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AVRO ARROW



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J. H. PARKIN
BRANCH
MAY 29 1995
ANNEXE
J. H. PARKIN
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monthly progress report



AVRO AIRCRAFT LIMITED

6-X

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**AVRO ARROW
PROGRESS REPORT**

SS 116

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SECTION 1

SECTION 2

SECTION 3

SECTION 4

SECTION 5

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SECTION 1

SECTION 2

SECTION 3

SECTION 4

SECTION 5

**AVRO ARROW
PROGRESS REPORT**

JANUARY 1958

AVRO AIRCRAFT LIMITED
MALTON - ONTARIO

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SECRET

CONTENTS

SECTION

- INTRODUCTION
- 1 SUMMARY
 - Master Phasing Chart
 - Allocation of Aircraft - Program 5 (Amended)
 - Engineering
 - Tooling
 - Production
- 2 ENGINEERING - DESIGN AND TECHNICAL
 - Mockups and Specifications
 - Wind Tunnel and Free Flight Model Tests
 - Engineering Parts Release - ARROW 1 Aircraft No's 25201 to 25205
 - Engineering Parts Release Schedule ARROW 2
 - Engineering Mockups
 - Wind Tunnel and Free Flight Model Tests
 - Aircraft Design - Excluding Ground Support Equipment, Mockups, Models and A. S. T.
 - Technical Departments
 - Minneapolis - Honeywell (MH-64) Damping System
 - Air Conditioning System
- 3 ENGINEERING - TEST PROGRAM
 - Flight Test Program ARROW 1
 - Flight Test Program ARROW 1
 - Flight Test Program ARROW 2
 - Major Tests of Structure and Systems - ARROW 1
 - Major Tests of Structure and Systems - ARROW 2
 - Engineering Flight Test
 - Structure and Systems Tests
 - Instrumentation Laboratory
- 4 ENGINEERING - GROUND SUPPORT EQUIPMENT AND SYSTEMS TRAINERS
 - Engineering Ground Support Equipment and Systems Trainers
 - Ground Support Equipment - Design and Development
 - Ground Support Equipment - Major Items
 - Airframe Systems Trainer Design Study
- 5 TOOLING AND MANUFACTURING
 - Total Tooling - Costs and Performance
 - Progress Chart - First Aircraft
 - Progress Chart - Second Aircraft
 - Progress Chart - Third Aircraft
 - Progress Chart - Fourth Aircraft
 - Progress Chart - Fifth Aircraft
 - Progress Chart - Sixth Aircraft
 - Progress Chart - Seventh Aircraft
 - Progress Chart - Eighth Aircraft
 - Total Production - Costs and Performance

SECTION 1

SECTION 2

SECTION 3

SECTION 4

SECTION 5

SECRET

UNCLASSIFIED

CONTENTS (Cont'd)

Progress Chart - Static Test Aircraft
Test Components and Airborne Test Equipment Costs
Spares Production
Ground Support Equipment Production
Publications
Metal Mockup Production
Avro Furnished Equipment (Pacing Items) - Page 1
Avro Furnished Equipment (Pacing Items) - Page 2
Government Furnished Equipment - Page 1
Government Furnished Equipment - Page 2
Production Material Dollars



INTRODUCTION

This Progress Report has been prepared to indicate the current position of the ARROW Program at Avro Aircraft Limited and at the major sub-contractors associated with the Program.

Three elements of progress are reported as follows:

- (1) The physical progress in terms of percentage completed at the reporting date
- (2) Manhour expenditures
- (3) Dollar expenditures

The Master Phasing Chart represents the program being reported against. Where necessary for better definition, one bar on the Master Phasing Chart has been expanded into several bars in the Progress Reports.

Dollar expenditure charts show cumulative costs including labor, overhead, direct charges, material, administrative overhead, fees, and sales tax where applicable.

Engineering manhour expenditure charts show the direct cumulative manhours, including sub-contract engineering personnel used directly by Avro in the basic program. However, Engineering hours expended by outside sources of sub-systems, such as R. C. A., Honeywell and Orenda Engines Limited, are not included. Progress charts for some of the related external programs are included. Future reports will contain data of this type as it becomes available for other external programs. Manufacturing manhour expenditure charts include equivalent manhours for sub-contract work.

Amendments to basic information, over the previous issue of the report, are indicated thus ★.

SECTION 1

SECTION 2

SECTION 3

SECTION 4

SECTION 5

**SECTION 1
SUMMARY**

SECTION 1

SECTION 2

SECTION 3

SECTION 4

SECTION 5



SUMMARY

The Summary section includes the Master Phasing Chart, Allocation of Aircraft, Man-hour and Dollar Expenditure Charts for the Engineering, Tooling and Production programs.

The Master Phasing Chart and the Allocation of Aircraft Chart are now raised to Program 5 (Amended). Delivery of ARROW 2 Engineering Orders has been rescheduled to meet revised contractual requirements.

ENGINEERING

On the Master Phasing Chart, Stage 2, RCAF engineering evaluation of ARROW 1 which was previously scheduled for March 1958 is now scheduled for July 1958.

Pre-flight testing of Aircraft 25201 is now scheduled to continue until March 1958. Phase 1 and 2 of Aircraft 25201 flight testing is scheduled for completion by November 1959.

At present a program is being negotiated to modify aircraft 25204 and 25205 into development vehicles for the ASTRA I electronic system. The first flight dates shown in this report for these two aircraft are based on the assumption that they are built to the standard ARROW 1 configuration, incorporating an interim electronic system and with structural modifications for the ASTRA I installation. ASTRA I partial developmental systems for aircraft 25206, 25207 and 25208 are scheduled for November 1958, January 1959 and March 1959 respectively.

Flight development of the weapon pack is scheduled to commence in April 1959.

Aircraft systems trainer is amended to airframe systems trainer in Stage 4 and in the Go Ahead Required section. The RCAF evaluation of the airframe systems trainer study is now scheduled for January and February 1958.

The Allocation of Aircraft chart is raised to Program 5 (Amended) and has been redrawn.

A nominal 5% fee has been included in the actual dollar expenditure figures from April 1st, 1957 to facilitate comparison, pending negotiation of fees subsequent to March 1957.

Although various charts in this report showing physical progress have been amended in line with the re-scheduled first flight dates of the ARROW 1 aircraft the estimates for dollar and manhour expenditures have not been changed.

TOOLING

Dollar expenditures for the tooling program are substantially the same as our planned figure.

PRODUCTION

Expenditures on the program are proceeding within the planned program budget.

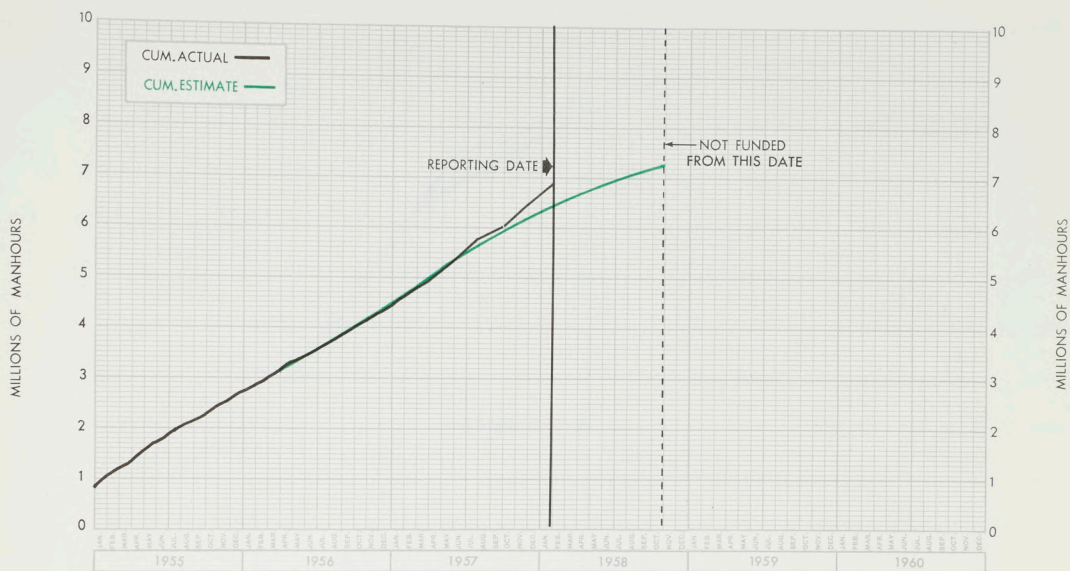
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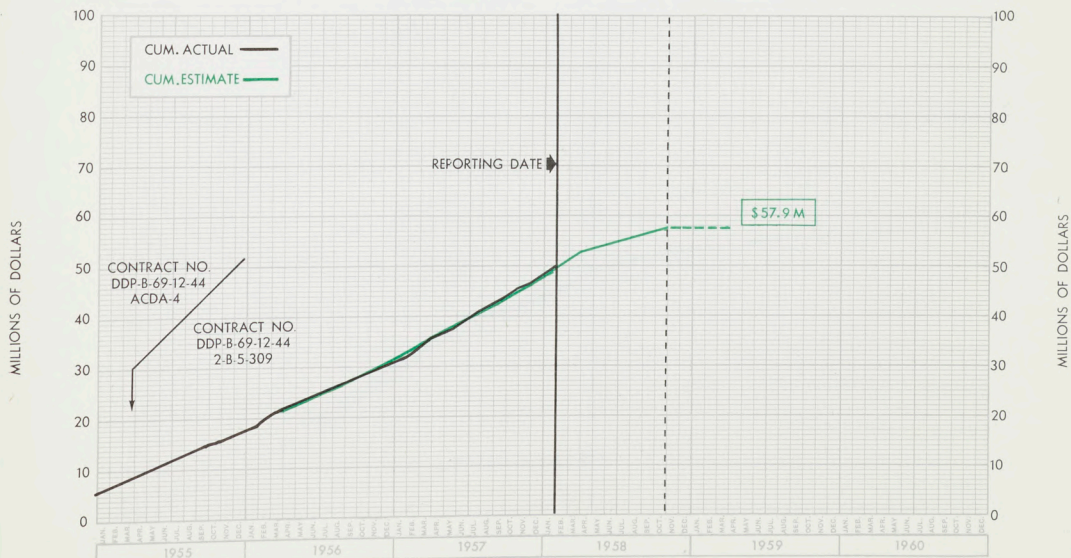
SECTION 4

SECTION 5

ENGINEERING



MANHOUR EXPENDITURES



DOLLAR EXPENDITURES

105-MPR63-7

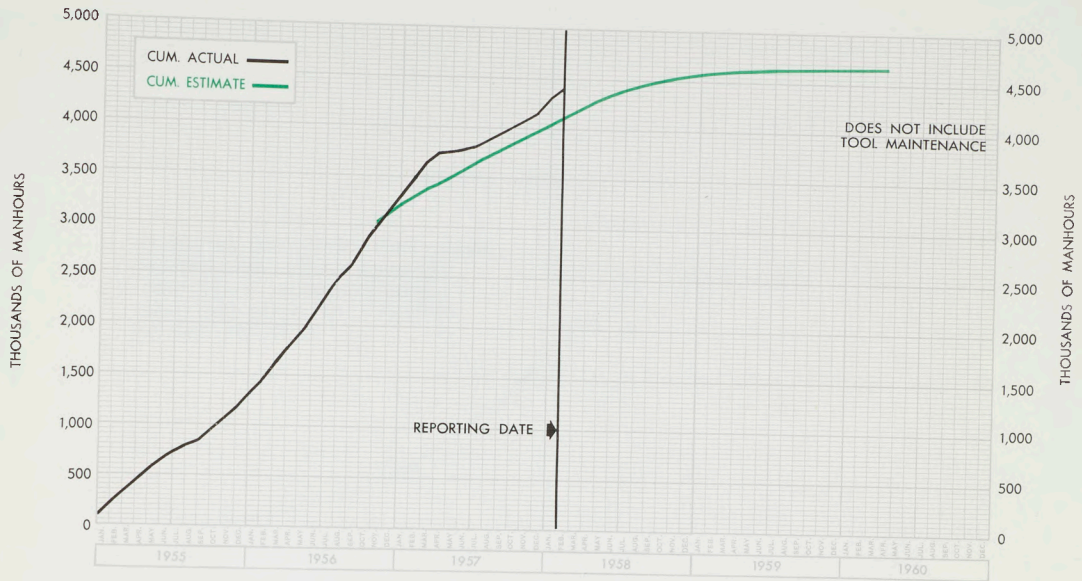
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SECTION 3

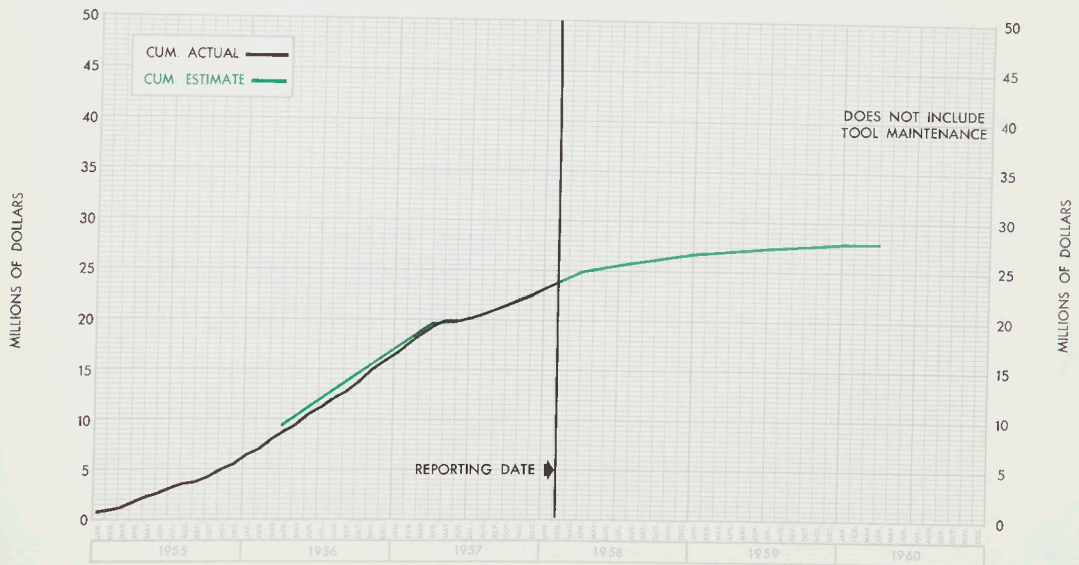
SECTION 4

SECTION 5

TOOLING



MANHOUR EXPENDITURES



105-MPR64-7

DOLLAR EXPENDITURES

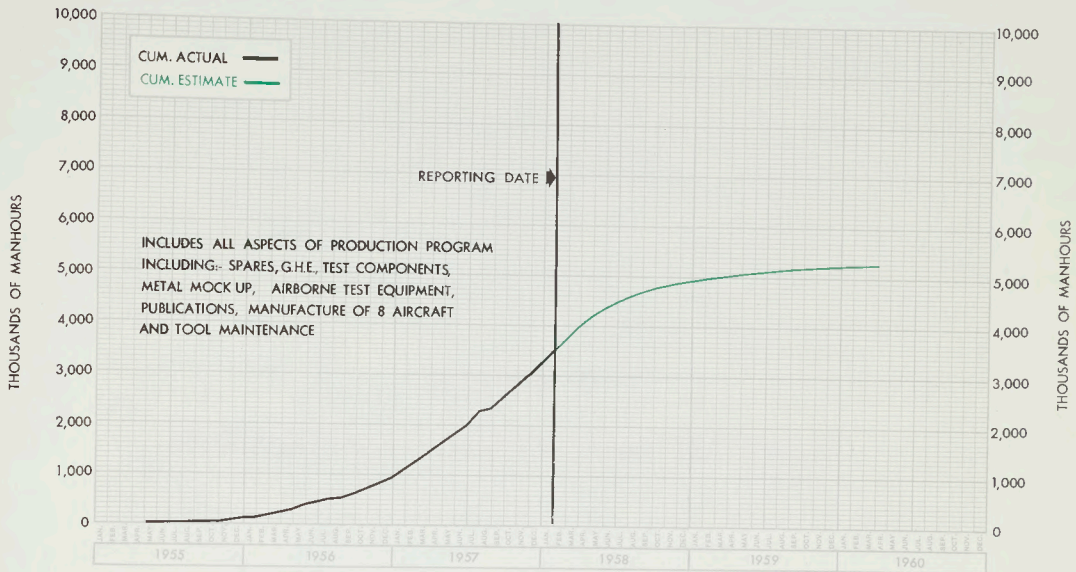
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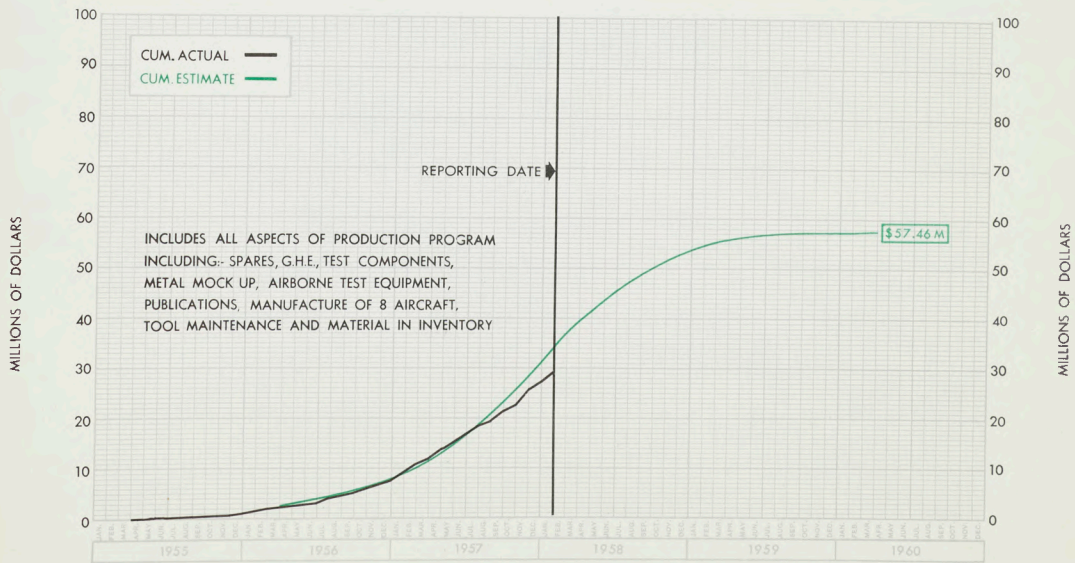
SECTION 4

SECTION 5

PRODUCTION



MANHOURLY EXPENDITURES



105-MPR65-7

DOLLAR EXPENDITURES

SECTION 2

SECTION 3

SECTION 4

SECTION 5

SECTION 2
ENGINEERING - DESIGN AND TECHNICAL

SECTION 2

SECTION 3

SECTION 4

SECTION 5



ENGINEERING - DESIGN AND TECHNICAL

Changes to the engine installation and gear-boxes on the ARROW 2 mockup as a result of the September 1957 mockup evaluation are nearing completion, and the RCAF evaluation of these changes is scheduled for February 17th, 1958. Finalization of the ARROW 2 Model Specification is dependent upon receipt of the RCAF comments on the draft specification.

On the Wind Tunnel and Free Flight Model Tests chart the reference to twelve wind tunnel and eleven free flight model tests has been clarified. A further test period is scheduled for the 1/10 low speed flutter model, and a manufacturing period and test period have been deleted from the section on the 1/40 high speed flutter model tests.

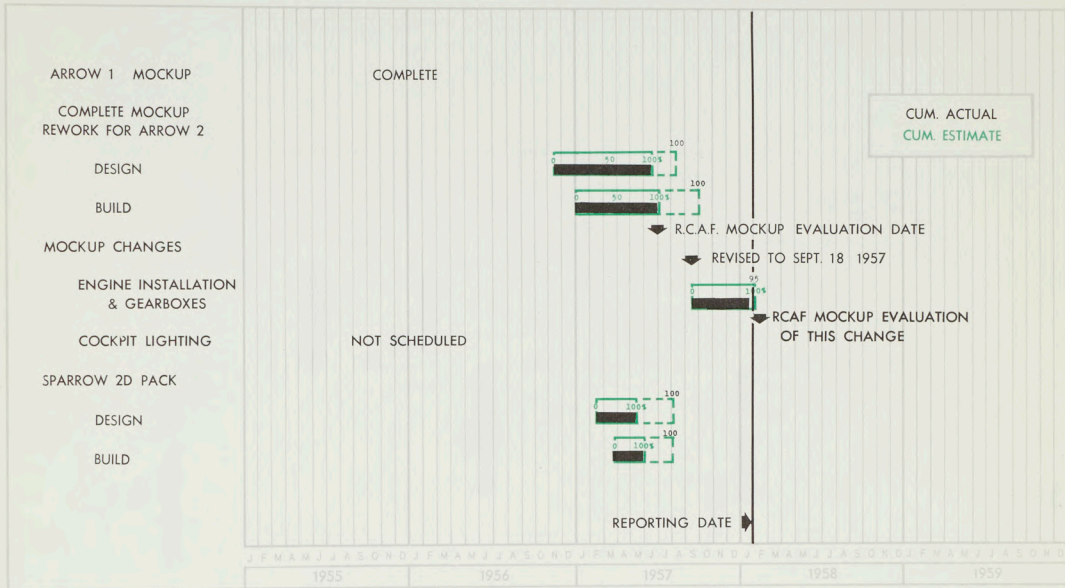
The current new parts estimates for twelve components on the ARROW 2 Engineering Parts

Release Schedule have been revised. Seven of these components are now behind schedule. The schedule for the ARROW 2 outer wing has been deleted as there are no major changes from the ARROW 1 configuration.

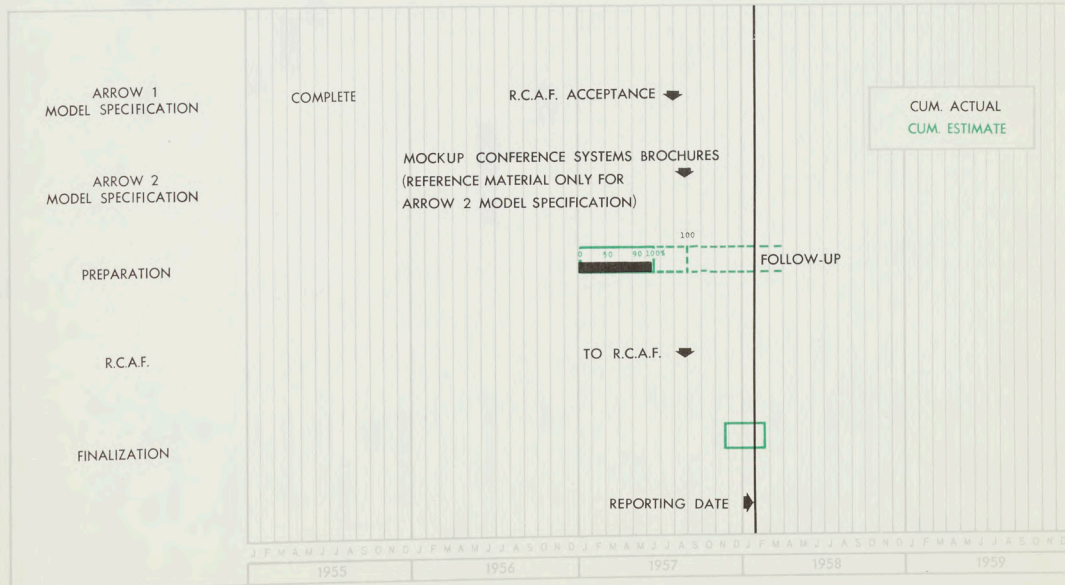
There has been no significant increase in the rate of expenditure of dollars and manhours shown in this section since the November report.

On the Air Conditioning System chart the note "Limited Flight Approved" has been added opposite the qualification section for the ARROW 1 turbine and fan. On the same chart the black line showing delivery of the ARROW 1 turbine and fan has been amended from 4 to 3 sets. The fourth and fifth sets have been returned to AiResearch Manufacturing Company for rework to the latest configuration.

MOCKUPS AND SPECIFICATIONS

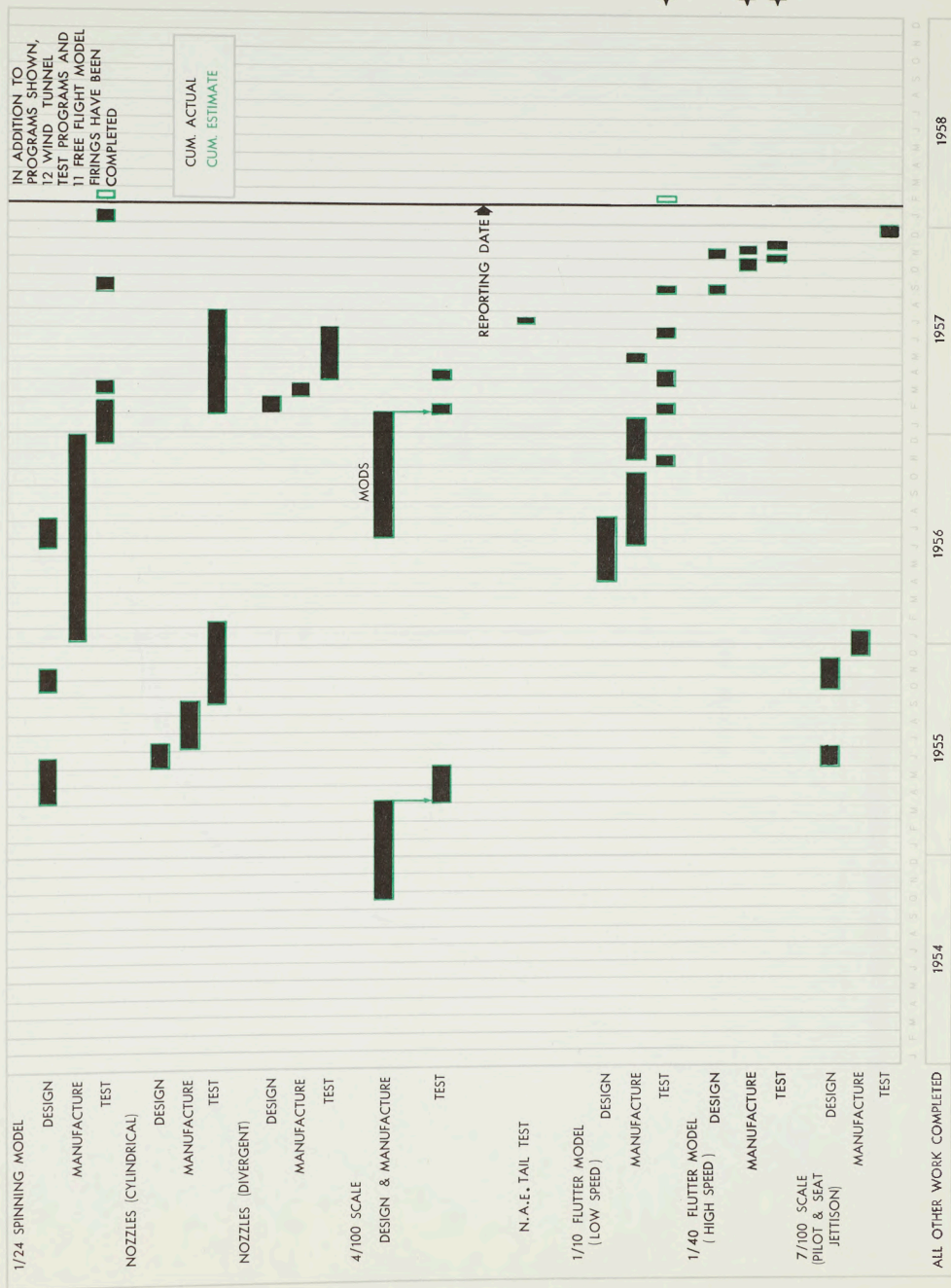


MOCKUPS



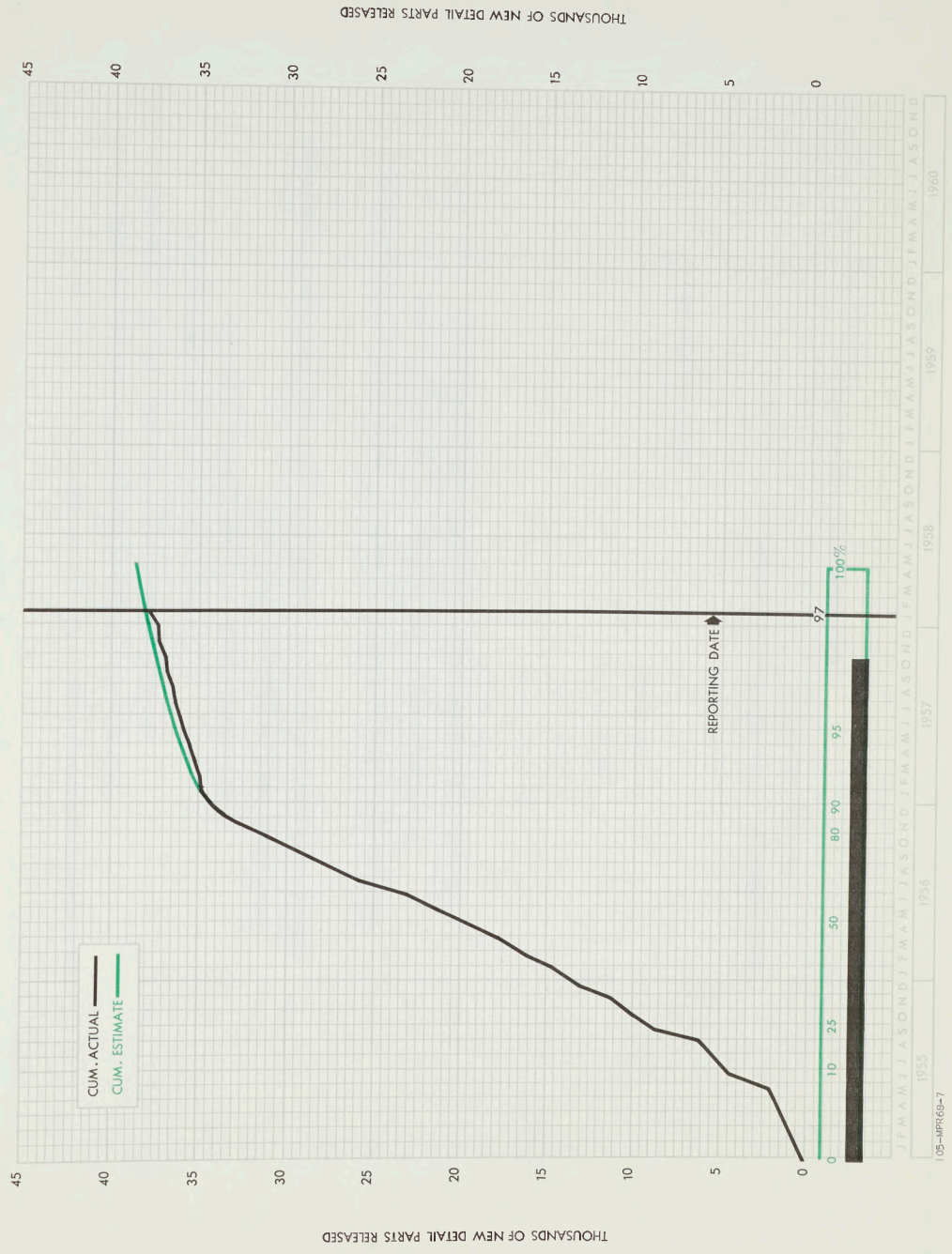
MODEL SPECIFICATIONS

WIND TUNNEL AND FREE FLIGHT MODEL TESTS



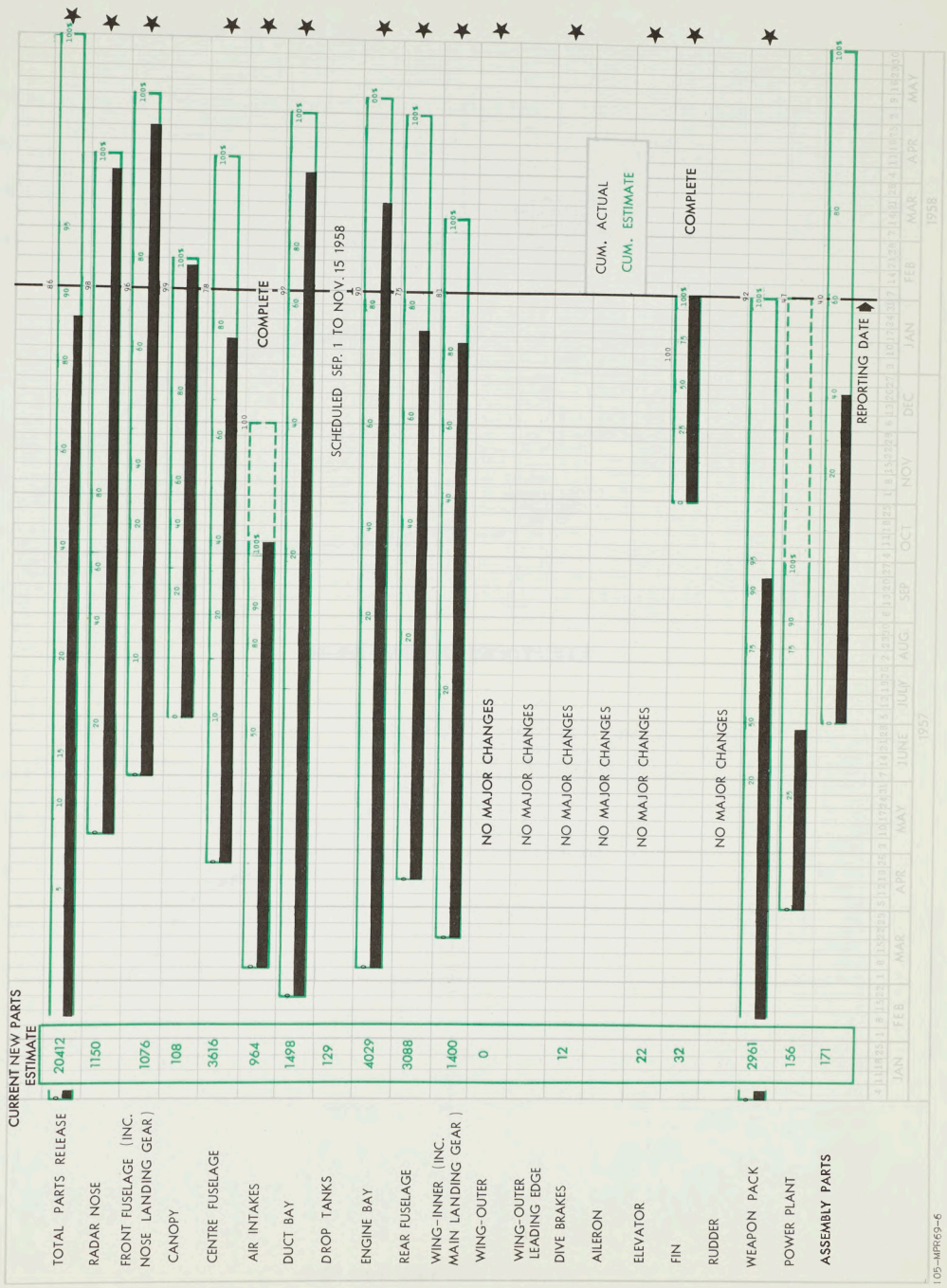
105-WPR67-6

ENGINEERING PARTS RELEASE - ARROW 1 AIRCRAFT NOS. 25201 TO 25205



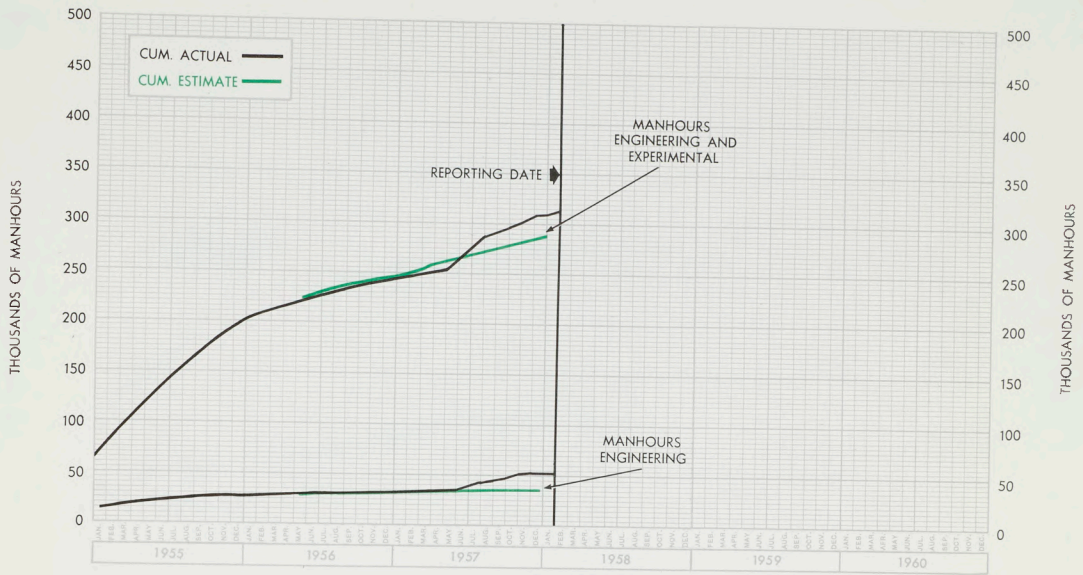
UNCLASSIFIED SECRET

ENGINEERING PARTS RELEASE SCHEDULE ARROW 2



105-44969-6

ENGINEERING MOCKUPS



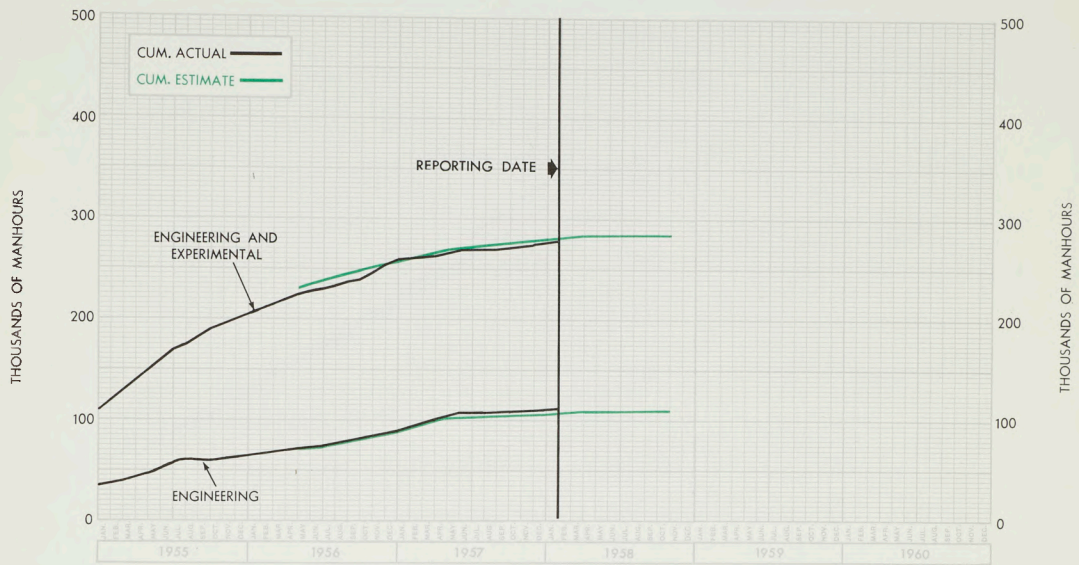
MANHOUR EXPENDITURES



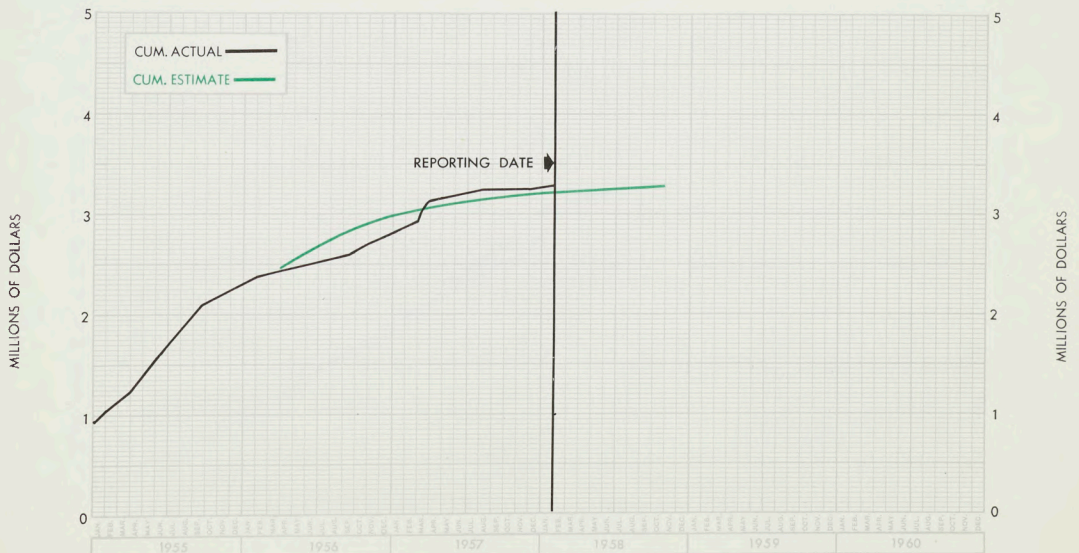
DOLLAR EXPENDITURES

105-MPR70-6

WIND TUNNEL AND FREE FLIGHT MODEL TESTS



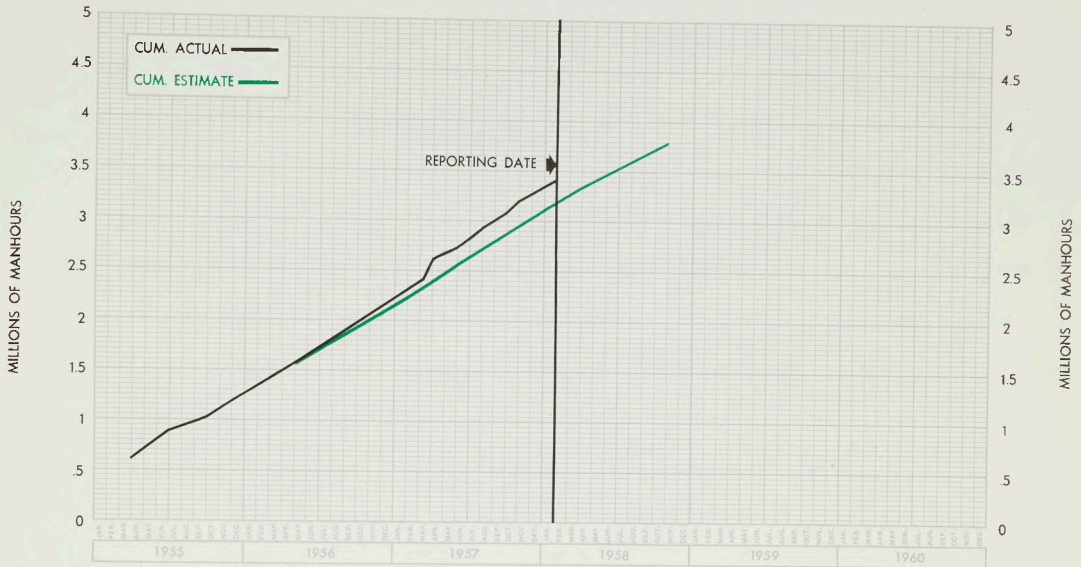
MANHOUR EXPENDITURES



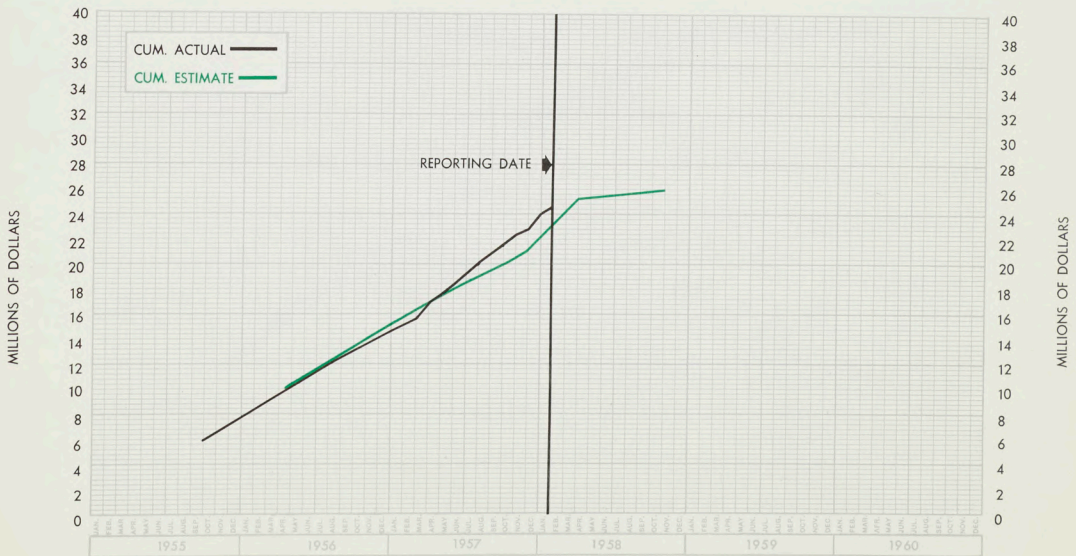
DOLLAR EXPENDITURES

105-MPR71-6

AIRCRAFT DESIGN-EXCLUDING GROUND SUPPORT EQUIPMENT, MOCKUPS, MODELS AND A.S.T.



MANHOURLY EXPENDITURES



DOLLAR EXPENDITURES

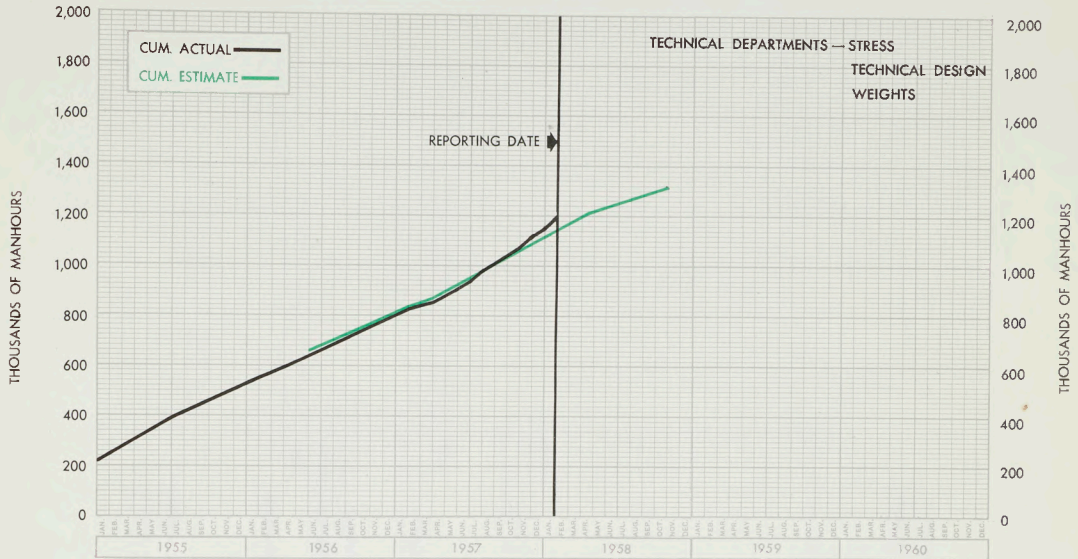
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SECTION 3

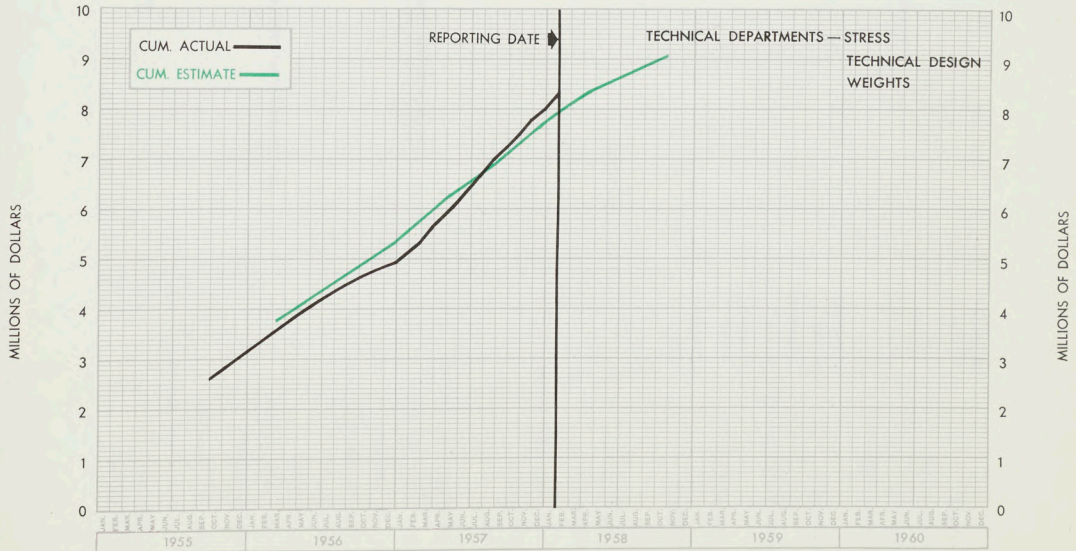
SECTION 4

SECTION 5

TECHNICAL DEPARTMENTS



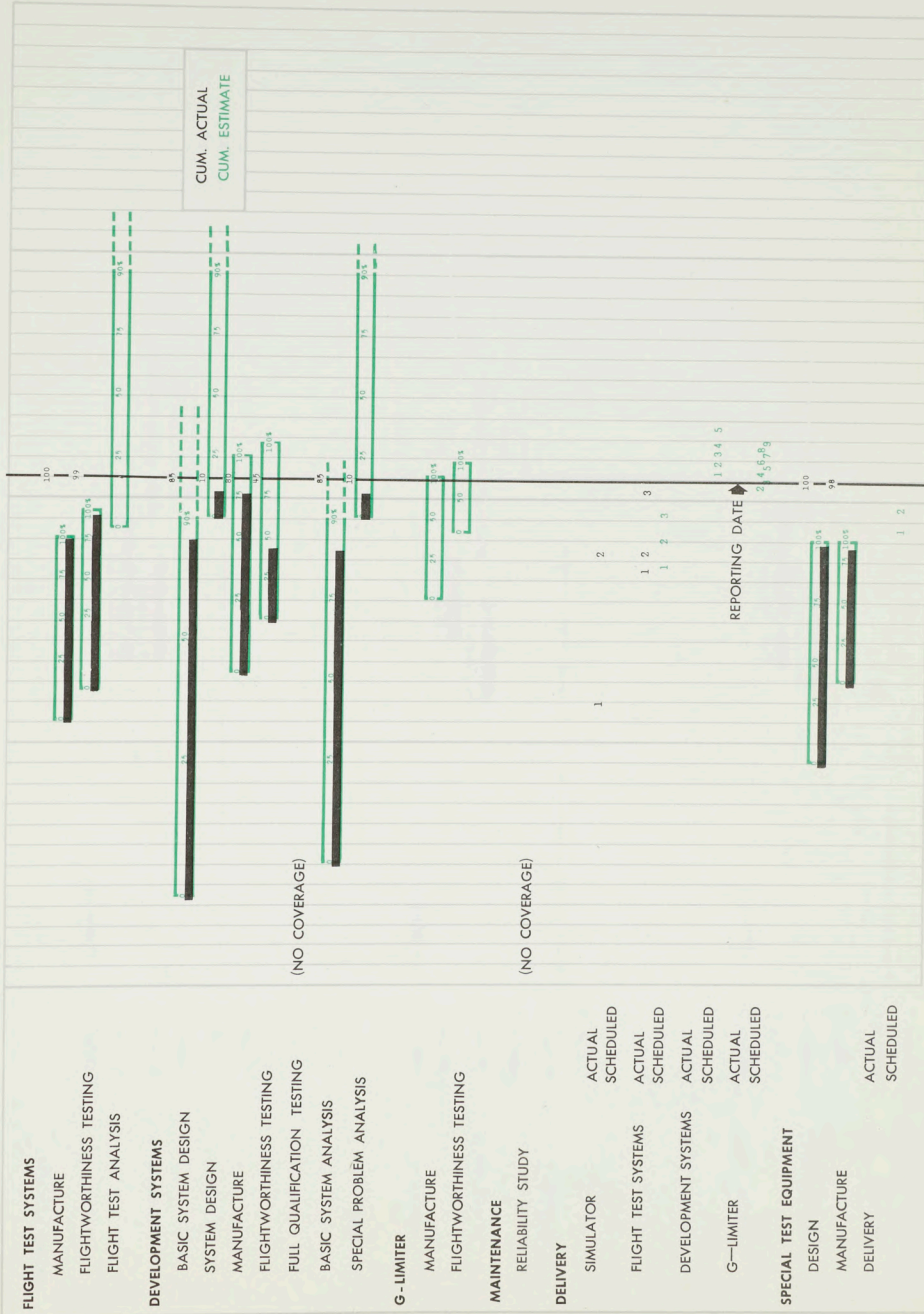
MANHOOUR EXPENDITURES



105-MPR73-6

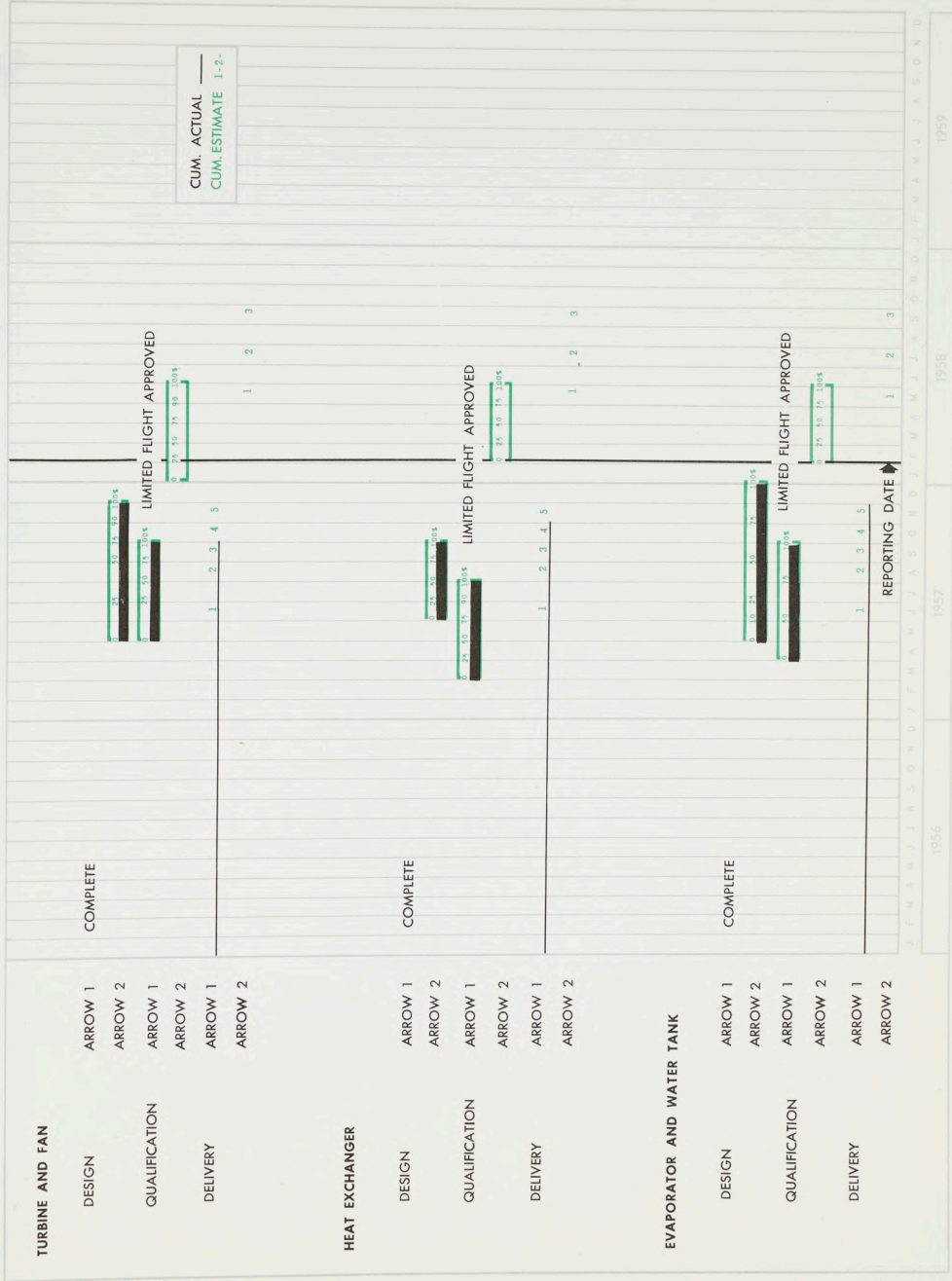
DOLLAR EXPENDITURES

MINNEAPOLIS-HONEYWELL (MH-64) DAMPING SYSTEM



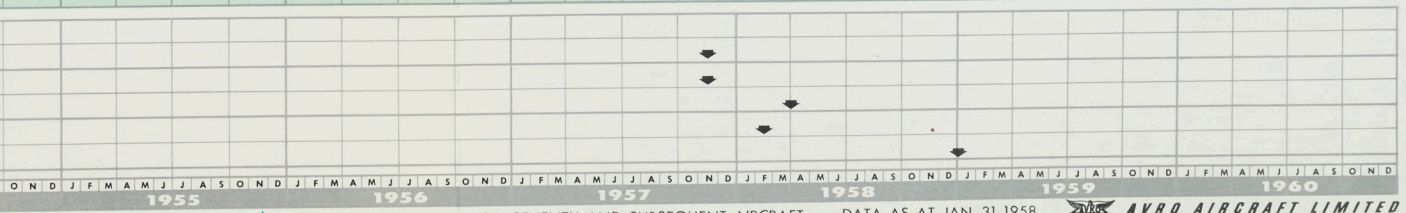
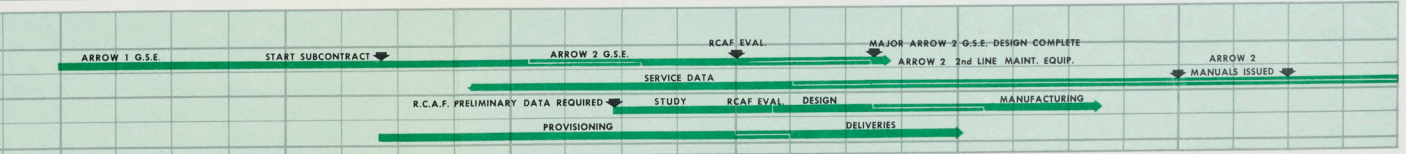
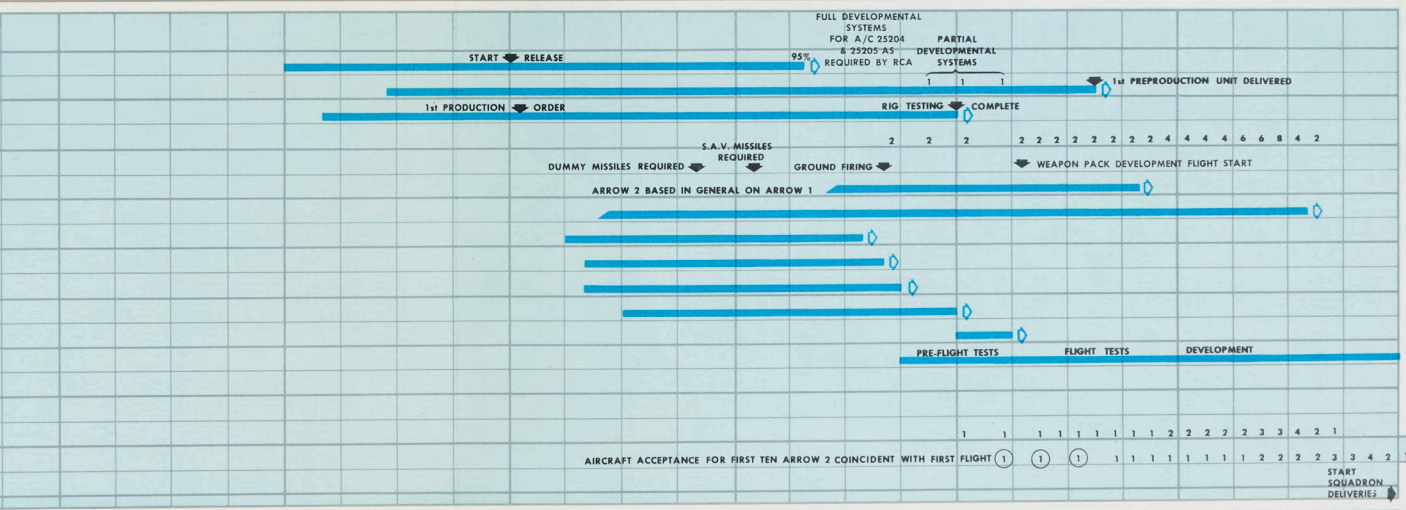
1956 1957 1958 1959
 J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D

AIR CONDITIONING SYSTEM



219-CA-5

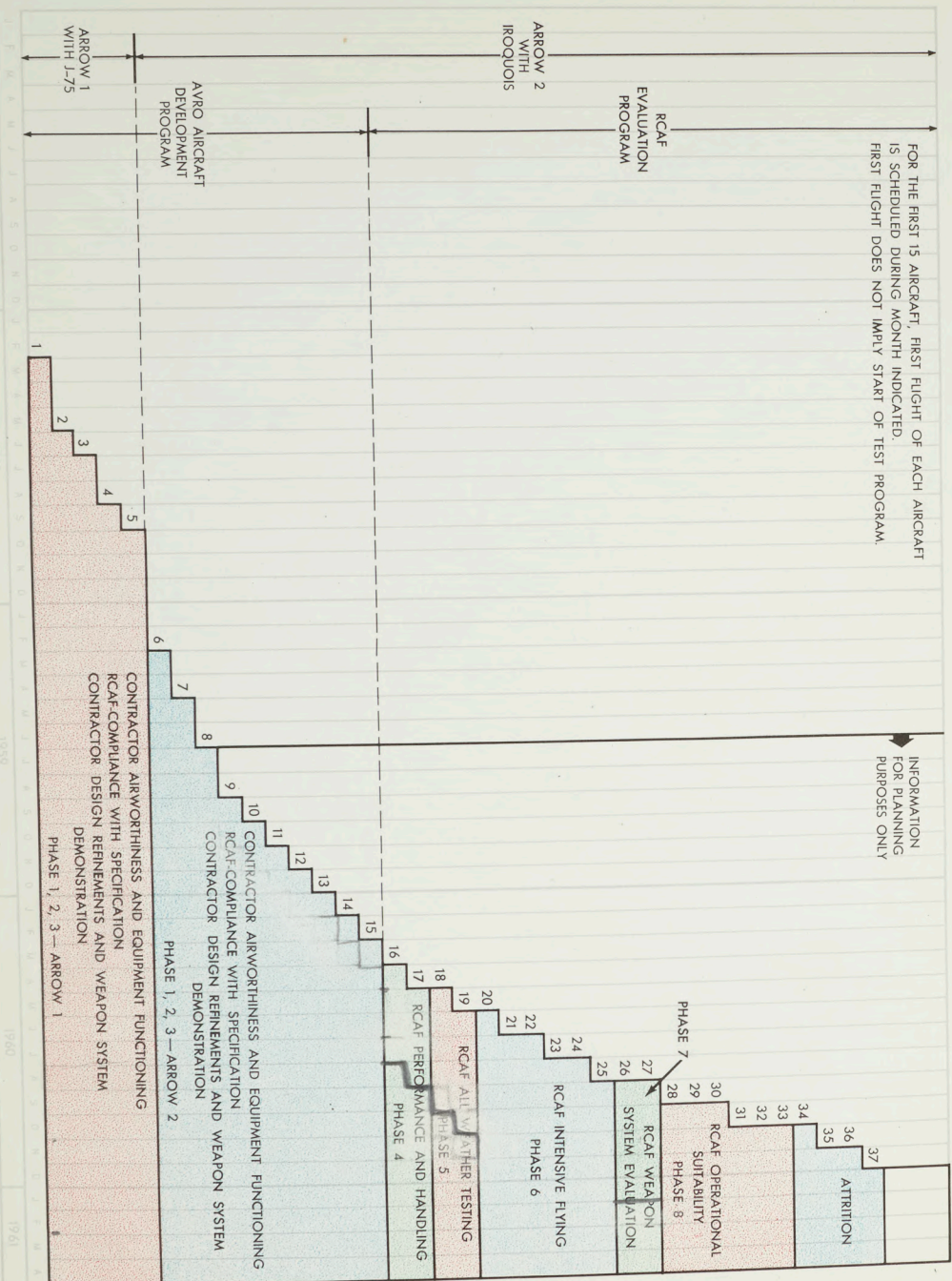
PROGRESS CHART PROGRAM FIVE (AMENDED) UNCLASSIFIED AVRO ARROW



ALLOCATION OF AIRCRAFT - PROGRAM 5 (AMENDED)

FOR THE FIRST 15 AIRCRAFT, FIRST FLIGHT OF EACH AIRCRAFT IS SCHEDULED DURING MONTH INDICATED. FIRST FLIGHT DOES NOT IMPLY START OF TEST PROGRAM.

INFORMATION FOR PLANNING PURPOSES ONLY



105-WPR82-4

1957 1958 1959 1960 1961

SECTION 3
ENGINEERING - TEST PROGRAM

SECTION 3

SECTION 4

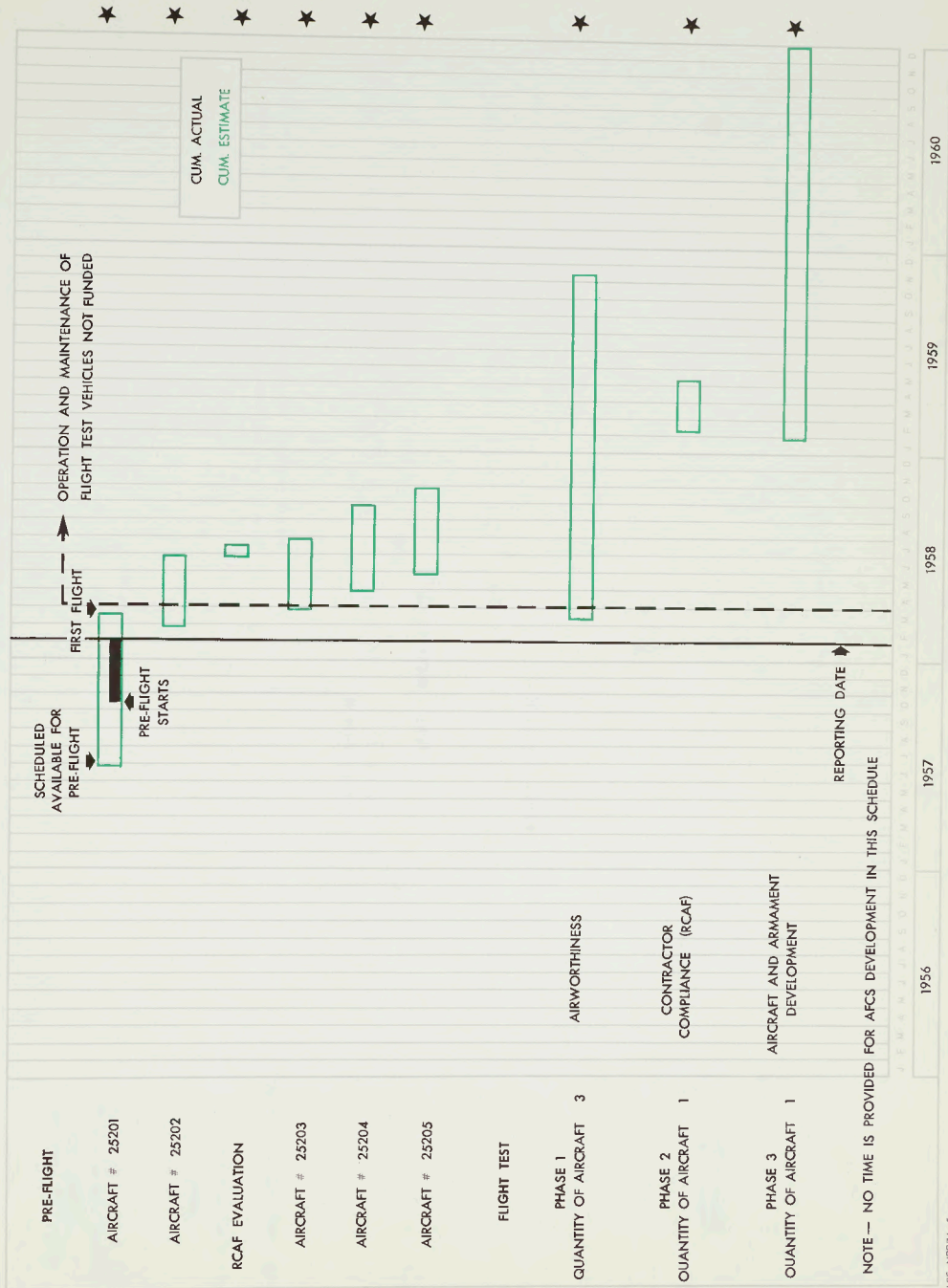
SECTION 5

ENGINEERING - TEST PROGRAM

Consequent upon the re-scheduling of the first flight dates for aircraft 25201 to 25205 it has been necessary to re-schedule the Flight Test Program for these aircraft. The three charts showing the Flight Test Program for all five ARROW 1 aircraft in general, for aircraft 25201 in particular, and the cumulative flying hours to December 31, 1958 for aircraft 25201, 25202 and 25203 have been amended. The flight test program for ARROW 2 aircraft has also been re-scheduled.

The bar showing progress on the ARROW 1 fuel system tests has been extended because testing additional to that originally scheduled is required. It is now estimated that testing of the Sparrow 2D missile pack, reported on the ARROW 2 structure and systems tests chart, will be completed at the end of April 1959. A schedule for ARROW 2 fuel system tests has been introduced on the ARROW 2 chart.

FLIGHT TEST PROGRAM ARROW 1

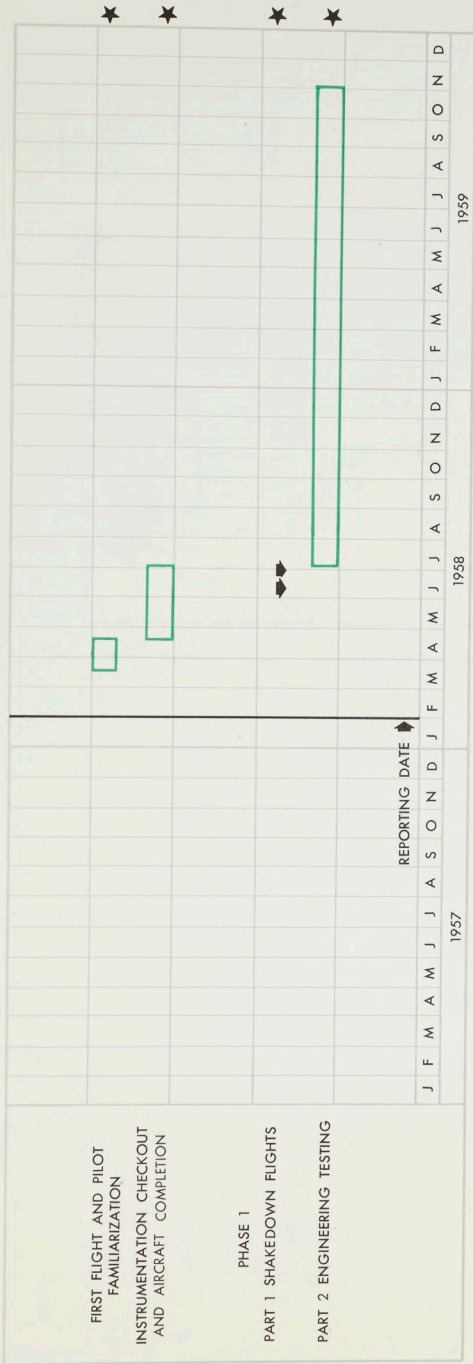


NOTE — NO TIME IS PROVIDED FOR AFCS DEVELOPMENT IN THIS SCHEDULE

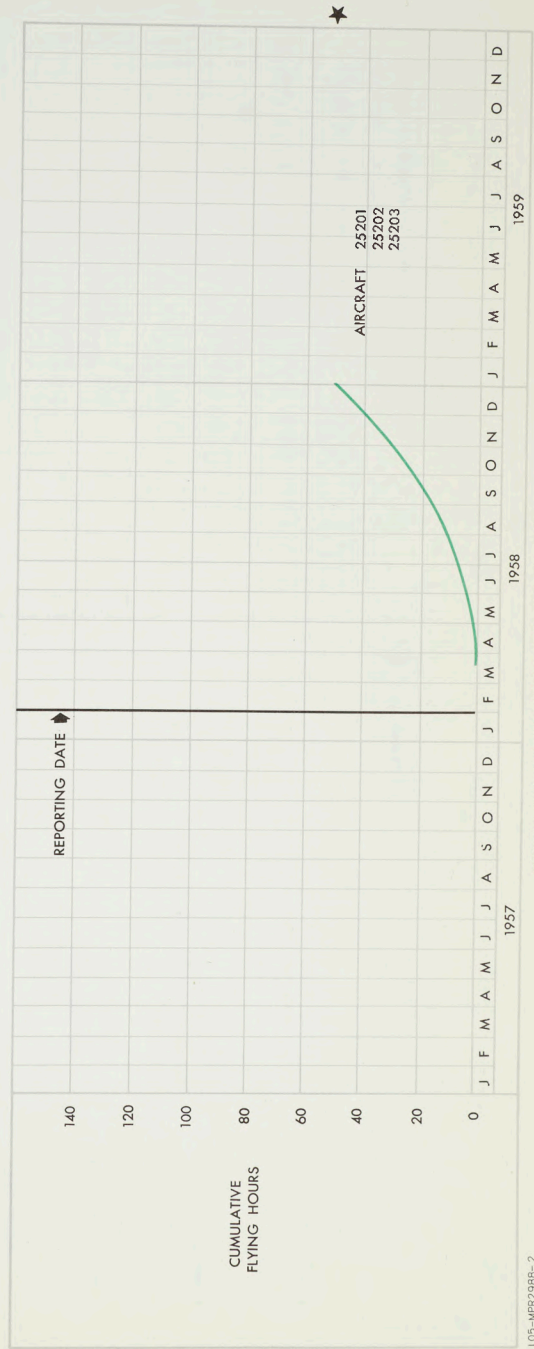
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1956 1957 1958 1959 1960

FLIGHT TEST PROGRAM ARROW 1



ARROW AIRCRAFT 25201

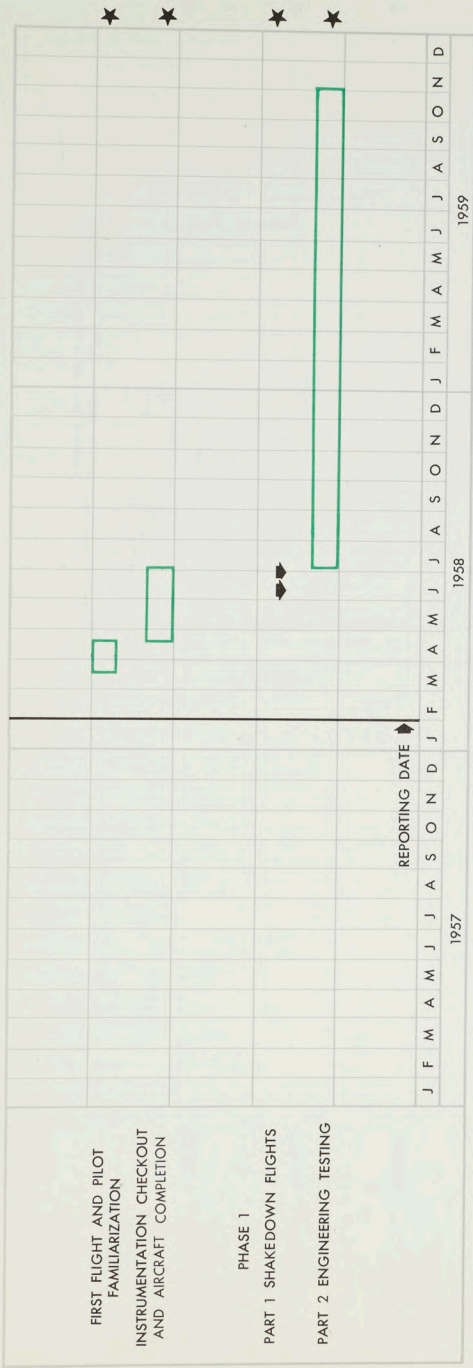


CUMULATIVE FLYING HOURS TO DEC. 31, 1958

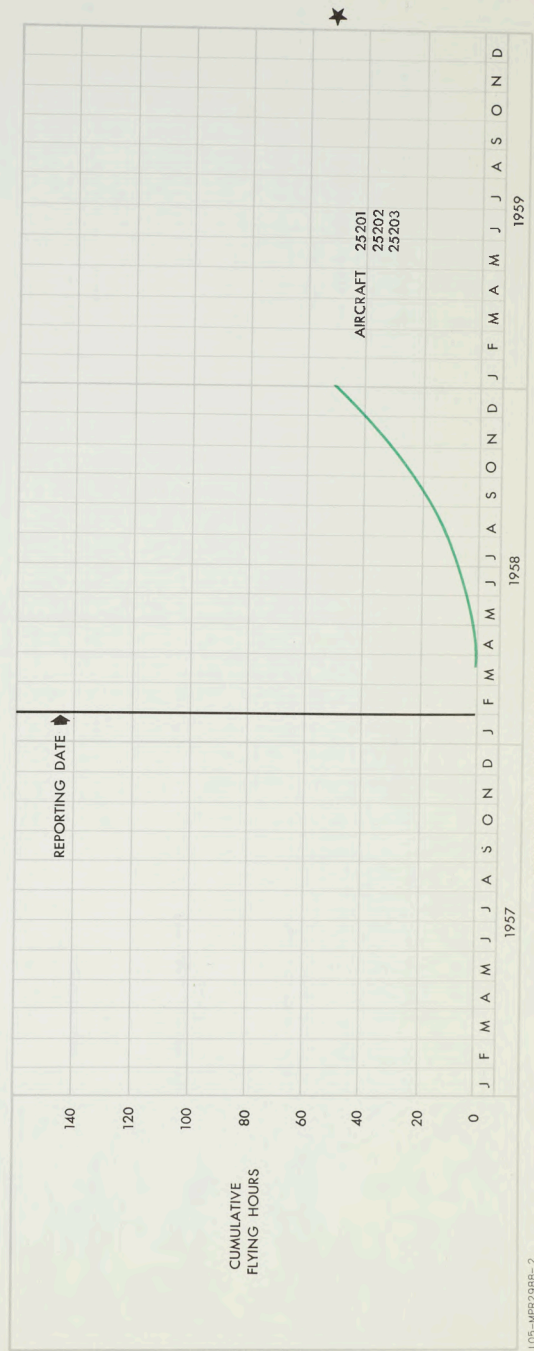
109-MPG2988-2

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FLIGHT TEST PROGRAM ARROW 1



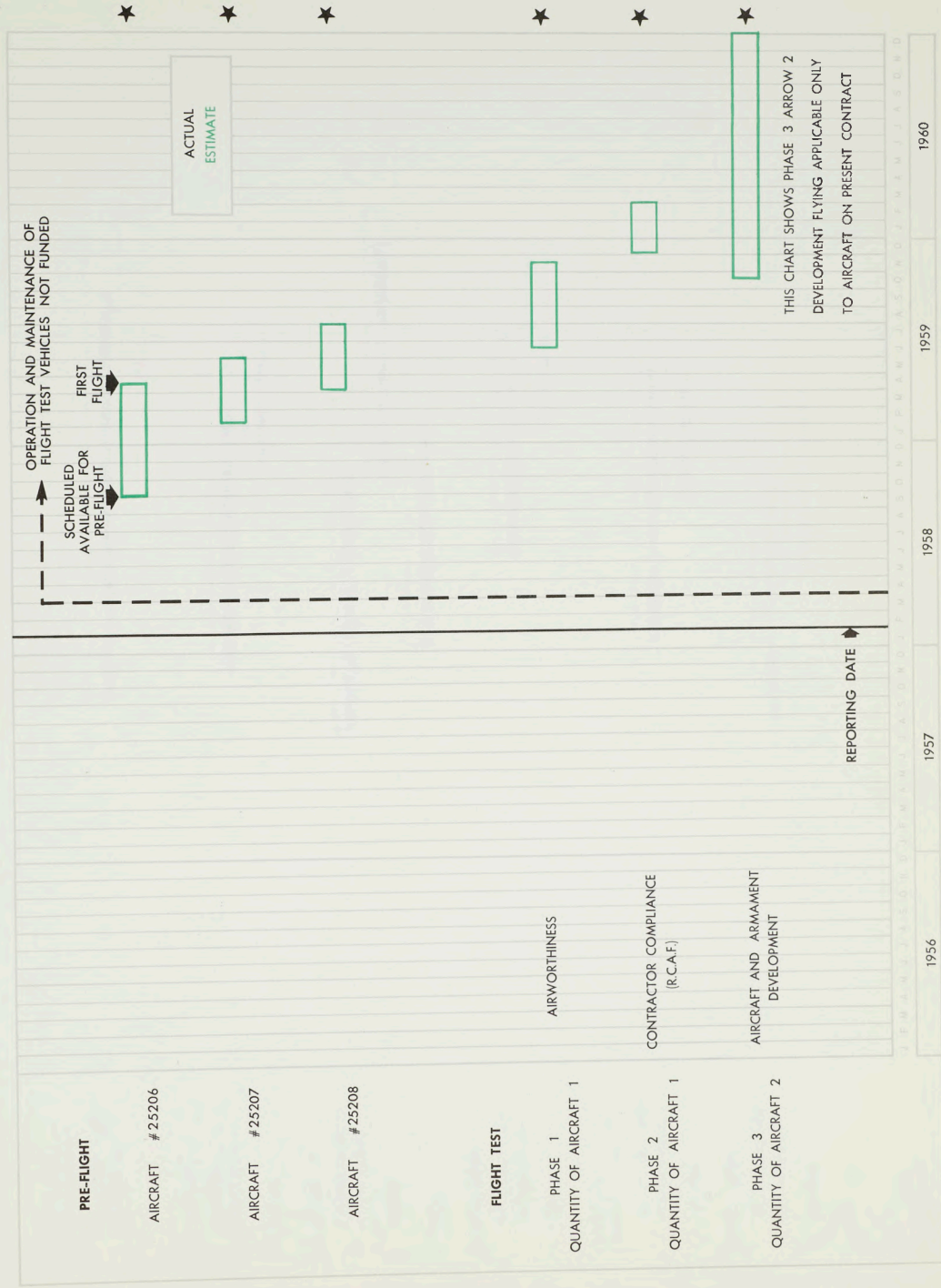
ARROW AIRCRAFT 25201



CUMULATIVE FLYING HOURS TO DEC. 31, 1958

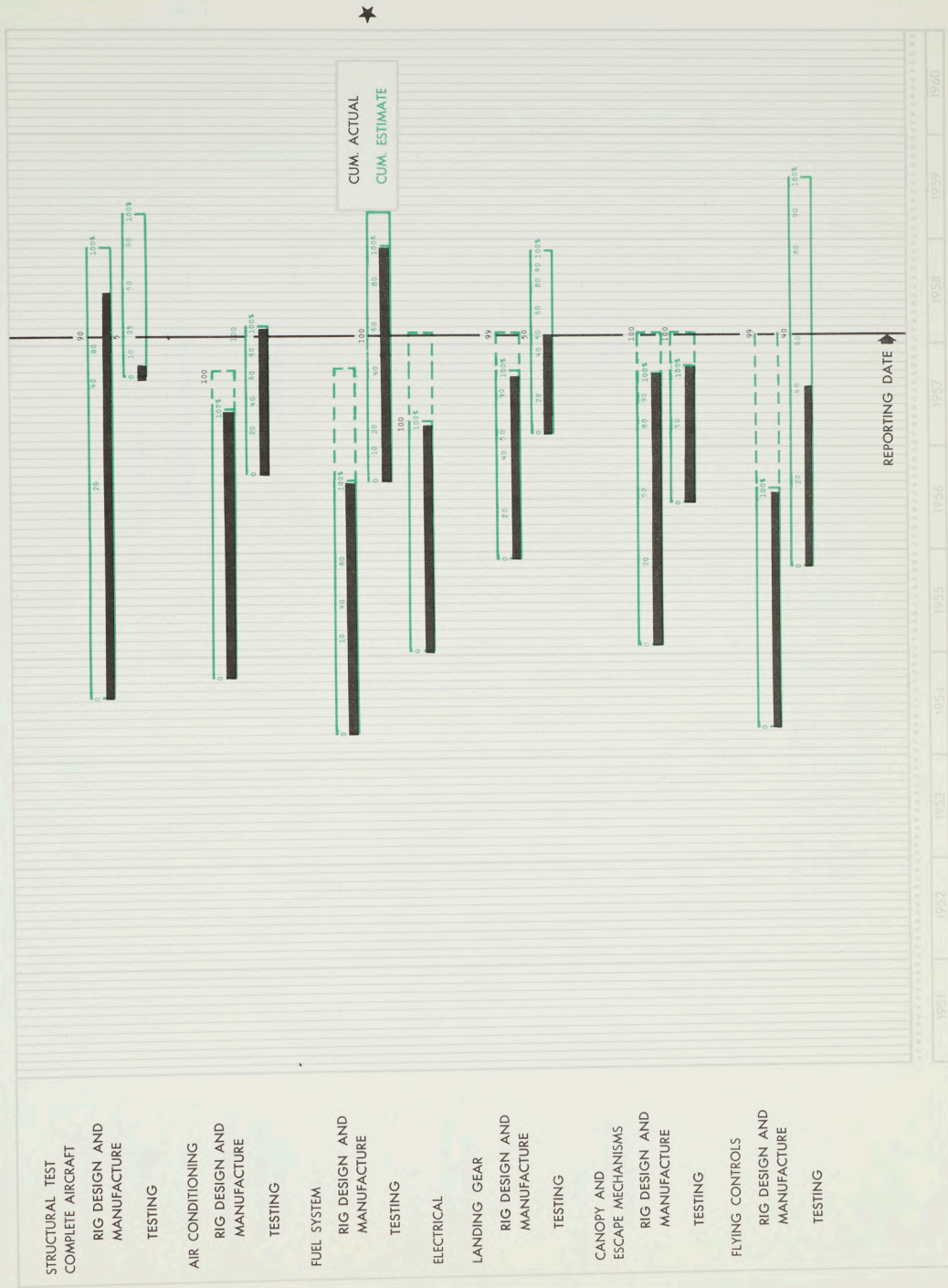
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FLIGHT TEST PROGRAM ARROW 2



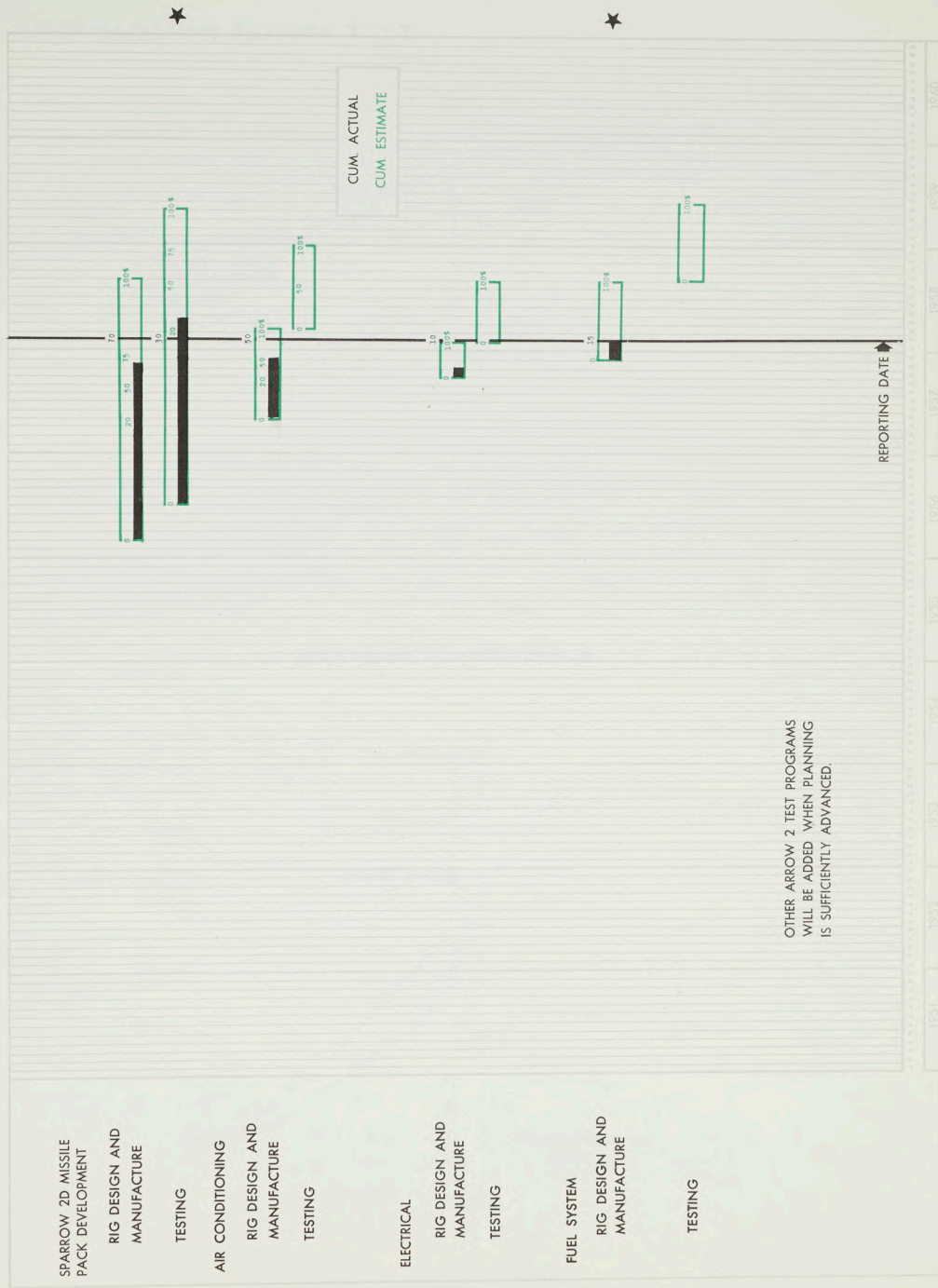
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MAJOR TESTS OF STRUCTURE AND SYSTEMS - ARROW 1



105-NPR76-6

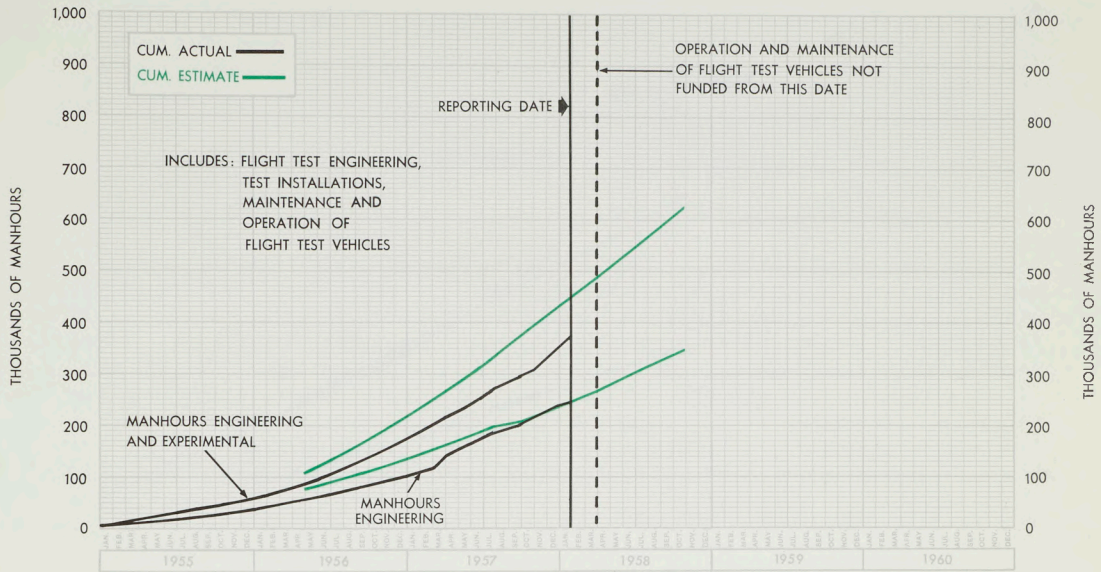
MAJOR TESTS OF STRUCTURE AND SYSTEMS -- ARROW 2



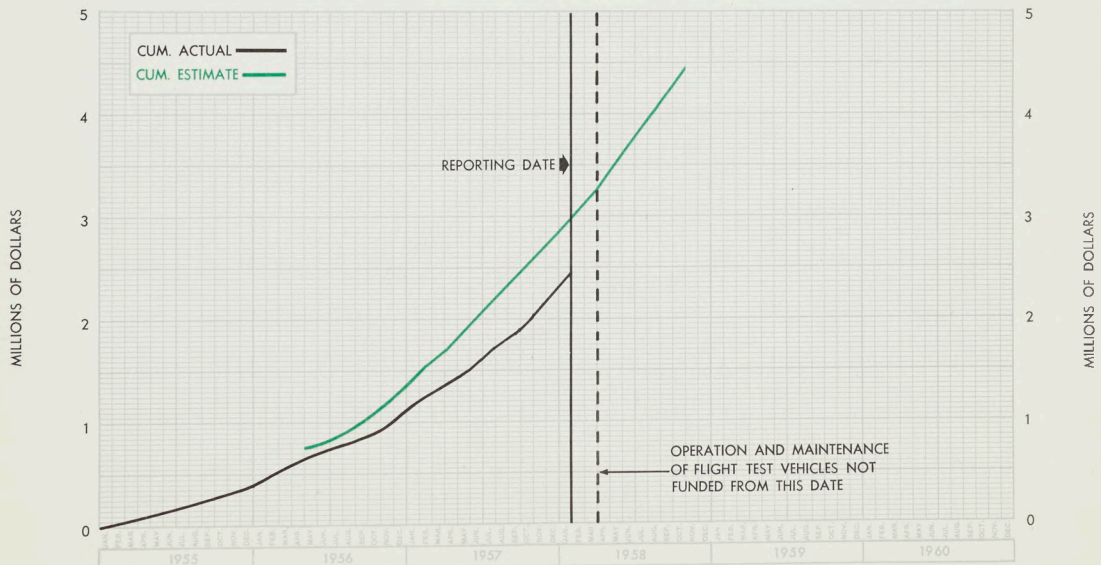
OTHER ARROW 2 TEST PROGRAMS WILL BE ADDED WHEN PLANNING IS SUFFICIENTLY ADVANCED.

105-MPR76A-5

ENGINEERING FLIGHT TEST



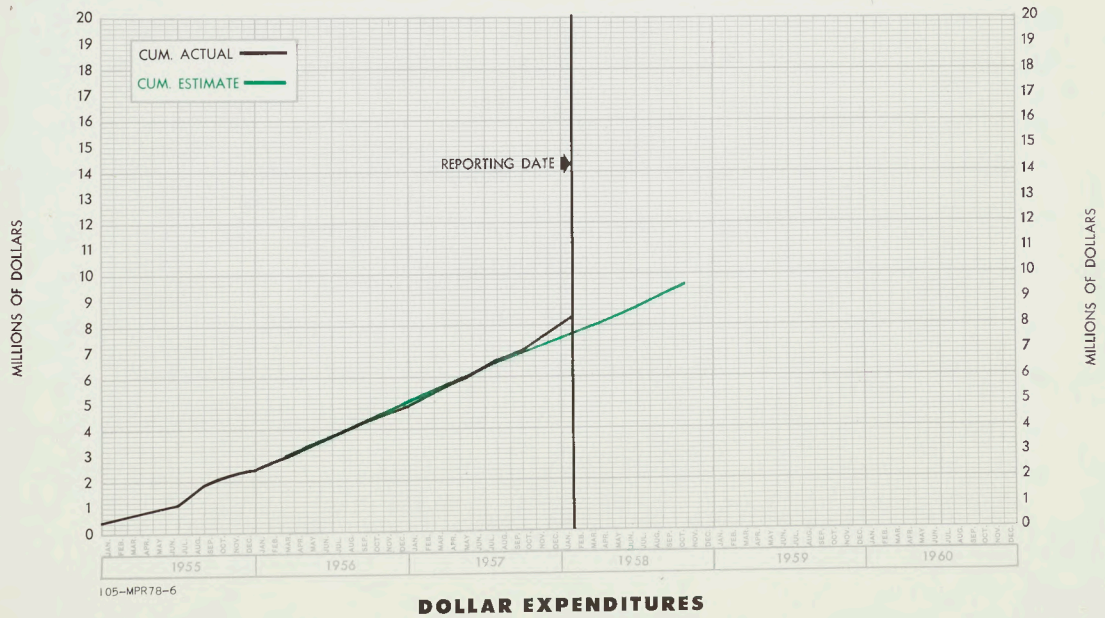
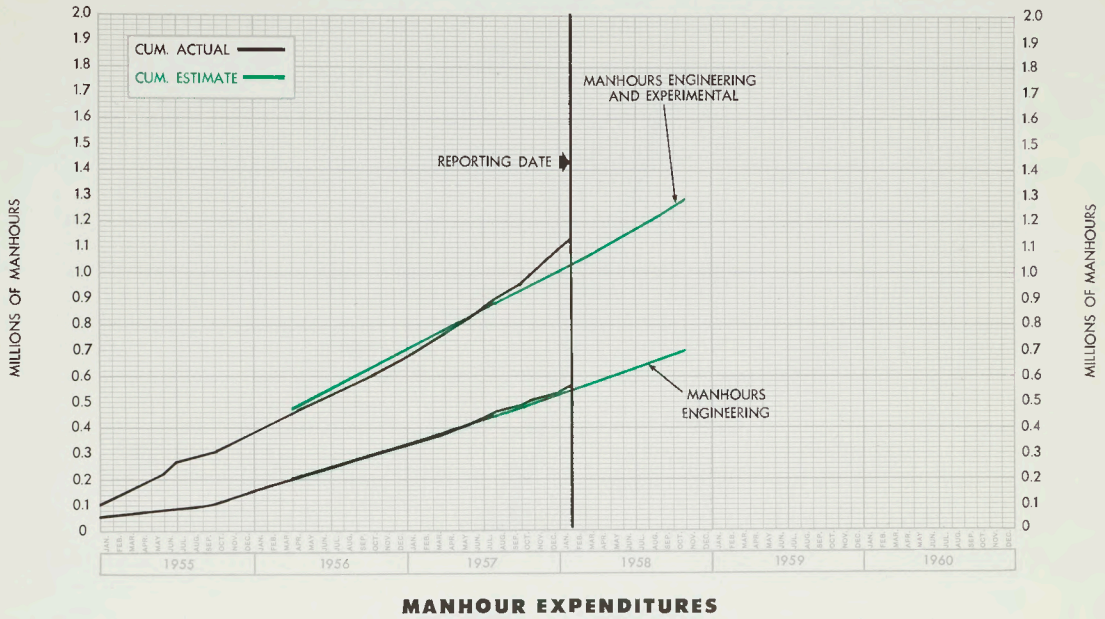
MANHOUR EXPENDITURES



105-MPR77-6

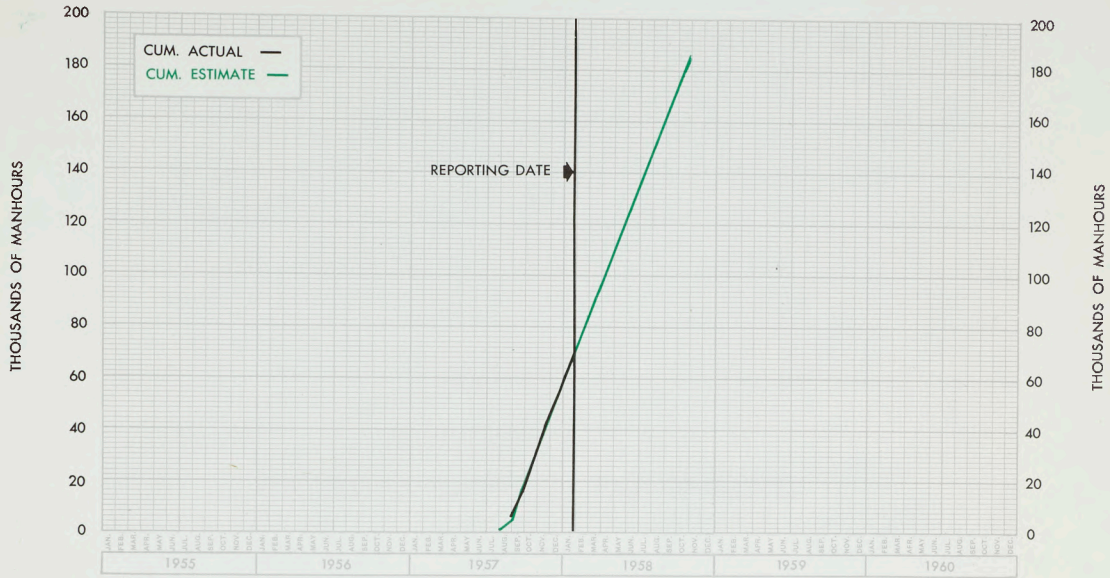
DOLLAR EXPENDITURES

STRUCTURE AND SYSTEMS TESTS



105-MPR78-6

INSTRUMENTATION LABORATORY



MANHOUR EXPENDITURES



105-MPR2883-3

DOLLAR EXPENDITURES

SECTION 4
ENGINEERING -
GROUND SUPPORT EQUIPMENT
&
AIRCRAFT SYSTEMS TRAINER

SECTION 4

SECTION 5

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ENGINEERING - GROUND SUPPORT EQUIPMENT AND SYSTEMS TRAINERS

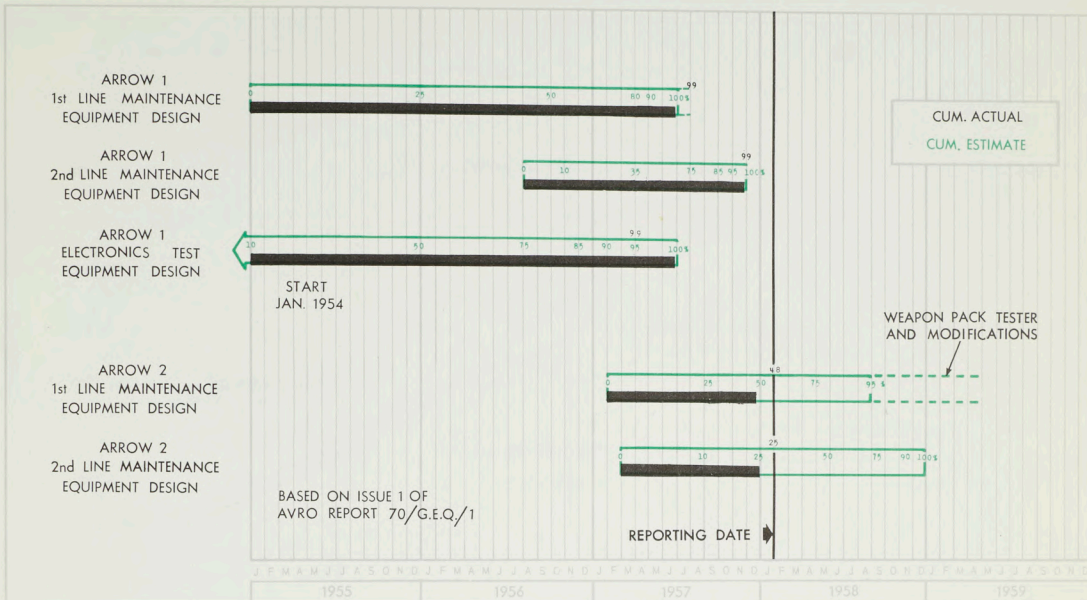
Charts previously titled Aircraft Systems Trainer are now titled Systems Trainers.

On the Ground Support Equipment - Major Items chart a Study Report bar has been added for the ARROW 2 Starter. Further work is necessary on the studies for the ARROW 2 Starter and Air Conditioning

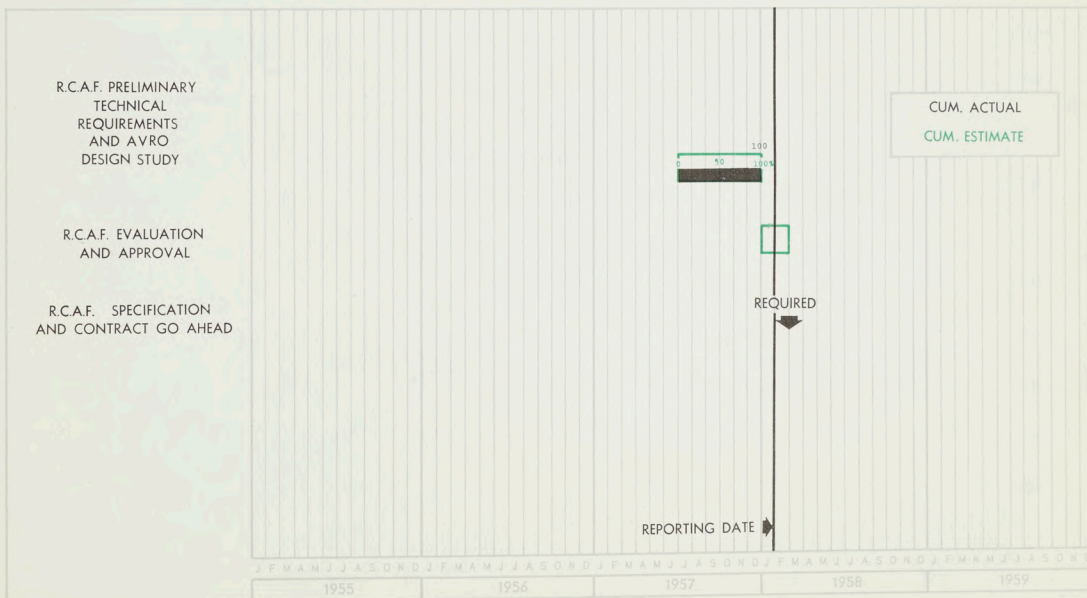
Vehicles. This further work is scheduled for February and March 1958, and following RCAF agreement on the revised studies, specification writing is scheduled from mid-April to mid-June 1958. Delivery dates for the ARROW 1 air conditioning vehicles, hydraulic stand and air-nitrogen compressor are re-scheduled.

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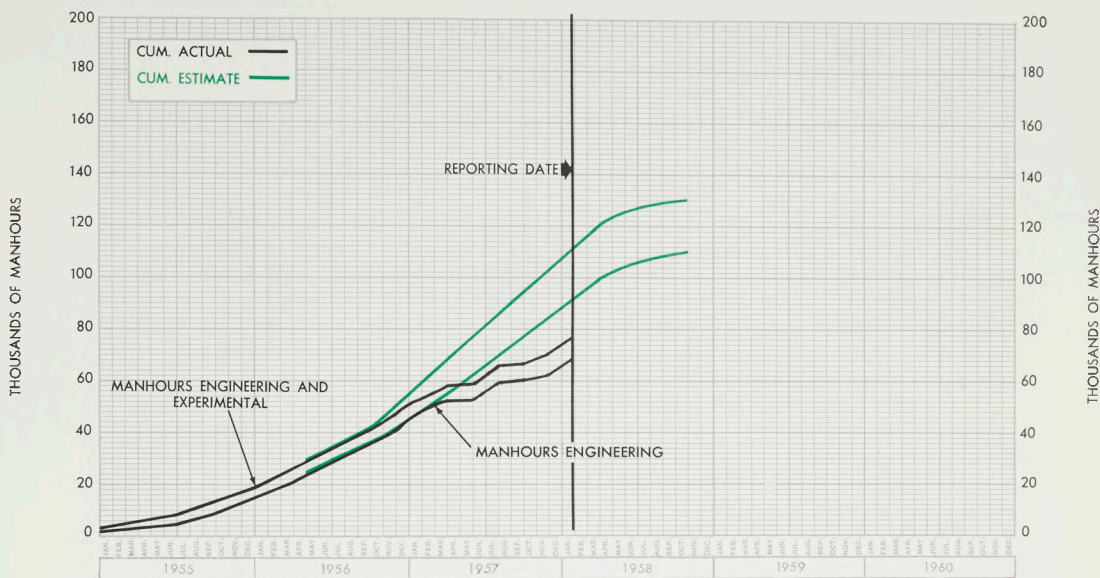
ENGINEERING GROUND SUPPORT EQUIPMENT AND SYSTEMS TRAINERS



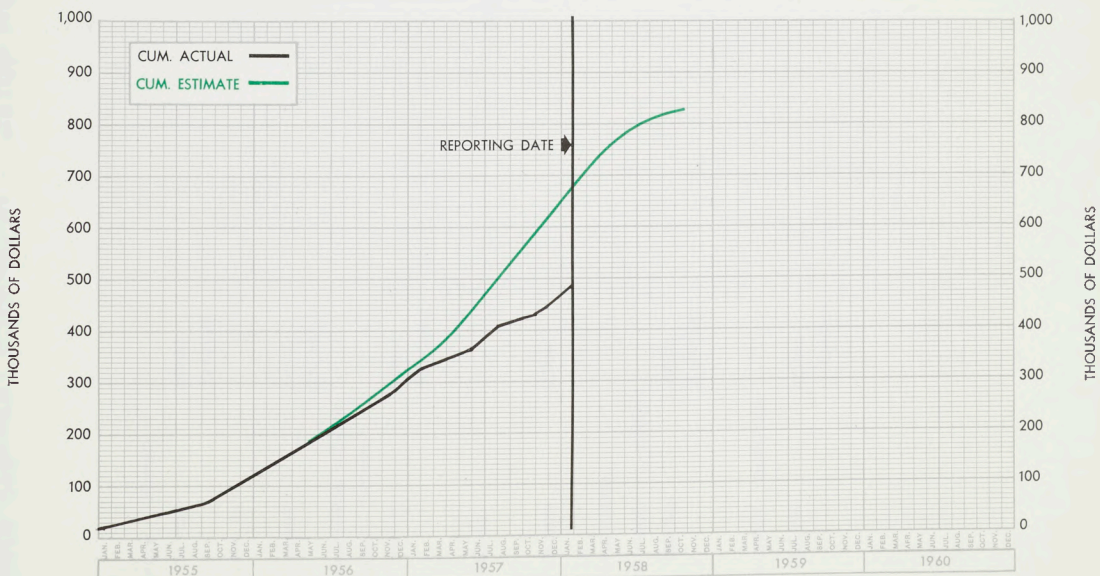
ENGINEERING GROUND SUPPORT EQUIPMENT



GROUND SUPPORT EQUIPMENT - DESIGN AND DEVELOPMENT



MANHOUR EXPENDITURES

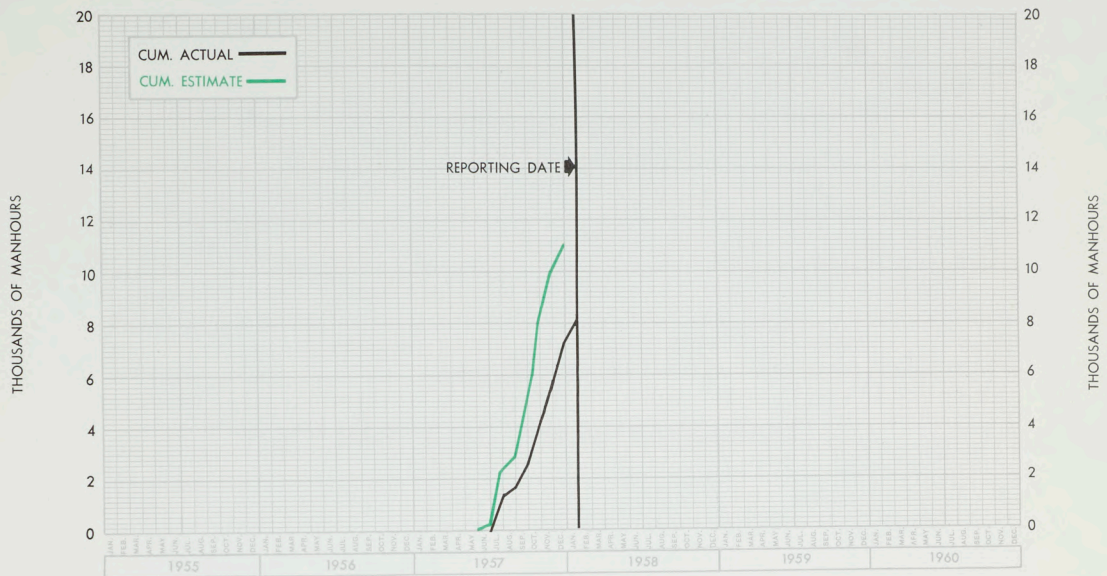


DOLLAR EXPENDITURES

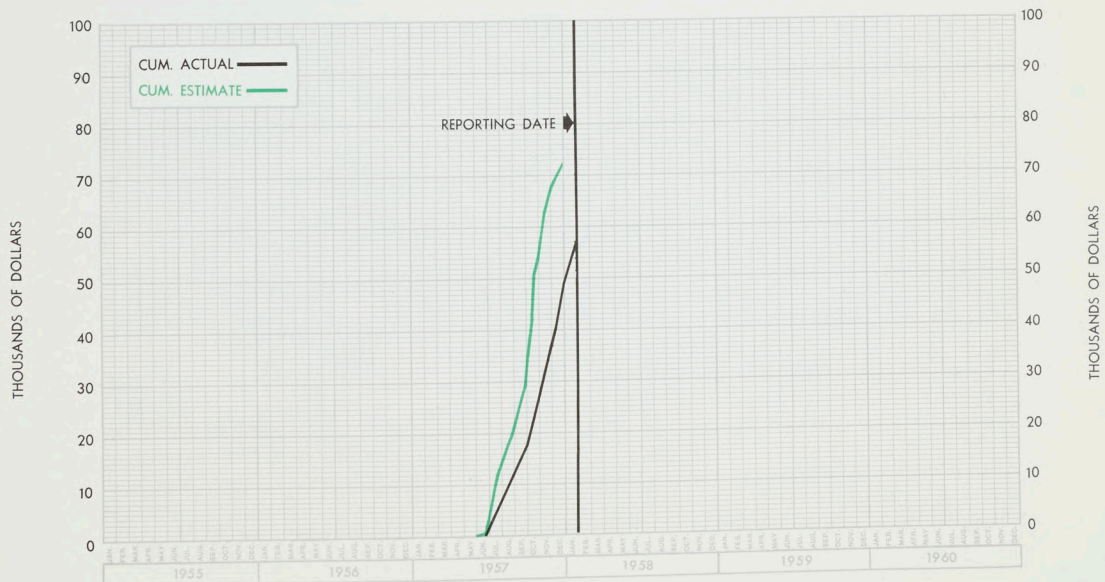
1 05-MPRB0-7

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AIRFRAME SYSTEMS TRAINER DESIGN STUDY ★



MANHOURLY EXPENDITURES



DOLLAR EXPENDITURES

105-MPR81-6

SECTION 5
TOOLING AND MANUFACTURING

TOOLING AND MANUFACTURING

This section deals with those phases of the program which relate to the Manufacturing Division. It affords a comparison of total Tooling and Production costs with performance in terms of percentage completed at the reporting date. Since the last issue the physical performance cumulative estimates have been amended on the chart showing total production costs and performance to coincide with schedule revision.

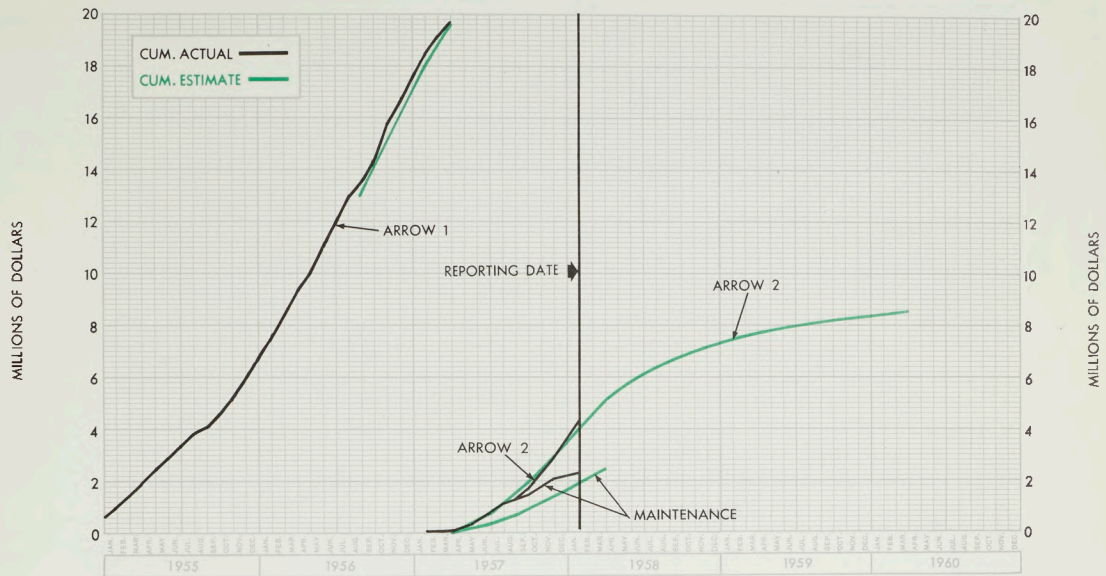
Bar charts showing the progress of the first eight aircraft and the static test aircraft are included. On the progress chart for the first aircraft the estimated schedules for production flight test and total aircraft have been extended to coincide with schedule revision. The estimated schedules for stages beyond details and subassembly have been amended on the progress charts for the second, third, fourth and fifth aircraft for the same reason. The estimated date for 25% total aircraft com-

pletion has been amended on the progress chart for the seventh aircraft.

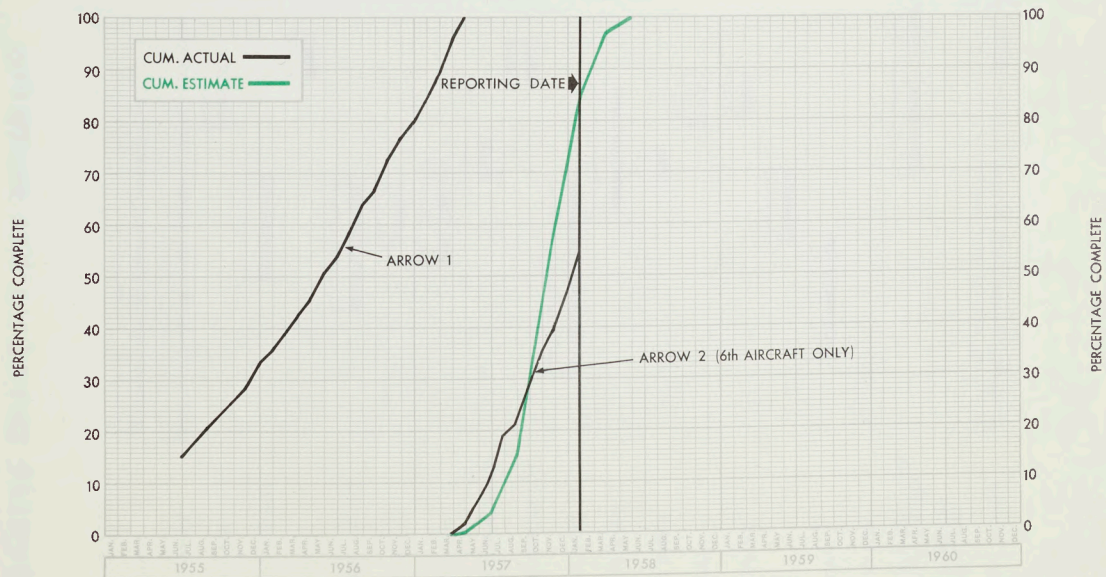
Manhour and dollar expenditures for the production of spares, ground support equipment, publications and the metal mockup are shown, as are costs for test components, airborne test equipment and production material. The record of production material cost associated with the first five aircraft has been amended to exclude development material.

The section also contains tables which reflect the supply position for pacing items of Avro furnished equipment and for Government Supplied Material. The aircraft acceptance and completion schedules in these tables have been revised. Information pertaining to the requirement and receipt of the dynamotor ALC-10 has been deleted as this item is no longer required.

TOTAL TOOLING – COSTS AND PERFORMANCE



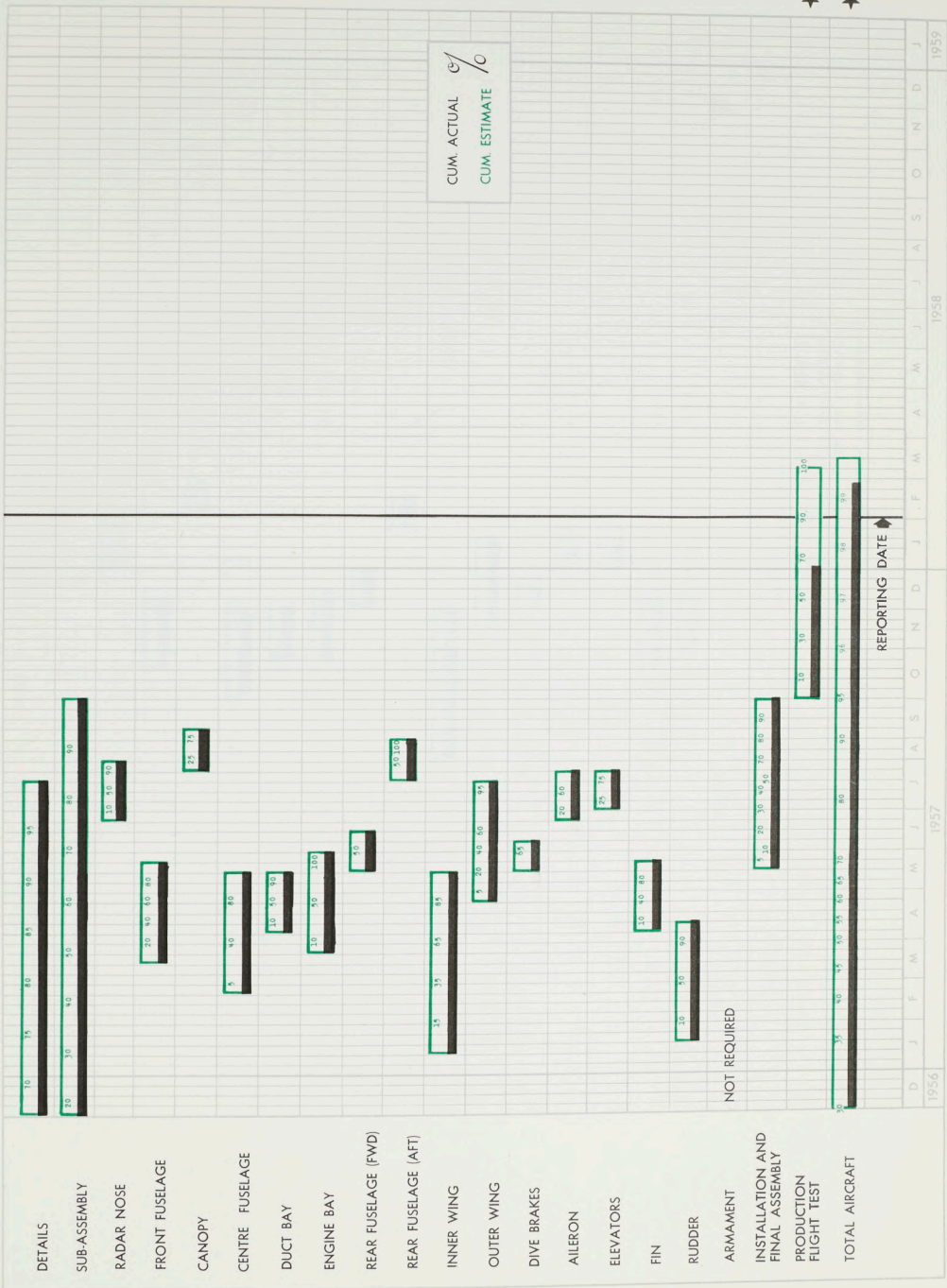
DOLLAR EXPENDITURES



105-MPR44-6

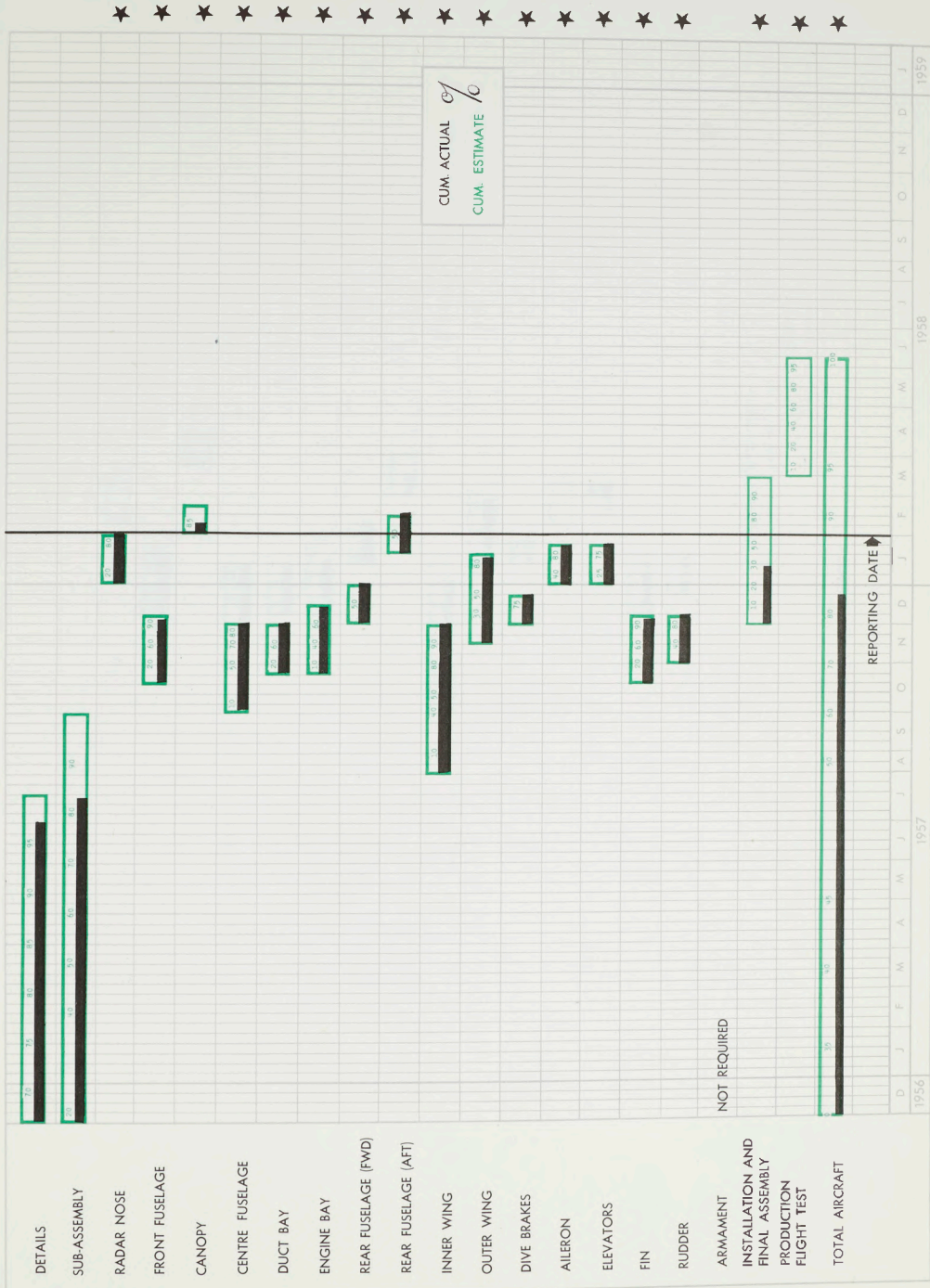
PHYSICAL PERFORMANCE

PROGRESS CHART — FIRST AIRCRAFT



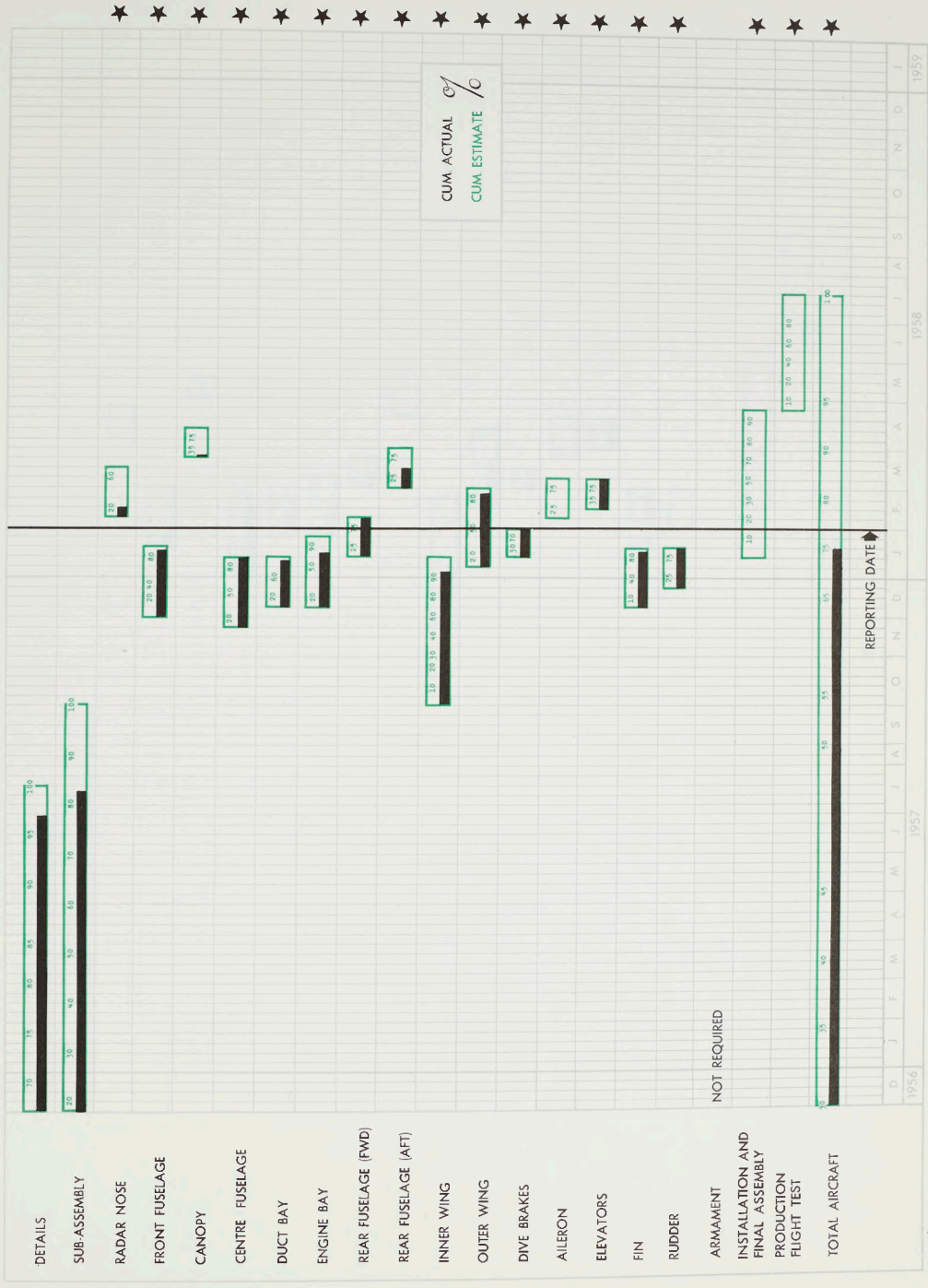
1956 1957 1958 1959

PROGRESS CHART - SECOND AIRCRAFT

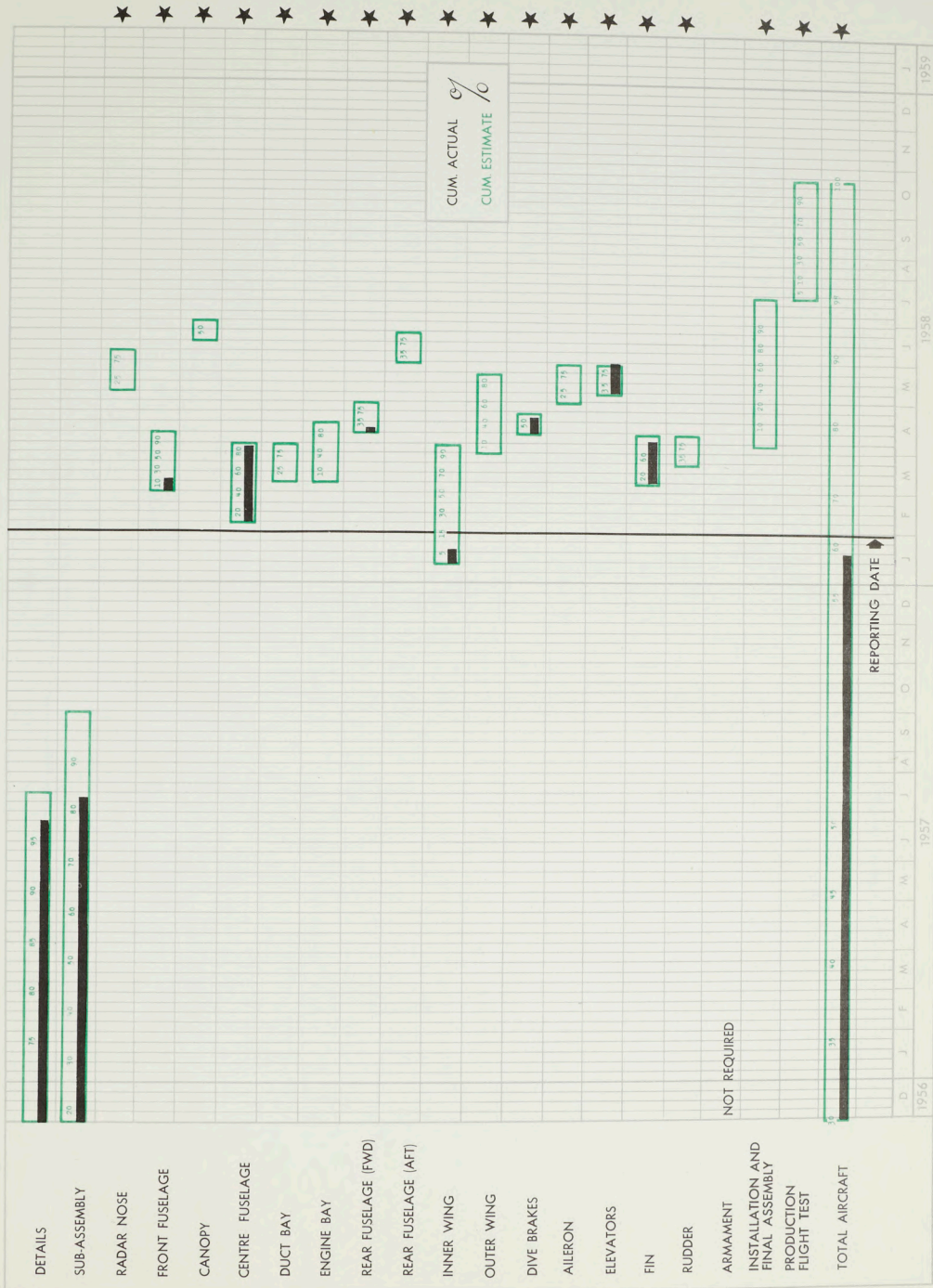


AVRO ARROW PROGRESS REPORT

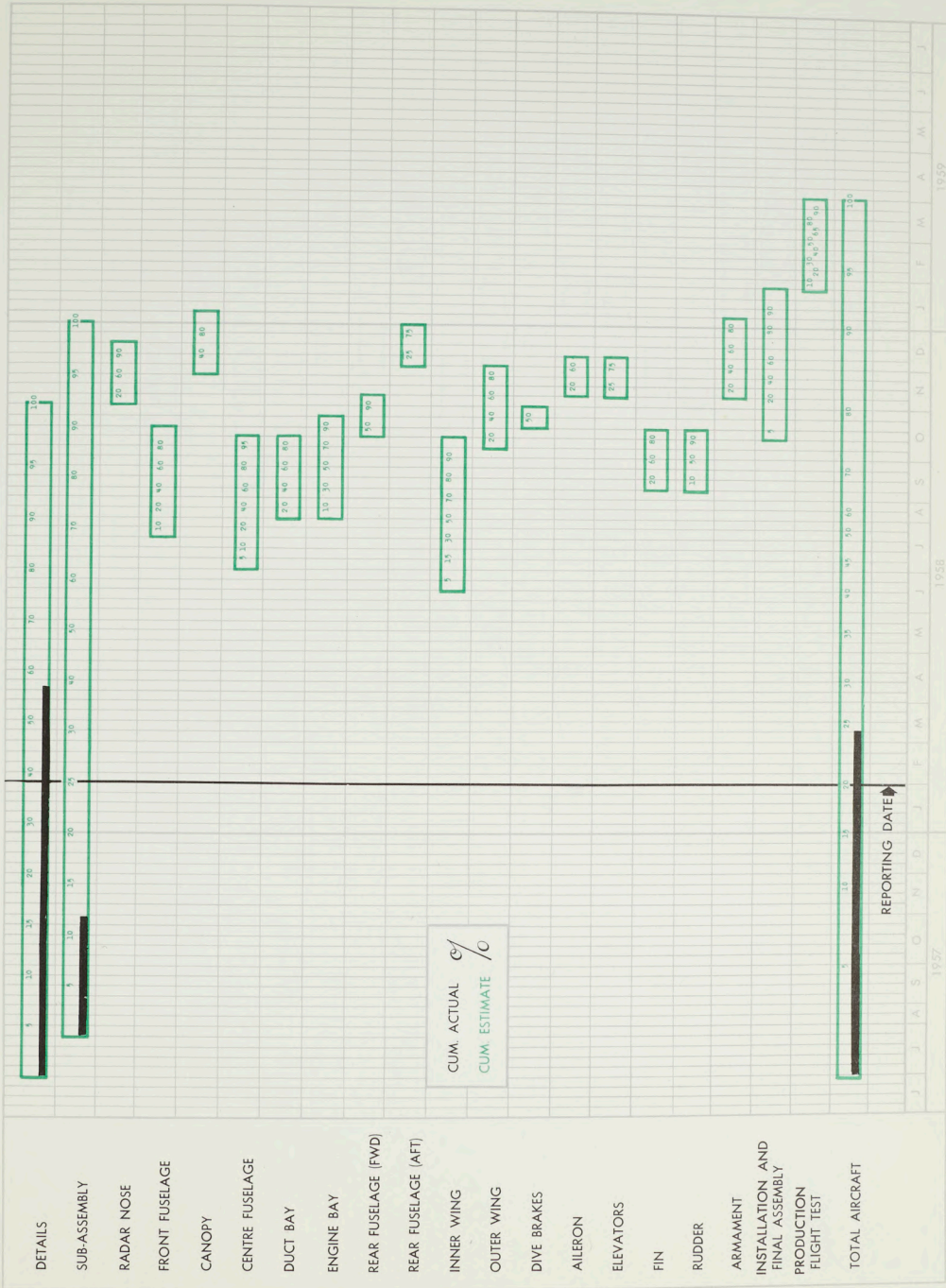
PROGRESS CHART -- THIRD AIRCRAFT



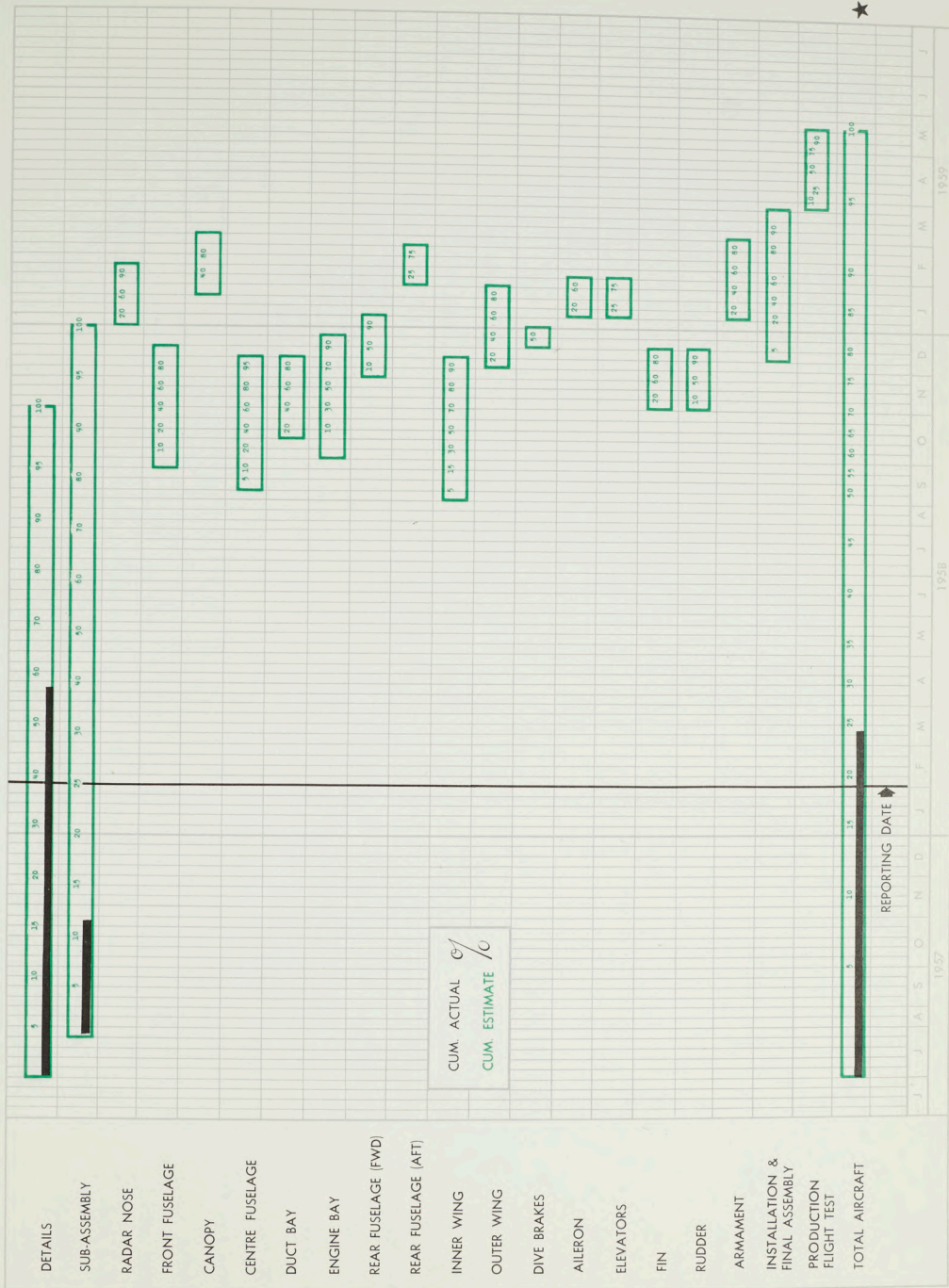
PROGRESS CHART - FIFTH AIRCRAFT



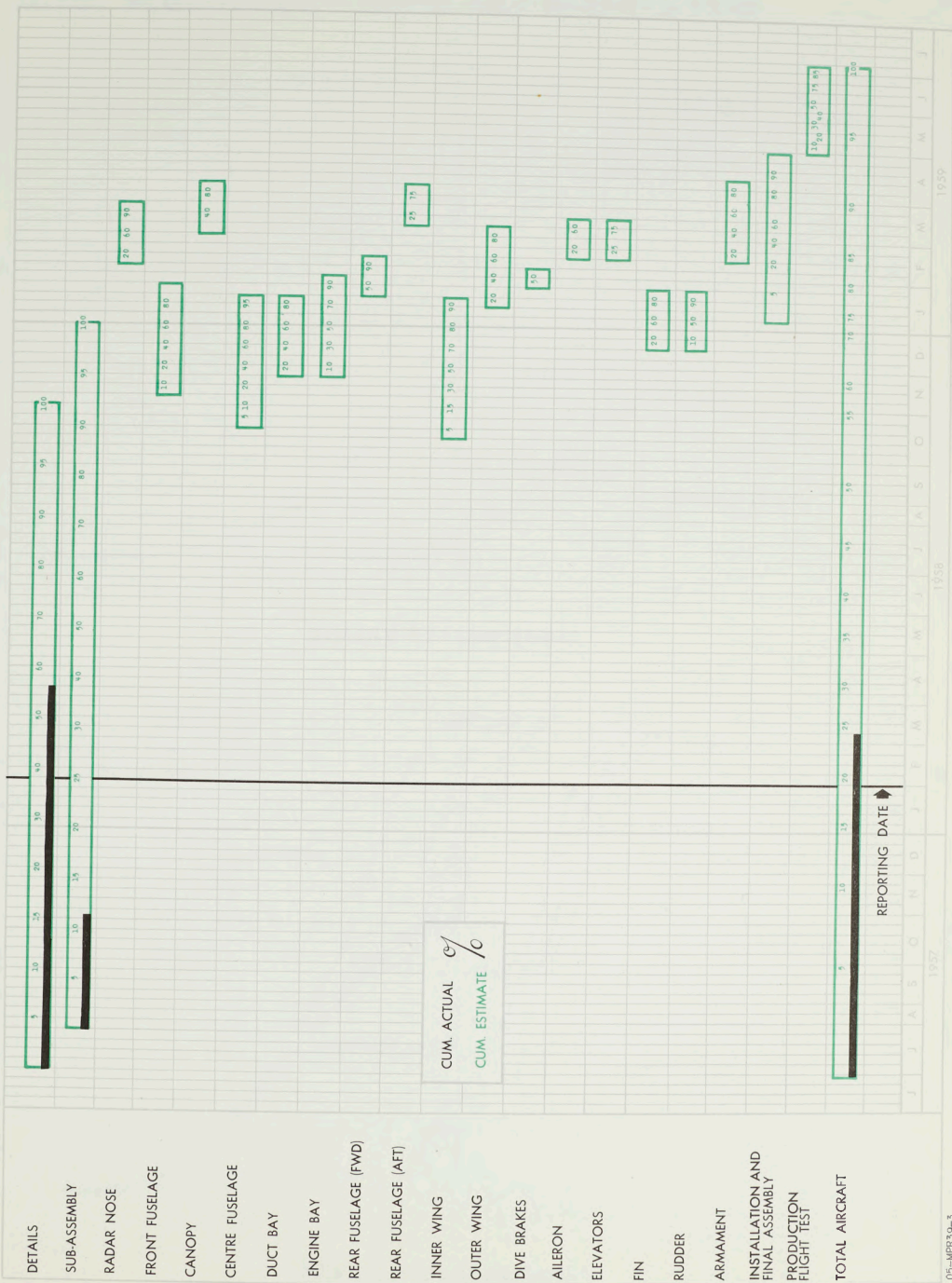
PROGRESS CHART -- SIXTH AIRCRAFT



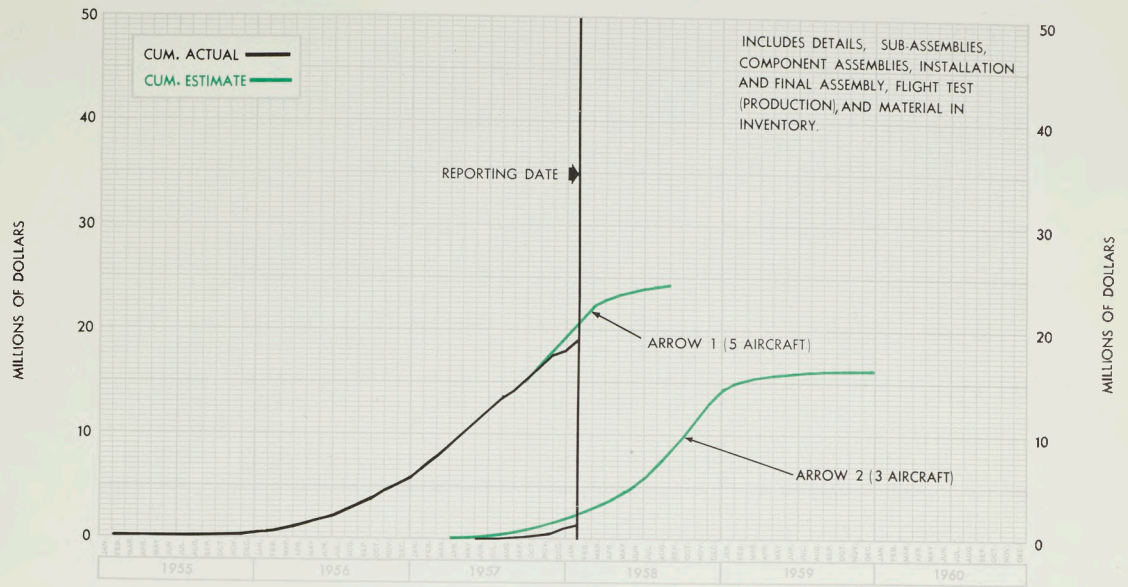
PROGRESS CHART - SEVENTH AIRCRAFT



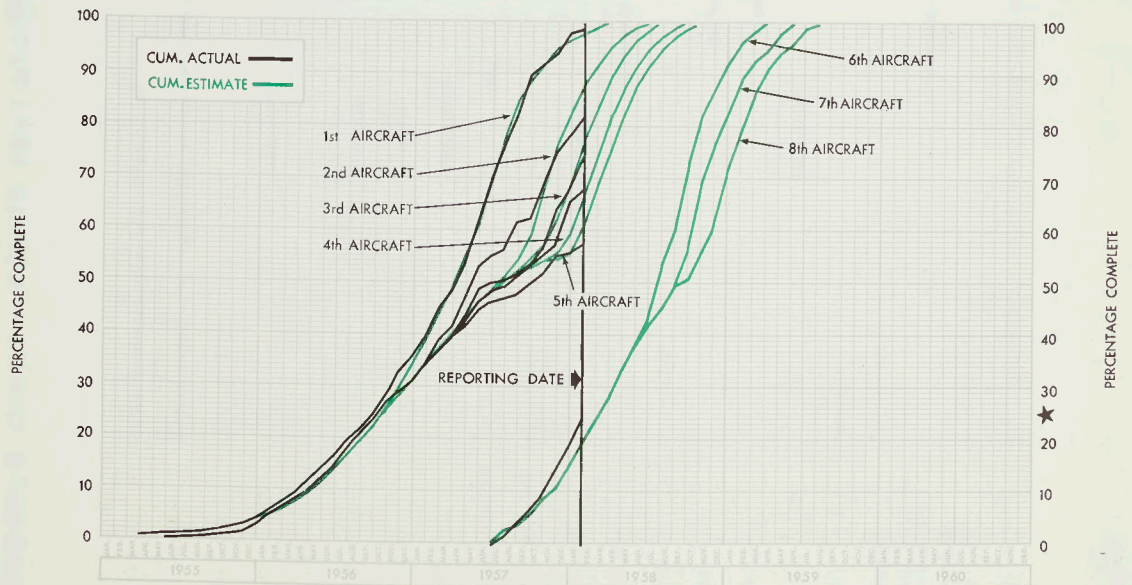
PROGRESS CHART - EIGHTH AIRCRAFT



TOTAL PRODUCTION - COSTS AND PERFORMANCE

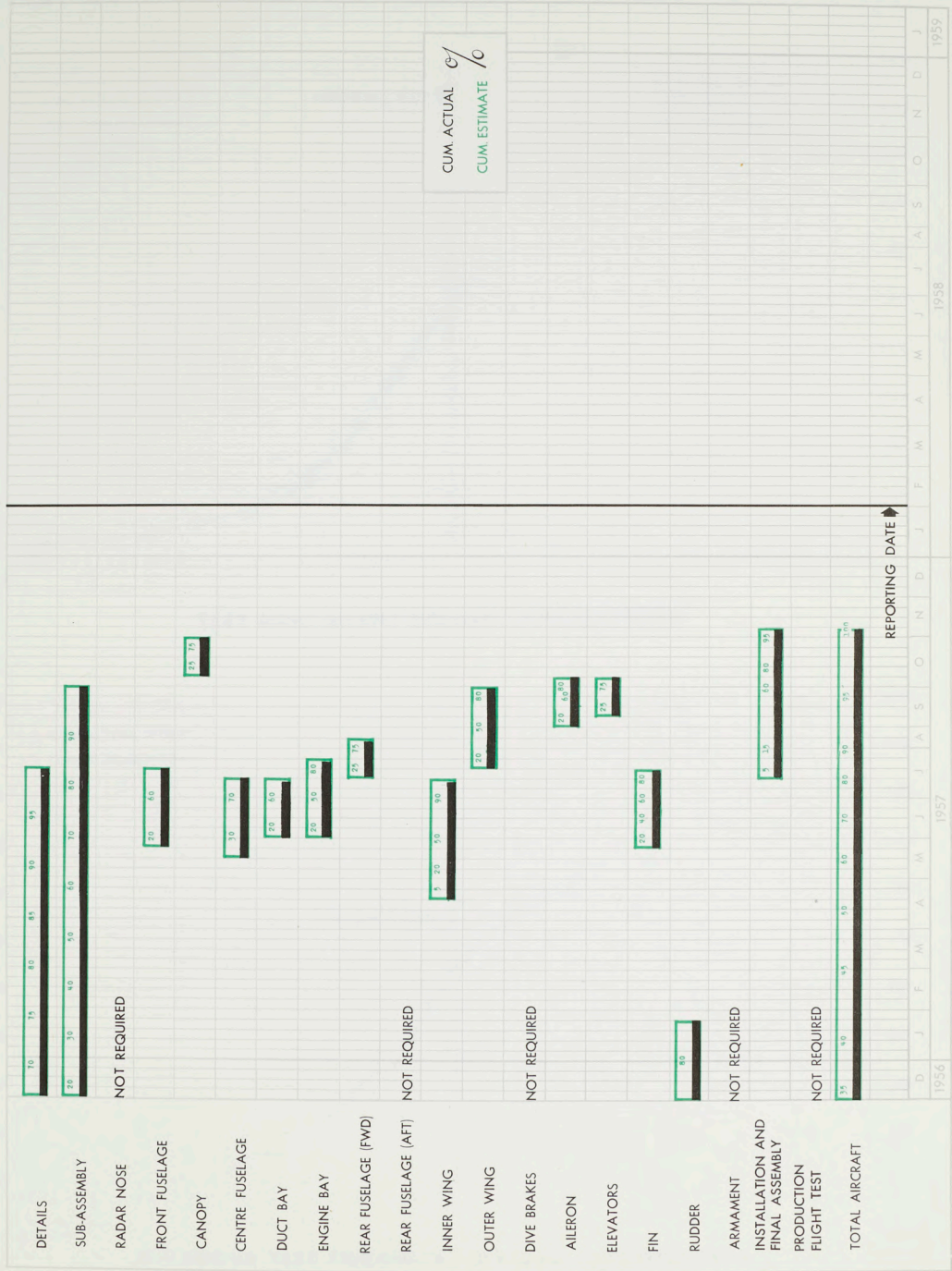


DOLLAR EXPENDITURES



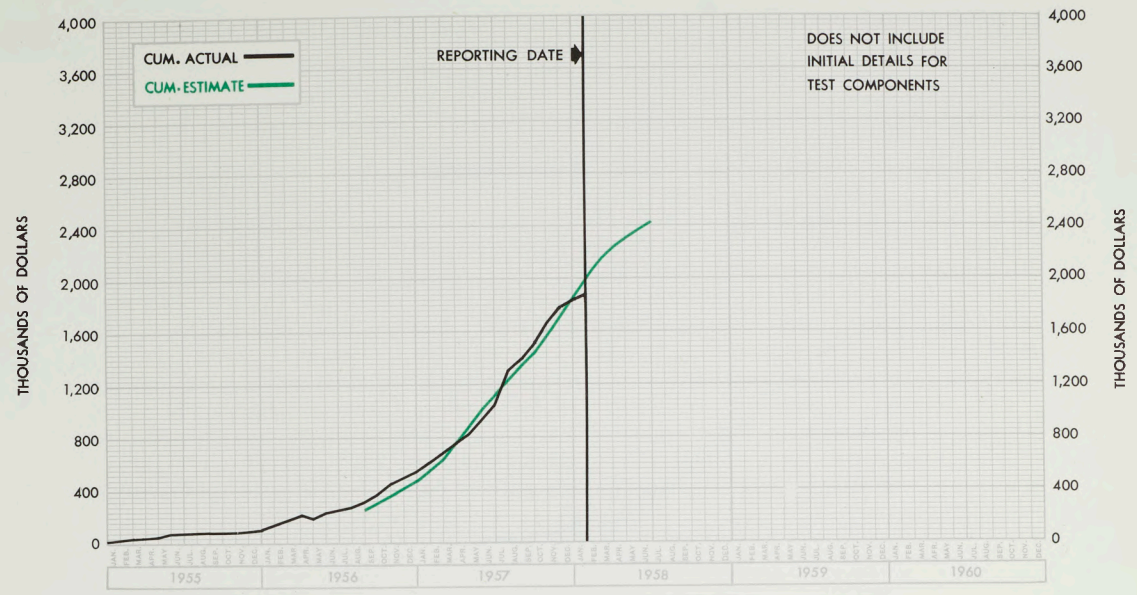
PHYSICAL PERFORMANCE

PROGRESS CHART — STATIC TEST AIRCRAFT

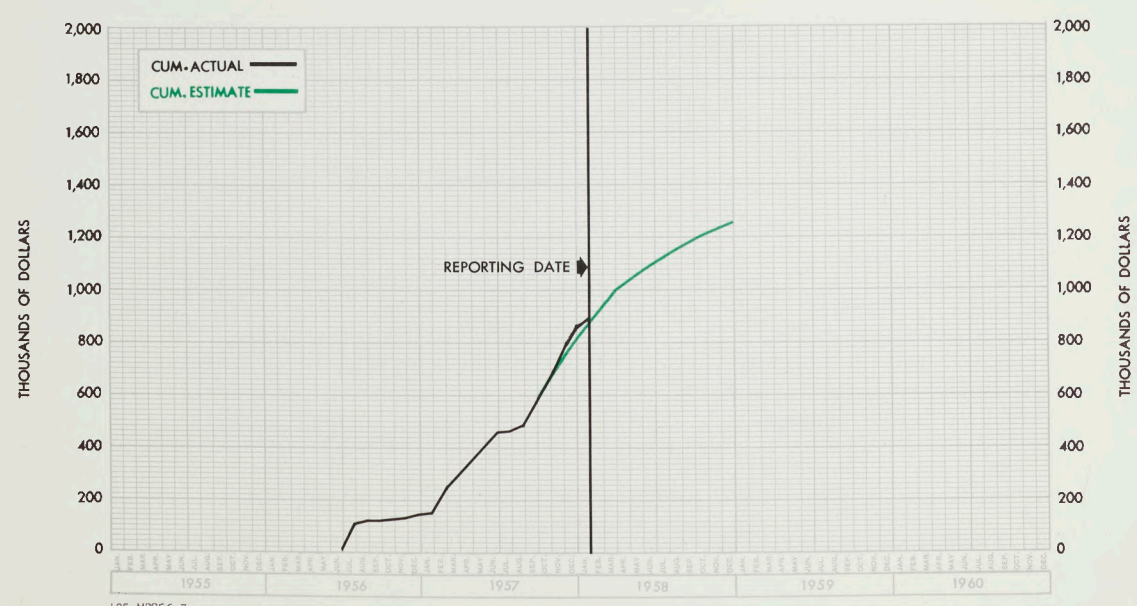




TEST COMPONENTS AND AIRBORNE TEST EQUIPMENT COSTS



TEST COMPONENT DOLLAR EXPENDITURES



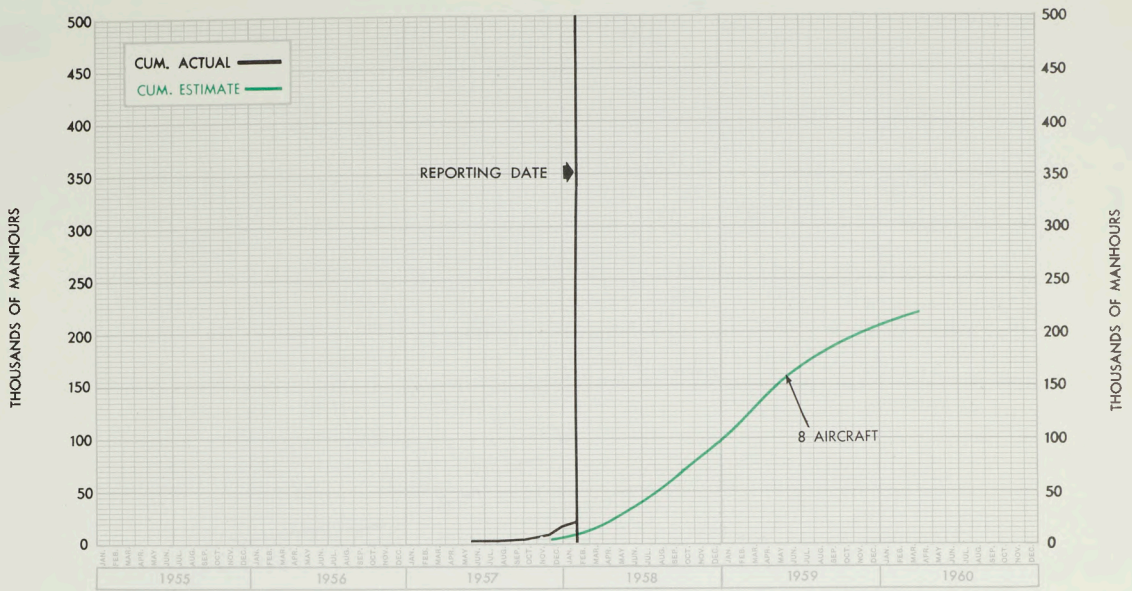
AIRBORNE TEST EQUIPMENT DOLLAR EXPENDITURES

105-MPR56-7

AVRO ARROW PROGRESS REPORT



SPARES PRODUCTION



MANHOOR EXPENDITURES

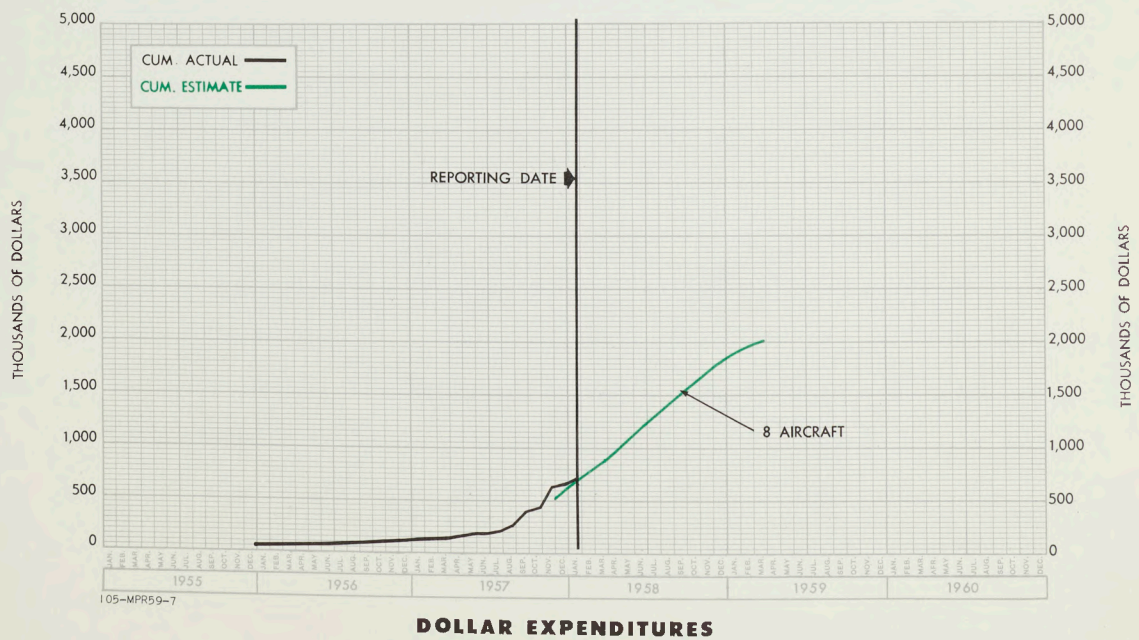
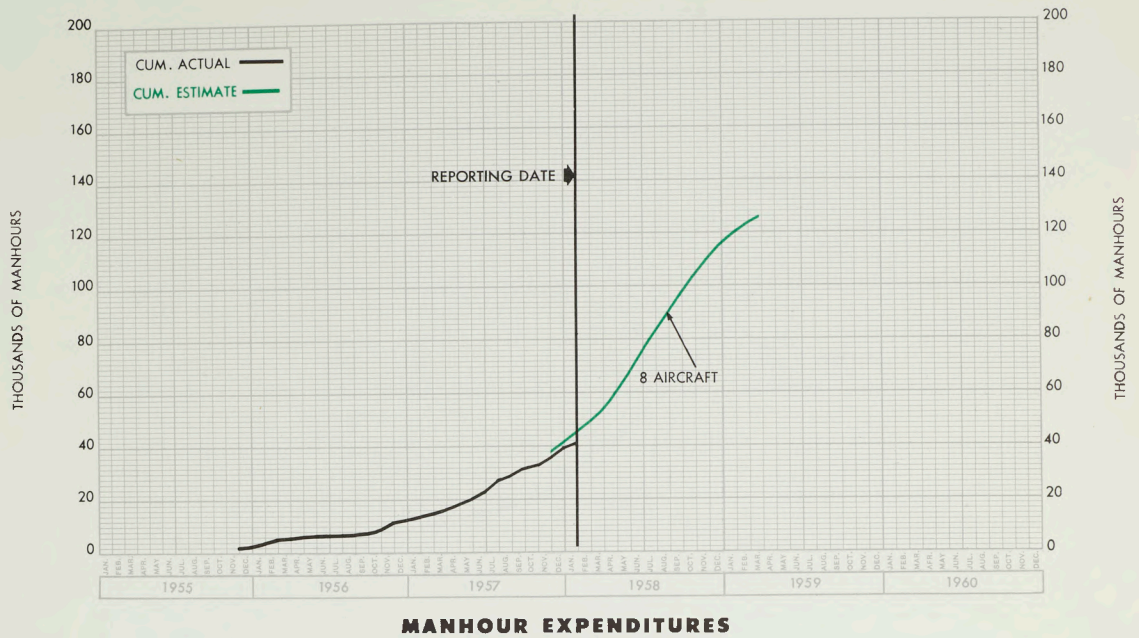


105-MPR58-7

DOLLAR EXPENDITURES

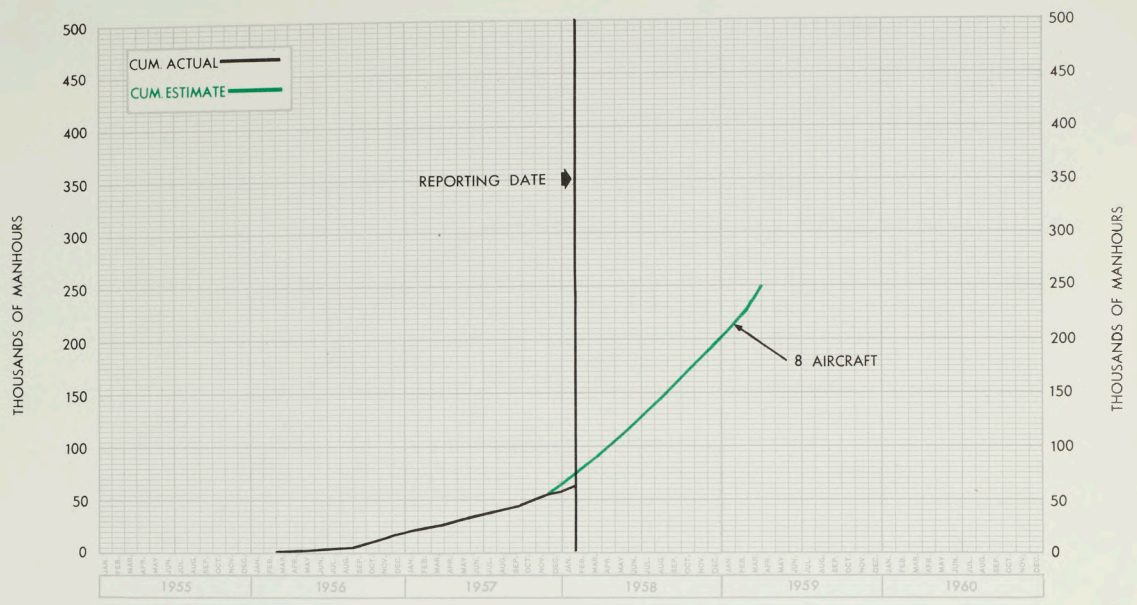


GROUND SUPPORT EQUIPMENT PRODUCTION

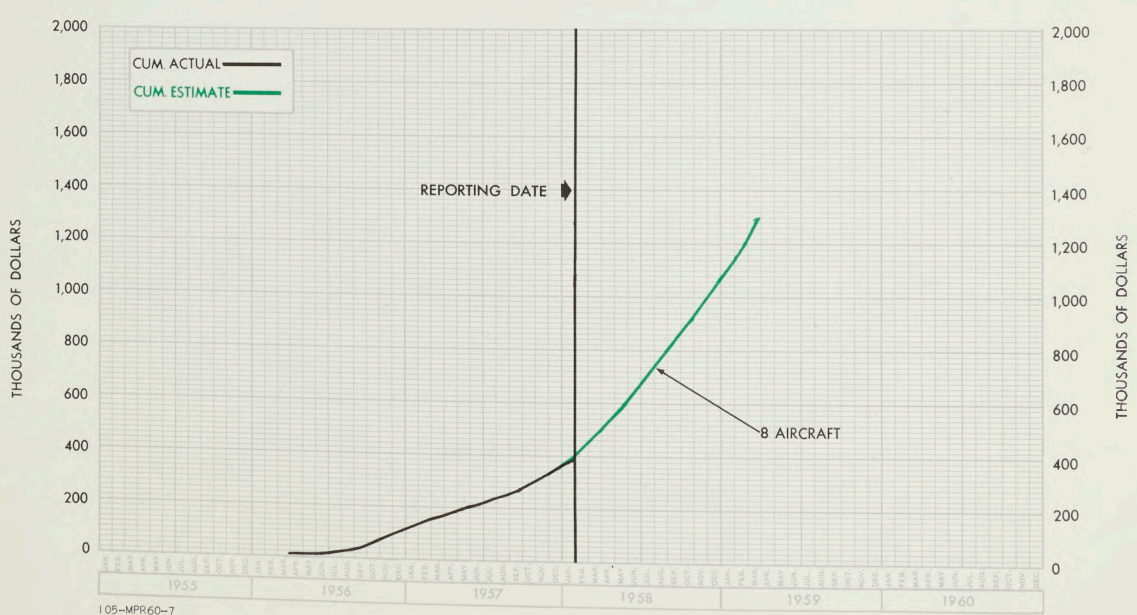


AVRO ARROW PROGRESS REPORT

PUBLICATIONS



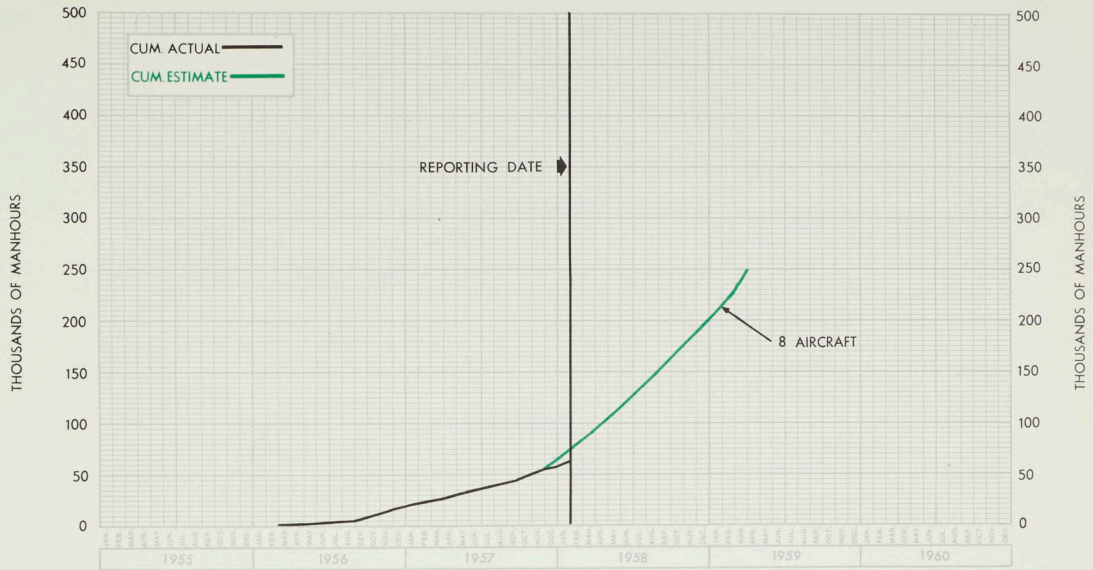
MANHOUR EXPENDITURES



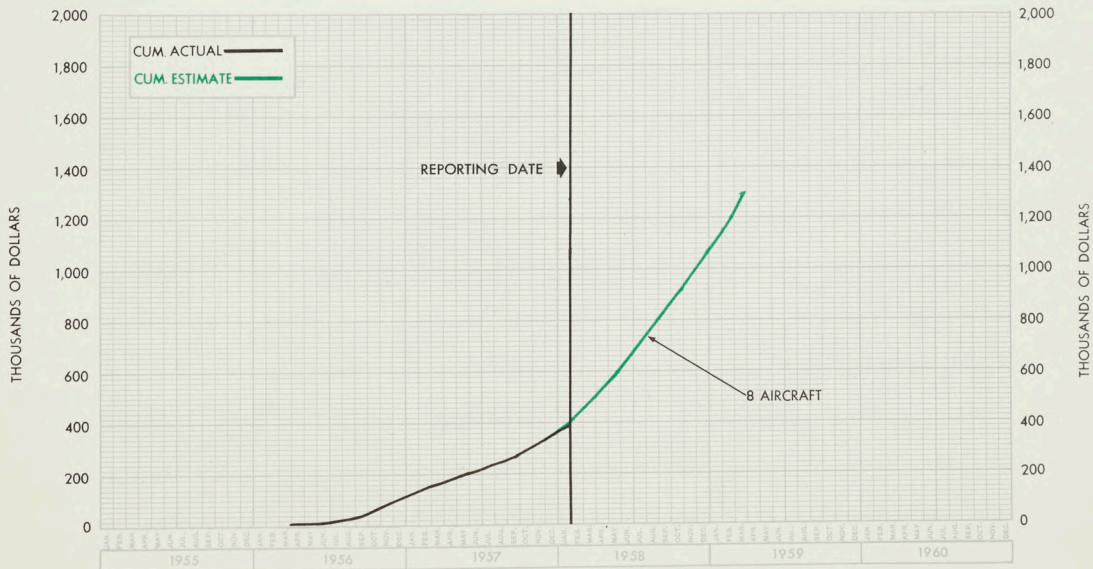
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DOLLAR EXPENDITURES

PUBLICATIONS



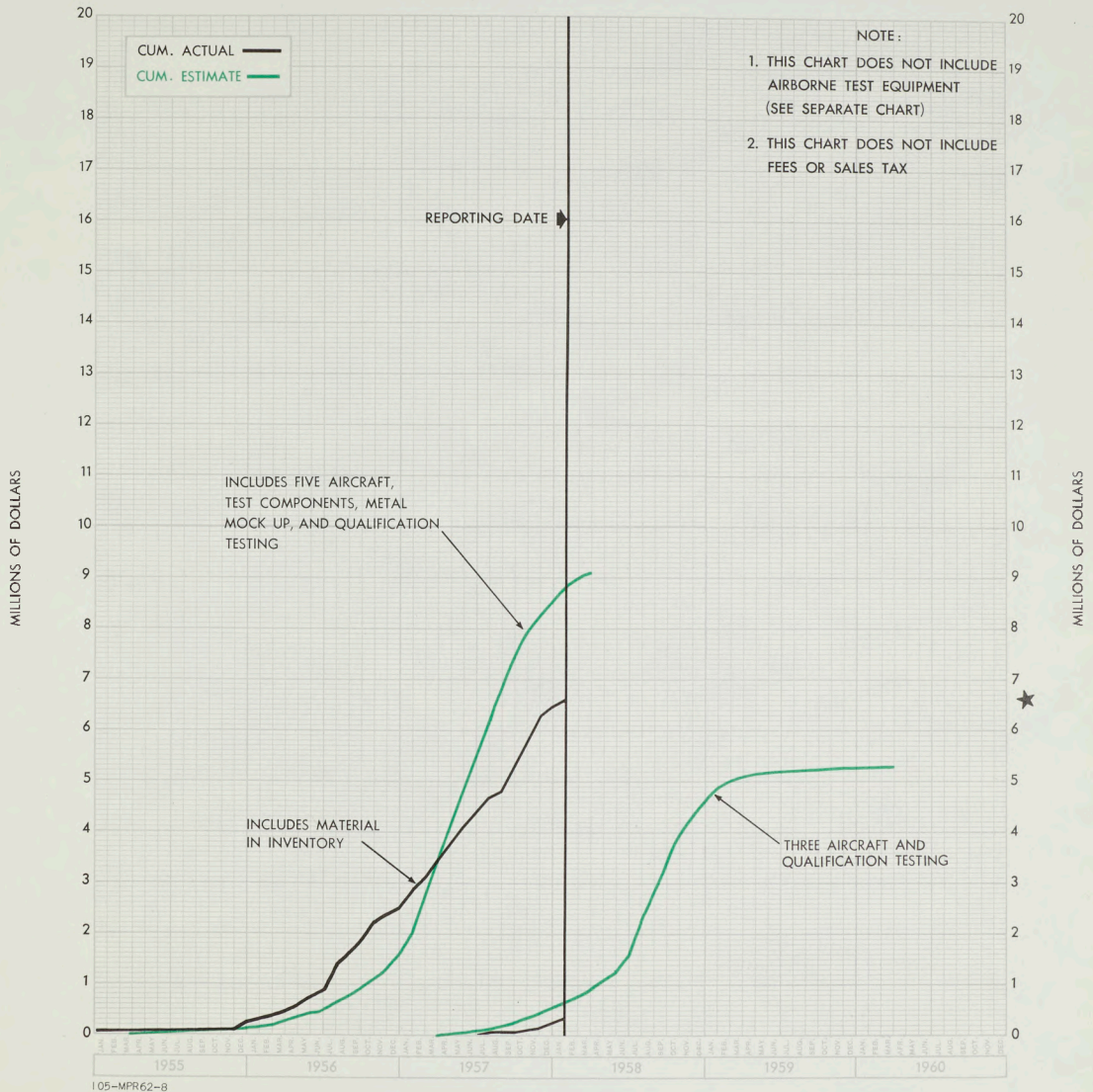
MANHOOR EXPENDITURES



DOLLAR EXPENDITURES



PRODUCTION MATERIAL DOLLARS



105-MPR62-8

