NASA FOCUS Lab Operations Manual

by

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Abstract

In 2010, Dr. Paul Craig, an aerospace professor at Middle Tennessee State University (MTSU), was awarded two National Aeronautics and Space Administration (NASA) grants to create the NASA Flight Operations Center – Unified Simulation (FOCUS) Lab. Although the NASA FOCUS Lab has a solid reputation for preparing MTSU's aerospace students for the aviation industry, the current quality of the lab is in jeopardy due to the high rate of lab staff turnover occurring within two years and lack of documentation that explains how to successfully operate the lab. Therefore, the NASA FOCUS Lab Operations Manual has been created, which contains information and procedures on how to successfully operate the lab that new and current lab staff members can study and consult while performing their roles during a simulation. Ultimately, the operations manual will sustain the current quality of the lab, prevent critical mistakes, and provide continuity when the staff turnover occurs.

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List of Abbreviations

AAR	After Action Review
CRJ	Canadair Regional Jet
CSC	Computer Sciences Corporation
FOCUS	Flight Operations Center – Unified Simulation
FOD	Flight Operations Data
GTA	Graduate Teaching Assistant
I/O	Industrial and Organizational
IRB	Institutional Review Board
MTSU	Middle Tennessee State University
NASA	National Aeronautics and Space Administration

CHAPTER I – INTRODUCTION

Prior to 2010, Middle Tennessee State University's (MTSU) Aerospace Department was training and teaching students in their specific aerospace concentrations, or educational "silos." This was a major problem for MTSU's Aerospace Department because people working in the aviation industry must work together as a team across disciplines on a daily basis. To resolve this problem, Dr. Paul Craig, an aerospace professor at MTSU, applied for and received two National Aeronautics and Space Administration (NASA) grants to create the NASA Flight Operations Center – Unified Simulation (FOCUS) Lab in 2010 to break down the educational "silos."

The NASA FOCUS Lab is a simulation of an operations center of a Part 121 regional airline called "Universal E-Lines," which operates 30 Canadair Regional Jet (CRJ) – 200 aircraft and services 16 airports across the southeast region of the United States of America. During a simulation, senior undergraduate aerospace students enrolled in the Aerospace Seminar course at MTSU are assigned to teams to work a three-hour shift in specific positions for the virtual airline. The students on each team must work together across disciplines in order to operate the virtual airline safely and efficiently.

In addition, the NASA FOCUS Lab staff plays a major role in the operation of the NASA FOCUS Lab simulations. The NASA FOCUS Lab staff consists of three Aerospace professors, three Industrial and Organizational (I/O) Psychology professors, three Aerospace Graduate Teaching Assistants (GTAs), three I/O Psychology GTAs, three Aerospace undergraduate students, and three I/O Psychology undergraduate students. During a simulation, the NASA FOCUS Lab staff implements real-world scenarios, or "triggers," into the simulation. Each trigger that is implemented into a

simulation requires the students on a team to work together across disciplines to determine a solution for the trigger. Once a team executes its solution to the trigger, the NASA FOCUS Lab staff evaluates the solution and determines how the scenario will proceed. This allows a team to understand how its decisions ultimately impact the safety and revenue of the virtual airline.

Also, NASA FOCUS Lab staff members observe and interact with students in specific positions to determine their positive and negative performances during a simulation. The staff members also evaluate each student based on his or her overall performance during a simulation. Overall, the staff members' observations, interactions, and evaluations help provide the information that is needed to perform the After Action Review.

One week after a team participates in a NASA FOCUS Lab simulation, the team attends an After Action Review (AAR), which is led by the I/O Psychology GTAs and professors on the NASA FOCUS Lab staff. During the AAR, the I/O Psychology GTAs and professors give a team feedback on their performance during the simulation. Also, each team member is given the opportunity to discuss the positive and negative actions that were taken by the team during the simulation. Each team member can also provide suggestions on how the team can improve in order to prevent mistakes from being made during the next simulation. Ultimately, AARs help the students combat their weaknesses and improve their strengths and teamwork skills.

In all, the NASA FOCUS Lab plays a significant role in preparing MTSU's aerospace students for the aviation industry. Due to the NASA FOCUS Lab's importance,

I have been inspired to sustain the quality of the NASA FOCUS Lab by creating the "NASA FOCUS Lab Operations Manual" for my Honors College thesis.

My Honors College thesis is comprised of three chapters and two appendices. The first chapter is titled "Introduction." In this chapter, I discussed why the NASA FOCUS Lab was created, what the lab is used for, and how the lab operates. The second chapter is titled "Literature Review." In this chapter, I wrote a literature review showing the importance of utilizing simulations to help prepare aviation college students for the aviation industry. Even though simulations do have some pitfalls, simulations have been proven to be effective. The third chapter is titled "Reflection." In this chapter, I reflected on my experience creating the NASA FOCUS Lab Operations Manual. The reflection includes information about the need for the operations manual and process that was used to create the operations manual. I also described the changes that were made to the operations manual and the positive and negative aspects of the process I used to create the operations manual. In addition, I discussed what I learned while creating the operations manual.

The first appendix in my thesis is the "NASA FOCUS Lab Operations Manual," which includes six chapters. The first chapter is titled "Background Information." This chapter provides information about the creation, history, purpose, and importance of the NASA FOCUS Lab. Also, this chapter contains information about the NASA FOCUS Lab's virtual airline called "Universal E-Lines," such as the company overview, values, corporate structure, and positions within the airline.

Chapter II of the operations manual is titled "NASA FOCUS Lab Startup and Shutdown Procedures." In this chapter, procedures are given in detail on how to turn on,

prepare, and shut down each position's computer or iPad, the lab's webcam, the lab's microphone, and all of the Computer Sciences Corporation (CSC) equipment inside the Ramp Tower room in the NASA FOCUS Lab.

Chapter III of the operations manual is titled "Administrative Roles." In this chapter, procedures are provided on how to perform the tasks required of each NASA FOCUS Lab administrative role before, during, and after a simulation.

Chapter IV of the operations manual is titled "Troubleshooting Procedures." In this chapter, procedures are given in detail on how to fix the technological errors that occur with the NASA FOCUS Lab's NexSim Frasca program, CSC equipment, communication networks with the CRJ – 200 simulator, computers, and programs. In addition, a list of people who can be contacted to help fix the errors is provided in this chapter.

Chapter V of the operations manual is titled "Maintenance on the NASA FOCUS Lab Equipment and Website." In this chapter, procedures are given in detail on how to perform maintenance on the NASA FOCUS Lab's NexSim Frasca program, PowerPoint, computers, programs, and website.

Chapter VI of the operations manual is titled "NASA FOCUS Lab Terms to Know." In this chapter, specific aviation terms and abbreviations that are used throughout the operations manual are defined.

The second appendix is my Institutional Review Board (IRB) approval letter. The IRB approval letter shows that the interview process that I used to write portions of the NASA FOCUS Lab Operations Manual was approved and considered "exempt."

Overall, the composition of my Honors College thesis and the NASA FOCUS Lab Operations Manual provides a thorough explanation of the NASA FOCUS Lab and each set of procedures, which will help the current and future lab staff members sustain the quality of the lab and successfully operate the lab.

CHAPTER II – LITERATURE REVIEW

In the past 20 years, 70% of all aviation accidents and incidents have occurred due to a breakdown in teams across aviation disciplines (Hamman, 2004; Helmreich, 2000). According to a study conducted by the National Aeronautics and Space Administration (NASA) Ames Research Center, there are two key differences between each aviation discipline that contribute to the breakdown in aviation teams (Hamman, 2004). The first difference is physical separation, which means that members of one aviation discipline are unaware of the responsibilities and duties of another aviation discipline's members (Flin, Maran, McKenzie, Paterson-Brown, & Yule, 2006; Hamman, 2004). The second difference is organizational factors, which means that each aviation discipline trains its members differently (Baker, Day, & Salas, 2006; Hamman, 2004). Combining results from empirical team research with the large number of aviation accidents and incidents, colleges have determined it is imperative to break down the "barrier" between each aviation discipline (Hamman, 2004). Colleges have implemented the use of simulations to bring aviation college students from every aviation discipline together to practice and develop their teamwork skills and prevent breakdowns in aviation teams in the future (Bond et al., 2007; Bowers, Rhodenizer, & Salas, 2009; Lateef, 2010).

A simulation is a device that provides a team with an opportunity to work in a safe environment that mirrors the real-world aviation environment (Baker & Beaubien, 2004; Bond et al., 2007; Lateef, 2010). While a simulation is in progress, researchers can implement real-world aviation scenarios into a simulation that range in level of difficulty in order to influence a team to coordinate, create, and execute solutions to the scenarios (Baker et al., 2006; Gardner et al., 2008; Lateef, 2010). A team can assess its solutions

based on the positive or negative consequences that occur throughout the remainder of the simulation (Birnback & Salas, 2008; Breur & Tennyson, 2002; Burke & Salas, 2002). As a result, a team learns to refrain from making similar negative decisions in the actual aviation industry or during the next simulation (Burke & Salas, 2002; Lateef, 2010). While simulations can help teams reduce the number of errors made in subsequent simulations and the real-world aviation industry, they can also help team members develop effective communication (Bradley, 2006; Burke & Salas, 2002; Hunt, Nelson, Shilkofski, & Stavroudis, 2007).

Researchers have determined that the second leading cause of breakdowns in aviation teams is the lack of effective communication (Burke, Donnelly, Priest, & Salas, 2004; Hall & Kuehster, 2010). A lack of effective communication exists in aviation teams because each team is comprised of members from different aviation disciplines (Baker et al., 2006). Each aviation discipline teaches its members how to communicate effectively using a specific "jargon" (Burke et al., 2004). Jargon is a specialized language that is used when communicating with others who understand the language (Krivonos, 2007). If each team member does not comprehend the jargon used in each aviation discipline, then accidents and incidents could occur due to misinterpretations. However, if each team member does comprehend each aviation discipline's jargon, then a team will exhibit effective communication (Krivonos, 2007).

One way simulations help aviation teams develop effective communication is through using a technique called closed loop communication (Hunt et al., 2007). During the use of closed loop communication, one team member sends a message, and a second team member obtains, interprets, and confirms the receipt of the message. The team

member who sent the message ensures that the message was received and interpreted correctly by the second team member (Burke et al., 2004; Hunt et al., 2007). In addition, closed loop communication helps each team member better understand his or her role on a team, develop effective decision-making skills, improve his or her teamwork skills, and learn that each team member's input is important during any situation, which ultimately improves a team's performance (Bond et al., 2007; Hall & Kuehster, 2010; Jagminas et al., 2004; Krivonos, 2007).

While simulations are effective, there are two major pitfalls to the use of simulations. The first major pitfall is the chance that students will engage in "negative learning" (Bond et al., 2007; Burke & Salas, 2002). Negative learning happens when a student incorrectly learns a new skill, piece of information, or procedure due to technical, environmental, or instructional factors (Bond et al., 2007). A second major pitfall is the possibility that students will view a simulation as unrealistic (Adobor & Daneshfar, 2006). Students view a simulation as unrealistic when scenarios are implemented into a simulation that do not mirror real-world problems and a simulation does not physically reflect the real-world environment. As a result, students lose interest in the simulation and stop performing to the best of their ability (Adobor & Daneshfar, 2006). Ultimately, these pitfalls could render a simulation ineffective in preparing students for the real world and improving students' teamwork and communication skills.

Although simulations may have some pitfalls, this review of literature displays the importance of utilizing simulations to improve teamwork and communication skills of aviation college students. By improving these skills, aviation college students will have

the capability of becoming extraordinary aviation professionals and reducing the number of accidents and incidents that occur in the aviation industry.

CHAPTER III – REFLECTION

The Need for the NASA FOCUS Lab Operations Manual

The use of real-world simulations is a valuable part of an aerospace student's collegiate training. These simulations prepare aerospace students for the aviation industry by enhancing their knowledge and skills through solving real-world problems within a simulated environment. With their enhanced knowledge and skills, aerospace students have the capability of reducing the number of accidents and incidents that occur in the aviation industry, which would ultimately save lives. Therefore, the quality of the experiences Middle Tennessee State University (MTSU) aerospace students have in the NASA FOCUS Lab must be exemplary. Though the NASA FOCUS Lab has a solid reputation and MTSU aerospace students have received a one-of-a-kind training experience, the support needed to maintain the current quality of the NASA FOCUS Lab is in jeopardy due to the high rate of lab staff turnover that is soon to occur, which will result in new and difficult situations.

Currently, 50% of the NASA FOCUS Lab staff is comprised of undergraduate and graduate students who have specific and important roles in the operation of the NASA FOCUS Lab. Because all of these students will be graduating in one to two years, new graduate and undergraduate students will be hired to fill the vacant staff positions in the NASA FOCUS Lab. An issue of significant concern is that no written informational and procedural documents that explain how to successfully operate the lab exists. This lack of documentation will hinder the new staff members' ability to successfully operate the NASA FOCUS Lab. To address this problem, the "NASA FOCUS Lab Operations Manual" has been created to sustain the quality of the NASA FOCUS Lab and to

continue to provide MTSU's aerospace students with the opportunity to enhance their knowledge and skills to be successful in the aviation industry. Also, the operations manual is a key component in preventing critical mistakes. All future and current staff members will be able to study and consult the operations manual as they perform their roles in the NASA FOCUS Lab. In addition, the creation of this operations manual will provide continuity when the staffing turnovers do occur.

Process for Creating the NASA FOCUS Lab Operations Manual

Six methods were used to create the NASA FOCUS Lab Operations Manual. The first method was the interview process, which was approved by the Institutional Review Board (IRB) (See Appendix B). I interviewed each NASA FOCUS Lab staff member to gather information about the creation, history, purpose, and importance of the NASA FOCUS Lab from their perspectives. While conducting each interview, I recorded the responses in a Microsoft Word document on my computer. The information that I gathered from each staff member helped me write several portions of the "Background Information" chapter in the operations manual.

Also, I interviewed each staff member who currently serves in the Maintenance Expert, Weather Expert, Crew Scheduling Coordinator, and Flight Operations Data (FOD) 2 Coordinator roles to gather the information on how to perform his or her tasks before, during, and after a simulation. I recorded each staff member's responses in a Microsoft Word document on my computer. The information that I acquired from these staff members was used to help me write the procedures for their roles in the "Administrative Roles" chapter of the operations manual.

Due to the conditions in which the IRB approved my interview process, I must keep the identity of each interviewed staff member confidential. Therefore, I am unable to cite the information that I gathered from the interviews with the NASA FOCUS Lab staff members in the operations manual.

The second method that I used was the knowledge and experience that I have gained by working as the NASA FOCUS Lab Administrator since 2013. As the Administrator, I oversee the entire operation of the NASA FOCUS Lab. Therefore, I used my knowledge and experience to write the "Troubleshooting Procedures" and "Maintenance on the NASA FOCUS Lab Equipment and Website" chapters in the operations manual. Also, I used my knowledge and experience to write the procedures on how to perform the NASA FOCUS Lab Administrator's tasks before, during, and after a simulation in the "Administrative Roles" chapter of the operations manual. In addition, I used my knowledge and experience to write the remaining portions of the "Background Information" chapter in the operations manual.

For the third method, I recorded step-by-step procedures on how to turn on, prepare, and shut down the NASA FOCUS Lab's CSC equipment, computers, and electronic devices. This information was recorded in a Microsoft Word document while performing the procedures. These procedures were used to help me write the "NASA FOCUS Lab Startup and Shutdown Procedures" chapter of the operations manual. By recording and performing the procedures simultaneously, I ensured that the procedures are accurate and listed in the correct sequence in the chapter.

For the fourth method, I took pictures of three procedures during the process of turning on, preparing, and shutting down the CSC equipment. I placed the pictures under

the three procedures in the "NASA FOCUS Lab Startup and Shutdown Procedures" chapter in the operations manual to serve as visual aids. The purpose of using the visual aids was to show how the CSC equipment should look after each of the three procedures.

The fifth method that I used was research. I researched the definitions of specific aviation terms and abbreviations that appear throughout the operations manual. I placed the aviation terms, abbreviations, and definitions in the "NASA FOCUS Lab Terms to Know" chapter of the operations manual.

For the sixth method, I met with my thesis advisor Dr. Andrea Georgiou on a weekly basis throughout MTSU's spring and fall semesters of 2015. During our meetings, I would ask her specific questions about the operations manual, such as how to format each chapter of the operations manual. In addition, Dr. Georgiou reviewed and gave feedback on how I could improve each chapter of the operations manual. After I made the suggested changes to each chapter, Dr. Georgiou and I reviewed the entire NASA FOCUS Lab Operations Manual one last time to ensure that the suggested changes were made correctly.

Positive Aspects of the Process

There are several positive aspects of the process I used to create the NASA FOCUS Lab Operations Manual. One of the positive aspects was the interview process. When I asked the NASA FOCUS Lab staff members if I could interview them to gather information for the operations manual, they unanimously agreed to be interviewed. They even scheduled appointments with me to be interviewed during their busy schedules. In addition, each staff member gave in-depth answers to my IRB-approved interview questions. Their in-depth answers provided me with more than enough information to

write several administrative roles in the "Administrative Roles" chapter and portions of the "Background Information" chapter in the operations manual.

The second positive aspect was devoting the entire summer of 2015 to working on the operations manual. By the end of the summer, I completed five out of six chapters of the operations manual. If I had waited to work on the operations manual during MTSU's fall semester of 2015, I would not have finished the operations manual or the other parts of my thesis before the deadline because of the numerous roles, tasks, and procedures that needed to be documented in the operations manual.

The third positive aspect was meeting with my advisor Dr. Andrea Georgiou. Every meeting that I had with Dr. Georgiou about the operations manual was very productive. She was always prepared to answer my questions during our meetings. Also, Dr. Georgiou provided great feedback on how to improve the operations manual. In addition, she was always readily available to answer any question I had about the operations manual, even if we did not have a scheduled meeting. Overall, Dr. Georgiou was the perfect advisor to work with on the operations manual. Her expertise and dedication to helping me succeed with the operations manual were far beyond what I could have ever imagined.

The fourth positive aspect was being able to use my knowledge and experience as the NASA FOCUS Lab Administrator to write the operations manual. Since I did not have any external factors, such as survey or experimental results, delaying my progress on the operations manual, I was able to write and complete the operations manual at my own pace.

Problems Encountered During the Process

There was only one problem that I encountered throughout the process of creating the NASA FOCUS Lab Operations Manual. The one problem that I encountered was not following the process I stated in my approved thesis proposal during the early stages of writing the operations manual. In my approved thesis proposal, I stated that I would "detail all of the information and procedures that are needed to successfully operate the lab" in the operations manual. However, as I began writing the procedures in each chapter of the operations manual, I found myself writing step-by-step instructions on how to perform each procedure. Luckily, my advisor caught this mistake early and told me that I must adhere to my approved thesis proposal. Therefore, I had to remove the unnecessary step-by-step instructions under each procedure that I had written at the time, which delayed my progress on the operations manual by at least two days. After correcting this mistake, I did not encounter any more problems while writing the NASA FOCUS Lab Operations Manual.

Changes Made to the NASA FOCUS Lab Operations Manual

There were three parts of the operations manual that I decided to change. The first change that I made involves the use of visual aids. In my approved thesis proposal, I stated that I would place visual aids in the "Troubleshooting Procedures" chapter of the operations manual to make the procedures easier to understand for the current and future NASA FOCUS Lab staff members. However, as I was placing the visual aids in this chapter, I realized that the visual aids were hindering the flow of the procedures. Also, I realized that the NASA FOCUS Lab staff members might accidently skip procedures that were placed before, between, or after the visual aids, which would cause errors to occur.

As a result, I did not place visual aids in the "Troubleshooting Procedures" chapter of the operations manual, and I focused on writing the troubleshooting procedures in a clear and concise manner.

The second part of the operations manual that I decided to change was the "NASA FOCUS Lab Simulations" chapter. In my approved thesis proposal, I stated that the "NASA FOCUS Lab Simulations" chapter would include "the start-up procedures for the NASA FOCUS lab equipment, procedures on how to implement scenarios into a simulation, and procedures on how to conduct each staff member's role before, during, and after a simulation." However, I decided to split this chapter into two chapters. One of the chapters created from the split was the "NASA FOCUS Lab Startup and Shutdown Procedures" chapter, which includes the procedures on how to turn on, prepare, and shut down the NASA FOCUS Lab's CSC equipment, computers, and electronics. The second chapter created from the split was the "Administrative Roles" chapter, which includes the procedures on how to perform the tasks of each NASA FOCUS Lab administrative role before, during, and after a simulation.

The third change that I made was the placement of the operations manual in my Honors College thesis. In my approved thesis proposal, I stated that I would divide my thesis into Part I and Part II. Also, I stated that I would place the introduction, literature review, and reflection in Part I and the NASA FOCUS Lab Operations Manual in Part II. However, after speaking with my Honors College thesis committee chair Dr. Philip Phillips, I decided to place the operations manual in my thesis as an appendix and the introduction, literature review, and reflection in the main part of my thesis. Ultimately, I made this change to help separate the operations manual from the main part of my thesis.

What I Have Learned

By creating the NASA FOCUS Lab Operations Manual, I learned that the "FOD 2 Guide for Cargo" and "Crew Scheduling Bust List for the Crew Scheduling Coordinator" documents needed to be improved. During the interviews with the current Crew Scheduling and FOD 2 Coordinators, I was informed that the documents need improvement because they were confusing and lacking information that they needed to successfully perform their tasks during a simulation. Therefore, I improved the documents based on the coordinators' suggestions. The newly improved documents are currently being tested by the coordinators during the NASA FOCUS Lab simulations this semester to ensure that the documents are easier to understand and contain the information they need to successfully perform their tasks.

In addition, I have increased my knowledge of each NASA FOCUS Lab administrative role. Before writing the operations manual, I had a limited knowledge of the tasks required of each administrative role, except the role of the NASA FOCUS Lab Administrator. However, by interviewing the staff members in each administrative role and writing each administrative role's procedures in the operations manual, I now understand all of the tasks that must be performed by each administrative role before, during, and after a simulation. With this increased knowledge, I believe I will be a better Administrator for the NASA FOCUS Lab.

Also, I have learned how to improve my writing skills. Before writing the operations manual, I had a habit of being too wordy in my papers and writing assignments for my classes at MTSU. However, while writing the operations manual, I learned the importance of writing in a clear and concise manner. For example, if I wrote a

procedure that was not clear or had too much detail, then a staff member would be confused on how to perform the procedure. Consequently, the staff member would perform the procedure incorrectly and cause errors to occur on the lab's equipment or during a simulation. In all, I will continue using my improved writing skills throughout the remainder of my undergraduate college career and my life in order to convey information in a clear and concise manner.

I also learned that all of the NASA FOCUS Lab staff members believe that the NASA FOCUS Lab is important in some way to MTSU, MTSU's Aerospace Department, MTSU's Industrial and Organizational (I/O) Psychology program, and MTSU's aerospace students. Ultimately, this means that all of the staff members understand that the quality of the NASA FOCUS Lab simulations must be sustained, which helps strengthen the need for the NASA FOCUS Lab Operations Manual.

In addition, I have learned that the next person to be hired as the NASA FOCUS Lab Administrator should be required to read the entire NASA FOCUS Lab Operations Manual and go through one year of on-the-job training as the Administrator. The next Administrator must know the history of the lab, the information about Universal E-Lines, the tasks performed by each administrative role, how to react to every type of situation that occurs during the lab's simulations, how each position's program operates, how to troubleshoot the lab's equipment, computers, programs, and electronics, and how to perform maintenance on the lab's equipment and website. By knowing all of this information and going through one year of on-the-job training, the next NASA FOCUS Lab Administrator will possess all of the necessary information and skills to be successful.

Finally, I have learned that the NASA FOCUS Lab Operations Manual must be updated as new developments occur. As the NASA FOCUS Lab continues to grow, the lab may acquire new technology and equipment to improve the lab's simulations. In addition, the procedures in the operations manual may change over time due to internal or external factors, or a new administrative role may be added to the NASA FOCUS Lab staff. Therefore, the NASA FOCUS Lab Operations Manual will be made available to the NASA FOCUS Lab staff on the lab's network drive and computers so that a NASA FOCUS Lab staff member can update the operations manual to reflect the technology, equipment, procedures, and administrative roles changes as needed.

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Appendices

Appendix A – NASA FOCUS Lab Operations Manual

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CHAPTER I – BACKGROUND INFORMATION

History of the NASA FOCUS Lab

During the early to mid-2000s, Middle Tennessee State University's (MTSU) Aerospace Department faced two critical issues. The first issue involved the department's SAFER program, which was a scenario-based training program for the professional pilot concentration. Although the SAFER program was widely successful and recognized by the Federal Aviation Administration (FAA), the issue was that the program only involved one aerospace concentration. The second issue was that MTSU's aerospace students were taught in educational "silos," which meant that the students in one aerospace concentration were taught only the skills and information that they needed to be successful in that specific concentration. The students were not taught the skills and information needed to interact and work with students in the other aerospace concentrations. This was a major issue for MTSU's Aerospace Department because people working in the aviation industry must work across disciplines in teams on a daily basis. These two issues served as motivation for Dr. Paul A. Craig, an aerospace professor at MTSU, to create a new scenario-based training program that involved all five of MTSU's aerospace concentrations.

Before he could develop the new training program, Dr. Craig had to search throughout the aviation industry to find a place where people from all aerospace disciplines come together to work as a team. The one place that Dr. Craig found where this occurs is the flight operations center of an airline. The flight operations center of an airline is a place where people from all aerospace disciplines work together to operate the airline safely and efficiently. Therefore, Dr. Craig decided that he wanted to bring

scenario-based training across the entire aerospace curriculum at MTSU through a simulation of a flight operations center. As a result, Dr. Craig applied for and received two National Aeronautics and Space Administration (NASA) grants between 2008 and 2010.

With the two NASA grants, Dr. Craig created the NASA Flight Operations Center - Unified Simulation (FOCUS) Lab in 2010 with help from two MTSU Aerospace professors, Dr. Andrea Georgiou and Mr. Gerald Hill. The NASA FOCUS Lab is a simulation of an operations center of a Part 121 regional airline that operates 30 Canadair Regional Jet (CRJ) – 200 aircraft and services 16 airports across the southeast region of the United States of America. During a NASA FOCUS Lab simulation, senior undergraduate aerospace students from all concentrations are placed in teams to work a shift for the virtual airline. The students must work as a team across disciplines to operate the airline safely and efficiently and resolve real-world problems.

Also in 2010, Dr. Craig teamed up with Dr. Richard Moffett, III, Dr. Glenn Littlepage, and Dr. Michael Hein, who are professors in MTSU's Industrial and Organizational (I/O) Psychology program, to further develop the NASA FOCUS Lab. These three professors developed the NASA FOCUS Lab's After Action Reviews (AAR), techniques for training the students before they enter a simulation, and more. In addition, these professors continuously collect data on teamwork, coordination, and communication and conduct various types of research during every NASA FOCUS Lab simulation. These professors also observe each team's performance during the simulations in order to give constructive feedback at each team's AAR.

In addition, Dr. Craig has teamed up with Aerospace and I/O Psychology graduate teaching assistants (GTAs) and undergraduate students since 2010. Both the GTAs and undergraduate students have and continue to develop training videos for the students, conduct teamwork, coordination, and communication research during NASA FOCUS Lab simulations, facilitate AARs, work in administrative positions during the simulations, and write theses based on research conducted in the lab.

Today, the NASA FOCUS Lab staff consists of three Aerospace professors, three I/O Psychology professors, three Aerospace GTAs, three I/O Psychology GTAs, three Aerospace undergraduate students, and three I/O Psychology undergraduate students. Each NASA FOCUS Lab staff member plays a significant role during every simulation. The roles played by the staff are the following: NASA FOCUS Lab Administrator, Flight Operations Data (FOD) 2 Coordinator, Maintenance Expert, Crew Scheduling Coordinator, Weather Expert, and observer. In addition, the NASA FOCUS Lab staff continues to conduct research and develop new techniques to better prepare all of MTSU's aerospace students for working in the aviation industry.

Purpose of the NASA FOCUS Lab

Although there are many purposes of the NASA FOCUS Lab, the following are the 10 most important purposes:

- To better prepare students for the workplace by exposing them to working in interdisciplinary teams.
- To give students an advantage over other applicants when applying for the same job.
- To address teamwork deficiencies of new employees of the aviation industry.

- To give aerospace students the opportunity to practice their teamwork and communication skills while working in a virtual airline's flight operations center.
- To research different areas of teamwork, including communication, coordination, situational awareness, task allocation, and shared mental models.
- To provide an opportunity for professors, graduate students, and undergraduate students to publish research on the national and international level for both aviation and psychology publications.
- To break down the educational silos in MTSU's Aerospace Department.
- To serve as the capstone course for MTSU's Aerospace Department.
- To give the aerospace students the opportunity to see how they fit in the aviation industry.
- To give the aerospace students an experience that allows them to understand the big picture of the aviation industry.

Importance of the NASA FOCUS Lab

To MTSU's Aerospace Department

The NASA FOCUS Lab is important to MTSU's Aerospace Department in many ways. The NASA FOCUS Lab:

- Distinguishes MTSU's Aerospace Department from all other universities' Aerospace Departments because there is no other program like it in the entire world.
- Provides MTSU's Aerospace Department with a lot of credibility due to the number of aviation companies who know about the NASA FOCUS Lab.

- Plays a significant role in the Aerospace Department's accreditation with the Aviation Accreditation Board International (AABI).
- Makes MTSU's Aerospace Department highly recognizable to many universities and college students around the world.

To MTSU's Aerospace Students

The NASA FOCUS Lab is important to MTSU's aerospace students in many ways. The NASA FOCUS Lab:

- Prepares MTSU's aerospace students to take the next step from being a college student to being a job seeker.
- Provides MTSU's aerospace students a valuable opportunity to practice the knowledge, skills, and abilities that are needed to run an airline.
- Allows MTSU's aerospace students to see the big picture of how airlines operate.
- Gives MTSU's aerospace students an advantage when they are applying for jobs due to the one-of-a-kind experience that they gain through the NASA FOCUS Lab simulations.
- Gives MTSU's aerospace students the opportunity to work across disciplines in teams.
- Simulates real-world problems that MTSU's aerospace students will face when they work in the aviation industry, which prepares them for the real world.

To MTSU's I/O Psychology Program

The NASA FOCUS Lab is important to MTSU's I/O Psychology program in many ways. The NASA FOCUS Lab:

- Provides I/O Psychology graduate students the opportunity to apply the knowledge and skills they are learning in the classroom to projects in the NASA FOCUS Lab.
- Allows the I/O Psychology graduate students the opportunity to gain experience in developing training materials and programs.
- Provides I/O Psychology graduate students and professors the opportunity to practice leading AARs.
- Allows I/O Psychology professors, graduate students, and undergraduate students to conduct research and present their results at national and international conferences to enhance the reputation of the I/O Psychology program, NASA FOCUS Lab, Aerospace Department, and MTSU.
- Provides I/O Psychology graduate and undergraduate students experience in collecting, analyzing, and managing data.
- Provides opportunities for I/O Psychology graduate classes to have unpaid consulting projects.
- Provides I/O Psychology graduate and undergraduate students real-world experience that they can place on their resumes, which gives them an advantage over other applicants.

To MTSU

The NASA FOCUS Lab is important to MTSU in many ways. The NASA FOCUS Lab:

- Is a research generator for MTSU. There have been at least four I/O Psychology master's theses, five Aerospace master's theses, one doctoral dissertation, and four Honors College theses completed from research conducted in the NASA FOCUS Lab.
- Helps attract high quality and high potential students to MTSU.
- Provides an opportunity for cross-departmental collaboration between MTSU's Aerospace Department and I/O Psychology program.
- Provides aerospace students a unique experience that no other university can provide, which helps strengthen the reputation of MTSU.
- Helps establish MTSU as an aerospace research institution through the vast amount of research that the NASA FOCUS Lab staff members have conducted and published.

Communication, Technology, and Assessing Performance

In order for each simulation to be realistic, the NASA FOCUS Lab utilizes various types of specially-designed equipment and technology.

There are desktop computers with dual monitors at each position in the NASA FOCUS Lab that allow each student to arrange and show various sources of information that are needed to successfully perform the specific tasks of his or her position. In addition, each student can verbally communicate with the other students on the team through the headsets that are connected to each desktop computer.

In addition to the computers and monitors, there are Microsoft Excel documents that were developed for each position in the NASA FOCUS Lab. The students in each position can manipulate the data in the Excel documents in order to retrieve the information needed to perform the tasks successfully at his or her position. This information must also be shared with the entire team in order to operate Universal E-Lines safely and efficiently. In addition, there is a flight status board within each Excel document that displays the tail number, flight numbers, departure airports, departure times, arrival airports, and arrival times for each Universal E-Lines' aircraft. The flight status board also uses status lights to indicate an upcoming flight, a flight is due, a flight is in progress, a flight has been delayed for 15 minutes or more, and a flight has been delayed for 30 minutes or more. The status lights update automatically based on the current Greenwich Mean Time (GMT). Lastly, the flight status board shows the team's financial data. The team's financial data includes the total delay loss, total time of delays, average departure time, average arrival performance, and daily revenue. The team's financial data updates automatically when the student in the FOD 1 position timestamps each flight's arrival and departure time boxes.

Also, various types of information that are used by each position are displayed on three large televisions that are mounted on each sidewall in the NASA FOCUS Lab. The types of information that are displayed on the three televisions include the flight tracking radar, flight status board, live weather radars, and Aviation Routine Weather Reports (METARs).

In addition, the NASA FOCUS Lab staff and the students at each position utilize two computer applications throughout a simulation. The first computer application used

is Skype. Skype allows students in the NASA FOCUS Lab and Pseudo Pilot room to communicate with each other via text or voice to discuss critical information and perform tasks as a team. The staff utilizes Skype's text and voice capabilities to respond to a team's solution to every trigger implemented into a simulation. The second computer application that is used is "Join.Me." This computer application allows the NASA FOCUS Lab staff to observe the computer monitors at each position on a personal computer or tablet to determine whether or not each student is successfully performing the tasks at his or her position. Also, the students at each position can use "Join.Me" to view the flight status board on one of the computer monitors at his or her position.

At the back of the NASA FOCUS Lab, the Ramp Tower room contains six desktop computers, one control station, and three large televisions. Overall, these pieces of equipment run the software that controls the movement of Universal E-Lines' simulated aircraft on the flight tracking radar throughout the southeast region of the United States of America. In addition, the three televisions show a 150-degree view of Concourse C at Nashville International Airport (KBNA), which is one of Universal E-Lines' hubs. By looking at Concourse C, the student in the Ramp Tower position can observe and control the movement of Universal E-Lines' simulated aircraft at Nashville International Airport.

In addition, during each NASA FOCUS Lab simulation, two students go to the Murfreesboro Municipal Airport (KMBT) to fly in MTSU's FAA – certified CRJ – 200 simulator. The students fly two flights in the simulator. The first flight is from Nashville, Tennessee (KBNA), to Knoxville, Tennessee (KTYS). The second flight is the reverse flight back to KBNA. Since the NASA FOCUS Lab and CRJ – 200 simulator are

connected through various network connections, the students in the lab can track the two flights on the flight tracking radar. In addition, the students in the CRJ – 200 simulator can communicate with the students in the Ramp Tower, Maintenance Control, Weather and Forecasting, and Flight Operations Coordinator (FOC) positions.

During 2014, 17 documents were created to help the NASA FOCUS Lab staff determine how well each student performed in his or her position during a simulation. In addition, the documents help determine the simulated financial penalties that a team should receive for taking actions that negatively affect the airline, do not conform to Federal Aviation Regulations (FARs), and do not comply with Universal E-Lines' Standard Operating Procedures (SOPs) during a simulation. These documents are also given to the facilitators of the AARs in order to give constructive feedback about the positive and negative behaviors and actions that were taken by each student and the team as a whole. Overall, these newly created documents help each student understand how their performance directly affects the operations of an airline.

Information About Universal E-Lines

Company Overview

Universal E-Lines is a virtual Part 121 regional airline that operates 30 CRJ-200 aircraft and services 16 airports across the southeast region of the United States of America through a hub and spoke system. Universal E-Lines' flight operations center is located in the NASA FOCUS Lab.

Mission Statement and Values

Universal E-Lines' mission statement is: "We are an airline dedicated to safety, efficiency, and high customer satisfaction." The values of Universal E-Lines are the following:

- Responsibility
- Respect
- Appearance
- Teamwork
- Professionalism
- Efficiency
- Problem Solving
- Safety Conscientiousness

Corporate Structure

Universal E-Lines' corporate structure is divided into four categories. The four categories are the Chief Executive Officer (CEO), Board of Directors, Administration, and Flight Positions. The CEO of Universal E-Lines is the instructor of MTSU's Aerospace Seminar course. The Board of Directors includes all of the Aerospace and I/O Psychology professors on the NASA FOCUS Lab staff, except for the instructor of the Aerospace Seminar course. The Administration includes the Aerospace and I/O Psychology undergraduate students and GTAs in the NASA FOCUS Lab Administrator, FOD 2 Coordinator, Crew Scheduling Coordinator, Weather Expert, and Maintenance Expert positions. The Flight Positions include the 11 NASA FOCUS Lab positions held by senior undergraduate aerospace students enrolled in the Aerospace Seminar course.

Hubs

Universal E-Lines has two hubs, which are in Nashville, Tennessee, and Jacksonville, Florida. The International Civil Aviation Organization (ICAO) airport identifiers for these airports are KBNA and KJAX, respectively.

Airports

Universal E-Lines provides service to 14 spoke airports across the southeast region of the United States of America. The ICAO airport identifiers for each airport that Universal E-Lines services are the following: KATL, KBHM, KCAE, KCLT, KMCO, KMEM, KMIA, KPNS, KRDU, KSAV, KSDF, KTLH, KTPA, and KTYS.

Aircraft Type

Universal E-Lines currently operates 30 CRJ-200 aircraft. Each CRJ-200 aircraft can seat 50 passengers.

Organizational Goals

Universal E-Lines has many organizational goals. However, the top eight organizational goals are the following:

- Ensure that no aircraft errors result in the loss of human life.
- Have minimal delays.
- Provide as much profit for the airline as possible.
- Maintain the professional image of Universal E-Lines.
- Expose students to the concepts of the real world.
- Help students understand the importance of teamwork in the aviation industry.
- Operate the airline safely and efficiently according to the Federal Aviation Regulations (FARs).

- Provide excellent customer service.

After Action Reviews (AARs)

One week after participating in a NASA FOCUS Lab simulation, a team will attend an After Action Review (AAR). The AARs are performed by the I/O Psychology professors and GTAs on the NASA FOCUS Lab staff. During the AARs, the I/O Psychology professors and GTAs provide feedback to a team on its performance during the simulation. In addition, each team member is given the opportunity to discuss the successful actions that were taken by the team and how they can improve during the next simulation. Overall, the AARs help students improve their strengths, combat their weaknesses, and ameliorate their problem-solving, coordination, and teamwork skills.

NASA FOCUS Lab Positions

The NASA FOCUS Lab has 11 positions that are filled with senior undergraduate aerospace students during each simulation. The 11 positions are the following: Flight Operations Coordinator (FOC), Crew Scheduling, Weather and Forecasting, Flight Operations Data (FOD) 1, Flight Operations Data (FOD) 2, Maintenance Planning and Scheduling, Maintenance Control, Ramp Tower, Pseudo Pilot, Captain in the CRJ – 200 simulator, and First Officer in the CRJ – 200 simulator.

CHAPTER II – NASA FOCUS LAB STARTUP AND SHUTDOWN PROCEDURES

Preparing Each Position's Computer / iPad

The following procedures must be used to prepare each position's computer or iPad before a simulation begins:

FOD 1

1. Turn on the FOD 1's Central Processing Unit (CPU), which is named Computer Alpha.
2. Plug in the Universal Serial Bus (USB) for the FOD 1's wireless headset into Computer Alpha.
3. Turn on both computer monitors at the FOD 1 position.
4. Turn on the FOD 1's wireless headset.
5. Enter the computer's password.
    a. Note: The password can be retrieved from a NASA FOCUS Lab staff member.
6. Start the program titled "Join.Me" and press the orange arrow button under "Start."
7. Press the "Share" button on the top left-hand side of the Join.Me program.
8. Write down the FOD 1's Join.Me code.
9. Minimize the FOD 1's Join.Me program.
10. Start the Skype program.
    a. Note: FOD 1's Skype account should automatically log in. However, if FOD 1's Skype account does not automatically log in, then enter the

appropriate username and password, which can be retrieved from a NASA FOCUS Lab staff member.

11. Minimize the Skype program.
12. Open the program titled "MasterNASA Schedule 6 for Daylight Saving Time" or "MasterNASA Schedule 6 for Non-Daylight Saving Time."
    a. Note: Choose the appropriate file based on the time of year.
13. Maximize the program's window.

FOD 2

1. Turn on the FOD 2's CPU.
2. Turn on both computer monitors at the FOD 2 position.
    a. Note: The computer should automatically log in. However, if the computer does not automatically log in, then enter the appropriate username and password, which can be retrieved from a NASA FOCUS Lab staff member.
3. Start the program titled "Join.Me" and press the orange arrow button under "Start."
4. Press the "Share" button on the top left-hand side of the Join.Me program.
5. Write down the FOD 2's Join.Me code.
6. Minimize the FOD 2's Join.Me program.
7. Start the Skype program.
    a. Note: FOD 2's Skype account should automatically log in. However, if FOD 2's Skype account does not automatically log in, then enter the

appropriate username and password, which can be retrieved from a NASA FOCUS Lab staff member.

8. Minimize the Skype program.
9. Double-click on the "Non-DST W&B" or "DST W&B CURRENT" file folder.
    a. Note: Double-click on the file folder based on the time of year.
10. Double-click on the appropriate FOD 2 program based on the time of year and the day's simulation number.
11. Maximize the program's window.

Crew Scheduling

1. Turn on the Crew Scheduling's CPU.
2. Turn on both computer monitors at the Crew Scheduling position.
    a. Note: The computer should automatically log in. However, if the computer does not automatically log in, then enter the appropriate username and password, which can be retrieved from a NASA FOCUS Lab staff member.
3. Start the program titled "Join.Me" and press the orange arrow button under "Start."
4. Press the "Share" button on the top left-hand side of the Join.Me program.
5. Write down the Crew Scheduling's Join.Me code.
6. Minimize the Crew Scheduling's Join.Me program.
7. Start the Skype program.
    a. Note: Crew Scheduling's Skype account should automatically log in. However, if Crew Scheduling's Skype account does not automatically log

in, then enter the appropriate username and password, which can be retrieved from a NASA FOCUS Lab staff member.

8. Minimize the Skype program.
9. Double-click on the file folder titled "CS Programs – Evan – 2014."
10. Double-click on the appropriate Crew Scheduling program based on the day's simulation number.
11. In the program, zoom in to 60% and edit the size of the program's window until it stretches across both computer monitors.
12. Click the "X" on the file folder's window.

Weather and Forecasting

1. Turn on the Weather and Forecasting's CPU.
2. Turn on both computer monitors at the Weather and Forecasting position.
    a. Note: The computer should automatically log in. However, if the computer does not automatically log in, then enter the appropriate username and password, which can be retrieved from a NASA FOCUS Lab staff member.
3. Start the Skype program.
    a. Note: Weather and Forecasting's Skype account should automatically log in. However, if Weather and Forecasting's Skype account does not automatically log in, then enter the appropriate username and password, which can be retrieved from a NASA FOCUS Lab staff member.
4. Minimize the Skype program.

5. Double-click on the Weather and Forecasting program titled “MasterNASA Schedule 7f” or “MasterNASA Schedule 7f (fixed for non daylight savings time).”
    a. Note: Double-click on the program based on the time of year.
6. Resize the Weather and Forecasting program’s window to make it stretch across both computer monitors.
7. Click on the tab titled “Data.”
8. Click on “Refresh all.”
9. Click “OK” on all of the pop-up messages that occur.
10. After refreshing the data, there may be an error in the program under the “WX” column. An error has occurred when “######” appears in the weather column. To fix the error, click on the “WX” button at the top of the column.
11. If a pop-up message occurs after pressing the “WX” button, press “OK.”

FOC

1. Turn on the FOC’s CPU.
2. Turn on the computer monitors at the FOC position.
    a. Note: The computer should automatically log in. However, if the computer does not automatically log in, then enter the appropriate username and password, which can be retrieved from a NASA FOCUS Lab staff member.
3. There are two Skype icons on the FOC’s desktop screen. Double-click on the left Skype icon.

a. Note: FOC's Skype account should automatically log in. However, if FOC's Skype account does not automatically log in, then enter the appropriate username and password, which can be retrieved from a NASA FOCUS Lab staff member.

4. Minimize the Skype program.
5. Double-click on the FOC program titled "MasterNASA Schedule 6 (Daylight Saving Time)" or "MasterNASA Schedule 6 (non-daylight saving time)."
    a. Note: Double-click on the program based on the time of year.
6. Maximize the program's window.

Maintenance Control

1. Turn on the Maintenance Control's CPU.
2. Turn on the computer monitors at the Maintenance Control position.
    a. Note: The computer should automatically log in. However, if the computer does not automatically log in, then enter the appropriate username and password, which can be retrieved from a NASA FOCUS Lab staff member.
3. Double-click on the following, which are all located on the right side of the desktop screen:
    a. The Internet Explorer icon.
    b. The file titled "AMM_Part2_1401."
    c. The file titled "cr2 mel [rev. 02] [11-20-2012] [entire manual]."
    d. The file titled "MX Control A."
4. Minimize the three files.

5. Open a new tab in Internet Explorer and go to www.join.me.
6. Click “Join Meeting” at the top right hand corner of the website, type in the FOD 1’s Join.Me code, and click “Join.”
7. Minimize the Internet Explorer window.
8. Start the program titled “Join.Me” and press the orange arrow button under “Start.”
9. Press the “Share” button on the top left-hand side of the Join.Me program.
10. Write down the Maintenance Control’s Join.Me code.
11. Minimize the Maintenance Control’s Join.Me program.
12. Start the Skype program.
    a. Note: Maintenance Control’s Skype account should automatically log in. However, if Maintenance Control’s Skype account does not automatically log in, then enter the appropriate username and password, which can be retrieved from a NASA FOCUS Lab staff member.
13. Minimize the Skype program.
14. Maximize the Internet Explorer and “cr2 mel [rev. 02] [11-20-2012] [entire manual]” windows.

Maintenance Planning and Scheduling

1. Turn on the Maintenance Planning and Scheduling’s CPU.
2. Turn on the computer monitors at the Maintenance Planning and Scheduling position.
    a. Note: The computer should automatically log in. However, if the computer does not automatically log in, then enter the appropriate username and

password, which can be retrieved from a NASA FOCUS Lab staff member.

3. Double-click on the following, which are all located on the right side of the desktop screen:
    a. The Internet Explorer icon.
    b. The file titled “AMM_Part2_1401.”
    c. The file titled “cr2 mel [rev. 02] [11-20-2012] [entire manual].”
    d. The file titled “MX Control B.”
4. Minimize the three files.
5. Open a new tab in Internet Explorer and go to www.join.me.
6. Click “Join Meeting” at the top right hand corner of the website, type in the FOD 1’s Join.Me code, and click “Join.”
7. Minimize the Internet Explorer window.
8. Start the program titled “Join.Me” and press the orange arrow button under “Start.”
9. Press the “Share” button on the top left-hand side of the Join.Me program.
10. Write down the Maintenance Planning and Scheduling’s Join.Me code.
11. Minimize the Maintenance Planning and Scheduling’s Join.Me program.
12. Start the Skype program.
    a. Note: Maintenance Planning and Scheduling’s Skype account should automatically log in. However, if Maintenance Planning and Scheduling’s Skype account does not automatically log in, then enter the appropriate

username and password, which can be retrieved from a NASA FOCUS Lab staff member.

13. Minimize the Skype program.
14. Maximize the Internet Explorer and "cr2 mel [rev. 02] [11-20-2012] [entire manual]" windows.

Pseudo Pilot

1. Turn on the Pseudo Pilot's laptop computer.
2. Start the Skype program.
    a. Note: Pseudo Pilot's Skype account should automatically log in. However, if Pseudo Pilot's Skype account does not automatically log in, then enter the appropriate username and password, which can be retrieved from a NASA FOCUS Lab staff member.
3. Minimize the Skype program.
4. Double-click on the Internet Explorer icon.
5. Open a new tab in Internet Explorer and go to www.join.me.
6. Click "Join Meeting" at the top right hand corner of the website, type in the FOD 1's Join.Me code, and click "Join."

Ramp Tower

1. Retrieve the Ramp Tower's iPad from the NASA FOCUS Lab Principal Investigator.
2. Power on the iPad.
3. Start the Skype application.

a. Note: Ramp Tower's Skype account should automatically log in. However, if Ramp Tower's Skype account does not automatically log in, then enter the appropriate username and password, which can be retrieved from a NASA FOCUS Lab staff member.

4. Press the "home" button on the iPad.
5. Start the Join.Me application.
6. In the box next to the green arrow, type in the FOD 1's Join.Me code and left click on the green arrow button.

Computer Bravo

1. Turn on Computer Bravo's CPU.
2. Turn on television number 1 and 4.
3. Enter Computer Bravo's password.
    a. Note: The password can be retrieved from a NASA FOCUS Lab staff member.
    b. Note: Allow the Weather Expert to set up Computer Bravo.

Computer Charlie

1. Turn on Computer Charlie's CPU.
2. Turn on the television above the NASA FOCUS Lab's sectional map.
3. Enter Computer Charlie's password.
    a. Note: The password can be retrieved from a NASA FOCUS Lab staff member.
4. Double-click the PowerPoint file titled "NASA FOCUS Lab PowerPoint (For use in FOCUS Lab)," which is on Computer Charlie's desktop screen.

5. Click on the “Slideshow” tab.
6. Click on the “From beginning” option.
7. Click the “X” in every pop-up that occurs after beginning the PowerPoint.

Setting Up the NASA FOCUS Lab’s Webcam

The following procedures must be used to set up the webcam inside the NASA FOCUS Lab:

1. Double-click on the Skype icon located on Computer Charlie’s desktop screen.
    a. Note: The Skype account should automatically log in. However, if the Skype account does not automatically log in, then enter the appropriate username and password, which can be retrieved from a NASA FOCUS Lab staff member.
2. Right click on the “Customer Service Department” Skype contact and left click on “video call.”
3. Immediately click the “X” in each Skype window that opens, so the students participating in the NASA FOCUS Lab’s simulation do not see the Skype video call.
4. Go to the NASA FOCUS Lab Control Room.
5. Answer the Skype video call using the Customer Service Department Skype account on the NASA FOCUS Lab Administrator’s laptop computer.
6. Go back to the NASA FOCUS Lab.
7. Restart the PowerPoint on Computer Charlie.
8. Click the “X” on every pop-up that occurs during the PowerPoint.

Setting Up the NASA FOCUS Lab's Microphone

The following procedures must be used to set up the microphone inside the NASA FOCUS Lab:

1. There are two Skype icons on the FOC's desktop screen. Double-click on the right Skype icon.
2. Select the "focus_lab_mic" Skype account in the username dropdown box and enter the appropriate password.
    a. Note: The password can be retrieved from a NASA FOCUS Lab staff member.
3. Using a personal electronic device (smartphone, iPad, etc.), place a Skype voice call to the "focus_lab_mic" Skype account.
4. Answer the Skype voice call in the "focus_lab_mic" Skype account.
5. Click the "X" in every Skype window that is connected to the "focus_lab_mic" Skype account on the FOC's computer.

Turning on the NASA FOCUS Lab Televisions

Turn on all seven televisions in the NASA FOCUS Lab by pressing the "ON" switch underneath or on the front of each television.

Powering on the CSC Equipment

Inside the Ramp Tower, there is CSC (Computer Sciences Corporation) equipment that makes the NASA FOCUS Lab's simulations possible. Since the CSC equipment was specially made for the NASA FOCUS Lab, the procedures below must be followed in order to successfully power on the CSC equipment:

1. Turn on all computer monitors.

2. Turn on all three televisions by pressing the “Power” button on the television remote located in the Ramp Tower room.
3. Turn on the CPU underneath the “Instructor Station.”
4. Double-click on the “Shortcut to NXS Admin.exe” icon on the desktop screen of the “Instructor Station.”
5. In the “NexSim Lab Administrator” pop-up window, make sure all of the boxes have checkmarks in them.
    a. Note: If they do not, then click each box until all of the boxes have a checkmark in them.
6. Click “Power On.”
7. Open the vault under the “Local 1 (20.1)” computer.
8. Open the “MUTHUR SERVER/HOST” vault.
9. Press the power button inside the “MUTHER SERVER/HOST” vault.
10. Close the “MUTHER SERVER/HOST” vault and the vault underneath the “Local 1 (20.1)” computer.
11. Open the vault under the “Ground 1 (20.2)” computer.
12. Open the “Local 1 20.1” and “IG4 100.4” vaults.
13. Press the “Power” button inside the “Local 1 20.1” and “IG4 100.4” vaults.
14. Close the “Local 1 20.1” and “IG4 100.4” vaults.
15. Close the vault under the “Ground 1 (20.2)” computer.
16. Go to the MUTHUR computer (third computer from the left) and click the “PrtScn/SysRq” key on the computer’s Logitech keyboard.

17. Using the numerical keypad on the Logitech keyboard, enter the number 12 and press the “Enter” key.
    a. Note: Make sure “num lock” is on before entering the number 12.
18. Type in the appropriate password.
    a. Note: The password can be retrieved from a NASA FOCUS Lab staff member.
19. Click the “X” in the upper right-hand corner of the “Karaf” program.
20. In the “OpenVPN Client” program, click the arrow in the dropdown box and click on the Internet Protocol (IP) address.
21. Click “Connect” and enter the appropriate username and password.
    a. Note: The username and password can be retrieved from a NASA FOCUS Lab staff member.
22. Press “Login.”
23. Minimize the “OpenVPN Client” program on the MUTHUR computer.
24. On the desktop screen of the “Local 1 (20.1)” computer, double-click on the “OpenVPN Client” icon.
25. Click the arrow in the dropdown box and click on the IP address.
26. Click “Connect” and enter the appropriate username and password.
    a. Note: The username and password can be retrieved from a NASA FOCUS Lab staff member.
27. Click “Login.”
28. Minimize the “OpenVPN Client” program on the “Local 1 (20.1)” computer.

29. On the “Instructor Station’s” desktop screen, double-click on the “NexSim Frasca” icon.
30. Click the file folder icon in the “Multi-Suite Scenario” box.
31. If it is currently Daylight Saving Time, then click on the file titled “MTSU_Ramp_Deliverable_12K-b.scs.” If it is currently Non-Daylight Saving Time, then click on the file titled “MTSU_Ramp_Deliverable_12K-c.scs.”
32. Click “Open” in the “Select scenario” pop-up window.
33. In the “Tower Suite 1” box, click the box beside “Part of Multi Suite Scenario.”
34. Click the “Airport” dropdown box and click on “BNA.”
35. In the “Radar Suite 1” box, click on the box beside “Part of Multi Suite Scenario.”
36. Click “ZZZ.”
37. Look at the “Local 1 (20.1)” computer to see if the “OpenVPN Client” icons are both green at the bottom right-hand corner of the computer screen.
    a. If so, continue to Step 38.
    b. If not, consult the appropriate procedures in the “Troubleshooting Procedures” chapter.
    c. Note: Skip this step if you are turning on the equipment for a NASA FOCUS Lab tour.
38. Look at the “MUTHUR” computer to see if the “OpenVPN Client” icon is green at the bottom right-hand corner of the computer screen.
    a. If so, continue to Step 39.
    b. If not, consult the appropriate procedures in the “Troubleshooting Procedures” chapter.

c. Note: Skip this step if you are turning on the equipment for a NASA FOCUS Lab tour.

39. Click on the green "Play" button in the "Multi Suite Scenario" box on the "Instructor Station's" computer monitor.
40. Wait a few minutes for the simulation to completely load before continuing to Step 41.
41. Make the view "full screen" on the left and middle televisions by using the following procedures:
    a. Go to the MUTHUR computer.
    b. Press the "PrtScn/SysRq" key on the computer's Logitech keyboard and type in 03 on the numerical keypad.
    c. Simultaneously press the "ALT" and "Enter" keys on the computer's Logitech keyboard.
    d. Press the "PrtScn/SysRq" key on the computer's Logitech keyboard and type in 06 on the numerical keypad.
    e. Simultaneously press the "ALT" and "Enter" keys on the computer's Logitech keyboard.
    f. Press the "PrtScn/SysRq" key on the Logitech keyboard and type in 12 on the numerical keypad to return to the MUTHUR computer's desktop screen.
42. Make the view "full screen" on the right television by using the following procedures:
    a. Retrieve the keyboard behind the "Clearance 1 (F1-20.3)" computer.

b. Open the vault underneath the “Clearance 1 (F1-20.3)” computer.

c. Open the “IG3 100.3” vault.

d. Plug the keyboard into a USB port inside the “IG3 100.3” vault.

e. Simultaneously press the “ALT” and “Enter” keys on the Logitech keyboard.

f. Unplug the keyboard and place it behind the “Clearance 1 (F1-20.3)” computer.

g. Close the “IG3 100.3” vault.

h. Close the vault underneath the “Clearance 1 (F1-20.3)” computer.

43. The view on the three televisions should look like the image in Figure 1.

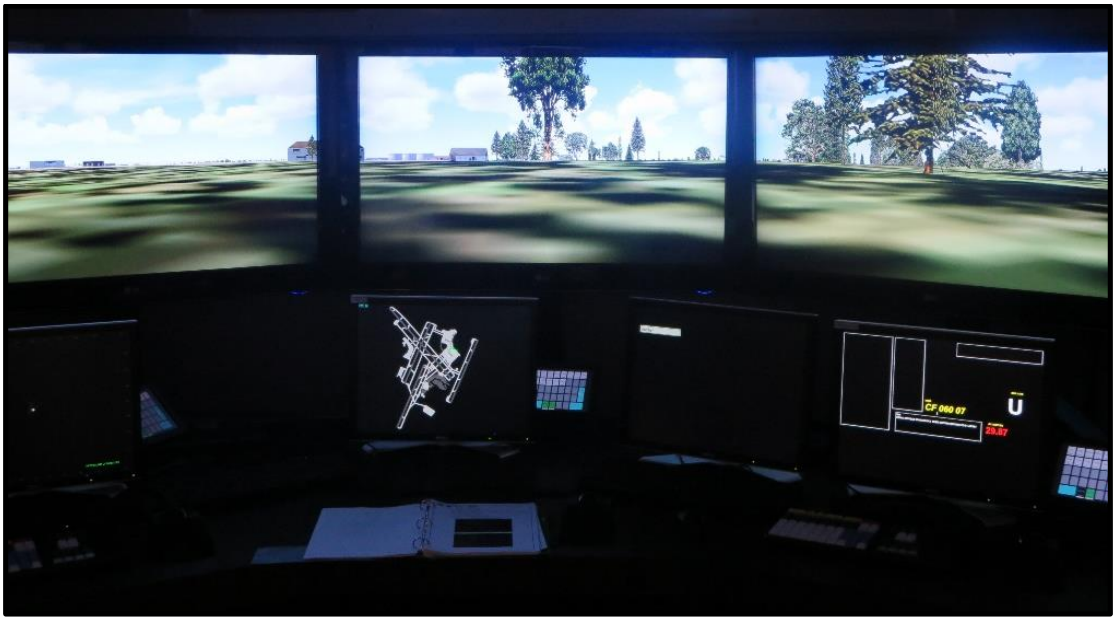

Figure 1. Initial ramp tower view. This figure shows what should be displayed on the three televisions in the Ramp Tower room immediately after Steps 39 through 42.

44. Move the camera above the C Concourse at BNA by using the following procedures:
    a. Right click on the trackball mouse in front of the “Local 1 (20.1)” computer monitor.
    b. Move the trackball slightly forward until BNA’s airport comes into view.
    c. On the Cherry keyboard in front of the “Local 1 (20.1)” computer, press the “W” button to move the camera forward, the “A” button to move the camera left, the “D” button to move the camera right, and the “S” button to move the camera backward until the C Concourse is visible. Also, use the trackball to move the camera’s view, as needed.
    d. The view on the three televisions should look like the image in Figure 2.

Figure 2. C concourse ramp tower view. This figure shows how the camera should be positioned over the C Concourse at Nashville International Airport after Step 44.

45. Currently, the “Local 1 (20.1)” computer screen shows the following green text: NEXFED_NOT_CONNECTED. To fix the connection, double-click on “Shortcut to servixmix.bat” icon on the MUTHUR computer’s desktop screen.
46. Wait for the green text on the “Local 1 (20.1)” computer screen to say the following: NEXFED_LISTED_FEMS.
47. On the small computer screen beside the “Clearance 1 (F1-20.3)” computer monitor, click on the black button that says “XMTR BNA.”
48. Go to the radar screen at the FOD 1 position and hover the cursor over the “Range” box using the trackball mouse.
49. Right click on the “Range” box until the number inside the “Range” box reaches 700.
50. Simultaneously press the “ALT” and “L” keys on the Cherry keyboard in front of the radar screen to place the ICAO airport identifiers on the radar screen.
51. Go to the Pseudo Pilot position and perform the following procedures:
    a. Turn on the desktop computer monitor.
    b. Simultaneously press the “ALT” and “L” keys on the keyboard in front of the desktop computer monitor to place the ICAO airport identifiers on the computer screen.
    c. Release the first four flights that pop-up on the computer screen by pressing each flight’s diamond and pressing the “Released by Dispatch” button.

52. Go to the Ramp Tower room and call the CRJ Flight Instructor that is assigned to be at the CRJ-200 simulator during the simulation to tell him or her to connect the simulator to the NASA FOCUS Lab.
    a. Note: The green text on the "Local 1 (20.1)" computer screen should say "NEXFED_LISTED_RUNNING" after the simulator connects to the NASA FOCUS Lab. If the computer screen does not show this text, then go to the "Troubleshooting Procedures" chapter to fix this issue.
53. Pause the simulation by simultaneously pressing the "ALT" and "P" keys on the Cherry keyboard in front of the radar screen at the FOD 1 position when the simulation's time reaches 20:00 Zulu during Daylight Saving Time. If it is currently Non-Daylight Saving Time, then pause the simulation when the simulation's time reaches 21:00 Zulu.
    a. Note: The simulation's time is located in the top left-hand corner of the radar screen.
54. Un-pause the simulation by simultaneously pressing the "ALT" and "P" keys on the Cherry keyboard in front of the radar screen at the FOD 1 position when the Zulu time on the clock in the NASA FOCUS Lab reaches 20:00 Zulu during Daylight Saving Time. If it is currently Non-Daylight Saving Time, then un-pause the simulation at 21:00 Zulu.
55. All of the equipment should now be turned on, and the simulation should now be in progress.

Shutdown Procedures for the CSC Equipment

1. On the “Instructor Station’s” computer screen, click on the “Stop” button in the "Multi-Suite Scenario” box.
2. Click on “File” and click “Exit” in the top left-hand corner of the “Instructor Station’s” computer screen.
3. On the “Local 1 (20.1)” computer, double-click on the “OpenVPN Client” icon and press “Disconnect”.
4. Click the “X” in the top right-hand corner of the “OpenVPN Client” program on the “Local 1 (20.1)” computer.
5. On the MUTHUR computer, click “X” in the top right-hand corner of the “Karaf” program.
6. Double-click on the “OpenVPN Client” icon and press “Disconnect” on the MUTHUR computer.
7. Click the “X” in the top right-hand corner of the “OpenVPN Client” program on the MUTHUR computer.
8. On the “Instructor Station’s” computer screen, click “Shutdown” in the “NexSim Lab Administrator” pop-up window.
9. Click “OK” on the two pop-up windows that say, “Unable to connect to 192.168.20.1” and “Unable to connect to 192.168.20.4.”
10. The “NexSim Lab Administrator” pop-up window should now look like the image in Figure 3.
    a. Note: If the pop-up window does not look like the image in Figure 3, then go to the “Troubleshooting Procedures” chapter to fix the issue.

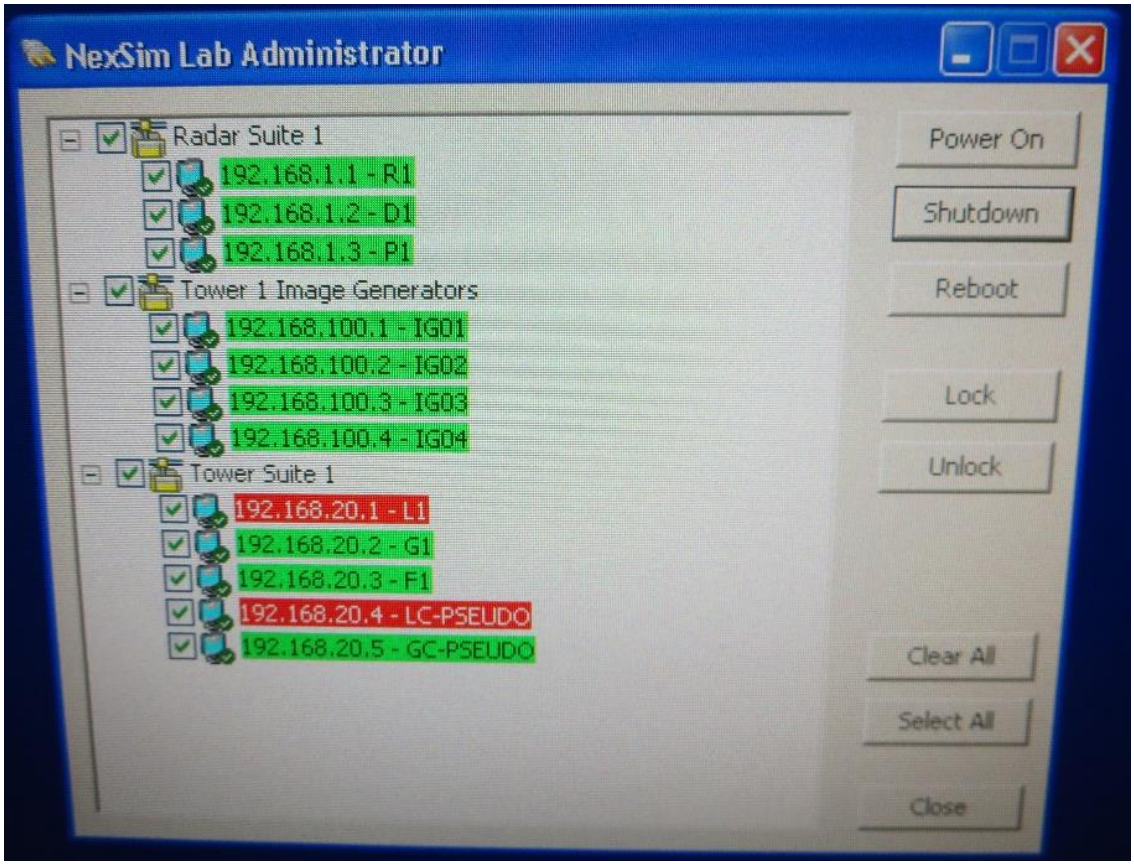

Figure 3. Shutdown view of the NexSim Lab Administrator pop-up window. This figure shows what the "NexSim Lab Administrator" pop-up window should look like after Steps 8 and 9.

11. Click the "X" in the "NexSim Lab Administrator" pop-up window.
12. Click "No" when a pop-up asks, "Do you want to save the current settings?".
13. Shut down the "Instructor Station," "Local 1 (20.1)," and "MUTHUR" computers by pressing the "Start" button in the lower left-hand corner of the desktop screen and click "Turn Off Computer."

14. Click on the "Turn Off" icon in the pop-up window to shut down the "Instructor Station," "Local 1 (20.1)," and "MUTHUR" computers.
15. Press the "Power" button on all of the computer monitors in the Ramp Tower room and at the Pseudo Pilot position.
16. Press the "Power" button on the television remote to turn off all three televisions in the Ramp Tower room.

Shutting Down Each Position's Computer / iPad: Part I & II

Part I – Apply to All Positions Except the Ramp Tower Position

1. Click the "X" in the top-right hand corner of every program that is open on each position's computer.
    a. Note: When prompted to "Save" or "Do not save" a program, always click on "Do not save."
2. Click the "X" in the top right-hand corner of every Internet browser's window that is open on each position's computer.
    a. Note: If a pop-up occurs after pressing the "X" in an Internet browser's window that says, "Do you want to close all tabs or the current tab," click on the button that says, "Close all tabs."
3. Click the "X" in the top right-hand corner of every Skype window that is open on each position's computer.
4. Click the "X" in the top right-hand corner of every file that is open on each position's computer.
    a. Note: When prompted to "Save" or "Do not save" a file, always click on "Do not save."

5. Shut down each position's computer by clicking on the "Start" button at the bottom left-hand corner of the desktop screen.
6. Click on "Shut down."
7. After each position's computer shuts down, press the power button on the computer monitors at each position, if applicable.

Part II – Apply to the Ramp Tower Position Only

1. Retrieve the iPad from the student in the Ramp Tower position.
2. Close the Skype application.
3. Close the Join.Me application.
4. Shut down the iPad.
5. Return the iPad to the NASA FOCUS Lab Principal Investigator.

Shutting Down Computer Bravo

1. Using the second mouse at the Weather and Forecasting position, click the "X" in the top right-hand corner of every Internet Explorer window that is open.
2. Shut down Computer Bravo by clicking on the "Start" button at the bottom left-hand corner of the desktop screen and click on "Shut down."

Shutting Down Computer Charlie

1. Using Computer Charlie's keyboard, press the "ESC" key to end the NASA FOCUS Lab PowerPoint.
2. Click the "X" in the top right-hand corner of the PowerPoint's window.
3. Click the "X" in the top right-hand corner of every Skype window that is open.
4. Shut down Computer Charlie by clicking on the "Start" button at the bottom left-hand corner of the desktop screen and click on "Shut down."

Turning Off the NASA FOCUS Lab Televisions

Turn off all seven televisions in the NASA FOCUS Lab by pressing the “OFF” switch underneath or on the front of each television.

CHAPTER III – ADMINISTRATIVE ROLES

NASA FOCUS Lab Administrator

Overview

The NASA FOCUS Lab Administrator plays a major role in the operation of the NASA FOCUS Lab and its simulations. As a result, the NASA FOCUS Lab Administrator must understand each staff member's role, each position's role, the airline industry, and how the NASA FOCUS Lab operates in its entirety.

Quick Guide for the NASA FOCUS Lab Administrator

Username and Password Guide

The usernames and passwords for the Universal E-Lines Administrator, Customer Service Department, and Gate Agent Skype accounts can be retrieved from a NASA FOCUS Lab staff member.

Duties Required Before the Start of a Simulation

1. Gather and distribute NASA FOCUS Lab documents.
2. Power on the NASA FOCUS Lab.
3. Set up the NASA FOCUS Lab Control Room.
4. Post the white sheets and Total Revenue Lost document.
5. Brainstorming with the Maintenance Expert.
6. Miscellaneous duties.

Duties Required During a Simulation

1. Observe the flight schedule.
2. Answer all Skype calls.
3. Implement non-embedded crew scheduling, maintenance, weather, and emergency triggers into a simulation.
4. Use the Pseudo Pilot computer commands, if needed.
5. Implement downstream consequences into a simulation, as needed.
6. Troubleshoot programs and equipment.
7. Write on the white sheets.
8. Update the “Total Revenue Lost” document.
9. Complete the Individual Performance Measure.

10. Pause the simulation.

Duties Required After a Simulation

1. Make announcements to students.
2. Capture and email a team's financial data.
3. Save a team's flight schedule.
4. Shut down the NASA FOCUS Lab Control Room.
5. Shut down the entire NASA FOCUS Lab.
6. Miscellaneous duties.

Duties Required Before the Start of a Simulation

Gathering and Distributing Documents

The NASA FOCUS Lab Administrator must gather and distribute the following documents from the file cabinet in the NASA FOCUS Lab:

- One "Fuel Load and Bumped Passengers" document to both the FOC and Pseudo Pilot positions.
- One "Total Revenue Lost" document to tape on the wall outside the NASA FOCUS Lab Control Room.
- One "Simulation Notes" document to the NASA FOCUS Lab Administrator's position in the NASA FOCUS Lab Control Room.

Powering on the NASA FOCUS Lab

The NASA FOCUS Lab Administrator is in charge of powering on the entire NASA FOCUS Lab, which includes the Pseudo Pilot room, Computer Sciences Corporation (CSC) program, CSC equipment, webcam, and microphone. The Administrator must follow the specific procedures found in the "NASA FOCUS Lab Startup and Shutdown Procedures" chapter to successfully power on the lab.

Setting Up the NASA FOCUS Lab Control Room

The NASA FOCUS Lab Administrator is in charge of setting up the NASA FOCUS Lab Control Room, which is typically located in an aerospace graduate student's office. Therefore, the Administrator must set up the NASA FOCUS Lab Control Room by using the following procedures:

1. Retrieve the NASA FOCUS Lab Administrator's laptop computer from the NASA FOCUS Lab Principal Investigator.

2. Retrieve the NASA FOCUS Lab Administrator's wireless headset and the wireless headset's Universal Serial Bus (USB) from the NASA FOCUS Lab.
3. Take the laptop computer, wireless headset, and the wireless headset's USB to the NASA FOCUS Lab Control Room.
4. Plug the wireless headset's USB into the laptop computer and turn the wireless headset on.
5. Turn on the laptop computer and enter the appropriate username and password.
    a. Note: The username and password can be retrieved from a NASA FOCUS Lab staff member.
6. Plug in the laptop computer's charger and mouse.
7. Take the Internet cable from a MTSU computer in the NASA FOCUS Lab Control Room and plug the Internet cable into the laptop computer.
    a. Note: Do not plug the Internet cable into the laptop computer until the laptop computer finishes loading.
8. There are two Skype icons on the NASA FOCUS Lab Administrator's laptop computer in the right-hand corner of the desktop screen. Double-click on the Skype icon that is on top and sign in to the "Universal E-Lines Administrator" Skype account.
    a. Note: The username and password can be retrieved from a NASA FOCUS Lab staff member.

9. Double-click on the Skype icon on the bottom and sign in to the "Customer Service Department" Skype account.
    a. Note: The username and password can be retrieved from a NASA FOCUS Lab staff member.
10. Double-click on the Skype icon on the bottom and sign in to the "Gate Agent" Skype account.
    a. Note: The username and password can be retrieved from a NASA FOCUS Lab staff member.
11. Double-click on the Internet Explorer icon and go to www.join.me.
12. Click "Join Meeting" at the top right-hand corner of the website, type in the FOD 1's Join.Me code, and click "Join."
13. Minimize the Internet Explorer window.

Posting White Sheets and "Total Revenue Lost" Document

The NASA FOCUS Lab Administrator must use the following procedures when posting the white sheets and "Total Revenue Lost" document outside the NASA FOCUS Lab Control Room:

1. From the white sheet packet, gather six white sheets and place them on the walls directly outside the NASA FOCUS Lab Control Room.
2. At the very top of each white sheet, write the team number, simulation number, and date.

3. On one white sheet, make a list of the triggers that will be implemented into the simulation and the flight numbers and/or airports that the triggers will be implemented on.
    a. Note: The NASA FOCUS Lab Administrator must continuously update the list of triggers throughout the simulation.
4. Tape the "Total Revenue Lost" document on a wall directly outside the NASA FOCUS Lab Control Room.
5. Circle the correct team number and the day's simulation number on the "Total Revenue Lost" document. Also, write down the date of the simulation on the "Total Revenue Lost" document.

Brainstorming with the Maintenance Expert

Before every simulation begins, the NASA FOCUS Lab Administrator must brainstorm with the Maintenance Expert about which non-embedded maintenance triggers to implement during the NASA FOCUS Lab simulation. The non-embedded maintenance triggers that can be implemented into a simulation by the Administrator and the Maintenance Expert include, but are not limited to:

1. Explosive decompression causing a hole in the aircraft.
2. Windshield anti-ice system is inoperative.
3. Brake temperature indication.
4. Engine oil leak.
5. Flaps stuck at 45°.
6. Cargo door indication is inoperative.
7. Engine generator (Integrated Drive Generator – IDG) is inoperative.

8. Bird strike.
9. Rapid cabin decompression.
10. One Pressurization and Air Conditioning Kit (PACK) is inoperative.
11. Tail strike causing damage to the aircraft.
12. Engine flameout.
13. Flight deck security door latch is inoperative.
14. Cockpit Voice Recorder (CVR) is inoperative.
15. Oxygen Low Pressure caution message.

The NASA FOCUS Lab Administrator and Maintenance Expert must choose the appropriate number of non-embedded maintenance triggers to implement into a simulation based on the simulation's number, or difficulty.

Miscellaneous Duties

The NASA FOCUS Lab Administrator must complete the following miscellaneous duties:

a. Place two pieces of white paper at each position in the NASA FOCUS Lab.
b. Place two pencils at each position in the NASA FOCUS Lab.
c. Roll the podium to the NASA FOCUS Lab Control Room.
d. Complete a communication check between the Canadair Regional Jet (CRJ) – 200 simulator and the Weather and Forecasting, FOC, Maintenance Control, and Ramp Tower positions.
e. Write down the Join.Me codes that are visible on each position's computer in the NASA FOCUS Lab.
f. Tape the Join.Me codes to a wall inside the NASA FOCUS Lab Control Room.

Duties Required During a Simulation

Observing the Flight Schedule

The NASA FOCUS Lab Administrator is in charge of observing the flight schedule during every simulation to ensure that the student in the FOD 1 position is manipulating the data in the flight schedule correctly. While observing the flight schedule, there are different situations that may occur. Therefore, the NASA FOCUS Lab Administrator must use the following procedures under each scenario while observing the flight schedule:

1. **If a flight number is not color coded when it should be, then the NASA FOCUS Lab Administrator must use the following procedures:**
    a. Call the student in the FOD 1 position by using the Universal E-Lines Administrator Skype account.
    b. Ask the student in the FOD 1 position, "What is wrong with flight number _____?".
    c. When the student in the FOD 1 position realizes the issue with the flight, tell the student to color code the flight number appropriately.
    d. End the Skype call.
2. **If the departure /arrival time is not timestamped correctly, then the NASA FOCUS Lab Administrator must use the following procedures:**
    a. Call the student in the FOD 1 position by using the Universal E-Lines Administrator Skype account.
    b. Tell the student in the FOD 1 position where the incorrect timestamp is located on the flight schedule.

c. Tell the FOD 1 to take the following actions:
    i. Click on the appropriate Excel box on the flight schedule where the incorrect timestamp is located.
    ii. Press the "Delete" key on the keyboard to erase the timestamp.
    iii. Type in the correct departure /arrival time in Zulu (as determined by the NASA FOCUS Lab Administrator)
        1. Note: The student in the FOD 1 position must place a colon in the time. If the student does not place a colon in the time, then the flight schedule will show an error in the delay loss box.
    iv. Press the "Enter" key on the keyboard.
d. End the Skype call.

3. **If a flight number is incorrectly color coded, then the NASA FOCUS Lab Administrator must use the following procedures:**
    a. Call the student in the FOD 1 position using the Universal E-Lines Administrator Skype account.
    b. Tell the student in the FOD 1 position to change the color of the flight number back to light or dark blue (depending on the flight schedule's color scheme).
    c. End the Skype call.

4. **If a flight number is color coded as "Flight Canceled," then the NASA FOCUS Lab Administrator must use the following procedures:**
    a. Immediately call the student in the FOC position using the Universal E-Lines Administrator Skype account.
    b. Ask the student to explain why the flight is canceled.
    c. Write down a brief summary of the student's explanation.
    d. Ask the student if there is a "better solution" than to cancel the flight.
        i. If there is a better solution, then allow the student in the FOC position to tell you the "better solution." Write down and implement the student's "better solution" into the simulation. Then, end the Skype call. This concludes the "Observing the Flight Schedule" section. If not, then continue to Step d part ii.
        ii. If there is not a "better solution" and/or the student in the FOC position does not think there is a "better solution," then the simulation shall continue with the flight being canceled. Then, end the Skype call and continue to Step e.
            1. Note: Do not provide a solution to the student in the FOC position at any time.
    e. Determine how many passengers will miss their connections and/or will be left at the airport due to the flight being canceled.
    f. Call the student in the FOC position using the Universal E-Lines Administrator Skype account.

g. Tell the student how many passengers will be missing their connections and/or will be left at the airport due to the flight being canceled.

h. Tell the student to inform the FOD 2 Coordinator about the plan to reroute the passengers to their destinations.

i. End the Skype call.

j. Allow the FOD 2 Coordinator to handle the remaining aspects of this situation.

5. If a flight number is color coded as "General Delay," then the NASA FOCUS Lab Administrator must use the following procedures:

a. Call the student in the FOD 1 or FOC position using the Universal E-Lines Administrator Skype account to ask him or her why the flight is delayed.

b. Record the student's explanation.

c. End the Skype call.

d. Inform the other NASA FOCUS Lab staff members of why the flight is delayed.

6. If a flight number is color coded as an "Emergency," then the NASA FOCUS Lab Administrator must use the following procedures:

a. Immediately call the student in the FOC position using the Universal E-Lines Administrator Skype account.

b. Ask the student why the flight number is color coded as an emergency.

c. Ask the student how the team will handle the emergency.

d. When the student requests emergency personnel, medical staff, police, TSA, etc., tell the student that you will arrange the appropriate authorities to meet the aircraft when it lands.

e. End the Skype call.

f. Write down a brief summary of the emergency situation.

g. Inform the NASA FOCUS Lab staff members of the emergency situation.

7. If a flight number is color coded as "Scheduled Maintenance" or "Unscheduled Maintenance," then the NASA FOCUS Lab Administrator must use the following procedures:

a. Ask the Maintenance Expert if there is scheduled or unscheduled maintenance on the flight that is color coded on the flight schedule.

i. If there is not scheduled or unscheduled maintenance on the flight, then use the procedures under Step 3 (or scenario 3) in this section to correct the situation on the flight schedule.

ii. If there is scheduled or unscheduled maintenance on the flight, then ask the Maintenance Expert what type of maintenance is being performed on the flight. Continue to step b.

b. Write down a brief summary of the information provided by the Maintenance Expert about the flight's maintenance issue.

8. **If the student in the FOD 1 position accidently erases a flight number on the flight schedule, then the NASA FOCUS Lab Administrator must use the following procedures:**
    a. Call the student in the FOD 1 position using the Universal E-Lines Administrator Skype account.
    b. Tell the student to reenter the flight number that was erased.
    c. Tell the student to press the "Enter" key on the keyboard after entering the flight number.
    d. End the Skype call.
9. **If a flight's departure and arrival time boxes are timestamped within minutes of each other, then the NASA FOCUS Lab Administrator must use the following procedures:**
    a. Call the student in the FOD 1 position using the Universal E-Lines Administrator Skype account.
    b. Tell the student to delete the flight's arrival timestamp.
    c. End the Skype call.
10. **If a flight departs before the 20-minute turnaround time has passed, then the NASA FOCUS Lab Administrator must use the following procedures:**
    a. Call the student in the FOC position using the Universal E-Lines Administrator Skype account.
    b. Remind the student that a flight cannot be released until 20 minutes have passed after the flight landed.

i. Note: If the team continues to release flights before the 20-minute turnaround time passes, then remind the student in the FOC position of Universal E-Lines' Standard Operating Procedure.

ii. Note: If this issue continues, then use the procedures in Step 11 (scenario 11) in this section.

11. If a team continuously releases flights before the 20-minute turnaround time passes, then the NASA FOCUS Lab Administrator must use the following procedures:

a. Call the student in the FOC position using the Universal E-Lines Administrator Skype account.

b. Tell the student that the turnaround time has not passed for a particular flight that he or she has released and that you will have to hold the flight until the turnaround time has passed.

c. End the Skype call.

d. Go to the Pseudo Pilot room and use one of the following options:

i. If the flight has already been released by the student in the Pseudo Pilot position, then make the flight hold its present position by clicking on the flight's "diamond," typing the letters "HPP" using the Pseudo Pilot position's keyboard, and pressing the "Enter" key on the keyboard.

1. After the turnaround time has been reached, tell the student in the Pseudo Pilot position that he or she can request for the flight's release.

2. Once the release has been secured, then release the flight from its present position by clicking on the flight's "diamond," typing three periods, and typing the International Civil Aviation Organization (ICAO) identifier for the flight's destination airport.

ii. If the flight has not been released by the student in the Pseudo Pilot position, then tell the student to not release the flight or ask for the flight's release until the turnaround time has been reached.

12. If "#VALUE" appears in the "Delay Loss" section of the flight schedule, then the NASA FOCUS Lab Administrator must use the following procedures:

a. Scan each flight's timestamped departure and arrival box and look for the following errors:

i. A colon is not present in the timestamp.

ii. The time is not entered correctly.

iii. The arrival box was timestamped before the departure box.

b. After scanning each timestamped departure and arrival box and the error cannot be found, then use the following procedures:

i. Take a picture of the flight schedule with a smartphone or another electronic device.

ii. Go to the NASA FOCUS Lab and close the flight schedule on the FOD 1 position's computer by clicking the "X" in the top right-hand corner of the flight schedule's window and pressing "Do not save."

iii. Access the picture of the flight schedule and help the student in the FOD 1 position reenter the times into the flight schedule that appear in the picture.

1. Note: Using these procedures should fix the error in the flight schedule. If the error continues, then try to fix the flight schedule after the NASA FOCUS Lab simulation.

13. If a flight is delayed more than 30 minutes, then the NASA FOCUS Lab Administrator must use the following procedures:

a. Call the student in the FOC position using the Universal E-Lines Administrator Skype account.

b. Ask the student why the flight has not been released.

c. Record the explanation made by the student.

d. End the Skype call.

14. If a negative value appears in the "Delay Loss," then the NASA FOCUS Lab Administrator must use the following procedures:

a. Scan the flight schedule to find a flight's departure and/or arrival box that has been timestamped early.

b. Call the student in the FOD 1 position using the Universal E-Lines Administrator Skype account.

c. Tell the student where the departure and/or arrival box was timestamped early and to click on that particular departure and/or arrival box.

d. Tell the student to press the "Delete" key on the keyboard.

e. Tell the student to manually enter the flight's correct departure and/or arrival time (as determined by the NASA FOCUS Lab Administrator) and press the "Enter" key on the keyboard after manually entering the time.

f. End the Skype call.

Answering Skype Calls from the FOC Position

During every simulation, the NASA FOCUS Lab Administrator will receive Skype calls from the student in the FOC position. The student will want to know different pieces of information or will make requests. Therefore, the NASA FOCUS Lab Administrator must use the procedures under each scenario below:

1. **If the student in the FOC position requests emergency vehicles (ambulance, police, Aircraft Rescue and Firefighting (ARFF), etc.) or Transportation Security Administration (TSA) personnel to meet a plane when it lands, then the NASA FOCUS Lab Administrator must use the following procedures:**

    a. Answer the Skype call from the student in the FOC position using the Universal E-Lines Administrator Skype account and allow the student in the FOC position to tell you why the specific emergency vehicles and/or TSA are needed.

    b. Tell the student that you will arrange the emergency vehicles and/or TSA to meet the plane when it lands at the airport.

    c. End the Skype call.

    d. Write down a brief summary of why the student requested emergency vehicles and/or TSA.

e. Write down the time that the student requested the emergency vehicles and/or TSA.

f. Call the student in the FOC position in five minutes using the Universal E-Lines Administrator Skype account to inform him or her that the emergency vehicles and/or TSA are in place to meet the airplane when it lands.

2. If the student in the FOC position requests for a flight to land at another airport due to an emergency or any other circumstance, then the NASA FOCUS Lab Administrator must use the following procedures:

a. Answer the Skype call from the student in the FOC position using the Universal E-Lines Administrator Skype account and allow the student to tell you where he or she wants the flight to land.

b. Ask the student why the flight is diverting to another airport.

c. Ask the student where the flight is currently located.

d. Tell the student that you will notify the appropriate airport of the situation.

e. End the Skype call.

f. Write down the flight number that is diverting to another airport, the airport that the flight is diverting to, the time that the student chose to divert the flight, and the reason why the flight is diverting.

g. Go to the Pseudo Pilot room and divert the flight to the airport that the FOC requested by using the procedures in the "Pseudo Pilot Computer Commands" section.

h. If the circumstance for which the flight was diverting for ends and the student in the FOC position informs the NASA FOCUS Lab Administrator that he or she wants the flight to continue to its destination, then go to the Pseudo Pilot room and use the procedures in the "Pseudo Pilot Computer Commands" section to make the flight continue its planned flight route.

3. **If the student in the FOC position requests a spare aircraft, then the NASA FOCUS Lab Administrator must use the following procedures:**
    a. Answer the Skype call from the student in the FOC position using the Universal E-Lines Administrator Skype account and allow the student to request a spare aircraft.
    b. Inform the student that he or she must make spare aircraft requests with the Maintenance Gate in Jacksonville or Nashville.
    c. Inform the student that he or she must also have a reserve crew available to fly the spare aircraft.
    d. End the Skype call.
4. **If the FOC requests to purhcase fuel at an airport that Universal E-Lines does not service, then the NASA FOCUS Lab Administrator must use the following procedures:**
    a. Answer the Skype call from the student in the FOC position using the Universal E-Lines Administrator Skype account and allow the student to request to purchase fuel from an airport that Universal E-Lines does not service.

b. Ask the student if the airport has Jet A fuel and for the price of the Jet A fuel.
    i. Note: If the airport does not have Jet A fuel, then inform the student that he or she must find another way to deliver Jet A fuel to the airport to fulfill their request. If the airport does have Jet A fuel, continue to Step c.
c. Ask the student to state how many pounds of fuel that he or she is requesting.
    i. Note: If the amount of fuel that the student requests is a reasonable and legal amount based on the airplane's destination, then continue to Step d. If the amount of fuel requested is not a reasonable and/or a legal amount, then inform the student that the fuel must be recalculated.
d. Inform the FOC that you will order the fuel at the airport and will call back when the refueling of the airplane has been completed.
e. End the Skype call.
f. Set a timer on a smartphone, watch, or other device for 20 minutes to represent the amount of time it will take for the aircraft to refuel.
g. Write down a brief summary of why the student requested fuel from an airport that Universal E-Lines does not service and the amount of fuel requested.
h. Write down the amount of fuel and price of the fuel bought at the airport on the "Total Revenue Lost" document.

i. After 20 minutes have passed, call the student in the FOC position using the Universal E-Lines Administrator Skype account and inform him or her that the refueling of the airplane has been completed.

j. End the Skype call.

k. Go to the Pseudo Pilot room to release the flight from its holding position, if needed, by using the procedures in the "Pseudo Pilot Computer Commands" section.

Answering Skype Calls from the Crew Scheduling Position

During every simulation, the NASA FOCUS Lab Administrator will receive Skype calls from the student in the Crew Scheduling position. The student will want to know different pieces of information or will make requests. Therefore, the NASA FOCUS Lab Administrator must use the procedures under each scenario below:

1. **If the student in the Crew Scheduling position calls about a flight crewmember with an expired medical, then the NASA FOCUS Lab Administrator must use the following procedures:**

    a. Answer the Skype call from the student in the Crew Scheduling position by using the Universal E-Lines Administrator Skype account and allow the student to explain the expired medical situation.

    b. Tell the student you will check Universal E-Lines' records to see if the flight crewmember does or does not have an expired medical and call him or her back via Skype with an answer.

    c. End the Skype call.

d. Ask the Crew Scheduling Coordinator if the flight crewmember has an expired medical.

e. Record the Crew Scheduling Coordinator's response.

f. Call the student in the Crew Scheduling position using the Universal E-Lines Administrator Skype account and inform him or her of one of these two scenarios:

    i. The flight crewmember does have an expired medical, and the student must find another flight crew to take over the flight.

    ii. The flight crewmember does not have an expired medical, and the student does not have to replace the flight crew.

g. End the Skype call.

h. Write down a brief summary of the conversation with the student in the Crew Scheduling position.

    i. Note: If the student in the Crew Scheduling position does not resolve the expired medical situation, then give the team an "illegal flight" penalty on the "Total Revenue Lost" document.

2. If the student in the Crew Scheduling position calls about running out of reserve crews, then the NASA FOCUS Lab Administrator must use the following procedures:

a. Answer the Skype call from the student in the Crew Scheduling position by using the Universal E-Lines Administrator Skype account and allow the student to explain that there are no more reserve crews available.

b. Inform the student that he or she may use flight crews that are not on the reserve crew list, including flight number 1902 and 2902's flight crew.

c. End the Skype call.

3. **If the student in the Crew Scheduling position requests a charter company, bus, rental car, etc. to transport a reserve crew to an aircraft that needs a new flight crew, then the NASA FOCUS Lab Administrator must use the following procedures:**

    a. Answer the Skype call from the student in the Crew Scheduling position by using the Universal E-Lines Administrator Skype account and allow the student to explain that the team would like to transport a reserve crew to an aircraft that needs a new flight crew.

    b. Ask the student how much that mode of transportation will cost.

    c. Ask the student the flight number that the reserve crew will take over.

    d. Tell the student that his or her request is approved, and he or she must contact and inform the Crew Scheduling Coordinator about the situation.

        i. Note: If the team's solution is not legal, safe, efficient, and/or quick, then you may tell the student that the team's request is not approved and the team must find another mode of transportation to send the reserve crew to the aircraft.

    e. End the Skype call.

    f. Write down a brief summary of the conversation with the student in the Crew Scheduling position.

g. Write down the cost for sending the reserve crew to the aircraft on the "Total Revenue Lost" document.

Answering Skype Calls From the Maintenance Positions

During every simulation, the NASA FOCUS Lab Administrator will receive Skype calls from the students in the Maintenance Control and Maintenance Planning and Scheduling positions. The students will want to know different pieces of information or will make requests. Therefore, the NASA FOCUS Lab Administrator must use the procedures under each scenario below:

1. **If the students in the Maintenance Control and Maintenance Planning and Scheduling positions request to use a contract maintenance company to inspect and/or fix a Universal E-Lines aircraft at a non-hub airport, then the NASA FOCUS Lab Administrator must use the following procedures:**
    a. Answer the Skype call from the students in the Maintenance Control and Maintenance Planning and Scheduling positions by using the Universal E-Lines Administrator Skype account and allow the students to request a contract maintenance company to inspect and/or fix the aircraft located at a non-hub airport.
    b. Ask the students for the contract maintenance company's name, phone number, and location.
    c. Ask the students what they would like for the contract maintenance company to do on the aircraft.
    d. Write down the information provided by the students.

e. Tell the students that you will call them back when the inspection and/or maintenance on the aircraft has been completed.

f. End the Skype call.

g. Ask the Maintenance Expert how long it will take for the inspection and/or maintenance on the aircraft.

h. Set a timer on a smartphone, tablet, or other device to the amount of time determined by the Maintenance Expert.

i. Call the students in the Maintenance Control and Maintenance Planning and Scheduling positions using the Universal E-Lines Administrator Skype account when the time determined by the Maintenance Expert has passed.

j. Tell the students that the inspection and/or maintenance on the aircraft has been completed.

k. Either:

    i. Tell the students what the contract maintenance company found during the inspection and what maintenance must be performed on the aircraft, if any. Then, go back to Step c if the students want the contract maintenance company to fix the aircraft OR

    ii. Tell the students what the contract maintenance company found during the inspection and that the aircraft is too damaged to be fixed by the contract maintenance company. Also, tell the students that they must send maintenance personnel and aircraft parts to fix the aircraft, which must be arranged with the Gate Maintenance at

Jacksonville or Nashville. Then, end the Skype call and continue to Step n OR

iii. Tell the students what the contract maintenance company fixed on the aircraft. Also, tell the students that the aircraft is ready to be placed back in service after all of the necessary paperwork has been completed. Then, continue to Step l.

l. End the Skype call.

m. Inform the Maintenance Expert that the contract maintenance company has fixed the aircraft.

n. Write down a brief summary of the students' request to use a contract maintenance company to inspect and/or fix an aircraft at a non-hub airport.

2. If the students in the Maintenance Control and Maintenance Planning and Scheduling positions request a spare aircraft, then the NASA FOCUS Lab Administrator must use the following procedures:

a. Answer the Skype call from the students in the Maintenance Control and Maintenance Planning and Scheduling positions by using the Universal E-Lines Administrator Skype account and allow the students to request a spare aircraft.

b. Inform the students that they must contact the Maintenance Gate in Jacksonville or Nashville to request a spare aircraft.

c. Inform the students that they must also have a reserve crew available to fly the spare aircraft.

d. End the Skype call.

e. Write down a brief summary about why the students wanted to use a spare aircraft and where the students wanted the spare aircraft to go.

Implementing Non-Embedded Crew Scheduling Triggers

During every simulation, the NASA FOCUS Lab Administrator must implement at least one non-embedded crew scheduling trigger into the simulation. The non-embedded crew scheduling triggers that the NASA FOCUS Lab Administrator can implement into a simulation are the following:

1. Sick Captain or First Officer.
2. Fatigued Captain or First Officer.
3. Captain or First Officer caught drinking at the bar before his or her flight.
4. Flight attendant was hurt during his or her flight and is unable to fly the rest of the day.
5. First Officer skateboarded to the gate and is fired for his or her actions.
6. Captain or First Officer fell in the gap between the airplane and the jet bridge, and he or she is unable to fly for the rest of the day due to breaking his or her leg.

To implement a non-embedded crew scheduling trigger into a simulation, the NASA FOCUS Lab Administrator must use the following procedures:

1. Ask the Crew Scheduling Coordinator what non-embedded crew scheduling trigger he or she would like to be implemented into the simulation, what flight number to implement the trigger on, and when to implement the trigger.
2. Implement the trigger through the student in the Pseudo Pilot position at the appropriate time.

3. Write down the trigger that was implemented on a white sheet outside the NASA FOCUS Lab Control Room and the responses by the students.
4. If the student in the Crew Scheduling position calls the Universal E-Lines Administrator Skype account, then answer his or her questions using the procedures found in the "Answering Skype Calls from the Crew Scheduling Position" section and/or your knowledge of the aviation industry. If not, continue to Step 5.
5. If the student in the FOC position calls the Universal E-Lines Administrator Skype account, then answer his or her questions using the procedures found in the "Answering Skype Calls from the FOC Position" section and/or your knowledge of the aviation industry. If not, continue to Step 6.
6. Ask the Crew Scheduling Coordinator how the student in the Crew Scheduling position is handling the trigger.
7. Write down how the student in the Crew Scheduling position is handling the non-embedded crew scheduling trigger on a white sheet outside the NASA FOCUS Lab Control Room.

Implementing Non-Embedded Maintenance Triggers

The NASA FOCUS Lab Administrator must implement non-embedded maintenance triggers into a simulation by using the following procedures:

1. Ask the Maintenance Expert what non-embedded maintenance trigger to implement into the simulation, what flight number to implement the trigger on, and when to implement the trigger into the simulation.

2. Implement the non-embedded maintenance trigger through the student in the Pseudo Pilot position at the appropriate time.
3. If the flight is in the air, then the student in the Pseudo Pilot position may want to divert the flight to the nearest suitable airport.
    a. If the student in the Pseudo Pilot position chooses to divert the flight to the nearest suitable airport, then use the procedures in the "Pseudo Pilot Computer Commands" section to divert the flight to the desired airport. Then, continue to Step 4.
    b. If the student in the Pseudo Pilot position wants the flight to continue to its destination airport, then continue to Step 4.
4. Write down whether or not the student in the Pseudo Pilot position chose to divert the flight to a suitable airport.
5. Write down the non-embedded maintenance trigger that was implemented into the simulation, the flight number that the trigger was implemented on, the time that the trigger was implemented, and how the students responded to the trigger on a white sheet outside the NASA FOCUS Lab Control Room.
6. Return to the NASA FOCUS Lab Control Room and answer any Skype calls about the non-embedded maintenance trigger using the appropriate procedures, your knowledge of the simulation, and/or your knowledge of the aviation industry.
7. If the flight landed at its destination airport and the maintenance issue has been resolved, then call and inform the students in the Maintenance Control and Maintenance Planning and Scheduling positions that the aircraft is ready to be

placed back in service after completing the necessary paperwork. If not, then continue to Step 8.

8. If the flight diverted to another airport and the maintenance issue has been resolved, then release the flight to its destination using the appropriate procedures found in the "Pseudo Pilot Computer Commands" section after the flight is released by the student in the FOC position. If not, then continue to Step 9.
9. If the flight diverted to another airport and the maintenance issue has not been addressed, then give the team the "Stranded Airplane" penalty on the "Total Revenue Lost" document. Also, determine the number of passengers on the flight and the aircraft's subsequent flights. Then, place that number under the "Passengers missing connections" category on the "Total Revenue Lost" document. If not, then continue to Step 10.
10. If the flight's destination airport is a Universal E-Lines' hub and the flight does not arrive at the hub within 40 minutes of its scheduled arrival time, then half of the passengers on the flight and the aircraft's subsequent flights will miss their connections. Therefore, ask the FOD 2 Coordinator if the student in the FOD 2 position has placed the passengers missing their connections on another flight to their destination.
    a. If so, then write down that the team found a way to reroute the passengers to their destination on a white sheet outside the NASA FOCUS Lab Control Room.
    b. If not, then write down the total number of passengers who missed their connections under the "Passengers missing connections" category on the

"Total Revenue Lost" document. Also, write down the total number of passengers missing their connections on a white sheet outside the NASA FOCUS Lab Control Room.

11. Write down how well the team handled the non-embedded maintenance trigger on a white sheet outside the NASA FOCUS Lab Control Room.

Implementing Non-Embedded Weather Triggers: Part I & II

Part I – FAA Ramp Checks

During a simulation, a flight may not have enough fuel for winds aloft and/or for filing a destination alternate as required by the Federal Aviation Regulations (FARs). Therefore, the NASA FOCUS Lab Administrator must implement the non-embedded weather trigger into a simulation by using the following procedures:

1. Ask the Weather Expert and the FOD 2 Coordinator if there are any flights that do not have enough fuel for winds aloft and/or for filing a destination alternate.
    a. If there is, then continue to Step 2.
    b. If not, then do not continue to Step 2.
2. Write down the flight numbers that do not have enough fuel and their scheduled arrival times.
3. Check the flight schedule on the FOD 1 Join.Me session to see if the flights have landed at their destination airport.
4. Call the student in the FOC position using the Universal E-Lines Administrator Skype account when the flights have landed at their destination airport.
5. Tell the student that you have received information that there are FAA (Federal Aviation Administration) representatives at the airplane performing a ramp check.

Also, tell the student that you will call him or her back as soon as you know more information about the situation.

6. End the Skype call.
7. Call the student in the FOC position back in five minutes using the Universal E-Lines Administrator Skype account.
8. Tell the student that the FAA representatives found that there was not enough fuel for winds aloft and/or for filing a destination alternate onboard the flight.
9. Tell the student that the FAA representatives are still investigating the situation, but the aircraft's subsequent flights can continue.
10. Tell the student that there will most likely be a fine given to the airline for failing to add the legal and required amount of fuel.
11. End the Skype call.
12. Place the total number of illegal flights due to an insufficient amount of fuel for winds aloft and/or for filing a destination alternate under the "Illegal Flight" category on the "Total Revenue Lost" document.
13. Write down the flight numbers that are illegal and the reason why they are illegal at the bottom of the "Total Revenue Lost" document.

Part II – NOTAM Trigger

The NASA FOCUS Lab Administrator can implement a NOTAM (Notice to Airmen) trigger into a simulation. To do so, the NASA FOCUS Lab Administrator must use the following procedures:

1. Ask the Weather Expert if there are any active NOTAMs or Temporary Flight Restrictions (TFRs) over an airport Universal E-Lines services.

a. If so, then do not implement the NOTAM trigger at that airport. Continue to Step 2.
b. If not, then continue to Step 2.

2. Find and open the file titled "NOTAM Trigger - Blue Angels - JAX – DST" on the desktop screen of the NASA FOCUS Lab Administrator's laptop computer.
3. Edit the issue, beginning, ending, and effective dates to reflect the date of the simulation.
4. Edit the beginning, ending, and effective times to where the NOTAM trigger lasts no more than 45 minutes.
5. Save the file.
6. Send the file to the student in the Weather and Forecasting position via a Skype text message using the Universal E-Lines Administrator Skype account.
7. Print and tape a color copy of the NOTAM trigger to a white sheet outside the NASA FOCUS Lab Control Room.
8. Answer any Skype calls about the NOTAM trigger using the appropriate procedures, your knowledge of the simulation, and/or your knowledge of the aviation industry.
9. Write down a brief summary of how the team handled the NOTAM trigger on a white sheet outside the NASA FOCUS Lab Control Room.

Implementing Non-Embedded Emergency Triggers

The NASA FOCUS Lab Administrator can implement non-embedded emergency triggers into a simulation. The non-embedded emergency triggers that the Administrator can implement are the following:

1. Bomb threat on a flight or in an airport.
2. Smoke in the Air Traffic Control (ATC) Tower.
3. Accident on the runway.
4. Fuel farm contamination.
5. Irate passenger.
6. Flight attendant is assaulted by a passenger and the entire flight crew is unfit to fly for the remainder of the day.

Due to the nature of these triggers, the students participating in the NASA FOCUS Lab will create various solutions to resolve the emergency situations. As a result, the NASA FOCUS Lab Administrator must respond to the students' solutions based on previously stated procedures, his or her knowledge of the aviation industry, and his or her knowledge of the simulation. Also, the NASA FOCUS Lab Administrator should consult the NASA FOCUS Lab staff members on how to respond to the students' solutions, as needed.

Pseudo Pilot Computer Commands

The following Pseudo Pilot computer commands can be used by the NASA FOCUS Lab Administrator during a simulation:

1. **Show Airport Identifiers**
    a. Simultaneously press the "ALT" and "L" keys on the keyboard.

2. **Pause the Simulation**

    a. Simultaneously press the "ALT" and "P" keys on the keyboard.

3. **Keep all Flights on Time**

    a. Left click on a flight's "diamond."

    b. Press the "+" key on the keyboard.

    c. Observe that the flight number and the "+" symbol are in the blue bar at the bottom of the computer screen.

    d. Press the "Enter" key on the keyboard.

4. **Change the Location of a Flight's Data Block**

    a. Press the "F1" (LDR) key on the keyboard.

    b. Press a number on the keyboard's numerical keypad that corresponds to the direction you want the flight's data block to go.

        i. Note: For example, if you want the flight's data block to go to the right, then press the number 6 on the keyboard's numerical keypad.

    c. Left click on the flight's "diamond."

        i. Note: You must have the cursor right on top of the flight's "diamond." If the flight's data block does not move, then repeat Steps a through c.

5. **Hold the Flight's Present Position**

    a. Left click on the flight's "diamond."

    b. Type in the letters "HPP."

    c. Observe that the flight number and the letters "HPP" are in the blue bar at the bottom of the computer screen.

d. Press the “Enter” key on the keyboard.

e. Observe the flight holding its present position.

i. Note: If the flight continues flying to its destination, then repeat Steps a through e.

6. Ending the Hold Present Position Command on a Flight (Option 1)

a. Left click on the flight’s “diamond.”

b. Type in three periods (…).

c. Type in the flight’s destination airport using the airport’s four letter ICAO identifier.

i. Note: For example, Jacksonville’s four letter ICAO identifier is KJAX.

d. Observe that the flight number, three periods, and ICAO airport identifier are in the blue bar at the bottom of the computer screen.

e. Press the “Enter” key on the keyboard.

f. Observe the flight leaving its present position and flying to its destination.

i. Note: If the flight does not leave its present position, then repeat Steps a through f.

ii. Note: If the flight does not leave its present position after repeating Steps a through f, then go to the procedures listed under “Ending the Hold Present Position Command on a Flight (Option 2).”

7. Ending the Hold Present Position Command on a Flight (Option 2)

a. Left click on the flight’s “diamond.”

b. Type in three periods (…).

c. Observe that the flight number and three periods are in the blue bar at the bottom of the computer screen.

d. Press the "Enter" key on the keyboard.

e. Observe the flight leaving its present position and flying to its destination.

i. Note: If the flight does not leave its present position, then repeat Steps a through e.

8. Change a Flight's Heading (Option 1 – Changing a Flight's Heading and Specifying the Turn to the Heading)

a. Left click on the flight's "diamond."

b. Type in the letters "TR" or "TL" to turn the airplane right or left to the heading you want the airplane to fly.

c. Type in the desired heading that the airplane should fly, i.e., 320.

d. Observe that the flight number, the letters "TR" or "TL", and the desired heading are in the blue bar at the bottom of the computer screen.

e. Press the "Enter" key on the keyboard.

f. Observe the flight turning toward the desired heading.

i. Note: If the flight does not turn toward the desired heading, then repeat Steps a through f.

9. Change a Flight's Heading (Option 2 – Changing a Flight's Heading Without Specifying the Turn to the Heading)

a. Left click on the flight's "diamond."

b. Type in the letters "FH".

c. Type in the desired heading that the airplane should fly, i.e., 320.

d. Observe that the flight number, the letters “FH,” and the desired heading are in the blue bar at the bottom of the computer screen.

e. Press the “Enter” key on the keyboard.

f. Observe the flight turning toward the desired heading.

    i. Note: If the flight does not turn toward the desired heading, then repeat Steps a through f.

10. Killing a Flight Going Off Course

a. Left click on the flight’s “diamond.”

b. Type in the word “Kill.”

c. Observe that the flight number and “Kill” are in the blue bar at the bottom of the computer screen.

d. Press the “Enter” key on the keyboard.

e. Observe that the flight is no longer on the computer screen.

    i. Note: If the flight is still visible on the computer screen after two minutes, then repeat Steps a through e.

11. Increase the Length of the Leader Lines

a. In the bottom left-hand side of the computer screen, right click the “Leader” box to increase the leader lines to the desired length.

12. Decrease the Length of the Leader Lines

a. In the bottom left-hand side of the computer screen, left click the “Leader” box to decrease the leader lines to the desired length.

13. Releasing a Flight (Option 1 – When Capable of Clicking on a Flight's "Diamond")

a. Left click on the flight's "diamond."

b. Left click on the "Released by Dispatch" button.

c. Observe the flight taking off from its departure airport.

i. Note: If a flight's number turns red to bright yellow, then repeat Steps a and b to release the flight.

ii. Note: If a flight does not take off after clicking the "Released by Dispatch" button, then repeat Steps a and b.

14. Releasing a Flight (Option 2 – When Unable to Click on a Flight's "Diamond")

a. Delete any text that appears in the blue bar at the bottom of the computer screen by pressing the "Backspace" key on the keyboard.

b. Type in the letters "LTN."

c. Type in the flight number.

d. Type in a comma (,).

e. Left click on the "Released by Dispatch" button.

Implementing Downstream Consequences

The NASA FOCUS Lab Administrator must implement downstream consequences into a simulation when a team member does not perform his or her duties or respond to triggers in a safe, legal, and/or efficient manner. There are various types of downstream consequences that the Administrator can implement into a simulation. As a result, the Administrator should talk with the Principal Investigator and/or a staff member

about what downstream consequences to implement into a simulation. After talking with the Principal Investigator and/or a staff member, the Administrator must implement the downstream consequence into a simulation at the appropriate time. Also, the Administrator should respond to the team's actions to the downstream consequence by using the procedures previously stated, his or her knowledge of the aviation industry, and his or her knowledge of the simulation. The Administrator must also document the downstream consequence and the team's reactions to the downstream consequence on a white sheet outside the NASA FOCUS Lab Control Room.

Troubleshooting Programs and Equipment

The NASA FOCUS Lab Administrator is in charge of troubleshooting the programs and equipment used during the NASA FOCUS Lab simulations. Therefore, if a program or piece of equipment malfunctions, the Administrator must use the procedures in the "Troubleshooting Procedures" chapter to fix the program or piece of equipment.

Writing on the White Sheets

The NASA FOCUS Lab Administrator must write down the following information on the white sheets outside the NASA FOCUS Lab Control Room during the simulation:

1. Each trigger that was implemented into the simulation.
2. The time that the trigger was implemented.
3. The flight number and/or airport that was affected by the trigger.
4. How the students responded to the trigger.
5. Any illegal actions taken by the team during a trigger and/or throughout the simulation.
6. The downstream consequences implemented into the simulation.

7. How the students reacted to the downstream consequences.
8. The student's overall performance in the FOD 1 position.
9. Observations and general impressions of the students in every position.

Updating the "Total Revenue Lost" Document

Throughout a simulation, the NASA FOCUS Lab Administrator must continuously update the "Total Revenue Lost" document, which is located outside the NASA FOCUS Lab Control Room.

Completing the Individual Performance Measure

At 10 to 20 minutes before the end of every simulation, the Industrial and Organizational (I/O) Psychology graduate students working in the NASA FOCUS Lab will hand the Administrator a sheet called the "Individual Performance Measure." On this sheet, the Administrator will rate the student's performance in the FOD 1 position. The Administrator may have to rate another student's performance in his or her position if there is not enough staff members at the simulation. Then, the Administrator will give the Individual Performance Measure sheets back to the I/O Psychology graduate students.

Pausing a Simulation

At 10 to 15 minutes before the course ends for the day, the NASA FOCUS Lab Administrator must pause the simulation by simultaneously pressing the "ALT" and "P" keys on the keyboard in front of the radar screen at the FOD 1 position.

Duties Required After a Simulation

Making Announcements to Students

After every simulation, the NASA FOCUS Lab Administrator must make the following announcements to the students:

1. Remind the students to fill out the After Action Review (AAR) forms and bring them to the team's AAR.
2. Remind the students that they will be going to the team's AAR next week in the Aerospace Department's conference room.
3. Remind the students that they will be going to class immediately after the team's AAR.
4. Remind the students that they will only go to class the week after the team's AAR.

Capturing and Emailing a Team's Financial Data

Before shutting down the FOD 1 computer, the NASA FOCUS Lab Administrator must capture the team's financial data, which is located at the bottom right-hand corner of the flight schedule. To do so, the Administrator must copy and paste the entire "Financial Delay" box in an email to the appropriate Industrial and Organizational Psychology graduate students.

Saving a Team's Flight Schedule

Before shutting down the FOD 1 computer, the NASA FOCUS Lab Administrator must save the team's flight schedule by using the following procedures:

1. In the upper left-hand corner of the flight schedule, click on the "File" tab.
2. Press "Save As."

3. Click on “Computer.”
4. Click on “Browse.”
5. Scroll to the top of the “Save As” pop-up window until “Desktop” is visible.
6. Click on “Desktop.”
7. Click on the “Recorded Sessions” file folder.
8. Click on the current semester’s file folder.
9. Click on the team’s file folder.
10. Erase the entire name in the “File name” box in the “Save As” pop-up window.
11. Type in the team and simulation number in the “File name” box in the “Save As” pop-up window.
    a. Note: A file name should look similar to the following: “Team 5 Sim 1.”
12. Click “Save.”

Shutting Down the NASA FOCUS Lab Control Room

The Administrator must shut down the NASA FOCUS Lab Control Room by using the following procedures:

1. On the NASA FOCUS Lab Administrator’s laptop computer, click the “X” in the top right-corner in every Skype window.
2. Click the red “End Call” button in the Skype video call window from the NASA FOCUS Lab webcam.
3. Click the “X” in the top right-hand corner in every Internet Explorer window.
    a. Note: If a pop-up occurs after pressing the “X” in the Internet Explorer windows that says, “Do you want to close all tabs or the current tab,” click on the button that says “Close all tabs.”

4. Close out all other programs open on the computer by clicking the "X" in the top right-hand corner of each program's window.
    a. Note: If prompted to save a document or program, always click on "Do not save."
5. Shut down the computer by pressing the "Start" button in the lower left-hand corner of the computer screen and click on "Shut down."
6. Disconnect the Internet cable and connect it back to the MTSU computer.
7. Unplug the wireless headset's USB from the laptop computer.
8. Power off the wireless headset.
9. Place the laptop computer, computer mouse, and charger back in the laptop computer bag.
10. Collect all of the documents and notes in the NASA FOCUS Lab Control Room and tape them on a white sheet.
11. Return the laptop computer bag back to the Principal Investigator.
12. Return the wireless headset and the wireless headset's USB to the NASA FOCUS Lab filing cabinet.
13. Turn off the lights in the aerospace graduate student's office.
14. Close and lock the door to the aerospace graduate student's office.

Shutting Down the Entire NASA FOCUS Lab

The Administrator is in charge of shutting down the entire NASA FOCUS Lab, which includes the Pseudo Pilot room, NexSim Frasca program, CSC equipment, webcam, and microphone. The Administrator must use the procedures found in the "NASA FOCUS Lab Startup and Shutdown Procedures" chapter to successfully shut down the NASA FOCUS Lab

Miscellaneous Duties

1. Collect the documents at each position in the NASA FOCUS Lab.
2. Tape the documents on a white sheet located outside the NASA FOCUS Lab Control Room.
3. Collect and tape the "Total Revenue Lost" document to a white sheet located outside the NASA FOCUS Lab Control Room.
4. Collect all of the white sheets outside the NASA FOCUS Lab Control Room and place them either in the aerospace graduate student's office if they are from the first simulation of the week or in the NASA FOCUS Lab if they are from the second simulation of the week.
5. Place the podium back in the NASA FOCUS Lab.

Crew Scheduling Coordinator

Overview

During a NASA FOCUS Lab simulation, the student in the Crew Scheduling position is in charge of entering each flight crew's duty times into the crew scheduling program, monitoring each flight crew's duty times, swapping flight crews with reserve crews, and communicating information regarding each flight crew to the FOC. When the student in the Crew Scheduling position needs to swap a flight crew with a reserve crew, the student must contact a NASA FOCUS Lab staff member via Skype. The staff member in charge of answering Skype calls from the student in the Crew Scheduling position is commonly referred to as the Crew Scheduling Coordinator. Also, the Crew Scheduling Coordinator is in charge of determining the overall performance of the student in the Crew Scheduling position.

Quick Guide for the Crew Scheduling Coordinator

Username and Password Guide

Retrieve the usernames and passwords for the Nashville (BNA) Reserve Crew Coordinator and Jacksonville (JAX) Reserve Crew Coordinator Skype accounts from a NASA FOCUS Lab staff member.

Duties Required Before the Start of a Simulation

1. Gather the Crew Scheduling position's documents.
2. Gather and analyze the Coordinator's documents.
3. Prepare a personal / staff member's computer.

Duties Required During a Simulation

1. Handle embedded crew scheduling triggers.
2. Implement non-embedded crew scheduling triggers.
3. Write on the white sheets.
4. Observe the crew scheduling program.
5. Observe the student in the Crew Scheduling position.
6. Complete the Individual Performance Measure.

Duties Required After a Simulation

1. Shut down the personal / staff member's computer.
2. Miscellaneous duties.

Duties Required Before the Start of a Simulation

Gathering the Crew Scheduling Position's Documents

The Crew Scheduling Coordinator must gather one copy of the "Reserve Crew Management Tool – Student Version" document and place the document at the Crew Scheduling position in the NASA FOCUS Lab.

a. Note: There are three "Reserve Crew Management Tool – Student Version" documents. Each document has the simulation number of when the document is to be used next to the title of each document. Select the document that corresponds to the day's simulation number.

Gathering and Analyzing the Coordinator's Documents

The Crew Scheduling Coordinator must gather the following documents from the file cabinet in the NASA FOCUS Lab:

1. "Reserve Crew Management Tool" document.
2. "Crew Scheduling Bust List for the Crew Scheduling Coordinator" document.
    a. Note: There are three versions for both of these documents. Each document has the simulation number of when the document is to be used next to the title of each document. Select the documents that correspond to the day's simulation number.

After gathering these documents, analyze the "Crew Scheduling Bust List for the Crew Scheduling Coordinator" document to understand where and when flight crews will bust their duty times during the simulation.

Preparing a Personal / Staff Member's Computer

During every simulation, the Crew Scheduling Coordinator must have a computer to perform the tasks required of the Crew Scheduling Coordinator position. If the Crew Scheduling Coordinator does not have a personal computer, then a NASA FOCUS Lab staff member will be more than willing to provide the Crew Scheduling Coordinator a computer. Also, the Crew Scheduling Coordinator must prepare the computer by using the following procedures:

1. Log in to the personal / staff member's computer by using the appropriate username and password.
2. Start Skype and Skype Secondary.
    a. Note: If the computer does not have Skype Secondary, then use a smartphone, tablet, or other device that has the Skype application.
3. Log in to the BNA Reserve Crew Coordinator and JAX Reserve Crew Coordinator Skype accounts.
    a. Note: The usernames and passwords for these Skype accounts can be retrieved from a NASA FOCUS Lab staff member.
4. Minimize both Skype accounts.
5. Using an Internet browser, open two new tabs.
6. In both tabs, go to www.join.me.
    a. In the first tab, enter in the FOD 1's Join.Me code.
    b. In the second tab, enter in the Crew Scheduling's Join.Me code.

i. Note: The list of Join.Me codes will be placed in the NASA FOCUS Lab Control Room by the NASA FOCUS Lab Administrator before every simulation begins.

7. While waiting for the simulation to begin, observe the student in the Crew Scheduling position to see if he or she is correctly performing the following two tasks:
    a. Entering the times 24:00, 25:00, and 26:00 into the crew scheduling program instead of 00:00, 01:00, and 02:00.
        i. Note: If the student fails to do so, then remind the student about how to correctly enter these times into the crew scheduling program.
        ii. Note: An error will occur if these times are not entered correctly into the crew scheduling program.
    b. Subtracting one hour from the departure time of every first leg flight.
        i. Note: If the student fails to do so, then remind the student to subtract one hour from the departure time of every first leg flight.
8. Go to the NASA FOCUS Lab and ask the student in the Crew Scheduling position if he or she has any questions regarding the simulation or the tasks of the Crew Scheduling position.
    a. Note: Answer his or her questions based on your knowledge of the Crew Scheduling position and the airline industry. Do not provide any answers to a problem that he or she will encounter during the simulation.

Duties Required During a Simulation

Handling Embedded Crew Scheduling Triggers: Part I & II

Part I – Embedded Flight Crew Busts

In all three crew scheduling programs, there are embedded flight crew triggers that the student in the Crew Scheduling position must solve during the simulation. One embedded flight crew trigger is flight crews busting their duty times. Therefore, once the student determines the flight crews that will bust their duty times during the simulation, the student will call the Crew Scheduling Coordinator to replace those flight crews with reserve crews. The Crew Scheduling Coordinator must use the following procedures to handle this embedded flight crew trigger:

1. Prepare for the student in the Crew Scheduling position to call the Crew Scheduling Coordinator through the BNA Reserve Crew Coordinator and/or the JAX Reserve Crew Coordinator Skype account(s).
    a. Note: Typically, students will arrive in the NASA FOCUS Lab early to enter in each flight crew's duty times. Therefore, the student will want to call the Crew Scheduling Coordinator as soon as the simulation begins to swap flight crews that are going to bust their duty times during the simulation with reserve crews.
    b. Note: Sometimes, the student in the Crew Scheduling position does not replace a flight crew with a reserve crew even though the flight crew's duty times will bust during the simulation. If this situation occurs, then write down the flights that departed illegally and inform the NASA FOCUS Lab Administrator of the situation. The NASA FOCUS Lab

Administrator will implement downstream consequences and a simulated financial penalty to the airline for this illegal action.

2. Answer all Skype calls from the student in the Crew Scheduling position using the appropriate Skype account.
3. Fill out the "Reserve Crew Management Tool" document by using the information provided by the student in the Crew Scheduling position during the Skype call.
    a. Note: If the student does not provide enough information, then ask the student the appropriate questions to receive the required information.
4. After receiving all of the information that is needed from the student in the Crew Scheduling position, tell the student that you will call him or her back when the reserve crew arrives at the airport.
5. Write down the Zulu time when the student in the Crew Scheduling position called the Crew Scheduling Coordinator in the "Call In Time" box on the "Reserve Crew Management Tool" document.
6. According to Universal E-Lines' Standard Operating Procedures, it always takes a reserve crew 30 minutes to arrive at the airport. Therefore, write down the time the Crew Scheduling Coordinator must call the student back in the "Call Back Time + (:30)" box on the "Reserve Crew Management Tool" document.
7. Set a timer for 30 minutes on a smartphone, watch, or other device immediately after the Skype call with the student in the Crew Scheduling position.

8. Observe the crew scheduling program using Join.Me to make sure the student is entering in each flight crew's duty times correctly and not swapping the flight crews with the reserve crews early in the crew scheduling program.
    a. Note: If the student swaps a flight crew with a reserve crew early in the crew scheduling program, then write down that the student is not adhering to the protocols of the Crew Scheduling position on a white sheet outside the NASA FOCUS Lab Control Room.
9. Once 30 minutes have passed, call the student in the Crew Scheduling position using the appropriate Skype account and inform him or her that the reserve crew has arrived at the airport.
    a. Note: When informing the student that the reserve crew has arrived at the airport, tell the student the reserve crew's number so he or she will not be confused on what reserve crew arrived at the airport.
10. In the "Called Back (✓)" box on the "Reserve Crew Management Tool" document, place a checkmark to show that the Crew Scheduling Coordinator has called back the student in the Crew Scheduling position and informed the student that the reserve crew has arrived at the airport.
11. Observe the crew scheduling program using Join.Me to make sure that the student swapped the flight crew with the reserve crew in the crew scheduling program.
    a. Note: If the student fails to do so, then write down that the student is not adhering to the protocols of the Crew Scheduling position on a white sheet outside the NASA FOCUS Lab Control Room.

b. Note: Sometimes, a flight will be released by the FOC without waiting for a reserve crew to arrive at the airport. Therefore, the flight departed illegally since the flight crew with busted duty times is operating that flight. As a result, write down that particular flight number and report this situation to the NASA FOCUS Lab Administrator. The Administrator will implement downstream consequences and a simulated financial penalty to the airline for this illegal action.

12. Write down any observations made during each embedded flight crew trigger on the back of the "Reserve Crew Management Tool" document.
13. Repeat Steps 2 through 12 every time the student in the Crew Scheduling position calls the Crew Scheduling Coordinator to swap a flight crew with a reserve crew.

Part II – Embedded Expired Medical

During only the second simulation for each team, there is an "Expired Medical" trigger embedded in the crew scheduling program. The student in the Crew Scheduling position must identify which flight crewmember has the expired medical in the crew scheduling program. If the student identifies the flight crewmember with the expired medical, then the student will call the Crew Scheduling Coordinator and/or the NASA FOCUS Lab Administrator. The Crew Scheduling Coordinator must use the following procedures to handle this embedded trigger:

1. Analyze the "Crew Scheduling Bust List for the Crew Scheduling Coordinator" document to determine which flight crewmember has the expired medical.

2. Wait for the student in the Crew Scheduling position to call the NASA FOCUS Lab Administrator to provide information on the flight crewmember's expired medical.
    a. Note: The student in the Crew Scheduling position can also call the Crew Scheduling Coordinator about the flight crewmember's expired medical.
    b. Note: If the flight crewmember who has the expired medical is not replaced before his or her flight is released, then the flight departed illegally. The Crew Scheduling Coordinator must notify the NASA FOCUS Lab Administrator about this situation, and the Administrator will implement a downstream consequence for this situation. In addition, the Administrator will give the airline a simulated financial penalty. If this situation occurs, then this concludes the "Part II - Embedded Expired Medical" section.
3. When the student in the Crew Scheduling position calls the NASA FOCUS Lab Administrator, the Administrator will inform the student that the flight crewmember's medical is actually expired, and the flight crewmember will not be able to fly the rest of the day. Also, the Administrator will inform the student that he or she will need to swap the entire flight crew with a reserve crew.
    a. Note: If the student calls the Crew Scheduling Coordinator, then the Crew Scheduling Coordinator will inform the student that the flight crewmember's medical is expired. Also, the Crew Scheduling Coordinator must inform the student that he or she needs to swap the entire flight crew with a reserve crew.

4. Use Steps 2 through 12 in the "Part I – Embedded Flight Crew Busts" section when the student in the Crew Scheduling position calls the Crew Scheduling Coordinator to replace the flight crew with a reserve crew.

Implementing Non-Embedded Crew Scheduling Triggers

The Crew Scheduling Coordinator must implement at least one non-embedded crew scheduling trigger into every simulation. The non-embedded crew scheduling triggers that the Crew Scheduling Coordinator can implement into a simulation are the following:

1. Sick Captain or First Officer.
2. Fatigued Captain or First Officer.
3. Captain or First Officer caught drinking at the bar before his or her flight.
4. A flight attendant was hurt during his or her flight and is unable to fly the rest of the day.
5. First Officer skateboarded to the gate and is fired at the gate for his or her actions.
6. Captain or First Officer fell in the gap between the airplane and the jet bridge, and he or she is unable to fly for the rest of the day due to breaking his or her leg.

The Crew Scheduling Coordinator will implement these triggers into a simulation by using the following procedures:

1. After most of the first leg flights have arrived at their destination, look at each second leg flight's departure airport. Choose a second leg flight that hasn't left its departure airport and is at a non-hub airport.

2. Tell the NASA FOCUS Lab Administrator what trigger to implement, when to implement the trigger, and what flight to implement the trigger on.
    a. Note: Typically, a non-embedded crew scheduling trigger should be implemented on a flight at least five to 10 minutes before the flight's scheduled departure time.
3. The NASA FOCUS Lab Administrator will go to the Pseudo Pilot room to implement the trigger.
4. While the Administrator is implementing the trigger, write down the trigger that is being implemented, the time the trigger was implemented, and the flight affected by the trigger on a white sheet outside the NASA FOCUS Lab Control Room.
5. After the Administrator implements the trigger, the Crew Scheduling Coordinator must wait in the NASA FOCUS Lab Control Room for a Skype call from the student in the Crew Scheduling position.
6. When the student in the Crew Scheduling position calls the Crew Scheduling Coordinator to replace a flight crew with a reserve crew, use Steps 2 through 12 in the "Part I – Embedded Flight Crew Busts" section.
7. If the student has any questions during the trigger, use your knowledge of the Crew Scheduling position, the trigger, and the aviation industry to answer his or her questions.
8. Write down detailed notes regarding how the student in the Crew Scheduling position handled the trigger on the white sheets outside the NASA FOCUS Lab Control Room.

Writing on the White Sheets

Directly outside the NASA FOCUS Lab Control Room, white sheets have been placed on the walls by a NASA FOCUS Lab staff member. These white sheets are available for all NASA FOCUS Lab staff members to write down any information regarding the day's simulation. Therefore, the Crew Scheduling Coordinator must write down how the student handled the embedded and non-embedded crew scheduling triggers on the white sheets. Also, the Crew Scheduling Coordinator must write down the flights that departed illegally and any observations made during the simulation on the white sheets.

Observing the Crew Scheduling Program

Throughout each simulation, the student in the Crew Scheduling position must accurately manipulate the data in the crew scheduling program. Therefore, the Crew Scheduling Coordinator must monitor how the student is performing these three actions in the program:

1. Entering the times from the flight schedule into the crew scheduling program.
2. Swapping flight crews with reserve crews.
3. Updating each flight crew's duty times after a flight has been timestamped as departed or arrived.

The Crew Scheduling Coordinator must write down how well the student in the Crew Scheduling position is performing these three duties on a white sheet outside the NASA FOCUS Lab Control Room.

Observing the Student in the Crew Scheduling Position

During a simulation, the Crew Scheduling Coordinator might have "free time" after all of the embedded and non-embedded triggers are handled by the student in the Crew Scheduling position. Therefore, the Crew Scheduling Coordinator should use this "free time" to come into the NASA FOCUS Lab to observe the student in the Crew Scheduling position and the team as a whole. Write down your observations on the white sheets outside the NASA FOCUS Lab Control Room.

Completing the Individual Performance Measure

At 10 to 20 minutes before the end of every simulation, the Industrial and Organizational (I/O) Psychology graduate students working in the NASA FOCUS Lab will hand the Crew Scheduling Coordinator a sheet called the "Individual Performance Measure." On this sheet, the Crew Scheduling Coordinator will rate the performance of the student in the Crew Scheduling position. Then, the Crew Scheduling Coordinator will give the Individual Performance Measure sheet back to the I/O Psychology graduate students.

Duties Required After a Simulation

Shutting Down the Personal / Staff Member's Computer

1. On the personal / staff member's computer, click the "X" at the top right-hand corner of the Internet browser's window.
    a. Note: If a pop-up occurs after pressing the "X" in the Internet browser's window that says "Do you want to close all tabs or the current tab," click on the button that says "Close all tabs."
2. Click the "X" in the top right-hand corner of Skype and Skype Secondary's windows to end both Skype sessions.
    a. Note: If Skype was used on a smartphone, tablet, or other device, then close the Skype application on the smartphone, tablet, or other device.
3. Close out all programs running on the computer by pressing the "X" at the top right-hand corner of each program's window.
    a. Note: If prompted to save a document or program, always press "Do not save."
4. Shut down the computer by pressing the "Start" button in the lower left-hand corner of the computer screen and click on "Shut down."

Miscellaneous Duties

After a NASA FOCUS Lab simulation ends, the Crew Scheduling Coordinator must complete the following duties:

1. Collect your notes and the "Reserve Crew Management Tool" document that was used during the simulation.

2. Collect the “Reserve Crew Management Tool – Student Version” document that was used by the student in the Crew Scheduling position during the simulation.
3. Tape these three documents on a white sheet outside the NASA FOCUS Lab Control Room.
4. If you are unable to attend the NASA FOCUS Lab weekly meeting, then you must type and send the following information to the NASA FOCUS Lab Administrator via email:
    a. How did the student handle the embedded and non-embedded crew scheduling triggers?
    b. Did the student catch the expired medical trigger? If so, how did the student handle the trigger?
    c. Did a flight crew bust their duty times? If so, what flight was the flight crew on?
    d. Were there any illegal flights during the simulation? If so, what flight numbers departed illegally and why?
    e. What was the student’s overall performance in the Crew Scheduling position during the simulation?

Flight Operations Data (FOD) 2 Coordinator

Overview

During a NASA FOCUS Lab simulation, the student in the FOD 2 position is in charge of bumping cargo and/or passengers off overweight flights, rerouting bumped cargo and/or passengers, placing the appropriate amount of fuel onto every flight, and communicating information regarding each flight's fuel, weight and balance, and bumped cargo and/or passengers to the Flight Operations Coordinator (FOC). When the student in the FOD 2 position bumps cargo and/or passengers off overweight flights, the student must also communicate via Skype with a NASA FOCUS Lab staff member who is commonly referred to as the FOD 2 Coordinator. Also, the FOD 2 Coordinator is in charge of determining the overall performance of the student in the FOD 2 position.

Quick Guide for the FOD 2 Coordinator

Username and Password Guide

Retrieve the username and password for the FOD 2 Coordinator Skype account from a NASA FOCUS Lab staff member.

Duties Required Before the Start of a Simulation

1. Gather the FOD 2 position's document.
2. Gather and analyze the FOD 2 Coordinator's documents.
3. Prepare a personal / staff member's computer.
4. If needed, fix the FOD 2 program.

Duties Required During a Simulation

1. Handle embedded weight and balance triggers.
2. Implement non-embedded FOD 2 triggers.
3. Observe the student in the FOD 2 position.
4. Write on the white sheets.
5. Complete the Individual Performance Measure.

Duties Required After a Simulation

1. Total the amount of unhandled cargo.
2. Total the number of unhandled passengers.
3. Shut down the personal / staff member's computer.
4. Miscellaneous duties.

Duties Required Before the Start of a Simulation

Gathering the FOD 2 Position's Document

The FOD 2 Coordinator must gather one copy of the "Weight and Balance" document and place the document at the FOD 2 position in the NASA FOCUS Lab.

Gathering and Analyzing the Coordinator's Documents

The FOD 2 Coordinator must gather the following documents from the file cabinet in the NASA FOCUS Lab:

1. "FOD 2 Guide for Cargo" document.
2. "Weight and Balance (FOD 2) Solutions" document.
3. "Backstory – FOD 2" document.
    a. Note: There are three versions for all of these documents. Select the documents that correspond to the day's simulation number.

After gathering these documents, analyze the "FOD 2 Guide for Cargo" document to understand what flights are overweight and must be handled by the student in the FOD 2 position during the simulation.

Preparing a Personal / Staff Member's Computer

During every simulation, the FOD 2 Coordinator must have a computer to perform the tasks of the FOD 2 Coordinator position. If the FOD 2 Coordinator does not have a personal computer, then a NASA FOCUS Lab staff member will be more than willing to provide the FOD 2 Coordinator a computer. Also, the FOD 2 Coordinator must prepare the computer by using the following procedures:

1. Log in to the personal / staff member's computer by using the appropriate username and password.

2. Using an Internet browser, open two new tabs.
3. In both tabs, go to www.join.me.
    a. In the first tab, enter in the FOD 1's Join.Me code.
    b. In the second tab, enter in the FOD 2's Join.Me code.
        i. Note: The list of Join.Me codes will be placed in the NASA FOCUS Lab Control Room by the NASA FOCUS Lab Administrator before every simulation.
4. Open a third tab in the Internet browser and go to www.kayak.com.
    a. Note: The website called "Kayak" will be used to determine whether or not the student in the FOD 2 position chose the best flight to reroute the bumped cargo and/or passengers to the intended destination. Also, Kayak will be used to determine whether or not the flight is a real flight.
5. Start Skype and log in as the FOD 2 Coordinator.
    a. Note: The username and password for the FOD 2 Coordinator Skype account can be retrieved from a NASA FOCUS Lab staff member.
6. In the Skype program, click on the FOD 2's Skype contact in the Contact List.
    a. Note: The FOD 2 Coordinator will only talk to the student in the FOD 2 position during the simulation.
7. Open the FOD 2 program that the student in the FOD 2 position will be using during the simulation.
    b. Note: There are two types of FOD 2 programs. The two types are Daylight Saving Time (DST) and Non-Daylight Saving Time (NDST). For each type, there are three versions. Every FOD 2 program has the

simulation number of when the spreadsheet is to be used in the file name. Select the FOD 2 program that corresponds to the day's simulation number and time of year.

8. Go to the NASA FOCUS Lab and ask the student in the FOD 2 position if he or she has any questions regarding the simulation or the tasks of the FOD 2 position.
    a. Note: Answer his or her questions based on your knowledge of the FOD 2 position and the airline industry. Do not provide any answers to a problem that he or she will encounter during the simulation.

Fixing the FOD 2 Program

If an error occurs in the FOD 2 program, then the following procedures must be used:

1. On the FOD 2 position's computer, click on the "X" in the right-hand corner of the FOD 2 program.
2. When prompted to save or do not save, always click on "Do not save."
3. Double-click on the "Non-DST W&B" or "DST W&B CURRENT" file folder.
    a. Note: Double-click on the file folder based on the time of year.
4. Double-click on the FOD 2 program based on the day's simulation number.
5. Maximize the program's window.

Duties Required During a Simulation

Handling Embedded Weight and Balance Triggers

In all FOD 2 programs, there are embedded weight and balance triggers that cause several flights to be overweight. The student in the FOD 2 position must bump cargo and/or passengers off those flights in order to meet the specific CRJ-200 weight requirements. If the student bumps cargo and/or passengers off the overweight flights, then the student must contact and inform the FOD 2 Coordinator about the changes made to the flights. In addition, the student must reroute the bumped cargo and/or passengers and inform the FOD 2 Coordinator of the rerouting method. In order to handle the embedded weight and balance triggers, the FOD 2 Coordinator must use the following procedures:

1. Retrieve the list of flights that will need extra fuel due to winds aloft and/or for filing a destination alternate from the Weather Expert.
    a. Note: By adding more fuel onto a flight, the student in the FOD 2 position may have to bump more cargo and/or passengers off the overweight flights.
    b. Note: According to Universal E-Lines' Standard Operating Procedures (SOPs), a flight that has to file a destination alternate must load one hour of additional fuel onto the flight.
    c. Note: According to Universal E-Lines' Standard Operating Procedures, any flight encountering headwinds at 50 knots or greater while at cruising altitude is required to load additional fuel onto the flight based on its enroute time, as described below.

i. Thirty minutes of extra fuel must be placed on a flight that has an enroute time of less than one hour.

ii. One hour of extra fuel must be placed on a flight that has an enroute time of one hour or more.

2. Check the flight schedule on the FOD 1 Join.Me screen to see if a flight listed as overweight on the "FOD 2 Guide for Cargo" document departed before the student in the FOD 2 position bumped cargo and/or passengers off the overweight flight.
    a. If so, then the flight departed illegally. Write down the flight number that departed illegally on the "FOD 2 Guide for Cargo" document.
    b. If not, then continue to monitor the flight schedule for illegal flights throughout the simulation. Continue to Step 3.
3. Prepare for the student in the FOD 2 position to call the FOD 2 Coordinator Skype account.
4. Answer all Skype calls from the student in the FOD 2 position.
    a. Note: If the student in the FOD 2 position has not called or messaged the FOD 2 Coordinator Skype account, then enter the NASA FOCUS Lab to see if the student put information about each overweight flight onto the "Weight and Balance" document. If so, then remind the student that he or she must call and inform the FOD 2 Coordinator about the changes made to each flight.

5. Fill out the "FOD 2 Guide for Cargo" document by using the information provided by the student in the FOD 2 position during the Skype call.
    a. Note: If the student does not provide enough information, then ask the student the appropriate questions to receive the required information.
6. Read back all of the information to the student to ensure that the information is recorded correctly on the "FOD 2 Guide for Cargo" document.
7. Check the list of flights that need extra fuel due to winds aloft and/or for filing a destination alternate.
8. Take the following actions after checking the list of flights that need extra fuel:
    a. If the student placed the correct amount of fuel onto a flight, then continue to Step 9.
    b. If the student did not place the correct amount of fuel onto a flight, then the flight departed illegally. Inform the Weather Expert about the flight(s) that departed illegally. In addition, write down the flight numbers that departed illegally on the back of the "FOD 2 Guide for Cargo" document. Then, continue to Step 9.
9. Check the "Weight and Balance (FOD 2) Solutions" document to determine whether or not the student bumped the appropriate amount of cargo and/or number of passengers off the overweight flight.
10. Take the following actions after checking the "Weight and Balance (FOD 2) Solutions" document:
    a. If the student bumped the correct amount of cargo and/or number of passengers off an overweight flight, then continue to Step 11.

b. If the student did not bump the correct amount of cargo and/or number of passengers off an overweight flight and the overweight flight has departed, then the flight departed illegally. Write down the flight number, the reason why the flight is considered illegal, and the amount of cargo and/or number of passengers left unhandled on the "FOD 2 Guide for Cargo" document. Also, place the letters "NH" in the "Handled / Not Handled" box on the "FOD 2 Guide for Cargo" document to indicate that the overweight flight was not handled correctly. Then, continue to Step 11.

11. If the student decides to place bumped cargo and/or passengers from an overweight flight on another Universal E-Lines flight, then use the following procedures:
    a. Maximize the FOD 2 program that the student is currently using in the simulation on the personal / staff member's computer.
    b. In the FOD 2 program, enter the flight number that the student is placing the bumped cargo and/or passengers on.
    c. Enter the amount of bumped cargo and/or number of passengers being placed on the flight.
    d. Enter the amount of fuel being placed on the flight.
    e. If a box on the spreadsheet turns red, then the student's solution will not work. The FOD 2 Coordinator must inform the student in the FOD 2 positon that his or her solution will not work and he or she must find another solution for the bumped cargo and/or passengers.

f. If red boxes do not appear on the spreadsheet, then the student's solution will work. The FOD 2 Coordinator must place a checkmark in the "Handled / Not Handled" box on the "FOD 2 Guide for Cargo" document to indicate that the student correctly handled the bumped cargo and/or passengers from an overweight flight.

    i. Note: If the student does not put bumped cargo and/or passengers on another Universal E-Lines flight, then continue to Step 12.

12. If the student in the FOD 2 position places bumped cargo and/or passengers on another airline's flight, then the FOD 2 Coordinator must use www.kayak.com to verify that the student is putting the cargo and/or passengers on an actual flight. Also, the FOD 2 Coordinator must check www.kayak.com and Universal E-Lines' flight schedule to determine if the student's solution was an optimal solution.

    a. Note: If the student does not put bumped cargo and/or passengers on another airline's flight, then proceed to Step 13.

    b. Note: If the student places bumped cargo and/or passengers on a fake flight, then the FOD 2 Coordinator must call the student via Skype to inform him or her that the flight is not a real flight. Also, the FOD 2 Coordinator must inform the student that he or she must choose another method to reroute the cargo and/or passengers to the intended destination.

13. Write down whether or not the student's solution was an optimal solution on the "FOD 2 Guide for Cargo" document.

14. Write down any observations made during each embedded weight and balance trigger on the "FOD 2 Guide for Cargo" document.
15. Repeat Steps 4 through 14 every time the student in the FOD 2 position calls and informs the FOD 2 Coordinator about changes made to overweight flights.

Implementing Non-Embedded FOD 2 Triggers

The FOD 2 Coordinator can implement two non-embedded FOD 2 triggers into each team's second and third simulation. The two triggers that the FOD 2 Coordinator can implement are the following:

1. Passengers missing their connections from the team's previous simulation.
2. Cargo left unhandled from the team's previous simulation.

The FOD 2 Coordinator will implement the non-embedded FOD 2 triggers into a simulation by using the following procedures:

1. Retrieve the printed version of the team's "Total Revenue Lost" Excel spreadsheet from the NASA FOCUS Lab Administrator.
2. Identify the total number of passengers who missed their connections and/or the total amount of cargo that the team left unhandled during their previous simulation.
    a. Note: If the team did not have passengers missing their connections and/or the team handled all of the cargo, then this concludes the section on how to implement non-embedded FOD 2 triggers into a simulation.
3. Choose an airport on the flight schedule where the passengers and/or cargo are currently located.

4. Choose the amount of passengers and/or cargo located at that airport based on the amount identified on the team's "Total Revenue Lost" Excel spreadsheet during Step 2.
5. Choose the passengers and/or cargo's destination airport on the flight schedule.
    a. Note: When choosing a destination airport, make sure there is a Universal E-Lines flight that can take the passengers and/or cargo to the destination airport.
6. Determine which Universal E-Lines flights fly from the airport chosen in Step 3 to the airport chosen in Step 5.
7. Maximize the FOD 2 program that the student in the FOD 2 position is currently using in the simulation on the personal / staff member's computer.
8. Type in each flight number from Step 6 into the FOD 2 program.
9. Determine whether or not each flight from Step 6 can take all of the passengers and/or cargo from the current location to the destination airport.
    a. If so, then write down the flight numbers and the number of passengers and/or amount of cargo that each flight can carry on the back of the "FOD 2 Guide for Cargo" document.
    b. If not, then go back to Step 3.
10. Implement the non-embedded FOD 2 trigger into the simulation by providing the student in the FOD 2 position with the following information via a Skype voice call:
    a. The airport where the passengers and/or cargo are currently located.
    b. Number of passengers and/or amount of cargo located at the airport.

c. The passengers and/or cargo's destination airport.

11. Allow the student time to determine the best way to get the passengers and/or cargo to the destination airport.
12. If the student in the FOD 2 position calls the FOD 2 Coordinator back with a solution for the passengers and/or cargo, write down the student's solution.
    a. Note: Sometimes, the student in the FOD 2 position will not call the FOD 2 Coordinator back with a solution for the non-embedded FOD 2 trigger. If this situation occurs, write down that the student did not provide a solution for the non-embedded FOD 2 trigger on the back of the "FOD 2 Guide for Cargo" document. This ends the section on how to implement non-embedded FOD 2 triggers into a simulation.
13. Compare the student's solution with the flight numbers written down during Step 6 and 9 and determine whether or not the student's solution was an optimal solution.
    a. Note: If the student in the FOD 2 position decides to place the passengers and/or cargo on another airline's flight, then the FOD 2 Coordinator must use www.kayak.com to verify that the student is putting the passengers and/or cargo on an actual flight. Also, the FOD 2 Coordinator must check www.kayak.com and Universal E-Lines' flight schedule to determine if the student's solution was an optimal solution.
14. Write down a brief summary of the student's performance during the non-embedded FOD 2 triggers on the back of the "FOD 2 Guide for Cargo" document.

Observing the Student in the FOD 2 Position

During a simulation, the FOD 2 Coordinator might have "free time" after all of the embedded and non-embedded triggers are handled by the student in the FOD 2 position. Therefore, the FOD 2 Coordinator should use this "free time" to observe the student in the FOD 2 position and the team as a whole in the NASA FOCUS Lab. Write down your observations of the student and the team on the white sheets outside the NASA FOCUS Lab Control Room.

Writing on the White Sheets

Directly outside the NASA FOCUS Lab Control Room, white sheets have been placed on the walls by a NASA FOCUS Lab staff member. These white sheets are available for all NASA FOCUS Lab staff members to write down any information regarding the day's simulation. Therefore, the FOD 2 Coordinator must write down the following information on the white sheets during the simulation:

1. Each flight that departed illegally and why.
2. Brief description of how the student in the FOD 2 position handled the embedded and non-embedded FOD 2 triggers.
3. General impressions of the student in the FOD 2 position.

Completing the Individual Performance Measure

At 10 to 20 minutes before the end of every simulation, the Industrial and Organizational (I/O) Psychology graduate students working in the NASA FOCUS Lab will hand the FOD 2 Coordinator a sheet called the "Individual Performance Measure." On this sheet, the FOD 2 Coordinator will rate the performance of the student in the FOD 2 position. Then, the FOD 2 Coordinator will give the Individual Performance Measure sheet back to the I/O Psychology graduate students.

Duties Required After a Simulation

Totaling the Amount of Unhandled Cargo

At the end of a simulation, the FOD 2 Coordinator must determine the total amount of cargo that was left unhandled by the student in the FOD 2 position by using the following procedures:

1. Determine the amount of unhandled cargo during the embedded weight and balance triggers.
    a. Note: "Unhandled cargo" means that the student bumped cargo off an overweight flight, that flight departed, and the bumped cargo was never rerouted to its destination.
    b. Note: Cargo bumped off of an overweight flight that has not departed is not considered "unhandled cargo."
2. Determine the amount of unhandled cargo during the non-embedded FOD 2 triggers.
3. Add the amounts of unhandled cargo from Steps 1 and 2 to find the total amount of unhandled cargo.

After taking these three steps, write down the total amount of unhandled cargo on the white sheets located outside the NASA FOCUS Lab Control Room.

Totaling the Number of Unhandled Passengers

At the end of a simulation, the FOD 2 Coordinator must determine the total number of passengers that were left unhandled by the student in the FOD 2 position by using the following procedures:

1. Determine the number of unhandled passengers during the embedded weight and balance triggers.
    a. Note: "Unhandled passengers" mean that the student bumped passengers off an overweight flight, that flight departed, and the bumped passengers were not rerouted to their destination.
2. Determine the number of unhandled passengers during the non-embedded FOD 2 triggers.
3. Add the number of unhandled passengers from Steps 1 and 2 to find the total number of unhandled passengers.

After taking these three steps, write down the total number of unhandled passengers on the white sheets located outside the NASA FOCUS Lab Control Room.

Shutting Down the Personal / Staff Member's Computer

The FOD 2 Coordinator must shut down the personal / staff member's computer by using the following procedures:

1. On the personal / staff member's computer, click the "X" at the top right-hand corner of the Internet browser's window.
    a. Note: If a pop-up occurs after pressing the "X" in the Internet browser's window that says "Do you want to close all tabs or the current tab," click on the button that says "Close all tabs."
2. Click the "X" in the top right-hand corner of the Skype window to end the Skype session.
3. Click the "X" in the top right-hand corner of the FOD 2 program and press "Do not save."

4. Close out all other programs running on the computer by pressing the "X" at the top right-hand corner of each program's window.
    a. Note: If prompted to save a document or program, always press "Do not save."
5. Shut down the computer by pressing the "Start" button in the lower left-hand corner of the computer screen and click on "Shut down."

Miscellaneous Duties

After a NASA FOCUS Lab simulation ends, the FOD 2 Coordinator must complete the following duties:

1. Collect your notes and the "FOD 2 Guide for Cargo" document that was used during the simulation.
2. Collect the "Weight and Balance" document that was used by the student in the FOD 2 position during the simulation.
3. Return the "Weight and Balance (FOD 2) Solutions" and "Backstory – FOD 2" documents to the file cabinet in the NASA FOCUS Lab.
    a. Note: If these documents have been written on, then please recycle these documents.
4. Tape your notes, the "FOD 2 Guide for Cargo" document, and the "Weight and Balance" document on a white sheet outside the NASA FOCUS Lab Control Room.

5. If you are unable to attend the NASA FOCUS Lab weekly meeting, then you must type and send the following information to the NASA FOCUS Lab Administrator via email:
    a. Brief description of how the student handled the embedded weight and balance triggers.
    b. Brief description of how the student handled the non-embedded FOD 2 triggers.
    c. The total amount of unhandled cargo.
    d. The total number of unhandled passengers.
    e. The flights that departed illegally and a brief description of why the flights departed illegally.
    f. The overall performance of the student in the FOD 2 position.

Maintenance Expert

Overview

During a NASA FOCUS Lab simulation, the students in the Maintenance Control and Maintenance Planning and Scheduling positions are in charge of scheduling maintenance on Universal E-Lines's aircraft at the most appropriate time, communicating each aircraft's maintenance situation to the Flight Operations Coordinator (FOC), inputting information into the Resource Maintenance System (RMS), and determining whether or not an aircraft's maintenance issue is on the Minimum Equipment List (MEL). When the students in the Maintenance positions need to schedule maintenance on a Universal E-Lines's aircraft, the students must call a NASA FOCUS Lab staff member via Skype. The staff member in charge of answering Skype calls from the students in the Maintenance positions is commonly referred to as the Maintenance Expert. Also, the Maintenance Expert is in charge of determining the overall performance of the students in the Maintenance positions.

Quick Guide for the Maintenance Expert

Username and Password Guide

Retrieve the usernames and passwords for the BNA and JAX Gate Maintenance Skype accounts from a NASA FOCUS Lab staff member.

Duties Required Before the Start of a Simulation

1. Prepare a personal / staff member's computer.
2. Prepare a second computer.
3. Clear the RMS of entries / embedded triggers.
4. Input embedded maintenance triggers.
5. Brainstorm with the NASA FOCUS Lab Administrator.
6. Review the Maintenance positions with the students.
7. Contact the CRJ Flight Instructor.

Duties Required During a Simulation

1. Implement embedded maintenance triggers.
2. Implement non-embedded maintenance triggers.
3. Implement non-embedded CRJ maintenance triggers.
4. Handle requests for spare aircraft.
5. Write on the white sheets.
6. Complete the Individual Performance Measure.

Duties Required After a Simulation

1. Shut down the second and personal / staff member's computer.
2. Miscellaneous duties.

Duties Required Before the Start of a Simulation

Preparing a Personal / Staff Member's Computer

During every simulation, the Maintenance Expert must have a computer to perform the tasks of the Maintenance Expert position. If the Maintenance Expert does not have a personal computer, then a NASA FOCUS Lab staff member will be more than willing to provide the Maintenance Expert a computer. Also, the Maintenance Expert must prepare the computer by using the following procedures:

1. Log in to the personal / staff member's computer by using the appropriate username and password.
2. Using an Internet browser, open three new tabs.
3. In all three tabs, go to www.join.me.
    a. In the first tab, enter in the Maintenance Planning and Scheduling's Join.Me code.
    b. In the second tab, enter in the Maintenance Control's Join.Me code.
    c. In the third tab, enter in the FOD 1's Join.Me code.
        i. Note: The list of Join.Me codes will be placed in the NASA FOCUS Lab Control Room by the NASA FOCUS Lab Administrator before every simulation.
4. On the desktop screen, open the file named "cr2 mel [rev. 02] [11-20-2012] [entire manual]."
5. Start Skype and Skype Secondary.
    a. Note: If the computer does not have Skype Secondary, then use a smartphone, tablet, or other device that has the Skype application.

6. Log in to the BNA and JAX Gate Maintenance Skype accounts.
    a. Note: The usernames and passwords for these Skype accounts can be retrieved from a NASA FOCUS Lab staff member.

Preparing a Second Computer

Inside the NASA FOCUS Lab Control Room, there are two computers provided by Middle Tennessee State University (MTSU). The Maintenance Expert must choose one of the two computers to use during the simulation. Also, the Maintenance Expert must prepare the computer by using the following procedures:

1. Turn on the MTSU computer.
    a. Note: The MTSU computer should automatically log in. If not, log in using the appropriate username and password, which can be retrieved from a NASA FOCUS Lab staff member.
2. Using an Internet browser, open a new tab.
3. In the new tab, go to www.Talon-systems.com/mtsu/rms.
4. Log in to the RMS.
    a. Note: The username and password for the RMS can be retrieved from a NASA FOCUS Lab staff member.
5. Press “OK” on the pop-up that occurs after logging in to the RMS.
6. On the left-hand side of the Internet browser’s window, click on “Resources.”
7. Uncheck the box titled “Only downed” and press the “Filter” button.

Clearing the RMS of Entries / Embedded Triggers

Before inputting the embedded maintenance triggers in the RMS for the upcoming simulation, the Maintenance Expert must clear the RMS of any entries and/or embedded maintenance triggers that were implemented during the previous NASA FOCUS Lab simulation.

Inputting Embedded Maintenance Triggers

When inputting the embedded maintenance triggers into the RMS for each simulation, the Maintenance Expert must abide by the following guidelines:

First Simulation for Each Team

a. Input two A-Checks (A-Phase Inspections) on two separate aircraft.
    i. Note: These inspections only last about 30 minutes.
b. Input one parts replacement on one aircraft, which can be the following:
    i. Fire extinguisher.
    ii. Hydraulic pump.
    iii. Battery.
c. Input one Category C MEL on one aircraft, which can be the following:
    i. Cargo door “open” indication is malfunctioning.
    ii. APU is inoperative.
    iii. Engine fire loop detection sensor is inoperative.
    iv. Thrust reverser is inoperative.
        1. Note: Category C MELs have three flight legs of eligibility.

Second Simulation for Each Team

a. Input two A-Checks (A-Phase Inspections) on two separate aircraft.
    i. Note: These inspections only last about 30 minutes.
b. Input one parts replacement on one aircraft, which can be the following:
    i. Fire extinguisher.
    ii. Hydraulic pump.
    iii. Battery.
c. Input one Category B MEL on one aircraft, which can be the following:
    i. Brake temperature indication.
    ii. Transformer Rectifier Unit (TRU) is inoperative.
    iii. Non-stabilized magnetic compass (Standby compass) is inoperative.
        1. Note: Category B MELs have two flight legs of eligibility.

Third Simulation for Each Team

a. Input two A-Checks (A-Phase Inspections) on two separate aircraft.
    i. Note: These inspections only last about 30 minutes.
b. Input one parts replacement on one aircraft, which can be the following:
    i. Fire extinguisher.
    ii. Hydraulic pump.
    iii. Battery.
c. Input one Category A MEL on one aircraft, which can be the following:
    i. Landing gear retraction failure.
    ii. Main battery is inoperative.

iii. Ice detection system is inoperative.

iv. Clocks are inoperative.

v. Flight Data Recorder (FDR) is inoperative.

vi. Ground Proximity Warning System (GPWS) is inoperative.

1. Note: Category A MELs have one flight leg of eligibility.

Note: Make sure each embedded maintenance trigger in the RMS shows the maintenance required on the aircraft, the word "Scheduled," and the due date for the maintenance on the aircraft (the due date should be the date of the simulation).

Brainstorming with the NASA FOCUS Lab Administrator

Before every simulation begins, the Maintenance Expert must brainstorm with the NASA FOCUS Lab Administrator about what non-embedded maintenance triggers to implement during the NASA FOCUS Lab simulation. The non-embedded maintenance triggers that can be implemented by the Administrator and the Maintenance Expert are the following:

1. Explosive decompression causing a hole in the aircraft.
2. Windshield anti-ice system is inoperative.
3. Brake temperature indication.
4. Engine oil leak.
5. Flaps stuck at 45°.
6. Cargo door indication inoperative.
7. Engine generator (Integrated Drive Generator – IDG) is inoperative.
8. Bird strike.
9. Rapid cabin decompression.

10. One air conditioning pack is inoperative.

11. Tail strike causing damage to the aircraft.

12. Engine flameout.

13. Flight deck security door latch is inoperative.

14. Cockpit Voice Recorder (CVR) is inoperative.

15. Oxygen Low Pressure Caution Message.

The NASA FOCUS Lab Administrator and the Maintenance Expert must choose the appropriate number of non-embedded maintenance triggers to implement into a simulation based on the simulation's number, or difficulty.

Reviewing the Maintenance Positions with the Students

Since each team only participates in a NASA FOCUS Lab simulation once every three weeks, the Maintenance Expert must give a brief retraining session to the students in the Maintenance Control and Maintenance Planning and Scheduling positions. The Maintenance Expert must begin the retraining session no later than 20 minutes before the NASA FOCUS Lab simulation is scheduled to begin. Also, the Maintenance Expert must base the retraining session off of the Maintenance Training Module, Maintenance Training Video, "MX Control A" Microsoft Word file, and/or "MX Control B" Microsoft Word file, which are available on D2L.

Contacting the CRJ Flight Instructor

The Maintenance Expert must make contact with the CRJ Flight Instructor 10 minutes before the NASA FOCUS Lab simulation begins. Once contact has been made, the Maintenance Expert and the CRJ Flight Instructor must decide on the non-embedded CRJ maintenance triggers that will be implemented during the simulation. The CRJ

Flight Instructor and the Maintenance Expert must choose at least one trigger from the list below to implement during every simulation:

1. Cargo door “open” indication is malfunctioning.
2. Generator (IDG) is inoperative.
3. Thrust reverser is inoperative.
4. Hydraulic pump indication.
5. Electronic Control Unit (ECU) is inoperative.
    a. Note: All of these maintenance issues are on the MEL.

After choosing the non-embedded CRJ maintenance trigger(s) to implement into the NASA FOCUS Lab simulation, the Maintenance Expert must tell the CRJ Flight Instructor to implement the trigger(s) while on the ground or on final at Knoxville, Tennessee (KTYS).

Duties Required During a Simulation

Handling Embedded Maintenance Triggers

During every simulation, the students in the Maintenance Control and Maintenance Planning and Scheduling positions must resolve five embedded maintenance triggers within the RMS. While the students are resolving the embedded maintenance triggers, the Maintenance Expert must use the following procedures:

1. Prepare for the students in the Maintenance Control and Maintenance Planning and Scheduling positions to call the BNA and/or JAX Gate Maintenance Skype accounts.
2. Answer all Skype calls from the students in the Maintenance positions.
3. Write down the type of maintenance that the students want performed on an aircraft that has an embedded maintenance issue, when the students want to schedule the maintenance on the aircraft, and when the aircraft is supposed to arrive at BNA or JAX.
    a. Note: If the students do not provide enough information, then ask the students the appropriate questions to receive the required information.
4. Inform the students that they will receive a Skype call when the maintenance has been completed on the aircraft.
5. Monitor the flight schedule on the FOD 1 Join.Me tab in the Internet browser to determine if the aircraft has arrived at BNA or JAX.
6. When the aircraft has arrived at BNA or JAX, take the aircraft out of service in the RMS by “downing” the aircraft.

7. Each embedded maintenance trigger takes a specific amount of time to complete. Therefore, set a timer on a smartphone, watch, or other device to a time listed below as a reminder to call the students back via Skype to inform them that the maintenance on the aircraft has been completed.
    a. A-Check (A-Phase Inspection) = 30 minutes.
    b. Part replacement = 25 minutes.
    c. MEL item = 20 minutes.
8. After the specific length of time passes, call and inform the students in the Maintenance positions that the maintenance on the aircraft has been completed. Also, remind the students to finish any entries in the RMS that must be completed before putting the aircraft back in service.
9. Check the RMS to see if the students take the following actions:
    a. They scheduled maintenance on the aircraft early in the simulation.
    b. They correctly entered information into the RMS.
    c. They closed the work order.
    d. They placed the aircraft back in service.
10. Write down a brief description of how the students handled the embedded maintenance trigger.
11. Repeat Steps 2 through 10 every time the students in the Maintenance positions call the JAX and/or BNA Gate Maintenance Skype accounts about embedded maintenance triggers.

Implementing Non-Embedded Maintenance Triggers

The Maintenance Expert must implement the non-embedded maintenance triggers that were chosen before the simulation by using the following procedures:

1. Choose one non-embedded maintenance trigger to implement into the simulation.
2. Determine whether or not the non-embedded maintenance trigger is on the MEL.
3. Choose a second-leg flight to implement the non-embedded maintenance trigger on.
    a. Note: Be aware of the triggers that have already been implemented into the simulation. Never implement two triggers on a single flight.
4. Inform the NASA FOCUS Lab Administrator of the trigger that will be implemented into the simulation and the flight number that will be affected by the trigger.
5. Implement the non-embedded maintenance trigger before the second-leg flight departs or while the second-leg flight is enroute to its destination.
    a. Note: Typically, the Maintenance Expert should implement the non-embedded maintenance trigger through the student in the Pseudo Pilot position. However, the Maintenance Expert should choose the appropriate method for implementing the trigger.
6. Once the students in the Maintenance positions have been notified about the aircraft with the maintenance issue, the students must enter a new work order for the aircraft in the RMS. Therefore, the Maintenance Expert must review the work order entered in the RMS by the students in the Maintenance positions. The work order must meet the following guidelines:

a. The information about the aircraft's maintenance issue is correctly documented in the work order.
b. The information in the work order is clear and concise.
    i. Note: If the work order does not meet these guidelines, then the Maintenance Expert must use the appropriate Skype account to call and inform the students in the Maintenance positions that the information provided in the work order is not correct, clear, and/or concise. Also, the Maintenance Expert must ask the students the appropriate questions to clarify the information in the work order until the guidelines are met.

7. After entering a new work order in the RMS, the students in the Maintenance positions must determine the best way to fix the aircraft's maintenance issue. The students will begin by looking for the aircraft's maintenance issue in the MEL. Open the Maintenance Control and Maintenance Planning and Scheduling Join.ME sessions to watch the students use the MEL. If the maintenance issue is in the MEL, then continue to Step 8. If the maintenance issue is not in the MEL, then continue to Step 19.
8. Since the maintenance issue is in the MEL, the Maintenance Expert should look for the students to take the following actions:
    a. Find the appropriate MEL number and Category.
    b. Enter the MEL number and Category in the work order for the aircraft with the maintenance issue in the RMS.

    c. Schedule maintenance on the aircraft at one of Universal E-Lines' hubs based on the information provided by the MEL.

9. Once the students have entered the required information in the work order, the students must call and inform the maintenance gate at JAX or BNA about when the aircraft with the maintenance issue will arrive at the airport, when they want the maintenance to be performed, and what kind of maintenance needs to be performed on the aircraft. Therefore, the Maintenance Expert must answer all Skype calls from the students in the Maintenance positions.
10. Write down the information provided by the students during the Skype call.
    a. Note: If the students do not provide enough information, then ask the students the appropriate questions to receive the required information.
11. Inform the students that they will receive a Skype call when the maintenance has been completed on the aircraft.
12. Monitor the flight schedule on FOD 1's Join.Me session to determine if the aircraft has arrived at BNA or JAX.
13. When the aircraft has arrived at BNA or JAX, the Maintenance Expert must take the aircraft out of service in the RMS by "downing" the aircraft.
14. Since maintenance on an MEL item takes 20 minutes to complete, the Maintenance Expert must set a timer on a smartphone, watch, or other device for 20 minutes as a reminder to call the students back via Skype to inform them that the maintenance has been completed on the aircraft.
15. Once 20 minutes have passed, the Maintenance Expert must call and inform the students in the Maintenance positions that the maintenance on the aircraft has

been completed. Also, remind the students to finish any entries in the RMS that must be completed before putting the aircraft back in service.

16. Check the work order in the RMS to see if the students took the following actions:
    a. Correctly entered the remaining information into the RMS.
    b. Closed the work order.
    c. Placed the aircraft back in service by "upping" the aircraft in the RMS.
17. Write down a brief description of how the students handled the non-embedded maintenance trigger.
18. Repeat Steps 1 through 17 when implementing a non-embedded maintenance trigger that is on the MEL.
19. Since the maintenance issue is not on the MEL, the Maintenance Expert must observe the Maintenance Control and Maintenance Planning and Scheduling Join.Me sessions to see if the students are taking any of the following actions:
    a. Using contract maintenance at a non-hub airport to resolve the aircraft's maintenance issue. If this action is taken, continue to Step 20.
    b. Using a Universal E-Lines' flight, another airlines' flight, or car to send two Universal E-Lines' maintenance personnel and aircraft parts to the airport where the aircraft with the maintenance issue is located. If this action is taken, then continue to Step 23.
    c. Sending two Universal E-Lines' maintenance personnel and aircraft parts on a Universal E-Lines' spare aircraft to the airport where the aircraft

with the maintenance issue is located. If this action is taken, then continue to Step 32.

20. Since the students want to use a contract maintenance company, the students must call the NASA FOCUS Lab Administrator about using a contract maintenance company at or near the airport where the aircraft is located. The NASA FOCUS Lab Administrator will grant the students permission to use the contract maintenance company and will inform the students when the maintenance has been completed. When the NASA FOCUS Lab Administrator informs the students and the Maintenance Expert that the contract maintenance on the aircraft has been completed, then the Maintenance Expert must look for the students to take the following actions:
    a. Entered the contract maintenance company name in the work order for the aircraft in the RMS.
    b. Entered how the aircraft was fixed by the contract maintenance company in the work order in the RMS.
    c. Closed the work order.
    d. Placed the aircraft back in service by "upping" the aircraft in the RMS, if needed.
        i. Note: If an aircraft has to make an emergency landing at a non-hub airport due to a non-embedded maintenance trigger, then the Maintenance Expert must also "down" the aircraft in the RMS when the aircraft has landed.

ii. Note: If an aircraft is damaged and cannot be repaired by the contract maintenance company, then the NASA FOCUS Lab Administrator will call the students via Skype to inform them that the aircraft is down for the day, and they must send Universal E-Lines' maintenance personnel to fix the aircraft. If this situation occurs, then return to Step 19.

21. Write down a brief summary of how the students handled the non-embedded maintenance trigger.
    a. Note: If the students did not handle the non-embedded maintenance trigger legally, safely, efficiently, and/or quickly, then downstream consequences can be implemented into the simulation (as determined by the NASA FOCUS Lab Administrator).
22. Repeat Steps 20 and 21 when the students use a contract maintenance company to fix an aircraft's maintenance issue at a non-hub airport.
23. Since the students are sending two Universal E-Lines' maintenance personnel and aircraft parts to fix the aircraft's maintenance issue, the Maintenance Expert should look for the students to take one of the following actions:
    a. Check with the student in the FOD 2 position to determine if there are enough seats available on a Universal E-Lines' flight to send two Universal E-Lines' maintenance personnel and aircraft parts to the airport where the aircraft with the maintenance issue is located.

b. Use the Internet to find another airline's flight that can take the two Universal E-Lines' maintenance personnel and the aircraft parts to the airport where the aircraft with the maintenance issue is located.

c. Find a rental car online that the maintenance personnel can use to drive to the airport where the aircraft with the maintenance issue is located.

24. After deciding on how to send the maintenance personnel and aircraft parts to the airport where the aircraft is located, the students in the Maintenance positions must call the Maintenance Expert. Therefore, the Maintenance Expert must answer all Skype calls from the students.
25. The Maintenance Expert must grant the students permission to use a Universal E-Lines' flight, another airline's flight, or a rental car to send the two Universal E-Lines' maintenance personnel and aircraft parts to the airport where the aircraft is located.
26. The Maintenance Expert must observe the RMS to see if the work order for the aircraft has been edited by the students to show that they sent two Universal E-Lines' maintenance personnel and aircraft parts on a specific flight or in a rental car to fix the aircraft with the maintenance issue.
27. After the maintenance personnel and aircraft parts arrive at the airport where the aircraft with the maintenance issue is located, set a timer to the amount of time it will take for the maintenance personnel to complete the maintenance on the aircraft as a reminder.
28. When the maintenance personnel has completed the maintenance on the aircraft, the Maintenance Expert must call the students in the Maintenance positions via

Skype to inform them that the aircraft is ready to be placed back in service. The Maintenance Expert should also remind the students to finish any entries in the RMS before placing the aircraft back in service.

29. The Maintenance Expert should observe the RMS to see if the students take the following actions:
    a. Correctly entered the remaining information into the RMS.
    b. Closed the work order.
    c. Placed the aircraft back in service by "upping" the aircraft in the RMS, if needed.
30. Write down a brief summary of how the students handled the non-embedded maintenance trigger.
    a. Note: If the students did not handle the non-embedded maintenance trigger legally, safely, efficiently, and/or quickly, then downstream consequences can be implemented into the simulation (as determined by the NASA FOCUS Lab Administrator).
31. Repeat Steps 23 through 30 when the students send two Universal E-Lines' maintenance personnel and aircraft parts to fix an aircraft with a maintenance issue at a non-hub airport.
32. Before the students in the Maintenance positions can use a spare aircraft to send two Universal E-Lines' maintenance personnel and aircraft parts to the airport where the aircraft with the maintenance issue is located, the students must call the Maintenance Expert via Skype to ask if there are spare aircraft available at Universal E-Lines' hubs.

33. The Maintenance Expert shall inform the students that there are spare aircraft available at Universal E-Lines' hubs.
34. The Maintenance Expert must observe the students in the Maintenance positions talking to the student in the Crew Scheduling position about getting a reserve crew to fly the spare aircraft.
    a. Note: If a reserve crew is available, then proceed to Step 35. If there are no reserve crews available, then the students in the Maintenance positions cannot use a spare aircraft.
35. The students in the Maintenance positions should call the Maintenance Expert via Skype about getting a reserve crew to fly the spare aircraft. Therefore, the Maintenance Expert must answer all Skype calls from the students.
36. When the students tell the Maintenance Expert that they have sent a reserve crew to fly the spare aircraft, the Maintenance Expert will grant the students a spare aircraft at one of Universal E-Lines' hubs.
    a. Note: The spare aircraft tail numbers in the RMS are the following:
        i. N61525
        ii. N61526
        iii. N61527
        iv. N61528
        v. N61529
        vi. N61530
        vii. N61531

37. The Maintenance Expert must observe the RMS to see if the work order has been edited by the students to show that they sent two Universal E-Lines' maintenance personnel and aircraft parts on a spare aircraft to perform maintenance on the aircraft with the maintenance issue.
38. When the maintenance personnel and aircraft parts have arrived at the airport, set a timer to the amount of time it will take for the maintenance personnel to complete the maintenance on the aircraft as a reminder.
39. When the maintenance personnel has completed the maintenance on the aircraft, the Maintenance Expert must call the students in the Maintenance positions via Skype to inform them that the aircraft is ready to be placed back in service. The Maintenance Expert should also remind the students to finish any entries in the RMS before placing the aircraft back in service.
40. The Maintenance Expert should observe the RMS to see if the students take the following actions:
    a. Correctly entered the remaining information into the RMS.
    b. Closed the work order.
    c. Placed the aircraft back in service by "upping" the aircraft in the RMS, if needed.
41. Write down a brief summary of how the students handled the non-embedded maintenance trigger.
    a. Note: If the students did not handle the non-embedded maintenance trigger legally, safely, efficiently, and/or quickly, then downstream

consequences can be implemented into the simulation (as determined by the NASA FOCUS Lab Administrator).

42. Repeat Steps 32 through 41 when the students use a spare aircraft to send two Universal E-Lines' maintenance personnel and aircraft parts to fix an aircraft's maintenance issue at a non-hub airport.

Implementing Non-Embedded CRJ Maintenance Triggers

The Maintenance Expert must use the following procedures to implement non-embedded CRJ maintenance triggers:

1. Call the CRJ Flight Instructor at the appropriate time to see if he or she has implemented the non-embedded CRJ maintenance trigger(s).
    a. If he or she has implemented the trigger(s), then continue to Step 2.
    b. If not, then the Maintenance Expert must tell the CRJ Flight Instructor to implement the trigger(s).
2. Once the students in the Maintenance positions have been notified about the maintenance issue on the CRJ – 200 simulator aircraft, the students must enter a new work order for the aircraft in the RMS. Therefore, the Maintenance Expert must review the work order in the RMS. The work order must meet the following guidelines:
    a. The information about the aircraft's maintenance issue is correctly documented in the work order.
    b. The information in the work order is clear and concise.
        i. Note: If the work order does not meet these guidelines, then the Maintenance Expert must use Skype to call and inform the students

in the Maintenance positions that the information provided in the work order is not correct, clear, and/or concise. Also, the Maintenance Expert must ask the students the appropriate questions to clarify the information in the work order until the guidelines are met.

3. Since all of the non-embedded CRJ maintenance triggers are on the MEL, the Maintenance Expert should look for the students in the Maintenance Control and Maintenance Planning and Scheduling positions to take the following actions:
    a. Find the appropriate MEL number and category.
    b. Enter the MEL number and category in the aircraft's work order in the RMS.
    c. Schedule maintenance on the aircraft at KBNA.
4. Once the students have entered the required information in the work order, they must call and inform the maintenance gate at KBNA about when the aircraft will arrive at the airport, when they want the maintenance to be performed, and what kind of maintenance needs to be performed on the aircraft. Therefore, the Maintenance Expert must answer all Skype calls from the students.
5. Write down the information provided by the students during the Skype call.
    a. Note: If the students do not provide enough information, then ask the students the appropriate questions to receive the required information.
6. Inform the students that they will receive a Skype call when the maintenance has been completed on the aircraft.

7. Monitor the flight schedule on the FOD 1 Join.Me session to determine if the aircraft has arrived at KBNA.
8. When the aircraft has arrived at KBNA, the Maintenance Expert must take the aircraft out of service by "downing" the aircraft in the RMS.
9. Since maintenance on an MEL item takes 20 minutes to complete, the Maintenance Expert must set a timer on a smartphone, watch, or other device for 20 minutes as a reminder to call the students back via Skype to inform them that the maintenance has been completed on the aircraft.
10. Once 20 minutes have passed, the Maintenance Expert must call and inform the students in the Maintenance positions that the maintenance on the aircraft has been completed. Also, remind the students to finish any entries in the RMS that must be completed before putting the aircraft back in service.
11. Check the work order in the RMS to see if the students took the following actions:
    a. Correctly entered the remaining information in the work order in the RMS.
    b. Closed the work order.
    c. Placed the aircraft back in service by "upping" the aircraft in the RMS.
12. Write down a brief description of how the students handled the non-embedded CRJ maintenance trigger(s).
13. Repeat Steps 1 through 12 when implementing non-embedded CRJ maintenance trigger(s).

Handling Requests for Spare Aircraft

During a simulation, a team may need a spare aircraft to resolve a trigger. Therefore, the Maintenance Expert must handle requests for a spare aircraft by using the following procedures:

1. Before the students in the Maintenance positions can be granted a spare aircraft, the students must call the Maintenance Expert via Skype to inquire about available spare aircraft at Universal E-Lines' hubs. The Maintenance Expert must answer all Skype calls from the students in the Maintenance positions.
2. The Maintenance Expert shall inform the students that there are spare aircraft available at Universal E-Lines' hubs.
3. The Maintenance Expert should observe the students in the Maintenance positions talking to the student in the Crew Scheduling position about sending a reserve crew to fly the spare aircraft.
    a. Note: If a reserve crew is available, then proceed to Step 4. If there are no reserve crews available, then the students in the Maintenance positions must use another option to resolve the trigger.
4. When the students in the Maintenance positions call and inform the Maintenance Expert that they have sent a reserve crew to fly the spare aircraft, the Maintenance Expert will grant the students a spare aircraft from the list below:
    a. N61525
    b. N61526
    c. N61527
    d. N61528

e. N61529

f. N61530

g. N61531

5. Observe the RMS to see if the students took the following actions after being granted a spare aircraft:
    a. Created a new work order in the RMS for the spare aircraft.
    b. Entered the spare aircraft's tail number in the work order.
    c. Entered the tail number of the aircraft that the spare aircraft is taking over, if needed.
    d. Entered the airport where the spare aircraft is going, if needed.
    e. Entered the reason why they are using the spare aircraft.
6. Set a timer on a smartphone, watch, or other device to the amount of time it will take for the spare aircraft to arrive at its destination as a reminder to call the students in the Maintenance positions.
7. When the spare aircraft arrives at its destination, the Maintenance Expert must call the students in the Maintenance positions via Skype to inform them that the spare aircraft has arrived at its destination.
8. Write down a brief summary of why the students used a spare aircraft and the quality of the spare aircraft's work order in the RMS.

Writing on the White Sheets

Directly outside the NASA FOCUS Lab Control Room, white sheets have been placed on the walls by a NASA FOCUS Lab staff member. These white sheets are available for all NASA FOCUS Lab staff members to write down any information

regarding the day's simulation. Therefore, the Maintenance Expert must write down the following information on the white sheets during the simulation:

1. Brief description of how the students in the Maintenance positions handled the embedded maintenance triggers.
2. Brief description of how the students in the Maintenance positions handled the non-embedded maintenance triggers.
3. Brief description of how the students in the Maintenance positions handled the non-embedded CRJ maintenance triggers.
4. Brief description of why the solutions the students used to handle the maintenance triggers were good or bad.
5. Brief description of any downstream consequences.
6. Brief description of any illegal flights and/or actions taken by the students in the Maintenance positions.
7. The number of contract maintenance companies used.
8. Any observations of the students in the Maintenance positions.
9. General impressions of the students in the Maintenance positions.

Completing the Individual Performance Measure

At 10 to 20 minutes before the end of every simulation, the Industrial and Organizational (I/O) Psychology graduate students working in the NASA FOCUS Lab will hand the Maintenance Expert two sheets called the "Individual Performance Measure." On these sheets, the Maintenance Expert will rate the performance of the students in the Maintenance Control and Maintenance Planning and Scheduling positions. Then, the Maintenance Expert will give the Individual Performance Measure sheets back to the I/O Psychology graduate students.

Duties Required After a Simulation

Shutting Down the Personal / Staff Member's Computer

The Maintenance Expert must shut down the personal / staff member's computer by using the following procedures:

1. Click the "X" at the top right-hand corner of the Internet browser's window.
    a. Note: If a pop-up occurs after pressing the "X" in the Internet browser's window that says, "Do you want to close all tabs or the current tab," click on the button that says "Close all tabs."
2. Click the "X" in the top right-hand corner of Skype and Skype Secondary's windows to end both Skype sessions.
    a. Note: If Skype was used on a smartphone, tablet, or other device, then end the Skype application.
3. Close out all of the programs running on the computer by pressing the "X" at the top right-hand corner of each program's window.
    a. Note: If prompted to save a program, always press "Do not save."
4. Shut down the computer by pressing the "Start" button in the lower left-hand corner of the computer screen and clicking on "Shut down."

Shutting Down the Second Computer

The Maintenance Expert must shut down the second computer by using the following procedures:

1. Click the "X" at the top right-hand corner of the Internet browser's window.
    a. Note: If a pop-up occurs after pressing the "X" in the Internet browser's window that says, "Do you want to close all tabs or the current tab," click on the button that says "Close all tabs."
2. Close out all of the programs running on the computer by pressing the "X" at the top right-hand corner of each program's window.
    a. Note: If prompted to save program, always press "Do not save."
3. Shut down the second computer by pressing the "Start" button in the lower left-hand corner of the computer screen and clicking on "Shut down."

Miscellaneous Duties

After a NASA FOCUS Lab simulation ends, the Maintenance Expert must complete the following duties:

1. Collect and tape your notes on a white sheet outside the NASA FOCUS Lab Control Room.
2. Give the team the appropriate financial penalties, as shown below:
    a. Contract maintenance company replacing an aircraft component = $5,000.
    b. Contract maintenance company performing an inspection on a Universal E-Lines' aircraft = $1000.
    c. Contract maintenance company resetting a flap motor = $1000.
    d. Flight takes off illegally = $10,000.

i. Note: A flight is considered illegal if the following happens:

1. Maintenance on the aircraft was not completed before the flight was released.
2. Paperwork was not filled out properly in the RMS.
3. The students did not put the aircraft back into service before the flight was released.
4. The aircraft overflies the MEL eligibility period.
5. The students put the wrong MEL eligibility into the RMS.

3. If you are unable to attend the NASA FOCUS Lab weekly meeting, then you must type and send the following information to the NASA FOCUS Lab Administrator via email:
    a. How did the students handle the embedded and non-embedded maintenance triggers?
    b. Did the students allow a flight to takeoff illegally? If so, what flight took off illegally and why is the flight considered illegal?
    c. How many contract maintenance companies were used during the simulation and why were they used?
    d. Did the students use a spare aircraft? If so, why was the spare aircraft used?
    e. What was the overall performance of the students in the Maintenance Control and Maintenance Planning and Scheduling positions?

Weather Expert

Overview

Real-time weather is used to increase the realistic value of each NASA FOCUS Lab simulation. The position that directly monitors and communicates the weather conditions during a NASA FOCUS Lab simulation is the Weather and Forecasting position. The Weather and Forecasting position is also in charge of determining whether or not a flight can take off from its departure airport, can land at its destination airport, needs more fuel for winds aloft, or needs to file a destination alternate. While a student is performing these duties in the Weather and Forecasting position, one member of the NASA FOCUS Lab staff monitors the student to determine whether or not the student is performing his or her duties safely, legally, quickly, and efficiently. The NASA FOCUS Lab staff member who continuously monitors the student's actions in the Weather and Forecasting position is commonly referred to as the Weather Expert.

Quick Guide for the Weather Expert

Username and Password Guide

Retrieve the usernames and passwords for Computer Bravo and the Weather and Forecasting position's Skype account from a NASA FOCUS Lab staff member.

Duties Required Before the Start of a Simulation

1. Prepare Computer Bravo.
2. Gather and distribute the weather documents.
3. Conduct the weather run-up.
4. Analyze the weather program.
5. Analyze TAFs and determine destination alternates.
6. Write down weather information on the white sheets.
7. Conduct the weather briefing.

Duties Required During a Simulation

1. Conduct duties in the NASA FOCUS Lab Control Room.
2. Observe the student in the Weather and Forecasting position.
3. Implement non-embedded weather triggers.
4. Complete the Individual Performance Measure.

Duties Required After a Simulation

1. Miscellaneous duties.

Duties Required Before the Start of a Simulation

Preparing Computer Bravo

The Weather Expert must prepare Computer Bravo by using the following procedures:

1. Turn on Computer Bravo's CPU, which is on top of the NASA FOCUS Lab's filing cabinet.
2. Turn on television number 1 and 4 to show Computer Bravo's desktop screen.
3. Using the second keyboard and second computer mouse at the Weather and Forecasting position, enter the appropriate password.
    a. Note: The password can be retrieved from a NASA FOCUS Lab staff member.
4. Using Internet Explorer, open a new tab and go to www.aviationweather.gov.
5. On www.aviationweather.gov, access the METARs issued for all 16 airports that Universal E-Lines services during a simulation.
6. Open a new tab in Internet Explorer and go to www.aviationweather.gov.
7. On www.aviationweather.gov, access the weather radar.
8. Adjust the weather radar until the southeast region of the United States of America is visible on television number 1 and 4.
9. During a simulation, the student in the Weather and Forecasting position must have both the METAR list and weather radar visible. Therefore, use the following procedures to display both the METAR list and the weather radar on television number 1 and 4:

a. Left click and hold the Internet Explorer tab that displays the METAR list.
b. Drag the tab displaying the METAR list to the left side of the television screen and release the left click.
c. Left click and hold the tab that displays the weather radar.
d. Drag the tab displaying the weather radar to the right side of the television screen and release the left click.
e. Resize both Internet Explorer windows until they both cover half of the television screen.

10. Refresh both Internet Explorer windows every 20 to 30 minutes to ensure that both the METAR list and weather radar show current and accurate weather information.

Gathering and Distributing the Weather Documents

The Weather Expert must gather the following weather documents from the file cabinet in the NASA FOCUS Lab and place them at the Weather and Forecasting position:

1. One copy of the "Weather Guidelines."
2. One copy of the "Weather Worksheet: Additional Fuel Allocation for Winds Aloft and Filed Alternates."
3. One copy of the "NOTAMS Worksheet."
4. Two copies of the "Weather Briefing Worksheet."
5. One copy of the "Crosswind Component Graph."
6. One copy of the "Current Team Roster."

Conducting the Weather Run-Up: Part I - IX

In order for the Weather Expert to accurately observe and rate the student's performance in the Weather and Forecasting position, the Weather Expert must understand the weather conditions that are occurring across the southeast region of the United States before each simulation begins. The process of gathering the weather information is commonly referred to as the "weather run-up." The Weather Expert must conduct the weather run-up by using the following procedures:

Part I – Flying Categories

In Part I of the weather run-up, the Weather Expert must analyze and interpret the flying categories present in the southeast region of the United States by using the following procedures:

1. On the Weather and Forecasting position's computer, access www.aviationweather.gov using Internet Explorer and analyze the flying categories across the southeast region of the United States.
2. Write down the different flying categories present throughout the southeast region of the United States along with each flying category's general location.
    a. Note: Analyzing the flying categories will help determine what conditions prevail across the southeast region of the United States.

Part II - Surface Prognostic Chart

In Part II, the Weather Expert will analyze and interpret the Surface Prognostic Chart by using the following procedures:

1. On www.aviationweather.gov, analyze the southeast region of the United States on the Surface Prognostic Chart.

2. Write down the following weather conditions if they appear in the southeast region of the United States on the Surface Prognostic Chart:
    a. The type and location of a front.
    b. A High Pressure Center and its location.
    c. A Low Pressure Center and its location.
    d. Strong pressure gradient and its location.
3. Compare this information with the weather radar screen that is visible on television number 1 and/or 4.
4. Determine the cause of the weather and the expected weather conditions in the southeast region of the United States during the simulation.
5. Write down the cause of the weather and the expected weather conditions in the southeast region of the United States.

Part III - Winds Aloft

According to Universal E-Lines' Standard Operating Procedures (SOP's), any flight encountering headwinds at 50 knots or greater while at cruising altitude is required to load additional fuel onto the flight based on its enroute time. Follow these guidelines to determine how much additional fuel must be loaded onto a flight:

a. For a flight that has an enroute time of less than one hour and will encounter headwinds at 50 knots or greater while at cruising altitude, 30 minutes of extra fuel must be placed on the flight.
b. For a flight that has an enroute time of one hour or greater and will encounter headwinds at 50 knots or greater while at cruising altitude, one hour of extra fuel must be placed on the flight.

The Weather Expert must use the following procedures to determine what flights will need additional fuel for winds aloft:

1. On www.aviationweather.gov, analyze the Winds and Temperatures Aloft Forecast chart for FL180 and FL240. Pay particular attention to the areas in the southeast region of the United States where the winds aloft are 50 knots or greater.
    a. Note: FL180 and FL240 are the lowest and highest cruising altitudes Universal E-Lines operates at during a simulation.
2. Based on the location and direction of the winds aloft at FL180 and FL240 in the southeast region of the United States, determine which flights will need to load additional fuel due to winds aloft, if any.
3. Write down a list of the flight numbers that will need to load additional fuel for winds aloft and the amount of additional fuel that each flight will need based on Universal E-Lines' Standard Operating Procedures.
4. Give the list from Step 3 to the FOD 2 Coordinator.
    a. Note: This information is important because the FOD 2 Coordinator will use this information to complete his or her duties during a simulation.

Part IV - Forecasted Icing Conditions

The Weather Expert must gather the location, intensity, and altitudes of the forecasted icing conditions in the southeast region of the United States by using the following procedures:

1. On www.aviationweather.gov, analyze the forecasted icing conditions from 1,000 feet MSL to FL250 in the southeast region of the United States.

a. Note: Although FL240 is the highest altitude Universal E-Lines' flights operate at, FL250 must be checked since there is not an option for FL240.

2. Write down the icing intensity or supercooled liquid droplet (SLD) threat, location of the forecasted icing conditions in the southeast region of the United States, and altitude where the forecasted icing conditions are present.

Part V – Convective & Non-Convective SIGMETs

In Part V, the Weather Expert must identify and interpret the pertinent Convective and Non-Convective SIGMETs (Significant Meteorological Information) by using the following procedures:

1. On www.aviationweather.gov, analyze all Convective and Non-Convective SIGMETs in the southeast region of the United States.
2. Write down the information provided by each SIGMET that adheres to all of the following guidelines:
    a. The SIGMET is active above an airport and/or flight route that Universal E-Lines services during a simulation.
    b. The base of the SIGMET is at or below FL240.
    c. The SIGMET will be active during the simulation.

Part VI - AIRMETs

During Part VI of the weather run-up, the Weather Expert will analyze and interpret the pertinent AIRMETs (Airmen's Meteorological Information) issued in the southeast region of the United States by using the following procedures:

1. On www.aviationweather.gov, analyze all of the AIRMETs issued in the southeast region of the United States.

2. Write down the information provided by each AIRMET that adheres to all of the following guidelines:
    a. The AIRMET is active above an airport and/or flight route that Universal E-Lines services during a simulation.
    b. The AIRMET is issued at or below FL240.
    c. The AIRMET will be active during the simulation.

Part VII – PIREPs

In Part VII, the Weather Expert will analyze and interpret the pertinent PIREP's (Pilot Reports) by using the following procedures:

1. On www.aviationweather.gov, analyze all of the PIREP's issued in the southeast region of the United States.
2. Write down the information provided by each PIREP that adheres to all of the following guidelines:
    a. The PIREP was issued above an airport and/or flight route that Universal E-Lines services during a simulation.
    b. The PIREP was issued at or below FL240.
    c. The PIREP was issued by an aircraft similar to a CRJ-200 or larger.

Part VIII - NOTAMs

During Part VIII, the Weather Expert will analyze the NOTAMs (Notice to Airmen) issued at all 16 airports that Universal E-Lines services during a simulation by using the following procedures:

1. Gather a "NOTAM Worksheet" from the file cabinet in the NASA FOCUS Lab.

2. In a new tab on Internet Explorer, type in the following web address: https://pilotweb.nas.faa.gov/PilotWeb/.
3. Enter in all 16 airport ICAO (International Civil Aviation Organization) identifiers that Universal E-Lines services.
4. Analyze all of the NOTAMs at each airport.
5. Write down every NOTAM and their effective times on the "NOTAM Worksheet" that are issued for the following:
    a. A primary or secondary runway closure at an airport.
    b. Reports of migrating flocks of birds.
    c. Unmanned Aircraft Systems (UAS) / Unmanned Aerial Vehicle (UAV) Operations.
    d. Parachuting activity.
    e. Any abnormal situation that would cause Universal E-Lines' flights to not be able to takeoff and/or land at an airport.
6. Do not record NOTAMs that have the following information:
    a. Obstructions, such as cranes.
    b. Taxiway closures.
    c. Information regarding the APRON or RAMP at an airport.
    d. Standard Instrument Departures (SIDs) or Standard Terminal Arrival Routes (STARs).

Note: Pay close attention to the effective times for each recorded NOTAM. A NOTAM's effective times may end before or during a simulation, which could cause the simulation to not be affected by the NOTAM.

Part IX - TFRs

In Part IX, the Weather Expert must check the FAA's website to determine whether or not TFRs (Temporary Flight Restrictions) exist over any of the 16 airports and/or flight routes that Universal E-Lines services during a simulation by using the following procedures:

1. In a new tab on Internet Explorer, type in the following web address: http://tfr.faa.gov/tfr_map_ims/html/reg/scale2/tile_2_2.html.
2. Analyze the interactive map on the FAA's website and determine whether or not a TFR is active over an airport and/or a flight route that Universal E-Lines services.
    a. If a TFR is present, then continue to Step 3.
    b. If not, then this concludes Part IX of the weather run-up.
3. Read the TFR's description.
    a. If the TFR's description states that the TFR will be in effect during the simulation, then write down a brief summary of the TFR.
    b. If the TFR's description states that the TFR will not be in effect during the simulation, then do not write down the TFR.

Analyzing the Weather Program

The Weather Expert must also understand the current weather conditions at the airports Universal E-Lines services. To do so, the Weather Expert must use the following procedures:

1. On the Weather and Forecasting position's computer, double-click on the appropriate weather program.
    a. Note: If the weather program is already open, then maximize the weather program.
2. Click the "Data" tab in the Excel ribbon and click "Refresh All" to update the information in the weather program.
3. Press "OK" on any pop-up that occurs during the refreshing process.
4. Analyze the weather program and determine which airports Universal E-Lines services may cause disruptions in the operations of the airline.
5. Write down the airports that have a weather condition that is color coded red on the weather program. Also, write down the weather condition that is color coded red at that particular airport.
    a. Note: Closely monitor these airports before and during the simulation to see if the weather conditions improve.

Analyzing TAFs and Determining Destination Alternates

According to Universal E-Lines' Standard Operating Procedures (SOPs), a flight that has to file a destination alternate must load one hour of additional fuel onto the flight. To determine whether or not a flight needs to file a destination alternate, the Weather Expert must use the following procedures:

1. On www.aviationweather.gov, analyze the Terminal Aerodrome Forecasts (TAFs) issued for each airport Universal E-Lines services during a simulation.
2. Write down the airports that will require flights flying to those airports to file a destination alternate based on the 1-2-3 Rule, if any.
3. Write down the flight numbers that will be flying to the airports listed in Step 2.
4. Report the flight numbers from Step 3 to the FOD 2 Coordinator.
    a. Note: The FOD 2 Coordinator must have these flight numbers in order to perform his or her duties during the simulation.

Writing on the White Sheets

Directly outside the NASA FOCUS Lab Control Room, white sheets have been placed on the walls by a NASA FOCUS Lab staff member. These white sheets are available for all NASA FOCUS Lab staff members to write down any information regarding the day's simulation. Therefore, the Weather Expert must write down a brief summary of the information gathered from the weather run-up and the weather program. Also, the Weather Expert must write down the flight numbers that will need extra fuel due to winds aloft and/or for filing a destination alternate.

Conducting the Weather Briefing

The Weather Expert must conduct a weather briefing with the student in the Weather and Forecasting position to ensure he or she fully understands the day's weather conditions across the southeast region of the United States. The Weather Expert will conduct a weather briefing by using the following procedures:

1. Wait for the student in the Weather and Forecasting position to arrive in the NASA FOCUS Lab.
    a. Note: The student should arrive no later than 2:40 P.M.
2. While waiting for the student to arrive, refresh the data in the weather program on the Weather and Forecasting position's computer.
3. Refresh both the METAR list and weather radar on Computer Bravo.
4. After the student in the Weather and Forecasting position arrives at the NASA FOCUS Lab, allow the student 10 to 15 minutes to gather the day's weather conditions across the southeast region of the United States
5. After 10 to 15 minutes have passed, conduct the weather briefing with the student in the Weather and Forecasting position by comparing the information gathered during the weather run-up with the information gathered by the student. Also, give the student feedback on the information he or she gathered.

Duties Required During a Simulation

Conducting Duties in the Control Room

1. On a personal or MTSU computer in the NASA FOCUS Lab Control Room, go to www.aviationweather.gov using Internet Explorer.
2. On www.aviationweather.gov, access the following information:
    a. The METARs for all 16 airports Universal E-Lines services.
    b. The weather radar.
    c. The TAFs for all 16 airports Universal E-Lines services.
    d. The Winds and Temperatures Aloft Forecast chart at FL180 and FL240.
3. Throughout the simulation, refresh these webpages to ensure that the information presented on these webpages is current and accurate. Also, continuously monitor these webpages for rapid changes in the weather conditions.
    a. Note: The Weather Expert must apply his or her aviation weather knowledge to understand how the rapid changes in the weather conditions will ultimately impact the operations of Universal E-Lines.
4. Alert the FOD 2 Coordinator if the following weather conditions change:
    a. The forecasted weather conditions at an airport no longer fall below the 1-2-3 Rule based on the TAF issued for that particular airport.
        i. Note: This situation will cause the flights flying to that airport to no longer be required to file a destination alternate.

b. The wind speed at FL180 and/or FL240 has changed from at or above 50 knots to below 50 knots over an area in the southeast region of the United States.

    i. Note: This situation will cause the flights flying over that particular area to no longer add extra fuel for winds aloft.

Observing the Weather and Forecasting Position

During a simulation, the Weather Expert must go into the NASA FOCUS Lab to observe the student in the Weather and Forecasting position by using the following procedures:

1. Enter the NASA FOCUS Lab during the simulation and sit in one of the chairs along the wall.
2. Observe the student in the Weather and Forecasting position performing the CRJ Weather Briefing.
3. Write down how well the student performed the CRJ Weather Briefing along with any other comments that might help rate the student's performance at the end of the simulation.
4. Throughout the simulation, observe the information that the student writes down on the "Weather Worksheet: Additional Fuel Allocation for Winds Aloft and Filed Alternates."
5. Compare the information written down on the "Weather Worksheet" with the information written down during the weather run-up.

a. If the student did not write down a flight that needed extra fuel for winds aloft and/or filing a destination alternate, then ask the FOD 2 Coordinator if extra fuel was loaded onto the flight.
    i. If the FOD 2 Coordinator informs the Weather Expert that fuel was added to the flight, then the flight departed legally.
        1. Remind the student in the Weather and Forecasting position to always fill out the information on the "Weather Worksheet: Additional Fuel Allocation for Winds Aloft and Filed Alternates."
    ii. If the FOD 2 Coordinator informs the Weather Expert that fuel was not added to the flight, then the flight departed illegally.
        1. Write down the flight number and the reason why the flight was illegal on the white sheets outside the NASA FOCUS Lab Control Room.
        2. Inform the NASA FOCUS Lab Administrator of this situation.
        3. The NASA FOCUS Lab Administrator will give the team a simulated financial penalty for the illegal flight.
b. If the FOD 2 Coordinator informs the Weather Expert that a flight departed without the required amount of fuel for winds aloft and/or filing a destination alternate, then enter the NASA FOCUS Lab to view the student's "Weather Worksheet: Additional Fuel Allocation for Winds Aloft and Filed Alternates."

i. If the student in the Weather and Forecasting position did write down the flight on the "Weather Worksheet" and checked the box that states "FOD 2 Notified," then the Weather Expert can assume that the student in the Weather and Forecasting position handled the additional fuel situation properly.

    1. Inform the FOD 2 Coordinator of the following information:

        a. The student in the Weather and Forecasting position notified the student in the FOD 2 position that additional fuel was needed on that particular flight.

        b. The student in the FOD 2 position must not have handled the situation properly.

        c. The FOD 2 Coordinator must contact the student in the FOD 2 position to receive more information regarding that particular flight.

ii. If the student in the Weather and Forecasting position did not write down the flight on the "Weather Worksheet," then the Weather Expert can assume that the student in the Weather and Forecasting position did not handle the situation properly. As a result, the flight departed illegally.

    1. Write down the flight number and the reason why the flight departed illegally on the white sheets outside the NASA FOCUS Lab Control Room.

2. Inform the NASA FOCUS Lab Administrator of this situation.
3. The NASA FOCUS Lab Administrator will give the team a simulated financial penalty for the illegal flight.

iii. If the student in the Weather and Forecasting position did write down the flight on the "Weather Worksheet" but did not check the box that states "FOD 2 Notified," then the Weather Expert can assume that the student in the Weather and Forecasting position did not inform the student in the FOD 2 position that the particular flight needed to add fuel for winds aloft and/or filing a destination alternate. As a result, the flight departed illegally.

1. Write down the flight number and the reason why the flight was illegal on the white sheets outside the NASA FOCUS Lab Control Room.
2. Inform the NASA FOCUS Lab Administrator of this situation.
3. The NASA FOCUS Lab Administrator will give the team a simulated financial penalty for the illegal flight.

6. Continuously monitor the student in the Weather and Forecasting position and take notes on the student's performance.
7. At about 20 minutes before the simulation ends, go to the Pseudo Pilot room and ask the student in the Pseudo Pilot position the following questions:

a. What type of communication have you had with the student in the Weather and Forecasting position?

b. What information did the student in the Weather and Forecasting position provide you during the simulation, if any?

8. Based on the Pseudo Pilot's answers, determine whether or not the student in the Weather and Forecasting position effectively communicated the weather conditions in the southeast region of the United States to the Pseudo Pilot.
9. Write down the conclusion from Step 8 on a white sheet outside the NASA FOCUS Lab Control Room.

Implementing Non-Embedded Weather Triggers

There are three non-embedded weather triggers that can be implemented into the simulation. The three non-embedded weather triggers that can be implemented are:

a. Lack of fuel for winds aloft.

b. Lack of fuel for filing a destination alternate.

c. NOTAM.

The Weather Expert must use the following procedures to implement one of these three non-embedded weather triggers into a simulation:

1. The Weather Expert must speak with the NASA FOCUS Lab Administrator about the on-going situation in the simulation and/or a trigger that needs to be implemented.
2. The NASA FOCUS Lab Administrator will implement one of the three non-embedded weather triggers into the simulation based on the on-going situation in the simulation and/or the Weather Expert's recommendation.

3. As the non-embedded weather trigger is being implemented into the simulation by the NASA FOCUS Lab Administrator, the Weather Expert must enter the NASA FOCUS Lab to observe how the students in each position react to the trigger.
4. Write down any observations of the students and/or actions that the students in each position take, if any.
5. Since there are no "correct answers" to a trigger, the NASA FOCUS Lab Administrator will respond to the students' actions during the non-embedded weather trigger using his or her knowledge of the aviation industry.
    a. Note: If the students take an action that is not legal, safe, quick, and/or efficient, then the NASA FOCUS Lab Administrator will implement the appropriate downstream consequences.
6. Write a brief summary of how the students responded to the non-embedded weather trigger on a white sheet outside the NASA FOCUS Lab Control Room.

Completing the Individual Performance Measure

At 10 to 20 minutes before the end of every simulation, the Industrial and Organizational (I/O) Psychology graduate students working in the NASA FOCUS Lab will hand the Weather Expert a sheet called the "Individual Performance Measure." On this sheet, the Weather Expert will rate the student's performance in the Weather and Forecasting position. Then, the Weather Expert will give the Individual Performance Measure sheet back to the I/O Psychology graduate students.

Duties Required After a Simulation

Miscellaneous Duties

After a NASA FOCUS Lab simulation ends, the Weather Expert must complete the following duties:

1. Collect your notes and any documents you used during the simulation.
2. Collect the "Weather Worksheet: Additional Fuel Allocation for Winds Aloft and Filed Alternates" and any other document that the student in the Weather and Forecasting position used during the simulation.
3. Tape your notes, your documents, and the student's documents on a white sheet outside the NASA FOCUS Lab Control Room.
4. If you are unable to attend the NASA FOCUS Lab weekly meeting, then you must type and send the following information to the NASA FOCUS Lab Administrator via email:
    a. Brief description of the weather conditions during the simulation.
    b. The flights that needed extra fuel for winds aloft and/or for filing a destination alternate.
    c. Did the student in the Weather and Forecasting position tell the student in the FOD 2 position to add more fuel to the flights that needed additional fuel for winds aloft and/or for filing a destination alternate?
    d. The flights that departed illegally and a brief description of why the flights departed illegally.

e. Were there any pertinent NOTAMs or TFRs, and did the student in the Weather and Forecasting position find and communicate them to the team?

f. Brief description of how the student in the Weather and Forecasting position handled the non-embedded weather triggers, if any.

g. Brief description of the overall performance of the student in the Weather and Forecasting position.

CHAPTER IV – TROUBLESHOOTING PROCEDURES

Killing a Flight Going Off Course

During a simulation, a flight may divert from its programmed flight path on the Computer Sciences Corporation (CSC) equipment. The following procedures must be used to resolve this situation:

1. Go to the Pseudo Pilot room.
2. On the Pseudo Pilot's computer, click on the "diamond" of the flight that is diverting from its programmed flight path.
3. Type in the word "KILL" in the blue bar at the bottom of the Pseudo Pilot's computer screen.
4. Observe that the flight number and the word "KILL" are in the blue bar at the bottom of the Pseudo Pilot's computer screen.
5. Press the "Enter" key on the keyboard.
6. Observe that the flight has been removed from the Pseudo Pilot's computer screen, which means it is no longer visible inside the NASA FOCUS Lab on the flight tracking radar.
    a. Note: If the flight is still visible on the Pseudo Pilot's computer screen after one minute, then repeat Steps 1 through 6 to "kill" the flight on the Pseudo Pilot's computer.

NexSim Frasca Program and/or CSC Equipment Crashes

During a NASA FOCUS Lab simulation, the NexSim Frasca program and/or CSC equipment may crash from a person using an unapproved procedure on the program and/or equipment, the hard drive in the "Local 1 (20.1)" computer being full from text files created by the CSC equipment, or an unknown error. The following procedures for each scenario must be used when the NexSim Frasca program and/or CSC equipment crash:

Crash Due to Using an Unapproved Procedure

1. Observe the pop-up error message on "Local 1 (20.1)'s" computer.
2. Press the "Okay" or "End" button(s) that appears in the pop-up error message.
3. Use the procedures in the "Shutdown Procedures for the CSC Equipment" section of the "NASA FOCUS Lab Startup and Shutdown Procedures" chapter to shut down the CSC equipment.
4. Use the procedures in the "Powering on the CSC Equipment" section of the "NASA FOCUS Lab Startup and Shutdown Procedures" chapter to restart the CSC equipment and NexSim Frasca program.
5. Go to the computer at the FOD 1 position and click the "X" in the top right-hand corner of the Excel file titled "MasterNASA Schedule 6 for Daylight Savings Time" or "MasterNASA Schedule 6 for Non-daylight."
6. Reopen the Excel file that was closed during Step 5 on the computer at the FOD 1 position.

7. Go to the computer at the FOC position and click the "X" in the top right-hand corner of the Excel file titled "MasterNASA Schedule 6 (Daylight Saving Time)" or "MasterNASA Schedule 6 (non-daylight saving time)."
8. Reopen the Excel file that was closed during Step 7 on the computer at the FOC position.
9. Go to the computer at the Weather and Forecasting position and click the "X" in the top right-hand corner of the Excel file titled "MasterNASA Schedule 7f" or "MasterNASA Schedule 7f (fixed for non daylight savings time)."
10. Reopen the Excel file that was closed during Step 9 on the computer at the Weather and Forecasting position.
11. Go to the computer at the Crew Scheduling position and click the "X" in the top right-hand corner of the Excel file titled "Crew Scheduling Session 1 - Evan Lester (2014)," "Crew Scheduling Session 2 - Evan Lester (2014)," or "Crew Scheduling Session 3 - Evan Lester (2014)."
12. Reopen the Excel file that was closed during Step 11 on the computer at the Crew Scheduling position.
13. Change the starting times in the Excel files on the computers at the FOD 1, Weather and Forecasting, and FOC positions by using the procedures in the "Changing Flight Schedule Times" section of the "Maintenance on the NASA FOCUS Lab Equipment and Website" chapter.
    a. Note: When changing the flight schedule times in each Excel file, do not press "Save" in the Excel files. The new flight schedule times are

temporary changes due to the NexSim Frasca program and/or CSC equipment crashing unexpectedly.

14. Tell the student in the Crew Scheduling position that he or she will have to enter the new departure and arrival times on the flight schedule into the Excel file on the computer at the Crew Scheduling positon.
15. Tell the student in the FOD 2 position that the data he or she has already collected can be used once the simulation restarts.

Crash Due to "Local 1 (20.1)'s" Hard Drive Being Full

1. Observe that the flight tracking radar in the NASA FOCUS Lab is frozen and/or a pop-up error message is on the "Local 1 (20.1)" computer.
2. If there is a pop-up error message on "Local 1 (20.1)'s" computer, then press the "Okay" or "End" button(s) that appears in the pop-up error message. If not, then continue to Step 3.
3. Use the procedures in the "Shutdown Procedures for the CSC Equipment" section of the "NASA FOCUS Lab Startup and Shutdown Procedures" chapter to shut down the CSC equipment and NexSim Frasca program.
    a. Note: If the NexSim Frasca program and CSC equipment do not shut down during these procedures, then double-click on the "NexSim Lab Administrator" icon on the "Instructor Station's" computer and click the "Shutdown" button. Also, shut down the "Instructor Station," "Local 1 (20.1)," and "MUTHUR" computers by clicking on the "Start" button in the lower left-hand corner of the desktop screen and clicking on the "Turn Off Computer" button.

4. Turn on all computer monitors.
5. Turn on all three televisions by pressing the “Power” button on the television remote located in the Ramp Tower room.
6. Turn on the CPU underneath the “Instructor Station.”
7. Double-click on the “Shortcut to NXS Admin.exe” icon on the desktop screen of the “Instructor Station’s” computer.
8. In the “NexSim Lab Administrator” pop-up window, make sure all of the boxes have checkmarks in them.
    a. Note: If they do not, then click each box until all of the boxes have a checkmark in them.
9. Click “Power On.”
10. Open the vault under the “Local 1 (20.1)” computer.
11. Open the “MUTHUR SERVER/HOST” vault.
12. Press the power button inside the “MUTHER SERVER/HOST” vault.
13. Close the “MUTHER SERVER/HOST” vault and the vault underneath the “Local 1 (20.1)” computer.
14. Open the vault under the “Ground 1 (20.2)” computer.
15. Open the “Local 1 20.1” and “IG4 100.4” vaults.
16. Press the “Power” button inside the “Local 1 20.1” and “IG4 100.4” vaults.
17. Close the “Local 1 20.1” and “IG4 100.4” vaults.
18. Close the vault under the “Ground 1 (20.2)” computer.
19. To access the MUTHUR computer (third computer from the left), click the “PrtScn/SysRq” key on the Logitech keyboard.

20. Using the numerical keypad on the Logitech keyboard, enter the number 12 and press the “Enter” key.
    a. Note: Make sure “num lock” is on before entering the number 12.
21. Type in the appropriate password.
    a. Note: The password can be retrieved from a NASA FOCUS Lab staff member.
22. Use the procedures in the “Deleting NexSim Error Logs” section of the “Maintenance on the NASA FOCUS Lab Equipment and Website” chapter to delete the unnecessary text files on the “Local 1 (20.1)” computer and create space on the “Local 1 (20.1)” computer’s hard drive.
23. Use the procedures in the “Powering on the CSC Equipment” section of the “NASA FOCUS Lab Startup and Shutdown Procedures” chapter to restart the CSC equipment and NexSim Frasca program.
    a. Note: Start with Step 19 in the “Powering on the CSC Equipment” section.
24. Go to the computer at the FOD 1 position and click the “X” in the top right-hand corner of the Excel file titled “MasterNASA Schedule 6 for Daylight Savings Time” or “MasterNASA Schedule 6 for Non-daylight.”
25. Reopen the Excel file that was closed during Step 24 on the computer at the FOD 1 position.
26. Go to the computer at the FOC position and click the “X” in the top right-hand corner of the Excel file titled “MasterNASA Schedule 6 (Daylight Saving Time)” or “MasterNASA Schedule 6 (non-daylight saving time).”

27. Reopen the Excel file that was closed during Step 26 on the computer at the FOC position.
28. Go to the computer at the Weather and Forecasting position and click the "X" in the top right-hand corner of the Excel file titled "MasterNASA Schedule 7f" or "MasterNASA Schedule 7f (fixed for non daylight savings time)."
29. Reopen the Excel file that was closed during Step 28 on the computer at the Weather and Forecasting position.
30. Go to the computer at the Crew Scheduling position and click the "X" in the top right-hand corner of the Excel file titled "Crew Scheduling Session 1 - Evan Lester (2014)," "Crew Scheduling Session 2 - Evan Lester (2014)," or "Crew Scheduling Session 3 - Evan Lester (2014)."
31. Reopen the Excel file that was closed during Step 30 on the computer at the Crew Scheduling position.
32. Change the starting times in the Excel files on the computers at the FOD 1, Weather and Forecasting, and FOC positions by using the procedures in the "Changing Flight Schedule Times" section of the "Maintenance on the NASA FOCUS Lab Equipment and Website" chapter.
    a. Note: When changing the flight schedule times in each Excel file, do not press "Save" in the Excel files. The new flight schedule times are temporary changes due to the NexSim Frasca program and/or CSC equipment crashing unexpectedly.

33. Tell the student in the Crew Scheduling position that he or she will have to enter the new departure and arrival times on the flight schedule into the Excel file on the computer at the Crew Scheduling positon.
34. Tell the student in the FOD 2 position that the data he or she has already collected can be used once the simulation restarts.

Crash Due to an Unknown Error

The NexSim Frasca program and/or CSC equipment could crash due to an unknown error. If this situation occurs, then you must use your technical knowledge to troubleshoot and fix the unknown error. If you are unable to fix the unknown error, then contact Evan Lester or Paul Carlson to help fix the unknown error.

CRJ Communication Failure

During a simulation, the communication network between the CRJ-200 simulator and specific positions in the NASA FOCUS Lab may fail. The following procedures must be used to fix the communication failure:

1. Go to the "MUTHUR" computer in the Ramp Tower room.
2. If the computer monitor's screen is black, move the "MUTHUR" computer's mouse left and right one time, press the "Prt SC" button, and type in the number "12." If not, then continue to Step 3.
3. Click the "X" in the top right-hand corner of the "Karaf" program.
4. Go to the "Local 1 (20.1)" computer in the Ramp Tower room.
5. Observe the green text in the bottom right hand-corner of the "Local 1 (20.1)'s" computer screen change from "NEXFED_LISTED_RUNNING" to "NEXFED_LISTED_FEMS."

6. Go to the “MUTHUR” computer in the Ramp Tower room.
7. Double-click on the “Shortcut to servixmix.bat” icon on the “MUTHUR” computer’s desktop screen.
8. Call the CRJ Flight Instructor that is assigned to be at the CRJ-200 simulator during the simulation. Tell him or her to connect the CRJ-200 simulator to the NASA FOCUS Lab.
    a. Note: Do not end the phone call with the CRJ Flight Instructor because you will need to talk with him or her during Step 11.
9. Go to the “Local 1 (20.1)” computer in the Ramp Tower room.
10. Observe the green text in the bottom right-hand corner of the “Local 1 (20.1)’s” computer screen change from “NEXFED_LISTED_FEMS” to “NEXFED_LISTED_RUNNING.”
11. Tell the CRJ Flight Instructor to try talking to the student in the FOC position on the “125.0” frequency. Also, tell the CRJ Flight Instructor to try talking to the students in the Ramp Tower, Weather and Forecasting, and Maintenance Control positions on the “121.9” frequency.
12. If contact has been made with each student in the four positions listed in Step 11, then this ends the “CRJ Communication Failure” section. However, if these procedures do not fix the communication failure, then tell the students in the NASA FOCUS Lab to contact the students in the CRJ-200 simulator via cellphone.

Communication Failure Between the FOC and Pseudo Pilot Positions

During a simulation, communications between the students in the FOC and Pseudo Pilot positions may fail. The following procedures must be used to resolve the communication failure:

1. Go to the FOC position in the NASA FOCUS Lab.
2. Beside the computer monitors at the FOC position, there is a small computer screen that displays frequencies used during a NASA FOCUS Lab simulation inside two green boxes. If one of the boxes is orange and not green, then tell the student in the FOC or Pseudo Pilot position to fix their "stuck mic."
    a. Note: If both boxes are green, then continue to Step 3.
3. Ask the student in the FOC position if he or she is using the headset that has the "CRJ/Pseudo" label.
4. If the student is using the headset that has the "CRJ/Pseudo" label, then continue to Step 5. If the student is using the headset that has the "Skype" label, then tell the student to use the headset with the "CRJ/Pseudo" label, which should resolve the communication failure. If not, then continue to Step 5.
5. If the communication failure between the FOC and Pseudo Pilot positions persists, then contact Evan Lester or Paul Carlson to help resolve the communication failure.

Program Malfunctions on a Position's Computer

During a simulation, a position's program may malfunction. The following procedures must be used to resolve a malfunctioning program:

1. Go to the position's computer in the NASA FOCUS Lab.

2. On the position's computer, click the "X' in the top right-hand corner of the program and click "Do not save" to close the program.
    a. Note: If the FOD 1, Crew Scheduling, or FOC's program malfunctions, then tell the students in those positions to take a picture of the program before clicking the "X."
3. Reopen the program that was closed in Step 2.
    a. Note: Tell the student in the FOD 1, Crew Scheduling, or FOC position to manually enter the information in the picture that was taken during Step 2 into the program.
    b. Note: If the FOD 2 or Weather and Forecasting's program was reopened, then tell the student in the FOD 2 or Weather and Forecasting position to continue where he or she left off.
4. If the program works properly after Step 3, then this concludes the "Program Malfunctions on a Position's Computer" section. If the program continues to malfunction, then contact Evan Lester or Paul Carlson to help fix the program.

Skype Call with the NASA FOCUS Lab Microphone Ends Unexpectedly

During a simulation, the Skype call between the personal electronic device and the "focus_lab_mic" Skype account may end unexpectedly. The following procedures must be used to restart the Skype call:

1. Go to the computer at the FOC position in the NASA FOCUS Lab with the personal electronic device.
2. There are two Skype icons on the FOC's desktop screen. Double-click on the right Skype icon.

a. Note: The “focus_lab_mic” Skype account should already be logged in. However, if the Skype account is not logged in, then select the “focus_lab_mic” Skype account in the username dropdown box and enter the appropriate password, which can be retrieved from a NASA FOCUS Lab staff member.

3. Using the personal electronic device, place a Skype voice call to the “focus_lab_mic” Skype account.
4. Answer the Skype voice call in the “focus_lab_mic” Skype account.
5. Click the “X” in every Skype window that is connected to the “focus_lab_mic” Skype account on the computer at the FOC positon.

Skype Call with the NASA FOCUS Lab Webcam Ends Unexpectedly

During a simulation, the Skype call between the “Customer Service Department” Skype account and the NASA FOCUS Lab’s webcam may end unexpectedly. The following procedures must be used to restart the Skype call:

1. Go to Computer Charlie in the NASA FOCUS Lab.
2. Press the “ESC” button on Computer Charlie’s keyboard to end the NASA FOCUS Lab’s PowerPoint.
3. In the Skype window, right click on the “Customer Service Department” Skype contact and click “video call.”
4. Immediately click the “X” in each Skype window that opens, so the students participating in the NASA FOCUS Lab’s simulation does not see the Skype video call.

5. Restart the NASA FOCUS Lab PowerPoint by left-clicking on the “Slideshow” tab and left-clicking on the “From Beginning” option.
6. Go to the NASA FOCUS Lab Control Room.
7. Answer the Skype video call using the “Customer Service Department” Skype account on the NASA FOCUS Lab Administrator’s laptop computer.
8. Go back to Computer Charlie in the NASA FOCUS Lab.
9. Click the “X” in every pop-up that appears on Computer Charlie’s television screen, if any.

NASA FOCUS Lab not Connecting to the OpenVPN Server

While starting the CSC equipment, the NASA FOCUS Lab’s OpenVPN accounts may not connect to the OpenVPN server that is located at the Murfreesboro Municipal Airport. When this situation occurs, the OpenVPN icons in the bottom-right hand corner of the “MUTHUR” and/or “Local 1 (20.1)” computer(s) will be yellow instead of green. The following procedures must be used to fix the connection to the OpenVPN server:

1. Call the CRJ Flight Instructor currently at the CRJ-200 simulator and ask him or her if the OpenVPN server is on.
    a. If the CRJ Flight Instructor says that the OpenVPN server is off, then tell him or her to turn the server on. Then, try to reconnect the NASA FOCUS Lab’s OpenVPN accounts to the OpenVPN server.
        i. If the accounts connect to the server, then this concludes the “NASA FOCUS Lab not Connecting to the OpenVPN Server” section.

ii. If the accounts do not connect to the server, then continue to Step 2.

b. If the CRJ Flight Instructor says that the OpenVPN server is on, then continue to Step 2.

2. Ask the CRJ Flight Instructor if the simulator building's Internet connection is working properly.

   a. If the CRJ Flight Instructor says that the simulator building's Internet connection is not working properly, then skip Steps 20 through 28, 37 through 38, 45 through 46, and 52 in the "Powering on the CSC Equipment" section in the "NASA FOCUS Lab Startup and Shutdown Procedures" chapter. Also, skip Steps 3 through 7 in the "Shutdown Procedures for the CSC Equipment" section in the "NASA FOCUS Lab Startup and Shutdown Procedures" chapter. This concludes the "NASA FOCUS Lab not Connecting to the OpenVPN Server" section.

   b. If the CRJ Flight Instructor says that the simulator building's Internet connection is working properly, then continue to Step 3.

3. Try to reconnect the NASA FOCUS Lab's OpenVPN accounts to the OpenVPN server.

   a. If the accounts do not connect to the server, then skip Steps 20 through 28, 37 through 38, 45 through 46, and 52 in the "Powering on the CSC Equipment" section in the "NASA FOCUS Lab Startup and Shutdown Procedures" chapter. Also, skip Steps 3 through 7 in the "Shutdown Procedures for the CSC Equipment" section in the "NASA FOCUS Lab

Startup and Shutdown Procedures" chapter. In addition, contact Evan Lester or Paul Carlson to help fix the connection issue between the NASA FOCUS Lab's OpenVPN accounts and the OpenVPN server. This concludes the "NASA FOCUS Lab not Connecting to the OpenVPN Server" section.

b. If the OpenVPN accounts successfully connect to the OpenVPN server, then continue using all of the procedures in the "Powering on the CSC Equipment" and "Shut Down Procedures for the CSC Equipment" sections in the "NASA FOCUS Lab Startup and Shutdown Procedures" chapter.

Error While Swapping a Flight Crew with a Reserve Crew

During a simulation, the student in the Crew Scheduling position may receive an error message that states, "Can only swap two selections. There are 3 selections on the worksheet," when he or she is trying to swap a flight crew with a reserve crew in the Crew Scheduling program. The following procedures must be used to resolve the error:

1. Go to the NASA FOCUS Lab to speak with the student in the Crew Scheduling position.
2. Ask the student if he or she has been pressing the "CTRL" key on the keyboard while highlighting both the flight crew and reserve crew's rows in the Crew Scheduling program.
    a. If the student answered "Yes" to this question, then remind the student to only hold down the "CTRL" key on the keyboard when highlighting his

or her second selection in the Crew Scheduling program. Then, continue to Step 3.

b. If the student answered "No" to this question, then continue to Step 3.

3. Tell the student to try swapping the flight crew with the reserve crew in the Crew Scheduling program using the correct procedures.
4. Observe the student swapping the flight crew with the reserve crew in the Crew Scheduling program to make sure he or she is using the correct procedures.
5. If the student successfully swaps the flight crew with the reserve crew, then this concludes the "Error While Swapping a Flight Crew with a Reserve Crew" section.

    a. If the student is not able to swap the flight crew with the reserve crew, then use the procedures in the "Program Malfunctions on a Position's Computer" section in this chapter to restart the Crew Scheduling program. Then, continue to Step 6.

6. Tell the student to try swapping the flight crew with the reserve crew in the Crew Scheduling program using the correct procedures.
7. Observe the student swapping the flight crew with the reserve crew in the Crew Scheduling program to make sure he or she is using the correct procedures.

8. If the student successfully swaps the flight crew with the reserve crew, then this concludes the "Error While Swapping a Flight Crew with a Reserve Crew" section.
    a. If the student is not able to swap the flight crew with the reserve crew, then contact Evan Lester or Paul Carlson to help fix the Crew Scheduling program.

Contacts for Support

1. Computer Sciences Corporation (CSC)
    a. Note: The NASA FOCUS Lab Principal Investigator will have CSC's contact information.
2. Frasca
    a. Note: The NASA FOCUS Lab Principal Investigator will have Frasca's contact information.
3. Paul Carlson
    a. Email: carlsonpaul@icloud.com
4. Evan Lester
    a. Email: eml3d@mtmail.mtsu.edu

CHAPTER V – MAINTENANCE ON THE NASA FOCUS LAB EQUIPMENT AND WEBSITE

Deleting NexSim Error Logs

During every simulation, the "Local 1 (20.1)" computer creates and saves a log of the errors that were made by the NexSim Frasca program and CSC equipment in a text file. As a result, the text files deplete a large portion of the "Local 1 (20.1)" computer's space on its hard drive. When there is a small amount of space on the "Local 1 (20.1)" computer's hard drive, the CSC equipment and NexSim Frasca program both crash. Therefore, to prevent the equipment and program from crashing, the text files must be deleted on the "Local 1 (20.1)" computer every month. The following procedures must be used to delete the text files:

1. On the "Local 1 (20.1)" computer, click on the "Start" button at the bottom left-hand corner of the computer's desktop screen.
2. Click on "My Computer."
3. Double-click on "Local Disk (C:)".
4. Double-click on the "NexSim" file folder.
5. Double-click on the "Logs" file folder.
6. Delete all of the files in the "Logs" file folder.
    a. Note: If a pop-up occurs that asks if you want to delete a file permanently because the file is too big to go into the computer's Recycle Bin, then click "Yes to all."
7. Click on the "Back" arrow twice.
8. Double-click on the "NexSim Backup B" file folder.

9. Double-click on the “Logs” file folder.
10. Delete all of the files in the “Logs” file folder.
    a. Note: If a pop-up occurs that asks if you want to delete a file permanently because the file is too big to go into the computer’s Recycle Bin, then click “Yes to all.”
11. Click on the “Back” arrow twice.
12. Double-click on the “NexSim Backup C” file folder.
13. Double-click on the “Logs” file folder.
14. Delete all of the files in the “Logs” file folder.
    a. Note: If a pop-up occurs that asks if you want to delete a file permanently because the file is too big to go into the computer’s Recycle Bin, then click “Yes to all.”
15. Click the “X” in the top right-hand corner of the “Local Disk (C:)” window.

Updating the NASA FOCUS Lab Computers

The NASA FOCUS Lab computers must be updated every month. The following procedures must be used to update every NASA FOCUS Lab computer:

1. Click on the “Start” button at the bottom left-hand corner of the computer’s desktop screen.
2. Click on “All Programs.”
3. Click on “Windows Update.”
4. In the “Windows Update” pop-up window, click on “Check for updates.”
    a. If there are updates available, then continue to Step 5.

b. If there are no updates available, then click on "Check online for updates from Microsoft Update."
    i. If there are no updates available after "checking online for updates from Microsoft Update," then this ends the "Updating the NASA FOCUS Lab Computers" section.
    ii. If there are updates available after "checking online for updates from Microsoft Update," then continue to Step 5.

5. Click on the "optional updates are available" link.
    a. If there are no "optional updates," then continue to Step 8.
6. Click on the boxes to the left of each "optional update."
7. Press "OK" at the bottom right-hand corner of the "optional update" pop-up window.
8. Install both "important" and "optional" updates by clicking the "Install Updates" button.
9. After all of the updates have been installed, press the "Restart now" button in the "Windows Update" pop-up window.

Updating the NASA FOCUS Lab PowerPoint

During a simulation, a PowerPoint is played on the television beside the main entrance of the NASA FOCUS Lab. On one PowerPoint slide, the names of all NASA FOCUS Lab staff members are listed. However, new professors, undergraduate students, and/or graduate students are added to the NASA FOCUS Lab staff every year. Therefore, the PowerPoint must be updated before every semester begins to reflect the current

members on the NASA FOCUS Lab staff. The following procedures must be used to update the PowerPoint:

1. Turn on Computer Charlie and the television next to the main entrance of the NASA FOCUS Lab.
2. Enter in the appropriate password.
    a. Note: The password can be retrieved from a NASA FOCUS Lab staff member.
3. On Computer Charlie's desktop screen, double-click on the file titled "NASA FOCUS Lab PowerPoint (For use in FOCUS Lab)."
4. Go to slide number two.
5. Delete the names and majors/concentrations of the former NASA FOCUS Lab staff members.
6. Add the names and majors/concentrations of the new NASA FOCUS Lab staff members.

Changing Flight Schedule Times

Currently, the NASA FOCUS Lab simulations occur on Mondays and Wednesdays at 2:40 P.M. every semester. If the time when the NASA FOCUS Lab simulations occur changes, then the times in the FOD 1, FOC, and Weather and Forecasting programs will need to be changed. The following procedures must be used to change the times in each program:

FOD 1

1. Open the Excel file titled "MasterNASA Schedule 6 for Daylight Savings Time" on the computer's desktop screen at the FOD 1 position.

2. At the bottom of the Excel file, press the left arrow until the “PreSchedule” tab is visible.
3. Click on the “PreSchedule” tab.
4. Double-click on cell A1.
5. Enter in the Zulu time that corresponds to ten minutes prior to the start of the new simulation time.
    a. Note: For example, if the NASA FOCUS Lab simulations will begin at 2:00 P.M. during Daylight Saving Time, then enter in “6:50.”
6. Press the “Enter” key on the keyboard.
7. Click the right arrow at the bottom of the Excel file until the “Status Board” tab is visible.
8. Click on the “Status Board” tab.
9. Save the Excel file.
10. Close the Excel file by pressing the “X” in the top right-hand corner of the Excel file’s window.
11. Open the file titled “MasterNASA Schedule 6 for Non-daylight” on the computer’s desktop screen at the FOD 1 position and repeat Steps 2 through 10.
    a. Note: When repeating Step 5, make sure to enter in the correct Non-Daylight Saving time in Zulu.

FOC

1. Open the Excel file titled “MasterNASA Schedule 6 (Daylight Savings Time)” on the computer’s desktop screen at the FOC position.

2. At the bottom of the Excel file, press the left arrow until the “PreSchedule” tab is visible.
3. Click on the “PreSchedule” tab.
4. Double-click on cell A1.
5. Enter in the Zulu time that corresponds to ten minutes prior to the start of the new simulation time.
    a. Note: For example, if the NASA FOCUS Lab simulations will begin at 2:00 P.M. during Daylight Saving Time, then enter in “6:50.”
6. Press the “Enter” key on the keyboard.
7. Click the right arrow at the bottom of the Excel file until the “FO Coordinator” tab is visible.
8. Click on the “FO Coordinator” tab.
9. Save the Excel file.
10. Close the Excel file by pressing the “X” in the top right-hand corner of the Excel file’s window.
11. Open the file titled “MasterNASA Schedule 6 (non-daylight time)” on the computer’s desktop screen at the FOC position and repeat Steps 2 through 10.
    a. Note: When repeating Step 5, make sure to enter in the correct Non-Daylight Saving time in Zulu.

Weather and Forecasting

1. Open the Excel file titled “MasterNASA Schedule 7f” on the computer’s desktop screen at the Weather and Forecasting position.

2. At the bottom of the Excel file, press the left arrow until the “PreSchedule” tab is visible.
3. Click on the “PreSchedule” tab.
4. Double-click on cell A1.
5. Enter in the Zulu time that corresponds to ten minutes prior to the start of the new simulation time.
    a. Note: For example, if the NASA FOCUS Lab simulations will begin at 2:00 P.M. during Daylight Saving Time, then enter in “6:50.”
6. Press the “Enter” key on the keyboard.
7. Click the right arrow at the bottom of the Excel file until the “Meteorology” tab is visible.
8. Click on the “Meteorology” tab.
9. Save the Excel file.
10. Close the Excel file by pressing the “X” in the top right-hand corner of the Excel file’s window.
11. Open the file titled “MasterNASA Schedule 7f (fixed for non-daylight savings time)” on the computer’s desktop screen at the Weather and Forecasting position and repeat Steps 2 through 10.
    a. Note: When repeating Step 5, make sure to enter in the correct Non-Daylight Saving time in Zulu.

Updating Medical Durations in the Crew Scheduling Program

Before every semester begins, each first officer and captain’s medical duration in two of the Crew Scheduling programs must be updated. The titles of the Crew Scheduling

programs that need to have the medical durations updated are "Crew Scheduling Session 1 – Evan Lester (2014)" and "Crew Scheduling Session 2 – Evan Lester (2014)." The following procedures must be used to update the medical durations:

"Crew Scheduling Session 1 – Evan Lester (2014)"

1. Open the file folder titled "CS Programs – Evan – 2014" on the computer's desktop screen at the Crew Scheduling position.
2. Open the Excel file titled "Crew Scheduling Session 1 – Evan Lester (2014)."
3. Locate the medical durations for the first officers, which are found in cells X 8 through X 37.
4. Double-click on each first officer's medical duration.
5. Add one year to each first officer's medical duration.
    a. Note: For example, a first officer's medical duration looks like the following: 1st Class Priv. Exp. 06-15. The updated version of the first officer's medical duration looks like the following: 1st Class Priv. Exp. 06-16.
6. Press the "Enter" key on the keyboard after adding one year to each first officer's medical duration.
7. Locate the medical durations for the captains, which are found in cells AE 8 through AE 37.
8. Double-click on each captain's medical duration.

9. Add one year to each captain's medical duration.
    a. Note: For example, a captain's medical duration looks like the following: 1st Class Priv. Exp. 06-15. The updated version of the captain's medical duration looks like the following: 1st Class Priv. Exp. 06-16.
10. Press the "Enter" key on the keyboard after adding one year to each captain's medical duration.
11. Click on cell A8.
12. Save the Excel file.
13. Close the Crew Scheduling program by clicking the "X" in the top right-hand corner of the Excel file's window.

"Crew Scheduling Session 2 – Evan Lester (2014)"

1. Open the file folder titled "CS Programs – Evan – 2014" on the computer's desktop screen at the Crew Scheduling position.
2. Open the Excel file titled "Crew Scheduling Session 2 – Evan Lester (2014)."
3. Locate the medical durations for the first officers, which are found in cells X 8 through X 38.
4. Double-click on each first officer's medical duration.
5. Add one year to each first officer's medical duration except for Jason Evans' medical duration in cell X 21.
    a. Note: For example, a first officer's medical duration looks like the following: 1st Class Priv. Exp. 06-15. The updated version of the first officer's medical duration looks like the following: 1st Class Priv. Exp. 06-16.

6. Press the “Enter” key on the keyboard after adding one year to each first officer’s medical duration.
7. Jason Evans’ medical duration must be expired to comply with the embedded “expired medical” Crew Scheduling trigger. Therefore, edit Jason Evans’ medical duration by using the following procedures:
    a. Double-click on cell X 21.
    b. Subtract two months from the current month.
    c. Enter the current year.
        i. Note: For example, if Jason Evans’ medical duration currently states, “1st Class Priv. Exp. 08-15,” then the updated version of Jason Evans’ medical duration should state, “1st Class Priv. Exp. 06-15.”
8. Locate the medical durations for the captains, which are found in cells AE 8 through AE 38.
9. Double-click on each captain’s medical duration.
10. Add one year to each captain’s medical duration.
    a. Note: For example, a captain’s medical duration looks like the following: 1st Class Priv. Exp. 06-15. The updated version of the captain’s medical duration looks like the following: 1st Class Priv. Exp. 06-16.
11. Press the “Enter” key on the keyboard after adding one year to each captain’s medical duration.
12. Click on cell A8.
13. Save the Excel file.

14. Close the Crew Scheduling program by clicking the "X" in the top right-hand corner of the Excel file's window.

Updating the NASA FOCUS Lab Website

The tabs, fall schedule, spring schedule, contact list, presentation list, and research/publication list on the NASA FOCUS Lab's website must be updated before every semester begins. The following procedures must be used to update these items on the NASA FOCUS Lab website:

1. On a computer, use an Internet browser to go to www.mtsu.edu/ou.
2. Enter the appropriate username and password.
    a. Note: The username and password should be the same as your MTSU Pipeline and email credentials.
3. Press the "Content" tab at the top of the website.
4. Type in "NASA" in the "Filter" box.
5. Click on the blue link titled "nasafocuslab."
6. Continue to the appropriate list of procedures located below each website item.

Tabs

1. Click on the file folder titled "components."
2. Click on the blue link titled "comp_leftnav.inc."
3. Edit the years in the "Fall Schedule" and "Spring Schedule" links to the current years.
4. Proofread the "Fall Schedule" and "Spring Schedule" links and fix any errors that are present.

5. Click “Save.”
6. Click on the green “Publish” button.
7. In the “Publish” pop-up window, click the green “Publish” button.
8. Go to www.mtsu.edu/nasafocuslab.
9. Proofread the “Fall Schedule” and “Spring Schedule” tabs on the left-hand side of the web page.
10. Correct all of the errors that are present in the tabs, if any, by repeating Steps 1 through 9.

Fall Schedule

1. Scroll down until the blue link titled “schedule.pcf” is visible.
2. Click on the blue link titled “schedule.pcf.”
3. Scroll down until the green “Edit” button is visible above Team 1’s schedule.
4. Click on the green “Edit” button above Team 1’s schedule.
5. Edit each team’s schedule using the official NASA FOCUS Lab schedule made by the Principal Investigator.
6. Proofread each team’s schedule and fix any errors.
7. Click “Save.”
8. Click on the green “Publish” button.
9. In the “Publish” pop-up window, click the green “Publish” button.
10. Go to www.mtsu.edu/nasafocuslab and click on the “Fall Schedule” tab on the left-hand side of the web page.
11. Proofread each team’s schedule.

12. Correct all of the errors that are present in each team's schedule, if any, by repeating Steps 1 through 11.

Spring Schedule

1. Scroll down until the blue link titled "springschedule.pcf" is visible.
2. Click on the blue link titled "springschedule.pcf."
3. Scroll down until the green "Edit" button is visible above Team 1's schedule.
4. Click on the green "Edit" button above Team 1's schedule.
5. Edit each team's schedule using the official NASA FOCUS Lab schedule made by the Principal Investigator.
6. Proofread each team's schedule and fix any errors.
7. Click "Save."
8. Click on the green "Publish" button.
9. In the "Publish" pop-up window, click the green "Publish" button.
10. Go to www.mtsu.edu/nasafocuslab and click on the "Spring Schedule" tab on the left-hand side of the web page.
11. Proofread each team's schedule.
12. Correct all of the errors that are present in each team's schedule, if any, by repeating Steps 1 through 11.

Contact List

1. Scroll down until the blue link titled "Contact.pcf" is visible.
2. Click on the blue link titled "Contact.pcf."
3. Scroll down until the green "Edit" button is visible below the Contact Information description.

4. Click on the green “Edit” button below the Contact Information description.
5. Remove any former NASA FOCUS Lab staff member’s name and contact information.
6. Add each current NASA FOCUS Lab staff member’s name and contact information that is not currently in the list of contacts.
7. Proofread the entire contact list and fix any errors.
8. Click “Save.”
9. Click on the green “Publish” button.
10. In the “Publish” pop-up window, click the green “Publish” button.
11. Go to www.mtsu.edu/nasafocuslab and click on the “Contact” tab on the left-hand side of the web page.
12. Proofread each NASA FOCUS Lab staff member’s name and contact information.
13. Correct all of the errors that are present in the contact list, if any, by repeating Steps 1 through 12.

Presentation List

1. Scroll down until the blue link titled “presentations.pcf” is visible.
2. Click on the blue link titled “presentations.pcf.”
3. Click on the green “Edit” button below the title “Presentations.”

4. Add the year and citation for each presentation provided by a NASA FOCUS Lab staff member.
    a. Note: Before every semester begins, ask the NASA FOCUS Lab staff members if they have any citations that they would like to have on the "Presentations" web page on the NASA FOCUS Lab's website.
5. Proofread each new presentation citation and fix any errors.
6. Click "Save."
7. Click on the green "Publish" button.
8. In the "Publish" pop-up window, click the green "Publish" button.
9. Go to www.mtsu.edu/nasafocuslab and click on the "Presentations" tab on the left-hand side of the web page.
10. Proofread each new presentation citation.
11. Correct all of the errors that are present in the presentation list, if any, by repeating Steps 1 through 10.

Research/Publications List

1. Scroll down until the blue link titled "research.pcf" is visible.
2. Click on the blue link titled "research.pcf."
3. Click on the green "Edit" button below the title "NASA FOCUS Lab Research."
4. Add the year and citation of each research paper and/or publication that was given to you by a NASA FOCUS Lab staff member.
    a. Note: Before every semester begins, ask the NASA FOCUS Lab staff members if they have any citations that they would like to have on the

"Research/Publication" web page on the NASA FOCUS Lab's website.

5. Proofread each new research and/or publication citation and fix any errors.
6. Click "Save."
7. Click on the green "Publish" button.
8. In the "Publish" pop-up window, click the green "Publish" button.
9. Go to www.mtsu.edu/nasafocuslab and click on the "Research/Publications" tab on the left-hand side of the web page.
10. Proofread each new research paper and/or publication citation.
11. Correct all of the errors that are present in the research/publication list, if any, by repeating Steps 1 through 10.

Contacts for Website Support

1. Eric Niemiller
    a. Phone: 615-494-8684
    b. Email: Eric.Niemiller@mtsu.edu
    c. Location: Room 0105 / Bldg. ROTX
2. Evan Lester
    a. Email: eml3d@mtmail.mtsu.edu

CHAPTER VI – NASA FOCUS LAB TERMS TO KNOW

1-2-3 Rule	A destination alternate is required when the weather reports or forecasts indicate that the ceiling will be less than 2,000 feet and/or the visibility will be less than three statute miles at one hour before or one hour after the estimated time of arrival at the destination airport (FAA Alternate airport for destination: IFR or over the top: Domestic operations, 2016).
AABI	Aviation Accreditation Board International
AAR	After Action Review
A-check	Maintenance procedure on an aircraft that lasts about 30 minutes (Also known as A-Phase Inspections).
AIRMET	Airmen's Meteorological Information – gives information about weather that could be hazardous to every aircraft, but the weather does not meet the criteria of a SIGMET, which includes Instrument Flight Rules (IFR) or mountain obscuration, turbulence, and icing ("ADDS SIGMET help," n.d., para. 6).
ARFF	Aircraft Rescue and Firefighting
ATC	Air Traffic Control
Bumped cargo	Cargo that is taken off a flight because of weight restrictions.

Bust	A term used when a flight crewmember exceeds the allowed duty time in a 24-hour period, any seven consecutive days, a month, or any calendar year.
Category A MEL	An MEL item that can be inoperative for only one flight leg before the item has to be fixed or replaced.
Category B MEL	An MEL item that can be inoperative for only two flight legs before the item has to be fixed or replaced.
Category C MEL	An MEL item that can be inoperative for only three flight legs before the item has to be fixed or replaced.
CEO	Chief Executive Officer
Contract maintenance	Aircraft maintenance company that can be contracted to perform maintenance on a Universal E-Lines' aircraft that is at a non-hub airport (not at KBNA or KJAX).
Convective SIGMET	Convective Significant Meteorological Information – issued for a line of thunderstorms, embedded thunderstorms, severe surface weather, or other types of convective weather that is hazardous to every type of aircraft ("ADDS SIGMET help," n.d., para. 3).
CPU	Central Processing Unit
CRJ	Canadair Regional Jet
CSC	Computer Sciences Corporation
CVR	Cockpit Voice Recorder

Destination alternate	An airport that an aircraft can divert to and land if the aircraft cannot land at its intended destination airport (FAA General definitions, 2016). A flight is required to have a destination alternate when the weather conditions at the flight's destination do not comply with the 1-2-3 Rule.
Downing aircraft in RMS	An action taken in the RMS to take an aircraft out of service and make the aircraft unavailable to fly.
DST	Daylight Saving Time
Duty time	The set time limits that a flight crewmember are allowed to legally fly. The set time limits are: 1,000 hours in any calendar year, 100 hours in any calendar month, 30 hours in any seven consecutive days, and eight hours in a 24-hour period.
Embedded triggers	Scenarios that are embedded into the NASA FOCUS Lab's programs that require a response from a person in a specific position.
Engine flameout	The failure of a turbine engine that is not caused by the failure of a part within the engine (Garrison, 2006).
Explosive decompression	Very fast decompression of an aircraft, which can cause structural damage to the aircraft.
FAA	Federal Aviation Administration
FAR	Federal Aviation Regulations
FDR	Flight Data Recorder

Flight crew	A flight crew consists of a Captain and a First Officer.
Flight crewmember	A Captain or First Officer.
Flying categories	Includes Low Instrument Flight Rules (LIFR), Instrument Flight Rules (IFR), Marginal Visual Flight Rules (MVFR), and Visual Flight Rules (VFR) conditions ("ADDS-METAR help page," n.d., para. 1).
FOC	Flight Operations Coordinator
FOCUS	Flight Operations Center – Unified Simulation
FOD	Flight Operations Data
GMT	Greenwich Mean Time
GPWS	Ground Proximity Warning System
GTA	Graduate Teaching Assistant
Handled cargo	Cargo that was bumped off an overweight flight and rerouted to its destination.
Handled passengers	Passengers that were bumped off an overweight flight and rerouted to their destinations.
Hub	A major airport where Universal E-Lines' maintenance personnel, aircraft parts, reserve crews, and spare aircraft are located. The two Universal E-Lines' hubs are KBNA and KJAX.
Hub and spoke system	A system in which a major airport (a hub) is the primary location for connecting flights to and from other (spoke) airports ("Hub-and-spoke," n.d.).

ICAO	International Civil Aviation Organization
Illegal flight	A flight that departed without adhering to the Federal Aviation Regulations (FARs) and/or Universal E-Lines' Standard Operating Procedures (SOPs).
I/O	Industrial and Organizational
IRB	Institutional Review Board
Join.Me	A computer application that allows the NASA FOCUS Lab staff to observe the computer monitors at each position on a personal computer or tablet. Also, it allows the students at each position to view the flight status board on one of the computer monitors at his or her position.
KATL	Hartsfield-Jackson Atlanta International Airport in Atlanta, Georgia.
KBHM	Birmingham-Shuttlesworth International Airport in Birmingham, Alabama.
KBNA (or BNA)	Nashville International Airport in Nashville, Tennessee.
KCAE	Columbia Metropolitan Airport in Columbia, South Carolina.
KCLT	Charlotte Douglas International Airport in Charlotte, North Carolina.
KJAX (or JAX)	Jacksonville International Airport in Jacksonville, Florida.
KMBT	Murfreesboro Municipal Airport in Murfreesboro, Tennessee.

KMCO	Orlando International Airport in Orlando, Florida.
KMEM	Memphis International Airport in Memphis, Tennessee.
KMIA	Miami International Airport in Miami, Florida.
KPNS	Pensacola International Airport in Pensacola, Florida.
KRDU	Raleigh-Durham International Airport in Morrisville, North Carolina.
KSAV	Savannah/Hilton Head International Airport in Savannah, Georgia.
KSDF	Louisville International Airport – Standiford Field in Louisville, Kentucky.
KTLH	Tallahassee International Airport in Tallahassee, Florida.
KTPA	Tampa International Airport in Tampa, Florida.
KTYS	McGhee Tyson Airport in Knoxville, Tennessee.
MEL	Minimum Equipment List – a list of discrepancies that may be deferred for maintenance under specific conditions.
METAR	Aviation Routine Weather Report – hourly surface observations of weather conditions.
MTSU	Middle Tennessee State University
NASA	National Aeronautics and Space Administration
NDST	Non-Daylight Saving Time
Non-embedded triggers	Scenarios that are implemented into a simulation that require a teamwork response.

Non-hub airport	All of the airports Universal E-Lines' services except for KBNA and KJAX.
NOTAM	Notice to Airmen – provides non-weather information about individual airports such as runway closures and temporary flight restrictions (TFRs) due to air shows, government/military operations, etc.
Optimal solution	The best solution that could be made in regards to a trigger or scenario based on the current conditions in the simulation.
PACK	Pressurization and Air Conditioning Kit
PIREP	Pilot Report – a report made by pilots regarding their observation of weather conditions in flight, such as turbulence, clouds, and icing.
Ramp check	An inspection carried out by FAA officials to determine whether or not a flight was conducted legally in regards to the Federal Aviation Regulations (FARs).
Reserve crew	Flight crewmembers who will take over the remaining legs of a flight in the event that the currently scheduled flight crew is unable to finish the remaining flight legs.
RMS	Resource Maintenance System – a program used by the maintenance positions to help them manage all of the maintenance issues with Universal E-Lines' aircraft.

SIGMET	Significant Meteorological Information – provides information regarding weather conditions that are hazardous to every aircraft and do not meet the criteria of a Convective SIGMET, such as severe icing, volcanic ash, and severe turbulence ("ADDS SIGMET help," n.d., para. 1).
SLD	Supercooled Liquid Droplets – water droplets that become ice when they make contact with an aircraft.
SOPs	Standard Operating Procedures
Spare aircraft	An extra Universal E-Lines' aircraft located at one of Universal E-Lines' hubs (KBNA or KJAX) that can be used by a team during a simulation. There are a total of six spare aircraft. There are three spare aircraft at both KBNA and KJAX.
TAF	Terminal Aerodrome Forecast – provides the forecasted weather conditions at an airport over a specific period of time (typically over a 24-hour period) ("TAF decoder," n.d., para. 1).
TFR	Temporary Flight Restriction – a restricted area that Universal E-Lines' aircraft cannot enter (Federal Aviation Administration, n.d., para. 1).
TSA	Transportation Security Administration
UAS	Unmanned Aircraft Systems

UAV	Unmanned Aerial Vehicle
Unhandled cargo	Cargo that was bumped off an overweight flight, that flight departed, and the bumped cargo was never rerouted to its destination. Cargo bumped off of an overweight flight that has not departed is not considered unhandled cargo.
Unhandled passengers	Passengers that were bumped off an overweight flight, that flight departed, and the bumped passengers were not rerouted to their destination. Passengers bumped off an overweight flight that has not departed are not considered unhandled passengers.
Upping aircraft in RMS	An action taken in the RMS to place an aircraft back in service and make the aircraft available to fly.
USB	Universal Serial Bus
Zulu time	Another term for Greenwich Mean Time (GMT) or Coordinated Universal Time (UTC) that is used in the aviation industry to prevent the confusion that occurs when operating in different time zones (“Aviation time,” n.d., para. 1).

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Appendix B – Institutional Review Board (IRB) Approval Letter

MIDDLE TENNESSEE STATE UNIVERSITY

2/11/2015

Investigator(s): Evan Michael Lester, Andrea Georgiou
Department: Aerospace
Investigator(s) Email Address: eml3d@mtmail.mtsu.edu; Andrea.Georgiou@mtsu.edu

Protocol Title: NASA FOCUS Lab Operations Manual

Protocol Number: #15-178

Dear Investigator(s),

Your study has been designated to be exempt. The exemption is pursuant to 45 CFR 46.101(b)(2) Educational Tests, Surveys, Interviews, or Observations.

We will contact you annually on the status of your project. If it is completed, we will close it out of our system. You do not need to complete a progress report and you will not need to complete a final report. It is important to note that your study is approved for the life of the project and does not have an expiration date.

The following changes must be reported to the Office of Compliance before they are initiated:

- Adding new subject population
- Adding a new investigator
- Adding new procedures (e.g., new survey; new questions to your survey)
- A change in funding source
- Any change that makes the study no longer eligible for exemption.

The following changes do not need to be reported to the Office of Compliance:

- Editorial or administrative revisions to the consent or other study documents
- Increasing or decreasing the number of subjects from your proposed population

If you encounter any serious unanticipated problems to participants, or if you have any questions as you conduct your research, please do not hesitate to contact us.

Sincerely,

Lauren K. Qualls, Graduate Assistant
Office of Compliance
615-494-8918