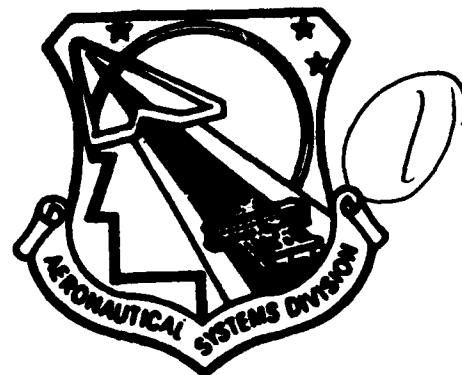


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**KC-135 CREW REDUCTION FEASIBILITY
DEMONSTRATION SIMULATION STUDY
VOLUME 1: FUNCTION ANALYSIS AND
FUNCTION REALLOCATION**

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**CREW STATION EVALUATION FACILITY
HUMAN FACTORS BRANCH
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WRIGHT-PATTERSON AFB, OHIO 45433-6503**

June 1991

Final Report for Period October 1990 - January 1991

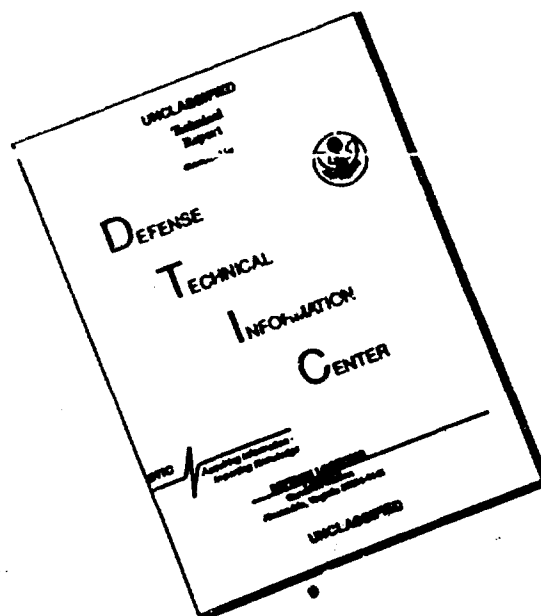
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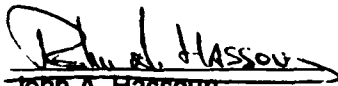
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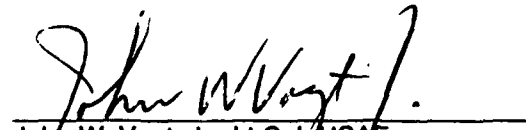
This technical report has been reviewed and is approved for publication.



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19. ABSTRACT (Continue on reverse if necessary and identify by block number) 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 implemented 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 navigator's 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 uninterrupted 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 timeline 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.

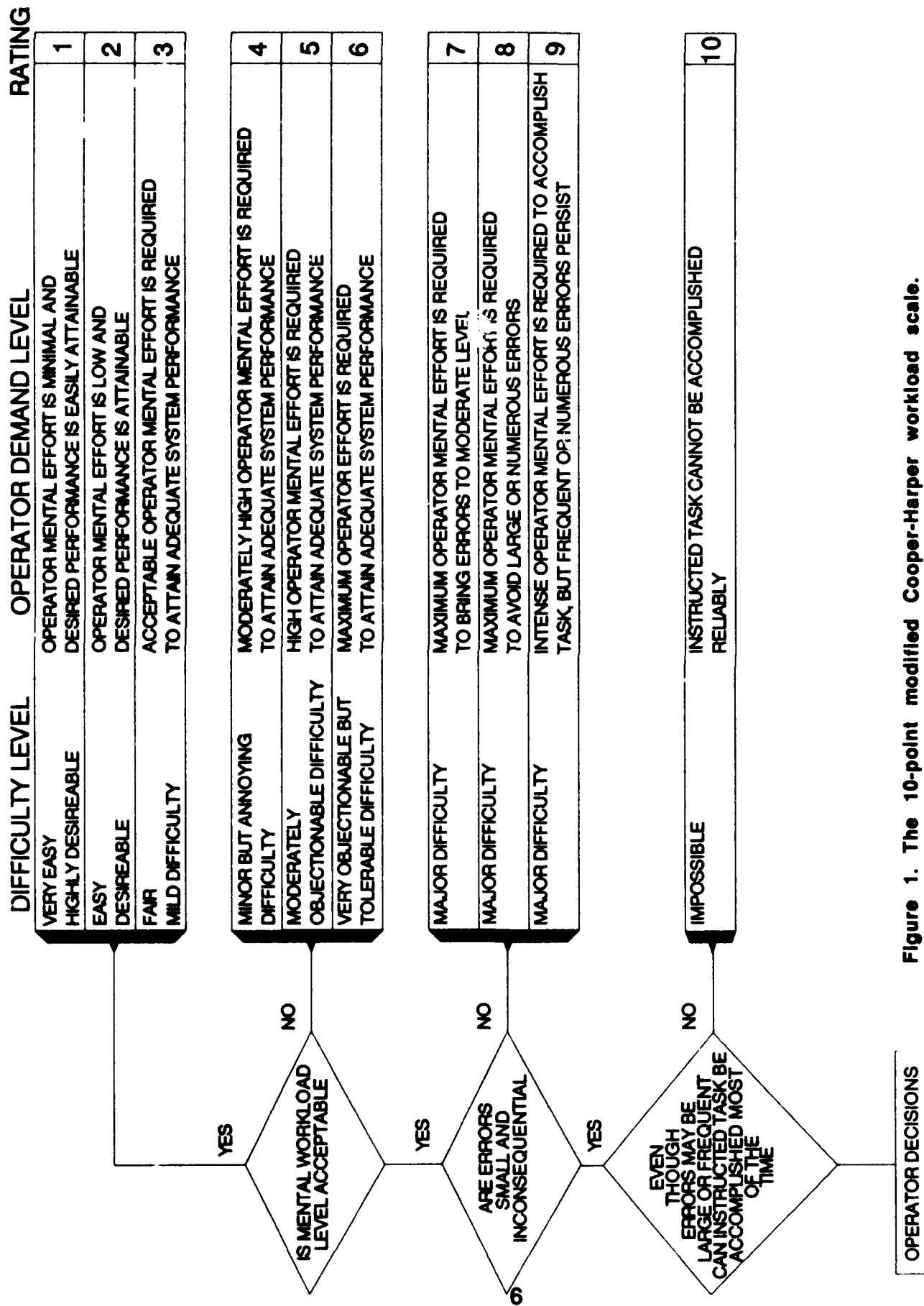


Figure 1. The 10-point modified Cooper-Harper workload scale.

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 shows 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 3-day 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,

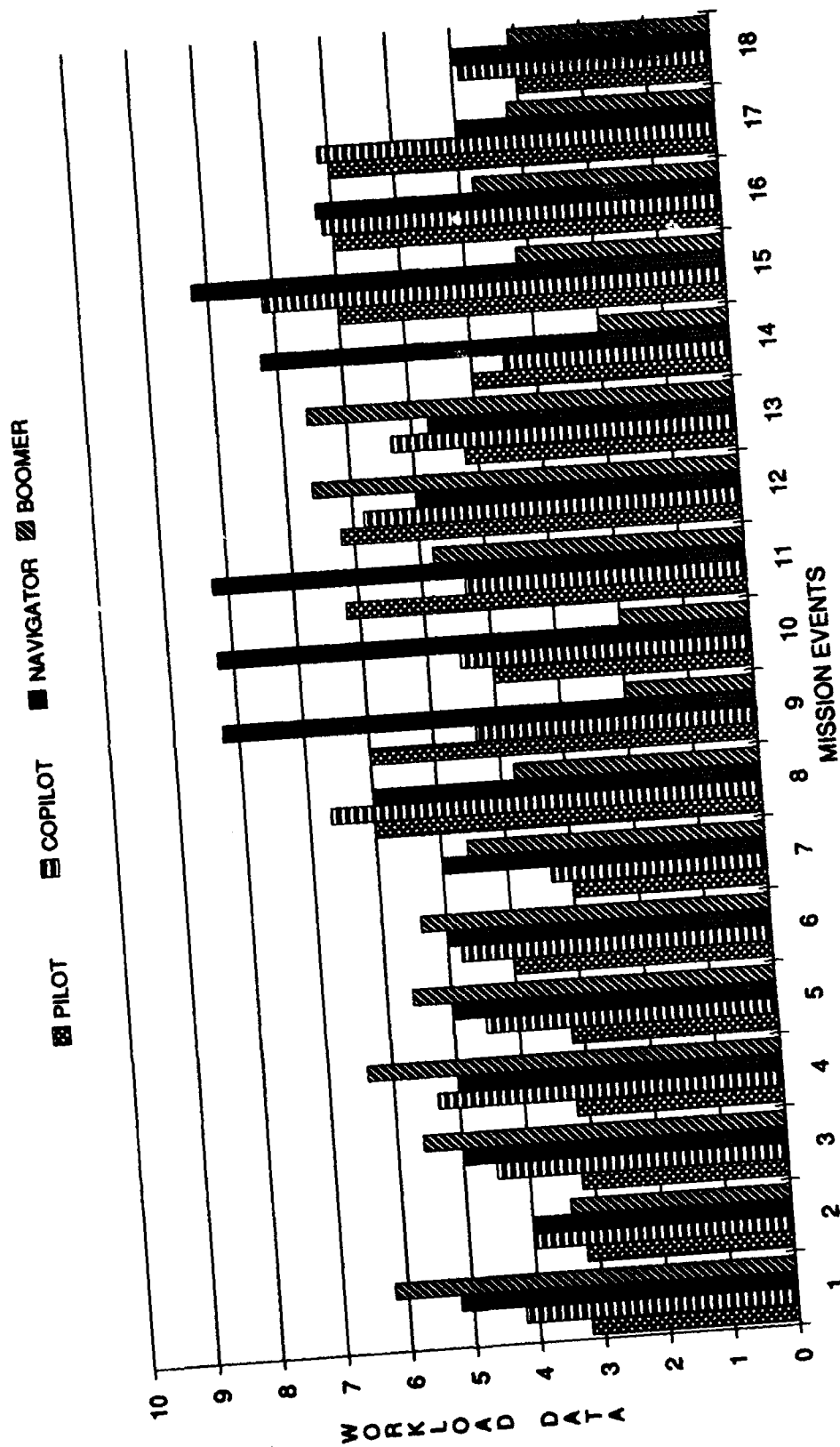


Figure 2. Crew workload as a function of mission event.

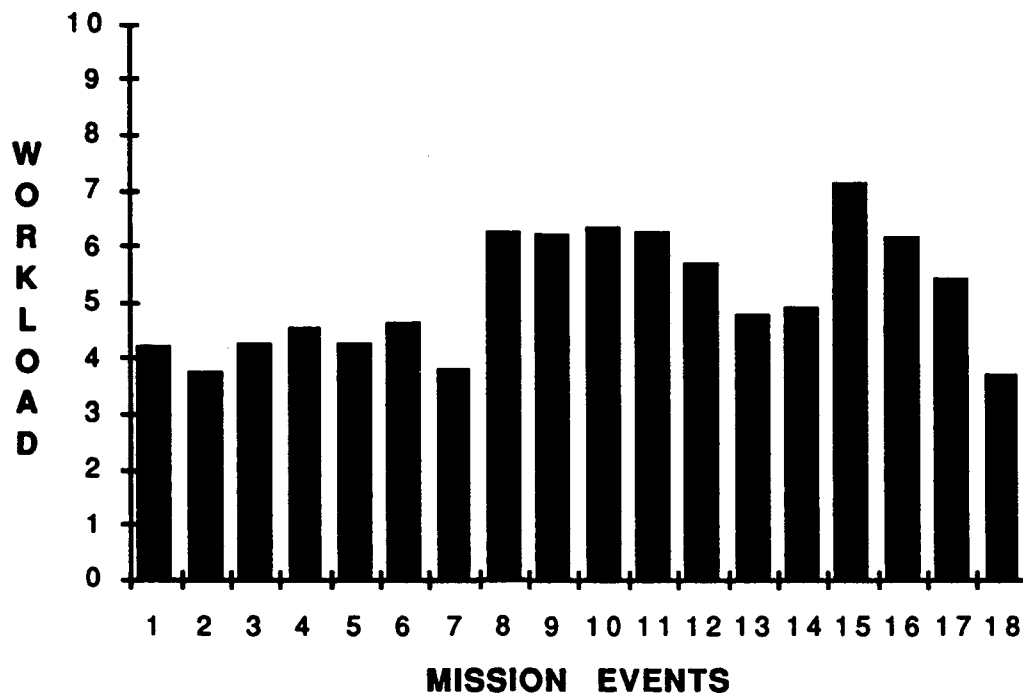
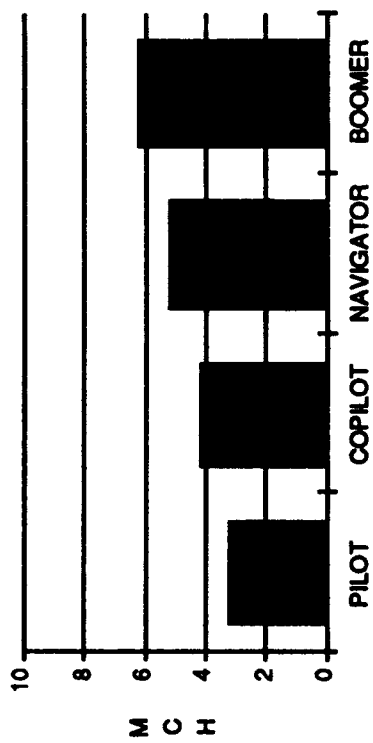


Figure 3. Mean crew workload as a function of mission event (exclude boom operator).

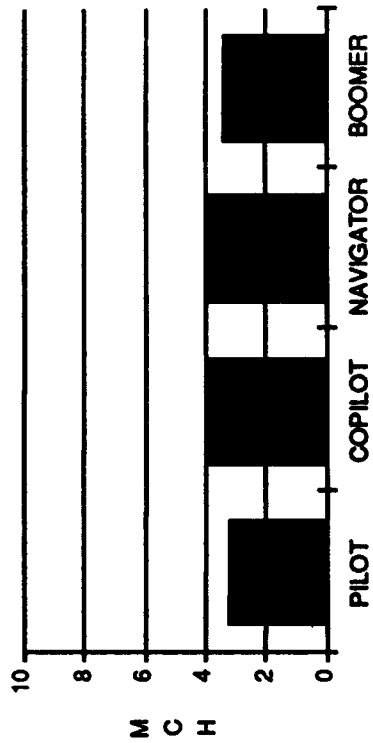
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MISSION PLANNING



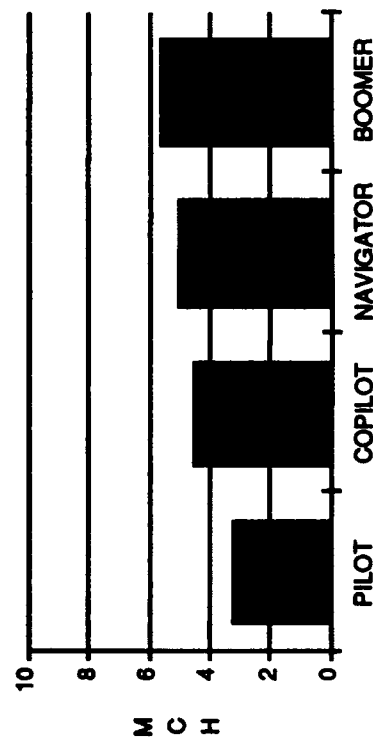
(5)

SQUADRON/BASE OPS



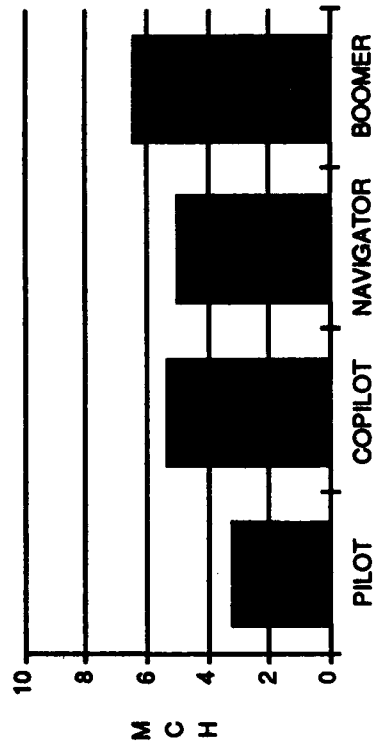
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POWER OFF INSPECTION



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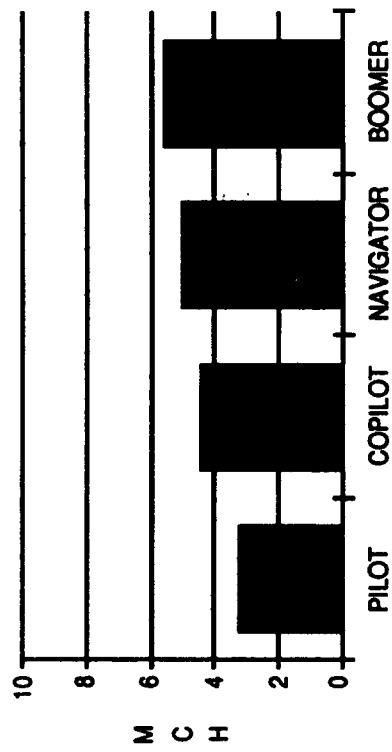
POWER ON INSPECTION



Figures 4-7. Crew workload for each mission event.

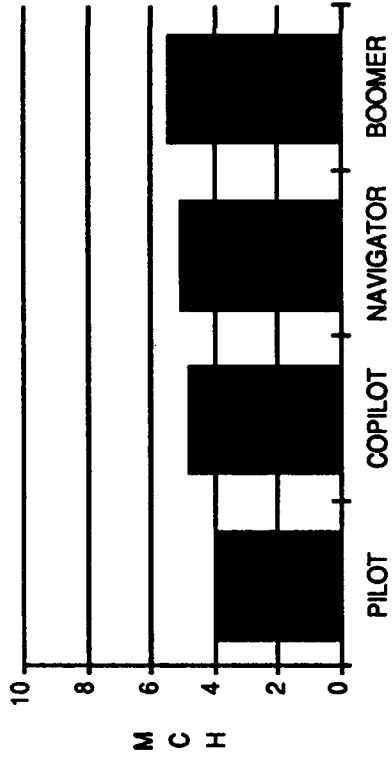
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START ENGINES & BEFORE TAX



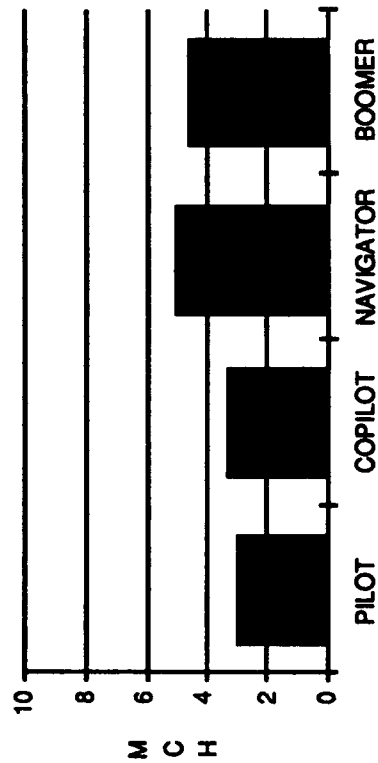
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TAXI



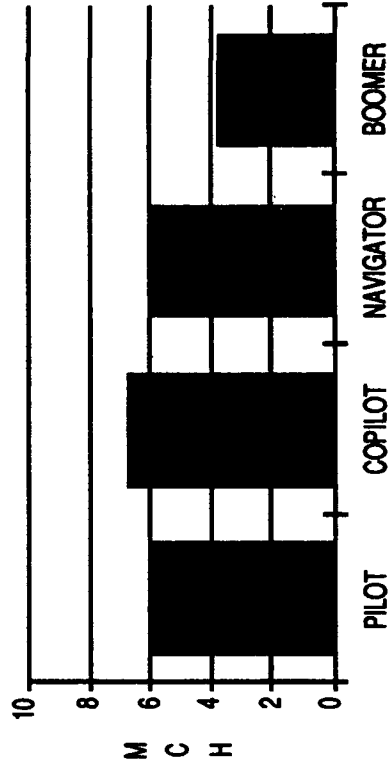
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BEFORE TAKEOFF



(11)

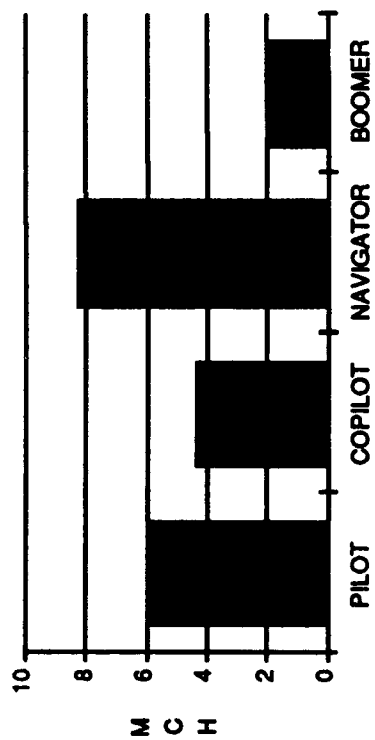
TAKEOFF



Figures 8-11. Crew workload for each mission event.

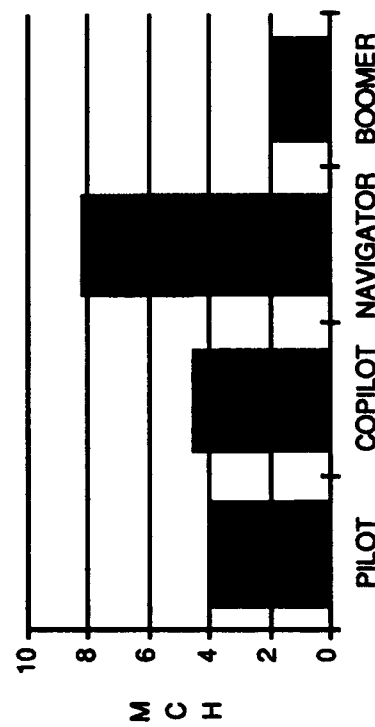
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CELL JOIN UP



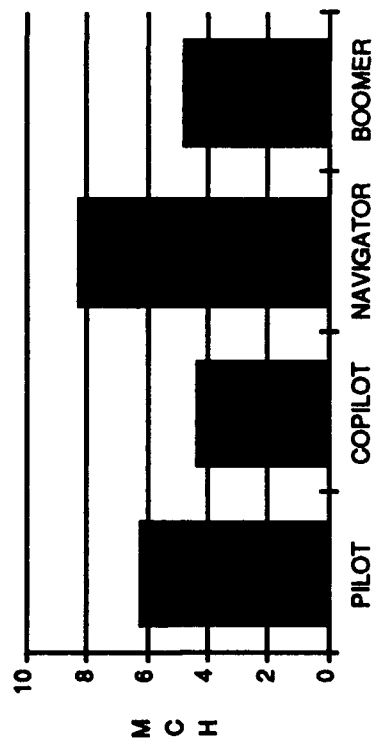
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CRUISE 1



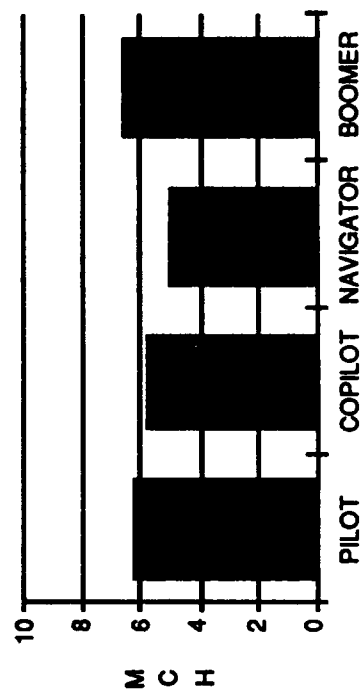
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PREPARE FOR CONTACT



(15)

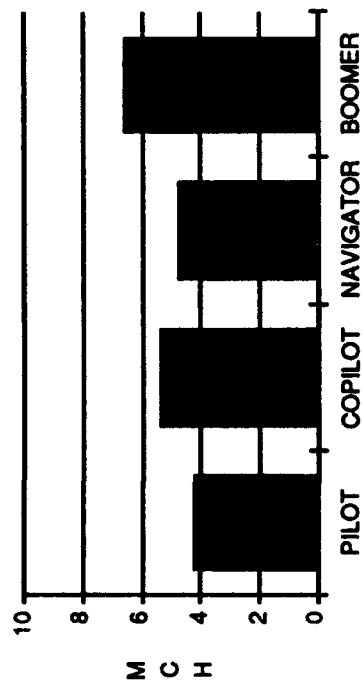
AIR REFUELING



Figures 12-15. Crew workload for each mission event.

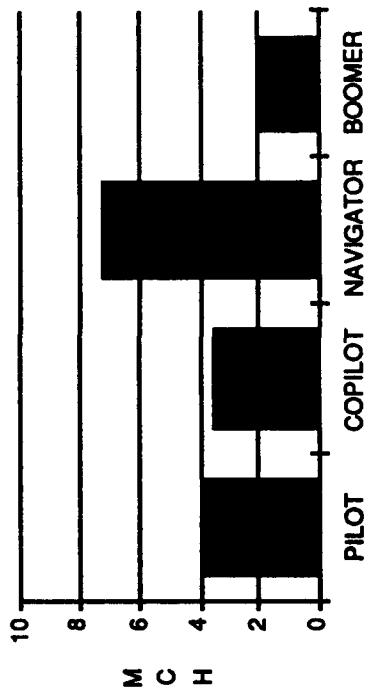
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POST AIR REFUELING



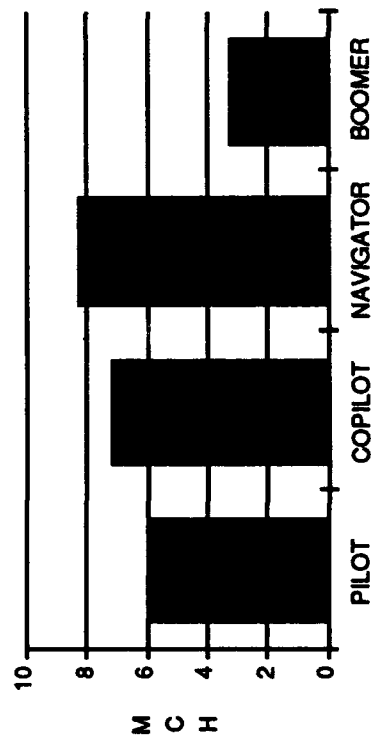
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CRUISE 2



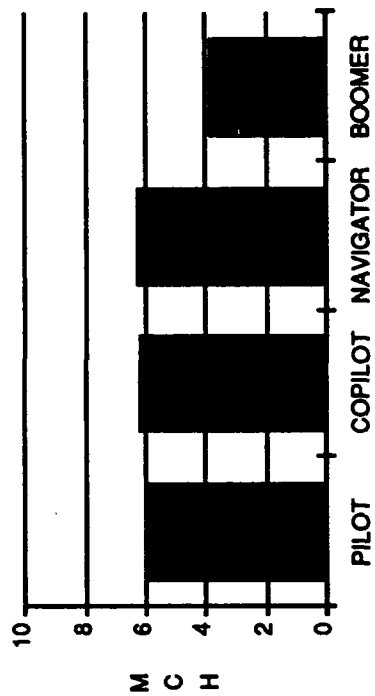
(18)

PLAN DIVERT



(19)

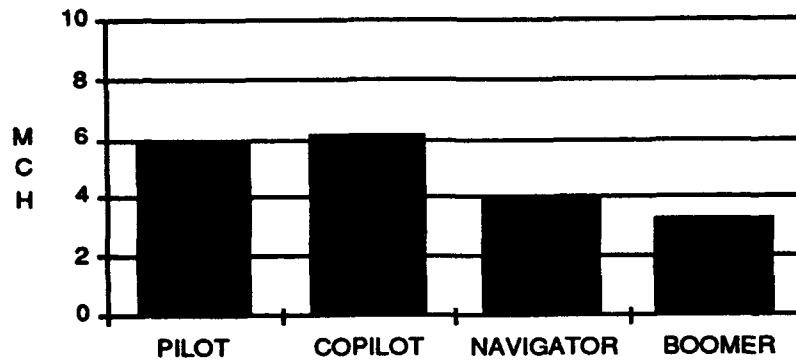
DESCENT



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

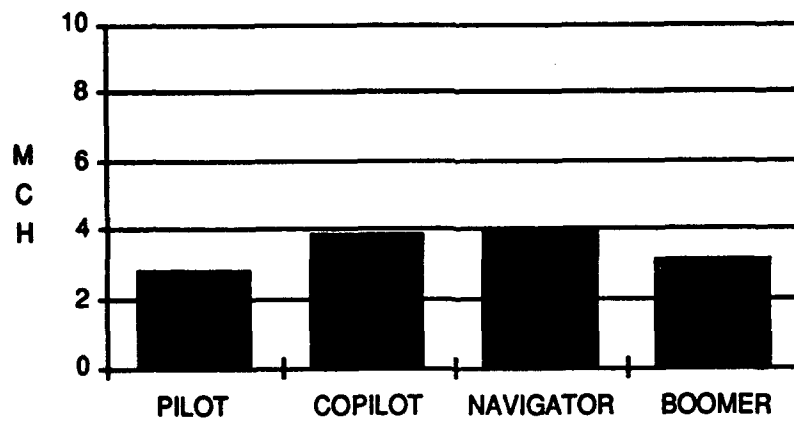
(20)

APPROACH AND LANDING



(21)

AFTER 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 Appendix D. All tasks strictly concerning the navigator (i.e., navigator strap-in, oxygen system tasks, etc.) were deleted 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 waypoint data
- Verify waypoints (pilot or copilot)

Functions Reallocated 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 Pilot:

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 Copilot:

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 alpha-numeric 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 Copilot:

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 left-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.

Functions 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. The results of the function reallocation and requirements of certain 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 pilot was defined as the pilot actually flying the aircraft at any given time. The copilot 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 transferred 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 and 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

MISSION PLANNING

PILOT FUNCTIONS

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

NAV FUNCTIONS

Prepare Navigation Charts
Select Correct charts
Develop route of flight to meet mission timing
Plot Celestial Navigation Leg on charts
Place Special Use Airspace data on charts
Place Air Refueling data on charts
Place Emergency Airfields on charts
Annotate Highest terrain and obstructions on chart
Annotate Level Off Point
Annotate ADIZ Entry Point (if applicable)
Complete Mission Paperwork (mission review worksheet, pre-comp sheet)
Complete Form 200
Complete navigator briefing guide
Complete Correlation Sheet
Complete Scheduling blocks of Mission
Accomplished Report (MAR)
Review and study Flight Information Publication (FLIP) and General Planning (GP) requirements
Conduct Crew Flight Briefing
Discuss mission requirements with Wing intelligence and communications officers
Study Mission Charts
Check Form 200 and chart for accuracy
Fill out known information on in-flight log
Determine Where Celestial observations will take place
Predetermine Radar targets at action points
Attend Pretakeoff Brief

COPLOT FUNCTIONS

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

BOOMER FUNCTIONS

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

BOOMER FUNCTIONS (continued)

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

SQUADRON/BASE OPS AND COMBAT CREW DUTIES

PILOT FUNCTIONS

Check weather
 Check Notams
 Compute take-off data
 Conduct MITO/Cell briefing
 File mission paper work (Flight plan, weight and balance, etc.)
 Check aircraft and mission status
 Brief planned flight demonstration maneuvers
 Brief touch 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

COPILLOT FUNCTIONS

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

NAV FUNCTIONS

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

BOOMER FUNCTIONS

Check Crew Information File
 Coordinate Life Support equipment
 Attend Weather Briefing
 Pick up flight meals

PILOT FUNCTIONS

Perform walkaround inspection
Check interphone and oxygen system
Complete crew report
Test and check interior lights
Read AF Form 781
Verify crew of type of fuel on board
Verify APU with generator installed
Notify crew of engine start time
Brief AF Form 781 data
Complete release and weather briefing
Announce start engine time
Provide additional instructions, as required
State which APU has generator
Inspect and close nose compartment
Check for presence of Foreign Object Damage (FOD)
Check nose wheel well
Check nose gear condition
Ensure nose gear pin removed
Ensure actuators are connected to nose gear doors
Check manual defueling valve cover closed
Check right wheel well
Check right system hydraulic accumulator pressure
Set manual refueling valve handle to FLIGHT
Check single point refueling receptacle
Check single point refueling panel
Ensure landing gear door downlocks are removed
Ensure landing gear pins are removed
Check right wing
Check general condition of engines
Check fire bottle discharge indicators
Check fire bottle pressure gauges
Check all fuelage and tail assembly
Check general condition of fuelage/temperature
Check general condition of boom
Check top surface of wings
Ensure APU doors closed
Check left wheel well
Check left system hydraulic accumulator pressure
Check reserve brake accumulator pressure
Check wheel well/gear general condition
Ensure gear door downlocks removed
Ensure landing gear safety pins removed
Check left wing
Check general condition of engines
Check fire bottle discharge
Check fire bottle pressure
Inspect aircraft main fuelage area
Ensure pilot covers are removed
Check aircraft/gear general condition
Ensure pins, downlocks and ground wires removed

COPILLOT FUNCTIONS

Attend Crew Assembly
Perform Interior Inspection (Power off)
Check FDR/GA Circuit Breakers
Check Interphone Oxygen Panel
Check Regulator OFF, Dialer lever at 100%
Bleed pressure down
Check Portable Oxygen Bottles
Set Altitude Selector Knob to NORM
Check pressure above 80 psi
Check Hydraulic Press. Switch OFF
Check Engine Starter Switch OFF (R)
Check PWC switches ON, guard closed
Check Emergency Hydraulic crossover valve lever in NORMAL
Check Pressurization/Air conditioning panel
Check Cabin Pressure Test Valve handle position
Set Cabin Manual Pressure Control OFF
Set Cabin Pressure Controller as required
Set Cabin Pressure Rate Of Change knob as desired
Check Air Conditioning Crossover switch OPEN
Set Cabin Temperature Control as desired
Set Air Conditioning Master switch to RAM AIR
Check Alternate Pressurization switches OFF and guards closed
Check Overhead Panel
Check radios in preset mode
Set manuals to initial planned frequency
Check UHF Comm 1
Check UHF Comm 2
Check VHF (if applicable)
Check all switches OFF
Check Flight Director Mode selector switch in GYRO
Check DG Switches NORMAL (R)
Check Fire Switches IN
Check Inboard Spoiler Switch in CUTOFF
Check Landing Gear Handle DOWN, in Detent
Check Fuel Panel
Check all Fuel Valves CLOSED
Check all switches OFF
Set CDU Select Panel
Check Power Switch in NORM
Check CDU Select Switch in DNS
Check Radar Intensity Switch Full counter clockwise
Check Thrusts CUTOFF
Check Rudder Power Switch OFF
Check Trim Servo Switch in NORMAL
Check Anti-icing/J-4 Panel
Check Anti-ice, Pilot Heat, and
Set Window Heat OFF (as applicable)
Ensure J-4 Compass Mode Selector switch in MAG
Perform External Power applications procedures (if applicable)
Set External Power Switch to TRIP (if applicable)
Check all Warning Flags (as applicable)
Set Battery Power Switch to EMERGENCY (if applicable)
Check EGT Lights if applicable
Check Battery voltage if applicable
Activate Alarm Bell (momentarily)
Perform APU Start Procedures if required
Set External Power Switch to CLOSE if applicable
Check T-R voltage
Set Battery Power Switch to NORMAL (if applicable)

POWER OFF/WALKAROUND

NAV FUNCTIONS

Attend Crew Assembly
Perform Interior Inspection (power off)
Check Portable Oxygen Bottle
Check Cleanliness, general condition, and stored in normal position
Check For pressure approximating 300 PSI
Service Altitude Selector Knob in NORMAL position
Service Portable Oxygen Bottle (if required)
Replace Portable Oxygen Bottle
Hook up helmet to oxygen
Prepare navigator station for preflight
Take out charts and equipment
Ensure Celestial Tables and Air Almanacs on board and current
Perform FF Control Panel preflight
Set Master Switch OFF
Set Mode 4 Code Switch to A or B (as required)
Set Mode Enabling Switches OUT
Set Mode 3/A Code Switch ON
Set Mode 3/A Code Selectors to all 0s
Check MSU-INS and MSU-DNS Mode selectors OFF
Check CDU Power Switch in NORMAL or AUX
Set APN-218 Doppler Switch to OFF
Set Search Radar Control Panel
Set FTC Switch OFF
Set IAGC Switch OFF
Set PAIT 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 Knob 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 Radar/Randomness Control Panel
Set Master Power Switch OFF
Set Pulse Width Switch (as required)
Set Code Selector Switches (as required)
Set Electronic Cabinet Cooling switch to ON
Set Search Radar Indicators
Set Range Delay Switch OFF
Set Intensity Control Knob fully counterclockwise
Set Range Control Knob fully clockwise
Set Interphone Panel
Set Interphone Panel Switches as desired
Set FSACAS Control Panel (if applicable)
Set FSACAS Power Switch OFF
Check Oxygen System
Turn Oxygen Supply Lever ON
Don Flight Helmet and Oxygen Mask
Check Helmet and Mask connections
Place Regulator-Oiler Lever to 100 percent
Test Oxygen Mask for leaks
Place Emergency Oxygen Toggle lever to EMERGENCY
Place Regulator-Oiler Lever to NORMAL
Place Emergency Toggle Lever to center position
Place Oxygen Supply Lever OFF
Place Oxygen Regulator-Oiler lever to 100 percent
Test Helmet Transmitter/Receiver capability
Take off helmet
Don headset
Test transmitter/receiver capability
Complete Crew Report
Place Interphone Rotary Switch to CALL position
Acknowledge Crew Position Verbal/ly

BOOMER FUNCTIONS

Attend Crew Assembly
Start APU
Check Crew Equipment Stowed
Walkthrough Aircraft to Determine Preflight Schedule
Check Circuit breakers
Remove And store Nose Gear Ground/Downlock And Release
Check Portable Oxygen Bottle
Check Interphone Panel settings
Check Interphone
Perform Oxygen System check
Perform Boom Operator's forward station preflight
Perform Crew Report
Perform Start Check (if required)
Position Navigator's Sighting Stool
Check Seatbelt Mount
Install and Check Alignment of Seatbelt
Check Timer
Perform Instantaneous Shoot (as required)
Remove And store Seatbelt and Stool
Perform Cargo Compartment Preflight
Check Cargo Compartment A/C master switch in MANUAL
Check Passenger Station Oxygen Panel
Check Emergency Interphone Panel
Check Gaseous Oxygen System Quantity Gauge
Check Gaseous Oxygen System Valves
Perform Boom Operator's compartment preflight procedures
Check Air Outlet Doors and Detent Stile
Open Sighting Door
Check Interphone Panel
Check Oxygen Regulator
Check EDO Oxygen Regulator
Check Emergency Override Switch
Check Boom Limit Switches
Check Indicator Lights
Set Telescope-At-Disconnect Switch
Check Circuit breakers
Set A/R Boom Operator's Control Panel Master Switch ON
Check Boom fully retracted
Perform Signal Call Test
Set Underbody and Underwing Lights ON
Check Nozzle Light and Tail Mounted Floodlight (Night AR)
Check Sighting Door open
Close Sighting Door Lever
Set Rudder Trim Control at ZERO
Perform Miscellaneous Preflight Procedures
Verify DD Form 385-4 data
Conduct Ground Safety Locus Check
Inform Pilot of Actual Takeoff Weight and Center of Gravity
Ensure Cargo and loose equipment Secure
Perform APU Accumulator Check
Close Cargo Door and Emergency Exit Hatches (if required)
Check External Power Switch Trip
Perform Passenger Loading
Check Seats and Safety Belts
Position Life Support Equipment
Check Passenger Information Cards
Remove Floor obstructions
Install Boom Operator's Compartment Entry Panels
Open Cargo Door
Position Passenger Loading Stand
Brief Passengers
Direct Personnel to Seats and verify Manlist
Check Cargo Manifest
Secure Baggage and loose Equipment

PILOT FUNCTIONS

Check battery charging current
Check battery charging level
Pressurize hydraulic system
Check pressure switches ON
Set right system auxiliary pump switch to AUTO
Set left system auxiliary pump switch to RESERVE BRAKE
Set left system auxiliary pump switch to AUTO
Check attitude system
Check parking brake OFF
Check Test panel indicators BLANK
Set attitude test switch to FWD
Set attitude test switch to AFT
Ensure test panel indicators are BLANK
Check hydraulic pressure in normal range
Check speed brakes
Set inbound spoiler switch to NORMAL
Set speed brake lever to 80 degrees
Set yoke to full left
Set yoke to full right
Set yoke to center
Set inbound spoiler switch to CUTOFF
Set outboard switch to cutoff
Set speed brake lever to zero degrees
Return inbound and outboard spoiler switches to NORMAL
Check altitude and glare shield clearance

Move yoke left
Move yoke right
Move yoke center
Check elevator trim
Check trim indication
Move yoke forward
Move yoke aft
Move yoke center
Check electric trim
Check manual trim
Activate stab trim control switch NOSE DOWN then NOSE UP
Set stab trim control switch to CUTOFF
Set stab trim control switch to NORMAL
Check rudder
Check rudder power switch OFF
Push rudder full LEFT
Push rudder full RIGHT, then release
Set rudder power switch to ON
Check rudder pressure
Check rudder trim
Check Engine Failure Alert System (EFAS)
Set EFAS switch to TEST, then ON
Check engine system
Check yaw damper system
Set SYD switch to TEST, then ON
Check DISENG light comes on and goes out within 35 seconds
Check radios
Check ILS receivers
Check VOR
Check TACAN
Check COMM 1 UHF
Check COMM 2 UHF (ground radio)
Check HF radio
Set-up HAVE QUICK radios
Determine HQ 1 or if availability
Load Word of Day (WOD) or load Multiple WODs (MWOOD)
Set Time of Day (TOD)
Practice WOOD/MWOOD
Check operation of altimeters
Check flight director heading mode

POWER ON INSPECTION

Check instruments
Check all dials and gauges
Check Attitude Director Indicator (ADI)
Check INS gyro
Set clock
Set oil temp selector switch to TEST
Set oil temp selector switch to M
Check fuel quantity readings
Check Rotation Go Around (RGA) mode Check flap and speed brake warning horn
Check Autopilot
Check autopilot turn knob in detent position
Set autopilot engage switches ON, as required
Rotate autopilot turn knob LEFT then RIGHT
Rotate pitch knob NOSE UP, then NOSE DOWN
Depress pilot's disengage button
Set autopilot engage switches ON, as required
Activate stab trim switch
Press test switch, if applicable
Press velocity/altitude test indicator, if applicable
Check flight controls for freedom of movement
Set trim for take-off
Move flight director mode selector to gyro
Adjust seats, pedals, belts and harnesses
Ensure fuel panel set for take-off
Perform CELL check
Perform ground radio check
Inform CELL lead ready to start engines
Check APU accumulator pressure
Set aux pumps to OFF
Review takeoff and emergency procedures
Perform FSACAS alignment and insertion procedures

Close Generator Breaker Switches
Set Remaining Switches ON as required
Set VOR to ON
Set TACAN to ON
Set VHF Radio ON
Set UHF Radio ON
Set HF Radio ON
Set Autopilot ON
Set RGA Power Switches ON
Set Instrument Power Gyro
Ensure Required publications are available
Ensure presence of Aircraft Flight Manuals
Ensure Parachute preflight completed
Check Interphone and oxygen
Ensure Crew report complete
FSAS preflight procedures
Ensure FSACAS POWER Switch ON
Accomplish FMP Interface Test
Check Fuel Status Indications
Press FUEL Key
Press Data Key
Press Multifunction Data Key
Verify Airplane Type
Verify Engine Type
Verify Brakes and Anti-Skid type
Check IDU STATUS Displays
Check System Status Display
Slow IDU Display to Bus Status 2/3
Check Bus Status Display
Check WT and Balance info on ICDD for FSAS
Obtain Crew Report

Set Interior lights
Check wheel wells clear
Ensure System Pressure Switches ON
Check anti-skid
Check Fuel Quantity reading
Check Hydraulic System Pressure
Check Hydraulic System quantity
Check Pump Supply Guards CLOSED
Press to Test all gauges
Record actual readings on Form 14, 385-4 and flight log
Hydraulic Pressure checks
Check L/R Systems & Pilot's reserve
Pressure gauges in Normal range
Turn on autopilot yaw damper switch
Check Gas Warning Light extinguished
Complete control & trim check
Check Fuel Dump Actuator
Check Boom retracted
Set Fuel Dump Switch to FUEL DUMP
Set Fuel Dump Switch to OFF
Ensure Wheel Well Doors clear
Receive Report from each crewmember
Check INS/ONS CDU Test Switch (if applicable)
Check DNS NAV INOP Light Illuminated
Check Fuel Dump Switch to FUEL DUMP
Check Fuel Dump Switch to FUEL DUMP
Check Flap lever in 50 degree detent
Accomplish DNS Interface Test if desired
Depress Captain's autopilot Disengage button
Set Fuel Dump Switch to OFF
Set Stabilizer Trim as required
Set Flap Lever to 40 degree detent
Move Flap Lever through 30 degree to 20 degree detent
Set Flap Lever to 0 degree detent
Set Flap Lever to 30 degree detent
Set Flap Lever to 0 degree detent

COPLOT FUNCTIONS

Perform Interior Inspection (Power On)
Set FD Master Power Switches ON
Ensure FD 100 Power Off Lights ON
prior to placing switches ON
Set FD 100 Master Power Switches to ON
Ensure FD 100 Power Off Lights out after placing switches ON
Perform APP Panel Checks (As applicable)
Set Master Refuel Switch to ON
Press to test all Indicator lights not illuminated
Set Manifold Valves Switch to FLIGHT
Check Main APP/RR Valve Switch CLOSED
Check Tank Level Control Switches CLOSED
Check Scavenge Switch OFF
Check Reverse Refuel Pumps Switch OFF
Check Slingway Door Switches CLOSED
Check Signal Amplifier Power Switch in NORMAL
Check Manual Toggle Latch Switch In RELEASE
Set Master Refuel Switch to OFF
Check Engine Bleed Valves OPEN
Perform Bleed Air Leak Detection Test
Press Bleed Air Leak Detection test switch
Check all LEAK DET, OVER PRESS and OVER TEMP Lights ON
Release Test Switch
Ensure Lights go out after releasing test switch

Set Navigation Lights
Set Flash-Steady Switch to FLASH
Set all Fuel Boost Pump Switches to ON
Set Bright-Dim Switch to BRIGHT
Set #2 Tank-To-Engine-Manifold Valve Switch to OPEN
Set ARI Line Valve Switch to OPEN
Report ACDS Lights ON/OFF if applicable

NAV FUNCTIONS

Perform Interior Inspection (power on)
Set Control Panel Switches (As Required)
Perform N-1 Compass Preflight
Check Latitude Correction Pointer OFF
Set Composites to correct MAG heading
Center Annunciation Pointer
Accomplish Grid Check (if required)
Perform INS/ONS System Preflight procedures
Check INS-Doppler Status Panel
Set MSU-INS and MSU-DNS Mode selectors to ALIGN
Turn on FSACAS power switch
Perform APN-218 Doppler Checks
Turn Mode Selector to LAND
Perform Bit Test
Turn Mode Selector to OFF
Insert INS and DNS
Set IFF Master 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
Encode Mode 4
Check Mode 4 light out
Set Master Switch to STANDBY
Set Mode 1, 2, 3/A, and C switches as required
Set Mode 1, 2, and 3/A Codes as required
Set AudioLight Switch (as required)
Set RAD - TEST/MON Switch (as desired)
Turn APN-59 Function Switch to STBY
Perform Altimeter Preflight procedures
Set Altimeter to correct Barometric Pressure
Compare Altimeter setting with field elevation
Accomplish DNS Interface Test
Accomplish INS Interface Test
Insert Waypoint Data
Insert TACAN Data
Verify waypoints
Perform Launch Authentication procedures
Load KY-58
Request Authentication and Launch message from command post
Respond with correct Authentication
Install seatant stool and seatant
Check seatant mount
Check seatant delectant
Check seatant
Check seatant alignment
Observe a celestial body
Perform celestial precomp
Resolve seatant accuracy
Remove and stow seatant and stool
Turn FSACAS Power Switch ON
Fit Life Preserver Unit (LPU)

BOOMER FUNCTIONS

Continue with power off list if required

STARTING ENGINES AND BEFORE TAXI

<u>PILOT FUNCTIONS</u>	<u>COPILOT FUNCTIONS</u>	<u>NAV FUNCTIONS</u>	<u>BOOMER FUNCTIONS</u>
Start APU if required	Fasten seat belts and harness	Perform Starting Engines And Before Taxi checklist procedures	Perform Before Starting Engines procedures
Fasten belts and harnesses	Set oxygen to 100%	Turn Oxygen System ON	Start APU (if required)
Turn oxygen to 100 percent	Set External Power Switch to CLOSE	Set INS/DNS System to NAV Mode	Remove Entrance Ladder
Set battery switch to EMERGENCY	Set Air Conditioning Master switch	Don Gloves	Close And latch Entry Door
Set hydraulic pressure switches	Set Throttle to Cross Start RPM if required	Monitor engine start	Slow Entrance Ladder
Flip external power switch as required	Check Overhead Panel Caution Lights out	Perform Aircraft Electrical Power check	Check Emergency Exit Hatches
Set parking brakes	Set Generator Circuit Breaker Switches to CLOSE if required	Check For at least One Generator on line	Turn On Boom Operator's
Check hydraulic pressure	Set Beacon and Navigation Light Switches to BOTH ON and STEADY	Perform IFF Control Panel preflight	Compartment Window Heat Switch
Set starter switch to START *	Set Copilot's Instrument Power Switch to START	Set IFF Master Switch to STANDBY	Check Air Refueling Line Valve OPEN
Set throttle to START at 25 percent N2 RPM*	Set Pitot and Q-Inlet Heat Switches to ON	Turn APN-218 Doppler Mode Selection ON	Cycle APU Generator Switch
Monitor engine instruments *	Set Engine Anti-Ice as required	Turn search radar to STBY	
Set throttle to IDLE at 50 percent N2 RPM*	Perform Taxi Report Procedures	Set Radar/Rendezvous Beacon as required	
Set starter switch to OFF *	Set Air Conditioning Master Switch as required	Perform Warning and Indicator Light Test	
Turn on starter selector switch (last engine only)	Set altimeter to STANDBY	Report over Interphone "Ready to Taxi"	
Check overhead panel caution lights	Confirm INS NAV INOP & DNS NAV INOP as required	Check receiver status	
Shutdown APU as required		Ensure Taxi Clearance received	
Ensure external power and chocks removed			
Set battery switch to NORMAL			
Turn on engine anti-ice as required			
Reset altimeters			
Check INS NAV INOP and DNS NAV INOP lights			
Ensure taxi report complete			

* Repeated for each engine

TAXI

PILOT FUNCTIONS

Check hydraulic pressure, brakes and steering
 Check flight controls
 Check flight instruments
 Check speed brakes to ZERO
 Set flaps
 Advance power momentarily to begin taxi
 Release parking brakes
 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 RIGHT and hold
 Push rudder pedal full LEFT and hold
 Set EFAS and SYD switches to ON
 Set EFAS switch to ON
 Set yaw damper switch to ON
 Review takeoff data
 Ensure trim ready for takeoff
 Check rudder trim at ZERO
 Check aileron trim at ZERO
 Check stab trim
 Set and recheck NAV aids
 Set flight director and climb selector switch to RGA mode
 Set APU start-stop switches to STOP if required
 Obtain last chance inspection
 Check radar to STBY
 Set parking brakes
 Clear SOF for last chance inspection report
 Check EFAS/SYD annunciators
 Check annunciators
 Check APU doors open and lights turned out
 Close windows
 Turn on window heat
 Adjust throttle friction
 Obtain MITO approval
 Change radios to MITO discrete frequency
 Obtain radio check on MITO frequency
 Set power for MITO
 Release parking brakes when directed by lead
 Scan for traffic
 Maintain spacing
 Accomplish additional radio checks as required
 Accomplish takeoff report

COPILOT FUNCTIONS

Check hydraulic pressure, brakes and steering
 Obtain taxi clearance
 Check/set Anti-Ice Equipment as required
 Set Anti-Icing ON
 Set Anti-Icing OFF unless needed for takeoff
 Set Flaps as required
 Check Overhead Panel
 Ensure Bus Tie, Generator breaker and generator control lights off
 Check Main T-R Units for normal operation
 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 if applicable
 Discuss Take-Off Data
 Set Stabilizer Trim for Takeoff
 Obtain Weather data
 Recalculate Takeoff data if required
 Obtain ATC clearance
 Review and set N1 RPM indices
 Set NAV aids for departure
 Set FLT Director Mode & Climb
 Selector switches to RGA Max Mode
 Check Door Warning/OVHD Panel
 Caution Light, as applicable
 Close window and set Window heat switch as required
 Accomplish Crew Take-off Report
 Scan for traffic

NAV FUNCTIONS

Perform Search Radar Turn On Procedures
 Set Function Switch to SEARCH
 Adjust Intensity Control
 Adjust heading mark Intensity control
 Set Scan Switch as desired
 Set Stab Switch to Up
 Fine-tune Radar
 Check beacon capability
 Perform Radio Procedures (As Required)
 Ensure Departure Clearance is received
 Ensure Flight Safety Check by (SOF) is accomplished
 Ensure MITO/Cell Radio Check is accomplished
 Fasten Seat Belt and Shoulder Harness
 Perform safety check
 Prepare For Takeoff
 Report ready for takeoff

BOOMER FUNCTIONS

Notify Passengers and Extra crewmembers prepare for takeoff
 Check Cargo Door Closed and Locked
 Complete TAXI Report
 Monitor Electrical Control Panel

BEFORE TAKEOFF

PILOT 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
 Turn radar on
 Scan for traffic

COPLOT FUNCTIONS

Set lights as required
 Call for pilot to move starter switches
 to IGNITION
 Scan for traffic

NAV FUNCTIONS

Perform Before Takeoff Checklist Procedures
 Set Radar/Rendezvous Beacon (as required)
 Set IFF (as required)

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

TAKEOFF

<u>PILOT FUNCTIONS</u>	<u>COPILLOT FUNCTIONS</u>	<u>NAV FUNCTIONS</u>	<u>BOOMER FUNCTIONS</u>
Advance power as required Release parking brake as directed Maintain left hand on nose wheel steering as required Taxi into position and align aircraft with centerline Assure flight idle Maintain full pressure on yoke Maintain spacing/timing as required Direct copilot to set take-off thrust Maintain directional control and wings level Check airspeed at 90 knots Maintain full forward until ground minimum control speed is reached Acknowledge S1 Interphone call as required Activate Rotation Go Around (RGA) within 10 knots of rotation speed Pull back on yoke until takeoff attitude is reached Call for gear up Follow command bars as required until 2000 feet above ground Push forward on yoke Call for flaps up Check hydraulic pressure in low range Look for lead aircraft visually or on radar	Turn Radar Intensity Switch clockwise Hold yoke full forward Check for FLT idle on all four engines Announce FLT idle on all four engines Set Takeoff thrust Call 90 knots Call S1 Call pickle Call rotate Call climb speed Raise Gear Move flaps up	Perform Takeoff Duties Monitor lead aircraft for MITO timing Record Takeoff Time Monitor Aircraft Instruments Perform Initial Climbout procedures Ensure positive rate of climb Ensure Gear Up Ensure flaps raised	Monitor Takeoff (Overhead Control Panel)

CELL JOIN UP

PILOT FUNCTIONS	COPILOT FUNCTIONS	NAV FUNCTIONS	BOOMER FUNCTIONS
Perform joinup procedures as required Maintain cell position as required Call for climb power and after takeoff climb check Ensure landing gear up Ensure flaps up Call for engine anti-ice on/off Set starter switches as required Set altimeter to 29.92 and radio altimeter MDA Index to 2000 feet Ensure oxygen on, 100 percent Ensure fuel panel is set Ensure RGA switches off Level off Pull power back Set level flight attitude Trim aircraft Engage autopilot Maintain formation position Change position as required Perform cell communications as required Terminate formation if necessary	Turn off Starter Switches (as required) Turn on Engine Anti-ice (as required) Check Cabin Pressurization Set Fuel Panel as required Turn off RGA Power Switches Turn off landing light at 10,000 Ft. Set radio altimeters to 2000 Ft. Direct crew to set 29.97 Altimeter setting passing FL180	Perform Cell Joinup 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 Ensure Correct Headings are flown Ensure Correct Altitudes are flown Perform Climb Altitude Procedures Perform After Takeoff Checklist Procedures Check IFF Mode 4 Caution Light off Reset Altimeter at Transition Altitude Ensure Oxygen Requirements Are Met Ensure Oxygen is ON and at 100% when aircraft is above 10,000 ft. Ensure Oxygen is readily available above FL250 Don Helmet above FL430 Make 2,000' prior to Level Off Call Make 1,000' prior to Level Off Call Record Level Off Time Monitor Interphone And Radios Monitor Interphone and COMM radios from takeoff Monitor HF after passing out of home station UHF range during alpha monitor periods	Turn Off Wheel Well Lights Set Air Conditioning Master Switch to CONDITION AIR Install Sextant Stool (if Required) Install Sextant Check Cargo Compartment Turn On Nacelle Illumination Set Boom Nozzle Light (as required) Set Boom Marker Lights (as required)

PILOT FUNCTIONS

Maintain cell position
Perform turbine engine monitoring system (TEMS) test

COPLOT FUNCTIONS

Check hydraulics
Check electrical system
Monitor fuel system
Monitor O2 system
Monitor engine instruments
Give control of HF Radio to NAV

NAV FUNCTIONS

Perform General Cruise/Navigation
Complete Comm Log
Request And record UHF Traffic
Accomplish HF Contact
Record HF Traffic
Monitor Radios And Interphone
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 Interphone as required
Monitor And Update Navigation Equipment as required
Update INS/DNS position
Monitor APN 59 Radar
Monitor Navigation Radio aids
Perform station keeping duties
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 below FL230
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

CRUISE #1

NAV FUNCTIONS(Cont.)

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 Position and Time
Compute "Alter Heading" and ETA to turn
Perform Dead Reckoning (DR) Navigation
Accomplish Celestial Pre-comps (SACF 289)
Resolve MPP/FIX
Complete Log work on Form 200
Direct Aircraft along planned route to coast end point/ADIZ
Accomplish Celestial control time to air refueling control point
Monitor Navigation equipment for malfunction
Perform Overwater Navigation
Update INS/DNS as required
Set IFF as required
Set APN-218 to SEA
Track Aircraft Position
Use All navigation aids to monitor position within 20 NM of track
Update ETAs to Pilot as necessary for HF position report
Monitor Interphone and Radio
Perform Cell Formation
Perform Station Keeping Duties
Monitor Radar for Skin Paint or Beacon
Keep Pilot informed (verbally) on Aircraft position

BOOMER FUNCTIONS

Provide Crew Support (as required)
Take Celestial Observations
Collect Azimuths and Elevations From navigator
Dial in Azimuth and Elevation
Give Elevations to Navigator

PREPARATION FOR CONTACT

<u>PILOT FUNCTIONS</u>	<u>COPLOT FUNCTIONS</u>	<u>NAV FUNCTIONS</u>	<u>BOOMER FUNCTIONS</u>
Accomplish preparation for contact checklist Check altimeter Reset altimeter Confirm altimeter setting Ensure proper air refueling frequency Disconnect autopilot elevator/pitch axis Accurate stabilizer trim Check stabilizer trim Reengage autopilot elevator/pitch axis Check autopilot stabilizer trim follow up Set Air-to-Air TACAN Establish air refueling echelon formation Initiate 1/2 mile checklist Check oxygen as required Confirm oxygen setting correct Set autopilot HDG SEL/VOR LOC switches to OFF	Obtain permission to delay at the ARCP until revised ARC1 Obtain block altitude Request permission to conduct AR Declare MARSAs (Military Assumes responsibility for separation of aircraft) Compute Max Continuous Thrust setting Post Max Continuous Thrust setting Compute turn range and off-set Set Max Continuous thrust setting on N1 Bug Compute turn range and off-set Request end Air Refueling request from receiver	Ensure RZ Timing is met Adjust TAS to make timing Adjust Track to make timing Perform Orbit Holding Procedures Compute Orbit Headings Set Equipment As Required For Rendezvous Perform station keeping duties Monitor/Set Miscellaneous Equipment As required Set Assigned Radio frequencies Monitor Radios Set Altimeter as required Monitor Altitude Establish Radio Contact With Receiver as required Obtain Receivers information as required Relay Tanker information as required Compute Turn Range And Offset Determine Turn Range from chart using TAS closure and drift inbound Determine Offset required from chart using TAS and drift inbound Set Oxygen Regulator As Required Set Oxygen Regulator to ON Set regulator-diluter Lever to 100% Perform Rendezvous Ensure ATC clearance to air refuel received Conduct Point Parallel Rendezvous Establish Offset Accomplish Automatic Direction Finder (ADF) check if applicable Accomplish Positive Beacon ID (if applicable) Start Timing Instruct Pilot to turn at turn range Monitor echelon position Place Beacon to STBY as required Initiate Overrun Procedures (if applicable) Perform Precontact Set Equipment As Required Set Rendezvous Beacon Control to STBY	Perform Air Refueling Preparation Procedures Set Forward Oxygen Panel OFF, 100% Inform Passengers and ext a Crewmembers Set Refueling Oxygen Panel (if applicable) Monitor Command Radios Set Sighting Door Lever OPEN Check Signal Coil Set Telescope-At-Disconnect (as required) Ensure Extension and Elevation Limit switches active Set Emergency Override Switch (as required) Set Receiver Director Light Rheostats Turn On A/R Floodlight (as required) Set Ruddervisor Trim Control to Zero (as required) Perform Boom Lowering Procedures Extend Boom Check Boom Controls Obtain Radio Contact Brief Receiver for Contact (as Required) Set External Lights (as required) Provide Visual commands to Receiver (As required) Maintain Required communications with receivers Maintain proper boom alignment

AIR REFUELING

<u>PILOT FUNCTIONS</u>	<u>COPILLOT FUNCTIONS</u>	<u>NAV FUNCTIONS</u>	<u>BOOMER FUNCTIONS</u>
Monitor receiver/observer position Advance power as required Maintain cell position	Set altimeter to 29.92 or as briefed Set Radios as required Set Air to Air TACAN if required Check oxygen Dump Fuel if required Set Lights as required Set Position Lights to STEADY and DIM Set Rendezvous Beacon Lights as required Complete Fuel quantity check Set No Smoking/Seat Belt lights ON as applicable Set Autopilot VOR/LOC and Heading select switches off Set TACAN as required Set Fuel Panel for A/R Set one A/R Pump Switch to ON Set Beacon Lights to BOTH ON and Position Lights to BRIGHT	Perform General Air Refueling Record Air Refueling Data Record Number of contacts Record Amount of fuel transferred Monitor Cell Formation (If Required) Tune Radar for optimum picture Keep Pilot advised of position Maintain ATC Clearance Requirements Alter Aircraft as necessary to maintain course within 10 NM of cleared course Monitor And update NAV systems Monitor Interphone and Radios Monitor UHF Radios Monitor HF Radio Monitor Interphone Perform Breakaway Procedures (If necessary) Configure Radar to skinpaint Receiver at bottom of air refueling block Set APN-69 to OPERATE Monitor Altitude	Perform Contact Procedure Monitor Boom Position Indicators Monitor Receiver position Perform Disconnect or Breakaway procedures Recycle System for subsequent contacts

POST AIR REFUELING

<u>PILOT FUNCTIONS</u>	<u>COPLOT FUNCTIONS</u>	<u>NAV FUNCTIONS</u>	<u>BOOMER FUNCTIONS</u>
Initiate post air refueling checklist	Complete post air refueling check	Accomplish Post Air Refueling Checklist procedures	Perform Post Air Refueling procedures
Assure fuel panel reconfigured for cruise	Re-engage Autopilot as required	Set Radar/Rendezvous Beacon to OFF	Set Rudder Trim Control to "0" (as required)
Assure radios reset	Provide Post A/R Report to Receiver/Cell	Monitor Radios	Retract, Stow, and Latch Boom
Set altimeter to 29.92 and check oxygen 100 percent if required	Set No Smoking/Seat Belt Lights as required	Set Altimeters (if necessary)	Close Sighting Door with Sighting Door Lever
Reestablish cell position	Record Fuel quantity	Check Oxygen	Check Rudderlocks locked Switch
Maintain cell position	Establish Cruise Configuration	Open fuel tank circuit breakers as required	Set External Lights (as required)
	Set Position and Rendezvous beacon lights as required		Set Refueling Station Oxygen Panel
	Set Altimeter to 29.92 (as required)		Inform Pilot BOOM STOWED
	Turn off oxygen (as required)		Return to Forward Cabin
			Set Forward Station Oxygen Panel ON, 100%

<u>CRUISE #2</u>			
<u>PILOT FUNCTIONS</u>	<u>COPILOT FUNCTIONS</u>	<u>NAV FUNCTIONS</u>	<u>BOOMER FUNCTIONS</u>
Engage autopilot Maintain formation position Change position as required Perform cell communications as required Terminate formation if necessary	Notify ATC A/R terminated Pass receiver'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	Terminate Celestial/over water navigation Accomplish Final DR position and announce ETA to coast end Accomplish coast end fix Terminate Celestial Navigation clearance Check N1 and J4 compass heading Assume Cell lead navigation responsibilities	Provide crew support (as required)

PLAN DIVERT

PILOT FUNCTIONS

Obtain destination weather
 Direct navigator to determine range
 Direct copilot to determine if we have
 fuel capability to reach destination
 Direct crewmember to look up
 instrument flight rule supplement
 Direct copilot to obtain proper
 clearances
 Coordinate plan with #1 aircraft
 Obtain destination weather/monitor air
 route traffic control center

COPLOT FUNCTIONS

Compute fuel required for divert
 Obtain ATC clearance

NAV FUNCTIONS

Replan divert
 Prepare chart
 Compute distance, time, and fuel

BOOMER FUNCTIONS

Provide crew support as required

DESCENT

<u>PILOT FUNCTIONS</u>	<u>COPILOT FUNCTIONS</u>	<u>NAV FUNCTIONS</u>	<u>BOOMER FUNCTIONS</u>
Direct call breakup	Make entries in landing data card	Prepare For Descent	Calculate Landing Center of Gravity
Call for descent checklist	Back up NAV for ADIZ penetration time and coordinates	Navigate To IAF	Stow Sextant Stool and Sextant
Review weather	Accomplish descent checklist	Monitor #1 aircraft	Check Circuit Breakers
Review approach procedures	Review descent and approach procedures	Review Penetration and Approach	Set Cargo Compartment Temperature
Direct navigator to advise destination base of aircraft status	Set N1 RPM Index	Review highest terrain	Notify Passengers and Crewmembers
Brief the approach	Set Radio Altimeters	Review emergency airfields	Walkthrough to Boom Pod
Confirm N1 RPM Index set	Set and select Nav Aids	Review special use airspace	Perform Boom Latched Check
Set specific altitude into radio altimeter	Set Anti-icing Equipment	Authenticate mission change	Walkthrough to Forward Cabin
Insure navigation aides are set	Check Electric and Hydraulic Systems	Monitor weather reports	Fasten and Lock Safety Belt and Shoulder harness
Set starter switches to Ignition	Set Cabin Pressure Controller at 500 ft above field pressure altitude	Monitor Aircrew Terminal Information service (ATIS)	
Direct anti-ice equipment use as required	Set Altimeters	Set Altimeters	
Check switches and pressure of left, right, reserve brake, and powered rudder systems	Turn Landing Lights on	Fasten Safety Belt and Shoulder Harness	
Accuate brakes and check for gauge fluctuation		Ensure Approach Clearance received	
Reduce power to initiate descent		Contact Command Post	
Ensure proper course, altitude, and airspeed		Perform Descent Altitude Procedures	
Set appropriate altimeter setting		Make "2,000' Prior to Assigned Altitude" Call	
Confirm descent checklist complete		Make "1,000' Prior to Assigned Altitude" Call	
		Monitor Cell breakup	

APPROACH AND LANDING

<u>PILOT FUNCTIONS</u>	<u>COPILOT FUNCTIONS</u>	<u>NAV FUNCTIONS</u>	<u>BOOMER FUNCTIONS</u>
Call for before landing checklist	Review Approach Procedure	Perform Instrument Approaches	Monitor electrical control panel
Ensure speed brakes set to ZERO	Ensure Speed Brakes are set to zero	Perform Airborne Directed Radar Approach (if required)	Monitor fuel panel
Ensure autopilot disengaged	Set RGA Power & Speed Deviation switches ON	Relay Ground Speed and Drift Information	
Direct copilot to lower flaps as required	Ensure flaps set as desired	Ensure Altitude Restrictions are met	
Set EFAS/SYD switches on	Check Rudder Hydraulic pressure	Configure Radar	
Ensure proper navigation aides selected and set	Set and Select Nav Aids	Direct Descent as published as required	
Scan for traffic	Monitor Altitude, Airspeed, Sink Rate, ground speed, wind shear, A/C altitude	Monitor Approach	
Direct copilot to lower landing gear	Scan for traffic	Monitor Radios	
Confirm landing gear down and locked	Set fuel panel for landing	Monitor timing as required	
Check anti-skid system	Set Flaps for landing	Perform Safety Checks	
Direct additional flaps as required for landing	Set Flaps A/C on center line for landing	Scan For Traffic	
Ensure fuel panel set for landing	Call VDP	Check Flap setting	
Ensure flaps set for landing	Call out MDA/DH	Check Gear position down	
Raise speed brakes	Call missed approach point if necessary	Check Pilot Approach Speed (as required)	
Apply wheel brakes as required	Advise pilot when engines decelerate to ground idle during landing rollout	Check Fuel Panel	
Ensure 4 engines in ground idle	Check Anti-Skid after gear lowered	Announce Approach for Decision Height or MDA	
Maintain aircraft directional control	Check Rudder Pressure in hydraulic set	Call Missed Approach Point as required	
Taxi clear of the runway		Perform Go Around as required	
		Ensure Missed Approach Procedures Are Accomplished	
		Advise Pilots of any hazards noted	
		Make Required Altitude calls	
		Record Time	
		Monitor landing roll out/ground speed	

PILOT FUNCTIONS

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

AFTER LANDING

Ensure communication kit and classified documents secured
Complete AF Form 781
Relay crew and aircraft status to home base
Locate secure location for secrets
Complete remaining paperwork
Complete SAC Form 828 as required
COPLOT FUNCTIONS
Set Starter Switches as required
Set lights as required
Set Engine Anti-ice as required
Set pitot, Q-inlet, and window switches to OFF
Set Flaps to UP
Set speed brakes to Zero
Set Cabin Manual Pressure Control to FULL DECREASE
Set Air Conditioning Master switch to RAM AIR
Set Pilots' Radar intensity to full counter clockwise
Set HF Radio to OFF
Set Lights as required
Ensure INS Accuracy Check complete
Turn off Auto Pilot
Zeroize Ciphony Control Panel if required
Set Manifold Valve Switch to WING REFUEL
Set Engine Anti-ice to OFF (if not previously accomplished)
Set engine starter switches to off (if not previously accomplished)
Apply External Power as required
Set Air Conditioning Master switch to RAM AIR
Set External Power Switch to TRIP if required
NAVFUNCTIONS
Monitor radios
Turn Equipment Off
Set Mode 4 Code Switch (as required)
Set Mode 4 On/Out Switch OFF
Set IFF Master Switch OFF
Turn APN-218 System OFF
Turn DNS MSU Switch OFF
Set Search Radar Control Panel
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)
Set Oxygen System
Set Supply Lever OFF
Set Diluter Lever 100%
Ensure Oxygen pressure bleeds to Zero
Perform INS Accuracy Check Procedures
Select Way Point
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 left-hand data display
Press Clear Key
Record Nav Time of last flight
Calculate nav accuracy
Turn INS MSU Switch OFF after parked
Set IFF/SIF As Required
Set Mode 2 Code (as required)
Set FSA/CAS power OFF
Zeroize Code in KIK-18 and KY-58
Assist in Aircraft Offload As Required
Offload Flight Equipment
Offload Passengers/Personnel
Enter Navigation systems maintenance discrepancies into Form 781
Perform maintenance debriefing
Relay INS accuracy check information
Turn in comm kit, KIK-18, KY-58 and FLIP publications
Complete mandatory aircrew requirements
Complete SAC Form 157 (if applicable)
Turn in all navigation mission paperwork
Turn in helmet and mask to life support
Perform crew mission debriefing

BOOMER FUNCTIONS

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

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,Vis,Aud						
Check Name		Vis,Cog						
Compute take-off data	Crew Coordination,SOF, and weather	Man,Vis,Cog						
Conduct MITO/Call briefing	Squadron Handout	Voc,Aud						
File mission paper work		Man,Vis						
Check Aircraft and mission status	SOF	Voc,Aud						
Brief planned flight demonstration	Crew Coordination	Voc,Aud						
maneuvers								
Brief touch and go procedures	Crew Coordination	Voc,Aud						
Brief deployment requirements	Intelligence,Operations	Voc,Aud						
Brief Call Procedures	Briefing Guide	Voc,Aud						
Brief MITO Procedures	Briefing Guide	Voc,Aud						
Complete local mission planning/briefing	Crew Coordination and Briefing Guide	Voc,Aud						
certificate								
Complete flight plan	Crew Coordination	Man,Vis,Aud,Cog						
Preflight								
Perform exterior inspection								
Check Interphone and oxygen system		Man,Vis						
Complete crew report		Voc,Aud						
Test and check interior lights		Man,Vis						
Read AF Form 781		Man,Vis						
Notify crew of type of fuel on board	Fuel Sheet from Maintenance	Man,Vis,Voc,Aud						
Verify APU with generator installed		Vis						
Notify crew of engine start time		Voc,Aud						
Brief AF Form 781 data		Voc						
Review AF Form 781 data, as required		Man,Vis						
Complete mission and weather briefing		Vis						
Announce start engine time		Voc						
Provide additional instructions		Voc,Aud						
State which APU has generator		Voc						
Inspect and close nose compartment		Man,Vis						
Check for presence of Foreign Object		Vis						
Damage (FOD)								
Check nose wheel well		Vis						
Check nose gear condition		Vis						
Ensure nose gear pin removed		Man,Vis	Not sufficiently checked	Structural damage to aircraft				
Ensure actuators are connected to nose gear doors		Man,Vis	Not sufficiently checked	Structural damage to aircraft				

Check manual refueling valve cover closed		Vis		
Check right Wheel well		Vis		
Check right system Hydraulic accumulator pressure		Vis		
Check wheel well		Vis		
Set manual refueling valve handle to FLIGHT		Man,Vis		
Check single point refueling receptacle		Man,Vis		
Check single point refueling panel		Vis		
Ensure landing gear door downlocks are removed		Vis	Not sufficiently checked	Structural damage to aircraft
Ensure landing gear pins are removed		Vis	Not sufficiently checked	Structural damage to aircraft
Check right wing		Vis		
Check general condition of engines		Vis		
Check fire bottle discharge indicators		Vis		
Check fire bottle pressure gauges		Vis		
Check aft fuselage and tail assembly		Vis		
Check general condition of fuselage/empennage		Vis		
Check general condition of boom		Vis		
Check top surface of wings		Vis		
Ensure APU Doors Closed		Vis		
Check Left Wheel Well		Vis		
Check left system hydraulic accumulator pressure		Vis		
Check reserve brake accumulator pressure		Vis		
Check wheel well/gear general condition		Vis		
Ensure gear door downlocks removed		Vis	Not sufficiently checked	Structural damage to aircraft
Ensure landing gear safety pins removed		Vis	Not sufficiently checked	Structural damage to aircraft
Check left wing		Vis		
Check general condition of engines		Vis		
Check fire bottle discharge		Vis		
Check fire bottle pressure		Vis		
Inspect aircraft main fuselage area		Vis		
Ensure pilot covers are removed		Vis		
Check aircraft/ramp general condition		Vis		
Ensure pins, downlocks and ground wires removed		Vis		
Check battery charging level		Man,Vis		
Pressurize hydraulic system				
Check pressure switches ON		Man,Vis,Aud		
Set right system auxiliary pump switch to AUTO		Man,Vis,Aud		
Set left system auxiliary pump switch to RESERVE BRAKE		Man,Vis,Aud		

Set left system Auxiliary pump switch to AUTO		Man, Vis, Aud		
Check antiskid system		Man, Vis		
Check parking brake OFF		Man, Vis		
Check Test panel indicators BLANK		Man, Vis		
Set antiskid test switch to FWD		Man, Vis		
Set antiskid test switch to AFT		Man, Vis		
Ensure test panel indicators are BLANK		Man, Vis		
Check hydraulic pressure in normal range		Vis		
Check speed brakes		Man, Vis		
Set inboard spoiler switch to NORMAL		Man, Vis		
Set speed brake lever to 60 degrees	Crew Coordination	Man, Vis, Aud		
Set yoke to full left	Crew Coordination	Man, Vis, Aud		
Set yoke to full right	Crew Coordination	Man, Vis, Aud		
Set yoke to center	Crew Coordination	Man, Vis, Aud		
Set inboard spoiler switch to CUTOFF	Crew Coordination	Man, Vis, Aud		
Set outboard switch to CUTOFF	Crew Coordination	Man, Vis, Aud		
Set speed brake level to zero degrees	Crew Coordination	Man, Vis, Aud		
Return inboard and outboard spoiler switches to NORMAL	Crew Coordination	Man, Vis, Aud		
Check ailerons and glare shield clearance	Crew Coordination	Man, Vis		
Move yoke left	Crew Coordination	Man, Vis, Aud		
Move yoke right	Crew Coordination	Man, Vis, Aud		
Move yoke center	Crew Coordination	Man, Vis, Aud		
Check aileron trim		Man, Vis		
Check elevators		Man, Vis		
Check trim indication		Vis		
Move yoke forward	Crew Coordination	Man, Vis		
Move yoke aft	Crew Coordination	Man, Vis		
Move yoke center	Crew Coordination	Man, Vis		
Check electric trim	Crew Coordination	Man, Vis		
Check manual trim		Man, Vis		
Actuate stab trim control switch	Crew Coordination	Man, Vis		
NOSE DOWN then NOSE UP				
Set stab trim control switch to CUTOFF	Crew Coordination	Man, Vis		
Set Stab trim control switch to NORMAL	Crew Coordination	Man, Vis		
Check rudder				
Check rudder power switch OFF	Crew Coordination	Man, Vis		
Push rudder full LEFT	Crew Coordination	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	Crew Coordination	Man, Vis		
Check rudder pressure	Crew Coordination	Man, Vis		
Check rudder trim	Crew Coordination	Man, Vis		
Check Engine Failure Alert System (EFAS)		Man, Vis		
Set EFAS switch to TEST, then ON		Man, Vis		
Check engage system		Man, Vis		

Check yaw damper system		Man, Vis	
Set SYD switch to TEST, then ON		Man, Vis	
Check DISENG light comes on and goes out		Vis	
Check radios			
Check ILS receivers	Crew Coordination	Man, Vis, Aud	
Check VOR	Crew Coordination	Man, Vis, Aud	
Check TACAN	Crew Coordination	Man, Vis, Aud	
Check COM1 1 UHF	Crew Coordination	Voc	
Check COM2 2 UHF (ground radio)	Crew Coordination	Voc	
Check VHF radio	Crew Coordination	Man, Vis, Voc, Aud	
Check HF radio	Crew Coordination	Man, Vis, Voc, Aud	
Check operation of altimeters		Man, Vis, Voc, Aud	
Check flight director heading mode		Man, Vis, Voc, Aud	
Check instruments		Man, Vis	
Check all dials and gauges		Vis	
Check Attitude Director Indicator (ADI)		Man, Vis	
Check INS gyro		Man, Vis	
Set deck		Man, Vis	
Set oil temp selector switch to TEST		Man, Vis	
Set oil temp selector switch to M		Man, Vis	
Check fuel quantity readings		Man, Vis	
Check Rotation Go Around (RGA) mode	Crew Coordination	Vis	
Check flap and speed brake warning horn	Crew Coordination	Man, Vis	
Check Autopilot		Man, Vis, Aud	
Check autopilot turn knob in detent position		Man, Vis	
Set autopilot engage switches ON		Man, Vis	
Re-raise autopilot turn knob LEFT then RIGHT		Man, Vis	
Re-raise pitch knob NOSE UP, then NOSE DOWN		Man, Vis	
Depress pilot's disengage button		Man, Vis	
Set autopilot engage switches ON		Man, Vis	
Activate stab trim switch		Man, Vis	
Press autopilot test switch		Man, Vis	
Press valid/invalid test indicator		Man, Vis	
Check flight controls for freedom of movement		Man, Vis	
Move flight director mode selector to gyro		Man, Vis	
Adjust seats, pedals, belts and harnesses		Man, Vis	
Ensure fuel panel set for take-off	Crew Coordination	Vis	
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 pumps			
Set left aux pump switch to OFF		Man, Vis	

Set right aux pump switch to OFF					
Review takeoff and emergency procedures	Crew Coordination			Man, Vis	
Perform FSA/CAS alignment and insertion procedures	Weather, Flight Plan, and crew coordination			Man, Vis, Voc, Aud	
				Man, Vis	
Starting Engines and Before Taxi					
Start APU if required				Man, Vis	
Fasten belts and harnesses				Man, Vis	
Turn oxygen to 100 percent				Man, Vis	
Set battery switch to EMERGENCY				Man, Vis	
Set hydraulic pressure switches				Man, Vis	
Activate external power switch as required				Man, Vis	
Set parking brakes				Man, Vis	
Check hydraulic pressure				Man, Vis	
Set starter switch to START *	Ground Coordination			Man, Vis, Voc, Aud	
Start 1 engine *	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			Man, Vis	
Set starter switch to OFF *				Man, Vis	
(*Repeat for each engine)					
Set starter selector switch to OFF				Man, Vis	
(last engine only)					
Check overhead panel caution lights				Vis	
Shutdown APU as required				Man, Vis	
Ensure external power and chocks removed	Ground Coordination			Voc, Aud	
Set battery switch to NORMAL				Man, Vis	
Turn on engine anti-ice as required	Crew Coordination			Man, Vis, Voc, Aud	
Reset altimeters	Crew Coordination			Man, Vis, Voc, Aud	
Check IRS and DNS NAV INOP lights	Ground Coordination			Voc, Aud	
Ensure taxi report complete	Crew Coordination			Voc, Aud	
Taxi					
Check hydraulic pressure, brakes and steering	Crew Coordination			Man, Vis	
Check flight controls	Crew Coordination			Man, Vis	
Check flight instruments				Man, Vis	
Check speed brakes to ZERO	Crew Coordination			Vis	
Set flaps	Crew Coordination			Man, Vis	
Advance power momentarily to begin taxi	Crew Coordination			Man, Vis	
Release parking brakes	Crew Coordination			Man	
Position airplane as required				Man, Vis	
Check powered rudder system					

Check system and rudder power hydraulic pressure gauges	Vis		
Push rudder pedal full LEFT	Man,Vis		
Push rudder pedal full RIGHT and hold	Man,Vis		
Push rudder pedal full LEFT and hold	Man,Vis		
Set EFAS and SYD switches to ON			
Set EFAS switch to ON	Man,Vis		
Set yaw damper switch to ON	Man,Vis		
Review takeoff data	Man,Vis		
Ensure trim ready for takeoff			
Check rudder trim at ZERO	Vis		
Check aileron trim at ZERO	Vis		
Check stab trim	Vis		
Set and recheck NAV aids	Man,Vis		
Set flight director and climb selector switch to RGA mode	Man,Vis		
Set APU start-stop switches to STOP	Man,Vis	Oil seal on	Damage APU
Obtain last chance inspection	Voc,Aud		
Check radar to STBY	Man,Vis		
Set parking brakes	Man,Vis		
Clear SCF for last chance inspection report	Man,Voc,Aud		
Check EFAS/SYD annunciators	Vis		
Check annunciators	Vis		
Check APU doors open and lights turned out	Vis		
Close windows	Man,Vis		
Adjust throttle friction	Man,Vis		
Obtain MITO approval	Man,Vis		
Change radio to MITO discrete frequency	Voc,Aud		
Coordinate between aircraft	Man,Voc,Aud	Enter incorrect frequency	Meshap
Obtain radio check on MITO frequency	Man,Vis,Aud		
Set power for MITO	Man,Vis		
Release parking brakes when directed by lead	Man,Vis,Aud		
Maintain spacing	Man,Vis		
Accomplish additional radio checks	Man,Vis		
Accomplish takeoff report	Man,Vis		
Ensure fuel panel set for take off	Vis		
Move starter switches to ignition	Man,Vis		
Turn radar on	Man,Vis		
Takeoff			
Advance power as required	Man,Vis		
Release parking brake as directed	Man,Vis		
Taxi into position and align aircraft with centerline	Man,Vis		

Assure flight idle	Crew Coordination	Man, Vis		
Maintain spacing/timing as required	Crew Coordination	Man, Vis		
Direct copilot to set take-off thrust	Crew Coordination	Man, Vis, Voc		
Maintain directional control and wings level	Crew Coordination	Man, Vis		
Check airspeed at 90 knots	Crew Coordination	Vis, Voc		
Acknowledge S1 interphone call as required	Crew Coordination	Vis, Voc, Cog		
Activate Retention Go Around (RGA) within 10 knots of rotation speed	Crew Coordination	Man, Vis		
Pull back on yoke until takeoff attitude is reached		Man, Vis, Cog, Aud	Important to maintain pitch attitude	Stall
Call for gear up	Crew Coordination	Voc, Vis, Man		
Follow command bars as required until reaching 2,000 feet above ground		Man, Vis		
Push forward on yoke		Man		
Call for flaps up	Crew Coordination	Voc	Improper setting	Wrong speed would effect MITO
Check hydraulic pressure in low range		Vis		
Look for lead aircraft visually or on radar		Vis		
Perform joinup procedures as required	Coordination between aircraft	Man, Vis, Aud, Voc		
Maintain call position as required	Coordination between aircraft	Man, Vis		
Call for climb power and after takeoff climb check	Crew Coordination	Voc		
Ensure landing gear up		Vis		
Ensure flaps up		Vis		
Call for engine anti-ice on/off		Man, Vis		
Set starter switches as required		Man, Vis		
Set altimeter to 29.92 and radio altimeter MDA index to 2,000 feet		Man, Vis	Omission	Malap
Ensure oxygen on 100 percent		Vis		
Ensure fuel panel is set	Crew Coordination	Voc, Aud		
Ensure RGA switches off		Man, Vis		
Level Off				
Pull power back		Voc, Vis, Man		
Set level flight attitude		Man, Vis		
Trim aircraft		Man, Vis		
Engage autopilot	Crew Coordination	Man, Vis, Voc		
Maintain formation position	Crew Coordination	Man, Vis, Voc, Aud		
Change position as required	Coordination between aircraft	Man, Vis, Voc, Aud		
Perform call communications as required	Coordination between aircraft	Vis, Voc		
Terminate formation if necessary	Coordination between aircraft	Vis, Voc, Aud, Man		
Oversee fuel panel management	Crew Coordination	Vis, Voc	Inadequate crew coordination	
Maintain call position	Coordination between aircraft	Man, Vis, Voc, Aud		
Perform Turbine Engine Monitoring System (TEMS) test	Crew Coordination	Man, Vis, Voc, Aud		

Accomplish preparation for contact checklist					
Check altimeter	Crew Coordination	Vis			
Reset altimeter	Crew Coordination	Man, Vis			
Confirm altimeter setting	Coordinate with receiver	Man, Vis, Voc, Aud			
Ensure proper air refueling frequency	Crew Coordination	Man, Vis, Voc, Aud			
Disconnect autopilot elevator/pitch axis		Man, Vis			
Accuate stabilizer trim		Man, Vis			
Check stabilizer trim		Vis			
Reengage autopilot elevator/pitch axis		Man, Vis			
Check autopilot stabilizer		Man, Vis			
Trim follow-up					
Set Air-to-Air TACAN		Man, Vis			
Establish air refueling echelon		Vis, Voc, Aud			Missed rendezvous
formation					
Initiate 1/2 mile checklist	Crew Coordination	Voc			
Check oxygen as required		Vis			
Confirm oxygen setting correct		Vis			
Set autopilot HDG SELVOR LOC switches to OFF		Man, Vis			
Monitor receiver/observer position		Vis			
Initiate post air refueling checklist		Voc			
Assure fuel panel reconfigured for cruise		Man, Vis, Aud			
Assure radios reset		Vis			
Set altimeter to 29.92		Man, Vis			
Check oxygen 100 percent if required		Man, Vis			
Reestablish cell position		Man, Vis, Aud, Voc			
Maintain cell position		Man, Vis	Insufficient monitoring		Mishap
Obtain destination weather		Man, Vis, Aud, Voc			
Direct navigator to determine range	Crew Coordination	Voc			
Direct copilot to determine fuel capability	Crew Coordination	Voc			
Direct crewmember to look up instrument flight rule supplement	Crew Coordination	Voc			
Direct copilot to obtain proper clearances	Crew Coordination	Voc			
Coordinate plan with #1 aircraft	Coordinate with #1 aircraft	Man, Voc, Aud			
Direct cell break up	Coordinate with other aircraft	Man, Voc, Aud			
Obtain destination weather/monitor air route traffic control center	Crew Coordination	Man, Voc, Aud			
Call for descent checklist	Crew Coordination	Voc			
Review weather	Crew Coordination	Man, Vis, Voc, Cog			
Review approach procedures	Crew Coordination	Man, Vis, Voc, Cog			
Direct navigator to advise destination base of aircraft status	Crew Coordination	Man, Voc, Aud			
Brief the approach	Crew Coordination	Man, Voc			
Confirm N1 RPM Index set		Man, Vis, Voc			

Set specific altitude into radio altimeter		Man, Vis				
Ensure 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 reserve brake and powered rudder system	Crew Coordination	Man, Vis, Voc, Aud				
Accuate brakes and check for gauge fluctuation	Crew Coordination	Man, Vis, Voc, Aud				
		Man, Vis				
Descent						
Reduce power to initiate descent						
Ensure proper course, altitude and airspeed	Crew Coordination	Man, Vis, Cog				
Set appropriate altimeter setting	Crew Coordination	Vis				
Confirm descent checklist complete	Crew Coordination	Man, Vis, Voc, Aud				
Call for before landing checklist	Crew Coordination	Voc, Aud				
Ensure speed brakes set to ZERO	Crew Coordination	Voc				
Ensure autopilot disengaged		Man, Vis				
Direct copilot to lower flaps	Crew Coordination	Man, Vis				
Set EFAS/SYD switches on		Voc				
Ensure proper navigation aides selected and set		Man, Vis				
		Vis				
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 landing		Vis, Voc				
Ensure fuel panel set for landing		Vis				
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	Crew Coordination	Man, Vis				
Direct copilot to set engine anti-ice	Crew Coordination	Man, Vis, Voc				
Take time hack	Crew Coordination	Man, Vis				
Set speed 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				
Ensure flight director mode selector switch to GYRO	Crew Coordination	Man, Vis				

COPLOT'S TASK LIST

TASK	INFORMATION IN	MODALITY	ERRORS	ERROR EFFECTS
Preparation for Flight				
Get Form 200 data from navigator	Navigator	Man, Vis, Aud, Voc	Reciprocal headings, math errors possible Input errors more likely	Bad takeoff data
Get Form 365 data from boom operator	Boom operator	Man, Vis, Aud, Voc		
Compute takeoff data (SAC Form 71)	Computer	Man, Vis	Wrong flap setting	Problem w/ pushing A/C limits
Record fuel data on SAC Form 200	Weather	Man, Vis		
Complete copilot's chart		Man, Vis	Mistake in fuel load	Could impact mission and safety
Update takeoff data as required (weather and runway changes)		Man, Vis, Cog	Erroneous takeoff data	Could impact safety
Preflight				
Check Thrust Settings and Critical field length		Vis	Errors in takeoff data	Could impact safety
Read Crew Information File		Vis		
Pick up quick done, helmet, mask, and publications		Man, Vis		
Go to Base Operations				
Attend weather brief	Weather	Vis, Aud		
Check aircraft readiness		Voc, Aud		
Recheck takeoff data	Weather	Man, Vis, Aud, Cog		
Load Baggage		Man, Vis		
Pre-position Quickdon, helmet, Pubs, and checklist		Vis		
Power Off Inspection				
Check FDIRGA Circuit Breakers		Vis		
Check Instructor Oxygen Panel		Vis		
Check Regulator OFF, Dikter Lever at 100%		Vis		
Bleed pressure down		Man, Vis		
Check Portable Oxygen Bottles		Vis		
Set Altitude Selector Knob to NORM		Man, Vis		
Check pressure above 50 psi		Vis		
Check hydraulic pressure switch OFF		Vis	Switch error possible	Could result in personnel injury
Check engine starter switch OFF		Vis		
Check PMC switches ON, guard closed		Vis		
Check Emergency Hydraulic		Vis		
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 flight
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	Vis		
Set Cabin Temperature Control as desired	Man, Vis		
Set air conditioning master switch to RAM AIR	Man, Vis		
Check Alternate Pressurization switches OFF and Guards Closed	Vis		
Check Overhead Panel	Vis		
Check radios in preset mode	Vis		
Set manuals to initial planned frequency	Man, Vis		
Check UHF Comm 1	Vis		
Check UHF Comm 2	Vis		
Check VHF (if applicable)	Vis		
Check all switches OFF	Vis		
Check Flight Director Mode selector switch in GYRO	Vis		
Check IDG switches NORMAL	Vis		
Check Fire Switches IN	Vis		
Check Inboard spoiler switch in CUTOFF	Vis		
Check landing gear handle DOWN, in detent	Man, Vis	Omission	Equipment damage possible
Check all Fuel Valves CLOSED	Vis		
Set CDU Select Panel	Vis		
Check Power Switch in NORM	Vis		
Check CDU Select Switch in DNS	Vis		
Check Radar Intensity Switch Full counter clockwise	Man, Vis		
Check Throttles CUTOFF	Man, Vis		
Check Rudder Power Switch OFF	Vis		
Check Trim Servo Switch in NORMAL	Vis		
Check Anti-Icing/J-4 Panel	Vis		
Check anti-ice, pilot heat & set window heat OFF	Man, Vis		
Ensure J-4 compass mode selector switch in MAG	Vis		
Perform External Power applications procedures	Man, Vis		
Set External Power Switch to TRIP	Vis		
Check all Warning Flags (as applicable)	Man, Vis, Voc		
Set battery power switch to EMERGENCY	Man, Vis		
Check EGT Lights if applicable	Vis		
Check Battery voltage if applicable	Vis		
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		

Ensure FD 109 Power Off Lights ON prior to placing switches ON		V/is		
Set FD 109 master power switches to ON		Man, Vis		
Ensure FD 109 power off lights are out		V/is		
Perform ARR Panel Checks				
Set Master Refuel Switch to ON		Man, Vis		
Press to test all indicator lights not illuminated		Man, Vis		
Set manifold valves switch to FLIGHT		Man, Vis		
Check main ARR/IFR valve switch CLOSED		V/is		
Check tank level control switches CLOSED		V/is		
Check Scavenge Switch OFF		V/is		
Check Reverse Refuel Pumps Switch OFF		V/is		
Check Slipway Door Switches CLOSED		V/is		
Check signal amplifier power switch in NORMAL		V/is		
Check manual toggle latch switch in RELEASE		V/is		
Set Master Refuel Switch to OFF		Man, Vis		
Check Engine Bleed Valves OPEN		V/is	Omission	Damage to wing structure
Perform Bleed Air Leak Detection Test		Man, Vis	Omission	Damage to wing structure
Press bleed air leak detection test switch		Man, Vis	Omission	Damage to wing structure
Check all LEAK DET, OVER PRESS and OVER TEMP Lights ON		V/is	Omission	Damage to wing structure
Release Test Switch				
Ensure Lights go out after releasing test switch		Man, Vis		
Close Generator Breaker Switches		V/is		
Set Remaining Switches ON as required		Man, Vis		
Set VOR to ON		Man, Vis		
Set TACAN to ON		Man, Vis		
Set VHF Radio ON		Man, Vis		
Set UHF Radio ON		Man, Vis		
Set HF Radio ON		Man, Vis		
Set Autopilot ON		Man, Vis		
Set RGA Power Switches ON		Man, Vis		
Set Instrument Power Gyro		Man, Vis		
Ensure Required Publications Are available		V/is	Fail to notice missing publications	Could be critical in emergency situations
Ensure presence of Aircraft Flight manuals		V/is	Use improper flight manual	Could result in use of improper emergency procedures
Check Interphone and oxygen				
Perform FSAS preflight procedures		Man, Vis, Aud		
Ensure FSACAS POWER Switch ON		Man, Vis		
Accomplish IFMP Interface Test		Man, Vis		
Check Fuel Status Indications		V/is	Omission - this is only display of CG	Could result in overweight takeoff
Press fuel key		Man, Vis		
Press Data Key		Man, Vis		
Press Malfunction Data Key		Man, Vis		
Verify Airplane Type		V/is		
Verify Engine Type		V/is		

Verify Brakes and Anti-Stud type		Vis		
Check ICU STATUS Displays				
Check System Status Display		Vis		
Slew ICU Display to Bus Status 2/3		Man, Vis		
Check Bus Status Display		Vis		
Check WT and Balance info on ICU for FSAS		Man, Vis		
Obtain Crew Report		Man, Voc, Aud		
Set interior lights		Man, Vis		
Check wheel wells clear			Omission, Incomplete check	Could injure maintenance personnel
Ensure System Pressure Switches ON		Vis		
Check anti-skid		Vis		
Check fuel quantity reading		Vis		
Check Hydraulic System Pressure		Vis, Man, Aud, Voc		
Check Hydraulic System quantity		Vis, Man, Aud, Voc		
Check Pump Supply Guards CLOSED		Vis, Man, Aud, Voc		
Press to Test all gauges		Vis, Man, Aud, Voc		
Record actual readings on Form 14, 365-4, and flight log		Vis, Man, Aud, Voc		
Check Hydraulic Pressure		Vis, Man, Aud, Voc		
Check L.R. Systems & Pilot's reserve pressure gauges in Normal range		Vis, Man, Aud, Voc		
Turn on autopilot yaw damper switch		Man, Vis		
Check Gear Warning Light extinguished		Vis, Man, Aud, Voc		
Complete control and trim check		Vis, Man, Aud, Voc		
Check Fuel Dump Actuator		Man, Vis	Can only check on ground	Could result in overweight landing
Check Boom retracted		Aud, Voc		
Set Fuel Dump Switch to 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 Copilot's autopilot Disengage button		Man, Vis		
Set Stabilizer Trim as required		Man, Vis		
Set Flap Lever to 40 degree detent		Man, Vis		
Move Flap Lever through 30 degree to 20 degree detent		Man, Vis		
Set Flap Lever to 0 degree detent		Man, Vis		
Set Flap Lever to 30 degree detent		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 engine flame out on takeoff
Set Bright-Dim Switch to BRIGHT		Man, Vis		

Set #2 Tank To Engine Manifold valve switch to OPEN	Man, Vis		
Set air refueling line valve switch to OPEN	Man, Vis		
Report ACDS Lights ON if applicable	Vis, Voc		
Report ACDS Lights OFF if applicable	Vis, Voc		
Starting Engines & Before Taxi			
Fasten seat belts and harness	Man, Vis		
Set oxygen to 100%	Man, Vis	Omission	Could be critical in rapid decompression
Set External Power Switch to CLOSE	Man, Vis		
Set Air Conditioning Master switch	Man, Vis		
Set Throttle to Cross Start RPM if required	Man, Vis		
Check Overhead Panel Caution lights out	Vis		
Set Generator Circuit Breaker switches to CLOSE	Man, Vis		
Set Beacon and Navigation Light switches to BOTH ON or STEADY	Man, Vis	Omission	Distraction later in flight
Set Copilot's Instrument Power Switch to START	Man, Vis		
Set Pilot and Q-Inlet Heat Switches to ON	Man, Vis	Omission	Temporary Loss of Cockpit Lights Loss of airspeed and altimeter
Set Engine Anti-Ice 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 altimeter to STANDBY	Man, Vis		
Confirm INS & DNS NAV INOP as required	Vis		
Taxi			
Check hydraulic pressure, brakes, and steering	Man, Vis	Omission	Can lose brakes with low hydraulic pressure
Obtain taxi clearance	Man, Voc, Aud		
Check/set anti-ice equipment as required	Man, Vis		
Set Anti-Icing ON	Man, Vis		
Set Anti-Icing OFF unless needed for takeoff	Man, Vis		
Set Flaps as required	Man, Vis, Aud	Omission	Warning horn comes on if set improperly
Check Overhead Panel	Vis		
Ensure bus tie, generator breaker and generator control lights extinguished	Man, Vis		
Check Main T-R Units for normal operation	Man, Vis		
Check Air Conditioning	Vis		
Check AC Ammeters for balanced load	Man, Vis		
Check Pressurization Panel for proper switch settings	Vis		
Check Circuit Open, IDG Failure and DISC system lights out	Vis		
Discuss Take-Off Data	Voc, Aud		

Set Stabilizer Trim for Takeoff	Weather station or ground control	Man, Vis	Wrong form could lead to improper setting	Could result in early rotation
Obtain Weather data		Voc, Aud, Man, Vis		
Recompute takeoff data if required		Voc, Aud, Vis, 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 FLT Director Mode & Climb Selector		Man, Vis	Improper setting	Could lose back-up
switches to RGA, Max Mode				
Check door warning/OVHD panel caution light		Man, Vis		Engine fire, thrust reverser most critical
Close window & set Window Heat Switch		Man, Vis		
Accomplish Crew Take-off Report		Voc, Aud		
Take-Off				
Set fuel panel for takeoff		Man, Vis		Boost pump switches off and aircraft low on fuel could starve the engines, mishap
Set lights as required		Man, Vis		
Turn Radar Intensity Switch clockwise		Man, Vis		
Hold yoke full forward		Man		
Check for FLT idle on all four engines		Vis		
Announce FLT idle on all four engines		Voc		
Set Take-Off thrust		Man, Vis, Voc		
Call 90 knots		Voc		
Call S1		Voc		
Call pickle		Voc		
Call rotate		Voc		
Call climb speed		Voc		
Raise Gear		Man, Vis		
Move flaps up		Man, Vis		
After Takeoff				
Begin ATC Communications	ATC	Man, Vis		
Turn off Starter Switches (as required)		Man, Vis		
Turn on engine anti-ice (as required)		Man, Vis		
Check cabin pressurization		Vis	Omission	Distraction later in flight
Set Fuel Panel as required		Man, Vis	Omission	Mishap
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 electrical system		Vis		
Monitor fuel system		Vis		

Monitor oxygen system		Vis			
Monitor engine instruments		Vis		Could miss engine status information	Critical especially during icy conditions
Set fuel panel for cruise	Flight plan/crew coordination	Man, Vis			
Preparation for Contact					
Obtain permission to delay at the ARCP until revised ARC1	ATC	Voc, Aud			
Obtain block altitude	ATC/Flight plan	Voc, Aud			
Request permission to conduct air refueling	ATC	Voc, Aud			
Declare MARSA (Military Assumes Responsibility for Separation of aircraft)	ATC	Voc			
Compute Max Continuous Thrust setting		Via, Man, Cog			
Post Max Continuous Thrust setting		Man			
Set Max Continuous thrust setting on N1 bug		Man, Vis			
Record end air refueling request from receiver		Aud, Man, Vis			
Air Refueling					
Set altimeter to 29.92 or as briefed		Man, Vis			
Set Radios as required		Via, Man			
Set air-to-air TACAN if required		Via, Man			
Set Lights as required		Via, Man			
Set Position Lights to STEADY and DIM		Via, Man			
Count contacts		Via, Aud, Cog		After 5 dry contacts, must wet boom	Improper count results in equipment damage
Set Rendezvous Beacon Lights as required		Via, Man		Improper settings	Increases rendezvous difficulty for receiver
Complete fuel quantity check		Via, Man			
Set No Smoking/Seat Belt lights ON as applicable		Via, Man			
Set Autopilot VOR/LOC & Hdg Sel switches off		Via, Man			
Set TACAN as required		Via, Man			
Set 1 air refueling pump switches to ON	Crew Coordination	Via, Man			
Set Beacon Lights to BOTH ON and position lights to BRIGHT		Via, Man			
Complete post air refueling check		Man, Vis, Aud, Cog			
Reengage autopilot as required	Crew Coordination	Man			
Provide post air refueling report to receiver		Voc, Aud			
Record Fuel quantity		Via, Man			
Establish Cruise Configuration		Via, Man			
Set position and rendezvous beacon lights		Via, Man			
Set Altimeter to 29.92		Via, Man			
Turn off oxygen		Via, Man			
Descent					
Notify ATC air refueling terminated		Voc, Aud			
Pass receiver's requested route of flight		Voc			

NAVIGATOR'S TASK LISTING

TASK	INFORMATION IN	MODALITY	ERRORS	ERROR EFFECTS
Preparation for Flight				
Perform Mission Planning				
Select correct charts	Schedule JMC charts	Man,Vis,Cog		
Develop route of flight to meet mission timing	Schedule AP1B,AP1A	Man,Vis	Route developed incorrectly	Violation of foreign airspace
Plot celestial navigation leg on charts	Schedule Flight plan	Man,Vis		
Place special use airspace data on charts	HO-249,Air almanac	Man,Vis		
	Star/sun volumes			
Place air refueling data on charts	Scheduling,AP1B,AP1A	Man,Vis		
Place emergency airfields on charts	IFR supplement,Tech order	Man,Vis		
Annotate highest terrain and obstructions on chart	Enroute charts, AP1A,CHUM	Man,Vis		
Annotate level off point	Crew Coordination	Man,Vis		
Annotate ADIZ entry point	Enroute charts, TAC communications office	Man,Vis		
Complete Mission Paperwork	Schedule HO-249 Air almanac	Man,Vis		
Complete Form 200	Wind sheets,Crew Coordination	Man,Vis,Cog	Record wrong wind/velocity	
Complete navigator briefing guide	Flight plan,Charts	Man,Vis		
Complete Scheduling blocks of		Man,Vis		
Mission Accomplished Report (MAR)	MAR			
Review and study Flight Information Publication (FLIP) and General Planning (GP) requirements	Enroute charts,AP1A,AP1B	Man,Vis		
Conduct crew flight briefing	Crew briefing guide	Voc		
Discuss mission requirements with wing intelligence and communications officers	TAC communications office and Intelligence	Voc,Aud	Transcriber	Inaccurate code for incoming threat
Check Form 200 and chart for accuracy	Whiz Wheel, Form 200,Chart	Man,Vis,Cog		
Fill out known information on in-flight log	Wind sheet,Form 200	Man,Vis		
Determine Where Celestial observations will take place		Man,Cog		
Predetermine Radar targets at action points	Chart	Cog,Man,Vis		
Attend Pretakeoff Brief	Weather shop	Voc,Aud		
Perform Squadron Preflight Activities				
Check Flight Schedule for changes		Vis		
Review Flight Crew Information File (FCIF)		Vis		
Perform Base Operations Duties				
Attend Weather Briefing		Aud		
Check weather for impact on mission timing	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		
Check Aircraft parking spot	SOF	Voc,Aud		

Check receiver status	SOF	Voc,Aud		
Attend Crew Briefing and Cell briefing	CELL lead	Aud		
Pick-up Helmet and Oxygen Mask from life support		Man,Vis		
Pick up required in flight publications	Intel,TAC communications office	Man,Vis		
Pick up classified information	SOF intelligence,TAC comm. office	Man,Vis	Inaccurate decoding	Compromise classified mission
Check KIK-18		Man,Vis		
Pick up KY-58		Man,Vis		
Perform Extender Inspection				
Attend Crew Assembly		Aud		
Review 781 writeups		Vis		
Load Equipment onto Aircraft		Man,Vis		
Review Crew Aircraft Evacuation plan		Vis		
Power Off Inspect vn				
Check portable oxygen bottle				
Check Cleanliness, general condition, and stored in normal position	Dash 1	Vis		
Check For pressure approximating 300 psi	Dash 1	Vis		
Check Altitude Selector Knob in NORMAL position	Dash 1	Vis		
Service Portable Oxygen Bottle	Dash 1	Man,Vis		
Replace Portable Oxygen Bottle	Dash 1	Man,Vis		
Pick up helmet to oxygen		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 almanacs on board and current		Man,Vis		
Perform IFF Control Panel preflight				
Set Master Switch OFF	TAC Communications office	Man,Vis		
Set Mode 4 Code Switch to A or B	KIK-18	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 selectors OFF		Man,Vis		
Check CDU power switch in NORMAL or AUX		Man,Vis		
Set APN-218 Doppler Switch to OFF		Man,Vis		
Set Search Radar Control Panel		Man,Vis		
Set FTC Switch OFF		Man,Vis		
Set IAGC Switch OFF		Man,Vis		
Set PATT switches as desired		Man,Vis		
Set Bearing Switch as desired		Man,Vis		
Set STC Dial full counterclockwise		Man,Vis		

Set Sub Switch OFF		Man, Vis	
Set Gain Control full counterclockwise		Man, Vis	
Set Heading Select Knob to local magnetic variation		Man, Vis	
Set Scan Switch OFF		Man, Vis	
Set Test Meter Switch to "MAG"		Man, Vis	
Set Range Switch to 3-30/5		Man, Vis	
Set Function Switch OFF		Man, Vis	
Set Radar Pressurization Control switch to ON		Man, Vis	
Set Radar/Rendezvous Control Panel		Man, Vis	
Set Master Power Switch OFF		Man, Vis	
Set Pulse Width Switch (as required)		Man, Vis	
Set Code Selector Switches		Man, Vis	
Set electronic cabinet cooling switch to on		Man, Vis	
Set Search Radar Indicators		Man, Vis	
Set Range Delay Switch OFF		Man, Vis	
Set Intensity Control Knob fully counterclockwise		Man, Vis	
Set range control knob fully clockwise		Man, Vis	
Set interphone panel switches	Crew Coordination	Man, Vis	
Set FSACAS power switch OFF		Man, Vis	
Check Oxygen System		Man, Vis	
Turn Oxygen Supply Lever ON		Man, Vis	
Don Flight Helmet and Oxygen Mask		Man, Vis	
Check Helmet and Mask connections		Man, Vis	
Place Regulator-Diluter Lever to 100%		Man, Vis	
Test Oxygen Mask for leaks		Man, Vis	
Place Emergency Oxygen Toggle lever to EMERGENCY		Man, Vis	
Place Regulator-Diluter Lever to NORMAL		Man, Vis	
Place Emergency Toggle Lever to center position		Man, Vis	
Place Oxygen Supply Lever OFF		Man, Vis	
Place Oxygen Regulator-Diluter lever to 100 percent		Man, Vis	
Test Helmet Transmit/Receive capability		Man, Vis	
Take off helmet		Man, Vis	
Don headset		Man, Vis	
Test transmit/receive capability		Man, Vis	
Complete Crew Report		Voc, Aud	
Place Interphone Rotary Switch to CALL position		Man, Vis	
Acknowledge Crew Position (verbally)		Voc, Aud	

Power On Inspection			
Set control panel switches as required	Man,Vis		
Perform N 1 compass preflight	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			
Accomplish Grd Check	Man,Vis		
Perform INS/DNS System Preflight procedures			
Check INS Doppler Status Panel	Vis		
Set MSU-INS and MSU-DNS Mode selectors	Man,Vis		
to ALIGN			
Turn on FSA/CAS power switch	Man,Vis		
Perform APN-218 Doppler Checks	Man,Vis		
Turn Mode Selector to LAND	Man,Vis		
Perform Bk Test	Man,Vis		
Turn Mode Selector to OFF	Man,Vis		
Insert INS and DNS	Man,Vis		
Set IFF Mixer Switch as desired	Man,Vis		
Set IFF Antenna Switch to BOTH	Man,Vis		
Set RAD - TEST/MON Switch to OUT	Man,Vis		
Set IFF master switch to NORMAL	Man,Vis		
Test Modes 1, 2, 3/A and C	Man,Vis		
Encode Mode 4	Man,Vis	Keying errors	Must recheck all other code settings
Check Mode 4 light out	Man,Vis		
Set master switch to STANDBY	Man,Vis		
Set Mode 1, 2, 3/A, and C switches	Man,Vis		
required			
Set Mode 1, 2, and 3/A Codes	Man,Vis		
Set Audio/Light Switch	Man,Vis		
Set RAD - TEST/MON Switch	Man,Vis		
Turn APN-58 Function Switch to STBY	Man,Vis		
Perform Altimeter Preflight procedures			
Set Altimeter to correct Barometric	Man,Vis		
Compare Altimeter setting with field elevation	Man,Vis		
Accomplish DNS Interface Test	Man,Vis		
Accomplish INS Interface Test	Man,Vis		
Insert Waypoint Data	Man,Vis	Keying errors	Could severely impact mission success
Insert TACAN Data	Man,Vis	Keying errors	Could affect navigation accuracy
Verify waypoints	Man,Vis		
Perform launch authentication procedures			
Load KY-58	Man,Vis		
Request authentication and launch message from command post	Voc,Aud		
	Man,Vis		

Respond With correct Authentication		Vis		
Install sextant stool and sextant		Man, Vis		
Check sextant mount		Man, Vis		
Check sextant deascant		Man, Vis		
Check averager		Man, Vis		
Check sextant alignment		Man, Vis		
Observe a celestial body		Man, Vis		
Perform celestial precomp		Man, Vis		
Resolve sextant accuracy		Man, Vis		
Remove and stow sextant and stool		Man, Vis		
Turn FSA/CAS Power Switch ON		Man, Vis		
Fit Life Preserver Unit (LPU)		Man, Vis		
Starting Engines And Before Taxi				
Perform starting engines and before taxi checklist procedures		Man, Vis		
Turn Oxygen System ON		Man, Vis		
Set INS/DNS System to NAV Mode		Vis		
Don Gloves				
Monitor engine start		Vis		
Perform aircraft 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 doppler mode selection ON		Man, Vis		
Turn search radar to STBY		Man, Vis		
Set Radar/Rendezvous Beacon as required		Man, Vis		
Perform warning and indicator light test		Aud, Man, Vis		
Report over interphone "Ready to Taxi"		Man, Vis		
Check receiver status		Voc, Aud		
Ensure Taxi Clearance received		Voc, Aud		
Taxi				
Perform search radar turn on procedures				
Set Function Switch to SEARCH		Man, Vis		
Adjust Intensity Control		Man, Vis		
Adjust heading mark intensity control		Man, Vis, Cog, Aud, Voc		
Set Scan Switch as desired	Crew Coordination	Voc, Aud		
Set Slab Switch to UP	Ground and clearance control	Man, Vis, Aud		
Fine-tune Radar	SOF	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 accomplished		Voc, Aud		

Fasten Seat Belt and Shoulder Harness		Man, Vis		
Perform safety check		Man, Vis		
Prepare For Takeoff		Man, Vis		
Report Ready For Takeoff		Man, Vis		
Perform before Takeoff Checklist procedures				
Set Radar/Rendezvous Beacon		Man, Vis		
Set IFF (as required)		Man, Vis		
Perform Takeoff Roll		Vis		
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		
Ensure Gear Up		Vis		
Ensure Flaps are raised		Vis		
Cell Joinup				
Direct Pilot Into Enroute Formation	RAPOON	Man, Vis, Voc		
Use All available equipment to effect join up		Man, Vis		
Inform pilot of other aircraft's position		Voc, Vis		
Ensure Level Off in Altitude Block		Man, Vis		
Acquire lead aircraft on radar		Man, Vis, Voc	Misread radar	Mishap
Make departure call		Man, Vis, Voc		
Monitor Departure Being Flown		Vis		
Ensure Correct Headings are flown		Vis		
Ensure Correct Altitudes are flown		Vis		
Perform after takeoff checklist procedures				
Check IFF Mode 4 Caution Light off		Vis		
Reset Altimeter at Transition Altitude		Man, Vis		
Ensure Oxygen Requirements Are Met				
Ensure Oxygen is ON and at 100% when aircraft is above 10,000 feet		Man, Vis		
Ensure Oxygen is readily available above FL250		Man, Vis, Voc		
Don Helmet 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	Mishap
Record Level Off Time	Training sheet	Man, Vis, Aud		
Monitor Interphone And Radios		Aud		
Monitor Interphone and COMM radios from takeoff		Aud		

Monitor HF when out of home station UHF range during alpha monitor periods		Aud			
Cruise					
Complete Communication Log		Man, Vis			
Request And record UHF Traffic		Man, Vis, Aud, Voc			
Accomplish HF Contact		Man, Vis, Aud, Voc			
Record HF Traffic		Man, Vis, Aud, Voc			
Monitor Radios And Interphone		Aud			
Monitor UHF Command Post/Cell frequency		Aud			
Monitor UHF Air Traffic Control	ATC	Aud			
Inquiries					
Monitor HF giant talk during alpha monitor period	TACANVOR	Aud			
Update IFF Mode 3A as required	TACANVOR	Man, Vis, Aud	Omission		
Monitor Interphone as required	TACANVOR	Man, Vis, Aud			
Monitor And Update Navigation Equipment		Man, Vis, Aud			
Update INS/DNS position		Man, Vis			
Monitor APN 50 Radar		Man, Vis, Aud			
Monitor Navigation Radio aids		Man, Vis, Aud			
Perform station keeping duties					
Keep Aircraft within 10 NM of track		Man, Vis, Aud, Voc			
Direct Aircraft to avoid thunderstorms by 10 NM below FL290		Man, Vis, Aud, Voc, Cog	Misread radar		Aircraft damage
Direct Aircraft to avoid thunderstorms by 20 NM at or above FL230		Man, Vis, Aud, Voc, Cog	Misread radar		Aircraft damage
Make in-flight log entries		Man, Vis			
Record Aircraft position and time at all planned turn points		Man, Vis			
Record Aircraft position at least once every 30 minutes		Man, Vis			
Perform Celestial Navigation	Mission Accomplished Report	Man, Vis, Cog, Aud, Voc			
Ensure Celestial Navigation clearance is obtained	Navigation aids, INS, DNS, TACAN	Man, Vis, Aud, Voc			
Set Equipment as required for specific navigation Log		Man, Vis			
Take coast out files		Man, Vis, Cog, Aud, Voc			
Record accurate start position and time	Air almanac/HO-249	Man, Vis, Cog			
Compute "Alter Heading" and ETA to turn		Man, Vis, Cog, Voc			
Perform Celestial Procedures		Man, Vis, Cog			
Perform Dead Reckoning (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			

Direct aircraft along planned route to coast and point/ADIZ		Man, Vis, Cog, Voc		
Accomplish celestial control time to air refueling control point		Man, Vis, Cog		
Monitor navigation equipment for malfunction		Vis		
Perform Overwater Navigation				
Update INS/DNS as required		Man, Vis, Cog		
Set IFF as required		Man, Vis, Cog, Aud		
Set APR-216 to SEA		Man, Vis		
Track Aircraft Position		Man, Vis		
Use all navigation aids to monitor position within 20 NM of track		Man, Vis, Cog		
Update ETAs to Pilot as necessary for HF position report		Man, Vis, Voc, Aud		
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 Pilot informed (verbally) on aircraft position		Man, Vis, Voc, Aud		
Ensure 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
Maintain ATC assigned airspace and altitude		Man, Vis, Aud, Voc		
Set Equipment As Required For Rendezvous		Man, Vis		
Monitor/Set Miscellaneous Equipment		Man, Vis		
Set Assigned Radio Frequencies		Man, Vis, Aud, Voc		
Monitor Radios		Aud, Voc		
Set Altimeter as required		Man, Vis		
Monitor Altitude	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	Miss rendezvous
Determine Turn Range from chart using TAS closure and drift inbound		Man, Vis, Cog		
Determine Offset required from chart using TAS and drift inbound		Man, Vis, Cog		
Set Oxygen Regulator As Required		Man, Vis, Aud, Voc		
Set Oxygen Regulator to ON		Man, Vis, Aud, Voc		
Set regulator-diluter Lever to 100%		Man, Vis, Aud, Voc		
Perform Rendezvous				
Ensure ATC clearance to air refuel received		Man, Vis, Aud, Voc		
Conduct Point Parallel Rendezvous		Man, Vis		

Establish Offset		Man, Vis		
Accomplish Automatic Direction Finder		Man, Vis		
(ADF) check				
Accomplish Positive Beacon ID		Man, Vis		
Start Timing		Man, Vis		
Instruct Pilot to turn at turn range	Radar, compass, DME	Man, Vis, Voc, Aud		
Monitor echelon position		Vis		
Place Beacon to STBY as required		Man, Vis		
Initiate Overrun Procedures		Aud, Voc		
Perform Precontact	Crew Coordination, contact light	Man, Vis		
Air Refueling				
Set Equipment As Required	Crew Coordination, contact light	Man, Vis		
Set Rendezvous Beacon Control to STBY	Crew Coordination	Man, Vis		
Record Air Refueling 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 Radar for optimum picture		Man, Vis		
Keep Pilot advised of position		Man, Vis, Voc, Aud		
Maintain ATC Clearance Requirements		Man, Vis	Requirements not maintained	Airspace violation
Alter Aircraft as necessary to maintain course within 10 NM of cleared course		Man, Vis, Voc, Aud, Cog		
Monitor And update NAV systems		Aud, Man, Vis		
Monitor Interphone and Radios		Aud		
Monitor UHF Radios		Aud		
Monitor HF Radio		Aud		
Monitor Interphone		Aud		
Perform Breakaway Procedures		Man, Vis, Voc, Aud		
Configure Radar to skingaint Receiver at bottom of AR block		Man, Vis		
Set APN-88 to OPERATE		Man, Vis		
Monitor Altitude		Man, Vis, Voc, Aud		
Post Air Refueling				
Set Radar/Rendezvous Beacon to OFF		Man, Vis		
Monitor Radios		Man, Vis, Aud		
Set Altimeters		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 announce ETA to coast end	Coordinate with lead aircraft	Man, Vis, Cog, Voc	Error - ADIZ violation	Violate ADIZ entry point
Accomplish coast end 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 navigation responsibilities		Man, Vis, Voc, Aud		
Plan Divert				
Plan divert				
Prepare chart		Man, Vis, Cog, Aud, Voc		
Compute distance, time, and fuel	Crew Coordination	Man, Vis, Cog, Voc		
Prepare for Descent		Man, Vis, Cog		
Navigate To IAF		Man, Vis	Altitude Errors	Mishap
Monitor #1 aircraft	Crew Coordination	Man, Vis		
Review Penetration and Approach	ATC	Man, Vis, Cog, Aud, Voc		
Review highest terrain	Metro	Man, Vis		
Review emergency airfields		Man, Vis		
Review special use airspace		Man, Vis		
Authenticate mission change		Man, Vis, Aud, Voc		
Monitor weather reports		Man, Vis, Aud, Voc		
Monitor Alcnrow Terminal Information	RAPCON and command post	Man, Vis, Aud		
service (ATIS)				
Set Altimeters		Man, Vis		
Fasten safety belt and shoulder harness		Man, Vis		
Ensure Approach Clearance received		Man, Vis, Aud, Voc		
Contact Command Post		Man, Vis, Aud, Voc		
Descent				
Perform Descent Altitude Procedures				
Make "2,000' Prior to Assigned	RAPCON	Man, Vis, Voc	Miss altitude call	Mishap
altitude" call				
Make "1,000' Prior to Assigned		Man, Vis, Voc	Miss altitude call	Mishap
altitude" call				
Monitor Cell breakup		Man, Vis, Aud, Voc, Cog		
Perform Instrument Approaches	Approach plate	Man, Vis, Aud, Voc, Cog		
Perform Airborne Directed Radar		Man, Vis, Aud, Voc, Cog		
Approach (ARA)	Approach plate			
Relay Ground Speed and Drift Information		Man, Vis, Voc, Aud		
Ensure Altitude Restrictions are met		Man, Vis, Voc	Altitude violation	Mishap
Configure Radar		Man, Vis		
Direct Descent as published as required		Man, Vis, Voc, Aud		
Monitor Approach		Man, Vis		
Monitor Radios		Man, Vis, Aud		
Monitor timing as required		Man, Vis		
Perform Safety Checks				
Scan For Traffic		Vis		
Check Flap setting		Vis		

Check Gear position down		Vis		
Check Pilot Approach Speed		Vis		
Check Fuel Panel	Approach plate	Vis		
Announce approach for decision height or MDA	Approach plate	Man,Vis,Voc		
Call Missed Approach Point as required	Chart	Man,Vis,Voc		
Perform Go Around as required		Man,Vis,Voc,Aud		
Ensure Missed Approach Procedures are accomplished		Man,Vis,Voc		
Advise Pilot of any hazards noted		Man,Vis,Voc		
Make Required Altitude calls		Man,Vis,Voc		
After Landing				
Record Time		Man,Vis		
Monitor landing roll out/ground speed		Vis		
Accomplish after landing checklist				
Call command post		Voc,Aud		
Pass landing time		Voc,Vis		
Get parking		Aud,Voc		
Monitor radios		Aud,Vis		
Turn Equipment Off				
Set Mode 4 Code Switch		Man,Vis	Setting	Harm ground personnel
Set Mode 4 On/Off Switch OUT		Man,Vis		
Set IFF Master Switch OFF		Man,Vis		
Turn APN-218 System OFF		Man,Vis		
Turn DNS MSU Switch OFF		Man,Vis		
Set Search Radar Control Panel		Man,Vis		
Set Gain Control counter clockwise		Man,Vis		
Set Intensity Control counter clockwise		Man,Vis		
Set Heading Marker Control 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,Vis		
Set Oxygen 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		
Load Airplane Actual Position		Man,Vis		

BOOM OPERATOR'S TASK LIST

TASK	OUTCOME	MODALITY	ERRORS	ERROR EFFECTS
Cargo Loading				
Plan Cargo Loading	For proper loading within design limits of aircraft	Man.Vis,Aud,Voc,Cog		
Check Cargo Unit Dimensions	For fit into aircraft	Man.Vis,Aud,Voc	Transcription	Incorrect cargo load plan
Check for Hazardous Materials	Special terms, packaging, securing	Man.Vis,Aud,Voc	Transcription	Customs/safety problems
Determine Weights of Cargo Units	For CG calculations, footprint limits	Man.Vis,Aud,Voc	Transcription	Incorrect load plan and CG
Determine CG location of large cargo loads	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 so that it stays within limits	Man.Vis,Cog		
Determine Load Plan of Cargo	To ease unload, stay within limits		Misplace equipment	Incorrect cargo load plan, CG
Complete Forms 83, 83A, and 84	Aircraft load plans (actual schematics with calculations)	Man.Vis,Cog		
Determine Total Load and Aircraft CG location	This will feed into mission planning and takeoff data	Man.Vis,Cog	Error in CG location	
Coordinate and Order Flight Meals	Taking orders from crew, making the request to the flight kitchen	Man.Vis,Aud,Voc		
Check Tail Support Strut installed	Must be in place prior to loading to keep aircraft from falling on its tail	Man.Vis	Omission, improper installation	Tipping of aircraft/damage
Check Check position	Move from fire to compensate for tire compression during cargo loading	Man.Vis	Improper placement	
Check Ground Wire installed	Must be installed for electrical hazard safety	Man.Vis	Omission	Safety hazard
Check Cargo Loading Area clear	Remove obstructions, debris, loose equipment	Man.Vis	Omission	Trip hazards, damage to equipment
Check Fire Extinguisher available	For fire safety	Man.Vis	Omission	Fire safety hazard
Check Tie-down Equipment	Ensure adequate quantity, in proper condition	Man.Vis	Omission	Damage to cargo
Check Shoring	Ensure adequate quantity, in proper condition	Man.Vis	Insufficient amount	Time factor (to get more shoring)
Open Cargo Door	For access to cargo bay	Man.Vis	Not opened far enough	May not clear vehicle/damage
Check Cargo Door Sill protected	Place shoring on door sill area to protect latching mechanism	Man.Vis	Omission	Latching mechanism damage, Safety of Flight (SOF)
Stow Seats	Fold them up out of the way	Man.Vis	Omission	Seats can get in way/damage
Position Shoring	In path of cargo to be loaded to disperse weight during loading	Man.Vis	Misplacement	Damage to floor
Check Manifest and Waybills	Cargo must have accompanying paperwork	Man.Vis,Cog	Omission, misread	Customs problems
Check Mounted Cargo secured to carrier	Equipment on trailers, loaders should be properly secured	Man.Vis	Omission, improper mounting	Damage to vehicle, cargo, and aircraft
Brief Load Team Members	Assign them their positions, duties	Aud,Voc	Omission, inadequate briefing	Bad coordination, time factor

Position Loading Vehicle	Direct the vehicle to the cargo door for proper positioning	Man,Vis	Improper backing signals	Aircraft and vehicle damage
Load Cargo	Load each piece in proper order.	Man,Vis	Misplacement of cargo	CG problems and aircraft and cargo damage
Secure Cargo	position in accordance with Forms 83 in accordance with T O's	Man,Vis	Asymmetric and improper tiedown	Shifting of cargo, damage
Stow Loose equipment	Walkthrough of cargo area to secure all unsecured equipment	Man,Vis	Omission	Top hazards, SOF
Preparation for Flight				
Complete DD Form 365-4 weight and balance information	Calculate aircraft takeoff gross weight, CG, and ensure its within limits	Man,Vis,Coq	Math errors and incorrect information	CG errors
Complete AF-781, AF-791, and AFIO-76	781-flight time, 791-fuel offload report 76-structural life report	Man,Vis,Coq	Incorrect information and incorrect tail number	Bad mission paperwork
Perform Boom Operator Portion of mission briefing	Inform crew of offload schedule, etc	Man,Vis,Aud,Voc		
Brief Offload Type	Boom or drogue	Man,Vis,Aud,Voc		
Brief Offload Amount	Fuel weight	Man,Vis,Aud,Voc		
Brief air refueling control times	Contact times	Man,Vis,Aud,Voc		
Brief Receiver Type	Type of receiving aircraft	Man,Vis,Aud,Voc		
Brief Receiver Callsigns		Man,Vis,Aud,Voc		
Base Operations Activities				
Check Crew Information File	For base closures, changes, etc.	Man,Vis		
Coordinate Life Support Equipment	For each crewmember and any additional passengers	Man,Vis,Aud,Voc	Inefficient amount or wrong type	Time factor and passenger problems
Attend Weather Briefing		Vis,Aud		
Pick up Flight Meals		Man,Vis		
Preflight				
Perform Interior Inspection				
Perform Crew Assembly	Brief where oxygen bottles located	Man,Vis,Aud,Voc		
Review Aircraft Forms	Become aware of aircraft disposition, problems, and status	Vis,Aud,Voc		
Load on Personal and Professional equipment	Bags, helmets, publications, secrets	Man,Vis		
Enter Alt 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, helmets, publications, etc on seat	Man,Vis	Omission, wrong location	Time factor
Walkthrough Aircraft to Determine preflight schedule	A first look around to see if there will be any problems	Man,Vis		
Check Circuit Breakers	Ensure all are in	Man,Vis		
Remove And stow Nose Gear Ground downlock And Release Handle	To allow nose gear retraction after takeoff	Man,Vis,Coq	Omission, misread	SOF, time factor
		Man,Vis	Omission	Nose gear will not retract, SOF

Perform Boom Operator's Forward station preflight	Emergency equipment checks			
Check Portable Oxygen Bottle	Check service record, selector in NORMAL	Man.Vis	Omission, misread	SOF
Check Interphone Panel settings	Selector switches on INTERCOM, check intercom channel	Man.Vis	Water switch in wrong position	
Check Interphone	Put on helmet, check transmit and receive	Man.Vis,Aud,Voc	Omission	Headset or panel may not work
Perform Oxygen System check	Regulator function check	Man.Vis		
Perform Crew Report	Check CALL position on intercom, also serves as a reference point for	Aud,Voc		
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 Sextant Mount	Check for damage to mount, that it's not installed backwards	Man.Vis	Installed backwards	Incorrect Zn for celestial shots
Install Sextant		Man.Vis		Sextant damage, misalignment
Check Alignment of Sextant	Check accuracy of sextant	Man.Vis	Improper alignment	Inaccurate celestial shots
Check Timer	For proper operation, accuracy	Man.Vis	Omission	May not average over 2 min
Perform Instantaneous Shoot	Final check of sextant operation, provides sextant correction	Man.Vis,Cog	Shoot false body	Inaccurate reading or sextant
Remove And store Sextant		Man.Vis		
Remove And store Sextant Stool		Man.Vis		
Perform cargo compartment preflight				
Check cargo compartment air condition master switch in MANUAL	Keeps hot air from entering cabin	Man.Vis		
Check passenger station oxygen panel	Place in OFF and 100% for switch position check and operation	Man.Vis	Omission, switch in wrong position	Possible depletion of oxygen supply
Check Emergency Interphone Panel	Operation check with a headset	Man.Vis,Aud,Vis	Omission	SOF
Check Aft Compartment Interphone panel	Operation check with a headset	Man.Vis,Aud,Vis	Omission	SOF
Check Gaseous Oxygen System quantity gauge	Adequate pressure	Man.Vis	Omission, misread	SOF
Check Gaseous Oxygen System valves	Valve position	Man.Vis	Omission, wrong position	SOF
Check Air Outlet Doors and defrost slide	Backup defroster for boom pod windows	Man.Vis	Omission	Backup defroster may be inoperable
Open Sighting Door	Checks door operation, allows flow of hydraulic fluid	Man.Vis	Omission	Sighting door may be inoperable
Check Interphone Panel	Operation check with a headset, ensure communication with pilots and navigator	Man.Vis,Aud,Voc	Omission, improper switch position	SOF (communications with receiver)
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, depletion 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 or manual retract mode	Man.Vis	Omission	Lights may be inoperable
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.Vis,Cog	Omission	SOF

Set air refueling boom operator's panel master switch ON	Gives power to Boom Pod Panels, allows reading of the gauges	Man, Vis	Omission	No DC power to air refueling equipment
Check Boom fully retracted	Check gauge for full retraction	Man, Vis	Omission	
Perform Signal Coil Test	Press to test for either open or shorted	Man, Vis	Omission	May have no disconnect capability
Set Underbody and Underwing lights ON	Turn on to full bright	Man, Vis	Omission	No lights for receiver under KC-135
Check Nozzle Light and Tail mounted floodlight	Turn on, ask Crew Chief if they're on	Man, Vis		
Check Sighting Door open		Man, Vis	Not ensuring door opened completely	Damage to door, inoperable in flight
Close Sighting Door Lever	Must close it prior to takeoff	Man, Vis		
Set Rudderator Trim Control at ZERO	For trim starting point (Normal setting for lighters)	Man, Vis	Omission	Changes angle of boom ruddervators puts stress on boom - damage
Perform Boom Compartment Checks		Man, Vis	Boom latch lever not closed	Could drop boom
Recheck All Applicable Swift Dies		Man, Vis	Math errors, misread	CG and aircraft performance impacts
Perform miscellaneous preflight procedures		Man, Vis, Cog		
Verify DD Form 365-4 data	Verify cargo and fuel loaded correctly make changes to 365-4 if required	Man, Vis, Cog		Gear cannot retract, SOF
Conduct Ground Safety Locks Check	Gear locks removed and stowed in aircraft	Man, Vis	Omission, miscount	
Inform Pilot of Actual Takeoff weight and center of gravity		Vis, Voc		
Ensure Cargo and loose equipment secure	Walkthrough to ensure all equipment and cargo is stowed and light	Man, Vis	Improper tiedown	Shifting and loosening of cargo
Perform APU Accumulator Check	Check for correct pressure	Man, Vis	Omission	Insufficient pressure for restart
Close Cargo Door and Emergency exit hatches	To allow pressurization, keep out smoke and fumes	Man, Vis	Omission, improper procedure	SOF and depressurization in flight
Brief Passengers	On emergency procedures	Man, Vis, 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	SOF
Position Life Support Equipment	Head count and oxygen kits match up	Man, Vis	Omission, improper inspection	SOF
Check Passenger Information Cards	Currency, sufficient number of cards	Man, Vis	Omission	SOF and outdated cards
Remove floor obstructions	Ensure passenger area is clear	Man, Vis	Omission	SOF and trip hazard
Install boom operator's compartment entry panels		Man, Vis	Omission	SOF and fall hazard
Open Cargo Door		Man, Vis		
Position Passenger Loading Stand		Man, Vis		
Brief Passengers		Man, Vis, Aud, Voc	Omission	SOF
Direct personnel to seats and verify manifest	Brief individuals that will be seated near emergency exits	Man, Vis, Aud, Voc		
Check Cargo Manifest	All items accounted for	Man, Vis	Omission	Customs problems
Secure Baggage and loose equipment		Man, Vis	Omission	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		
Remove Entrance Ladder	Clear entrance area	Man, Vis	Omission	Cannot close door

Close And latch Entry Door		Man, Vis	Omission, not latched properly	SOF and depressurization
Show Entrance Ladder		Man, Vis	Omission, improper stowage	Tripping hazard
Check Emergency Exit Hatches	Ensure aircraft integrity	Man, Vis	Omission, not latched properly	SOF and depressurization
Turn on boom operator's compartment window heat switch	Window defroster	Man, Vis	Omission	Fogged sighting window and cold pod
Check air refueling line valve open	Fuel can be dumped through boom	Man, Vis	Omission	Cannot dump fuel if necessary
Cycle APU Generator Switch	Resets generator for next preflight	Man, Vis	Omission	Time factor for next aircrew
Before Takeoff				
Notify passengers and extra crewmembers prepare for takeoff	Seat belts on	Aud, Voc	Omission	SOF, crew, and passengers may not strap in
Check cargo door closed and locked	Aircraft integrity	Man, Vis	Omission, improper latching	SOF and depressurization
Complete TAXI Report	Report ready for takeoff	Aud, Voc		
Walkthrough from boom pod	Last check before takeoff	Man, Vis		
Monitor Electrical Control Panel	Backup flight crew	Vis	Omission, misread	SOF
Takeoff and Climb				
Check passenger and extra crewmember status	Seat belts on	Man, Vis		
Check Fuel distribution	Check 344-4F figures against actual, no leaks	Vis	Omission, misread	SOF
Check Circuit breakers	Reset if applicable (Not fuel system)	Man, Vis, Cog	Omission, misread	SOF and extra workload
Set Oxygen Panel ON, 100%		Man, Vis	Omission	SOF
Fasten and lock safety belts and harness	Preparation for takeoff	Man, Vis	Omission	SOF
Complete Takeoff Report	Report ready for takeoff	Aud, Voc	Omission, not ready to report	Time factor
Monitor takeoff	Crosscheck and backup flight crew	Vis	Misread, improper reaction	SOF
After Takeoff				
Turn Off Wheel Well Lights		Man, Vis	Omission	Impact life of light bulbs
Set air conditioning master switch to		Man, Vis	Omission	No cabin pressurization
CONDITION AIR				
Install Sextant Stool		Man, Vis		
Install Sextant		Man, Vis		
Check Cargo Compartment	Check for fumes, cargo, shifting, and passenger status	Vis	Omission, misread	Shifting cargo, smoke, and fumes
Turn On Nacelle Illumination		Man, Vis	Omission	No light on engine nacelles
Set Boom Nozzle Light	Allows bulb to heat	Man, Vis		
Set Boom Marker Lights	For lighter refuelings	Man, Vis		
Cruise				
Provide Crew Support (as required)		Man, Vis, Aud, Voc, Cog		
Take Celestial Observations				

Collect Azimuths and Elevations from navigator	To dial into sextant mount and position sextant	Man,Vis,Aud		
Dial in Azimuth and Elevation		Man,Vis		
Take Celestial Observations		Man,Vis		
Give Elevations to Navigator		Vis,Voc		
Air Refueling				
Perform Air Refueling Preparation procedures				
Set Forward Oxygen Panel OFF, 100%	Moving from cockpit to boom pod	Man,Vis	Omission	SOF
Set Refueling Oxygen Panel	Plug into aircraft oxygen system, can stay on oxygen bottle	Man,Vis	Omission, incorrect setting	SOF
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 Signal Coil	Can't disconnect without a "Good" condition	Man,Vis	Omission	If bad coil, cannot disconnect
Set Telescope-A1-Disconnect	Fighters-MANUAL, others-AUTO	Man,Vis	Omission, set to AUTO	Could pull receiver into KC-135
Ensure extension and elevation limit switches active	Check	Man,Vis	Omission, incorrect setting	
Set Emergency Override Switch	NORMAL-Limits are active, OVERRIDE-no limits	Man,Vis	Incorrect setting	Confusion of system configuration
Set receiver director light rheostats	Set intensity of Pilot Director Indicator (PDI) lights	Man,Vis		
Turn On air refueling Floodlight	Aids in depth perception	Man,Vis		
Set ruddertrim trim control to zero		Man,Vis	Omission	Cannot lower boom until zeroed
Perform Boom Lowering Procedures				
Raise 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		
Extend Boom	Check "flight" characteristics	Man,Vis	Omission, not extending far enough	
Check Boom Controls	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 comm for breakaway	Aud,Voc		
Set External Lights		Man,Vis		
Provide Visual commands to receiver	Via PDI lights	Man,Vis,Cog	Incorrect, not timely	SOF and time factor
Maintain Required communications with receivers	Via PDI lights or radio	Man,Vis,Aud,Voc		
Maintain Proper Boom alignment	Keep light out of receiver's eyes; keep aligned with receptacle	Man,Vis	Incorrect	Strike receiver
Perform Air Refueling				
Perform Contact Procedure		Man,Vis		
Monitor Boom Position Indicators	Within limits	Vis	Incorrect position	SOF
Monitor Receiver position	Within limits (don't bow the boom)	Vis	Insufficient monitoring	Blind receptacle or strike receiver
Perform disconnected or breakaway procedures	If outside limits or before damage occur	Man,Vis	Omission	Pull receiver into KC-135

Recycle System for subsequent contacts	Reset button reconfigures PDI lights and signal amplifier	Man,Vis	Omission	PDI lights not reset, it in NORMAL after disconnect, no fuel flow
Perform Post Air Refueling				
Set Ruddervator 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 door lever	Reduce aircraft drag	Man,Vis		
Check Ruddervators locked	Reduces drag and checks boom fully stored	Man,Vis	Omission	Stress on boom, aircraft control
Set Telescope-At-Disconnect switch	To MANUAL while boom is stowed	Man,Vis	Omission	Possible rapid boom retraction
Set external lights	Turn off PDI lights	Man,Vis		
Set refueling station oxygen panel	Check Oxygen bottle quantity, turn off and bleed down pod oxygen	Man,Vis		
Inform Pilot BOOM STOWED		Aud,Voc		
Return to Forward Cabin	Walkthrough to check on passengers	Man,Vis		
Set forward station oxygen panel ON, 100%		Man,Vis	Omission	SOF
Descent				
Calculate landing center of gravity	To ensure within limits	Man,Vis,Cog	Math error, lookup error	Incorrect CG
Stow Seatant Stool and Seatant		Man,Vis	Omission, damage to seatant	Trip hazard and seatant damage
Check Circuit Breakers	Reset as required	Man,Vis,Cog		
Set Cargo Compartment Temp	As desired	Man,Vis		
Walkthrough to Boom Pod	Ensure boom latched	Man,Vis		
Perform Boom Latched Check		Man,Vis	Omission	SOF and damage to aircraft on landing
Walkthrough to Forward Cabin	Return to cockpit for landing	Man,Vis		
Fasten and Lock Safety Belt and shoulder harness		Man,Vis		
Monitor Electrical Control Panel	Flight crew backup	Vis		
Monitor Fuel Panel	Flight crew backup	Vis		
After Landing				
Perform After Landing Procedures				
Set Oxygen OFF, 100%		Man,Vis	Omission	Deplete oxygen system
Install Nose Gear Ground Down	Keep gear down and locked	Man,Vis		
Lock And Release Handle				
Check APU start accumulator pressure gauges	Ensure that accumulator did not bleed, sufficient pressure for next engine start	Man,Vis	Omission and insufficient pressure	
Set cargo compartment temperature control switch to manual	Temperature control in cargo bay	Man,Vis		
Perform Aircraft Checks				
Set Interphone		Man,Vis	Omission	
Open Entry Door		Man,Vis		
Open Grill		Man,Vis		
Install Entrance Ladder		Man,Vis		
Close Grill		Man,Vis		

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 Time Factor, a Mental Effort Factor, and a Stress Factor. 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

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

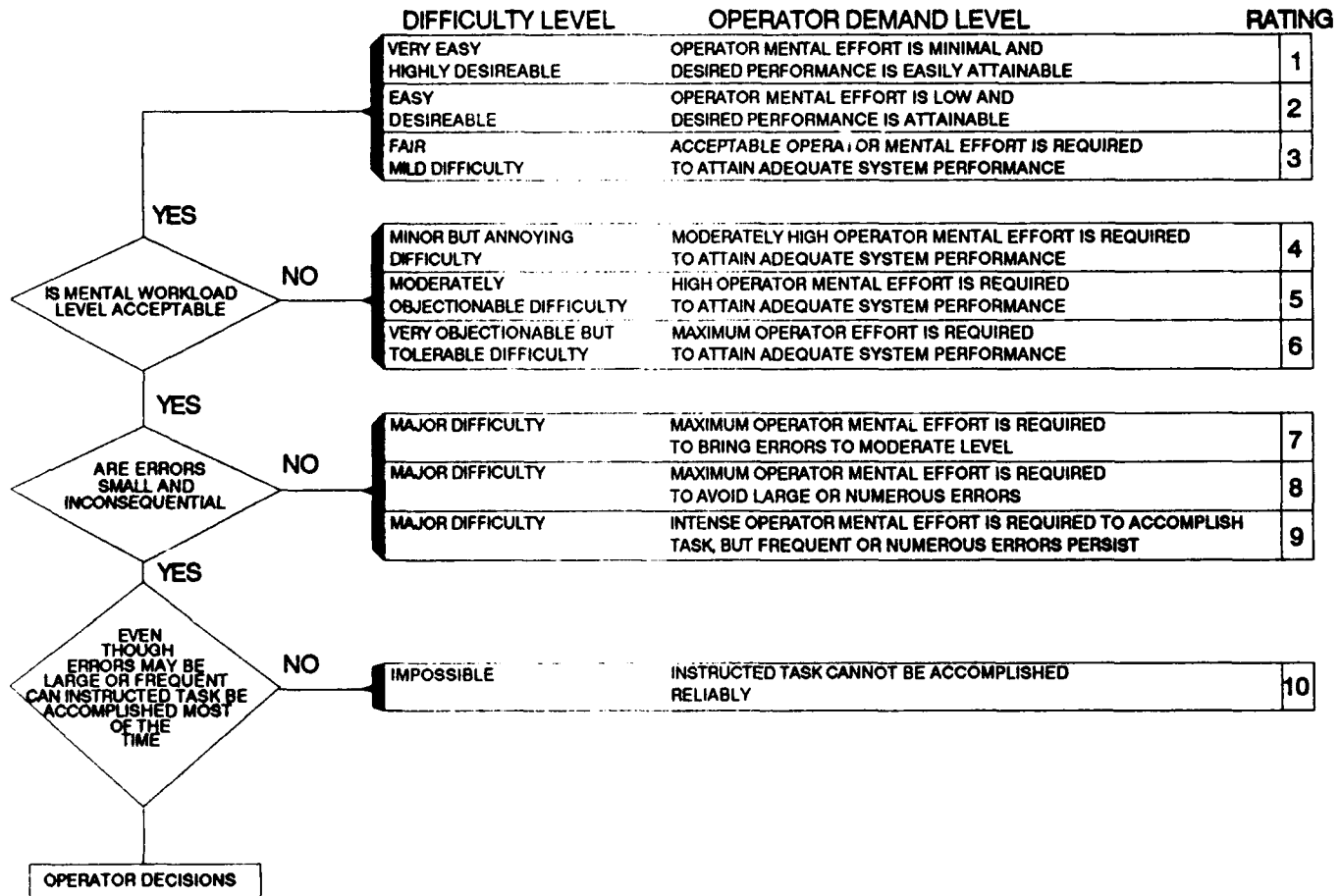
Plan divert

Descent

Approach and landing

After landing

WORKLOAD RATING SCALE



APPENDIX D

THREE MAN CREW TASK LISTS

PILOT FUNCTIONS

Complete mission paper work
Discuss mission requirements with wing intelligence and communications officers
Attend pretakeoff brief
Complete Navigator briefing guide
Complete correlation sheet
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

COPLOT FUNCTIONS

Complete offload plan
Get Form 365 data from Boom
Print out Form 200
Discuss mission requirements with wing intelligence and communication officers
Attend pretakeoff brief
Input coordinates, airspeeds, altitudes, control times, gross weight, fuel load, receiver type and offload amounts
Select navigation charts
Develop route of flight to meet mission timing
Place special use airspace data on charts
Place emergency airfields on charts
Annotate highest terrain and obstructions on chart
Annotate level off point
Annotate ADIZ entry point (if applicable)
Predetermine radar targets at action points

BOOMER FUNCTIONS

Plan Cargo Loading
Check Cargo Unit Dimensions
Check For hazardous materials
Determine Weights of Cargo Units
Determine CG Location of Large cargo loads
Compute Contact Area Pressures
Determine Shoring Requirements
Determine load plan for cargo
Complete Forms 83, 83A, and 84
Determine Total Load and Aircraft CG location
Coordinate and Order Flight Meals
Perform Aircraft Exterior preparation for cargo loading
Check Tail Support Strut Installed
Check Chock position
Check Ground Wire Installed
Check cargo loading area clear
Check Fire Extinguisher available
Perform Aircraft Interior preparation for cargo loading
Check Tie-down Equipment
Check Shoring
Open Cargo Door
Check Cargo Door Sill protected
Stow Seats
Position Shoring
Check Manifest and Waybills
Check Mounted Cargo secured to carrier
Brief Load Team Members
Position Loading Vehicle
Load Cargo
Secure Cargo
Stow Loose equipment
Perform Flight Crew Planning
Complete DD Form 365-4 weight and balance
Information with computer by hand calculation
Complete Other mission planning paperwork:
AF-781, AF-791 or AFTO-76
Perform Boom Operator Portion of mission briefing
Brief Offload Type
Brief Offload Amount
Brief Air Refueling Control times
Brief Receiver Type
Brief Receiver Callsigns
Discuss mission requirements with wing intelligence and communications officers
Attend pretakeoff brief

PILOT FUNCTIONS

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

COPILLOT FUNCTIONS

Read Flight Crew Information File
Pick up Publications, Quick dons, helmet, and mask from life 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
Recompute weight and balance if necessary
Attend crew briefing and CELL briefing
Pick-up helmet and oxygen mask from life support
Check KIK-18

POWER OFF/WALKAROUND INSPECTION

PILOT FUNCTIONS

Read AF Form 781
Notify crew of type of fuel on board
Verify APU with generator installed
Notify crew of engine start time
Brief AF Form 781 data
Review AF Form 781 data, as required
Complete mission and weather briefing
Announce start engine time
Provide additional instructions, as required
State which APU has generator
Perform walkaround inspection
Inspect and close nose compartment
Check for presence of Foreign Object Damage (FOD)
Check nose wheel well
Check nose gear condition
Ensure nose gear pin removed
Ensure actuators are connected to nose gear doors
Check manual defueling valve cover closed
Check right wheel well
Check right system hydraulic accumulator pressure
Check wheel well
Set manual refueling valve handle to FLIGHT
Check single point refueling receptacle
Check single point refueling panel
Ensure landing gear door downlocks are removed
Ensure landing gear pins are removed
Check right wing
Check general condition of engines
Check fuel bottle discharge indicators
Check fire bottle pressure gauges
Check all fuelage and fuel assembly
Check general condition of fuselage/empennage
Check general condition of boom
Check top surface of wings
Ensure APU doors closed
Check left wheel well
Check left system hydraulic accumulator pressure
Check reserve brake accumulator pressure
Check wheel well/gear general condition
Ensure gear door downlocks removed
Ensure landing gear safety pins removed
Check left wing
Check general condition of engines
Check fire bottle discharge
Check fire bottle pressure
Inspect aircraft main fuelage area
Ensure pilot covers are removed
Check aircraft ramp general condition
Ensure pins, downlocks and ground wheels removed
Set Electronic Cabinet Cooling switch to ON
Set Search Radar Indicators
Set Interphone panel switches as desired

COPILOT FUNCTIONS

Attend Crew Assembly
Perform Interior Inspection (Power 7)
Check FDR/QCA Circuit Breakers
Check Instructor Oxygen Panel
Check Regulator OFF, Deluxer lever at 100%
Bleed pressure down
Check Portable Oxygen Bottles
Set Altitude Selector Knob to NORM
Check pressure above 50 psi
Check Hydraulic Press. Switch OFF
Check Engine Starter Switch OFF (R)
Check PWC switches ON, guard closed
Check Emergency Hydraulic crossover valve lever in NORMAL
Check Pressurization/Air conditioning panel
Check Cabin Pressure Test Valve handle position
Set Cabin Manual Pressure Control OFF
Set Cabin Pressure Controller as required
Set Cabin Pressure Rate Of Change knob as desired
Check Air Conditioning Crossover switch OPEN
Set Cabin Temperature Control as desired
Check Alternate Pressurization switches OFF & guards closed
Check Overhead Panel
Check radios in preset mode
Set manuals frequency to initial planned frequency
Check UHF Comm 1
Check UHF Comm 2
Check all switches OFF
Check Flight Director Mode selector switch in GYRO
Check DG Switches NORMAL (R)
Check Fire Switches IN
Check Inboard Spoiler Switch in CUTOFF
Check Landing Gear Handle DOWN, in Desert
Check Fuel Panel
Check all Fuel Valves CLOSED
Check all switches OFF
Set CDU Select Panel
Check Power Switch in NORM
Check CDU Select Switch in DNS
Check Radar Intensity Switch Full counter clockwise
Check Thrusts CUTOFF
Check Rubber Power Switch OFF
Check Trim Servo Switch in NORMAL
Check Anti-Ice, Pilot Heat, and
Set Window Heat OFF
Perform External Power applications procedures if applicable
Set External Power Switch to TRIP
Check all Warning Flags
Set Battery Power Switch to EMERGENCY
Check EGT Lights
Check Battery voltage
Activate Alarm Bell
Perform APU Start Procedures
Set External Power Switch to CLOSE
Check T-R voltage
Set Battery Power Switch to NORMAL

COPILOT FUNCTIONS (Cont.)

Take out Navigation Publications
Perform IF Control Panel p-Flight
Set Master Switch OFF
Set Mode 4 Code Switch to A or B (as required)
Set Mode Enabling Switches OUT
Set Mode 4 On/Off Switch ON
Set Mode 3/A Code Selections to all 0s
Check MSU-INS Mode selection OFF
Check CDU Power Switch in NORMAL or AUX
Set Search Radar Control Panel
Set FTC Switch OFF
Set I/QC Switch OFF
Set PATT switches as desired
Set Bearing Switch as desired
Set STC Dial full counter-clockwise
Set Sub Switch OFF
Set Gain Control full counter-clockwise
Set Heading Select Knob 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 Radar/Handicross Control Panel
Set Master Power Switch OFF
Set Pulse Width Switch
Set Code Selector Switches
Set Interphone Panel Switches
Set FSACAS Control Panel
Set FSACAS Power Switch OFF

BOOMER FUNCTIONS

Attend Crew Assembly
Start APU
Check Crew Equipment Stowed
Check Circuit breakers
Remove and stow Nose Gear Ground Downlock and release handle
Check Portable Oxygen Bottles
Check Interphone Panel settings
Check Interphone
Perform Oxygen System check
Perform Boom Operator's Forward station preflight
Perform Crew Report
Perform Cargo Compartment Preflight
Check Cargo Compartment A/C master switch in MANUAL
Check Passenger Station Oxygen Panel
Check Emergency Interphone Panel
Check Alt Compartment Interphone Panel
Check Gaseous Oxygen System Quantity Gauge
Check Gaseous Oxygen System Valves
Perform Boom Operator's compartment preflight procedures
Check Air Outlet Doors and Deluxer Slide
Open Sighting Door
Set Interphone panel switches

BOOMER FUNCTIONS (CONT.)

Check Interphone panel
Check oxygen regulator
Check ISO oxygen regulator
Check emergency override switch
Check boom limit switches
Check indicator lights
Set telecope-at-disconnect switch
Check circuit breakers
Set A/R boom operator's control panel master switch ON
Check boom fully retracted
Perform signal call test
Set underbody and underwing lights ON
Check nozzle light and tail mounted floodlight
Check sighting door open
Close sighting door lever
Set rudervator trim control at ZERO
Perform miscellaneous preflight procedures
Verify DO Form 385-4 data
Conduct ground safety locks check
Inform pilot of actual takeoff weight and CG
Ensure cargo and loose equipment secure
Perform APU accumulator check
Close cargo door and emergency exit hatches
Check external power switch trip
Perform passenger loading
Check seats and safety belts
Position life support equipment
Check passenger information cards
Remove floor obstructions
Install boom operator's compartment entry panels
Open cargo door
Position passenger loading stand
Brief passengers
Direct personnel to seats and verify mar feet
Check cargo manifest
Secure baggage and loose equipment
Check portable oxygen bottles
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

POWER ON INSPECTION

PILOT FUNCTIONS

Check battery charging current
Check battery charging level
Pressurize hydraulic system
Check pressure switches ON
Set right system auxiliary pump switch to AUTO
Set left system auxiliary pump switch to RESERVE BRAKE
Set left system Auxiliary pump switch to AUTO
Check auxiliary system
Check parking brake OFF
Check Test panel indicators BLANK
Set auxiliary test switch to FWD
Set auxiliary test switch to AFT
Ensure test panel indicators are BLANK
Check hydraulic pressure in normal range
Check speed brakes
Set inbound spooler switch to NORMAL
Set speed brake lever to 60 degrees
Set yoke to full left
Set yoke to full right
Set yoke to center
Set inbound spooler switch to CUTOFF
Set speed brake lever to zero degrees
Return inbound and outbound spooler switches to NORMAL
Check altimeters and glare shield clearance
Move yoke left
Move yoke right
Move yoke center
Check altimeter trim
Check elevators
Check trim indication
Move yoke forward
Move yoke aft
Move yoke center
Check manual trim
Check manual trim
Adjust stab trim control switch NOSE DOWN then NOSE UP
Set stab trim control switch to CUTOFF
Set stab trim control switch to NORMAL
Check rubber
Check rubber power switch OFF
Push rubber full LEFT
Push rubber full RIGHT, then release
Set rubber power switch to ON
Check rubber pressure
Check rubber trim
Check Engine Failure Assist System (FSAS)
Set EFAS switch to TEST, then ON
Check engine system
Check year damper system
Set STD switch to TEST, then ON
Check DISENG light comes on and goes out within 35 seconds
Check radios
Check LS receivers
Check VOR
Check TACAN
Check COMM 1 UHF
Check COMM 2 UHF (ground radio)
Check HF radio
Set-up HAVE QUICK radios
Determine HOI or II availability
Load Word of Day (WOD) or Load Multiple WODs (MWOD)

PILOT FUNCTIONS (CONT.)

Set Time of Day (TOD)
Practice WOODAWOOD
Check operation of altimeters
Check flight director heading mode
Check instruments
Check all dials and gauges
Check Attitude Director Indicator (ADI)
Check INS gyro
Set clock
Set oil temp selector switch to TEST
Set oil temp selector switch to M
Check fuel quantity readings
Check Rotation Go Around (RGA) mode Check flap and speed brake warning horn
Check Autopilot
Check autopilot turn knob in desired position
Set autopilot engage switches ON, as required
Rotate autopilot turn knob LEFT then RIGHT
Rotate pitch knob NOSE UP, then NOSE DOWN
Depress pilot's ejection button
Set autopilot engage switches ON, as required
Activate auto trim switch
Press test switch, if applicable
Press velocity/altitude test indicator, if applicable
Check flight controls for freedom of movement
Set trim for take-off
Move flight director mode selector to gyro
Adjust seats, pedals, belts and harnesses
Ensure fuel panel set for take-off
Perform CELL check
Perform ground radio check
Inform CELL lead ready to start engines
Check APU accumulator pressure
Set gas pumps to OFF
Review takeoff and emergency procedures
Perform FSACAS alignment and insertion procedures
Check telephone and oxygen system
Complete crew report
Test and check interior lights
Compare altimeter setting with field elevation
Monitor INS interface test
Perform INS System Preflight procedures
Check INS Status Panel
Insert INS present position
Read very point data
Verify waypoints

COPILOT FUNCTIONS

Perform interior inspection (Power On)
Set FD Master Power Switches ON
Ensure FD 100 Power Off Lights ON prior to placing switches ON
Set FD 100 Master Power Switches to ON
Ensure FD 100 Power Off Lights are out after placing switches ON
Perform ABR Panel Checks
Set Master Refuel Switch to ON
Press to test all indicator lights not illuminated
Set Manifold Valves Switch to FLIGHT
Check Main AIR/REFR Valve Switch CLOSED
Check Tank Level Control Switches CLOSED
Check Scavenge Switch OFF

COPILOT FUNCTIONS (CONT.)

Check Reverse Refuel Pumps Switch OFF
Check Sliding Door Switches CLOSED
Check Signal Amplifier Power
Switch in NORMAL
Check manual toggle latch switch in release
Set master valve switch to OFF
Check engine bleed valves OPEN
Perform bleed air leak detection test
Perform bleed air leak detection test switch
Check all LEAK DET, OVER PRESS and OVER TEMP lights ON
Release test switch
Ensure lights go out after releasing test switch
Close generator breaker switches
Set remaining switches ON as required
Set VOR to ON
Set TACAN to ON
Set VHF radio ON
Set UHF radio ON
Set HF radio ON
Set autopilot ON
Set RGA power switches ON
Set instrument power gyro
Ensure required publications are available
Ensure presence of aircraft flight manuals
Ensure parachute preflight completed
Check telephone and oxygen
Perform FSAS preflight procedures
Ensure FSAS POWER switch ON
Accomplish FUP interface test
Check fuel status indications
Press FUEL key
Press DATA key
Press multifunction data key
Verify engine type
Verify engine type
Verify brakes and anti-skid type
Check ICU status displays
Check system status display
Slow ICU display to BUS status 20
Check bus status display
Check WT and Balance Information ICU for FSAS
Obtain crew report
Set interior lights
Check wheel wells clear
Ensure system pressure switches ON
Check anti-skid
Check fuel quantity reading
Check hydraulic system pressure
Check hydraulic system quantity
Check pump supply guards CLOSED
Press to test all gauges
Record actual readings on Form 14, 385-4 and flight log
Perform hydraulic pressure checks
Check L.R. systems and pilot's reserve
Ensure pressure gauges in normal range
Turn on autopilot year damper switch
Check gear warning light extinguished
Complete control and trim check
Check fuel dump actuator
Check boom retracted
Set fuel dump switch to FUEL DUMP

COPILOT FUNCTIONS (CONT.)

Set fuel dump switch to OFF
Ensure wheel well doors clear
Receive report from each crewmember
Check INS/ONS COU Test Switch if applicable
Check Fuel Dump Actuator
Set Fuel Dump Switch to FUEL DUMP
Check flap lever in 50 degree descent
Accomplish INS Interface Test if desired
Depress Copilot's autopilot Disengage button
Set Fuel Dump Switch to OFF
Set Stabilizer Trim as required
Set Flap Lever to 40 degree descent
Move Flap Lever through 30 degree to 20 degree descent
Set flap lever to 0 degree descent
Set flap lever to 30 degree descent
Set flap lever to 0 degree descent
Set navigation lights
Set flash-steady switch to FLASH
Set all fuel boost pump switches to ON
Set bright-dim switch to BRIGHT
Set 42 tank-to-engine manifold valve switch to OPEN
Report ACOS lights ON if applicable
Report ACOS lights OFF if applicable
Perform INS System Preflight procedures
Check INS Status Panel
Insert INS present position
Set MSU-INS Mode selectors to ALIGN
Turn on FSACAS power switch
Set FF Intercom Switch as desired
Set FF Antenna Switch to BOTH
Set RAD - TEST/MON Switch to OUT
Set FF Master Switch to NORMAL Test Modes 1, 2, 3/A and C
Check Mode 4 light out
Set Master Switch to STANDBY (R)
Set Mode 1, 2, 3/A, and C switches as required
Set Mode 1, 2, and 3/A Codes as required
Set Audio/Light Switch (as required)
Set RAD - TEST/MON Switch (as desired)
Turn APN-58 Function Switch to STBY
Insert Waypoint Data

BOOMER FUNCTIONS

Continue with power off list if required
Load KY-48
Request Authentication and Launch message from command post
Respond With correct Authentication
Encode Mode 4

STARTING ENGINES AND BEFORE TAXI

PILOT FUNCTIONS

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

* Repeated for each engine

COPLOT FUNCTIONS

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

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
 Turn 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

TAXI

PILOT FUNCTIONS

Check hydraulic pressure, brakes and steering
 Check flight controls
 Check flight instruments
 Check speed brakes to ZERO
 Set flaps
 Advance power momentarily to begin taxi
 Release parking brakes
 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 RIGHT and hold
 Push rudder pedal full LEFT and hold
 Set EFAS and SYD switches to ON
 Set EFAS switch to ON
 Set yaw damper switch to ON
 Review takeoff data
 Ensure trim ready for takeoff
 Check rudder trim at ZERO
 Check aileron trim at ZERO
 Check stab trim
 Set and recheck NAV aids
 Set flight director and climb selector switch to RGA mode
 Set APU start-stop switches to STOP if required
 Obtain last chance inspection
 Check radar to STBY
 Set parking brakes
 Clear SOF for last chance inspection report
 Check EFAS/SYD annunciators
 Check annunciators
 Check APU doors open and lights turned out
 Close windows
 Turn on window heat
 Adjust throttle friction
 Obtain MITO approval
 Change radios to MITO discrete frequency
 Obtain radio check on MITO frequency
 Set power for MITO
 Release parking brakes when directed by lead
 Maintain spacing
 Accomplish additional radio checks as appropriate
 Accomplish takeoff report

COPILLOT FUNCTIONS

Check hydraulic pressure, brakes and steering
 Obtain taxi clearance
 Check/set Anti-Ice Equipment as required
 Set Anti-icing ON
 Set Anti-icing OFF unless needed for takeoff
 Set Flaps as required
 Check Overhead Panel
 Ensure Bus Tie, Generator breaker & generator control lights extinguished
 Check Main T-R Units for normal operation
 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
 Obtain Weather data
 Recompute Takeoff data if required
 Obtain ATC clearance
 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
 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
 Set IFF squawk
 Perform weather scan

BOOMER FUNCTIONS

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

BEFORE TAKEOFF

PILOT 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
Turn on radar

COPLOT FUNCTIONS

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

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

TAKEOFF

PILOT FUNCTIONS

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

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 S1
 Call pickle
 Call rotate
 Call climb speed
 Raise Gear
 Move flaps up
 Monitor lead aircraft for MITO timing
 Perform Initial Climbout procedures
 Advance power as required

BOOMER FUNCTIONS

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

CELL JOIN UP

PILOT FUNCTIONS

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

COPILOT FUNCTIONS

Turn off Starter Switches (as required)
 Turn on Engine Anti-Ice (as required)
 Check Cabin Pressurization
 Set Fuel Panel as required
 Turn off RGA Power Switches
 Turn off landing light at 10,000 Ft. or sooner in weather
 Set radio altimeters to 2000 Feet
 Direct crew to set 29.92 Altimeter setting passing FL180
 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

BOOMER FUNCTIONS

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

CRUISE #1

PILOT FUNCTIONS

Maintain cell position
 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 FL230
 Compute "Alter Heading" and ETA to turn
 Perform Dead Reckoning navigation
 Direct aircraft along planned route to coast end point/ADIZ
 Monitor equipment for malfunction
 Set IFF as required
 Track aircraft position
 Perform CELL formation
 Perform station keeping duties
 Monitor radar for skin paint or beacon

COPLOT FUNCTIONS

Check hydraulics
 Check electrical system
 Monitor fuel system
 Monitor O2 system
 Monitor engine instruments
 Give control of HF Radio to BOOM
 Complete Comm Log
 Request And record UHF Traffic
 Accomplish HF Contact
 Record HF Traffic
 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
 Direct Aircraft to avoid thunderstorms by 10 NM below FL230
 Direct Aircraft to avoid thunderstorms by 20 NM at or above FL230
 Set equipment as required for specific navigation leg
 Take coast out fixes
 Complete Log work on Form 200
 Monitor equipment for malfunction
 Update and monitor INS as required
 Set IFF as required
 Track Aircraft Position
 Use All navigation aids to monitor position within 20 NM of track
 Update ETAs to Pilot as necessary for HF position report

BOOMER FUNCTIONS

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

PREPARATION FOR CONTACT

PILOT FUNCTIONS

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

COPLOT FUNCTIONS

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

BOOMER FUNCTIONS

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

AIR REFUELING

PILOT 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
Alter Aircraft as necessary to maintain course
within 10 NM of cleared course
Monitor And update NAV systems
Monitor Interphone and Radios
Monitor UHF Radios
Monitor HF Radio
Monitor Interphone
Monitor Altitude

COPILLOT FUNCTIONS

Set altimeter to 29.92 or as briefed
Set Radios as required
Set Air to Air TACAN if required
Check oxygen
Set Lights as required
Set Position Lights to STEADY and DIM
Set Rendezvous Beacon Lights as required
Complete Fuel quantity check
Set No Smoking/Seat Belt lights ON as applicable
Set Autopilot VOR/LOC and Heading Select Switches OFF
Set TACAN as required
Set Fuel Panel for AVR
Set one A/R Pump Switch to ON
Set Beacon Lights to BOTH ON and
Position Lights to BRIGHT
Perform General Air Refueling
Record Air Refueling Data
Record Number of contacts
Record Amount of fuel transferred
Monitor Cell Formation (if Required)
Tune Radar for optimum picture
Keep Pilot advised of position
Maintain ATC Clearance Requirements
Monitor And update NAV systems
Monitor Interphone and Radios
Monitor UHF Radios
Monitor HF Radio
Monitor Interphone
Set APN-69 to OPERATE
Monitor Altitude

BOOMER FUNCTIONS

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

POST AIR REFUELING

PILOT FUNCTIONS

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

COPLOT FUNCTIONS

Complete post A/R 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 Altimeter to 29.92 (as required)
Turn off oxygen (as required)
Set Radar/Rendezvous Beacon to OFF
Monitor Radios

BOOMER FUNCTIONS

Perform Post Air Refueling
Set Ruddevator Trim Control to "0"
Retract, Stow, and Latch Boom
Close Sighting Door with Sighting Door Lever
Check Ruddevators locked Switch
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

PILOT FUNCTIONS

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

CRUISE #2

COPLOT FUNCTIONS

Notify ATC A/R terminated
Pass receiver'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)

PLAN DIVERT

PILOT FUNCTIONS

Obtain destination weather
Direct copilot to determine range
Direct copilot to determine if there is enough fuel
to reach destination
Direct crewmember to look up instrument flight
rule supplement
Direct copilot to obtain proper clearances
Coordinate plan with #1 aircraft
Obtain destination weather/monitor air route
traffic control center

BOOMER FUNCTIONS

Provide crew support as required

COPILOT FUNCTIONS

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

PILOT FUNCTIONS

Direct call breakup
Call for descent checklist
Review weather
Review approach procedures
Direct Boom Operator to advise destination base of aircraft status
Brief the approach
Confirm N1 RPM Index set
Set specific altitude into radio altimeter
Insure navigation aides are set
Set starter switches to ignition
Direct anti-ice 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, altitude and airspeed
Set appropriate altimeter setting
Confirm descent checklist complete
Review Penetration and Approach
Review highest terrain
Review emergency airfields
Review special use airspace
Monitor Aircrew Terminal Information Service (ATIS)
Fasten Safety Belt and Shoulder Harness
Ensure Approach Clearance received
Perform Descent Altitude Procedures
Make "2,000' Prior to Assigned Altitude" Call
Make "1,000' Prior to Assigned Altitude" Call

COPILOT FUNCTIONS

Make entries in landing data card
Accomplish descent checklist
Review descent and approach procedures
Set N1 RPM Index
Set Radio Altimeters
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 altitude
Set Altimeters
Turn Landing Lights on
Calculate landing distance
Tune radar
Monitor radar
Configure radar
Communicate with weather for weather avoidance
Call for descent checklist
Navigate To IAF
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 "2,000' Prior to Assigned Altitude" Call
Make "1,000' Prior to Assigned Altitude" Call

BOOMER FUNCTIONS

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 Altimeters
Contact command post
Set altimeters at navigation station

APPROACH AND LANDING

PILOT FUNCTIONS

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

COPLOT FUNCTIONS

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

BOOMER FUNCTIONS

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

PILOT FUNCTIONS

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

AFTER LANDING

Perform maintenance debriefing
 Relay INS accuracy check information
 Ensure aircraft security
 Coordinate aircraft servicing
 Ensure communication kit and classified documents secured
 Complete AF Form 781
 Relay crew and aircraft status to home base
 Complete mission paperwork
 Turn INS MSU switch OFF after parked
 Relay INS accuracy check information
 Assist in aircraft offload as required
 Offload flight equipment
 Perform crew mission debriefing

COPILLOT FUNCTIONS

Set lights as required
 Set Engine Anti-ice as required
 Set pitot, Q-inlet, and window switches to OFF
 Set Flaps to UP
 Call for speed brakes Zero
 Set Cabin Manual Pressure Control to FULL DECREASE

Set Air Conditioning Master Switch to RAM AIR
 Set Pilots' Radar intensity to full counter clockwise
 Set HF Radio to OFF
 Set Lights as required
 Ensure INS Accuracy Check complete
 Turn off Auto Pilot
 Zeroize Ciphony Control Panel if required
 Set Engine Anti-ice to OFF (if not previously accomplished)
 Call for engine starter switches to off (if not previously accomplished)
 Apply External Power as required
 Set Air Conditioning Master switch to RAM AIR
 Set External Power Switch to TRIP
 Turn Equipment Off
 Set Mode 4 Code Switch
 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
 Perform INS Accuracy Check Procedures
 Select Way Point
 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 left-hand data display
 Press Clear Key
 Turn INS MSU Switch OFF after parked
 Set IFF/SIF As Required
 Set Mode 2 Code (as required)
 Set FSA/CAS power OFF
 Assist in Aircraft Offload As Required

Unload Passengers and Cargo
 Open Cargo Door
 Install Tail Stand
 Ensure Passenger Loading Stand in position
 Unload Baggage
 Check Tail Support Strut Installed
 Check Position of Chocks
 Check External Power available
 Check Ground Wire Installed
 Check Cargo Loading Area clear
 Check Fire Extinguisher available
 Check Cargo Door Sill protected
 Stow Seats
 Remove Tie-down Devices
 Position Shoring
 Unload Cargo
 Stow Aircraft Equipment
 Complete Form 76
 Complete Form 791
 Monitor radios
 Record flight time
 Zeroize code in KIK-18 and KY-58
 Enter navigation systems maintenance discrepancies into Form 781
 Turn in comm kit, KIK-18, KY-58 and FLIP publications

BOOMER FUNCTIONS

Perform After Landing Procedures
 Set Oxygen OFF, 100%
 Install Nose Gear Ground Down lock and Release Handle
 Check APU Start Accumulator pressure gages
 Set cargo compartment Temperature control switch to Manual
 Check APU Start Accumulator pressure gages
 Perform Aircraft Checks
 Set Interphone
 Open Entry Door
 Open Grill
 Install Entrance Ladder
 Close Grill
 Set Boom Compartment Switches
 Perform APU Shutdown
 Complete Form 781