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KC-135 CREW REDUCTION FEASIBILITY DEMONSTRATION SIMULATION STUDY VOLUME 1: FUNCTION ANALYSIS AND FUNCTION REALLOCATION

G. Fred Ward, Capt, USAF Ross A. Dudley, Capt, USAF John A. Hassoun Edward R. Hughes Justin D. Rueb, Maj, USAF Blair W. Conroy, C1C, USAFA



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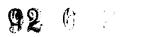
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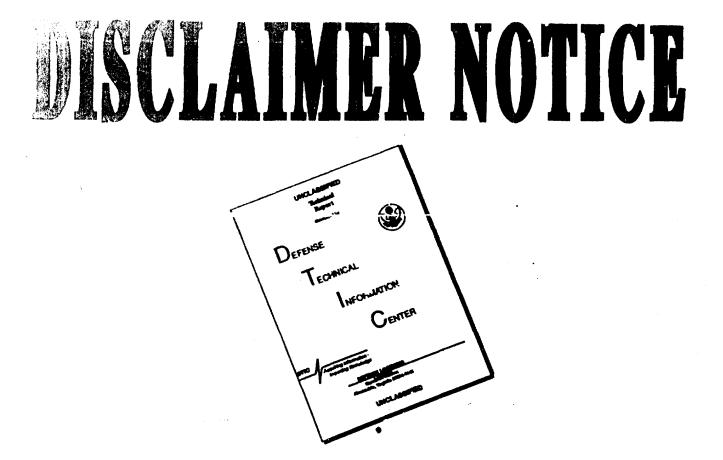
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Sov

John A. Hassoun Program Director Crew Station Evaluation Facility

Technical Specialist Human Factors Branch

John W. Vogt, Jr., Lt Col/USAF Director, Support Systems Engrg

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A function analysis of the four-person crew KC-135 and function reallocation to a three-person crew were completed in support of the KC-135 Avionics Modernization program. This report is volume one of a three-volume technical report. This effort provided a distribution of functions between automation concepts and the remaining three crewmembers. The function redistribution and automation concepts served as a baseline for a crew station design group to design a cockpit configuration for a three-person crew KC-135 (Vol II). This configuration was then implementated in a simulator at the Crew Station Evaluation Facility (CSEF) for a comprehensive man-in-the-loop simulation evaluation (Vol III). The function analysis and reallocation were the first step towards modifying the KC-135 cockpit and will be instrumental in future KC- 135 efforts.									
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BACKGROUND

As the budget deficit continues to grow, government dependent programs are being asked to do more with less. Within the Department of Defense (DOD), the Air Force has scaled back its acquisition activities and has instituted several programs to reduce the size of the force. Part of this personnel reduction effort involved the KC-135. Specifically, can the crew size in the KC-135 be reduced feasibly from four people to three people? HQ SAC/XRH sought to answer this question, and via ASD/SDB requested support from the Crew Station Evaluation Facility (CSEF) in a message (number 90280) dated 11 Oct 90.

The CSEF is an U.S. Air Force simulation facility that belongs to the Aeronautical Systems Division (ASD) of Air Force Systems Command, at Wright-Patterson AFB, Ohio. The CSEF government personnel are assigned by the Crew Systems Division (ASD/ENEC). The facility performs human engineering evaluations in support of a variety of System Program Offices (SPOs).

The KC-135 crew reduction issue has been addressed several times in the past. Geiselhart, Schiffler, and Ivey (1976) conducted a series of flight tests to assess the feasibility of reducing crew size. A dual INS was installed in the test aircraft and workload was prohibitively high with a three man crew in an Emergency War Order (EWO) scenario. Schiffler, Geiselhart and Ivey (1976) reviewed task analysis documents and conducted a series of flight tests. It was concluded that crew workload was too high during various mission segments, hence, maintaining a four man crew was recommended. Barbato, Madero, Sexton, Moss, and Brandt (1980), performed a mockup cockpit design study to determine the avionics control and display criteria needed if the crews were to successfully fly the given mission. The study incorporated reallocated crew functions and used 1980 state-of-the-art systems including a navigation management system, electronic horizontal situation/multipurpose displays and upgraded avionics systems. Results indicated that the subject crews would strongly support a reduced crew size only if the present cockpit hardware was updated and relocated. Madero, Barbato, and Moss (1981) used prior analysis and mockup evaluations to determine desirable and undesirable characteristics of three designs. The results of the mockup evaluations were used to develop a "composite" configuration which was evaluated in a full mission simulation. The simulation validated the acceptability of the composite configuration and verified that the KC-135 mission could successfully be accomplished using a three man crew. In short, results from prior evaluations are mixed. Some researchers found that workload reaches unacceptably high levels when one crew member is eliminated, while others concluded that given the appropriate equipment and design changes KC-135 missions are unaffected by the reduced crew size. The present analysis effort is the first of a three-phase feasibility demonstration. Phase II is system design, and Phase III, simulation, test and evaluation, is a direct result of Phases I and II.

INTRODUCTION

The primary focus of this analysis phase (Phase I) was to complete a function analysis of the four KC-135 crew positions, and recommend function reallocation including certain automation concepts that can be integrated into a three man crew KC-135 configuration. The function analysis was comprehensive and examined the following: the functions performed during various phases of flight, a breakdown of the functions to the task level. inputs needed to perform each task, equipment needed to perform the task, sensory modality being used for task performance, control inputs and their effects, common errors, task criticality, training required to proficiently perform each task, the time needed to perform each function, and workload associated with each function. The function analysis/reallocation was accomplished in three steps: (1) the construction and validation of task listings for each KC-135 crew position, (2) the performance of function analysis for each crew position, and (3) the reallocation of the navigators functions among the remaining crewmembers and automation concepts. Crews supporting this effort flew either the KC-135A, E, or R model. Procedural differences do exist between models, but for the purposes of this function analysis, the differences were insignificant.

STEP 1 - TASK LISTINGS

A current task listing of all KC-135R crew positions was collected to serve as a basis for the entire effort.

METHOD

The CSEF obtained a listing of each KC-135 crewmember's tasks from the 93 BMW/DO5 at Castle AFB. This task listing was constructed in the fall of 1989 and included tasks for the KC-135 A-, Q-, and R-model aircraft. Two CSEF engineers were sent to Castle AFB from 5 Nov to 9 Nov 90 to interview crewmembers from each crew position in order to update and verify the task listing. Flight crew checklists and T.O. 1C-135(K)R-1 were also used to construct the comprehensive task listing for each crewmember. The working definition of a task employed by the CSEF engineers was: "the uninterruptible crew activities that are required for the successful completion of a function." The CSEF engineers interviewed five pilots/copilots, two navigators, and seven boom operators from the 330 CFIS. The pilots/copilots averaged 2,880 hours (standard deviation=249.0 hours) and 9.4 years flying time in the KC-135. Navigators averaged 1,875 hours (standard deviation=176.8 hours) and 9 years, and boom operators averaged 3,386 hours (standard deviation=933.5 hours) and 11.1 years flying time in the KC-135. While validating the task listings, shown in Appendix A, CSEF engineers also began the boom operator function analysis. A detailed description of the function analysis is provided in the "Function Analysis" section.

Mission Scenario

For the task listings, function analysis, and function reallocation, a mission scenario was provided to give the interviewers and crewmembers a realistic mission context. The scenario used in this evaluation was developed using inputs from HQ SAC/XRH personnel, ASD/SDB personnel, crew members from Castle Air Force Base (AFB) and Wurtsmith AFB, and the Barbato et al., (1980) document entitled "Tanker Avionics/Aircrew Complement Evaluation (TAACE), Phase O - Analysis and Mockup, Volume III: Mission Scenario." A written description of the scenario is provided below:

You are the #2 aircraft in a 2-ship Cell/MITO leaving Mildenhall. You will be carrying support cargo and a crew chief. Your mission is to refuel F-4s over the Baltic Sea (assume no radar returns) in confined airspace. There is one refueling track, and a point parallel rendezvous will be used. The F-4s arrive late. After refueling, you head toward Fairford, your intended recovery base. Due to weather throughout the region, you are directed to recover to Zaragosa. After planning the divert, the lead navigator's equipment goes out and the #2 navigator must take on the lead navigation responsibilities. The communication level throughout this mission is EMCON-2.

RESULTS

The task listings generated served as the basis for the function analysis; they can be found in Appendix A.

STEP 2 - FUNCTION ANALYSIS

Function analyses for each of the four crewmembers were completed to ensure that all of the functions required in a KC-135 mission would be taken into account and that no crewmember would be overloaded by taking on the residual navigator's tasks.

METHOD

Two CSEF engineers were sent to Grissom AFB from 26 Nov to 30 Nov 90 to fly in two air refueling missions, and interview crewmembers from each crew position. The CSEF engineers interviewed nine pilots/copilots who averaged 4,430 hours (standard deviation=1182.8 hours) and 17.2 years flying time in the KC-135. Five navigators and four boom operators were interviewed and respectively averaged 2,721 hours (standard deviation=1516.6 hours) and 12.4 years, and 3,372 hours (standard deviation=1307.0 hours) and 13.8 years flight time in the KC-135. All crews were from the 434 AREFW and 72 AREFS. The mission scenario described in the previous method section was employed as a reference for the crewmembers. The definition of each analysis category is given below.

Task - The actual task being performed (often a checklist item).

Modality - The modality of activity required for the task from the following listing:

- Man Manual
- Vis Visual
- Aud Auditory
- Cog Cognitive
- Voc Vocal

- Criticality Crewmembers were instructed to identify those tasks that were critical due to effects on mission performance, potential equipment damage, or personal safety (boom operators only).
- Errors Potential errors associated with each task. Crewmembers were instructed to identify only those errors that had a reasonable probability of occurrence.
- Information in The source of any information that the crewmember needed to complete the task.
- Error Effects Effects of the errors that are likely to occur in the performance of a task.
- **Desired Outcome -** The desired outcome of the task. This item answered the question "why is this task completed?" (boom operators only).
- Training The amount of training (either no training, on-the-job training (OJT) or formal training) each crewmember would need to perform the various navigator tasks.

Other parts of the function analysis included a workload assessment and a training evaluation. These efforts began with interviews of four crewmembers at Rickenbacker AFB and ended with a workload questionnaire and subsequent data analysis.

Prior to the interviews, the mission was divided into 20 discrete, time-sequenced "mission events." The mission events are listed in Table 1. Dividing the mission made workload assessment and function reallocation more manageable. "Mission events" were either phases of flight (i.e., takeoff), checklists (i.e., preparation for contact) or major occurrences (i.e., mission planning). The two objectives of this effort were (1) to collect workload and unteline data for each of the mission events and (2) to finish collecting training data which were not completed at Grissom AFB. Four crewmembers, one from each crew position, were interviewed. The crew averaged 3,100 hours (standard deviation=2447.4 hours) and 12.8 years flying time in the KC-135.

Workload data were collected for each crew position using the 10-point modified Cooper-Harper scale shown in Figure 1 (Boff, Kaufman & Thomas, eds, 1986). Each crewmember was given a comprehensive task list for his crew position so he or she could reference the list to see what tasks were performed for that mission event. Each crewmember rated the level of workload for each mission event, as a function of his/her own experience.

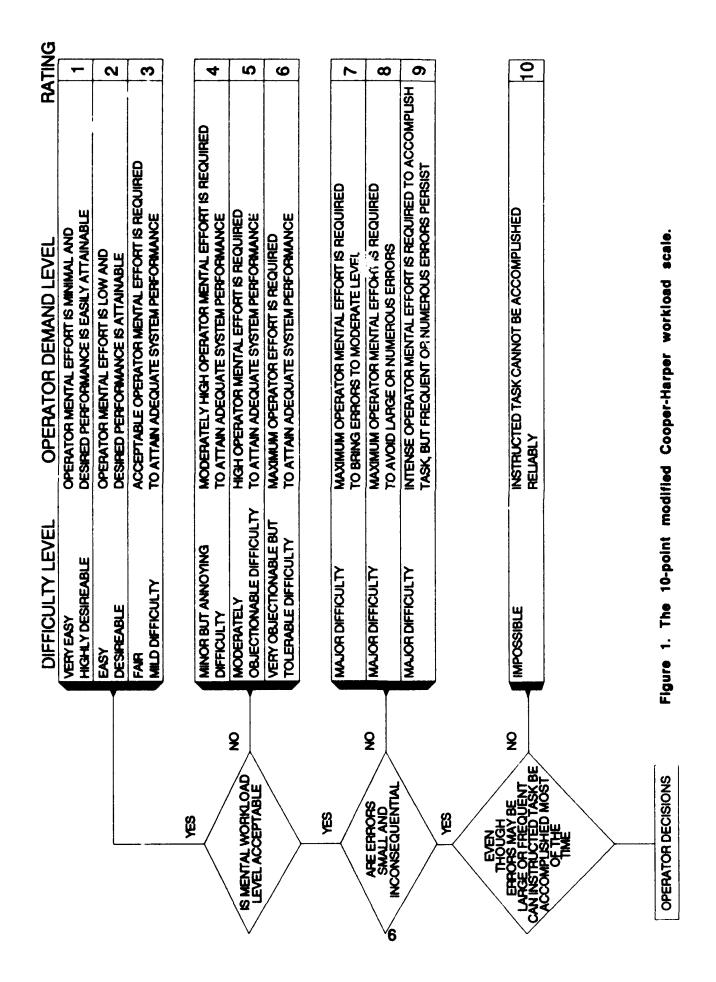
Following this effort at Rickenbacker AFB, more workload data were solicited from personnel of the 330 CFIS at Castle AFB. A questionnaire was administered to document the workload level of each crew position and mission event. Based upon a recommendation received at Rickenbacker AFB, the last three mission events were combined and titled "after landing"; thus, there were now 18 events instead of the original 20. The CSEF received 18 completed questionnaires from Castle AFB: Ten from pilots/copilots, four from navigators and four from boom operators. A copy of the questionnaire and ratings description are provided in Appendix C.

To ascertain potential training requirements, the pilot, copilot and boom operator were given a navigator task list and asked to indicate the type of training (no training, OJT or formal training) that would be required before the crewmember could perform

- **1. MISSION PLANNING**
- 2. SQUADRON/BASE OPS AND COMBAT CREW DUTIES
- 3. POWER OFF/WALK AROUND INSPECTION
- 4. POWER ON INSPECTION
- 5. STARTING ENGINES AND BEFORE TAXI
- 6. TAXI
- 7. BEFORE TAKEOFF
- 8. TAKEOFF
- 9. CELL JOIN UP
- 10. CRUISE #1
- **11. PREPARATION FOR CONTACT**
- **12. AIR REFUELING**
- **13. POST AIR REFUELING**
- 14. CRUISE #2
- **15. PLAN DIVERT**
- **16. DESCENT**
- 17. APPROACH AND LANDING
- **18. AFTER LANDING***
- **19. TURN OFF EQUIPMENT***
- 20. MAINTENANCE DEBRIEF, ETC.*

*For timeline development and workload assessment, mission events 18-20 were combined into 1 event entitled "After Landing"

Table 1. The 20 defined mission events.



each task. The navigator's opinion of which crewmember would be best suited to perform each navigator task was also solicited, as well as the associated amount of training required. These data were used to make general statements about new training requirements for each crewmember.

RESULTS

The result of the function analysis was a completed function matrix (example in Appendix B). The matrices served as a common reference point for members of the function reallocation team.

Figure 2 shows each crewmember's workload as a function of mission event. Figure 3 chows the average workload ratings for the pilot, copilot, and navigator as a function of mission event. The boom operator was not considered in this average because most of the navigator functions were not going to be reallocated to the boom anyway. Takeoff, cell join-up, cruise #1, preparation for contact, air refueling, planning a divert, descent, and approach and landing yielded relatively high mean workload ratings. Individual workload graphs were used during the function reallocation to prevent overloading any crew position and are shown in Figures 4-21.

Some experienced crewmembers know how to perform a few of the true navigator functions already, but because experience levels vary from crew to crew, a more structured approach to reallocating navigator functions is required. This structured approach leads to additional training needs. These training needs are addressed below in very generic terms.

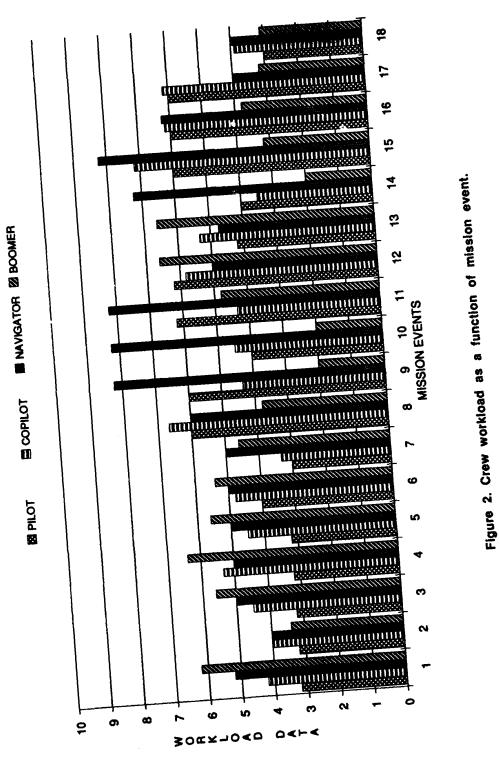
Generally, the copilots and boom operators felt their present jobs allowed them to pick up the navigator functions, if necessary, without causing serious workload problems. Many of these functions could be performed proficiently after OJT, while others, such as radar tasks, would require additional formal training. Copilots were given all tasks associated with radar.

STEP 3 - FUNCTION REALLOCATION

A function reallocation was conducted in an attempt to distribute navigator functions among the remaining crewmembers in such a way that no one crewmember would be overworked. By referencing the function analyses, the navigator tasks that still pertained to a three-man crew could be distributed to the remaining crewmember(s) that could best handle the additional workload.

METHOD

The function reallocation was conducted in a series of round table meetings over a 3day period. Participants in the working group included CSEF, ASD/SDBA, and SACSO personnel. Three members of this working group were pilots (two of which were KC-135 pilots). Two working group members were navigators (one KC-135 and one B-52). Each participant was provided copies of the function and workload analysis results, a copy of the mission scenario, a list of available technologies for automation, and a list of functions for each crew position. As each function was reallocated, its impact on the recipient of the function was assessed to assure that the crewmember would not become overworked. Each navigator function was either allocated to another crew member,





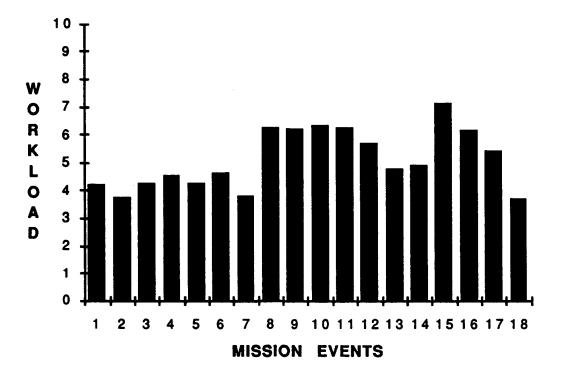
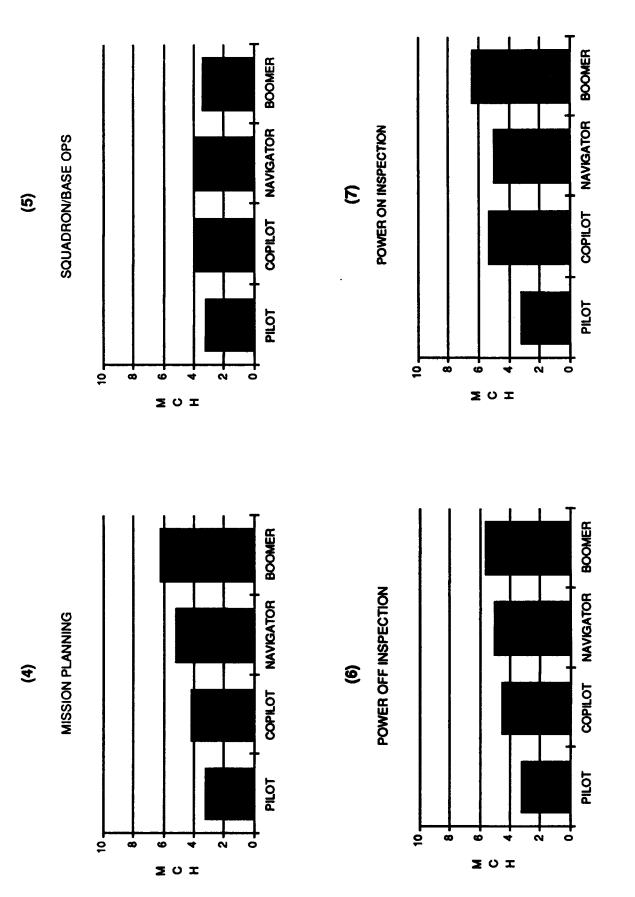
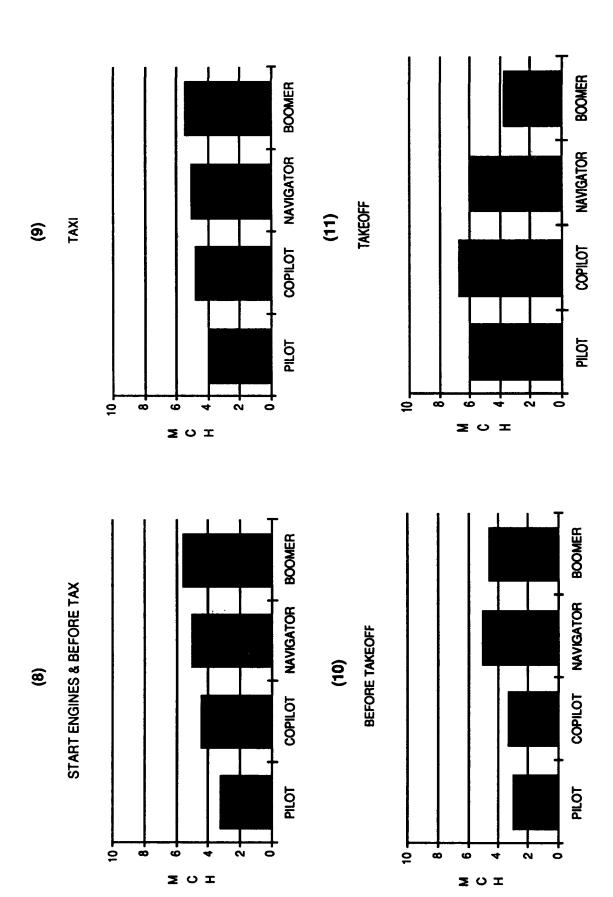


Figure 3. Mean crew workload as a function of mission event (exclude boom operator).

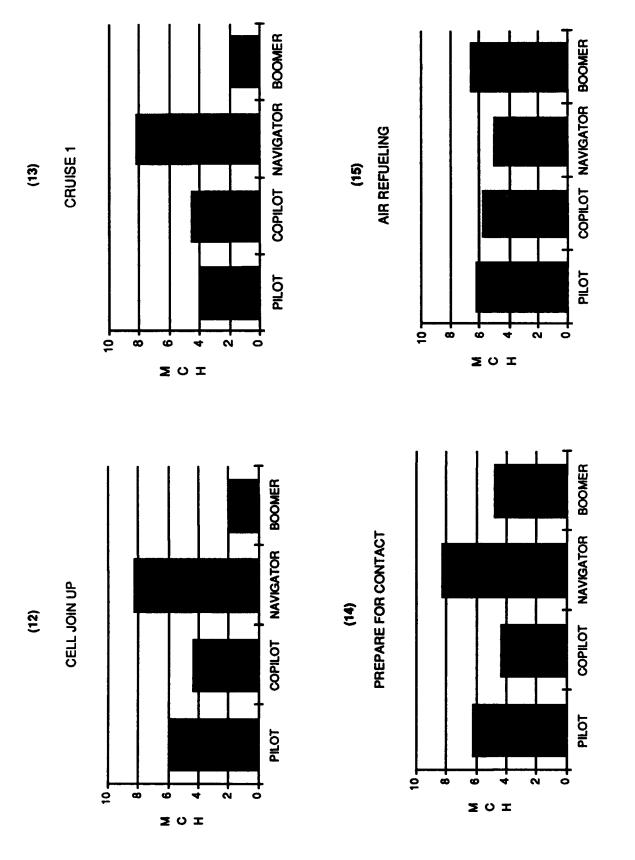






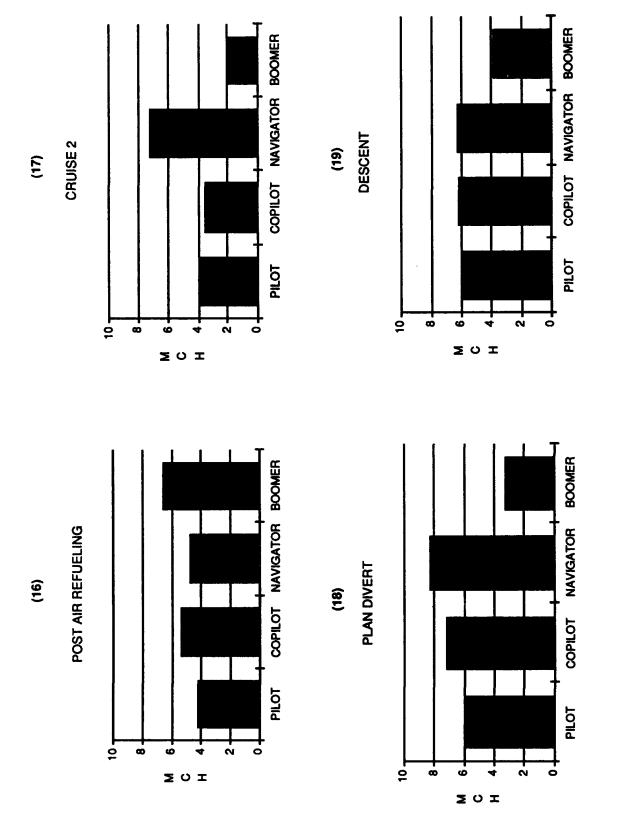
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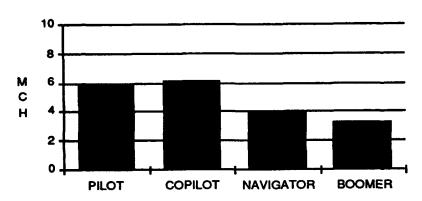
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Figures 16-19. Crew workload for each mission event.

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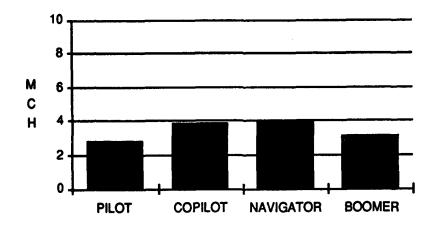




APPROACH AND LANDING







Figures 20-21. Crew workload for each mission event.

allocated to a proposed automation concept or deemed as no longer necessary and removed from the list.

RESULTS

The following results describe the reallocated functions for each crew position by mission event. Those functions allocated to automation concepts are included at the end of this section. The three-crewmember task listings for each crew position can be found in Apr andix D. All tasks strictly concerning the navigator (i.e., navigator strap-in, oxygen system tasks, etc.) were deteted from the task listings.

The following section provides a baseline for the reallocated functions. This baseline will undoubtedly be modified as the systems and subsystems are maturing through the design, and test and evaluation phases.

Mission Planning (Event 1)

Figure 4 shows each crewmember's workload during mission planning. The navigator and boom operator have the highest workload rating during this event. The boom operator has the responsibility of loading cargo onto the aircraft. Cargo loading is a workload intensive period for the boom operator, consequently the navigator's mission planning tasks were reallocated to the pilot and copilot. Most of the navigator's work during this event involved chart and flight plan document preparation.

Functions Reallocated to the Pilot:

Complete briefing guide Complete correlation sheet Complete scheduling blocks of mission accomplished report (MAR) Review and study FLT Info Pubs (FLIP) and general planning requirements Conduct crew flight briefing Check Form 200 and chart for accuracy

Functions Reallocated to Copilot:

Select correct charts Develop route of flight to meet mission timing Place special use and space data on chart Annotate highest terrain and obstructions on chart Annotate level off point Annotate ADIZ entry point (if applicable) Pre-determine radar targets at action points

Functions Reallocated to Boom Operator:

None

Functions Eliminated:

Plot celestial navigation leg on charts Place air refueling data on chart Complete mission paperwork (mission review worksheet, pre-comp sheets) Complete Form 200 Fill out known information on in-flight log Determine where celestial observation will take place

Justification for eliminating functions: The charts and mission paperwork were deleted given the assumption of a navigation database and a data transfer system. The mission paperwork and Form 200 will be automated, air refueling data will be automated in the navigation system via the navigation database. Since celestial navigation will not be used, no navigation legs or points for celestial observations need be selected or annotated on the charts.

Squadron/Base Operations and Combat Crew Duties (Event 2)

Squadron/base operations and combat crew duties typically begin approximately two hours before take-off time. Crew workload is very low (see Figure 5).

Functions Reallocated to the Pilot:

Synchronize crewmember's watches (time hack) Check receiver status Check aircraft parking spot

Functions Reallocated to the Copilot:

Check flight schedule for changes Check weather for impact on mission timing Pick up KY-58 Check for departing and landing airfield pages

Functions reallocated to the Boom Operator:

Check KIK-18

Functions Eliminated:

Review approach plates and enroute charts Pick up required inflight publications

Justification: Since the navigator is no longer a crewmember, and assuming a navigation database is available, his duties of reviewing the mission and picking up inflight publications are no longer necessary.

* If a mission change occurs, such as a fuel load change, then some copilot functions would have to be picked up by the pilot because the copilot would have to recompute take off data, etc.

Power Off/Walkaround Inspection (Event 3)

Again crew workload is very manageable (see Figure 6). The pilot briefs the crew prior to their boarding the aircraft, and then walks around the aircraft inspecting the exterior surfaces and equipment. The copilot and navigator are seated in their positions ensuring that all switches are correctly set. The boom operator preflights the cargo

compartment, the boom operator's compartment and performs miscellaneous preflight procedures.

Functions Reallocated to the Pilot:

None

Functions Reallocated to the Copilot:

Take out navigation publications Set IFF master switch off Set mode 4 code switch to A or B (as required) Set mode enabling switches OUT Set mode 4 on/out switch ON Set mode 3/A code selectors to all Os Check MSU-INS mode selectors off Check CDU power switch in NORMAL or AUX Set FSA/CAS power switch off Set search radar FTC switch OFF Set IAGC switch off Set PATT switches as desired Set bearing switch as desired Set STC dial full counterclockwise Set stab switch off Set gain control full counterclockwise Set heading select knot to local magnetic variation Set scan switch OFF Set test meter switch to "Mag" Set range switch to 3-30/5 Set function switch OFF Set radar pressurization control switch to ON Set pulse width switch (as required) Set code selector switches (as required) Set radar intensity control knob fully counterclockwise Set range control knob fully clockwise

Functions Reallocated to Boom Operator:

Check portable oxygen bottle Check cleanliness, general condition, and stored in normal position Check for pressure approximating 300 PSI Check altitude selector knob in NORMAL position Service portable oxygen bottle (if required) Replace portable oxygen bottle Ensure oxygen supply lever OFF

Functions Eliminated:

Take out navigation charts and equipment Ensure celestial tables and air almanacs on-board and current Set APN 218 Doppler switch to OFF Check MSU-DNS mode selectors OFF Set search radar range delay switch OFF Justification: The navigator's charts, equipment, and celestial references should no longer be necessary. The DNS is assumed deleted.

Power On Inspection (Event 4)

Workload for each crewmember is shown in Figure 7. The pilot and copilot are seated inspecting switches, radios, flight controls, and display accuracy. The navigator, also seated, checks navigation equipment and inserts waypoint data. The boom operator continues checking the cargo compartment, the boom operator's compartment or finishes miscellaneous tasks.

Functions Reallocated to the Pilot:

Perform INS system preflight procedures (pilot or copilot) Check INS status panel (pilot or copilot) Set MSU-INS mode selectors to ALIGN (pilot or copilot) Insert INS present position Set altimeter to correct barometric pressure (pilot or copilot) Verify waypoints (pilot or copilot) Read waypoint data

Functions Reallocated to the Copilot:

Perform INS system preflight procedures (pilot or copilot) Check INS status panel (pilot or copilot) Set MSU-INS mode selectors to ALIGN (pilot or copilot) Turn FSA/CAS power switch ON Insert INS present position (pilot and copilot) Set IFF mixer switch as desired Set IFF antenna switch to BOTH Set RAD-TEST/MON switch to OUT Set IFF master switch to NORMAL test modes, 1, 2, 3/A and C Check Mode 4 light outset master switch to STANDBY Set Mode 1, 2, 3/A and C switches as required Set Mode 1, 2, and 3A codes as required Set Audio/Light switch as required Set RAD-TEST/MON switch as desired Turn APN-59 function switch to STBY Set altimeter to correct barometric pressure (pilot or copilot) Input wavpoint data Verify waypoints (pilot or copilot)

Functions Realiocated to Boom operator:

Encode Mode 4 Load KY-58 Request authentication and launch message from command post Respond with correct authentication

Functions Eliminated:

Check N-1 compass latitude correction pointer OFF Set N-1 compass to correct MAG heading Center annunciation pointer Accomplish GRID check Perform DNS system preflight procedures Check Doppler status panel Set MSU-DNS mode selectors to ALIGN Turn APN-218 mode selector to LAND Perform bit test Turn APN-218 mode selector to OFF Insert DNS present position Compare altimeter setting with field elevation Accomplish DNS interface test Accomplish INS interface test Insert TACAN data Check sextant mount Check sextant desiccant Check averager Check sextant alignment Observe a celestial precomp **Resolve sextant accuracy** Remove and stow sextant and stool

Justification: With new navigation equipment, N-1 compass procedures and the grid check should no longer be necessary. The DNS is assumed deleted. TACAN data should be included in the navigation database. The sextant check is no longer necessary since celestial navigation will not be accomplished.

Starting Engines and Before Taxi (Event 5)

Crewmember workload during the start engines and before taxi event are shown in Figure 8. Only moderate workload was induced.

Functions reallocated to the Pilot:

None

Functions reallocated to the Copilot:

Set INS system to NAV mode Check for at least one generator on line Set IFF master switch to STANDBY Turn search radar to STANDBY Set radar/rendezvous beacon as required Perform warning and indicator light test Check receiver status Ensure taxi clearance received

Functions reallocated to the Boom operator:

Turn oxygen system ON

Functions eliminated:

Set DNS system to NAV mode

Monitor engine start Turn APN-218 Doppler mode selection ON

Justification: The DNS is assumed deleted.

Taxi (Event 6)

Figure 9 shows that crewmember workload was very manageable during Taxi. All navigator functions performed during this event were either eliminated or reallocated to the copilot.

Functions reallocated to the Pilot:

None

Functions reallocated to the Copilot:

Set search radar function switch to SEARCH Adjust radar intensity control Adjust heading mark intensity control Set scan switch as desired Set stabilization switch to ON Fine-tune radar Check beacon capability Ensure departure clearance is received Perform weather scan

Functions reallocated to the Boom operator:

None

Functions eliminated:

Perform radio procedures

Justification: This function was for the navigator only.

Before Takeoff (Event 7)

At this point in the mission each crewmember is accomplishing last minute tasks before takeoff. Workload is low (see Figure 10).

Functions reallocated to the Pilot:

None

Functions reallocated to the Copilot:

Set radar/rendezvous beacon (as required) Set IFF (as required)

Functions reallocated to the Boom Operator:

None

Functions eliminated:

None

Takeoff (Event 8)

Takeoff is a very intense event, and consequently workload is high (see Figure 11) for the pilot and copilot who are flying the aircraft, and for the navigator who is busy trying to skin paint the lead aircraft using radar.

Functions reallocated to the Pilot:

Monitor lead aircraft for MITO timing (Pilot and Copilot)

Functions reallocated to the Copilot:

Monitor lead aircraft for MITO timing (Pilot and Copilot) Perform initial climb-out procedures i.e. skin paint lead aircraft

Functions reallocated to the Boom Operator:

Record take-off time Monitor aircraft instruments

Functions eliminated:

Ensure positive rate of climb Ensure gear up Ensure flaps raised

Justification: The pilot and copilot already ensure these tasks are performed.

Cell Join Up (Event 9)

Figure 12 shows cell join up is a high workload event for the pilot, who is flying, and for the navigator who is communicating on the radio and with the pilot, as well as trying to acquire the lead aircraft on radar. These communication and radar related functions were reallocated to the copilot for two reasons: (1) Copilot workload is low and (2) The radar equipment will be available within the copilot's workspace envelope.

Functions reallocated to the Pilet:

Ensure correct altitudes are flown Ensure correct headings are flown Perform climb altitude procedures Perform after takeoff checklist procedures Monitor interphone and radios (pilot, copilot and, boom operator)

Functions reallocated to the Copilot:

Direct pilot into enroute formation Use all available equipment to effect join up Inform pilot of other aircraft's position Ensure level off in altitude block Acquire lead aircraft on radar Make departure call Monitor departure being flown Make 2,000' prior to level off call Make 1,000' prior to level off call Monitor interphone and radios (pilot, copilot and, boom operator)

Functions reallocated to the Boom Operator:

Check IFF mode 4 caution light off Monitor HF after passing out of home station UHF range during Alpha monitor periods Monitor interphone and radios (pilot, copilot and, boom operator)

Functions eliminated:

Reset altimeter at transition altitude Ensure oxygen requirements are met Ensure oxygen is ON and at 100% when aircraft is above 10,000' Ensure oxygen is readily available above FL250 Record level off time Monitor interphone and COMM radios from takeoff

Justification: The level off time should be recorded by the flight data recording system. The remainder of the functions are performed by each crewmember individually.

Cruise #1 (Event 10)

This event typically involves celestial navigation which is the primary reason why the navigator's workload rating was above 8 (see Figure 13). For the other crewmembers this is not a workload intensive event.

Functions reallocated to the Pilot:

Monitor UHF command post/cell frequency (pilot, copilot, and boom operator) Monitor UHF air traffic control frequencies (pilot, copilot, and boom operator) Monitor HF giant talk during alpha monitor period (pilot, copilot, and boom operator) Update IFF mode 3a as required (pilot and copilot) Monitor APN 59 radar (pilot and copilot) Monitor navigation radio aids (pilot and copilot) Keep aircraft within 10 NM of track Direct aircraft to avoid thunderstorms by 20 NM at or above FL230 (pilot and copilot) Compute "alter heading" and ETA to turn Perform dead reckoning (DR) navigation Direct aircraft along planned route to coast end point/ADIZ Accomplish control time to air refueling control point Monitor equipment for malfunction (pilot and copilot) Set IFF as required Track aircraft position (pilot and copilot) Perform CELL formation Perform station keeping duties Monitor radar for skin paint or beacon

Functions reallocated to the Copilot:

Complete Comm log Request and record UHF traffic Accomplish HF contact **Record HF traffic** Monitor UHF command post/CELL frequency (pilot, copilot and, boom operator) Monitor UHF air traffic control frequencies (pilot, copilot and, boom operator) Monitor HF giant talk during Alpha monitor period (pilot, copilot and, boom operator) Update IFF mode 3A as required (pilot and copilot) Monitor APN 59 radar (pilot and copilot) Monitor navigation radio aids (pilot and copilot) Direct aircraft to avoid thunderstorms by 20 NM at or above FL230 (pilot and copilot) Set equipment as required for specific navigation leg Take coast out fixes Complete log work on form 200 Monitor equipment for malfunction (pilot and copilot) Perform over water navigation Update and monitor INS as required Set IFF as required (pilot and copilot) Track aircraft position (pilot and copilot) Use all navigation aids to monitor position within 20 NM of track Update ETAs to pilot as necessary for HF position report

Functions reallocated to the Boom Operator:

Monitor UHF command post/CELL frequency (pilot, copilot, and boom operator)

Monitor UHF air traffic control frequencies (pilot, copilot, and boom operator)

Monitor HF giant talk during Alpha monitor period (as applicable) (pilot, copilot, and boom operator)

Functions eliminated:

Update DNS position Update INS position Accomplish in-flight log entry requirements Record aircraft position and time at all planned turn points Record aircraft position at least once every 30 minutes Prepare for celestial navigation Ensure celestial navigation clearance is obtained Start celestial navigation Record accurate start position and time Accomplish celestial pre-comps (SACF 289) Resolve MPP/FIX Set APN-218 to SEA

Justification: The DNS is assumed deleted, as is the need for celestial navigation. Update of the INS will be automatic via the navigation computer or by copilot radar fixing. In-flight log entries will be accomplished by the flight data recording system.

Preparation for Contact (Event 11)

All crewmembers experienced high workload during this event. The navigator ensured rendezvous times were met, performed orbit holding procedures, and performed the rendezvous. The pilot accomplished the preparation for contact checklist, and the boom operator prepared for air refueling. Although not shown in Figure 14, Copilot workload can be very high during preparation for contact. Copilots typically communicate with air traffic controllers and begin determining the amount of fuel to offload, from where the fuel will be off-loaded and the number of pumps to use during the off-load. For newer copilots, accomplishing all of the necessary functions prior to contact with the receiver is impossible. So there is concern about reallocating navigator functions to the copilot.

Functions reallocated to the Pilot:

Set equipment as required for rendezvous (pilot and copilot) Perform station keeping duties (pilot and copilot) Set assigned radio frequencies (pilot and copilot) Monitor radios (pilot and copilot) Establish radio contact with receiver as required Obtain receivers information as required Relay tanker information as required Establish offset Accomplish Automatic Direction Finder (ADF) Check if applicable Monitor echelon position Place beacon to STBY as required (pilot and copilot) Initiate overrun procedures (pilot and copilot) Set equipment as required for contact (pilot and copilot) Ensure rendezvous time is met Perform orbit holding procedures

Functions reallocated to the Copilot:

Set equipment as required for rendezvous (pilot and copilot) Perform station keeping duties (pilot and copilot) Set assigned radio frequencies (pilot and copilot) Monitor altitude (pilot and copilot) Ensure ATC clearance to air refuel received Accomplish positive beacon ID (if applicable) Start timing Place beacon to STBY as required (pilot and copilot) Initiate overrun procedures if applicable (pilot and copilot) Set equipment as required for contact (pilot and copilot)

Functions reallocated to the Boom Operator:

None

Functions eliminated:

Conduct point parallel rendezvous Instruct pilot to turn at turn range and give a time to turn

Justification: Point parallel rendezvous and turn range information should be accomplished via commands from the navigation system.

Air Refueling (Event 12)

Figure 15 clearly shows that workload is high for the entire crew. Because the KC-135 and receivers are in such close proximity during air refueling, the pilot really has to concentrate and maintain airspeed, altitude, and attitude to avoid a mishap. The copilot performs the fuel transfer functions and monitors the aircraft's center-of-gravity, which is crucial. The boom operator performs contact procedures, and the navigator performs peripheral air refueling functions such as recording the amount of fuel transferred and the number of contacts made, as well as monitoring radios. The navigator becomes much more involved if refueling occurs in an anchor area because navigating in an anchor area is more difficult and using radar to skinpaint the receiver is necessary.

Functions reallocated to the Pilot:

Monitor CELL formation (pilot and copilot) Tune radar for optimum picture (pilot or copilot) Alter aircraft as necessary to maintain course within 10NM of cleared course Monitor and update navigation systems (pilot and copilot) Monitor interphone and radios (pilot and copilot) Monitor altitude (pilot and copilot)

Functions reallocated to the Copilot:

Record air refueling data Record number of contacts Record amount of fuel transferred Monitor CELL formation (pilot and copilot) Tune radar for optimum picture (pilot or copilot) Keep pilot advised of position Maintain ATC clearance requirements Monitor and update navigation systems Monitor interphone and radios (pilot and copilot) Set APN-69 to OPERATE Monitor altitude

Functions reallocated to the Boom Operator:

None

Functions eliminated:

Configure radar to skinpaint receiver at bottom of air refueling block

Justification: "Configure radar to skinpaint receiver at bottom of air refueling block" is a breakaway procedure. Having to do this during air refueling would cause excessive workload. Therefore, the receiver should ensure lateral clearance immediately after disconnect so no skinpaint would be necessary.

Post Air Refueling (Event 13)

Following air refueling, each crewmember completes the post air refueling checklist. The boom operator has the highest workload (Figure 16) as he retracts, stows and latches the boom, closes the sighting door and ensures the ruddervators are locked.

Functions reallocated to the Pilot:

Monitor radios (pilot and copilot)

Functions reallocated to the Copilot:

Set radar/rendezvous beacon to OFF (if required) Monitor radios (pilot and copilot)

Functions reallocated to the Boom Operator:

Open fuel tank circuit breakers as required

Functions eliminated:

None

Cruise #2 (Event 14)

Figure 17 shows that only the navigator's workload was high during cruise; however, assuming celestial navigation becomes obsolete, workload would be drastically reduced. In fact, all navigation functions are eliminated during this phase except "assume CELL lead navigation responsibilities," which the pilot or copilot would do.

Functions reallocated to the Pilot:

Assume CELL lead navigation responsibilities (pilot or copilot)

Functions reallocated to the Copilot:

Assume CELL lead navigation responsibilities (pilot or copilot)

Functions reallocated to the Boom Operator:

None

Functions eliminated:

Terminate celestial/over water navigation Accomplish final DR position and announce ETA to coast in Accomplish coast in fix Terminate celestial navigation clearance Check N1 and J4 compass heading

Justification: Actual navigation functions will be accomplished by the navigation system. No celestial navigation will be used.

Plan Divert (Event 15)

Planning a divert is workload (see Figure 18) intensive for the navigator because a new route of flight, distance traveled and time required must be determined. Workload is high for the copilot who must compute the fuel required for the divert. As aircraft commander, the pilot must oversee these activities to ensure a logical and safe route of flight given the amount of fuel available.

Functions reallocated to the Pilot:

None

Functions reallocated to the Coplict:

Compute distance and time

Functions reallocated to the Boom Operator:

None

Functions eliminated:

Prepare chart

Justification: Chart work should be unnecessary because the alternate routes of flight should be in the navigation system. The copilot will have to type in an alphanumeric identifier of the diversion base and the system should provide the best route of flight as well as time and fuel required.

Descent (Event 16)

Figure 19 depicts the workload for each crewmember during descent. The pilot generally just flies the descent, while the copilot accomplishes the descent checklist. The navigator reviews the penetration, approach, highest terrain, emergency airfields and so on.

Functions reallocated to the Pilot:

Review penetration and approach (pilot or copilot) Review highest terrain (pilot or copilot) Review emergency airfields (pilot or copilot) Review special use airspace (pilot or copilot) Monitor aircrew terminal information service (ATIS) (pilot or copilot) Ensure approach clearance received (pilot or copilot) Make "2,000' prior to assigned altitude" call (pilot or copilot) Make "1,000' prior to assigned altitude" call (pilot or copilot)

Functions reallocated to the Coplict:

Review penetration and approach (pilot and copilot) Review highest terrain (pilot and copilot) Review emergency airfields (pilot or copilot) Review special use airspace (pilot or copilot) Monitor aircrew terminal information service (ATIS) (pilot or copilot) Ensure approach clearance received (pilot or copilot) Make "2,000' prior to assigned altitude" call (pilot or copilot) Make "1,000' prior to assigned altitude" call (pilot or copilot) Monitor weather reports

Functions reallocated to the Boom Operator:

Set altimeters Contact command post

Functions eliminated:

None

Approach and Landing (Event 17)

Approach and landing is a very critical phase of flight, hence as Figure 20 shows pilot and copilot workload is high. Most of the reallocated navigator functions went to the boom operator, with a few going to the pilot and copilot.

Functions reallocated to the Pilot:

Scan for traffic (pilot, copilot, and boom operator) Perform go around as required Monitor landing roll out/ground speed (pilot and copilot)

Functions reallocated to the Copilot:

Ensure altitude restrictions are met Monitor approach Monitor radios (copilot and boom operator) Monitor timing as required Scan for traffic (pilot, copilot, and boom operator) Ensure missed approach procedures are accomplished Make required altitude calls Monitor landing roll out/ground speed (pilot and copilot)

Functions reallocated to the Boom Operator:

Monitor radios (copilot and boom operator) Scan for traffic (pilot, copilot, and boom operator) Check flap setting Check gear position down Check pilot approach speed (as required) Check fuel panel Advise pilots of any hazards noted Record time

Functions eliminated:

Perform instrument approaches Perform airborne radar directed approach (if required) Configure radar Direct descent as published (as required)

Justification: Instrument approaches should be included in the navigation database and displayed (at least) to the copilot. An airborne radar approach display should be available to the copilot for him to direct the pilot in airborne radar approaches.

After Landing (Event 18)

Figure 21 clearly shows that crew workload during the after landing phase was low.

Functions reallocated to the Pilot:

Turn INS MSU switch OFF after parked (pilot and copilot) Assist in aircraft offload (as required) (pilot, copilot, and boom operator) Offload flight equipment (pilot, copilot, and boom operator) Assist in off-loading passengers/personnel (pilot, copilot, and boom operator) Relay INS accuracy check information

Functions reallocated to the Copilot:

Set mode 4 code switch (as required) Set mode 4 on/out switch OUT Set IFF master switch OFF Set gain control CCW Set intensity control CCW Set heading marker control CW Set scan switch OFF Set stab switch OFF Set function switch OFF Set APN-69 control panel OFF (if required) Select way point for INS accuracy check Press hold key Record latitude and longitude coordinates Press hold key Load pure present position Load airplane actual position Set data selector to DIST/TIME Press WY PT CHG key Press 1 and 2 keys in sequence Record distance from laft-hand data display Press clear key

Turn INS MSU switch OFF after parker (pilot and copilot) Set IFF/SIF (as required) Set mode 2 code (as required) Set FSA/CAS power OFF Assist in aircraft offload as required (pilot, copilot, and boom operator) Offload flight equipment (pilot, copilot, and boom operator) Assist in offload of passengers/personnel (pilot, copilot, and boom operator)

Functions reallocated to the Boom Operator:

Monitor radios Record flight time Zeroize code in KIK-18 and KY-58 Assist in aircraft offload as required (pilot, copilot, and boom operator) Offload flight equipment (pilot, copilot, and boom operator) Assist in offload of passengers/personnel (pilot, copilot, and boom operator) Enter navigation systems maintenance discrepancies into Form 781 Turn in comm kit, KIK-18, KY-58 and FLIP publications

Functions eliminated:

Turn APN-218 system OFF Turn DNS MSU switch OFF Calculate nav accuracy Complete SAC Form 157 Turn in navigation mission paperwork

Justification: The DNS is assumed deleted. Navigation accuracy should be calculated by the data transfer system. Mission paperwork will be completed by the flight data recording system and the data transfer system.

Eunctions Reallocated to Automation Concepts (All Mission Events)

Navigation Functions:

Navigate by Dead reckoning
Update navigation systems (INS, radar, compasses, etc.)
Update estimated time of arrivals (ETAs) for pilot HF reports
Perform orbit holding procedures via commands to the pilot (orbital pattern displayed)
Computation of distance, time, fuel, and route of flight for waypoints and divert airfields
Mission paperwork (Form 200, Inflight Log, etc.)
Record significant mission events (waypoints, refuelings, 30-min updates, etc.)
Provide station keeping information and commands

Air Refueling Functions:

Calculate air refueling control time (ARCT) to air refueling control point (ARCP) Command true airspeed (TAS) to make timing for ARCP or waypoints (ADIZ) Command track to make timing for ARCP or waypoints (ADIZ) within designated corridor Conduct rendezvous (point parallel, etc.)

Perform orbit holding procedures via commands to the pilot (orbital pattern displayed)

Compute turn range and offset, time to turn, and range with copilot input of receiver airspeed, track, and altitude

Mapping of anchor point and refueling track on pilot's display for air refuelings using anchor points

Track receiver aircraft on radar

Departure/Approach Functions:

Commands for navigation to initial approach fix (IAF) when entered into the flight mission computer (FMC)

Provide approach and standard instrument departure (SID) information and commands

Provide ability for airborne radar approach

CONCLUSION

The objectives of this effort were to complete a function analysis of the four KC-135 crew positions and to recommend function reallocations and automation concepts that can be integrated into a three-man crew KC-135 cockpit configuration. The effort began at Castle AFB where task listings for each crew position were validated. The function/task lists were then refined iteratively at Grissom AFB and Rickenbacker AFB. At the same time, data were collected concerning inputs, equipment, sensory modality, workload, control activations and task errors. Eighteen mission events were selected spanning from mission planning to after landing. Additional workload data were collected for each of these 18 events. Using the function analysis and the workload data, KC-135 crewmembers and CSEF engineers spent three days reallocating all navigator functions among the remaining crewmembers or automation concepts will be used by the CSEF cockpit design team during development of a three-man crew KC-135 cockpit configuration.

Throughout this effort, concern was expressed about removing the navigator from the KC-135; from the loss of "another set of eyes in the cockpit," to the increased training of the three remaining crewmembers. Replacing the navigator will be an automated system and a copilot whose primary role will be navigation. In essence the copilot is being replaced by a navigator who can fly the aircraft. The boom operator will have to take a more active role in the positive control of the aircraft and its systems. No longer will both pilots have the sole task of piloting the aircraft. Both must have the ability and training to share the navigation role, possibly switching roles while in flight. The little "free" time that a four-man KC-135 crew had will grow smaller, while overall reliance on automated systems, particularly navigation systems, will have to increase.

DISCUSSION

A three-man crew KC-135 should be capable of maintaining the flexibility and capability of the four-man crew KC-135, but only at a price of more automated and integrated systems, an overall increase in flight crew workload and increased aircrew training.

SYSTEM AUTOMATION

The systems most in need of automation involve the navigation functions and mission planning/execution paperwork. A system integrating these two functions would be the best solution since they are, to a great extent, concerned with the same information. The function of navigation should be automated, as much as possible, so pilots will only have to monitor the system and respond to its command indications. However, the aircrew's ability to input information or select navigation information sources should not be abridged. The system should be mechanized to allow for fixtaking and navigation source selection to assure aircrew control of navigation under degraded modes of operation. An automated system for mission planning/execution paperwork feeding directly into the aircraft's navigation system and mission computer could reduce some of the workload associated with crew reduction, while increasing the flexibility of the link between mission planning and execution.

CREW WORKLOAD

The workload of a three-man crew will be higher than that of a four-man crew, without extensive redesign of the cockpit and flight controls. Since the scope of this effort included minimum impact on the existing KC-135 cockpit while maintaining the system's capabilities, the function reallocation team attempted to maintain the crew workload at a "manageable" level. Requiring the same functions be completed in the same amount of time by a reduced number of crewmembers cannot escape an increase in overall crew workload without automating several navigator functions.

AIRCREW TRAINING

Aircrew training will have to be increased to account for the additional crew duties levied upon the remaining crewmembers. All crewmembers should be trained on the new systems that will be implemented, as well as in navigation theory and practice.

RECOMMENDATIONS

The following are the CSEF's recommendations for the aircraft systems that would meet the requirements of the functions allocated to the automation concepts. These recommendations have been structured for use by the CSEF cockpit design team in their effort to develop a three-crewmember KC-135 conceptual cockpit design for simulation purposes.

PILOT/COPILOT

Throughout the function reallocation the <u>pilot</u> was defined as the pilot actually flying the aircraft at any given time. The <u>copilot</u> was defined as the non-flying pilot. Thus, both pilots should be able to take on either role at any given time. Navigation tasks are considered the responsibility of the copilot. Several control panels (IFF, radar, etc.) will need to be moved, duplicated, or made accessible through the control/display units (CDUs) to provide access to both pilots.

SWITCH/DISPLAY RELOCATIONS

Switches and displays found on the navigator's station that will require activation or monitoring in a new mechanization should be moved to a position accessible to one or both of the pilots (navigation systems power switches, warning lights, etc.).

SECRET DOCUMENTATION

Secret documentation should be positioned in a place accessible to all crewmembers.

DOPPLER NAVIGATION SYSTEM

The Doppler navigation system should be removed.

CELESTIAL NAVIGATION

Celestial navigation should no longer be a requirement.

FLIGHT DATA RECORDING SYSTEM

A flight data recording system should be installed to take the place of the navigator's log.

DUAL INERTIAL NAVIGATION SYSTEMS (INS)

Dual Inertial Navigation Systems were considered necessary for system navigation accuracy.

GLOBAL POSITIONING SYSTEM (GPS)

The aircraft should be equipped with receivers for the GPS.

NAVIGATION DATABASE

The aircraft should have a navigation database onboard, either totally indigenous or merely a host system for a data transfer system. This navigation database should, as a minimum, include the three-, four- and five-letter identifiers and corresponding information of all navaids, refueling tracks, anchor areas, and airfields near the route of flight (location, elevation, frequencies, runway lengths, etc.) as well as waypoint information. Other useful information include: Location and pertinent information on restricted airspace (area, dates, times, altitudes, etc.), standard instrument departure/approach information (turnpoints, IAFs, frequencies, MDAs, etc.), and preplanned radar fix information (location, elevation) that could be loaded via the data transfer system.

DATA TRANSFER SYSTEM (DTS)

The DTS should include automated flight plans, takeoff and landing data, navigation information (Form 200), fuel information, and weight and balance information that can be transfered to the aircraft navigation database. Information updates (Notes To Airmen (NOTAMs), Flight Information Publications (FLIPs), Crew Information Files (CIFs)) should automatically update information on navaids, airfields, restricted airspace, and other database entries.

NAVIGATION SYSTEM

The navigation system should be capable of integrating all navigation information (navaids, INS, GPS, radar) for a navigation solution. Updating should be virtually instantaneous so the aircraft corrects for track automatically when in autopilot modes or gives commands for return to track in manual modes. Weather avoidance modes should allow the copilot to either enter the new waypoints via a CDU or by a cursor, and have a correct to track option. Navigation charts should only be needed as a backup or reference information. The copilot should be able to select the navigation input(s) (INS 1, INS 2, GPS, radar) in case of degraded modes or malfunction.

RADAR SYSTEM

The copilot should control the radar system. Since either pilot can take this role, the controls for the radar system should either be centrally located for access by both pilots, or each pilot should have his own radar controls. The radar system should have ground map, skin paint, beacon, and weather modes. As a minimum, the beacon mode should allow the copilot to designate a receiver for tracking purposes; this ability should prove useful in the skinpaint mode as well. Color radar displays should seriously be considered to reduce cognitive processing time.

CONTROLS AND DISPLAYS

Each pilot should have his own control/display unit. The four CRT displays should be capable of displaying any format in either an original or a repeater mode. Navigation displays should be able to display waypoints, desired track, actual aircraft location, navaid information and radar information (weather, skin paint, beacon, or ground map). A station keeping display should give the pilot the information needed to maintain aircraft control and station when in a cell an d during cell join up. Each display should have a complete set of controls for brightness and contrast, as well as gain, range, antenna tilt, and cursor controls for those displays that will be used with the radar.

TRAINING

Secret Documentation

All crewmembers should be trained in the handling, decoding, and usage of classified material so that any crewmember can receive classified messages as they are received.

Data Transfer System

All crewmembers should be trained in the use of the DTS as it applies to their crew position. Pilots should be trained in the navigation, and fuel aspects of the DTS, while boom operators should be trained in the weight and balance and cargo loading aspects of the DTS. All crewmembers should be trained in the DTS as it applies to NOTAMS, FLIPs, CIFs, etc.

Navigation System

Pilots will need to be trained in navigation theory and the specific navigation systems on the aircraft. Boom operators, as a minimum, should be trained in the aircraft's navigation systems as a precaution against incapacitation of a pilot.

Radar System

Pilots will need to be trained in radar theory and actual radar system performance. Again, boom operators should be trained in the aircraft's radar systems as a precaution against incapacitation of a pilot.

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APPENDIX A

FOUR MAN CREW TASK LISTS

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MISSION PLANNING

PILOT FUNCTIONS

Discuss mission requirements with Complete mission paper work communications officers wing intelligence and Attend pretakeoff brief

COPILOT FUNCTIONS

weight, fuel load, receiver type and Discuss mission requirements with altitudes, control times, gross Get Form 365 data from Boom input coordinates, airspeeds, communication officers Attend pretakeoff brief wing intelligence and Complete offload plan Print out Form 200 offload amounts

38

Prepare Navigation Charts Select Correct charts

NAV FUNCTIONS

Place Special Use Airspace data on charts Annotate Highest terrain and obstructions Plot Celestial Navigation Leg on charts Develop route of flight to meet mission Place Emergency Airlieids on charts Place Air Refueling data on charts Annotate Level Off Point on chart

Annotate ADIZ Entry Point (if applicable) Discuss mission requirements with Wing Complete Scheduling blocks of Mission Check Form 200 and chart for accuracy Complete Mission Paperwork (mission review worksheet, pre-comp sheet) **Review and study Flight Information** Complete navigator briefing guide Publication (FLIP) and General Accomplished Report (MAR) Planning (GP) requirements Conduct Crew Flight Briefing **Complete Correlation Sheet** Study Mission Charts Complete Form 200

intelligence and communications officers Fill out known information on in-flight log Determine Where Celestial observations

Predetermine Radar targets at action Attend Pretakeoff Briel will take place points

BOOMER FUNCTIONS

Perform aircraft exterior preparation for **Coordinate and Order Flight Meals Determine Weights of Cargo Units** Check Mounted Cargo secured to Compute Contact Area Pressures **Determine Shoring Requirements** Check Fire Extinguisher available Check Cargo Loading Area clear Determine CG Location of Large Complete Forms 83, 83A and 84 Check Cargo Door Sill protected Check For hazardous materials **Determine Load Plan of Cargo** Plan Cargo Loading Check Cargo Unit Dimensions Preparation for Cargo Loading Check Manifest and Waybills Check Ground Wire installed Determine load and aircraft Check Tiedown Equipment Brief Load Team Members Check Tail Support Strut Position Loading Vehicle Stow Loose equipment Perform Aircraft Interior Check Chock position Open Cargo Door **Position Shoring** cargo loading Check Shoring Cargo Loads Secure Cargo CG Location Load Cargo Stow Seats installed Carrier

BOOMER FUNCTIONS (continued)

paperwork: AF-781, AF-791, AFTO-Perform Flight Crew Planning Complete DD Form 365-4 weight and balance information with computer Perform Boom Operator portion of Complete Other mission planning **Brief Air Refueling Control Brief Receiver Callsigns** or by hand calculation Brief Offload Amount Brief Receiver Type Brief Offload Type mission briefing Times

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Check weather Check Noterns

Crieck Notems Compute take-off data Conduct MITO/Cell briefing File mission paper work (Filight plan, weight and belance, etc.) Check alrcraft and mission status Brief planned filght demonstration maneuvers Brief planned filght demonstration Brief buch and go procedures Brief deployment requirements if applicable Brief cell procedures Brief MITO procedures

Complete local mission planning/

briefing certificate if applicable

Complete flight plan

COPILOT FUNCTIONS

Read Crew Information File Go to Life Support Pick up Publications, Quick Dons, heimet, and mask Attend Weather Briefing Lipdate Takeoff data as required

NAV FUNCTIONS

SOUADRON/BASE OPS AND COMBAT CREW DUTIES

Pick-up Helmet and Oxygen Mask from life support Synchronize Crewmembers' watches (Time Hack) Attend Crew Briefing and Cell briefing (if required) Check for departing and landing airfield pages Check weather for impact on mission timing Review approach plates and enroute charts Check Flight Notices to Airmen (NOTAMS) Pick up required in-flight publications Perform Squadron Preflight Activities Check Flight Schedule for changes Perform Base Operations Dutles Pick up classified information Check Aircraft parking spot Review FCIF (if applicable) Perform combat crew duties Attend Weather Briefing Check receiver status Check KIK-18 Pick up KY-58

BOOMER FUNCTIONS

Check Crew Information File Coordinate Life Support equipment Attend Weather Briefing Pick up flight meals POWER OFF/WALKAROUND

Set Certan Set Certan Set Certan Se Cebh Check A 1 -Check **Sect** Check Check for presence of Foreign Object Damage (FOD) noted to note gear doon etem Hydraufic accumulator pressu ng valve handle to FL/GHT inducting monthly valve cover Yeck reerve breke accumulator pr cas and ground ower one and made draufic accum Ensure landing gear ealery pins re al condition of engine weligeer general co inter Af Fean 781 data, as no al condition of engin pa d fuel on the 28 **1010 U** official sector Check Interphone and onygen witten of bo nepect and close nose compr Check at function and fail an 200 PILOT FUNCTIONS gener door do Enurs none gear pin remo ž Complete minister and un The second se ag and DA high way مرادية فر Check nose wheel well Check note gain and without at w unce start and the solution in Ensure APU doors ch insure geer door do ager was and the second se Ensure pine, dor すったそ 8 Check when te epice Enerre pla Check all Clerk II E Yak 1 S 1 Marco Ĭ ž Ĭ ŝ

and guards closed er vehn inver in NORMAL ons procedures (if applicable Perform Estemui Power applications procedures (il appli Set Estemui Power Switch to TRIP (il applicable) Check al Wenning Plags (as applicable) Set Battery Power Switch to EMENGENCY (il applicable) Check Flight Director Mode selector switch in GYRO Check IDG Switches NORIMAL (R) Check T-R voltage Set Battary Power Switch to NOPMAL (Il applicatio) Check Reder Intensity Swhich Full counter clockwise ector emitch in MAG Set External Power Switch to CLOSE If applicable Bet Air Conditioning Meeter ewtich to RAM AIR Check Alternate Preseurization switches OF Check Landing Geer Handle DOMN, in Deten Check FDFRGA Circuit Breakee Check Instructor Chygen Panel Check Regulator OFF, Diluter lev er et 100% meure Rate Of Change knob av Check Intoerd Spoller Switch in CUTOFF Check Emergency Hydraufic oreasowr vi Check Presentration/Ar conditioning per Perform APU Start Procedures If required Check Cabin Presure Test Valve handle Check radios in preset mode Set manuals to initial planned frequency seure Control OFI seure Controller as requ Engine Status Sentch OFF (F) PMC emitches ON, guard clos Bet Cabin Temperature Control as de E phonds Press, Suddh OFF Set Atlande Selector Knob to NOR Check pressure above 50 psi Check Trim Serve Settch in NOP8 Check Bettery voltage If applicable COPILOT FUNCTIONS Check COU Select Selfich in DNS Rudder Power Settch OFI Set Window Heat OFF (as applit Ensure J-4 Company Mode Sele all Fuel Valves CLOSED whom Intertor Inspection (Powe Check And-Los, Plict Heat, and nditioning Crosed Set CDU Select Panel Check Power Switch in NORM Check Ventole Orygen Battle Check EGT Lights I applicable Attino()-4 Panel Check MFF (It applicable) Check Throttles CUTOFF Check Overheed Panel Check all weltches OFF Check Fire Switches IN Activate Narm Bell (mor al emistres OFF Ĩ Check LHF Comm 1 Check UHF Comm 2 Check Fuel Panel

ics on board and current Place Emergency Orrygen Toggle lever to EMERGENCY i N Place Oxygen Regulator-Dituter lever to 100 percer Set Matter Switch OFF Set Mode 4 Code Switch to A or B (as required) Set Mode Enabling Switches CUT Set Mode 4 On/Out Switch CU Set Mode 3 AC Code Selectors to al Os Check MSU-NS and MSU-ONS Mode selectors Of Check COU Power Switch in NOPMAL or AUX Set Test Meare Switch to "HAIC" Set Range Switch to 3:305 Set Function Switch OFF Set Rader Presentization Control emitch to ON Set Master Power Switch OFF Set Pulse Width Switch (an required) Set Codo Salactor Switchae (an required) Set Electronic Cathriet Cooling switch to OM Set Seerch Radar Institutions Place Emergency Toggle Lever to center pr Place Regulator-Diluter Lever to 100 perce 3 Complete Crew Report Place Interphone Rotary Switch to CALL Arithmeetina Crew Praitinn Nerthallin Set APN-218 Doppler Switch to OFF Set Search Radiar Control Panel Set FTC Switch OFF Set LACS Switch OFF Set RATT evolutions as desired Set Bearing Switch as desired Set STC Dial full counteerclockeels Place Regulator-Dituter Lever to NORM Set Interphone Panel Set Interphone Panel Set ExVCAS Control Panel (It applicable Set FSA/CAS Power Swach OFF Check Onrygen System Set Heading Select Knob to local ma Set Scan Switch OFF Check Helmet and Mask connections Don Fight Heimet and Onygen Mask Set Rader/Rendervous Central Pane Check Allinde Gelector Kindo in NOF Test Heimst Transmit/Receive citpu Set Range Delay Switch OFF Set Intensity Control Kinch fully co Set Range Control Kinch fully co Perform IFF Control Panel prefight Place Oxygen Supply Lever OFF Set Gain Control full counterclock Ensure Celestial Tables and Air ther station for pro-Tum Onygen Supply Lever ON Test transmit/receive capability Test Orygen Mask for leafor intin Orygen Br Take out charts and equips Take out Nandpation Public Service Pontable Oxygen Br NAV FUNCTIONS Attend Crew Assembly Perform Intentor Inspection (Check Portable Onygen Bo nt to cayou Check Cleanifrees, Tation of heimet Check For pre-Replace Port Hock up helm Don headeel Į

POWER ON INSPECTION

Sheck instruments

Check DISENG light comes on and goes out within 36 seconds Check radios Advante stato trim control evoluti NOSE DOWN then NOSE UP Set left system auxiliary pump awarch to RESERVE BRAKE Load Word of Day (WOD) or load Multiple WODs (NWOD) Whiches to NORMAL Set right system auxiliary pump sentch to AUTO Set left system Auxiliary pump sector to AUTO Check antibild system Check Test panel indicators BLANK Set antidud test evects to PMO Set antidud test evects to AFT Ensure test panel indicators are BLANK Check typesed breakers in normal range Check speed breaker Set inboard spoke settach to NORIAIAL Set speed braite lever to 60 degrees Set yoka to Iud fayt Set yoka to fud fayt Set inboard spoke settach to CUTOFF Set outboard spoke settach to cutoff Est speed braite level to zero degrees Return inboard and outboard spoke settach Check allerons and gleve shield desarros Chadt Engine Fallure Assist System (FSAS) Set EFAS switch to TEST, then ON Set Stab trim control ewhich to NORIMAL Bet stab trim control swhch to CUTOUT Push rudder full RICHT, then release Check COMM 1 UHF Check COMM 2 UHF (ground radio) Check rudder power switch OFF Bet SVD swhich to TEST, then ON while HO | or || availability Set rudder power ewhich to ON PILOT FUNCTIONS Presurva hydrauka system Check pressure switches ON Check bartery charging current Check bettery charging level Bel-up HAVE QUICK radios Check perling brake OFF Check year damper system Set Time of Day (TOD) Practice WOO/WWOO Check rudder preseure Push rudder ful LEFT Check enginge system Check trim indication Check ILS receivers Check VOR More yoke fight More yoke center Creat alarton tim Check alarton Move yoke towerd Move yoke center Check electric trim Check menual trim Check rudder thin Check HF radio Total years Check TACAN More yoke aft Check rudder

Check Rotation Go Around (RGA) mode Check flap and Perform FSACAS alignment and Insertion procedures Rotate plicit knob NOSE UP, then NOSE DOWN Set autoplict engage switches ON, as required Rotate autoplict turn knob LEFT then RIGHT Depress pliot's disengage button Bet autopliot engage switches ON, as nequired Activets stab trim ewitch Check flight controls for freedom of movement Press text switch, il applicable Press valid/invelid test indicator, il applicable Check autoplict turn knob in detent position off and emergency procedures Set trim for tata-off Move flight director mode selector to gyro Adjust seets, pedais, bets and hameese Check al dials and gauges Check Attitude Director Indicator (ADI) Perform ground radio check Intorm CELL lead ready to start engines Check APU accumulator preserves Set clock Set oil temp selector switch to TEST Set oil temp selector switch to M Ensure huel partiel set for take-off Check fuel quantity readings speed brake warning hom Set aux pumps to OFF Perform CELL check Check NS gyro Check Autoplice Refer (4

COPILOT FUNCTIONS

Be Mambod Varines Switch to FLICHT Check Main APRUFR Varie Switch CLOSED Check Tark Level Control Switches CLOSED Check Screenge Switch OFF Check Represe Not Switches CLOSED Check Styree Noor Switches CLOSED Check Styree Ampliker Power Ensure Lights go out after releasing test ewhich Set FD 100 Master Power Switches to ON Ensure FD 100 Power Off Lights out after placing switches ON Perform APR Panel Checks (As applicable) Set Master Refuel Swhich to OFF Check Engine Bleed Valves OPEN Perform Bleed Ar Lask Detection Test Press Bleed Ar Laak Detection test av Check al LEAK DET, OVER PRESS Ensure FD 109 Power Off Lights ON Perform Intentor Inspection (Power On) Check Manuel Toggie Latch Switch **Set FD Master Power Switches ON** Bet Master Refuel Switch to ON Prees to test all Indicator prie ::: placing entrches ON and OVER TEMP Lights ON lights not illuminated Release Test Selich **BINICH IN NORMAL** In RELEASE

Record actual readings on Form 14, 386-4 and flight tog Hydraulic Pressure checks Move Flap Lever through 30 degree to 20 degree detent Check WT and Balance into on ICDU for FSAS Obtain Creek Report Ser Remarking Switches CN as required ser VOR to CN Ser VHF Radio CN Ser UHF Radio CN Ser LHF Radio CN Ser Autophot CN Ser Rada Power Satches CN Ser Rada Power Satches CN Ser Rada Power Synch Accompliais DNS Interface Test # desired Depress Copilor's autoplicit Disengage button Set Fuel Dump Switch to OFF Ensure presence of Aircraft Flight Manuals Check and etud Check Tuel Ournity reading Check Hydraullis System Pressure Check Hydraulis System quantity Check Purrp Supply Guards CLOSED Press to Text al gages Verty Engine Type Verty Brates and Ant Skid type Check (CDU STATUS Displays Check System Status Display Sew KDU Display to Bus Status 23 Check Bus Status Display Receive Report from each crewmember Check INS/DNS CDU Test Switch (Il appl Ensure FSACAS POWER Switch ON Creat: L.R. Systems & Pilor's reserve Preseure gages in Normal range Turn on autoplicit yeav damper switch Check Gaar Warming Light extinguished Set Interfor lights Check wheel wells cheer Ensure System Preseure Switches ON Set Fuel Dump Swhich to FUEL DUMP Set Fuel Dump Swhich to OFF Ensure Wheel Well Doors clear Check DNS NAV INOP LIGH #uminated **Bet Fuel Durry Switch to FUEL DUMP** Ensure Parachute preflight completed Check Interprione and corygen Check Flep lever in 50 degree detent Close Generator Breaker Switches Bet Fierp Lever to 40 degree detert Bet Flap Lever to 30 degree detert Bet Flap Lever to 0 degree detert Accomplish IFMP Interface Test Bet Flap Lever to 0 degree detert Check Fuel Status Indications Complete control & trim check Check Fuel Dump Actuator bet Orabilitier Trim as required Ensure Crew report complete Press Data Key Press Mathurction Data Key FSAS preflight procedures Check Fuel During Actuation Check Boom retracted Verby Alipiane Type Press FUEL Key

Set Flash-Steady Switch to FLASH Set all Fuel Boost Pump Switches to ON Set Bright-Dim Switch to BRIGHT Set A/R Line Valve Switch to OPEN Set #2 Tank-To-Engine-Manifold Value Switch to OPEN Set Navigation Lights

Set MSU-INS and MSU-DNS Mode selectors to ALIGN Accomplish Grid Chadx (If required) Perform INS/DNS System Preflight procedures Check INS-Doppler Status Panel Set Mode 1, 2, 3/A, and C switches as required Set Mode 1, 2, and 3/A Codes as required Compare Attimater setting with field elevation Accomplish DNS interface Test Request Authentication and Launch message Pertorn Interfor Impection (power on) Set Control Panel Switches (As Required) Perform Launch Authentication procedures Load KY-58 Check Latitude Correction Pointer OFF Report ACDS Lights ON/OFF If applicable Set Compase to correct MAG heading Set IFF Antenna Switch to BOTH Set RAD - TESTAION Switch to OUT Set IFF Manter Switch to NORMAL test Set Audio/Light Switch (as required) Set RAD - TESTANON Switch (as desin Set Altimeter to correct Barometric Pre **Tum APN-59 Function Switch to STBN** Perform Attimeter Preflight procedures Respond With correct Authentication Remove and stow sextant and stool Pertorn APN-218 Doppler Checks Tum FSA/CAS Power Switch ON Perform N-1 Compare Preflight fum on FSACAS power ewitch Bat FF Mirer Switch as desired Check Mode 4 light out Set Master Switch to STANDBY Install sectant stool and sectant **Center Annunciation Pointer** Accomplish INS Interface Test Tum Mode Selector to LAND Turn Mode Selector to OFF Insert INS and DNS Check settern alignment Observe a celestial body Perform celestial precomp Fit Life Preserver Unit (LPU) NAV FUNCTIONS Reading sectars accuracy modes 1, 2, 3/A and C Check sextant desiccant from command post Check sextant mount Intern Waypoint Date ment TACAN Date Pertorm Blt Test Encode Mode 4 Check averager Verity weypoints

Check flight director heading mode

Check operation of altimaters

STARTING ENGINES AND BEFORE TAXI

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BOOMER FUNCTIONS	Check Passenger and extra Crewmenther status Check Fuel distribution Check Circuit breakens Set Oxygen Panel ON, 100% Fasten And lock Safety Belta and Harness Complete Takeoff Report		•••	
NAV FUNCTIONS	Perform Before Takeoff Checklist Procedures Set Radar/Rendezvous Beacon (as required) Set IFF (as required)			
COPILOT FUNCTIONS	Set lights as required Call for plict to move starter switchs to IGNITION Scan for traffic			
PLOT FUNCTIONS	Accomplish before takeoff checklist Ensure fuel panel set for take off Ensure landing lights on Rotate beacons as appropriate Move starter switches to ignition Turm radar on Scan for traffic	44		

BEFORE TAKEOFE

.

	PILOT FUNCTIONS	COPILOT FUNCTIONS	NAV EUNCTIONS	BOOMER FUNCTIONS
	Advance power as required Release parking braike as directed Maintain left hand on nose wheel steering as required Taxi into position and align aircraft with centerline Assure fight idle Maintain full pressure on yoke Maintain full forward until ground minimum control speed is reached Acknowledge S1 interphone call as required Activate Rotation Go Anound (RGA) within 10 knots of rotation speed Pull back on yoke until takeoff attitude is	Turn Radar Intensity Switch clockwise Hold yoke full forward Check for FLT Idie on all four engines Announce FLT Idie on all four engines Set Takeoff thrust Call S1 Call S1 Call S1 Call climb speed Raise Gear Move flaps up	Perform Takeoff Duties Monitor lead alrcraft for MITO timing Record Takeoff Time Monitor Alrcraft instruments Perform Initial Climbout procedures Ensure positive rate of climb Ensure flaps raised	Monitor Takeoff (Overhead Control Pane
45	reached Call for gear up Follow command bars as required until 2000 feet above ground Push forward on yoke Call for flape up Chack hydraulic pressure in low range Look for lead aircreft visually or on rader			

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IAKEOFE

CELL JOIN UP

PLOT FUNCTIONS

Perform joinup procedures as required Call for climb power and after takeoff Maintain cell position as required Cimb check

Set altimeter to 29.92 and radio Set starter switches as required Call for engine anti-ice on/off Ensure landing gear up Ensure flaps up

altimeter MDA Index to 2000 feet Perform cell communications as Ensure oxygen on, 100 percent Change position as required Maintain formation position Ensure RGA switches off Ensure fuel panel is set Set level flight attitude Engage autopliot Pla power back Trim aircraft Level of

Terminate formation if necessary naquirad 46

Turn off Starter Switches (as required) Turn on Engine Anti-Ice (as required) Check Cabin Pressurization

Direct crew to set 29.97 Attimeter setting Turn off landing light at 10,000 Ft. Set radio altimeters to 2000 Ft. Turn of RGA Power Switches Set Fuel Panel as required passing FL180

NAV FUNCTIONS

COPILOT FUNCTIONS

Perform Cell Johnup

Use All available equipment to effect Join Up Perform After Takeoff Checklist Procedures Ensure Oxygen is readily available above Ensure Oxygen is ON and at 100% when Ensure Oxygen Requirements Are Met Inform Pilot of other Aircraft's position Reset Attimeter at Transition Attitude Check IFF Mode 4 Caution Light of Ensure Correct Headings are flown Direct Pliot Into Enroute Formation Perform Climb Altitude Procedures Ensure Correct Altitudes are flown Ensure Level Off In Attitude Block Make 2,000' prior to Level Off Call Monitor Departure Being Flown Acquire lead aircraft on radar aircraft is above 10,000 ft. Don Heimet above FL430 Make departure call **F**250

BOOMER FUNCTIONS

Set Air Conditioning Master Swhch to Install Sextant Stool (If Required) Tum Off Wheel Well Lights CONDITION AIR Install Sextant

Set Boom Marker Lights (as required) Set Boom Nozzle Light (as required) Turn On Nacelle Illumination Check Cargo Compartment

Monitor HF after passing out of home station

Monitor Interphone and COMM radios from

takeoff

Monitor Interphone And Radios

Record Level Off Time

Make 1,000' prior to Level Off Call

UHF range during alpha monitor periods

PILOT FUNCTIONS	NAV FUNCTIONS	NAV FUNCTIONS(Cont.)	BOOMER FUNCTIONS
Mairtain ceil poetion Perform turbine engine monitoring system (TEMS) test coPtLOT FUNCTIONS	Perform General Cruise/Navigation Complete Comm Log Request And record UHF Traffic Accomplish HF Contact Record HF Traffic Accord HF Traffic Monitor UHF Contact Monitor UHF Contrand Post/Cell frequencies Monitor UHF air Traffic Control frequencies Monitor HF giant task during alpha monitor period as applicable	Perform Celestial Navigation Prepare For Celestial Navigation Ensure Celestial Navigation clearance is obtained if required Set Equipment as required for specific navigation leg start Celestial Navigation Take coast out fixes Record Accurate Start Poetion and Time Compute "Alter Heading" and ETA to turn	Provide Crew Support (as required) Take Celestial Observations Collect Azimuths and Elevations From navigator Dial in Azimuth and Elevation Give Elevations to Navigator
Check hydraulics Check hydraulics Check electical system Monitor fuel system Monitor o2 system Monitor engine instruments Give control of HF Radio to NAV	Update IFF Mode 3A as required Monitor Interphone as required Monitor And Update Navigation Equipment as required Update INS/DNS position Monitor APN 59 Radar Monitor APN 59 Radar Monitor APN 59 Radar Monitor APN 59 Radar Monitor APN 69 Radar Monitor APN 69 Radar Monitor APN 69 Radar Monitor APN 69 Radar Perform station keeping duties Keep Aircraft to avoid thunderstorms by 10 MM below FL230 Direct Aircraft to avoid thunderstorms by 20 MM at or below FL230 Direct Aircraft to avoid thunderstorms by 20 MM at or below FL230 Accomplien In-fight log entry requirements Record Aircraft position and time at all planned turn points Record Aircraft position at least once every 30 minutes	Perform Dead Heckoning (DH) Navgation Accomplish Celestial Pre-comps (SACF 289) Resolve MIPP/FIX Complete Log work on Form 200 Direct Aircraft along planned route to coast end point/ADIZ Accomplish Celestial control time to air nefueling control point Monitor Navigation equipment for maltunction Perform Overwater Navigation Update INS/DNS as required Set FF as required Set FF as required Set APN-218 to SEA Track Aircraft Position Update ETAs to Pilot as necessary for HF position report Monitor Interphone and Radio Perform Cell Formation Perform Cell Formation Perform Cell Formation Perform Cell Formation Perform Cell Formation Perform Cell Formation Perform Station Keeping Duties Monitor Radar for Stah Paint or Beacon Keep Pilot Informed (verbally) on Aircraft position	

CRUISE #1

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Compute Max Continuous Thrust setting Set Max Continuous thrust setting on N1 Obtain permission to delay at the ARCP Request and Air Retueling request from Post Max Continuous Thrust setting Request permission to conduct AR Declare MARSA (Military Assumes Compute turn range and off-set Compute turn range and off-set Obtain block attinde Disconnect autopilot elevator/pitch axis Check autoplict stabilizer trim follow up Reengage autopilot elevator/pitch axis Ensure proper air refuelling frequency Accomplish preparation for contact Set autopliot HDG SELVOR LOC Confirm oxygen setting correct Establish air refueling echelon Check oxygen as required Confirm altimeter setting Intiate 1/2 mile checklist Accuate stabilizer trim Set Air-to-Air TACAN Check stabilizer trim switches to OFF Check altimeter Recet altimeter omation checklet

5ng

receiver

PREPARATION FOR CONTACT

NAV FUNCTIONS

COPILOT FUNCTIONS

until revised ARCI

Perform Air Refueling Preparation Procedures Determine Turn Range from chart using TAS Obtain Radio Contact Set Equipment As Required For Rendezvous Accomplish Automatic Direction Finder (ADF) Accomplish Positive Beacon ID (if applicable) Ensure ATC clearance to air refuel received Determine Offset required from chart using Establish Radio Contact With Receiver as Set Rendezvous Beacon Control to STBY Initiate Overrun Procedures (if applicable) Monitor/Set Miscellaneous Equipment As Obtain Receivers information as required Relay Tanker information as required Place Beacon to STBY as required Set Oxygen Regulator As Required Conduct Point Parallel Rendezvous Set regulator-diluter Lever to 100% Perform Orbit Holding Procedures Compute Tum Range And Offset Instruct Pilot to turn at turn range Set Assigned Radio frequencies Perform station keeping duties Set Oxygen Regulator to ON Set Equipment As Required Adjust Track to make timing closure and drift inbound Compute Orbit Headings Adjust TAS to make timing Ensure RZ Timing is met Set Attmeter as required TAS and drift Inbound Monitor echelon position Perform Rendezvous check if applicable Perform Precontact **Establish Offset** Monitor Radios **Monitor Altitude** Start Timing required responsibility for separation of aircraft)

BOOMER FUNCTIONS

Set Emergency Override Switch (as required) Inform Passengers and extra Crewmembers Set Telescope-At-Disconnect (as required) Set Refueling Oxygen Panel (If applicable) Provide Visual commands to Receiver (As Brief Receiver for Contact (as Required) Set Ruddevator Trim Control to Zero (as Maintain Required communications with Set Forward Oxygen Panel OFF, 100% Set Receiver Director Light Rheoetats Ensure Extension and Elevation Limit Tum On AR Floodlight (as required) Perform Boom Lowering Procedures Maintain proper boom alignment Set External Lights (as required) Set Sighting Door Lever OPEN Monitor Command Radios Check Boom Controls switches active Check Signal Coll Extend Boom required) (perinper **Teceivers**

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AIR REFUELING

PILOT FUNCTIONS

Monitor receiver/observer position Advance power as required Maintain cell position

COPILOT FUNCTIONS

Set Position Lights to STEADY and DIM Set No Smoking/Seat Belt lights ON as Set Autopilot VORAOC and Heading Set Beacon Lights to BOTH ON and Set altimeter to 29.92 or as briefed Set Rendezvous Beacon Lights as Set one AR Pump Switch to ON Set Air to Air TACAN if required Complete Fuel quantity check Set TACAN as required Set Radios as required Set Fuel Panel for A/R Set Lights as required select switches off Dump Fuel If required Check oxygen applicable required

NAV FUNCTIONS

course within 10 NM of cleared course Configure Radar to skinpaint Receiver at Maintain ATC Clearance Requirements After Aircraft as necessary to maintain Monttor Cett Formation (If Required) Perform Breakaway Procedures (If Record Amount of fuel transferred Monitor And update NAV systems bottom of air refueling block Tune Radar for optimum picture Monitor Interphone and Radios Keep Pilot advised of position Perform General Air Refueling Record Number of contacts Record Air Refueling Data Set APN-69 to OPERATE **Monitor UHF Radios** Monitor Interphone Monitor HF Radio necessary) Monitor Altitude

BOOMER FUNCTIONS

Perform Contact Procedure Monitor Boom Position indicators Monitor Receiver position Perform Disconnect or Breakaway procedures Recycle System for subsequent contacts

Position Lights to BRIGHT

POST AIR REFUELING

PILOT FUNCTIONS

Initiate post air refueling checklist Assure fuel panel reconfigured for cruise Assure radios reset Set attimeter to 29.92 and check oxygen 100 percent if required Reestablish cell position Maintain cell position

COPILOT FUNCTIONS

Complete post air refueling check Re-engage Autopilot as required Provide Post A/R Report to Receiver/Cell Set No Smoking/Seat Belt Lights as

required Record Fuel quantity Establish Cruise Configuration Set Position and Rendezvous beacon lights as required Set Attimeter to 29.92 (as required) Turn off oxygen (as required)

required

NAV FUNCTIONS

STIONS

Accomplish Post Air Refueling Checklist procedures Set Radar/Rendezvous Beacon to OFF Monitor Radios Set Attimeters (if necessary) Check Oxygen Open fuel tank circuit breakers as

BOOMER FUNCTIONS

Perform Post Air Refueling procedures Set Ruddevator Trim Control to "0" (as

required) Retract, Stow, and Latch Boom Close Sighting Door Lever Check Ruddevators locked Switch Set External Lights (as required) Set Refueling Station Oxygen Panel Inform Pilot BOOM STOWED Return to Forward Cabin Set Forward Station Oxygen Panel ON, 100%

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BOOMER FUNCTIONS	Provide crew support (as required)	
NAV FUNCTIONS	Terminate Celestia/Vover water navigation Accomplish Final DR position and announce ETA to coast end Accomplish coast end fix Accomplish coast end fix Terminate Celestial Navigation responsibilities Assume Cell lead navigation responsibilities	
COPILOT FUNCTIONS	Notify ATC ArR terminated Pass reciever's requested route of flight Make position reports when out of radar range Obtain phone patch on HF radio to update weather Establish VHF contact prior to coast-in	
PILOT FUNCTIONS	Engage autopilot Maintain formation position Change position as required Perform cell communications as required Terminate formation if necessary	51

CRUISE #2

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Obtain destination weather Direct navigator to determine range Direct copilot to determine if we have tuel capability to reach destination instrument flight rule supplement instrument flight rule supplement Direct copilot to obtain proper clearances Coordinate plan with #1 aircraft Obtain destination weather/monitor air

route traffic control center

PLAN DIVERT

NAV FUNCTIONS

Replan divert Prepare chart Compute distance, time, and fuel

Compute fuel required for divert Obtain ATC clearance

COPILOT FUNCTIONS

BOOMER FUNCTIONS

Provide crew support as required

.

	PILOT FUNCTIONS	COPILOT FUNCTIONS	NAV FUNCTIONS	BOOMER FUNCTIONS
	Direct cell breakup Call for descent checklist Review weather Review approach procedures Direct navigator to advise destination base of aircraft status Brief the approach Confirm N1 RPM Index set	Make entries in landing data card Back up NAV for ADIZ penetration time and coordinates Accomplish descent checklist Review descent and approach procedures Set N1 RPM Index Set Radio Attimeters Set and select Nav Ads	Prepare For Descent Navigate To IAF Monitor #1 aircraft Review Penetration and Approach Review highest terrain Review special use airspace Authenticate mission change	Calculate Landing Center of Gravity Stow Sextant Stool and Sextant Check Circuit Breakers Set Cargo Compartment Temperature Notity Passengers and Crewmembers Walkthrough to Boom Pod Perform Boom Latched Check Walkthrough to Forward Cabin
	Set specific attitude into radio altimeter Insure navigation aldes are set Set starter switches to ignition Direct anti-ice equipment use as required Check switches and pressure of left,	Set Anti-Icing Equipment Check Electric and Hydraulic Systems Set Cabin Pressure Controller at 500 ft above field pressure attitude Set Attimeters Turn Landing Lights on	Monitor weather reports Monitor Aircrew Terminal information service (ATIS) Set Attimeters Fasten Safety Belt and Shoulder Harness Ensure Approach Clearance received	Fasten and Lock Safety Belt and Shoulder hamess
53	rgnr, reserve brake, and powered rudder systems Accuate brakes and check for gauge fluctuation Reduce power to initiate descent Ensure proper course, attitude, and airspeed Set appropriate attimeter setting Confirm descent checklist complete		Comact Commany Fost Perform Descent Attrude Proceedures Make "2,000" Prior to Assigned Attrude" Call Marke "1,000" Prior to Assigned Attrude" Call Montror Cell breakup	iai iai

DESCENT

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PILOT FUNCTIONS	COPILOT FUNCTIONS	NAV FUNCTIONS	BOOMER FUNCTIONS
Call for before landing checklist Ensure speed brakes set to ZERO Ensure autopilot disengaged Direct copilot to lower flape as required Set EASSYD switches on Ensure proper navigation aldes selected and set Scan for traffic Direct copilot to lower landing gear Confirm landing gear down and locked Check anti-skid system Direct additional flaps as required for landing Ensure tuel panel set for landing Ensure tuel panel set for landing Ensure 4 engines in ground idle Maintain alricraft directional control Taxi clear of the runway		Perform Instrument Approaches M Perform Airborne Directed Radar Approach M (if required) Relay Ground Speed and Drift information Ensure Attrude Restrictions are met Configure Radar Direct Descent as published as required Monitor Approach Monitor Approach Monitor Radios Monitor Radios Regel Radios Performation Regel Radios Regel Radios R	Monitor fuel panel Monitor fuel panel
54		Accomplished Advise Pilots of any hazards noted Make Required Altitude calls Record Time Monitor landing rol! out/ground speed	

APPROACH AND LANDING

AFTER LANDING

Complete remaining paperwork

Complete AF Form 781

base

documents secured

COPILOT FUNCTIONS

Set lights as required

Ensure all electrical switches off or closed Ensure APU start accumulator pressures Direct copilot to request progressive taxi Turn off instrument power gyro switches Shut down inboard or outboard throttles Ensure INS accuracy check complete furn off FD #1 and #2 master power Set battery power switch as required **Furn off hydraulic pressure switches** Direct copilot set engine anti-ice as Ensure flight director mode selector Direct engine anti-ice to OFF (if not Perform walk-around inspection as furn off boost pump and fuel valve Ensure chocks installed and check Set starter switches to OFF (if not Direct engine shut down checklist Taxi airplane to assigned parking Set starter switches as required Turn off radios and yaw damper furn off window heat switches Turn off RGA power switches Call for after landing checklist previously accomplished) previously accomplished) C1 Set battery power switch to Set speed brakes to ZERO Confirm APU if required location as required Ensure aircraft security Release parking brake Stop APU as required PILOT FUNCTIONS EMERGENCY Set parking brake switch in gyro Turn throttles off are checked Turn oxygen off Take time hack Instructions rum off lights switches required switches required brakes

5

Set Lights as required

Turn off Auto Pilot

required

REFUEL

Set HF Radio to OFF

clockwise

RAM AIR

Record Distance from left-hand data display **Record Latitude and Longitude Coordinates** Set APN-69 Control Panel OFF (if required) Complete mandatory aircrew requirements Turn in comm kit, KIK-18, KY-58 and FLIP Perform INS Accuracy Check Procedures furn in all navigation mission paperwork Ensure Oxygen pressure bleeds to Zero Turn INS MSU Switch OFF after parked Enter Navigation systems maintenance Complete SAC Form 157 (if applicable) Relay INS accuracy check information Assist in Aircraft Offload As Required Zeroize Code in KIK-18 and KY-58 Set Heading Marker Control CW Press 1 and 2 Keys in sequence Perform maintenance debriefing Set Search Radar Control Panel Set Data Selector to DIST/TIME discrepancies into Form 781 Set Mode 2 Code (as required) Offload Passengers/Personnel Load Airplane Actual Position Record Nav Time of last flight Turn DNS MSU Switch OFF Turn APN-218 System OFF Load Pure Present Position Set Intensity Control CCW Set FSA/CAS power OFF Offload Flight Equipment Set Function Switch OFF Set IFF/SIF As Required Press WY PT CHG Key Set Gain Control CCW Set Diluter Lever 100% Calculate nav accuracy Set Supply Lever OFF Set Scan Switch OFF Set Stab Switch OFF Set Oxygen System Select Way Point Press Clear Key **Press Hold Key** Press Hold Key publications Ensure communication kit and classified Set Pilots' Radar intensity to full counter Set engine starter switches to off (if not Set Engine Anti-ice as required Set pitot, Q-inlet, and window switches Relay crew and aircraft status to home Ensure INS Accuracy Check complete Set Mode 4 Code Switch (as required) Complete SAC Form 828 as required Set Air Conditioning Master switch to Set Air Conditioning Master switch to Set External Power Switch to TRIP # Set Cabin Manual Pressure Control Set Manifold Valve Switch to WING Locate secure location for secrets Apply External Power as required Set Engine Anti-ice to OFF (if not Set Starter Switches as required Zeroize Ciphony Control Panel If

Set speed brakes to Zero

Set Flaps to UP

to FULL DECREASE

Furn in helmet and mask to life support

Perform crew mission debriefing

Set Mode 4 On/Out Switch OUT Set IFF Master Switch OFF

Coordinate aircraft servicing

Turn Equipment Off

Monitor radios

NAVEUNCTIONS

required

previously accomplished)

RAM AIR

previously accomplished)

Set Cargo Compartment Temperature Ensure Passenger Loading Stand in Perform APU Shutdown (if required) Set Boom Compartment Switches Check Tail Support Strut installed Check Fire Extinguisher available Check Cargo Loading Area clear Check Cargo Door Sill protected Install Nose Gear Ground Down Check External Power available ²erform After Landing Procedures Perform Maintenance Debriefing Check APU Start Accumulator Check APU Start Accumulator **Unioad Passengers and Cargo** Check Ground Wire installed Lock And Release Handle **Control Switch to Manual** Remove Tiedown Devices Check Position of Chocks Stow Aircraft Equipment Set Oxygen OFF, 100% Install Entrance Ladder Perform Aircraft Checks BOOMER FUNCTIONS Complete Form 781 Complete Form 781 Complete Form 791 Pressure Gages Pressure Gages Complete Form 76 Open Cargo Door Open Entry Door Install Tail Stand Unload Baggage Position Shoring Set Interphone Unioad cargo Stow Seats Close Gri position Open Grill

APPENDIX B

FUNCTION ANALYSIS MATRICES FOR EACH CREW POSITION

PILOT'S TASK LIST				
TASK	INFORMATION IN	MODALITY	ERRORS	ERROR EFFECTS
Preparation for Flight				
Check weather	TV. Supervisor Of Flying (SOF), and Weather	Man, Via, Aud		
		Vis.Cog		
Compute take-off data	Crew Coordination, SOF, and weather	Man, Vis, Cog		
Conduct MITO/Cell briefing		Voc,Aud		
File mission paper work		Man, Vis		
Check Aircreft and mission status	55	Voc,Aud		
Brief planned flight demonstration	Crew Coordination	Voc.Aud		
Lowers				
Brief touch and go procedures	Crew Coordination	Voc.Aud		
Brief deployment requirements	tions	Voc.Aud		
Brief Cell Procedures		Voc.Aud		
Brief MITO Procedures	Brieting Guide	Voc,Aud		
Complete local mission planning/briefling	Crew Coordination and Briefing Guide	Voc.Aud		
centificate				
Complete flight plan	Crew Coordination	Man, Via, Aud, Cog		
Preflight				
Perform exterior inspection			والمحافظ والمحاومة والمتراجع والمحاولة والمح	
Check interphone and oxygen system		Man, Via		
Complete crew report		Voc.Aud		
Test and check interior lights		Man, Vis		
Reed AF Form 781		Man.Vis		
Notity crew of type of fuel on board	Fuel Sheet from Maintenance	Man, Via, Voc, Aud		
Verity APU with generator installed		Vis		
Notify crew of engine start time		Voc.Aud		
Briter AF Form 781 data		Voc		
Review AF Form 781 data, as required		Man.Vis		
Complete mission and weather briefing		Vis		
Amounce start engines time		Voc		
Provide additional instructions		Voc.Aud		
State which APU has generator		Voc		
Inspect and close nose compartment		Men,Vis		
Check for presence of Foreign Object		Vie		
Demage (FOD)				
Check nose wheel well		VIa		
Check nose gear condition		Vis		
Ensure nose gear pin removed		Man.Vis	Not sufficiently checked	Structural damage to alincraft
Ensure actuators are connected to		Man.Vis	Not sufficiently checked	Structural damage to aincraft
nose gear doors				

Other Number Number </th <th></th> <th></th> <th></th> <th></th>				
Via Via Via Via Via Man/Va Man/Va Man/Va	Check manual refueling valve cover	VIE		
Vie Nie Vie Man,Vie Man,Vie Man,Vie Man,Vie,Mand Man,Vie,Mand Man,Vie,Mand Man,Vie,Mand	closed			
Via Via Marviva Marviva Via Marviva Marviva Marviva Via Marviva Marviva Marviva Marviva Marviva Marviva Marviva Marviva Marviva Marviva Marviva Marviva Marviva	Check right Wheel well	VI8		
Via Via Man.Via Man.Via Man.Via Man.Via Man.Via Man.Via Via Noi	Check right system Hydraulic	Vis		
NI NI Man, Va Man, Va Man, Va Man, Va Via Na Via Na <th>accumulator presente</th> <th></th> <th></th> <th></th>	accumulator presente			
Man, Visit Man, Vi	Check wheel well	Vis		
Nis Nis <th>Set manuel refueling value handle to</th> <th>Man, Vis</th> <th></th> <th></th>	Set manuel refueling value handle to	Man, Vis		
Man.Vis. Man.Vis. Noi Noi Mat. Mich. Noi Noi Mich. Noi Noi Noi Noi Noi Noi </th <th>P.IGHT</th> <th></th> <th></th> <th></th>	P.IGHT			
Via Nia Minicipanty checked Via Nia unticentry checked Via Via Via Nia unticentry checked Via Via Nia Via Nia Nia Via Nia Nia Nia Via Nia Nia Via Nia Nia Nia Nia N	Check single point refueling receptacle	Man, Vis		
• Via Mail autricentry checked • </th <th>Chack sindle point refueling panel</th> <th>Vis</th> <th></th> <th></th>	Chack sindle point refueling panel	Vis		
No No Mo Uncleaning created Via Via No Via No No	Ensure landing gear door downlocks		lot sufficiently checked	Structural damage to aircraft
Via Via Via	benomen an	-	lot sufficiently checked	Structural damage to aircraft
Via Via Via	Energy landing pairs pine and moved	VIB		
Via Via Via	Chack right wing	Vis		
Vis Vis Vis Net authictenity checked Vis Vis Vis Vis <t< td=""><th>Check ceneral condition of engines</th><td>VIS</td><td></td><td></td></t<>	Check ceneral condition of engines	VIS		
Vis Vis Vis	Check fire bottle discharge indicators	VIS		
Via Via Na Via Na Via Na Via Na Via Via Via Via Via Via Via Via Via Via Via Via No autilicienty checked No Via Via No Via No Via No	Check fire bottle pressure capits	Vis		
Via Via Via No autificientity checked No Via No Via No No Via No <	Check at fuseisce and tail seeembly	Via		
Decent Vite Nite Decent Vite Vite Decent Vite Nite Decent Vite Nite Decention Vite Nite Decention Vite Nite Decention Vite Not Defect Preserve Vite Not	Check ceneral condition of	Via		
Determ VIE VIE List VI VIE List VIE VIE List VIE VIE List VIE VIE List VIE NIE List NIE NIE List NIE NIE	tuseisce embernace			
via Via via Via via Via viato Viato	Check general condition of boom	Vis		
C VIE VIE Letter preseure VIE Not uterator preseure VIE Not endered VIE Not	Check top surface of wings	Vis		
lic Via lic Via mulator presure Via mulator presure Via mulator presure Via mulator presure Via meral condition Via meral condition Via paremond Via y prime Via orgene Via orgene Via ended Man.Via,Aud punp entich	Ensure APU Doors Closed	VIE		
multic Vie Net commutator preseure Vie Net general condition Vie Net general condition Vie Net docts mmoved Vie Net docts mmoved Vie Net docts mmoved Vie Net doct Vie Net<	Chack Left Wheel Well	NI&		
• Via Via Via Not aufticiently checked Via Not aufticiently checked Via Not aufticiently checked Via Not aufticiently checked Via Via Via Via Via Via Via Via Via Via Via Via Via Nativia Via Man, Via, Aud Man, Via, Aud Man, Via, Aud	Check left system hydraulic	VIA		
Vis Vis Vis Not sufficiently checked Vis Not sufficiently checked Vis Not sufficiently checked Vis Vis Vis Vis Vis Vis Vis Vis Man, Vis, Aud Man, Vis, Aud Man, Vis, Aud Man, Vis, Aud	accumulator pressure			
VIe Net eufticiently checked 1 Net eufticiently checked Net euticiently checked 1 Net euticiently checked Net euticiently checked 1 Net eutochecked Net eutochecked 1 Net eutochecked Net eutochecked 1 Net eutochecked Net eutochecked 1 Net eutocheckecked Net eutochecked	Check reserve brake accumulator pressure	Vis		
VIE Not eutiliciently checked VI Not eutiliciently checked VIE Not eutiliciently checked VIE VIE	Check wheel welligear general condition	Vis		
red Vis Not authiciently checked vis vis vis vis vis vis n vis vis	Eneure gear door downlocks removed		lot sufficiently checked	Structural damage to alrcraft
	Ensure landing gear safety pins removed		lot sufficiently checked	Structural damage to aincraft
ergines galana oved a condition a condition ground wires a b n bump switch to umb switch to	Check left wing	Vis		
ge area oved I condition ground wires I I I I I I I I I I I I I I I I I I I	Check general condition of engines	Vie		
ge area ored area d condition ground wires a fin burrp awtich to trinp awtich to	Check fire bottle discharge	Vis		
area area neved al condition d ground wires ei m Pump switch to bump switch to	Check fire bottle pressure	Via		
	Inspect aircraft main tuselage area	VIE		
	Ensure pilot covers are removed	Vie		
	Check aircraft/ramp general condition	Vis		
	Ensure pine, downlocks and ground wires	Vis		
	Check battery charging level	Man,Vis		
	Pressurize hydraulic system			
	Check pressure switches ON	Man.Vis.Aud		
	Set right system auxiliary pump switch	Man.Vis.Aud		
	te AUTO			
RESERVE BRAKE	Set left system auxiliary pump switch to	Man, Vis, Aud		
	RESERVE BRAKE			

Set left system Auxiliary pump switch to		Man.Vis.Aud		
ALTO				
Check arriskid system		Man,Vis		
Check parting brake OFF		Man, Vis		
Check Test panel indicators BLANK		Man,Vis		
Set antiskud test switch to FWD		Man.Vis		
Set entiritied test ewitch to AFT		Man, Vis		
Ensure test panel indicators are BLANK		Man.Vis		
Check hydraulic pressure in normal range		VI.		
Check streed brakes		Man.Vis		
Set inboard spoker switch to NORMAL		Man.Vis		
Set spend brake lever to 60 degrees	Cine Coordination	Man.Vis.Aud		
Set yoke to full left	Crew Coordination	Man.Vis.Aud		
Set yoka to full right	Crew Coordination	Men.Vis.Aud		
Set yoke to center	Crew Coordination	Man, Vis. Aud		
Set inboard spoller switch to CUTOFF	Craw Coordination	Man.Vis.Aud		
Set outpound switch to CUTOFF	Crew Coordination	Man, Vis, Aud		
Set speed brake level to zero degrees	Crew Coordination	Men,Vis.Aud		
Return inboard and outboard applier	Crew Coordination	Man, Vie. Aud		
emitches to NORMAL				
Check allerens and glare shield clearance	Crew Coordination	Man.Via		
Move yoke left	Crew Coordination	Man, Vis, Aud		
Move yoke right	Craw Coordination	Man, Vis, Aud		
Mave yoke certer	Crew Coordination	Man, Vis, Aud		
Check alleron trim		Man, Vis		
Check elevators		Man, Vis		
Check trim indication		Vis		
Move yoke forward	Crew Coordination	Man, Vis		
Move yoks alt	Crew Coordination	Man,Vis		
Move yoke center	Crew Coordination	Man, Vie		
Check electric trim	Crew Coordination	Man, Vis		
Check menuel trim		Man,Vis		
Actuate stab trim control switch	Crew Coordination	Man, Vis		
NOSE DOWN than NOSE UP				
Set stab trim control switch to CUTOUT	Crew Coordination	Man, Vis		
Set Stab trim control ewtich to NORMAL	Crew Coordination	Man, Vis		
Check rudder				
Check rudder power switch OFF	Crew Coordination	Man, Vis		
Push rudder full LEFT		Man, Vis	Not sufficiently checked in windy conditions	Mission delay
Push rudder full RIGHT, then release	Crew Coordination	Man, Vis	Not sufficiently checked	Mission delay
Set rudder power switch to ON		Man, Vis		
Check rudder preseure		Man,Vis		
Check rudder trim	Crew Coordination	Man, Vis		
Check Engine Falture Assist System (FSAS)		Man,Vis		
Set EFAS evench to TEST, then ON		Men.Vis		
Check engage system		Man, Vis		

Check yaw damper system		Man, Vis		
Set SYD mutch to TEST, then ON		Man.Vis		
Check DISENG licht comes on and goes out		Via		
Check ILS receivers		DUA, SIV, AND		
Check VOR	Crew Coordination	Man,Vis,Aud		
3	Crew Coordination	Man, Via, Aud		
		Voc		
F (around radio)		Voc		
		Man. Vis. Voc. Aud		
		Man.Vis.Voc.Aud		
		Man Via Voc Aud		
Creek operation of automate				
Check tlight director heading mode				
Chack instruments				
Check all dials and gauges		Via		
Check Antitude Director Indicator (ADI)		Man, Vis		
Chack INS arre		Man,Vis		
See cinct		Man, Vis	-	
Set all terms activity mutch in TEST		Man.Vis		
Set oil temp selector settch to M		aux, rusw		
Check fuel quantity readings		Vie		
Check Retetion Go Around (RGA) mode	Crew Coordination	Man, Vis		
E	oordination	Man, Vis, Aud		
1				
		Man.Vis		
Dester				
Set autoplict engage switches ON		Man, Vis		
Rotate autopliot turn knee LEFT then		Man.Via		
RIGHT				
Refer the attent inneb NOSE UP, then NOSE DOWN		Man,Vis		
Decrese pilors disengage button		Man, Vis		
Set summint ensure suffiches ON		Man, Vis		
Article state time and the		Man.Vis		
		Man. Vis		
Base velteforvelle test jodicetor		Man.Via		
		Man Vis		
		May Via		
MOVE THEIR OFFICIAL FILMER BONCIAL TO GIVE		Man Vie		
ADJUN BOUR, DECEN, CAN'S AND PAUPERS				
Ensure fuel panel set for take-off		!</td <td></td> <td></td>		
Perform CELL check	Crew Coordination	Man,Vis.Voc		
Perform Comm 2 radio check		Man.Vis.Voc		
Inform CELL lead ready to start engines		Man, Vis, Voc, Aud		
Check APU accumulator pressures		Vis		
Set aux purros				
Set left aux purpo switch to OFF		Man, Vis		

.

Set right aux pump settch to OFF		Man, Vis	
Review takeoft and emergency procedures	Crew Coordination	Man, Vis. Voc. Aud	
Perform FSA/CAS alignment and insertion	Weather, Flight Plan, and crew coordination	Man.Vis	
procedures			
Starting Engines and Before Taxi			
Start APU it required		Man,Vis	
Fasten beits and hameases		Man, Vis	
Turn arygen to 100 percent		Man,Vis	
Set battery settch to EMERGENCY		Man.Vis	
Set hydraulic pressure switches		Man, Vis	
Activate external power switch as required		Man.Via	
Set parting brakes		Man,Vis	
Check hydrautic pressure		Man,Vis	
Set starter switch to START .	Ground Coordination	Man, Vis, Voc. Aud	
Start 1 angine -	Crew Coordination	Man, Vis. Voc, Aud	
Set throttle to START at 25 percent N2 RPM	Crew Coordination	Man, Vis	
Monitor engine instruments "		Vis	
Set throttle to IDLE at 50% N2 RPM*	Crew Coordination	Men, Vis	
Set starter switch to OFF -		Man, Vis	
("Repeat for each engine)			
Set starter selector switch to OFF		Man, Vis	
(lest engine only)			
Check overhead panel caution lights		Via	
Shuttown APU as required		Man, Vis	
Ensure external power and chocks removed	Ground Coordination	Voc.Aud	
Set battery eartich to NORMAL		Man, Vis	
Tum on engine anti-los as required	Crew Coordination	Man, Vis. Voc, Aud	
Reset attimeters	Crew Coordination	Man, Vis, Voc, Aud	
Check INS and DNS NAV INOP lights	Ground Coordination	Voc.Aud	
Ensure taxi report complete	Crew Coordination	Voc.Aud	
Taxi			
Check hydraulic pressure, brakes and	Crew Coodination	Man,Vis	
steering			
Check flight controls	Crew Coordination	Man, Vis	
Check flight instruments		Man, Vis	
Check speed brakes to ZERO	Crew Coordination	Vie	
Set flaps	Crew Coordination	Man, Vis	
Advance power momentarily to begin taxt	Craw Coordination	Man, Vis	
Release parting brakes	Crew Coordination	5	
Position airplane as required		Man,Vis	
Check powered rudder system			

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Check system and rudder power hydraulic		Vie		
preserve gauges				
Push rudder pedal full LEFT		Man.Vis		
Push rudder pedal full RIGHT and hold		Man,Vis		
Pueh rudder pedal full LEFT and hold		Man,Vis		
Set EFAS and SYD switches to CN				
See EFAS emitch to ON		Man, Vis		
Set very deriver switch to ON		Man, Vis		
Review takeoft data		Man, Vis		
Ensure trim ready for taledt				
Check rudder trim at ZERO		Vie		
Chack altern tim at ZERO		Vie		
Check such trim		Vie		
Set and mehack NAV aids		Man.Vis		
Set flight director and climb selector		Man, Vis		
ewitch to RGA mode				
Set APU stan-ston switches to STOP		Man, Vis	O nisalon	Demage APU
Obtain last chance inspection		Voc.Aud		
Check reducts STBY		Man.Vis		
Set native bates		Man.Vis		
Class of the last chance becarion		Man.Voc.Aud		
		-17		
Check EFASSYU amundations				
Creck Amuncations				
Check APU doors open and lights turned out		V(6		
Clese whitewa		BLA, LIDHM		
Adjust throttle friction		Man, Vie		
Obtain MITO appreval		Voc,Aud		
Change radies to MITO discrete frequency	Ceordinate between aircraft	Man, Voc, Aud	Enter Incorrect trequency	Mehap
Obtain radio check on MITO frequency	Ceordinate between aircraft	Man, Vis, Aud		
Set power far MITO		Man,Via		
Release parting brakes when directed by	Coordinate between aircraft	Man, Via, Aud		
bed				
Meimein specing		Man,Vie		
onal radio checks	Crew Coordination	Man.Vis		
	Crew Coordination	Man, Vis		
the off	Coordination	Vis		
		Man, Vis		
Tum rader on		Man,Vis		
Takeoff				
Advance power as required		Man.Vis		
Release parking brake as directed		Man,Vis		
Taxi into position and align alreraft with		Man,Vis		
centertine				

oordination oordination		Case Coordination	Man. Via		
Rest Lension Lension Re off Traction Core Concenterion Varia Re off Traction Varia - Re off Traction - - Re off Tracting Traction - - </td <td></td> <td></td> <td>Man Vie</td> <td></td> <td></td>			Man Vie		
and and any line constrained (a) and any line constrained (b) and any line constrained (b) any line <thcmlore< th=""> constrained (c) any line<!--</td--><td></td><td></td><td>Man Vie Voe</td><td></td><td></td></thcmlore<>			Man Vie Voe		
In In In In In In In In In Visue Visue Visue Visue In Visue Visue Visue Visue Visue In Visue Visue Visue Visue Visue In Visue Visue Visue Visue Visue Visue In Visue Visue Visue Visue Visue Visue Visue Visue In Visue	Direct copilot to set take-off thrust	Crew Coordination	Man, Vis, V OC		
(ii) Care Concriterio (iv) Vec. Ref (al.) Care Concriterio May Vec.Cag Ref (al.) Care Concriterio May Vec.Cag May (al.) Care Concriterio May (al.) May (al.) May (al.) May (al.) May (al.) May (al.) <td>Maintain directional control and wings level</td> <td>Crew Coordination</td> <td>Man, Vis</td> <td></td> <td></td>	Maintain directional control and wings level	Crew Coordination	Man, Vis		
no. cat is neglined Cate Controller Na, Na Level (RD), within Cate Controller Man, Na Level (RD) Man, Na Man, Na Level (RD) Man, Na <td< td=""><td>Check arrapeed at 90 knots</td><td>Crew Coordination</td><td>Vis.Voc</td><td></td><td></td></td<>	Check arrapeed at 90 knots	Crew Coordination	Vis.Voc		
and set Core Contraction Jannia asset Mary Nacogradio Mary Nacogradio Asset Mary Nacogradio Mary Nacogradio <td>call as monified</td> <td>Craw Coordination</td> <td>Vis. Voc. Cog</td> <td></td> <td></td>	call as monified	Craw Coordination	Vis. Voc. Cog		
Matrix Crear Concrete <in< th=""> Matrix exel Text, activity Text Concrete<in< td=""> Matrix exel Exel Constration Vex.V&LMAIN Matrix exel Exel Vex.V&LMAIN Matrix Matrix exel Exel Matrix Matrix Matrix exel Exer Exer Matrix Matrix exel Exer Matrix Matrix Matrix exervation Vex Matrix Matrix Matrix</in<></in<>	2				
eed Important is matriced Use of an and a strategy of the strategy	Activate Hotation Go Around (HGA) within	Crew Coordination	Man, Vis		
Laboration Learning Important to matricen pelos retrodo Inguined unit Cree Coordination Vec.VB.MB.n. Men.NB. Inguined unit Cree Coordination Vec.VB.MB.n. Men.NB. Inguined unit Cree Coordination Vec.VB.MB.n. Men.NB. Information Cree Coordination between strend Men.NB. Men.NB. Information Coordination between strend Men.NB. Men.NB. Information Vec.VB.MB.n. Vec. Inportant strend Information Vec.VB.MB.n. Vec.NB. Men.NB. Information Vec.NB. Men.NB. Men.NB. Information Vec.NB. Men.NB. Men.NB. Information Vec.NB. Men.NB. Men.NB. Information Vec.NB. Men.NB. Men.NB. Information Men.NB. Men.NB. Men.NB. Information Men.NB. Men.NB. Men.NB. Information Men.NB. Men.NB. Men.NB. Information Men.NB. Men.NB. </td <td>10 knots of rotation speed</td> <td></td> <td></td> <td></td> <td></td>	10 knots of rotation speed				
Cree Coordination Very Na. Main Regind with Cree Coordination Main Na Regind with Learning Main Na Regind with Cree Coordination Very Main Regind with Cree Coordination Very Main Regind contact Very Main Main Nin Regind contact Very Main Main Nin Regind contact Very Main Main Nin Reference Very Main Very Main Reference Very Main Very Main Reference Very Main Very Main	Pult back on yoke until takeoft attende		Man, Vis. Cog. Aud		Stall
Cene Coordination Vex, Ver, Main E Regind units Man, Vis Man, Vis Man, Vis Man, Man, Man, Man, Man, Man, Man, Man,	is reached				
Revined wat Leavyse	Call for gear up	Crew Coordination	Voc.Vis.Man		
Res grund Lin Lin <thlin< th=""> Lin <thlin< th=""> <thlin<< td=""><td>Follow command bars as required until</td><td></td><td>Man.Vis</td><td></td><td></td></thlin<<></thlin<></thlin<>	Follow command bars as required until		Man.Vis		
Mar. Mar. Mar. Mar. 1 Now maye Coerdination Voc Inproper retring 2 Now maye Coerdination Voc No ast negative Coerdination Now maye No ast negative Coerdination Now Mar.Vec.Aud.Voc No d alter tasent Coerdination Nov.Vec.Aud.Voc Nov.Vec.Aud.Voc d alter tasent Nov.Vec.Aud.Voc Nov.Vec.Aud.Voc Nov.Vec.Aud.Voc d alter tasent Nov.Vec.Aud.Voc.Aud.Voc Nov.Vec.Aud.Voc					
Intermediation Vec Improper certing In Normage Leve Coordination Via Improper certing In Work Coordination between aircraft Mix, Mix, Mix, Mix, Mix, Mix, Mix, Mix,			3		
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Set specific attitude into radio attimeter		Man,Vis	Improper altimeter setting	Mishap
insure navigation aids are set	Crew Coordination	Man, Vis, Voc, Aud		
Set starter switches to ignition		Man, Vis		
Direct anti-ice equipment use as required	Crew Coordination	Man, Vis. Voc		
Check switches and pressure of left, right	Crew Coordination	Man, Vis, Voc, Aud		
reserve brake and powered rudder system				
Accuate brakes and check for	Crew Coordination	Man, Vis, Voc, Aud		
paupe fluctuation		Man, Vis		
Descent				
Reduce power to initiate descent		Man, Vis, Cog		
Ensure proper course, altitude and airapeed	Crew Coordination	Vis		
Set appropriate altimeter setting	Crew Coordination	Man, Vis, Voc, Aud		
Contirm descent checklist complete	Craw Coordination	Voc.Aud		
Call for before landing checklist	Crew Coordination	Voc		
Ensure speed braises set to ZERO		Man,Vis		
Ensure autopilot disengaged		Man, Vis		
Direct copilot to lower flaps	Craw Coordination	Voc		
Set EFAS/SYD switches on		Man, Vis		
Ensure proper navigation aides selected		Vis		
and set				
Direct copilot to lower landing gear	Crew Coordination	Voc		
Confirm landing gear down and locked		Vis		
Check anti-skid system		Vis		
Direct additional flaps as required for		Vis.Voc		
landing				
Ensure fuel panel set for landing		Vie		
Ensure flaps set for landing		Vis		
Raise speed brakes		Man, Vis		
Apply wheel brakes as required		Man, Vis		
Maintain aircraft directional control		Man, Vis		
Taxi clear of the runway		Man.Vis		
		-		
After Landing				
Call for after landing checklist	Crew Coordination	Voc		
Set starter switches as required	Craw Coordination	Man.Vis		
Direct copilot to set engine anti-ice	Crew Coordination	Man,Vis,Voc		
Take time hack	Crew Coordination	Man.Vis		
Set append brakes to ZERO	Crew Coordination	Man.Vis		
Taxi airplane to assigned parking location	Crew Coordination	Man.Vis		
Shut down inboard or outboard throttles	Crew Coordination	Man.Vis		
Eneure flight director mode selector	Crew Coordination	Man.Vis		
switch to GYRO				

Direct copilor to request progressive taxi	Crew Coordination	Man,Vis.Voc	
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COPILOT'S TASK LIST				
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Compute (ataof) data (SAC Form 71)	Computer	Man, Vis	Wrong flap setting	Problem If pushing A/C limits
Record fuel Data on SAC Form 200	Weather	Man.Vis		
Complete copikots chart		Man.Vis	Mistake in fuel load	Could impact mission and safety
Update takeoff data as required		Man.Vis.Cog	Erroneous takeofi data	Could impact safety
(weather and numery changes)				
Prefight				
Check Thrust Settings and Critical field length		Vis	Errors in takeoff data	Could impact safety
Read Crew Information File		Vis		
Pick up quick done, heimer, mask, and publications		Man,Via		
Go to Base Operations				
Attend weather brief	Weather	Vis, Aud		
Check aircraft readiness		Voc, Aud		
Recheck takeoff data	Weather	Man.Vis.Aud.Cog		
Lowd Baggage		Man,Vis		
Pre-position Quickdon, heimet, Pube, and checklists		Via		
Power Off Inspection				
Check FD/RGA Circuit Breakers		Vis		
Check Instructor Oxygen Panel		Vie		
Check Regulator OFF, Diluter Lever at 100%		Vis		
Bleed pressure down		Man.Vis		
Check Portable Oxyger: Bottles		Vis		
Set Attitude Selector Knob to NORM		Man, Vis		
Check pressure above 50 pel		Vie		
Check hydraulic pressure switch OFF		Vis	Switch error possible	Could result in personnel injury
Check engine starter switch OFF		Vie		
Check PMC switches ON, guard closed		VIa		
Check Emergency Hydraulic		VI8		
crossover Valve Lever in NORMAL				
Check pressurization/air conditioning panel		Vis		
Check Cabin Pressure Test Valve Handle Position		Man,Vis		
Set Cabin Manual Pressure Control OFF		Man.Vis	Switch error possible	Takeoff and climbout with improper pressure
		-		results in distraction later in tlight
Set Cabin Pressure Controller as required		Man, Vis		

Set cabin pressure rate of change knob as desired	Man, Vis		
Check air conditioning crossover switch OPEN	VIB		
Set Cabin Temperature Control as desired	Man,Vis		
Set air conditioning master ewitch to RAM AIR	Man,Vis		
Check Atternate Presentization	Vis		
autiches OEE and Guarts Chased			
	Vis		
Check radios in preset mode	V18		
Set manuals to initial planned frequency	Man,Vis		
Check UHF Comm 1	Vis		
Check UHF Comm 2	Via		
Check VHF (# applicable)	Vis		
Check all switches OFF	Vis		
Check Filant Director Mode selector	Vis		
anteh la GYPO			
Charle into automa MOBILAL	VIS		
	Vie		
CIPECK FIRE SWICHER IN			
Check intoard spoter switch in CUTOFF			Fourier demonst second his
Check landing gear handle DOWN, in detert	Man,Vis	Omission	Equipment carmage positions
Check all Fuel Valves CLOSED	VIE		
Set CDU Select Panel			
Chack Pewer Switch in NORM	VIA		
Check CDU Select Swhich in DNS	VIS		
Chack Radar Interaty Switch Full	Man.Vis		
counter clockwise			
Check Throtties CUTOFF	Man.Vis		
Check Rudder Power Switch OFF	Vis		
Chack Trim Serve Sentich in NORMAL	Vis		
Check Anti-Icine/J-4 Panel	Vis		
Chack anti-ica, pitot hast & set window hast OFF	Man,Vis		
Ensure J-4 compase mode selector swhich in MAG	Vis		
Perform External Power applications precedures			
Set External Power Switch te TRIP	Man,Vis		
Check all Warning Flags (as applicable)	Vis		
Set battery power switch to EMERGENCY	Man,Vis		
Check EGT Ligms If applicable	Vis		
Check Battery voltage it applicabli⊷	Vie		
Activate Alarm Bell (momentarily)	Man.Vis		
Perform APU Start Procedures If required	Man,Vis,Voc		
Set external power switch to CLOSE if applicable	Man,Vis		
Check T-R voltage	Vis		
Set battery power switch to NORMAL	Man, Vis		
Power On Inspection			
Set FD Master Power Switches ON	Man, Vis		

Energine FD 109 Power Of Lights ON	81		
pror to placing switches ON			
Set FD 108 master power switches to ON	Man.Vis		
Ensure FO 109 power off lights are out	V18		
Perform ARR Parsel Checks			
Set Master Reluel Switch to ON	Man, Vis		
Press to test all indicator lights not illuminated	Man.Vis		
Set manifold values switch to FLIGHT	Man,Vis		
Check main ARR/IFR valve switch CLOSED	Vis		
Check tank level control switches CLOSED	Vis		
Check Scaverge Seatch OFF	VIS		
Check Reverse Retuel Pumps Sentch OFF	VIE		
Check Slipway Door Switches CLOSED	VIE		
Check signal amplitier power switch in NORMAL	Vis		
Check mervual toggie latch switch in RELEASE	Vis		
See Manter Refuel Switch to OFF	Man, Vis		
Check Engine Bleed valves OPEN		Omission	Damage to wing structure
Perform Bleed Air Leak Detection Test	Man, Vis	Omiasion	Damage to wing structure
Press bleed air leak detection test switch			Damage to wing structure
Check al LEAK DET, OVER PRESS			Damage to wing structure
and OVER TEMP Lights ON			
Reisses Test Switch	Men.Vis		
Ensure Lights go aut after releasing test switch	VIS		
Close Generator Breaker Switches	Man, Vis		
Set Remaining Switches ON as required	Man, Vis		
Set VOR to ON	Man, Vis		
Set TACAN IS ON	Man, Vis		
Set VHF Radio ON	Man, Vis		
Set UHF Radio ON	Man.Vis		
Set HF Radio CN	Man, Vis		
Ser Autoplier ON	Man, Vis		
Set RGA Power Switches ON	Man, Vis		
Set Instrument Power Gyro	Man.Vis		
Ensure Required Publications Are available	Vis	Fail to notice missing publications	Could be critical in emergency altuations
Eneure presence of Aircraft Flight manuals	Vie	Use improper flight manual	Could result in use of improper emergency
	_		procedures
Check Interphone and oxygen	Man, Vis, Aud		
Perform FSAS preflight procedures			
Ensure FSA/CAS POWER Switch ON	Man.Vis		
Accomplish IFMP Interface Test	Man.Vis		
Check Fuel Status Indications	Vis	Ormission - this is only display of CG	Could result in overweight takeoft
Press fuel kay	Man.Vis		
Press Data Key	Man, Vis		
Press Mattunction Data Key	Man, Vis		
Vertig Aiplane Type	Vis		
Verity Engine Type	Vis		

Vertiv Brakes and Anti-Skid type				
Check ICDU STATUS Displays				
Chart Status Display		Vis		
		Man.Vis		
SIMM ICOO ONDIAN IS DUE SIGILIE 2/3				
Check Bus Status Display				
Check WT and Balance into on ICDU for FSAS		Man.Vis		
Obtain Craw Report	-	Man.Voc.Aud		
Set interior lights		Man, Vis		
Chack wheel wells clear		Via	Omission, incomplete check	Could Injure maintenance personnel
Eneure System Preseure Switches ON		VIG		
Check anti-akid		Vie		
Check fuel guantity mading		Vis		
Chart Hudrauke Switem Pressure		Vis, Man, Aud, Voc		
Check Hudswite Svitem guantity		Vis, Man, Aud, Voc		
		Vis, Man. Aud. Voc		
		Vis.Man.Aud.Voc		
		Vis.Man.Aud.Voc		
		Vis. Man. Aud. Voc.		
		Vis Man Aud Voc		
UNECK L'A SYRGENIS & FILST & RESERVE				
breaking galas in roomal sugar		Man Vie		
Tum on auteption yaw damper switch		Via Mar Aud Var		
Check Gear Warning Light extinguished		VIE MEN AUG VOC		
Cemplete centrel and trim check		20 A'DRY'URW'SA		Could define a summary leader
Check Fuel Dump Actuator		Man, Via		
Chack Beom retracted		Aug.Vec		
Set Fuel Dump Switch te FUEL DUMP		Vis.Man.Aud.Voc		
Set Fuel Dump Switch to OFF		Man,Aud		
Ensure Wheel Well Doors clear		Voc,Aud		
Receive Report from each Crew member		Aud		
Check INS/DNS CDU Test Switch (If applicable)		Vis		
Check DNS NAV INOP Light Illuminated		Vis		
Check Flap lever in 50 degree detent		VIS		
Depress Copilor's autopilot Disengage button		Man.Vis		
Set Stabilizer Trim as required		Man,Vis		
Sat Flap Lever to 40 degree deterit		Man, Vis		
Move Flap Lever through 30 degree		Man, Vis		
to 20 degree detent				
Set Flan Lever to 0 degree detent		Man,Vis		
Set Flap Lever to 30 degree detern		Man, Vis		
Set Flap Lever to 0 degree detent		Man,Vis		
Set Navigation Lights		Man,Vis		
Set Flash-Steady Switch to FLASH		Man,Vis		
Set all Fuel Boost Pump Switches to ON		Man, Vis	Omission	Could result in angine flame out on takeoff
Sat Bright-Dim Switch to BRIGHT		Man, Vis		

Set #2 Tank-To-Engine-Manifold		Man.Vis		
vatve sudich to OPEN				
Set all refueing in value switch to OPEN		Man,Vis		
Report ACDS Lights ON # applicable		Vis.Voc		
Report ACOS Lights OFF II applicable		Vis, Voc		
Starting Engines & Before Taxl				
Factors and hat have		Man.Vis		
Set arryonn to 100%		Man.Vis	Omission	Could be critical in rapid decompression
Set External Power Switch to CLOSE		Man.Vis		
Set Air Conditioning Master ewitch		Man.Vis		
Set Throttle to Cross Start RPM It required		Man, Vis		
Check Overhead Panel Caution lights out		Via		
Set Generator Circuit Brasker		Man.Vis		
switches to CLOBE				
Set Beacon and Navigativin Light		Man.Vis	Omission	Distraction later in flight
switches to BOTH ON and STEADY				
Set Copilors Instrument Power Switch to START		Man.Vis		Temporary Loss of Cocipit Lights
Set Ptot and O-inlet Heat Switches to ON		Man, Vis	Omission	Loss of airspeed and altimeter
Set Engine Amilice as required		Man.Vis		
Perform Taxi Report Procedures		Man, Vis, Aud		
Set Air Conditioning Master switch as required		Man.Vis		If cabin pressure is OFF, then warning light
				comes on passing 10K
Set atimeter to STANDBY		Man,Vis		
Confirm INS & DNS NAV INOP as required		VIE		
Taxi				
Check hydraulic pressure, brakes, and steering		Man, Vis	Omission	
Checkvet anti-ice equipment as required		Man, VIS		
Set Anti-Icing ON		Mari, Vie Man Vie		
Car Flam a multiple	Crew Constinue	Man Via Aud	Omission	Warning horn comes on if set improperly
Check Overhead Parel		Vis		
Ensure bus tie, generator breaker and		Man, Vis		
generator control lights extinguished				
Check Main T-R Units for normal operation		Man, Vis		
Check Air Conditioning		Via		
Check AC Ammeters for balanced load		Man, Vis		
Check Pressurization Panel for proper		Vis		
switch settings				
Check Circuit Open, IDG Failure and DISC		VIs		
system lights out				
Discuss Take-Off Data		Voc, Aud		

Sensitiver ITH TO' I AMOUT		MAN, VIE		
Recompute tateoff data if required		Voc, Aud, Via, Man, Cog		
Obtain ATC clearance	Air Traffic Control (ATC)	Voc.Aud		
Review and set N1 RPM Indices		Man, Vis		
Set NAV aids for departure		Man, Vis		
Set PLT Director Made & Climb Selector		Man, Vis	Improper setting	Could lose back-up
sentiches to RGA, Max Mode				
Check door warning/OVHD panel caution light		Man, Vis		Engine fire, thrust reverses most critical
Close window & set Window Heat Switch		Man.Vis		
Accomplish Crew Take-off Report		Voc.Aud		
Take-Off				
Set fuel panel for takeoft		Man, Vis		Boost pump switches off and alroraft low
				on fuel could starve the engines, mishep
Set lights as required		Man.Vis		
Turn Radar Intensity Switch clockwise		Man. Vis		
Hold years full forward		Į		
Check for FLT tide on all four engines		Vis		
Anneunce FLT title on all tour engines		Voc		
Set Take-Of thrust		Man.Vis.Voc		
Call & trade		Vac		
		Voc		
		Vac		
Haute Gear		Man, Vis		
Mere flaps up		Man, Vis		
After Takeoff				
Begin ATC Communications	ATC	Man, Vis		
Turn off Starter Switches (as required)		Man, Vis		
Tum on engine anti-ice (as required)		Man, Vis		
Check cabin preserrization		Vie	Omission	Distraction later in flight
Set Fuel Panel as required		Man, Vis	Omission	Michap
Turn off RGA Power Switches		Man.Vis		
Turn off landing light		Man, Vis		
Direct crew to set 29.97	Crewmember calls out 10,000' & 18,000'	Voc	Omission	Proper altitude necessary to avoid traffic
Cruise				
Check hydraulics		Vis		
Check electical system		Vis		
Monitor fuel system		Vis		

Montor oxygen system		Via		
Monitor engine instruments		Vie	Could miss angine status information	Critical especially during icy conditions
Set fuel panel for cruise	Flight plarvcrew coordination	Man.Vis		
Preparation for Contact				
Obtain permission to delay at the ARCP	ATC	Voc. Aud		
until revised ARCI				
Obtain block attitude	ATC/Flight plan	Voc. Aud		
Request permission to conduct air relueling	ATC	Voc. Aud		
Deciare MARSA (Military Assumes	ATC	Voc		
Responsibility for Separation of alroraft)				
Compute Max Continuous Thrust setting		Vie, Man, Cog		
Post Max Continuous Thrust setting		ž		
Set Max Continuous thrust setting on N1 bug		Man, Vis		
Record and air refueiting request from receiver		Aud, Man, Vis		
Air Retueling				
		M W-		
Set Brains as analysis		Man, Vis Vis Nac		
Gar aktionale TAPAN M consident		VIII Man		
de (inter as multimet				
See Pretton I Intra In STEADY and Dat		Vie Man		
Count contacts		Vis. Aud. Cop	After 5 dry contacts, must wet boom	Improper count results in equipment damage
Set Rendezvous Beacon Lights as required		Vis, Man	improper settings	Increases rendezvous difficulty for receiver
Complete fuel quantity check		Vis, Man		
Set No Smoking/Seat Bek lights ON as applicable		Vis, Man		
Set Autopilot VORACC & Hdg Set switches of		Vis, Man		
Set TACAN as required		Vis, Man		
Set 1 air refueling pump switches to ON	Crew Coordination	Vis, Man		
Set Beacon Lights to BOTH ON and position lights		Vie, Man		
to BRK3HT				
Complete post air retueling check		Man, Vis, Aud, Cog		
Reengage autopilot as required	Crew Coordination	ş		
Provide post air refueling report to receiver		Voc, Aud		
Record Fuel quantity		Vie, Man		
Establish Cruise Configuration		Vis, Man		
Set position and rendezvous beacon lights		Vis.Man		
Set Attimeter to 29.92		Vis, Man		
Turm off oxygen		Vis, Man		
Descent				
Notify ATC air refueling terminated		Voc, Aud		
Pare reclevers requested route of them		Vac		

update vestmer reporte errer ou or reue conect Update vestmer Mete entries in landing data card Perform Test Engine Montioring test (TEMS) Set Anti-ting equipment Accomptish descent checklist		Voc.Aud.Man		
		1 TOM 'NOT 'N		
		1.01- A.4		
Perform Test Engine Montoring test (TEMS) Set Anti-tring equipment Accomptiah descent checklist	Weather, rues panel, crew coordination	VIR, MAN		
Set Anti-Icing equipment Accompileh descent checklist		Vis,Man		
Accompliah descent checklist		Vis, Man		
procedures	Weather, FLIP documents, landing data	Voc		
	Landing data	Vis. Man		
	FLIP documents	Vis. Man	Wrong attitude setting	Could meut in around impact
	F IP documents	Via Man		
		VIB		
Set Cabin Pressure Controller at 500 ft M	Weather	Via, Man		
above flatd pressure altitude				
Set Attimeters	Weather/ATC	Vis, Man		
Tum on landing lights		Vie, Man		
Approach and Landing				
Review approach procedure		Vis. Voc. Cog		
Fraum month bar and the read		Vie Man		
See BOA point A street deviation and then ON		Via Man		
	Casadia stilan	Vie Mee		
		Vic. 10-		
MONTER ARTICLES, ARTERED, SITK FAILS,				
ground append and wind sheer, A/C attitude				
grite		Vis, Man		
Set Flags for landing	Crew Coordination	Via, Man		
Centirm AC en center line for landing		Via		
Call VDP		Vec		
Call out MD/VDH		Vec		
Call missed approach point if necessary	FLIP documents	Vóc		
Advise pilot when engines decelerate to		Voc, Vis		If asymetric condition, safety impact
ground idle during tanding rolleut				
Check Arti-Skid after gear lowered		Vis		
Chack Rudder Pressure in hydraulic set		Vie		
After Landing				
Set Starter Switches as required		Man,Vis		
Set lights as required		Man,Vis		
Set Engine Anthice as required		Man,Vis		
Set pitot, Q-inlet, and window switches to OFF		Man.Vis		
Set Flape to UP		Man, Vis		
Set speed brakes to Zero		Man,Vis		
		Man Vie		

Set Ar Concisioning Maser metch is RAM AIR Set Ar Concisioning Maser and metany metany metany metany build counter excision and the metany is full counter excision and the metany is full counter excision and the metany metany is full counter excision and the metany metany is full counter excision and the metany metany is fully frequend to the metany	Man, Vis Man, Vis Man, Vis Man, Vis Man, Vis Man, Vis Man, Vis Man, Vis Vis	Man, Vis Switch left on inacventantly Man, Vis Switch left on inacventantly Man, Vis Man, Vis	Electric shock hazard to ground members
	Men. VIS Men. VIS Men. VIS Men. VIS Men. VIS Men. VIS Men. VIS Men. VIS VIS		Electric shock hazard to ground members
	Man, Vis Man, Vis Man, Vis Man, Vis Man, Vis Man, Vis Man, Vis Man, Vis Vis	d vec. Cog	
	Man.Vis Man.Vis Man.Vis Man.Vis Man.Vis Man.Vis Man.Vis Man.Vis Vis	d voc. Cog	
	Man.Vis Man.Vis Man.Vis Man.Vis Man.Vis Man.Vis Man.Vis Man.Vis Vis		
	Man.Vis Man.Vis		
	Man.Vis Man.Vis Man.Vis Man.Vis Man.Vis Man.Vis Man.Vis Vis		
	Man.Via Man.Via Man.Via Man.Via Man.Via Man.Via		
	Man.Via Man.Via Man.Via Man.Via Man.Via Via		
	Man.Via Via Man.Via Man.Via Via		
	VIB Man.Vis Man.Vis Man.Vis Vis	-	
	Man, Vis Man, Vis Man, Vis Vis		
	Man.Vis Man.Vis Vis Vis		
	Man.Vis Man.Vis Vis		
	Men.Vis Vis		
	Vis		
	and a second		

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TASK	INFORMATION IN	MODALITY	ERRORS	ERROR EFFECTS
Preparation for Flight				
Particin Maaion Planning				
Salact correct charts	Schedule, JMC charts	Man, Vis, Cog		
Develop route of flight to meet	Schedule, AP18, AP1A		Route developed incomectly	Violation of toneign airapace
mission (Iming				
Plot celestial nevigation leg on charts	Schedule, Filght plan	Man.Vis		
Place special use aimpace data on charts	HO-248 Air almanac.	Man.Vis		
	Star/aun volumes			
Place air refueling data on charts	Scheduling. AP18. AP1A	Man.Vis		
Place emergency airfields on charts	IFR supplement,Tech order	Man.Vis		
Annotate highest terrain and	Erroute charts, AP1A, CHUM	Man, Vis		
obstructions on chart				
Annetate level of point	Crew Coordination	Man, Vis		
Armstate ADIZ entry boint	Enroute charts, TAC communications office	Man, Vis		
Complete Minister Panemorts	Schadula-HO-249.Air almanac	Men.Vis		
Consider Form 200	Wind sheets.Crew Coordination	Man, Via. Cog	Record wrong wind/velocity	
Consistent marine to a sublementary and the	Flicht plan.Charte	Man.Vis		
		Man. Vis		
	10. 10. 10. 10.	Man Vis		
Heview and study Fight internation				
Publication (FLIP) and General				
Planning (GP) requirements				
Conduct crew flight briefing	Crew briefing guide	Vec		
Discuss mission requirements with wing	TAC communications office and	Vec.Aud	Transcriptior	Inaccurate code for Incoming threat
intelligence and communications officers	Intelligence			
Check Form 200 and chart for accuracy	Whiz Wheel, Form 200, Charl	Man.Vis.Cog		
Fill out known information on in-flight log	Wind sheet, Form 200	Man, Vis		
Determine Where Celestial		Men.Cog		
observations will take place				
Predetermine Radar targets at action points	Charl	Cog, Man, Vis		
Attend Pretakeoff Brief	Weather shop	Voc,Aud		
Perform Squadron Preilight Activities				
Check Flight Schedule for changes		VIB		
Review Flight Crew information File (FCIF)		Vie		
Perform Base Operations Dutles				
Attend Weather Briefing		Aud		
Check weather for impact on mission timing Weather shop	Weather shop	Aud, Voc	Not realizing impact of	Miss rendezvous
Review approach plates and enroute charts		Man, Vis, Cog		
Check Flight Notices to Airmen (NOTAMS)		Vis		
Synchronize Crewmembers' watches	Clock	Man, Vis		

Attend Crew Briefing and Cell briefing Pick-up Heimet and Oxygen Mask from	CELL had				
Pick-up Heimer and Oxygen Mask from		DOV			
		Man.Vis			
itte support					
Pick up required in flight publications	intel. TAC communications office	Man, Vis			
	SOF, intelligence, TAC comm. office	Man.Vis	Inaccurate decoding	Compromise classified mission	
		Man.Vis			
Pick up KY-58		Man, Vis			
Pertorm Externor Inspection					
Attend Crew Assembly		PnV			
Review 781 writeups		Via			
Load Equipment and Aircraft		Man, Vis			
Review Crew Aircraft Evacuation plan		Vis			
Bower Of Instanti v					
Check portable oxygen bottle					
Check Cleaniness, general condition,	Datah 1	Vis			
and stored in normal position					
Check For pressure approximating 300 pei	Desh 1	Via			
Check Altitude Selector Knob in NORMAL		Via			
position					
Service Portable Origen Bottle	Dateh 1	Man, Vis			
Replace Portable Oxygan Bottle	Death 1	Man, Vis			
Have's up helmet to exygen		Man, Vis			
Prepare navigator station for preflight					
Take out charts and equipment		Man, Vis			
Take out Navigation Publications		Man, Vis			
Ensure Celestial Tables and Air		Man, Vis			
almanace on board and current					
Perform IFF Control Panel preflight					
Set Master Settch OFF	TAC Communications office	Man, Vis			
Set Mode 4 Code Switch to A or B	KIK-16	Man, Vis			
Set Mode Enabling Switches OUT		Man, Vis			
Set Mode 4 On/Out Switch ON		Man.Vis			:
Set Mode 3/A code selectors to zeroes		Man, Vis			
Check MSU-INS and MSU-DNS Mode		Man.Vis			
selectors OFF					
Check CDU power ewitch in NORIMAL or AUX		Man.Vis			
Set APN-218 Doppler Switch to OFF		Man, Vis			
Set Search Radar Control Panel		Man,Vis			
Set FTC Seatch OFF		Man,Vis			
Set IAGC Switch OFF		Man, Vis			
Set PATT switches as desired		Man, Vis			
Set Bearing Switch as desired		Man, Vis			
Cet STC Dial full countemfortunise		Man.Vis			

Be fase factor for in controction on controction of the control of the contto control of the contto cont of the control of the control of t				
Crew Coordination	Stab Switch OFF	Man, Vis		
Crew Coordination	Gain Control full counterclockwise	Man, Vis		
Caw Coordinatesh	Heading Select Knob to local	Man, Vis		
Caw Coordinates	nagradic variation			
	Scan Swach OFF	Man, Vis		
Caw Coordinatesh	Test Meier Switch to "MAG"	Man, Vis		
Caw Coordinatesh	Ranna Seritch to 3-30/5	Man. Vis		
Caw Coordinatesh	Function Statich OFF	Man Vis		
Caw Coordination	Reder Preservization Control	Man. Vis		
Crew Coordination				
Crear Coordination	Radar/Rendezvous Control Panel	Man, Vis		
Crew Coordination	Master Power Switch OFF	Man, Vis		
	Putes Width Switch (as required)	Man, Vis		
Caw Coordinates	Code Selector Switches	Man, Vis		
Crew Coordinatesh	electronic cabinet cooling switch to an	Man, Vis		
ly construction for the constr	Search Radar Indicators	Man, Vis		
y Sochweise F Crew Coordination data A data A dat	Mariga Dalay Switch OFF	Man.Vis		
Activities Accordination Activities Accivities Activities Activiti	intensity Control Kneb fully	Man, Vis		
Accitates F Craw Coordination data. data. data. data. e loors e loor	ourtercieckwise			
F Crew Coordination data. data. data. data. e ioors e ioors ioors e ioors e ioors i ioors e ioors i io	ränge control knob fulty clockwise	Man, Vis		
F Crew Coordination data lever e lever e borad e borad e borad i e	interphone panel switches	Man, Vis		
	LL.	Man, Vis		
	ick Onygen System	Man.Vis		
	n Orrygen Suppery Ler ar ON	Man, Vis		
	hight Helmet and Orygen Mask	Man.Vis		
	ct Heimer and Mask cennectiens	Man, Vis		
	ce Regulater-Oliuter Lever to 100%	Man, Vis		
	i Orygen Mask fer lealus	Man.Vis		
	te Emergency Orygen Toggle lever	Man.Vis		
	BAERGBACY			
	te Regulater-Diluter Lever to NORMAL	Man.Vis		
	ce Emergency Topple Lever to	Man.Vis		
	erter position			
	ce Orygen Supply Lewer OFF	Man, Vis		
	ce Oxygen Regulator-Diluter lever	Man.Vis		
	100 percent			
	it Heimet Transmit/Receive capability	Man, Vis		
a aliy)	e off heimet	Man, Vis		
a Vilia:) headeet	Man, Vis		
y Switch lo stion (verbally)	it transmit/receive capability	Man, Vis		
	nplete Crew Report	Voc,Aud		
	ce Interphone Rotary Switch to	Man, Vis		
	ALL position			
	rowledge Crew Position (verbally)	Voc.Aud		

Set control panel switches as required		Man.Vis		
Perform N 1 compass preliight		Man,Vis	Overlook a compass error	Fly off course
Check latitude correction pointer OFF		Man,Vis		
Set Compass to correct MAG heading		Man.Vis		
center Annunciation Pointer				
Accomplian Grd Check		Man, Vis		
Perform INS/DNS System Preflight		-		
procedures				
Check INS-Doppler Status Panel		81		
Set MSU-INS and MSU-DNS Mode selectors	Craw Coordination	Man, Vis		
id Align				
Tum on FSA/CAS power switch		Man, Vis		
Perform APN-218 Doppler Checks		Man, Vis		
Tum Mode Selector to LAND		Man.Vis		
Pertorm Bit Test	Base operations	Man, Vis		
Turn Mode Selector to OFF		Man, Vis		
irren INS and DNS		Man,Vis		
Set IFF Mitter Sutton as desired		Man, Vis		
Set IFF American Sectich to BOTH		Man, Vis		
Set RAD - TESTANON Swhich to OUT		Man.Vis		
Set IFF mester ewitch to NORMAL	KiX-10	Man.Vis		
Test Modes 1, 2, 3/A and C		Man, Vis		
Ercade Made 4		Man, Vis	Keying errors	Must recheck all other code settings
Check Mode 4 light out		Man, Vis	م به معادلات من معامل مالیک اس و بن میں خلافان اف میں اور	
Set mester ewitch to STANOBY		Man, Vis		
Set Mode 1, 2, 3/A, and C ewtiches		Man.Vis		
required				
Set Mode 1, 2, and 3/A Codes		Man, Vis		
Set Audio/Light Switch		Man, Vis		
Set RAD - TESTANON Switch		Man.Vis		
Turn APN-58 Function Switch to STBY	Weather	Man,Vis		
Pertorm Attimater Preflight procedures				
Set Attimeter to correct Barometric		Man,Vis		
Compare Attimater setting with field		Man.Vis		
elevation				
Accompliah DNS Interface Test	Flight plan	Man.Vis		
Accompliah INS Interface Test	IFR supplement	Man, Via		
Insert Waypoint Data	IFR supplement	Man, Vis	Keying errors	Could severy impact mission success
Ineer TACAN Data		Man,Vis	Keying errors	Could affect navigation accuracy
Vertty waypoims		Man,Vis		
Perform launch authentication procedures				
Load KY-58		Man.Vis		
Request authentication and launch		Voc.Aud		

Hespond With correct Authemication				
Install sextant stool and sextant		Man,Vis		
Check sextart mount		Man.Vis		
Check sextant de siccant		Man, Vis		
Check averager		Man.Vis		
Check sextant alignment		Man.Vis		
Observe a celestial body		Man.Vis		
Perform celestial precomp		Man.Vis		
Resolve sextam accuracy		Man.Vie		
Remove and side sectant and shool		Man.Vis		
Tum FSACAS Power Sentch ON		Man, Vis		
Fi Lite Pressner Unit (LPU)		Man.Vis		
(m. m) sain san san san san sain sa				
Starting Engines And Before Taxi				
Perform starting engines and before taxi		Man, VIS		
Tum Origan Suman ON		Man.Vis		
Set INS/DNS Svitem to NAV Mode		Vis		
Den Glaves				
Meriter engine start		Vis		
Perform alreraft electrical power check		Man.Vis		
Check For at least One Generator on line		Man.Vis		
Set IFF Master Switch to STANDBY		Man.Vis		
Turn APN-218 dappler made selection ON		Man, Vis		
Tum search radar te STBY		Man,Vis	re.	
Set Radar/Rendszvous Beacon as required		Man.Vis		
Perform warning and indicator light test		Aud,Man,Vis		
Repert over Interphone "Ready to Tax!"		Man.Vis		
Check receiver status		Voc,Aud		
Ensure Taxi Clearance received		Voc,Aud		
				-
Texi				
Perform search radar turn on procedures				
Set Function Switch to SEARCH		Man,Vis		
Adjust intensity Comrol		Man, VI6		
Adjust heading mark intensity control		Man,Vis,Cog,Aud,Voc		
ver vcan varich as desired	Crew Coordination	V0C.7UG		
Set Stab Switch to UP	Ground and clearance control	Man,Vis,Aud		
Fine-tune Radar	80F	Man,Vis,Aud		
Check beacon capability		Man, Vis		
Perform radio procedures		Man.Vis		_
Ensure Departure Clearance is received		Voc.Aud		
Ensure Flight Safety Check by (SOF) is		Voc.Aud		

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Fasten Geat Batt and Shoutder Harness		Man.Vis			T
Perform safety check		Man, Vis			T
Prepare For Takeoft					-
Report Ready For Takeoff		Man, Vis			
Perform defore Takeoff Checklist					
procedurae					
Set Radar/Rendezvous Bescon		Man.Vis			
Set IFF (as required)		Man, Vis			
Pertorm Takeoff Rok		Vie			
Perform takeoff duties					
Monitor lead aircraft for MITO timing		Vis			
Record Takeoff Time		Man, Vis			
Monitor Aircraft instruments		Vis			
Perform initial Climbout procedures					
Ensure positive rate of climb		Vis			
Eneure Geer Lp		VIE			
Ensure Flaps are raised		Vis			
Celt Johnp					
Direct Pitot into Enroute Formation	IMPCON	Man, Vis, Voc			
Use All available equipment to effect		Man.Vis			
phr up					
Inform pilot of other aircraft's position		Voc.Vis			
Ensure Level Off in Althoda Block		Man, Vis			
Acquire lead alreraft on radar		Man, Vis, Voc	Mismad radar	Mishap	
Make departure call		Man.Vis.Voc			
Monitor Departure Being Flown		Vis			
Ensure Correct Headings are flown		Vis			
Ensure Correct Attitudes are flown		Vis			
Perform after takeoff checklist procedures					
Check IFF Mode 4 Caution Light of		Via			
Reset Attimeter at Transition Attitude		Man, Vis			
Ensure Oxygen Requirements Are Met					
Ensure Orrygen is ON and at 100% when		Man, Vis			
aircraft la above 17,000 feet					
Ensure Oxygen is readily available		Man, Vis, Voc			
above FL250					
Don Heimet above FL430		Man, Vis, Aud			
Make 2,000' prior to Level Off Call		Man, Vis, Aud	Omission	Mishap	
Make 1,000 prior to Level Off Call		Man.Vis.Aud	Omission	Miehap	
Record Level Off Time	Training sheet	Man, Vis, Aud			
Monitor Interphone And Radios		Aud			
Montor Interphone and COMM radios		Aud			
from takeoff					
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		· · · · · · · · · · · · · · · · · · ·			

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Monitor HF when out of home station UHF		Aud			
range during alpha monitiv periods					
Crutee					
Complete Communication Log		Man,Vis			
Request And record UHF Traffic		Man, Vis, Aud, Voc			
Accomptiath HF Contact		Man, Vis, Aud, Voc			
Record HF Traffic		Man, Vis. Aud, Voc			
Montor Redine And Interchone		Aud			
Monter UHF Command Post/Cell frequency		Aud			
Manitor LIME Ale Traffic Control	ATC	Aud			
Manutar HF slant talk during alpha		Aud			
monitor carlod	TACANVOR				
librate IFF Made 34 an multad	TACANWOR	Man Vis Aud	Omination		
Mandrov International as movined	TACANVOR	Man.Vis.Aud			
Monitor And I Indele Nextension Fouriement		Man. Vis. Aud			
		Man Vis			
		Man Via Aud			
MORNEY AFT DE FLAGE		Man, Vis, Aud			
Moniter Nevigation Radio alds		Man, Vis. Aud			
Perform station treeping duties					
Keep Aircraft within 10 NM of track		Man, Vis, Aud, Voc			
Direct Aircraft te avoid thunderstorms		Man, Vis. Aud, Voc. Cog	Misread radar	Arcraft damage	
by 10 NM below FL236					
Direct Aircraft te aveid thunderstorms		Man, Vis, Aud, Vec, Cog	Misreed radar	Aircraft damage	
by 20 NM at at above FL230					
Make in-flight leg entries		Man.Vis			
Recent Aircraft position and time at		Man.Vis			
ali pianned turn pointe					
Record Aircraft peaklion at least once		Man,Vis			
every 30 minutes					
Perform Celestial Navigation	Mission Accomplished Report	Man, Vis, Cog. Aud, Voc			
Ensure Celestial Navigation clearance		Man, Vis, Aud, Voc			
la obtained	Navigation alds, INS, DNS, TACAN				
Set Equipment as required for specific		Man, Vis			
navigation Leg					
Take coest out fixes		Man, Vis, Cog, Aud, Voc			
Record accurate start position and time	Air almanac/HO-249	Man, Vis. Cog			
Compute "After Heading" and ETA to turn		Man,Vis.Cog.Voc			
Perform Celestual Procedures		Man, Vis.Cog			
Perform Dead Rectioning (DR) Navigation		Man,Vis,Cog			
Accomplish celestial pre-comps		Man, Vis. Cog. Aud. Voc			
Resolve MPP/FIX		Man, Vis. Cog			
Complete Log work on Form 200		Man, Vis. Cog			

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		Man, Vis. Cog. Voc		
coast and point/ADIZ				
Accomplish celestial control time to		Man.Vis.Cog		
aur rafueting control pount				
Monitor navigation equipment for		Vis		
malfunction				
Perform Overwater Navigation				
Update INS/DNS as required		Man, Vis.Cog		
Set IFF as required		Man, Vis, Cog, Aud		
Set APN-218 to SEA		Man,Vis		
Track Aircraft Position		Man, Vis		
Use all navigation aids to montor		Man.Vis.Cog		
position within 20 NM of track				
Update ETAs to Pliot as necessary for HF		Man.Vis.Voc.Aud		
position report				
Monitor Interphone and Radio		Man, Vis, Aud, Voc		
Perform Station Keeping Duties	Receiver	Man, Vis, Aud, Voc		
Monitor Radar for Skin Paint or Beacon	Receiver	Man, Vis		
Keep Pliot informed (verbally) on		Man, Vis, Voc, Aud		
aircraft position				
Eneure RZ Timing is met		Man, Vis, Voc. Aud		
Adjust TAS to make timing		Man, Vis, Voc, Aud	Computation error	Timing not met
Adjust Track to make timing		Man, Vis. Voc. Aud	Computation error	Timing not met
Perform Orbit Holding Procedures		Man, Vis, Voc. Aud		
Compute Orbit Headings		Man, Vis, Cog	Computation error	Exit assigned airspace, miss rendezvous
Meintain ATC sesigned airspace and altitude		Man, Vis, Aud, Voc		
Set Equipment As Required For Rendezvous		Man,Vis		
Monitor/Set Miscelianeous Equipment		Man, Vis		
Set Assigned Radio frequencies		Man, Vis, Aud, Voc		
Monitor Radios		Aud, Voc		
Set Attimeter as required		Man,Vis		
Montor Atthude	Receiver	Vis		
Establish Radio Contact With Receiver		Man, Vis, Aud, Voc		
Obtain Receivers information as required		Man, Vis, Aud, Voc		
Relay Tanker information as required		Man, Vis, Aud, Voc		
Compute Turn Range And Offset		Man, Vis.Cog	Computation error	Mise rendezvous
Determine Turn Range from chart using		Man, Vis, Cog		
TAS closure and drift inbound				
Determine Offset required from chart		Man, Vis, Cog		
using TAS and drift inbound				
Set Oxygen Regulator As Required		Man, Vis, Aud, Voc		
Set Orygen Regulator to ON		Man.Vis.Aud.Voc		
Set regulator-diluter Laver to 100%		Man, Vis, Aud, Voc		
Pertorm Rendezvous				
Ensure ATC clearance to air refuel received		Man, Vis, Aud, Voc		

Establish Ottaal		Man, VIS			
Accompliah Automatic Direction Finder		Man, Vis			
(ADF) check					
Accomplish Positive Beacon ID	-	Man, Vis			
Start Timing		Man,Vis			
Instruct Pliot to turn at turn range	Rader, compase, DME	Man.Vis.Voc.Aud			
Monitor echaion position		Vie			
Place Beacon to STBY as required		Man, Vis			
Initiate Overrun Procedures		Aud.Voc			
Pertorm Precontact	Crew Coordination, contact light	Man,Vis			
Air Batuating					
Set Equipment As Required	Crew Coordination, contact light	Man.Vis			
Sei Rendezvous Beacon Control to STBY	Crew Coordination	Man,Vis			
Record Air Retueling Data		Man.Vis			
Record Number of contacts		Man, Vis, Aud, Voc		Violate air refueling track	
Record Amount of fuel transferred		Man.Vis.Aud.Voc	Excessive transfer	inadequate amount of fuel for transfer	
Monitor Cell Formation		Man,Vis			
Tune Redar for optimum picture		Man, Vis			
Keep Pliot advised of position		Man, Vis, Voc, Aud			
Maintain ATC Clearance Requirements		Man, Vis	Requirements not maintained	Airspace violation	
After Altorati as necessary to maintain		Man.Vis.Voc.Aud.Cog			
course within 10 NM of cleared course					
Moniter And update NAV systems		Aud,Man,Vis			
Mentor Interphone and Radios		Aud			
Menter UHF Radios		Aud			
Mentior HF Radie		Aud			
Menter interphene		Aud			
Perterm Breakaway Procedures		Man, Vis, Voc. Aud			
Configure Redar te stingaint Receiver		Man,Vis			
at bottom of AR block					
Set APN-68 to OPERATE		Man, Vis			
Mentor Atttude		Man, Vis, Voc. Aud			
Post Air Refueling					
Set Radar/Rendezvous Beacon to OFF		Man, Vis			
Monitor Radios		Man,Vis,Aud			
Set Attimeters		Man, Vis			
Check Oxygen		Man,Vis			
Open fuel tank circuit breakers		Man,Vis			
Terminate Celestial/over water navigation		Man.Vis			
Accomplish Final DR position and	Coordinate with lead aircraft	Man.Vis.Cog.Voc	Error - ADIZ violation	Violate ADIZ entry point	
announce ETA to coast and					Ī
Accomplish coast and fix		Man, Vis, Cog, Voc			

Terminate celestial navigation clearance		Man.Vis.Voc		
Check N1 and J4 compass heading	IFR supplement	Man.Vis.Voc		
Assume cell lead navidation responsibilities		Man.Vis.Voc.Aud		
Plan Divert				
Plan diven		Man, Vis, Cog, Aud, Voc		
Present chart		Man Vis Con Voc		
Commute destance time and fuel	Crew Coordination	Man Vie Con Voc		
FIRE IN URSCHIT		8		
Nevigene To AF		Man.Vis	Aititude Errors	Mishap
Monitor #1 aircraft	Crew Coordination	Men, Vis		
Review Penetration and Approach	ATC	Man, Vis, Cog, Aud, Voc		
Review highest terrain	Metro	Man, Vis		
Review emengency siniaids		Men.Vis		
Review energie use almosts		Man Via		
Authenticate minaton change		Man Vis Aud Voc		
Montro: unather records		Man Vin Aud Voc		
Monther Almont Territori Information				
		202		
Fasten salety bell and shoulder harmes		Man.VIS		
Ensure Approach Clearance received		Man.Vis,Aud,Voc		
Contact Command Post		Man.Vis.Aud.Voc		
Descent				
Perform Descent Attrude Procedures				
Make "2,000" Prior to Assigned	INFCON	Man, Vis, Voc	Miss attrude call	Mishap
attivde" call				
Make "1,000" Prior to Assigned		Man,Vis,Voc	Miss attitude call	Mishap
aintiude" cali				
Monitor Celi breakup		Man, Vis, Aud, Voc. Cog		
Perform Instrument Approaches	Approach plate	Man, Vis. Aud, Voc. Cog		
Perform Airborne Directed Rader		Man, Vis, Aud, Voc, Cog		
Approach (ARA)	Approach plate			
Relay Ground Speed and Drift information		Man, Vis, Voc, Aud		
Ensure Attitude Restrictions are met			Altitude violation	Mishap
Configure Reder				
Direct Descent as published as required		Man, Vis, Voc, Aud		
Monitor Approach		Man, Vis		
Monitor Radios		Man.Vis.Aud		
Monttor timing as required		Man.Vis		
Perform Safety Checks				
Scan For Traffic		Vis		

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Check Rear position down		V.8		
Check Dura Annuard Sneed				
	Assessed for the second s			
CIRCOL FUEL FEITER				
Announce approach for decision height	Approach plate	MEN.VIG.VOC		
		Man Vie Voc		
Ensure Massed Approach Procedures Are				
Action States of act Provide action		Man.Vis Voc		
Mate Bestind Attuch calls		Man, Vis. Voc		
After Landing				
Record Time		Man, Vis		
Menitor landing roll out/ground speed		Vis		
Accomplish after landing checklist				
Call command post		Voc.Aud		
Pass landing time		Voc.Vis		
Get parting		Aud.Voc		
Monitor radios		Aud, Vis		
Tum Equipment Off				
Set Made 4 Code Switch		Man,Vis	r setting	Harm ground personnel
Set Mede 4 On/Out Switch OUT		Man, Vis		
Set IFF Mester Switch OFF		Men, Vis		
Tum APN-218 System OFF		Man,Vis		
Tum DNS MSU Switch OFF		Man.Vis		
Set Search Radar Control Panel		Man.Vis		
Set Gain Centrel counter clockwise		Man, Vis		
Set intensity Control ceunter clockwise		Man, Via		
Set Heading Marker Centrol clockwise		Man.Vis		
Set Scan Switch OFF		Man, Vis		
Set Stab Switch OFF		Man,Vis		
Set Function Switch OFF		Man, Vis		
Set APN-88 Control Panel OFF		Man,Via		
Set Drygen System	FLIP documents	Man, Vis		
Set Supply Lever OFF		Man,Vis		
Set Diluter Lever 100%		Man.Vis		
Ensure Oxygen pressure bleeds to Zero		Man.Vis		
Perform INS Accuracy Check Procedures				
Select Way Point		Man.Vis		
Press Hold Key		Man, Vis		
Record latitude and longitude coordinates		Man, Vis		
Press Hold Key		Man, Vis		
Load Pure Present Position		Man, Vis		
		Man Vie		

Result VF TCHG Kky Mun. Val Prese V see in sequences Mun. Val Prese C Lear May Mun. Val Record Ner Time at later Tigget Mun. Val Record Ner Time at later Tigget Mun. Val Best Research Mun. Val Set Most 2 Code (an requirement Mun. Val <			
let Crew Coordination	Man.Vis		
Law Coordination	Man, Vis, Cog		
a Crew Coordination	Man.V.s		
a Crew Coordination	. Man, Via		
a Crew Coordination	Man, Vis		
Lever Coordination	Man.Vis.Cog		
P Coordination		Omission	Dead battery, can't align INS. It delay
Coordination			
Crew Coordination	Man, Vis		
s Crew Coordination	Man, Vis		
a Crew Coordination	500	Omission	Compromise secrets
a Craw Coordination	Man, Vis		
a Crew Coordination	Man, Vis		
a Crew Coordination	Man, Vis, Cog		-
a Crew Coordination	Voc.Aud.Vis		
a Coordination	Voc.Aud.Man.Vis.Cog		
Coordination			
Conditiation		Omission	Compromise secrets
a Crew Coordination			
	Crew Coordination Man, Vis. Cog. Aud, Voc		
	Men, Via		
	Men. Vis		
	Vis, Cog. Voc. Aud		

TASK	OUTCOME	MODALITY	ERRORS	ERROR EFFECTS
Cargo Loading				
Plan Cargo Loading	For proper loading within design	Man./ is Aud. Voc. Cog		
	Himks of aircraft		Transcription	Incorrect camp load plan
Check Cargo Unit Dimensions				
Check for Hazardous Materials			Transcription	Customs/safety problems
Determine Weights of Cargo Units	For CG calculations, footprint limits	Man.V.s. Aud. Voc	Transcription	Incorrect load plan and CG
Determine CG incretion of large cargo loade	For CG calculations, positioning in cargo area	Man.Vis.Aud.Voc	Transcription	Incorrect load plan and CG
Compute Contact Area Pressures	Cannot exceed limit	Man.Vis.Cog	Misread tables	Damage to floor of cargo bay
Determine Shoring Requirements	To disperse weight over greater area	Man.Vis.Cog		
	so that it stays within limits			
Determine Load Plan of Cargo	To ease unload, stay within limits		Misplace equipment	incorrect cargo load plan, CG
Complete Forms 53, 53A, and 54	Aircraft load plans (actual	Man.Via.Cog		
	schematics with calculations)			
Determine Total Load and Aircraft	This will feed into mission planning and	Man, Vis, Cog	Error in CG location	
CG location	takeoff data			
Coordinate and Order Flight Meals	Taking orders from crew, making the	Man, Vis, Aud, Voc		
	request to the flight kitchen			
Check Tail Support Strut Installed	Must be in place prior to loading to	Man, Vis	Omission, improper installation	Tipping of aircraft/damage
	keep aircraft from falling on its tail			
Check Chock position	Move from tire to compensate for tire	Man,Vis	Improper placement	
	compression during cargo loading			
Check Greund Wire installed	Must be installed for electrical	Man,Vis	Omission	Safety hazard
	hazard safety			
Check Cargo Loading Area clear	Remove obstructions, debris, loose	Man.Vis	Omiesion	Trip hazards, damage to equipment
	equipment			
Check Fire Extinguisher available	For the salety	Man.Vis	Omission	Fire safety hazard
Check Tiedown Equipment	Ensure adequate quantity, in proper	Man, Vie	Omission	Damage to carge
	cenditien			
Chack Shoring	Ensure adequate quantity, in proper	Man.Vis	Insufficient amount	Time factor (to get more shering)
	condition			
Open Cargo Doer		Man, Vis	Not opened far enough	May not clear vehicle/damage
Check Cargo Door Sill protected	Place shoring on door sill area to	Man.Vis	Omission	Latching mechanism damage,
	protect latching mechanism			Satety of Flight (SOF)
Stow Seats	Fold them up out of the way	Man, Vis	Omiasion	Seats can get in way/damage
Position Shoring	In path of cargo to be loaded to	Man, Vis	Misplacement	Damage to floor
	disperse weight during loading			
Check Manifest and Waybills	Cargo must have accompanying paperwork	Man, Vis, Cog	Omission, misread	Customs problems
Check Mounted Cargo secured	Equipment on trailers, loaders should	Man,Vis	Omission, improper mounting	Damage to vehicle, cargo,
to carrier	be properly secured			and aircraft
Brief Load Team Members	Assign them their positions, duties	Aud, Voc	Omission, inadequate briefing	Bad coordination, time factor

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Presium pading Vehicle	Direct the vehicle to the caroo door	Man Vis	limoroper backing signals	Aircraft and vehicle damage
	for propertioning			
			1 3	CG problems and annual
	LUGG GEGTI DIGUE MI DIGUEL OLOBI.	61 A 1) FM		
	position in accordance with Forms 83			and cargo damage
Secure Cargo	In accordance with T.O.s	Man.Vis	Asymmetric and improper liedown	Shifting of cargo, damage
Stow Loose equipment	Walkthrough of cargo area to secure	Man, Vis	Omission	Trip hazards, SOF
	all unsecured equipment			
Preparation for Flight				
Complete DD Form 365-4 weight	Calculate aircraft takeoff gross weight.	Man, Vis.Cog	Math errors and incorrect information	CG errors
and balance information	CG, and ensure its within limits			
Complete AF-781, AF-791, and	781-flight time, 791-fuel officed report	Man, Vis.Cog	Incorrect information and incorrect	Bad mission paperwork
AFTO-78	76-structural Me report		tall number	
Perform Boom Operator Portion	inform crew of offload schedule, etc	Man, Vis, Aud, Voc		
of mission briefing				
Brief Officed Type	Boom or drogue	Man, Vie. Aud, Voc		
Brief Officed Amount	Fuel weight	Man, Vis. Aud. Voc		
Brief air refueiling control times	Contact times	Man, Vis, Aud, Voc		
Brief Receiver Type	Type of receiving aircraft	Man.Vis.Aud.Voc		
Brief Receiver California		Man Vis Aud Voc		
Ree Oneratione Activities				
CONCOL COMM INTOTINUMOR THE		MED, VIS		
Coordinate Life Support Equipment	For each crewmember and any	Man.Vis.Aud.Voc	Insufficient amount or wrong type	Time factor and passenger
	additional passengers			probleme
Attend Weather Briefing		Vis.Aud		
Pick up Flight Meals		Man, Vis		
Prefilght				
Perform Interior Inspection				
Perform Crew Assembly	Brief where oxygen bottles located	Man, Vis, Aud, /oc		
Review Aircraft Forms	Become aware of aircraft disposition,	Vis, Aud. Voc		
	problems, and status			
Load on Personal and Professional	Bage, heimets, publicatione, secrets	Man, Vis		
equipment				
Erner Att Aircraft	To start APU	Man,Vis		
Start APU	For internal aircraft power	Man, Vis	Omission	No power to aircraft, time
Check Crew Equipment Stowed	Bags and equipment stowed, headsets,	Man,Vis	Omission, wrong location	Time factor
	heimets, publications, etc on seat			
Waikthrough Aircraft to Determine	A first book around to see if there	Man, Vis		
preflight schedule	will be any problems			
Chack Circuit Braakars	Ensure all are in	Iden, Vie, Cog	Omission, misread	SOF, time factor
Remove And stow Nose Gear Ground	To allow nose gear retraction after takeoff	Man, Vis	Omission	Nose gear will not retract, SOF
downlock And Release Handle				

station prettight				
CRECK PORTEDIA UNYGEN DOTHE	Check service record, selector in NORMAL	Man.Vis	Omission, misread	ğ
Check Interphone Panel settings	Selector switches on INTERCOM, check	Man, Vis	Wafer switch in wrong position	
	intercom channel			
Check interphone	Put on heimet, check transmit and receive	Man.Vis.Aud.Voc	Omission	Headset or panel may not work
Pertorm Oxygen System check	Regulator function check	Man, Vis		
Pertorm Crew Report	Check CALE position on intercom -	Aud. Voc		
	also serves as a reference point for			
Perform Sextant Check	Sextant condition and operation	Man,Vis		
Position Navigator's Sighting stool	If you need it to reach the mount	Man,Vis	Improper positioning	Stool can collapse, SOF
Check Settant Mount	Check for damage to mount, that it's	Man, Vis	Installed backwards	Incorrect Zn for celestial shots
	not metalled backwards			
Install Sexis 11		Man, Vis		Sextam damage, misalignment
Check Alignment of Sextant	Check accuracy of sextam	Man.Vis	Improper alignment	Inaccurate celestial shots
Chack Timer	For proper operation, accuracy	Man.Vis	Omission	May not average over 2 min
Perform Instantaneous Shoot	Final check of sextant operation.	Man, Vis.Cog	Shoot false body	Innacurate reading or sextant
	provides sextant correction			
Remove And store Sextant		Man,Vis		
Remove And store Sextant Stool		Man, Vis		
Perform cargo comperiment preflight				
Check carge compariment air	Keeps hot air from entering cabin	Man,Vis		
condition master switch in MANUAL				
Check passenger station oxygen panel	Place in OFF and 100% for ewitch	Man.Vis	Omission, switch in wrong position	Possible depletion of oxygen supply
	position check and operation			
Check Emergency Interphone Panel	Operation check with a headest	Man.Vis, Aud.Vis	Omission	ĝ
Check Aft Compartment Interphene	Operation check with a headest	Man.Vis.Aud.Vis	Omission	ĝ
parat				
Check Gaseous Okygen System	Adequate pressure	Man.Via	Omission, misread	ŝ
quantity gage				
Check Gaseous Oxygen System valves	Valve position	Man, Vis	Omission, wrong position	ĝ
Check Air Outlet Doors and	Backup defroater for boom pod windows	Man,Vis	Omission	Backup defrester may be inoperable
defrast slide				
Open Sighting Door	Checks door operation, allows flow of	Man, Vis	Omission	Sighting door may be inoperable
	hydraulic fluid			
Check Interphone Panel	Operation check with a headset, ensure	Man, Vis, Aud, Voc	Omission, improper switch position	SOF (communications with receiver)
	communication with pilots and navigator			
Check Oxygen Regulator	On, 100%, function	Man.Vis	Omission, improper switch position	SOF, depletion of aircraft oxygen
Check IBO Oxygen Regulator	On, 100%, function	Man.Vis	Omission, improper switch position	SOF, depietion of aircraft oxygen
Check Emergency Override Switch	Should be in NORMAL position	Man, Vis	Omission	System configuration unknown
Check Boom Limit Switches	Should be ACTIVE	Man, Vis	Omission	No automatic boom limits
Check Indicator Lights	Indicate whether boom is in automatic	Man, Vis	Omission	Lights may be inoperable
	or manual retract mode			
Set telescope-at-disconnect switch	Should be in MANUAL	Man.Vis	Set to AUTO	Damage if selected with boom stowed
Check Circuit breakers	All should be in reset if required	Man.Vie.Coo	Omission	20

	allows reading of the gauges			retueling equipment
Check Boom fully retracted	Check gauge for full retraction	Man, Vis	Omission	
Perform Signal Coll Test	Press to test we either open or shorted	Man, Vis	Omitsion	May have no disconned capability
Set Underbody and Underwing lights ON	Turm on to full bright	Man, Vis	Omission	No lights for receiver under KC-135
Chéck Nozzie Light and Tail	Turn on, ask Crew Chief if they're on	-Man.Vis		
mounted floodhgm				
Check Sighing Door open		Man, Vis	Not ensuming door opened completely	Damage to door, inoperable in tlight
Cines Sinthing Door Lever	Must close it prior to takeoff	Man, Vis		
Set Ruddevator Trim Control at ZERO	For the starting point (Normal	Man.Vis	Omission	Changes angle of boom ruddervators
	setting for tighters)			puts stress on boom - damage
Perform Boom Compariment Checks				
Recheck All Applicable Switches		Man, Vis	Boom latch lever not closed	Could drop boom
Perform miscellaneous preflight procedures				
Vertiy DD Form 365-4 data	Verify cargo and fuel loaded correctly	Man, Vis. Cog	Math errors, misread	CG and aircraft performance
	make changes to 365-4 it required			impacta
Conduct Ground Salery Locks Check	Gear locks removed and stowed in aircraft	Man, Vis	Omission, miscount	Gear cannot retract, SOF
Inform Pilot of Actual Takeoff		Vis.Voc		
weight and center of gravity				
Ensure Cargo and loose equipment	Walkthrough to ensure all equipment	Man.Vis	Improper tiedown	Shifting and loosening of cargo
secure	and cargo is stowed and light			
Pertorm APU Accumulator Check	Check for correct pressure	Man, Vis	Omission	Insufficient pressure for restart
Close Cargo Door and Emergency	To allow pressurization, keep out	Man.Vis	Omission, improper procedure	SOF and depressurization in flight
exit hatches	emoke and tumes			
Brief Passengers	On emergency procedures	Man, Vie, Aud, Voc	Omission	Passengers not briefed on SOF
Perform Passenger Loading		Man, Vis. Aud, Voc		
Check Seats and Safety Belts	Check for serviceability	Man.Vis	Omission	SC
Poetton Life Support Equipment	Head court and orygen lits match up	Man,Vis	Omission, improper Inspection	30
Check Passenger Information Cards	Currency, sufficient number of cards	Man.Vis	Cruission	SOF and outdated cards
Remove : toor obstructions	Eneure passenger area is clear	Man,Vis	Omission	SOF and trip hazard
install boom operator's compartment		Man.Vis	Omission	SOF and fail hazard
entry partets				
Open Cargo Door		Man.Vis		
Poakion Passenger Loading Stand		Man, Via		
Brief Passengers		Man, Via, Aud, Voc	Omission	86
Direct personnel to seats and verify	Brief individuals that will be seated	Man.Vis.Aud.Voc		
manifest	near emergency exits			
Check Cargo Manifest	All thems accounted for	Man, Vis	Omiseion	Customs problems
Secure Baggage and loose equipment		Man.Vis	Omiselon	SOF and shifting of baggage
Designate/Brief Troop Commander	Delegate command of passengers	Man, Vis, Aud, Voc	Omission	
Starting Engines and Before Taxi				
Start APU (if required)		Man.Vis		
Ramove Emirance Ladder	Clear entrance area	Man, Vis	Omission	Cannot close door

Montes Manuality Manuality Manuality Manuality Manuality Manuality Reserve attending Manuality Manuality Manuality Manuality Manuality Reserve Manuality Manuality Manuulity Manuality </th <th></th> <th></th> <th></th> <th>Omission are intribut anneath</th> <th>SOF and depresentization</th>				Omission are intribut anneath	SOF and depresentization
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Allows bulb to heat For fighter refuelings as required)	Turn On Nacelle Illumination		Man,Vis	Omission	No light on engine nacelles
For lighter reluelings as required) tions	Set Boom Nozzie Light	Allows built to heat	Man,Vis		
an required) None	Set Boom Marker Lights	For fighter refuelings	Man.Vis		
guired)					
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	Provide Crew Support (as required)		Man, Vis, Aud, Voc, Cog		
	Take Celeatial Observations				

	To dial into sextant mount and position	Man.Vis.Aud		
nevigator	sextant			
Dial In Azimuth and Elevation		Man,Vis		
Take Celestial Observations		Man, Vis		
Give Elevations to Navigator		Vis.Voc		
AIr Retueling				
Preparation				
procedures				
Set Forward Onygan Panel OFF, 100%	Moving from cockpit to boom pod	Man, Vis	Omission	30f
Sei Refueling Orygen Panel	Plug into aircraft oxygen system, can	Man.Vis	Omission, incorrect setting	50F
	stay on oxygen bottle			
Monitor Command Radios	Listen for receiver's call	Aud	Omission	May not hear other aircraft
Set Sighting Door Lever OPEN	Opens door and checks for hydraulic power	Man.Vis	Omission	Vision restriction
Check Signel Coll	Can't disconnect without a "Good" condition	Man.Vis	Omission	If bad coll, cannot disconnect
Set Telescope-At-Disconnect	Fighters-MANUAL, others-AUTO	Man.Vis	Omission, set to AUTO	Could pull receiver into KC-135
Ensure extension and elevation limit	Check	Man,Vis	Omission, incorrect setting	
entiches active				
Bet Emergency Override Switch	NORMAL-Limits are active, OVERRIDE-no	Man.Vis	Incorrect setting	Contusion of system configuration
	Itmits			
Set receiver director light rheostats	Set Intensity of Pilot Director	Man,Vis		
	indicator (POI) lights			
Tum On air refueling Floodlight	Alds in depth perception	Man.Vis		
Set ruddevator trim control to zero		Man.Vis	Omitesion	Cannot lower boom until zeroed
Perform Boom Lowering Procedures				
Reise Boom	To clear hook latch	Man,Vis	Omission	Cannot unlatch boom
Move Hook Latch	To allow lowering	Man, Vis	Omission	Cannot lower boom
Lower Boom		Man,Vis		
Estend Boom	Check "Hight" characteristics	Man, Vis	Omission, not extending far enough	
Check Boom Controle	Control check: Left, right, up, down	Man, Vis	Omission, overcontrol	Damage fuel lines and boom structure
Obtain Radio Contact		Man, Vis, Aud, Voc		
Brief Receiver for Contact	Short communications check to ensure	Aud, Voc		
	comm for breakaway			
Set External Lights		Man, Vis		
Provide Visual commands to receiver	Via PDI Retva	Man, Vis, Cog	Incorrect, not timely	SOF and time factor
Maintain Required communications	Via PDI lights or radio	Man, VIs, Aud, Voc		
with receivers				
Maintain Proper Boom alignment	Keep MpH out of receiver's eyes;	Man, Vis	Incorrect	Strike receiver
	keep aligned with receptacle			
Perform Air Refuelling				
Perform Contact Procedure		Man,Vis		
Monitor Boom Position Indicators	Within Imits	Via	Incorrect position	8 7
Monitor Receiver position	Within limits (don't bow the boom)	Vie	insufficient monitoring	Bind receptacie or strike receiver
and the second of the second the second se	and and and and a share to be	Man Vie		Out and the VO OF

Hecycle system for subsequent contacts	Reset button reconfigures PDI lights	Men.Vis	Omission	PDI lights not reek, if in NORMAL
	and signal amplitier			after disconnect, no tuel flow
Perform Doer Air Befueling				
Set Ruddewater Trim Control to "0"	Reset trim for boom storage	Man, Vis	Omission	Cannot latch boom
Retract, Stow, and Latch Boom	Reduce aircraft drag	Man.Vis	Omission	Structural damage
Close Sighting Door with Sighting	Reduce aircraft drag	Man, Vis		
dbor lever				
Check Ruddervators locked	Reduces drag and checks boom fully stowed	Man, Vis	Omission	Stress on boom, aircraft control
Set Telescope-At-Disconnect switch		Man.Vis	Omission	Possible rapid boom retraction
Set external lights	Tum off PDI lights	Man, Vis		
Sei refueiling station oxygen panel	Check Oxygen bottle quantity, turn	Man, Vis		
	off and bleed down pod oxygen			
Inform Plice BOOM STOWED		Aud.Voc		
Return to Forward Cabin	Walkthrough to check on passengers	Man.Vis		
Ser forward station surgan panel ON, 100%		Man,Vis	Omission	305
Descent				
Calculate landing center of gravity	To ensure within limits	Man, Vis, Cog	Math error, lookup error	Incorrect CG
Stow Sextant Stool and Sextant		Man,Vis	Omission, damage te sextant	Trip hazard and sextant damage
Check Circuit Breakers	Reset as required	Man.Vis.Cog		
Set Cargo Compartment Temp	As desired	Man.Vis		
Walkthrough to Boom Pod	Ensure beom latched	Man.Vis		
Perform Boom Latched Check		Man.Vis	Omission	SOF and damage to aircraft on landing
Walkhrough to Forward Cabin	Return to cocipit for landing	Man,Vis		
Fasten and Lock Safety Bett and		Man, Vis		
eheuder hamees				
Menter Electrical Centrol Panel	Flight crew backup	Vie		
Menter Fuel Panel	Flight crew backup	Vie		
After Landing				
Perform Atter Landing Procedures		Mervie	Outlet -	
intel Nee Gest Amind Down	Keen new down and horized	Man Via		
Lock And Rejease Handle				
Check APU start accumulator	Ensure that accumulator did not bleed.	Man, Vis	Omission and insufficient pressure	
pressure gauges	sufficient pressure for next engine start			
Set cargo compartment temperature	Temperature control in cargo bay	Man, Vis		
control switch to manual				
Perform Aircraft Checks				
Sei Interphone		Man, Vis	Omission	
Open Entry Door		Man,Vis		
Open Grit		Man.Vis		
Install Entrance Ladder		Man, Vis		

Set door conderment seriched	Power down boom pod and return switches	Man.Vis		
	to default positions			
Perform APU Shutdown		Man, Vis		
Complete Form 781	Maintenance write-ups	Man, Vis. Cog		-
Unioad Passengers and Baggage				
Open Cargo Door		Man,Vis		
Install Tail Stand	Prevent aircraft tilting and damage	Man,Vis	Omission, improper placement	Aircraft tipping
Ensure passenger loading stand in position		Man, Vis		
Unioad Baggaga		Man,Vis		
Check tail support strut installed	In place	Man, Vis		
Check Postion of Chocks	Against tires	Man,Vis	Omission	Aircraft could roll during unloading
Check External Power available		Man.Vis		
Check Ground Wire Installed		Man.Vis	Omission, improper sequence	Improper ground
Check caroo loading area clear	Prepare for transport vehicle	Man.Via	Omission	Ground safety
Chack Fire Extinculation available	Fire setety	Man.Vis	Omission	Fire salety
Remove Tindown Devices		Man.Vis		
Poeitien Shortna	Shoring in place for removal of cargo	Man, Vis	Omission, Improper placement	Damage to aircraft floor
University Cargo		Man, Vis		
Stow Alrcraft Equipment		Men.Vis	Omission	Trip hazard
Perform Maintenance Debriefing				
Complete Form 78	Structural record	Man, Vis, Cog	Omission	Incorrect records
Complete Form 781	Flying time	Man, Vis.Cog	Omission	Incorrect records
Comointe Form 791	Fuel officerd report		Omission	Incorrect records

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APPENDIX C

WORKLOAD QUESTIONNAIRE AND RATINGS DESCRIPTION

INSTRUCTIONS

Introduction: We are trying to determine the amount of workload, or mental workload as we call it, required for each crewmember during various phases of the mission or while accomplishing various checklists. A list of the phases/checklists we are interested in are shown on the next page. Place your ratings on this page. This list focuses on events that take place during the mission for each crewmember given the scenario below. Think of what you do (in the same scenario) during each event and make your rating accordingly. A 1-to-10 workload scale is provided along with a written description of what each number rating means. Please use the written descriptions as a guide when making a rating and please make ratings on your own.

Workload Definition: For our purposes, workload is composed of a <u>Time Factor</u>, a <u>Mental</u> <u>Effort Factor</u>, and a <u>Stress Factor</u>. Time refers to the total amount of time available to accomplish the given functions as well as any overlap of functions. Mental effort is the amount of attention or concentration required to perform the function, and Stress is the presence of confusion, frustration and/or anxiety associated with performing the function. In the Workload Chart you will notice the term "mental workload," remember that mental workload includes a time factor, mental effort factor, and a stress factor. Please consider these three factors when making a rating.

Scenario: You are the #2 aircraft in a 2-ship Cell/MITO leaving Mildenhall. You will be carrying support cargo and a crew chief. Your mission is to refuel F-4s over the Baltic Sea (assume no radar returns) in confined airspace. There is one refueling track, and a point parallel rendezvous will be used. The F-4s arrive late. After refueling, you head toward Fairford, your intended recovery base. Due to weather throughout the region, you are directed to recover to Zaragosa. After planning the divert, the lead navigator's equipment goes out and the #2 navigator must take on the lead navigation responsibilities. The communication level throughout this mission is EMCON-2.

WORKLOAD RATING SHEET

MISSION EVENT

WORKLOAD RATING

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Mission planning

Squadron/base ops and combat crew duties

Poweroff/walkaround inspection

Power on inspection

Starting engines and before taxi

Taxi

Before takeoff

Takeoff

Cell join up

Cruise #1

Preparation for contact

Air refueling

Cruise #2

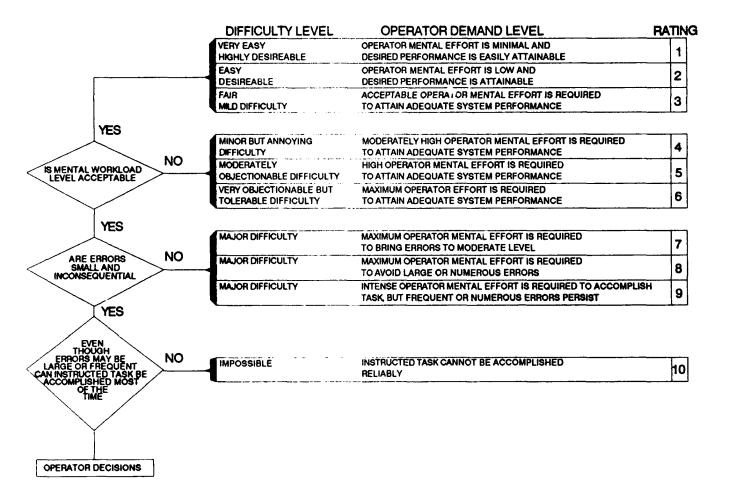
Plan divert

Descent

Approach and landing

After landing

WORKLOAD RATING SCALE



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APPENDIX D

THREE MAN CREW TASK LISTS

	Downloaded from http://www.everyspec.com
BOOMER FUNCTIONS	Plan Cargo Loading Check For hazardous materials Determine Weights of Cargo Unit Dimensions Creck For hazardous materials Determine CG Location of Large cargo loads Compute Contact Area Pressures Determine Shoring Requirements Compute Forms 83, 33A, and 84 Determine Shoring Paquirements Determine Shoring area dear Check Tail Support Strut Installed Check Ground Wire installed Check Ground Wire installed Check Ground Wire installed Check Ground Wire installed Check Shoring Check Shoring Check Shoring Check Shoring Check Manifest and Waybills Check Manifest and Waybills Check Manifest and Maybills Check Manifest and Maybills Check Manifest and Maybills Check Manifest and Waybills Check Cargo Door Sil protected Stow Seats Pation Shoring Check Manifest and Waybills Check Manifest and Waybills Check Manifest and Waybills Check Cargo Door Sil protected Stow Seats Pation Shoring Check Manifest and Waybills Check Cargo Door Sil protected Stow Seats Pation Shoring Check Cargo Door Sil protec
COPILOT FUNCTIONS	Complete offload plan Get Form 365 data from Boom Pint out Form 200 Discuss mission requirements with wing intelligence intelligence and communication officers Attend prelateoff brief Input coordinates, airsspeeds, attitudes, control times, gross weight, tuel load, receiver type and offload amounts Place special use airspace data on charts Place special use of point Annotate highest terrain and obstructions on chart Annotate highest errain and obstructions on chart Annotate kighest errain and obstructions on chart Annotate kighest errain and obstructions on chart Annotate ADIZ entry point (if applicable)

PILOT FUNCTIONS

Complete mission paper work Discuss mission requirements with wing intelligence and communications officers

Complete scheduling blocks of Mission Accomplished Report (MAR) Review and study Flight Information Publication (FLIP) and general planning requirements Conduct crew flight briefing Check Form 200 and chart for accuracy Attend pretakeoff brief Complete Navigator briefing guide Complete correlation sheet

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Check weather

certificate and passenger manifest if applicable Pick-up helmet and oxygen mask from Itle support File mission paper work (Flight plan, Weight and Check Alroraft and mission status and alroraft Brief planned flight demonstration maneuvers Brief deployment requirements if applicable Complete local mission planning/briefing Attand crew briefing and CELL briefing Review Flight Crew Information File Brief touch and go procedures Conduct MITO/Cell briefing Brief Cell Procedures Brief MITO procedures Attend weather briefing Compute take-off data Complete flight plan Balance sheet, etc) parking spot Check Notame

Synchronize crewmembers' watches

Check receiver status

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COPILOT FUNCTIONS

Read Flight Crew Information File Pick up Publications, Quick dons, heimet, and mask from It's support Attend weather Brief Update Takeoff data as required Check Mode 4 caution light out Attend crew briefing and CELL briefing Check flight schedule for changes Check weather for impact on mission timing Check for departing and landing airfield pages Pick-up classified information Pick-up KY-58

BOOMER FUNCTIONS

Check Flight Crew Information file Coordinate Life Support equipment Attend Weather Briefing Pick up Flight Meals Pick up Flight Meals Attend crew briefing and CELL briefing Pick-up heimet and oxygen mask from life support Check KIK-18

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POWER OFF/WALKAROUND INSPECTION

PILOT FUNCTIONS

Inspect and clase nose compariment Check for presence of Forwign Oxject Demage (FOO) Check nose wheel well Enture nose geer pin removed Enture actuation are connected to nose geer doors Check right system Hydraulic accumulator pressure Ensure pine, downlocks and around when remor Check manual definiting value cover closed Bet menual ruhusting valve handle b; FLIGHT Check single point ref-allhy receptacie Check single point retueling panel Enteure landing geer door downlocks are rem Enteure landing geer door downlocks are rem the California Coulting and the Form Check ist wheel well Check ist system hydraulic accumulator pr Check reserve brails accumulator pressure Arrounce start angines time Provide additional Instructions, as required Set Electronic Cabinet Coulting switch to (Set Search Radia Indicators Set Interphone panel switches as desired Check wheel welfgeer general condition Ensure geer door downlocks removed Review AF Form 781 data, as required Complete inholon and vestition briefing Ensure landing gaar pins are removed Check right wing Creat, general condition of engines Creat, the bottle discharge indicators Creat, the bottle pressure Jages Creat, at hausings and sate assembly Creat, general condition of husinguing Creat, general condition of hoom Ensure landing gear safety pins remov volty grew of type of husi on board general condition of engines inspect alrowsh main fueelage area why APU with generator include amp general cond istify crew of engine start time State which APU has generator Perform weikung inspection Check nose gear condition Check general condition of Check fire bottle discharge Check top surface of whose Enture phot covers are rer Check Park When we Ensure APU doors closed Check fire bottle preservi Brief AF Form 701 date Read AF Form 721 Check life wing Check at cally

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COLLOT FUNCTIONS American (Constraints) Ameri

COPILOT FUNCTIONS (Cent.)

Take our Navigation Publications Perform FT Control Panel p. Aget Rel Moote 4 Coole Switch to Are B (an required Set Moote 4 Coole Switch for Are B (an required Set Moote 4 Coole Switch for Areas Set Moote 4 Coole Switch for NOPANUL or AUX Set Moote 3 Switch for B and Set Moote 3 Switch for B and Set Moote 3 Switch for B and Set Coole Power Switch in NOPANUL or AUX Set Search Flash Control Panel B at FTC Switch OFF Set Locid Switch OFF Set Switch OFF Set Shatch OFF S

BOOMER FUNCTIONS

Attend Crew Assentby San APU Credit Crew Equipment Stowed Credit Crew Equipment Stowed Credit breaken Remove And stow None Gaar Ground Downlock and release Credit Inserptions Provide Internation Credit Inserptions Paral setting Credit Inserptions Perform Carpo System check Perform Carpo Compatiment AC meater earth In MANUAL Credit Presenger Station Crygen Perform Perform Carpo Compatiment AC meater earth In MANUAL Credit Presenger Station Crygen Perfor Credit Reservery Inserptions Paral Credit Reservery Inserptions Paral Credit Reserver Crygen System Cuently Carpo Credit An Ordite Doors and Defined Silos Credit Record

BOOMER FUNCTIONS (CONL)

NO 10 Mile land Check portable oxygen bottles Check chemisness, general condition, and stored instal boom operator's compartment entry panel Check for pressure approximating 300 PSI Check altitude selector knob in NORMAL position Close cargo door and emergency est hatches Check external power switch thp Direct personnel to seeks and varify manifes Set ART boom operator's control panel master as Check boom Auly retracted Perform algoral coll text Set underbody and underwing lights CN Check registring door open Close signiting door open Close signiting door beer Service portable oxygen bothe 7 roquired Replace portable oxygen bothe Conduct ground safety locits check Inform pilot of actual takeoft weight and CG Ensure cargo and loose equipment secure Secure beggege and loose equipment Ser rudonnetor trim control et ZERO Perform miscelleneous prefight procedures Verty DD Form 365-4 date Check passenger information cards Remove floor obstructions Position persenger loading stand Perform APU accumulator check Perform passenger loading Check seats and safety belts Set telescope at disconnect switch Check circuit breakers Position life support equipm Check Interphone panel Check unygen regulator Check (80 oxygen regulator Check emargency overnide se Check boom limit seekches Check cargo manilest normal position Open cargo door Brief persongers Check Indicator lights

POWER ON INSPECTION

PLOT FUNCTIONS

Press to test all indicator lights not liluminated Set Manitold Valves Swhich to FLIGHT Serup HAVE OLICK radios Desemine HO I or II availability Load Word of Day (WOD) or load Muitpie WODs (MWOD) switch NOSE DOWN than NOSE UP an ini yeun audiny puny anton to REENCE BNUE Se ini yeun Audiny puny anton to AUTO Check antoini gate Check Test panel Industra BLNK Check Test panel Industra BLNK IN NORMAL Bet right system multiny pump surph to AUTO Check nudde preseurs Check nudder tim Check Eigins Fallurs Azeit Byrtinn (FSAB) See EFAB emitch to TEST, then ON Grave and panel indication are BLANK Check hydroulds preserve in normal range Check hydrould grader match to KOPALAL Stat provide that and and the provide that and and Stat provide that and Stat provide that and Stat provide that and Stat induced spatier emistry to CUTOFF Bet glab trim central antich to NOFMAL much to CUTOUT Check engage system Check year damper system Set SYD authch to TEST, then ON Check DiSENG light comes on and go Push rudder full RIGHT, then rules Bet rudder power emitch to CN Check COMM 2 UHF (ground radio Sec. and other succession to FMC Sec. and other succession to AFT Check rudder permit autich OFF Check bellery cherging currer Check bellery cherging lavel Push weder heli LEFT to symposic asymposic Check COMM 1 UHF Check ILB receivers Check VOR Bet stab Yin carbo More yets conter Check electric time Check manual time Ansate state time of More yets card Credit almost with Credit structure Credit time indice Check IF 1200 Check TACM Total and Bet speed by Ream intoer Check alwone Check Canada Check radius Check Refer Ì Ĩ

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But class: But classes and the TEST But classes and classes and the NEST Check had quantity medings Check Remittion Cla Around (PRUA) mode Check flipp and Roome anophic lum lood LEFT then Rickif Roome phot londo MOSE UP, then MOSE DOWN Deyrame phots diverginge bullion are anophic engage switches ON, as required kolvess and builtin switch Set autoplict engage embrines ON, as required PILOT FUNCTIONS (CONT.) as valid/invelid text indicator, if applicable Set FD 106 Master Power Switches to ON Ensure FD 108 Power Of Lights are out after Check autoplict turn knob in deterri poeliton Ensure FD 108 Power Off Lights ON prior to act. Right controls for freedom of movems tertorm FSACAS alignment and insertion ioue Right director mode selector to gyro Check of date and gauges Check Ambudo Director Indicator (ADI) Check MS gyre Perform Interfor Inspection (Power On) im CELL had ready to start engine Test and check interior lights Compose altimator souting with field ele of and emergency proce seem, pedain, bein and hame COPILOT FUNCTIONS Jerterm INS System Prefight proces Neck interphone and oxygen syste Bet FD Master Power Subches ON ect APU accumulator preserves Check operation of altimeters Check Right director heading mod Check heltuments sure fuel panel set for take of Set Mester Refuel Swhich to ON mod grimew extend beauty ness test emilicit, if applicable nterm ground radio check Perform ARR Panel Checks Certime of Day (TOD) Pactos WODAWOD pitchg autohes ON Ionities NG Interface text placing emitches ON Field and the Party taux pumps to OFF and meaning Branning hours were and the form the first part and Check Antoble Antoques (fire)

Check ant-et/d Check hall quantity mading Check hydrautic ayeam preserve Check hydrautic ayeam preserve Check hydrautic ayeam quantity Creack purry sypty guards CLOSED Pres to her al guage Record actual readings on Form 14, 366-4 and flight tog Perform hydrautic preserve checks Perform bleed air hand detection test smitch Check ail LEAK DET, OVER PRESS and OVER TEMP Check WT and Balance Information ICOU for F3A9 COPILOT FUNCTIONS (CONT.) Enurs byth go out date releasing set earth) Close generator branker earthcha Set romaning satisfaes ON as required Set VOR to ON Set UFF radio ON Set UFF radio ON Set HF radio ON Set HF radio ON Set HE radio ON Set Ad power satisfaes ON Set Instrument governe groo Enurs required publications are available Ensure pressure gauges in normal range Check Revene Refer Pumps Switch OFF Check Signey Deer Switches CLOBED Check Signal Anyllier Power Check L.R. systems and plicts reserve Check system status display Stew (COU display to Bus status 2/3 Check bus status display Check menual toggie latich ewitch in rei Set menter reisef ewitch to OFF Ensure system pressure awhiches ON Perform FSAS preflight procedures Ensure FSAS POWER switch ON Check fivel dump actuator Check boom retracted Set fuel dump switch to FUEL DUMP Ensure presence of allocal flight me Perform bleed air teed detection teel Verity angine type Verity tradees and anti-atld type Check angine bland waters OPEN Ensure perachute prefight comple Accomplish IFMP interface tee Turn on autophot year darrper aw Check fuel status indications Press malfunction data kay Verity signame type Check Interphone and oxygen Check geer weming light extit ete control and trim chu Check wheel with clear Check ICOU status day Press FUEL key Press DATA key SWACH IN NOTHINL Obtain crew report Set interfor lights NO HIGH į

COPILOT FUNCTIONS (CONT.)

Bet fuel dump embch to OFF

Set IFF Manner Switch to NORMAL Test Modes 1, 2, 3/A and C Kine File Laver through 30 degree to 20 degree detert Set fap laver to 0 degree detert Set fab lavet to 0 detered detert Set fab eventy eviden to FLASH Set fab eventy eviden to FLASH Set fab lovet purp evidents to CN Set fag ed had lovet purp evidents to CN Set fag ed had lovet purp evidents to CN Set fart to engine manifold value evident to CPEN Report ACOS fights CN1 # applicable Periorn NCS Stytes CN1 # applicable Periorn NCS Stytes CN1 # applicable Periorn NCS Stytes CN1 # applicable Periorn NCS Status Perel Set MSU-NS Mode selecters to AUGN Turn en FSA/CAS power switch Set FF Mixer Switch as desired Check Mode 4 light out Set Maxim Swhich to STANDBY (F) Set Made 1, 2, 3/A, and C emiches as neg Set Mode 1, 2, and 3/A Codes as required Reade report from each oreumanitier Check INB/ONS COU Text Bretich If appl Set IFF Antenna Switch to BOTH Set RAD - TESTANON Switch to OUT Check File lever in 50 degree desert Accomplish INS insuface Test If desir Tum APN-68 Function Sentich to STBN Bet Fuel During Sentich to FUEL DURA Set RAD - TESTANON Swhich (as de Bet Author Light Switch (as required) Bet Flap Lever to 40 degree detert Depress Coplicits autoplics Disary nent INS preent position bet Fuel Dump Swhich to OFF Set Stabilizer Trim as required Ensure wheel well doors clear Check Fuel During Actuation neert Waypoint Data

BOOMER FUNCTIONS

Continue with power of that II required Load KY-48 quest Authentication and Launch Respond With correct Authentic Encode Mode 4

Check Tank Level Control Switches CLOSED

Check Scavenge Switch OFF

L

Check Main ARRVIER Valve Switch CLOSED

STARTING ENGINES AND BEFORE TAXI

PILOT FUNCTIONS

Furn on starter selector switch (last engine only) Ensure external power and chocks are removed Set throttle to START at 25 percent N2 RPM * Set throttle to IDLE at 50 percent N2 RPM * Check overhead panel caution lights Set battery switch to EMERGENCY furn on engine anti-loe as required Set hydraulic pressure switches Set battery switch to NORMAL Set starter switch to START * Check INS NAV INOP lights Fasten belts and harnesses Monitor engine instruments Furn oxygen to 100 percent Shutdown APU as required Ensure taxi report complete Set starter switch to OFF . Check hydraulic pressure Start APU If required Set parking brakes Reset attimeters Start 1 engine * Don gloves

Repeated for each engine

COPILOT FUNCTIONS

Set Beacon and Navigation Light Switches to BOTH ON and STEADY Set Generator Circuit Breaker Switches to CLOSE Set Copilot's Instrument Power Switch to START Perform IFF Control Panel preflight procedures Set Air Conditioning Master Switch as required Set Radar/Rendezvous Beacon as required Set Throttle to Cross Start RPM If required Check Overhead Panel Caution Lights out Set Pitot and Q-inlet Heat Switches to ON Perform Warning and Indicator Light Test Check For at least One Generator on line Perform Aircraft Electrical Power check Set External Power Switch to CLOSE Set IFF Master Switch to STANDBY Confirm INS NAV INOP as required Set Air Conditioning Master switch Perform Taxi Report Procedures Set Engine Anti-ice as required Ensure taxi clearance received Set INS System to NAV Mode Fasten seat belts and harness Set attimeter to STANDBY um search radar to STBY Check receiver status Set oxygen to 100%

BOOMER FUNCTIONS

Perform Before Starting Engines procedures Start APU (if required) Remove Entrance Ladder Close And latch Entry Door Stow Entrance Ladder Check Emergency Exit Hatches Tum On Boom Operator's compartment Window Heat Switch Check Air Refueling Line Valve OPEN Cycle APU Generator Switch Report over interphone "ready to taxi" Don gloves Turn oxygen system ON

PILOT EUNCTIONS	COPILOT FUNCTIONS	BOOMER FUNCTIONS
Check hydraulic pressure, brakes and steering Check flight controls Check flight instruments Check speed brakes to ZERO Set flags Advance power momentarily to begin taxi	Check hydraulic pressure, brakes and steering Obtain taxi clearance Check/set Anti-loe Equipment as required Set Anti-Icing ON Set Anti-Icing OFF unless needed for takeoff Set Flaps as required Check Owerhard Panel	Notify Passengers and Extra crewmembers prepare for takeoff Check Cargo Door Closed and Locked Complete TAXI Report Monitor Electrical Control Panel Report ready for takeoff
Position airplane as required Check powered rudder system Check system and rudder power hydraulic pressure gauges Push rudder pedal full LEFT Push rudder pedal full LEFT and hold Push rudder pedal full LEFT and hold Push rudder pedal full LEFT and hold Sat EFAS switch to ON Sat EFAS switch to ON Sat EFAS switch to ON Fault reader to ON Fault reader to ON Fault reader to ON Foreck rab trim Sat alleron trim at ZERO Check alleron trim at ZERO Check alleron trim at ZERO Check stab trim Sat alleron trim at ZERO Check stab trim Sat alleron trim at ZERO Check attab trim Sat and recheck NAV alds Sat APU star-stop switches to STOP if required Obtain last chance inspection Check area to STBY Sat APU star-stop switches to STOP if required Obtain last chance inspection report Check APU doore open and lights turmed out Check annunciators Check annunciators	Ensure Bus The, Generator breaker & generator control lights extinguished Check Main T-R Units for normal operation Check Air Conditioning and AC ammeters for balanced load Check Air Conditioning and AC ammeters for balanced load Check Pressurization Panel for proper switch settings Check Circuit Open, IDG Failure and DISC system lights out Discuss Take-Off Data Set Stabilizer Trim for Takeoff Otalin Marc I at a frequired Otalin ATC clearance Set NAV aids for departure Set NAV aids for departure Set FLT Director Mode & Climb Selector switches to RGA, max mode Check Door Warning/OVHD Panel caution light Close window and set Window Heat Switch as required Accomplish Crew Take-off Report Set Function Switch to SEARCH Adjust Intensity control Set Stabilization Switch to ON Set Stabilization Switch to ON Fine-tune Radar Check beacon capability Ensure Departure Clearance is received Set IFF squawk	

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Accomplish before takeoff checklist Ensure fuel panel set for take off Ensure landing lights on Rotate beacons as appropriate Move starter ewitches to ignition Turm on radar

COPILOT FUNCTIONS

Set lights as required Set Radar/Rendezvous Beacon (as required) Set IFF (as required) Calt for pilot to move starter switches to KONITION

BOOMER FUNCTIONS

Check Passenger and extra Crewmember status Check Fuel distribution Check Circuit breakers Set Oxygen Panel ON. 100% Fasten And lock Safety Belts and Harness Complete Takeoff Report

Follow command bars as required until reaching 2000 Activate Rotation Go Around (RGA) within 10 knots of Maintain left hand on nose wheel steering as required Maintain tuli forwand until ground minimum control axi into position and align aircraft with centerline Pult back on yoke until takeoff attitude is reached Acknowledge S1 Interphone call as required Maintain directional control and wings level ook for lead aircraft visually or on radar Check hydraulic pressure in low range Monitor lead aircraft for MITO timing Maintain spacing/timing as required Release parking brake as directed Direct copilot to set take-off thrust Maintain full pressure on yoke Check airspeed at 90 knots Advance power as required leet above ground Push forward on yoke rotation speed Assure flight idle Call for flaps up Call for gear up is reached

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COPILOT FUNCTIONS

Adjust Radar Intensity Hold yoke full forward Check for FLT Idle on all four engines Announce FLT Idle on all four engines Set Take-Off thrust Call 90 knots Call 90 knots Call pickle Call pickle Call climb speed Raise Gear Move flaps up Montor lead alrcraft for MITO timing Perform Initial Climbout procedures Advance power as required

BOOMER FUNCTIONS

Monitor Takeoff (Overhead Control Panel) Record Takeoff Time Monitor aircraft instruments

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Set takeoff thrust

CELL JOIN UP

PILOT FUNCTIONS

Call for climb power and after takeoff climb check Set altimeter to 29.92 and radio altimeter MDA Perform after takeoff checklist procedures Perform cell communications as required Perform joinup procedures as required Ensure correct headings are flown Perform climb altitude procedures Ensure correct altitudes are flown Maintain cell position as required ferminate formation if necessary Set starter switches as required Ensure oxygen on 100 percent Monitor Interphone and radios Call for engine anti-ice on/off Change position as required Maintain formation position Ensure RGA switches off Set level thight applyinge Ensure landing gear up Ensure fuel panel is set index to 2000 feet Engage autopilot Pull power back Ensure flaps up **Frim aircraft** TO TAN

COPILOT FUNCTIONS

Direct crew to set 29.92 Attimeter setting passing FL180 Turn off landing light at 10,000 Ft. or sooner in weather Use All available equipment to effect Join Up Turn off Starter Switches (as required) Inform Pliot of other Aircraft's position Turn on Engine Anti-Ice (as required) Direct Pilot Into Enroute Formation Make 2,000' prior to Level Off Call Make 1,000' prior to Level Off Call Ensure Level Off in Altitude Block Set radio altimeters to 2000 Feet **Monitor Departure Being Flown Fum of RGA Power Switches** Acquire lead aircraft on radar Check Cabin Pressurization Set Fuel Panel as required Make departure call

BOOMER FUNCTIONS

Monttor HF passing out of home station UHF range Set Boom Marker Lights (as required) Set Boom Nozzle Light (as required) Check IFF Mode 4 caution light off during Alpha monitor periods Turn On Nacelle Illumination Check Cargo Compartment **Furn Off Wheel Well Lights**

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PLOT FUNCTIONS	Maintain cell poetion Perform turbine engine monitoring system (TEMS) test Monitor UHF Command Post/Cell frequency Monitor UHF Air Traffic Control frequencies Monitor HF giant talk during alpha monitor period (as applicable)	Update IFF Mode 3A as required Monitor APN 59 Radar Monitor Navigation Radio aids Keep Aircraft within 10 NM of track Direct Aircraft to avoid thunderstorms by 10 NM below FL230 Direct Aircraft to avoid thunderstorms by 20 NM at or above 51 230	No et al Contractor
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CRUISE #1

COPILOT FUNCTIONS

Xirect Alrcraft to avoid thunderstorms by 20 NM at or above FL230 Use All navigation aids to monitor position within 20 NM of track Yrect Aircraft to avoid thunderstorms by 10 NM below FL230 Update ETAs to Pilot as necessary for HF position report set equipment as required for specific navigation leg Aonitor UHF Command Post/Cell frequency Aonitor UHF Air Traffic Control frequencies Aonitor HF giant talk during alpha monitor pdate and monitor INS as required Sive control of HF Radio to BOOM Aonitor equipment for mailunction Ipdate IFF Mode 3A as required Complete Log work on Form 200 Request And record UHF Traffic **Aonttor Navigation Radio aids Monitor engine instruments** period (as applicable) ccomplish HF Contact check electical system **Jonitor APN 59 Radar** rack Aircraft Position complete Comm Log ake coast out fixes **Aonttor fuel system** let IFF as required **Monitor O2 system Becord HF** Traffic check hydraulics

BOOMER FUNCTIONS

Provide Crew Support (as required) Monitor UHF Command Post/Celt frequency Monitor UHF Air Traffic Control frequencies Monitor HF giant talk during alpha monitor period (as required) Update IFF Mode 3A as required

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PREPARATION FOR CONTACT

PILOT FUNCTIONS

Set autopilot HDG SELVOR LOC switches to OFF Establish Radio Contact With Receiver as required Accomplish Automatic Direction Finder (ADF) Set Equipment As Required For Rendezvous Accomplish preparation for contact checklist Establish air refueling echelon formation Initiate Overrun Procedures (if applicable) Obtain Receivers information as required Check autopilot stabilizer trim follow up Disconnect autopilot elevator/pitch axis Reengage autopilot elevator/pitch axis Ensure proper air refueling frequency Place Beacon to STBY as required Set Assigned Radio frequencies Confirm oxygen setting correct Perform station keeping duties Check oxygen as required Confirm altimeter setting Set Attimeter as required **Monitor echelon position** nikiete 1/2 mile checklist Accuate stabilizer trim Set Air-to-Air TACAN check if applicable Check stabilizer trim Perform Precontact Reed altimeter Check altimeter **Wonkor Altitude** Monitor Radios

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Relay Tanker information as required

COPILOT FUNCTIONS

Obtain permission to delay at the ARCP until revised ARCI Instruct pilot to turn aat turn range and give a time to turn Declare MARSA (Military Assumes Responsibility for Request and Air Ratualing request from receiver Determine number of pumps to use in off-load Set Max Continuous thrust setting on N1 Bug Set Equipment As Required For Rendezvous Determine which tanks to off-load fuel from Accomplish positive beacon ID if applicable Compute Max Continuous Thrust setting nitiate Overrun Procedures if applicable Post Max Continuous Thrust setting Place Beacon to STBY as required Request permission to conduct AR Frack where receivers are located Perform Orbit Holding Procedures Set Assigned Radio frequencies Compute turn range and off-set Compute turn range and off-set Adjust Track to make timing Adjust TAS to make timing Establish fuel for off-load Set Altimeter as required Ensure RZ Timing is met Compute Orbit Headings separation of aircraft Obtain block altitude Perform Precontact Monitor fuel drain Compute off-load Monitor Altitude Monitor Radios Establish offset Monitor fuel Start timing leut go.

BOOMER FUNCTIONS

Provide Visual commands to Receiver Required Inform Passengers and extra Crewmembers Perform Air Refueling Preparation Procedures Set Telescope-At-Disconnect as required Set Forward Oxygen Panel OFF, 100% Set Receiver Director Light Rheostats Ensure Extension and Elevation Limit Maintain Required communications with Set Ruddevator Trim Control to Zero Brief Receiver for Contact as Required Tum On A/R Floodlight as required Perform Boom Lowering Procedures Set Emergency Override Switch Set Sighting Door Lever OPEN Maintain proper boom alignment Set Refueling Oxygen Panel Set External Lights as required Monitor Command Radios Check Boom Controls switches active **Obtain Radio Contact** Check Signal Coll as required as required Extend Boom

PILOT FUNCTIONS	COPILOT FUNCTIONS	BOOMER FUNCTIONS
Monitor receiver/observer position Advance power as required Maintain cell position Perform General Air Refueling Monitor Cell Formation Tune Radar for optimum picture Keep Pilot advised of position Aller Aircraft as necessary to maintain course within 10 NMM of cleared course Monitor And update NAV systems Monitor And update NAV systems	Set attimeter to 29.92 or as briefed Set Radice as required Set Air to Air TACAN if required Check oxygen Set Lights as required Set Position Lights to STEADY and DIM Set Position Lights to STEADY and DIM Set Rendezvous Beacon Lights as required Complete Fuel quantity check Set No Smoking/Seat Beit lights ON as applicable Set Autopilot VOR/LOC and Heading Select Switches OFF Set TACAN as required	Perform Contact Procedure Monitor Boom Position Indicators Monitor Receiver position Perform Disconnect or Breakaway Procedures Recycle System for subsequent contacts
Monitor Interphone and Radios Monitor UHF Radio Monitor Interphone Monitor Altitude	Set Fuel Panel for AR Set Fuel Panel for AR Set Fuel Panel for AR Set Dome AR Purnp Switch to ON Set Beacon Lights to BRIGHT Perform General Air Retueling Perform General Air Retueling Record Arrout of fuel transferred Monthor Cell Formation (# Required) Tune Radar for optimum picture Keep Plict advised of position Monthor And update NAV systems Monthor Interphone Monthor Interphone Set APN-69 to OPERATE Monthor Attude	

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AIR REFUELING

Initiate post air refueling checklist Assure fuel panel reconfigured for cruise Assure radios reset Set altimeter to 29.92 and check oxygen 100% Resetablish cell position Martain cell position Monitor Radios

POST AIR REFUELING

COPILOT FUNCTIONS

Complete post ArR check Re-engage Autopilot as required Provide Post ArR Report to Receiver/Cell Set No Smoking/Seat Belt Lights as required Record Fuel quantity Establish Cruise Configuration Set Position and Rendezvous beacon lights as required Set Attimeter to 29.92 (as required) Turm off oxygen (as required) Set Radar/Rendezvous Beacon to OFF Montor Radios

BOOMER FUNCTIONS

Perform Post Air Refueling Set Ruddevator Trim Control to "O" Retract, Stow, and Latch Boorm Close Sighting Door with Sighting Door Lever Check Ruddevators locked Switch Set External Lights Set External Lights Set Refueling Station Oxygen Panel Inform Pilot BOOM STOWED Return to Forward Cabin Set Forward Station Oxygen Panel ON, 100% Open fuel tank circuit breakers as required

Engage autopilot Maintain formation poeition Change poeition as required Perform cell communications as required Terminate formation il necessary Assume Cell lead navigation responsibilities

CRUISE #2

COPILOT FUNCTIONS

Notify ATC ArR terminated Pass reciever's requested route of flight Make position reports when out of radar contact Obtain phone patch on HF radio to update weather Establish VHF contact prior to coast-in Assume Cell lead navigation responsibilities

BOOMER FUNCTIONS

Provide crew support (as required)

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Direct copilot to determine if there is enough fuel Direct copilot to determine range Obtain destination weather to reach destination

Direct crewmember to look up instrument flight rule supplement

Direct copiliot to obtain proper clearances Coordinate plan with #1 aincraft Obtain destination weather/monitor air route

traffic control center

PLAN DIVERT

COPILOT FUNCTIONS

Compute fuel required for divert Obtain ATC clearance Compute distance and time

BOOMER FUNCTIONS

Provide crew support as required

	PILOT FLINCTIONS	COPILOT FUNCTIONS	BOOMER FUNCTIONS
	Direct cell breakup Call for descent checklist Review approach procedures Direct Boom Operator to advise destination base of aircraft status Brief the approach Confirm N1 RPM index set Set specific attitude into radio altimeter Insure navigation aldes are set	Make entries in landing data card Accomplish descent checklist Review descent and approach procedures Set N1 RPM Index Set Radio Attimeters Set and select Nav Aids Set and select Nav Aids Set Anti-Icing Equipment as required Check Electric and Hydraulic Systems Set Cabin Pressure Controller at 500 ft above field pressure attfude	Calculate Landing Center of Gravity Stow Sextant Stool and Sextant Check Circuit Breakers Set Cargo Compartment Temperature Notify Passengers and Crewmembers Walkthrough to Boom Pod Perform Boom Latched Check Walkthrough to Forward Cabin Fasten and Lock Safety Belt and Shoulder Harness Authenticate mission change
	Set starter switches to gnittion Direct anti-los equipment use as required Check switches and pressure of left, right, reserve brake and powered rudder system Accuate brakes and check for gauge fluctuation Reduce power to initiate descent Ensure proper course, attitude and airspeed Set appropriate attimeter setting Confirm descent checklist complete	Set Autimeters Turn Landing Lights on Calculate landing distance Tune radar Monttor radar Configure radar Communicate with weather for weather avoidancce Call for descent checklist Navigate To IAF	Contact command post Set attimeters at navigation station
116	Review Penetration and Approach Review highest terrain Review special use airspace Monitor Aircrew Terminal Information Service (ATIS) Fasten Safety Belt and Shoulder Harness Ensure Approach Clearance received Perform Descent Attrude Procedures Make "2,000 Prior to Assigned Attrude" Call Make "1,000 Prior to Assigned Attrude" Call	Review Penetration and Approach Review highest terrain Review emergency airfields Review special use airspace Monitor weather reports Monitor Aircrew Terminal Information Service (ATIS) Fasten Safety Belt and Shoulder Harness Ensure Approach Clearance received Perform Descent Altitude Procedures Make "1,000' Prior to Assigned Attitude" Call Make "1,000' Prior to Assigned Attitude" Call	

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Ensure proper navigation aides selected and set Direct additional flape as required for landing Accomplish missed approach procedures Direct coplicit to lower flaps as required Confirm landing gear down and locked Aonitor landing roll out/ground speed Ensure speed brakes set to ZERO Direct copilot to lower landing gear Maintain aircraft directional control Ensure fuel panel set for landing Apply wheel brakes as required Ensure 4 engines in ground idle Call for before landing checklist Perform go around as required Ensure autopilot disengaged Set EFAS/SYD switches on Ensure flaps set for landing Check anti-ekid system axi clear of the rumay Raise speed brakes Monitor readios Scan for traffic

APPROACH AND LANDING

COPILOT FUNCTIONS

Ensure Missed Approach Procedures Are Accomplished Monitor Attitude, Airspeed, Sink Rate, Ground Speed, Advise pilot when engines decelerate to ground idle Set RGA Power & Speed Deviation Switches - ON Announce Approach for Decision Height or MDA Call missed approach point if necessary Check Rudder Pressure in hydraulic set Ensure Speed Brakes are set to zero Confirm A/C on center line for landing Monitor landing roll out/ground speed Ensure Attitude Restrictions are met Check Anti-Skid after gear lowered Check Rudder Hydraulic pressure Wind Sheer, and Atttude Review Approach Procedure Make Required Attrude calls Ensure flaps set as desired Monitor timing as required Set fuel panel for landing during landing rollout Set and Select Nav Alds Set Flaps for landing Monitor Approach Scan For Traffic Monitor Radios Call VDP

BOOMER FUNCTIONS

Monitor Electrical Control Panel Monitor Fuel Panel Monitor Radios Scan For Traffic Check Flap setting Check Flap setting Check Pilot Approach Speed Check Fuel Panel Advise Pilots of any hazards noted Record Time Monitor command post radio

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AFTER LANDING

PILOT FUNCTIONS

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