffic	Paperwork	Flight Diversion	Logbook	
	Crew Scheduling	Unfamiliar Airport	Maintenance Errors	
	Manuals/Charts	Non-normal Conditions		
	FMC Database			
PHYSIOLOGY	CABIN	CREW		
Fatigue	Passengers	Experience		
Stress	Interruptions	Recency		
Hydration	Events/Distractions	First Crew Flight		
Nutrition	Flight Attendants	Mission Familiarity		
ERRORS / MITIGATION				
SKILL-BASED	DECISION-BASED	PERCEPTUAL	CRM	
Application of Procedures	Knowledge	Workload Management	Leadership & Teamwork	
Flight Path - Automation	Problem Solving &		Communication	
Flight Path - Manual	Decision Making		Situation Awareness	

TAKEOFF BRIEFING

THREATS (PM, PF) / MITIGATION BASIC PLAN

- Taxi Path, Runway, Intersection
- Route: Clearance, Flight Plan, FMC RTE crosscheck
- Return to the Airport: Emergency, Takeoff Alternate
- Takeoff Performance: Data Valid, Appropriate for Conditions, Configuration

CONSIDERATIONS

- Specific PM Duties, Noise Abatement, Takeoff Engine Failure Plan
- Review as Needed

APPROACH BRIEFING

THREATS (PM, PF) / MITIGATION BASIC PLAN

- Weather, FMC Programming, NOTAMs
- Flaps, VREF and Bugs, STAR and Routing
- Automation: Approach Mode, Minimums, MCP ALT Handling, Missed Approach, Alternate, Fuel
- Landing Runway, Landing Distance Assessment, Touchdown Point, Exit, Taxi
- Autobrakes

CONSIDERATIONS

- Specific PM duties, Arrival Missed Approach Plan

DEBRIEF

- Safety: Were margins of safety compromised anytime?
- Standards: Were standards, policies, tasks compromised?
- Unresolved Questions: What events prompted questions in pilots' minds that were never adequately answered?
- Opportunities for Improvement: In which areas could pilots have performed at a higher level?

Date: _____

Crew # _____

Subject # _____

left seat / right seat

PF / PM

TAFTT / LNDIZ

CB: T –L / L-T

Pre / Post 1 or 2

After flying the arrival – Threat Mitigations:
Estimating actual involvement levels

[skip this paragraph for the second post-arrival ratings]

Today's commercial aircrews typically face numerous threats to maintaining safe and efficient flight. These threats have many sources: Airport conditions, air traffic control, aircraft systems, weather and other aspects of the environment, the airline's operations and dispatch, flight-operational demands, ground, ramp, and maintenance operations, and behavioral and physiological factors for both passengers and crew members. Anticipating and mitigating these threats are critical aspects of crew ...

Having just flown this arrival, please take a few moments to think about your mitigations to any of these relevant threats you encountered:

- ☐ **Airport / runway construction**
- ☐ **Clearances / re-routes**
- ☐ **Arrival amendments**
- ☐ **Runway changes**
- ☐ **Visibility**
- ☐ **Delays**
- ☐ **Flight diversions**

After flying the arrival – Threat Mitigations

❖ Please rate [by *circling a number* along each scale] the extents of crew involvement in

- *Planning and general preparation*
- *Communication and coordination*
- *Vigilance and overall monitoring*

that were required for mitigating the following threats, if they became significant factors in the arrival.

☐ **Airport / runway construction**

- Actual amount of planning and preparation required:

1 2 3 4 5 6 7 8 9 10
None Extensive

- Actual amount of crew communication and coordination required:

1 2 3 4 5 6 7 8 9 10
None Extensive

- Actual amount of vigilance and monitoring required:

1 2 3 4 5 6 7 8 9 10
None Extensive

☐ **Clearances / re-routes**

- Actual amount of planning / preparation required:

1 2 3 4 5 6 7 8 9 10
None Extensive

- Actual amount of crew communication / coordination required:

1 2 3 4 5 6 7 8 9 10
None Extensive

- Actual amount of vigilance / monitoring required:

1 2 3 4 5 6 7 8 9 10
None Extensive

☐ **Arrival amendments**

- Actual amount of planning and preparation required:

1 2 3 4 5 6 7 8 9 10
None Extensive

- Actual amount of crew communication and coordination required:

1 2 3 4 5 6 7 8 9 10
None Extensive

- Actual amount of vigilance and monitoring required:

1 2 3 4 5 6 7 8 9 10
None Extensive

Date: _____

Crew # _____

Subject # _____

left seat / right seat

PF / PM

TAFTT / LNDIZ

CB: T –L / L-T

Pre / Post 1 or 2

After flying the arrival – Threat Mitigations

☐ **Runway changes**

- Actual amount of planning and preparation required:
1 2 3 4 5 6 7 8 9 10
None Extensive
- Actual amount of crew communication and coordination required:
1 2 3 4 5 6 7 8 9 10
None Extensive
- Actual amount of vigilance and monitoring required:
1 2 3 4 5 6 7 8 9 10
None Extensive

☐ **Visibility**

- Actual amount of planning / preparation required:
1 2 3 4 5 6 7 8 9 10
None Extensive
- Actual amount of crew communication / coordination required:
1 2 3 4 5 6 7 8 9 10
None Extensive
- Actual amount of vigilance / monitoring required:
1 2 3 4 5 6 7 8 9 10
None Extensive

☐ **Delays**

- Actual amount of planning and preparation required:
1 2 3 4 5 6 7 8 9 10
None Extensive
- Actual amount of crew communication and coordination required:
1 2 3 4 5 6 7 8 9 10
None Extensive
- Actual amount of vigilance and monitoring required:
1 2 3 4 5 6 7 8 9 10
None Extensive

☐ **Flight diversions**

- Actual amount of planning / preparation required:
1 2 3 4 5 6 7 8 9 10
None Extensive
- Actual amount of crew communication / coordination required:
1 2 3 4 5 6 7 8 9 10
None Extensive
- Actual amount of vigilance / monitoring required:
1 2 3 4 5 6 7 8 9 10
None Extensive

Date: _____

Crew # _____

Subject # _____

left seat / right seat

PF / PM

TAFTT / LNDIZ

CB: T –L / L-T

Pre / Post 1 or 2

Date: _____

Crew # _____

Subject # _____

left seat / right seat

PF / PM

TAFTT / LNDIZ

CB: T-L / L-T

Pre / Post 1 or 2

After flying the arrival – Error Mitigations:

Judgments of actual successfulness in mitigating potential errors

Today's commercial aircrews also employ a number of skills, practices, and strategies – pilot “competencies” -- to help ensure continued safe and efficient flight. Seasoned crews exercise these competencies daily in managing, mitigating, and often even avoiding altogether the commission of errors and mistakes that can occur in the complex and demanding operations required in current-day commercial aviation.

Having just flown this arrival, please take a few moments to think about the aspects of crew competency that you employed in managing, mitigating, and eliminating mistakes and errors that arose in the course of performing your crew-operational duties:

- ☐ Application of procedures
- ☐ Flight-deck automation management of aircraft flight path
- ☐ Manual-control management of aircraft flight path
- ☐ Aviation knowledge
- ☐ Problem solving and decision making
- ☐ Workload management
- ☐ Leadership and teamwork
- ☐ Communication
- ☐ Situation awareness

After flying the arrival – Error Mitigations

- ❖ For each of these crew competency factors, please indicate [by *circling a number* along each scale] how successful you were in managing, mitigating, or eliminating mistakes and errors that arose while flying the arrival.

☐ Application of procedures

- Actual level of success:

1 2 3 4 5 6 7 8 9 10
Not very successful Very successful

☐ Flight-deck automation management of aircraft flight path

- Actual level of success:

1 2 3 4 5 6 7 8 9 10
Not very successful Very successful

☐ Manual-control management of aircraft flight path

- Actual level of success:

1 2 3 4 5 6 7 8 9 10
Not very successful Very successful

☐ Aviation knowledge

- Actual level of success:

1 2 3 4 5 6 7 8 9 10
Not very successful Very successful

☐ Problem solving and decision making

- Actual level of success:

1 2 3 4 5 6 7 8 9 10
Not very successful Very successful

☐ Workload management

- Actual level of success:

1 2 3 4 5 6 7 8 9 10
Not very successful Very successful

☐ Leadership and teamwork

- Actual level of success:

1 2 3 4 5 6 7 8 9 10
Not very successful Very successful

☐ Communication

- Actual level of success:

1 2 3 4 5 6 7 8 9 10
Not very successful Very successful

☐ Situation awareness

- Actual level of success:

1 2 3 4 5 6 7 8 9 10
Not very successful Very successful

Date: _____

Crew # _____

Subject # _____

left seat / right seat

PF / PM

TAFTT / LNDIZ

CB: T –L / L-T

Pre / Post 1 or 2

Semi-Structured Interview

Initial Question: Unplanned and unexpected events happen routinely during operations in the NAS. We are interested in how pilots make adjustments before, during, and after these unplanned or unexpected events in order to maintain safe operations. Can you tell me about an unplanned or unexpected event that you experienced during the approach you flew?

Probe 1 (Anticipate):

- Were there things you were aware of at the start of your flight that you thought increased the likelihood that this event might occur during that flight?
- How did you know that this event might occur?
- How else might you have been able to anticipate that this event would occur?

Probe 2 (Monitor):

- Were there things that you experienced during your flight that you thought increased the likelihood that this event might occur during that flight?
- What signaled/indicated to you that this event was about to occur, was occurring, or had occurred?
- How did you know what indicators of this event to look for during your flight?
- What other indicators could have alerted you to this event?

Probe 3 (Respond):

- How did you respond to this event?
- How did you know what to do in response to this event?
- If you had not already known what to do to respond to this event, how would you have figured out what to do?

Probe 4 (Learn):

- What did you learn from this event?
- How did what you learned impact the remainder of your flight or that operation?

Probe 5 (Wrap-up):

- Is there anything further you'd like for us to know about this event that we haven't already discussed?

Pilot Incident/Situation Report

Aviation safety incident/situation reports are an important facet of the continuing effort to maintain and improve aviation safety.

Please write a situation report for the flight that you just reviewed. Keeping in mind the topics shown below, discuss those which you feel are relevant and anything else you think is important. Include what you believe really caused the problem, and what could be done to prevent a recurrence, or correct the situation. Note that your report will not be shared with your co-pilot or any other person who participated in the scenario (e.g., ATC).

CHAIN OF EVENTS

- How the problem arose
- How it was discovered
- Contributing factors
- Corrective actions

HUMAN PERFORMANCE CONSIDERATIONS

- Perceptions, judgments, decisions
- Actions or inactions
- Factors affecting the quality of human performance

[illegible]

PRIVACY ACT NOTICE

COLLECTION OF INFORMATION TO DETERMINE ELIGIBILITY TO PARTICIPATE IN RESEARCH AS A SUBJECT VOLUNTEER

GENERAL

This information is provided pursuant to Public Law 93-579 (Privacy Act of 1974), December 31, 1974, for individuals supplying information for inclusion in a system of records.

AUTHORITY

The authority to collect the information requested from you in the informed consent associated with the **Human Contributions to Safety (HC2S) SWS Operations and Technologies for Enabling Resilient In-Time Assurance (SOTERIA) Flight Simulation Study** in which you may participate is derived from one or more of the following: Title 14, Code of Federal Regulations, Sections 1212 and 1230; Title 51, United States Code, Section 20113.

PURPOSES AND USES

The information you supply will be used to determine your eligibility to participate as a volunteer subject in the **Human Contributions to Safety (HC2S) SWS Operations and Technologies for Enabling Resilient In-Time Assurance (SOTERIA) Flight Simulation Study**. The information you provide will be evaluated by NASA employees and contractors overseeing and conducting the research. Your personal identifying information will not be shared outside of NASA and contractor researchers working with NASA who are associated with this particular research. Your personal identifying information will be maintained under secure conditions (locked file), and only the Principal Investigator(s) (PI) overseeing your research will have access to your personal identifying information contained within the file.

The information will be maintained in a NASA System of Records: Human Experimental Research Data Records (NASA 10HERD). The information supplied is confidential and will be maintained under secure conditions as described above but is subject to routine uses for such information that are identified in System of Record Notice for Human Experimental Research Data Records published at 72 Federal Register 55812 on October 1, 2007. Release of such information is not permissible where your consent is required.

EFFECTS OF NONDISCLOSURE

Disclosure of the personal identifying information sought is voluntary; however, failure to furnish the information could exclude you from being able to participate as a volunteer in the research.

Signature of Interviewer

Signature of Volunteer

Date

Authorization for eIRB Submission

April 8, 2022

TO: Chad Stephens

FROM: LaRC Reviewer

TITLE: Human Contributions to Safety (HC2S) SWS Operations and Technologies for
Enabling Resilient In-Time Assurance (SOTERIA) Flight Simulation Study

This proposed study has been reviewed at NASA Langley Research Center and is authorized to proceed for submission into the eIRB process for review by the NASA IRB. The NASA IRB will determine the level of review required to ensure compliance with federal regulation 14 CFR 1230 and NASA policy to determine approval. The eIRB submission process is also required to receive a reliance acknowledgement with another IRB.

Sincerely,

A handwritten signature in black ink, appearing to read 'Anna', with a stylized flourish at the end.

Anna Trujillo,
LaRC RD IRB Reviewer,
Senior Research Engineer,
Dynamic Systems and Control Branch