

AEROSPACE RECOMMENDED PRACTICE

Submitted for recognition as an American National Standard

SAE ARP1623

REV.
A

Issued 1980-06
Cancelled 1997-10

Superseding ARP1623

Guide for Preparing an ECS Computer Program User's Manual

1. PURPOSE:

- 1.1 The purpose of this recommended practice is to provide aircraft industry with guidelines as to the pertinent information which should be contained in a user's manual for an environmental control system (ECS) computer program.
- 1.2 This recommended practice is intended to facilitate the preparation of a user's manual without unduly restricting its format or content.

2. SCOPE:

- 2.1 These recommendations apply to the user's manual for any computer program pertaining to aircraft ECS. This includes computer programs for:
 - a. Cabin air conditioning and pressurization performance.
 - b. Avionics equipment cooling system performance.
 - c. Engine bleed air system performance.
 - d. Compartment and equipment thermal analysis.
 - e. Environmental protection system performance.

These recommendations apply to user's manuals for generalized computer programs as well as those for a specific component or system.

- 2.2 The user's manual is a document which defines all procedures necessary for a user to initiate and utilize the program and obtain output data. The user's manual does not normally contain procedures or information required solely for modifying the program. Such procedures or information are contained in a programming or operator's manual; however, they may be contained in supplemental documentation to the user's manual.
- 2.3 These recommendations apply to computer programs which will be voluntarily released to users or are required to be released by contract. It is the intent of this recommended practice that proprietary data not be included in the user's manual.

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3. GENERAL REQUIREMENTS:

- 3.1 A user's manual should be prepared in conjunction with each ECS computer program. Both the computer program and user's manual should be validated prior to submittal to any user.
- 3.2 The manual should include sufficient information to provide personnel unfamiliar with the program the necessary instructions to readily use the program.
- 3.3 The computer user's manual should describe in detail all procedures necessary for the user to initiate and utilize the program. User's manuals which pertain to a particular ECS should include a complete description of the system modeled on the computer program. This should include a discussion of the method of system operation and the associated controls.

4. FORMAT AND CONTENT:

- 4.1 The user's manual format and content should be specifically designed to meet the needs of the intended users. Each manual should be organized to explain the program in terms of application, operation, and limitations.
- 4.2 The user's manual should be as self-contained as possible. Reference to other documents should be minimal. It should contain an index for cross referencing all volumes of the user's manual if it consists of more than one volume.
- 4.3 The user's manual need not include developments for equations and techniques used in the program. These should be included as a reference.
- 4.4 The level of comprehension for each manual should be appropriate for the intended users of the manual. The manual should identify the level of experience expected of the user. Usually, the user will be an ECS engineer who uses the program to do analyses.

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5. DETAILED REQUIREMENTS:

5.1 The following sections should be included as a minimum in any user's manual for an ECS computer program; however, not necessarily in the order shown:

- a. Table of Contents: A clear and complete table of contents should be provided.
- φ b. Introduction: This section should give a brief description of the purpose and scope of the manual and program. This section should identify the language and computer equipment upon which the program relies. All ECS computer programs should use the current standard version of FORTRAN as the programming language.
- c. ECS Description: User's manuals which pertain to a particular system should include a description of the system modeled and its method of operation. A flow schematic of the complete ECS should be included. User's manuals pertaining to a generalized program should include a section which describes the procedure for setting up a particular system.
- d. Program Structure: This section should give the user an outline of how the computer program is structured. A list of the program subroutine names and function of each subroutine should be included. The interaction of subroutines with the main program may be included. Flow charts should be included to aid describing program operation. The definitions, tabulations, and plots of all built-in thermochemical constants and data should be included.
- e. Nomenclature: The manual should include a listing which defines names of variables and the units for each of them. This listing should be limited to all input and all output variables and those which represent physical aspects of a system or component. Other program variables which are necessary to the programming language and the implementation on a computer should not be included except where conflict may arise with user supplied subroutines in reference to variables in blank or labeled common statements. Appendix A contains a listing of suggested units for use in ECS computer programs. All new computer programs should allow for use of U.S. customary units and S.I. units for input and output data.
- f. Program Input: This section should describe in detail the required input data to make use of all available program features. Input data procedures should be described, and when data cards are used, detailed instructions for their proper preparation should be included. An example of typical input should be included.
- ed. g. Program Output: This section should describe in detail the output data from the program. An example of typical output should be included.
- h. Program Messages and Limits: This section should explain program and operating system messages produced during program operation. Where applicable, error recovery procedures for conversational programs should be described. This section should define those limits of component and system performance; outside of which the program will not operate.

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5.1 (Continued):

- i. Test Cases: This section should describe the test cases that the supplier provides for program checkout by the user. Test cases should include information used for preparing input, the input, the output, rationale for the input, and interpretations of the output.
- j. User Created Subroutine: This section should include at least one example to show how to implement a user created subroutine.
- k. Identification and Revision: This section should define the unique identification and date for the program. Provision should be made to print out the identification on each set of output. The nature of, and reason for, changes or revisions to a program should be documented in this section. When revisions are made, they should be identified by a logical change to the basic identification with a corresponding revision date. The user's manual should be kept current with the latest revision to the program.
- l. References: This section should list all references cited in the User's Manual.
- m. Appendix: If a programming manual is not provided, include a complete listing of the source program as an appendix.

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