

MIL-M-38413C(USAF)
14 August 1987
SUPERSEDING
MIL-M-38413B(USAF)
15 September 1977

MILITARY SPECIFICATION

MANUAL AND AIRCREW CHECKLISTS FOR AIR REFUELING PROCEDURES, PREPARATION OF

This specification is approved for use within the Department of the Air Force, and is available for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers the preparation of air refueling procedures flight manuals and check lists that will provide flight crews with standard procedures and data refueling them to engage in air refueling operations as dictated by mission requirements.

2. APPLICABLE DOCUMENTS

2.1 Government documents

2.1.1 Specifications and standards. The following specifications and standards form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of these documents shall be those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation.

SPECIFICATIONS

MILITARY

MIL-M-7700	Manual, Flight
MIL-C-27278	Checklists, Flight Crew
MIL-C-38778	Checklists, General
MIL-M-38784	Manuals, Technical: General Style and Format Requirements
MIL-P-38790	Printing Production

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: ASD/ENES, Wright-Patterson AFB OH 45433-6503 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A

TMSS-F456

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

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(Copies of specifications, standards, and other Governments documents required by contractors in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting officer.)

2.2 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein, (except for associated detail specifications, specification sheets or MS standards) the text of this specification shall take precedence. Nothing in this specification, however, shall supersede applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Function of the manuals and checklists. The documents required herein shall consist of a single unclassified basic manual, supplemental manual, and the necessary checklists as specified herein. This shall include instructions for all pertinent crew members and shall cover the necessary procedures for tanker-receiver cell formation, orbit, rendezvous and air refueling with flying boom/receptacle and probe/drogue equipped aircraft. It shall also include all allied information and data necessary to the operational procedures of air refueling such as terminology, communication procedures, pertinent tables diagrams and profile charts, as applicable, and as provided for herein.

3.2 General specification. The requirements of MIL-M-38784 with the exceptions and additions called out herein, shall apply as requirements for the basic and the supplemental manuals covered by this specification. When the general specifications and this specification conflict, this specification shall govern.

3.2.1 Exceptions and additions to MIL-M-38784. The following exceptions and additions to MIL-M-38784 shall apply as indicated by paragraph headings:

- a. List of illustrations. Lists of illustrations are not necessary. Illustrations will be identified by an asterisk preceding entries in the alphabetical index.
- b. Part nouns. The requirements that part nouns and complete nomenclature shall be taken from engineering drawings shall not apply. Part nouns shall be standard and not necessarily as reflected on the engineering drawings.
- c. References. In the paragraph entitled "References", the following changes shall be made: General temperature references shall normally be given in degrees Celsius in lieu of degrees Fahrenheit. In lieu of requiring the text to refer to speed and distance readings as calibrated by the equipment, the speed and distance readings shall designate if the reading is indicated, calibrated, true, etc. Further, the readings shall indicate the units, e.g., nautical miles, feet, seconds, etc.
- d. Chapters/sections. In the paragraph entitled "In Chapters and Sections", tabulated information as well as illustrations shall be identified by the word "figure" and by ara-

rently incorporated operational and safety supplements as well as a reference to the appropriate technical order index for the current status of aircrew flight manuals, and operational and safety supplements. Incorporated supplements are incorporated, they shall be grouped. When no operational or safety supplements are replaced, the notice shall read: **REFER TO TECHNICAL ORDER INDEX T.O. (Applicable T.O. Number) FOR CURRENT STATUS OF SAFETY AND OPERATIONAL SUPPLEMENTS.**

3.4.1.2 List of effective pages. A list of effective pages shall be prepared in accordance with MIL-M-38784.

3.4.1.3 Status page for safety and operational supplements. A status page for safety and operational supplements will be included (see figure 4).

3.4.1.4 Table of contents. The table of contents shall include the major elements of the manual. The requirements of MIL-M-38784 for tables of contents shall apply.

3.4.1.5 Table of supplemental manuals. A table listing each of the supplemental manuals shall be included in the basic manual.

3.4.1.6 Introduction. The introduction shall contain the scope of the manual and any other pertinent data. To maintain the reader appeal of this page at a maximum level, the page shall contain an attention getting device consisting of applicable art or a provocative heading. In addition to the specific information required by this specification, additional information may be added as necessary. The introduction shall include the following information:

SCOPE. This manual is designed to be used in conjunction with the applicable Flight Manual and to provide information to all crew members who participate in air refueling operations. Deviations from the procedures contained in this manual must be authorized in detail by a specific operations order or a command directive. Proper control and utilization of the manual will insure concurrent intercommand distribution of standard and up-to-date air refueling data to tanker and receiver crew members. This manual contains information that is general in nature; each supplement contains more specific procedural and need-to-know information for a particular tanker/receiver combination. Each supplement is identified by a numerical designator, a listing of which is contained in the Table of Contents. Detailed information concerning individual aircraft air refueling systems, limitations, and performance is not contained in this manual.

SOUND JUDGMENT. Procedures in this manual are mandatory and must be performed in the prescribed manner, except where deviations are required in the interest of safety of flight.

HOW TO GET PERSONAL COPIES. The required quantities should be ordered before you need them to assure their prompt receipt. Individual requirements are to be identified to the unit Technical Order Distribution account custodian. Basically, you must order the required quantities on the Numerical Index and Requirements Table

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(T.O. 0-1-1-1). Technical Orders 00-5-1 and 00-5-2 give detailed information for properly ordering these publications. A system shall be established at each base to deliver these publications to the crews immediately upon receipt.

WARNINGS, CAUTIONS, AND NOTES. The following definitions apply to Warnings, Cautions and Notes found throughout the manual:

WARNING: Operating procedures, techniques, etc, which can result in personal injury or loss of life if not carefully followed.

CAUTION: Operating procedures, techniques, etc, which can result in damage to equipment if not carefully followed.

NOTE: An operating procedure, technique, etc, which is considered essential to emphasize.

SHALL, WILL, SHOULD, AND MAY. The following definitions apply to the words shall, will, should, and may:

SHALL: the instructions or procedures prefaced by **SHALL** are mandatory

WILL: the instructions or procedures prefaced by **WILL** are mandatory. **WILL** is also used to indicate simple futurity, e.g. "loss of hydraulic power will affect operations."

SHOULD: **SHOULD** is normally used to indicate a preferred, but non-mandatory method of accomplishment.

MAY: **MAY** is used to indicate an acceptable but non-mandatory means of accomplishment.

YOUR RESPONSIBILITY - TO LET US KNOW. Every effort is made to keep this flight manual current. Review conferences with operating personnel and a constant review of accident and flight test reports assure inclusion of the latest data in the manual. We cannot correct an error unless we know of its existence. In this regard, it is essential that you do your part. Comments, corrections, and questions regarding this manual or any phase of the flight manual program are questions regarding this manual or any phase of the flight manual program are welcome. (Insert instructions for submitting changes)

3.4.2 General. This section shall present general information and operational procedures which encompass air refueling operations by all types of aircraft.

- a. Command and control of tanker/receiver forces
- b. General tanker/receiver responsibilities (Information which is peculiar to specific aircraft types/models shall be covered in supplemental manuals.)

- c. Refueling airspace requirements
- d. Weather restrictions
- e. Communications requirements
- f. Visual signals

3.4.3 General. This section shall address flying safety issues which are peculiar to air refueling operations in general, e.g., flying large numbers of dissimilar aircraft in close proximity, conducting rendezvous in positive control airspace, etc. The section shall contain specific safety guidelines and lessons learned. Broad generalizations will be avoided.

3.4.4 Terminology. This section shall include a comprehensive glossary of terms and abbreviations used in air refueling operations. Terms which refer only to a particular class of aircraft or refueling technique, e.g., fighter, bomber, probe/droge, boom/receptacle, etc., shall be clearly identified.

3.5 Supplemental manuals. The supplemental manuals shall contain the following subject areas:

- a. Front Matter
- b. Section I – General
- c. Section II – Enroute Procedures
- d. Section III – Rendezvous Procedures
- e. Section IV – Air Refueling Procedures
- f. Section V – Emergency Procedures

3.5.1 Front matter (supplemental manuals). The front matter of supplemental manuals shall consist of the following:

- a. Title Page
- b. List of Effective Pages
- c. Status Page for Safety and Operational Supplements
- d. Table of Contents
- e. Introduction

3.5.1.1 Title page. Title pages for supplemental manuals shall be in accordance with the general requirements of MIL-M-38784 with the exception of the following special requirements.

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3.5.1.1.1 Illustration. A large, clear black and white photographic view of the aircraft in flight, with appropriate background scenery shall be placed on the title page (see figure 2). Each change and/or revision shall then contain the same view. It is not required that the aircraft be depicted as being air-refueled. The illustration shall be designed and placed so as not to interfere with any printed matter.

3.5.1.1.2 Title. The words FLIGHT CREW AIR REFUELING PROCEDURES shall be used and the type designation may be presented in any size and format suitable for an attractive title page. When applicable, the words PRELIMINARY, UTILITY, or PARTIAL shall be placed above the words FLIGHT CREW AIR REFUELING PROCEDURES. Only the words FLIGHT MANUAL shall not be used.

3.5.1.1.3 Supersedure notice. The supersedure notice for a change or revision shall be placed so as not to interfere with the illustration. It shall include a list of all currently incorporated operational and safety supplements as well as a reference to the appropriate technical order index for the current status of aircrew flight manuals, operational and safety supplements and checklists. Incorporated supplements shall normally be listed individually. When several sequenced supplements are incorporated, they shall be grouped. When no operational or safety supplements are replaced, the notice shall read: **REFER TO TECHNICAL ORDER INDEX T.O. (APPLICABLE T.O. NUMBER) AND ITS SUPPLEMENTS FOR CURRENT STATUS OF OPERATIONAL SUPPLEMENTS AND FLIGHT CREW CHECKLISTS.**

3.5.1.2 List of effective pages. A listing of all flight crew checklists to the manual, with the basic and change dates will be added to the bottom of the last page of the List of Effective Pages (see figure 3).

3.5.1.3 Status page for safety and operational supplements. A status page for safety and operational supplements will be included (see figure 4).

3.5.1.4 Table of contents. The table of contents shall include the major elements of the manual. The requirements that apply to the table of contents in MIL-M-38784 shall apply. As an additional requirement, each section shall have a table of contents listing the major elements of the section. When the entire page is not used for the table of contents, the text of the section may begin immediately below the table of contents.

3.5.1.5 Introduction. The introduction shall contain the scope of the manual and any other pertinent data. To maintain reader appeal of this page at a maximum level, the page shall contain an attention-getting device consisting of applicable art or a provocative heading. Any additional information may be added as necessary. The introduction shall include the following paragraph:

SCOPE. This manual is designed to be used in conjunction with the applicable Flight Manual and the basic Air Refueling Procedure Flight Manual and to provide

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tions and night/weather formations shall be described. Procedures for early arrival at the tanker(s) shall also be specified.

3.5.4.4 Detailed rendezvous procedures. This subsection shall specify detailed procedures for each type of refueling rendezvous, to include, where applicable, point parallel, on-course, enroute, and alternate rendezvous procedures. Special procedures for specific tanker/receiver combinations shall be included. Illustrations shall be used to depict tanker and receiver tracks for each type of rendezvous. Charts may be included to facilitate calculation of turn range and offset. Holding procedures for each type of rendezvous shall be described and illustrate. Receiver descent, closure, and rendezvous overrun procedures shall be specified.

3.5.5 Section IV – air refueling procedures. Section IV shall contain procedures to be used from the first receiver's arrival in the precontact position until the completion of air refueling operations. It shall contain the subsections specified.

3.5.5.1 General. This subsection shall explain the scope and contents of Section IV. Additionally, it shall contain general information about air refueling procedures which does not pertain to any other subsection. The importance of optimum techniques and vigilance while in close formation shall be stressed.

3.5.5.2 Refueling sequence. This subsection shall contain guidelines for determining the refueling sequence of multi-ship receiver flights. Procedures and techniques for moving to and from the precontact position shall be discussed. Responsibility for determining and modifying refueling sequence shall be specified.

3.5.5.3 Precontact. This subsection shall describe the precontact position and shall discuss precontact procedures and techniques to be used by receivers.

3.5.5.4 Contact and air refueling procedures. This subsection shall contain procedures and techniques for all participating crew members during contact and fuel transfer. Boom/receptacle and/or probe/drogue procedures will be described as applicable. Each tanker flight manual shall contain a line drawing of each compatible receiver aircraft which accurately depicts its proper contact position from the boom operator's aspect and the proper position for the boom or drogue. Receiver flight manuals shall illustrate boom envelope limits, correlated, where possible, with the receiver/director light displays for each compatible tanker. A line drawing shall depict each compatible tanker and boom or drogue assembly as they would appear to a receiver pilot in the proper contact position. Procedures/techniques for closure and effective contact shall be discussed as well as afterburner refueling, toboggan, and disconnect procedures. Normal fuel transfer rates shall be listed for each tanker/receiver combination.

3.5.5.5 Fuel management. This subsection shall contain procedures for managing fuel load and center of gravity.

3.5.5.6 Normal flight crew procedures. This subsection shall contain detailed flight crew procedures for air refueling which shall supplement the normal procedures in

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Section II of the Type I Basic Flight Manual and shall be presented in the same format, specified by MIL-M-7700. Each crew position with duties during air refueling will have procedures listed by the following phases of the air refueling operation as applicable: Hot Armament Safety Check, (inflight): Rendezvous and Predescent (Normally 30 minutes prior to Air Refueling Control Time (ARCT); Precontact/Preparation for contact (prior to 1/2 N/M); Contact; Disconnect; Post Air Refueling.

3.5.6 Section V – emergency air refueling procedures. Section V shall contain detailed emergency procedures for air refueling which supplement the emergency procedures in Section III of the Type I Basic Flight Manual, and shall be presented in the same format, specified by MIL-M-7700 and MIL-M-38784. Procedures for the following shall be included as applicable: Breakaway; air refueling system malfunctions; reverse flow air refueling; refueling with engine failure(s) or other aircraft malfunctions; responsibilities in the event of crash landing, ditching, or bailout.

3.6 Checklists. Air Refueling Checklists shall be prepared in accordance with MIL-C-27278 and MIL-C-38778. They shall contain the following:

- a. Normal Flight Crew procedures, as specified by (see 3.5.5)
- b. Emergency Procedures, as specified by (see 3.5.6).
- c. A table of air refueling visual signals.

4. QUALITY ASSURANCE PROVISIONS

4.1 The quality assurance provisions contained in Section 4 of MIL-M-38784 and MIL-M-38790 shall apply to this specification.

5. PACKAGING

5.1 Preparation for delivery. Preparation for delivery requirements shall be in accordance with MIL-P-38790.

6. NOTES

6.1 Intended use. This specification covers the preparation of manuals and checklists for use by aircrews in planning and executing air refueling operations.

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6.2 Ordering data. Procurement documents shall specify the following:

- a. Title, number and date of this specification
- b. Waiving of requirement for lists of illustrations (see 3.2.1)
- c. Format of manuals and checklists (see 3.3)
- d. Subject matter of major areas of manual (see 3.4, 3.5)
- e. Procedures for submission of recommended changes (see 3.4.1.6, 3.5.1.5)

6.3 Responsible activities. Responsible activities are:

- a. Air Force Systems Command is responsible for source data and specification on acquisition and operational aircraft. It is also responsible for the development and procurement for acquisition aircraft.
- b. Air Force Logistics Command is responsible for development and procurement of operational aircraft. It is also responsible for distribution of acquisition and operational aircraft.

6.4 Review of reproducible copy. The review of reproducible copy by Government activities is not intended to reduce or replace the contractor's responsibility for verification of technical accuracy.

6.5 Key words.

Air refueling
 Air refueling manual
 Air refueling procedures
 Departure procedures
 Emergency air refueling procedures
 Flight Crew checklists
 Rendezvous procedures

6.6 Changes from previous issue. Vertical lines or asterisks are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

Custodian:
 Air Force - 11

Preparing activity:
 Air Force - 11

Review activities:
 Air Force - 10, 99, 01

Project No. TMSS-F456

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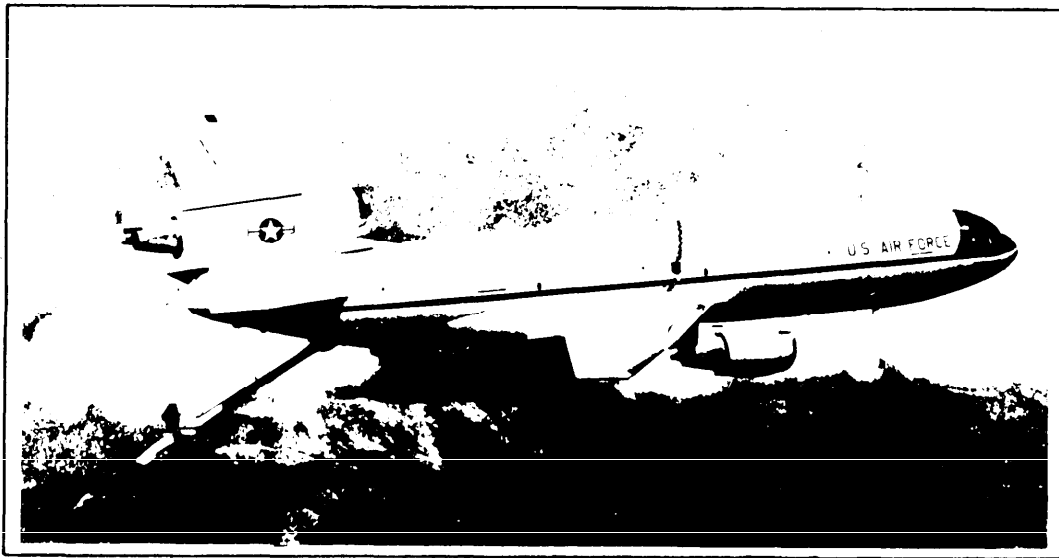
T.O. 1-1C-1

FLIGHT MANUAL

BASIC

FLIGHT CREW

AIR REFUELING MANUAL



F34601-83-D-1296

THIS PUBLICATION SUPERSEDES T.O. 1-1C-1, DATED 15 DECEMBER 1983.

Distribution Statement B. This publication is required for official use or for administrative or operational purposes only. Distribution is limited to U.S. Government agencies. Other requests for this document must be referred to Oklahoma City ALC/MMEDT, Tinker AFB OK 73145-5990.

Refer to technical order index T.O. for current status of safety and operational supplements.

Commanders are responsible for bringing this publication to the attention of all affected Air Force personnel.

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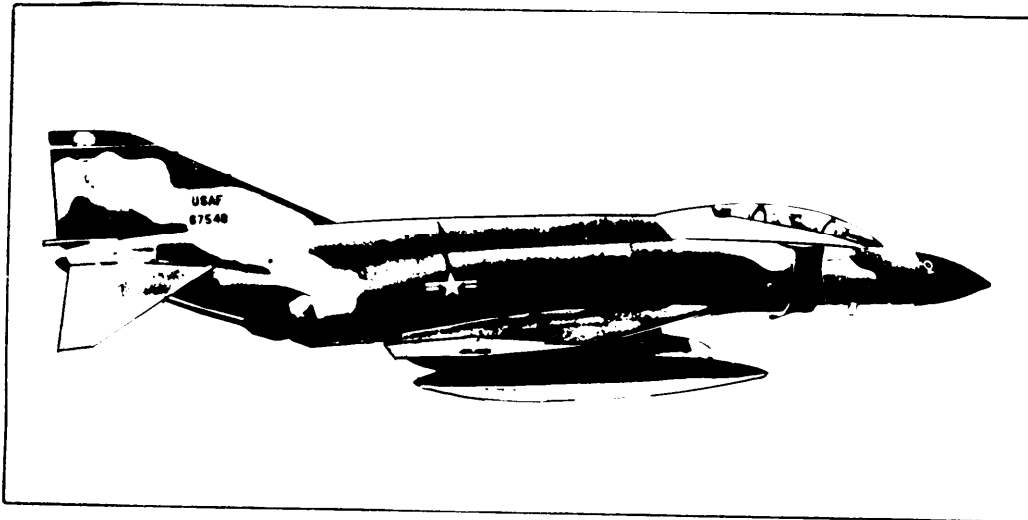
30 NOVEMBER 1984

FIGURE 1. Example of a basic flight manual title page.

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T.O. 1-1C-1-8

FLIGHT MANUAL



SUPPLEMENT VIII

F34601-83-D-1296

CHANGE

NOTICE

LATEST CHANGED PAGES SUPERSEDE
THE SAME PAGES OF PREVIOUS DATE

Insert changed pages into basic
publication. Destroy superseded pages

Distribution Statement B.— This publication is required for official use or for administrative or operational purposes only. Distribution is limited to U. S. Government agencies. Other requests for this document must be referred to Oklahoma City ALC/ MMEDT, Tinker AFB OK 73145-5990.

(See index T.O. 0-1-1-1, for current status of Safety and Operational Supplements and Flight Crew Checklists.)

Commanders are responsible for bringing this publication to the attention of all affected Air Force personnel.

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1 MAY 1978

CHANGE 6 30 NOVEMBER 1984

FIGURE 2. Example of a supplemental flight manual title page.

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T.O. 1-1C-1-8

Technical orders are normally distributed promptly after printing. Date(s) shown on the title page (lower right) are for identification only. This is not a distribution date. Processing time sometimes causes distribution to only appear to have been delayed.

INSERT LATEST CHANGED PAGES. DESTROY SUPERSEDES PAGES.

LIST OF EFFECTIVE PAGES

NOTE: The portion of the text affected by the changes is indicated by a vertical line in the outer margins of the page. Changes to illustrations are indicated by miniature pointing hands. Changes to wiring diagrams are indicated by shaded areas.

Dates of Issue for original and changed pages are:

Original . . . 0 . . . 1 May 78	Change . . . 3 . . . 20 Nov 81	Change . . . 6 . . . 30 Nov 84
Change . . . 1 . . . 1 Jul 79	Change . . . 4 . . . 1 Feb 83	
Change . . . 2 . . . 1 Nov 80	Change . . . 5 . . . 15 Dec 83	

TOTAL NUMBER OF PAGES IN THIS PUBLICATION BE 54 CONSISTING OF THE FOLLOWING:

Page No.	Change No.	Page No.	Change No.	Page No.	Change No.
Title	6	1-6	0	3-1	4
A.	6	1-6A	6	3-2	2
Flyleaf 1 . . . . .	.5	1-6B Blank	6	3-2A	5
Flyleaf 2 Blank . . . . .	.5	1-7 - 1-8	0	3-2B Blank	5
i - ii . . . . .	.5	1-9	6	3-3 - 3-4	6
iii . . . . .	.6	1-10 Blank	6	3-5	5
iv Blank . . . . .	.6	2-1 - 2-2	0	3-6	4
1-1 - 1-3 . . . . .	.4	2-3	5	4-1 - 4-2	0
1-4 . . . . .	.3	2-4 - 2-5	0	4-3 - 4-4 . . . . .	.1
1-5 . . . . .	.4	2-6 Blank	0	4-5 . . . . .	.5

CURRENT FLIGHT CREW AIR REFUELING CHECKLIST

1-1C-1-8CL-1	15 Apr 74	Change 8	15 Dec 83
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Upon receipt of the second and subsequent changes to this technical order, personnel responsible for maintaining this publication in current status will ascertain that all previous changes have been received and incorporated. Action should be taken promptly if the publication is incomplete.

ADDITIONAL COPIES OF THIS PUBLICATION MAY BE OBTAINED BY USAF ACTIVITIES
IN ACCORDANCE WITH T.O. OO-5-2.

USAF

A Change 6

FIGURE 3. An example of a list of effective pages.

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T.O. 1-1C-

STATUS OF SAFETY AND OPERATIONAL SUPPLEMENTS

This supplement status page is based on information available to the manual editor as of the date of this publication. The information may not be current as it must be updated by any subsequent supplement status pages and by reference T.O. 0-1-1-1.

SUPPLEMENTS IN THIS CHANGE

Number	Date	Short Title	Section Affected
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OUTSTANDING SUPPLEMENTS

Number	Date	Short Title	Section Affected
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FIGURE 4. An example of a safety and operational supplement status page.

INSTRUCTIONS: In a continuing effort to make our standardization documents better, the DoD provides this form for use in submitting comments and suggestions for improvements. All users of military standardization documents are invited to provide suggestions. This form may be detached, folded along the lines indicated, taped along the loose edge (*DO NOT STAPLE*), and mailed. In block 5, be as specific as possible about particular problem areas such as wording which required interpretation, was too rigid, restrictive, loose, ambiguous, or was incompatible, and give proposed wording changes which would alleviate the problems. Enter in block 6 any remarks not related to a specific paragraph of the document. If block 7 is filled out, an acknowledgement will be mailed to you within 30 days to let you know that your comments were received and are being considered.

NOTE: This form may not be used to request copies of documents, nor to request waivers, deviations, or clarification of specification requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

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 ASD/ENES
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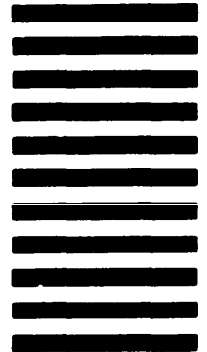
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STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions - Reverse Side)

1. DOCUMENT NUMBER MIL-M-38413C(USAF)		2. DOCUMENT TITLE Manual and Aircrew Checklists For Air Refueling Procedures	
3a. NAME OF SUBMITTING ORGANIZATION		4. TYPE OF ORGANIZATION (Mark one) <input type="checkbox"/> VENDOR <input type="checkbox"/> USER <input type="checkbox"/> MANUFACTURER <input type="checkbox"/> OTHER (Specify): _____	
b. ADDRESS (Street, City, State, ZIP Code)			
5. PROBLEM AREAS			
a. Paragraph Number and Wording:			
b. Recommended Wording:			
c. Reason/Rationale for Recommendation:			
6. REMARKS			
7a. NAME OF SUBMITTER (Last, First, MI) - Optional		b. WORK TELEPHONE NUMBER (Include Area Code) - Optional	
c. MAILING ADDRESS (Street, City, State, ZIP Code) - Optional		8. DATE OF SUBMISSION (YYMMDD)	

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82 MAR

PREVIOUS EDITION IS OBSOLETE.

ASD/ENES OVERPRINT, JAN 85

TO DETACH THIS FORM, CUT ALONG THIS LINE.)