Technical Publications

IN THE AIRCRAFT INDUSTRY

By HARRY McDOUGALL

The following is the concluding portion of a two-part article on the subject of technical publications. Last month the author discussed the general problems of producing such publications, and also described the various skills that were required in their production. In this article, he goes into detail about the several main sections that are common to most engineering orders, and further considers the peculiarities of technical publication production in Canada.

Part II.

EACH TYPE of publication poses particular problems. The smallest but perhaps the most important publication is the Pilots Operating Instructions. This must supply the pilot with a brief description of each particular system, full details on the Handling of the aircraft, a separate section covering Emergency Handling, and all necessary Operating Data to enable him to operate the aircraft under all conditions. It must also contain illustrations of every control in the cockpit so that he can become familiar with the cockpit layout even before receiving the aircraft.

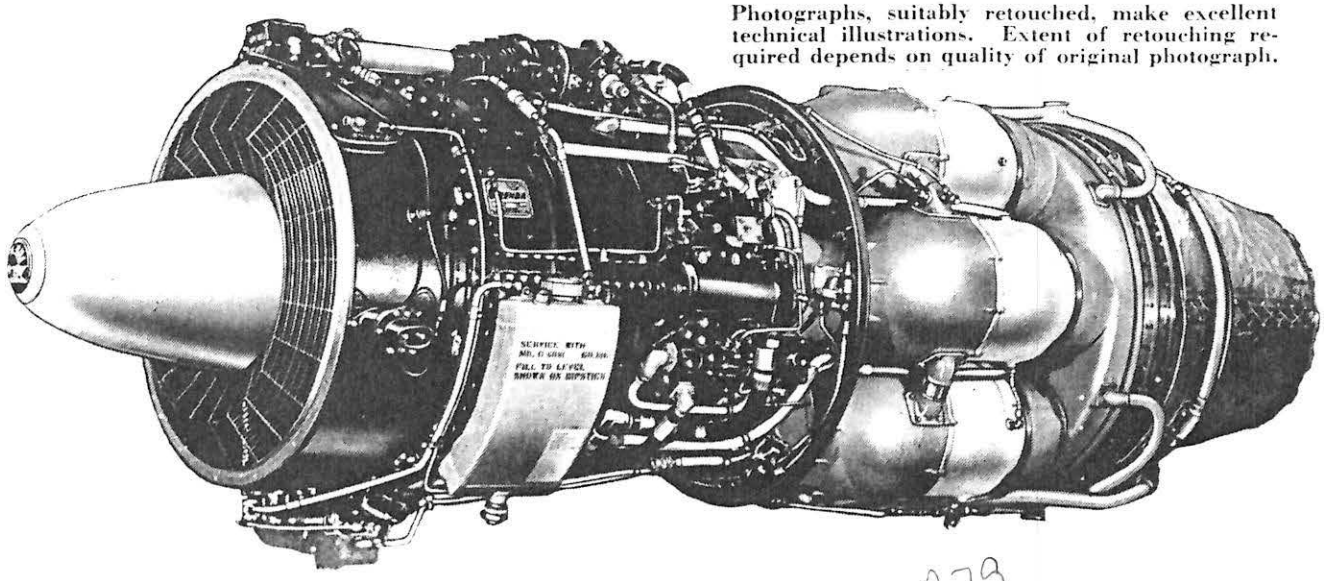
The preparation of the Pilots Operating Instructions is a specialized task. It is usually evolved from a continuing series of discussions with the test pilots who have the necessary experience of practical operation of the aircraft, the Aerodynamics section which provides performance estimates and the RCAF representatives who give their final approval for the publication and ensure that nothing it contains contravenes their training and operational programs.

Maintenance Manual: The Maintenance Manual, identified in the RCAF as the Description and Maintenance Instructions, gives all details required to keep the aircraft serviced from the time it is delivered until it is returned for a complete overhaul. The Maintenance Schedule says what should be done and when. The Maintenance Manual says how. Wide coverage is required. In the first part it may contain such mundane statements as "The aircraft is fitted with a tricycle landing gear", but in its later pages it may also contain much abstruse data on the adjustment of radar equipment.

The Maintenance Manual is sometimes divided into two portions to comply with Security regulations, the Armament and fire Control Systems being in a separate section designated as Confidential so that the bulk of the publication can be circulated under a lower classification. The emphasis is on servicing techniques. The structure will be covered briefly and illustrated sufficiently to show all attachment points, transport joints, etc., but it is the systems which gain most of the writer's attention.

To cover an Air Conditioning and Pressurization System, there will first be a "once over lightly" description followed by details of all the ducting, the position of each component, its individual function, and the functioning of the complete system. A schematic drawing, usually in colour, will show how the air gets from the intake to the cockpit, a perspective view will show the routing of the pipes, and cutaway drawings are provided to illustrate the function of each component. Every major control is illustrated, the purpose of each control is defined and a graph shows the performance of the system at all altitudes to the aircraft's ceiling. This is followed by all the servicing techniques, also illustrated where necessary, and the coverage is completed by the inclusion of removal and installation procedures for all major components.

In rare instances, with exceptional co operation, the information is ob-



Photographs, suitably retouched, make excellent technical illustrations. Extent of retouching required depends on quality of original photograph.

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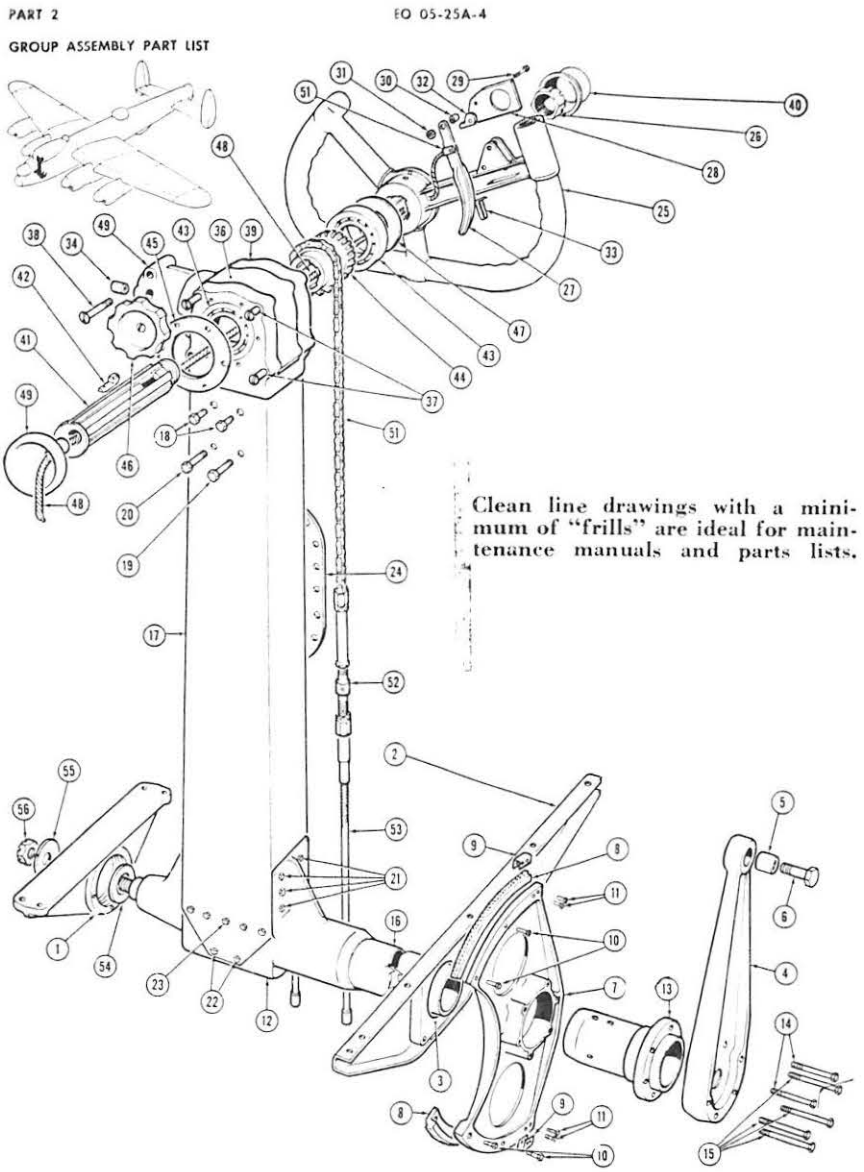
tained easily; more often it is the result of many hours of research. The writer starts with the blueprints, which, if complete, usually yield enough information to enable him to prepare an adequate description. From the prints he can usually also draft out the details of the system's operation but not the servicing and general maintenance techniques. For this information the writer must draw on his own experience or consult with shop personnel who have had previous experience with similar aircraft. Opinions vary. The best method of rigging a set of flying controls can cause a plantwide controversy and the writer may find himself acting as arbitrator. If he does not agree with a procedure being employed in the shops he may establish a completely new procedure provided he can justify his decision in any later controversies. Right or wrong, the writer is unable to "pass the buck". It is far more difficult to deny the written than the spoken word.

Illustrated Part List: The largest publication required is the Illustrated Part List. Although the skill required to produce this book is not as great as that required to produce the Maintenance Manual it poses a considerable problem of organization. Due to the large number of illustrations required the actual cost of preparing the part list may exceed that of preparing the corresponding Maintenance Manual. The part list must list and illustrate all procurable items omitting only such components as ribs, formers and other structural members which would not normally be stocked for maintenance purposes. Since such a list may consist of over 30,000 items the use of illustrations is absolutely necessary for identification purposes. This publication, unlike the maintenance manual, is broken down into individual sections of the aircraft rather than systems, since the compiler who prepares the part list is not concerned with how the system works but only with identifying the part numbers of each component.

The part lister first studies the blue prints to decide which parts can be considered as procurable items and with various coloured pencils makes suitable marks on the blueprints. The blueprints are then issued to the illustrator who prepares the illustrations in substantially the same manner as those for the Maintenance Manual except that no colour is used and shading is kept to a minimum. Illustrations taken from part lists are frequently used in the Services as guides when removing and dismantling parts. This is an unsafe procedure, which has in one instance in the U.S. led to disaster. The true purpose of the part list is only to facilitate identification of parts.



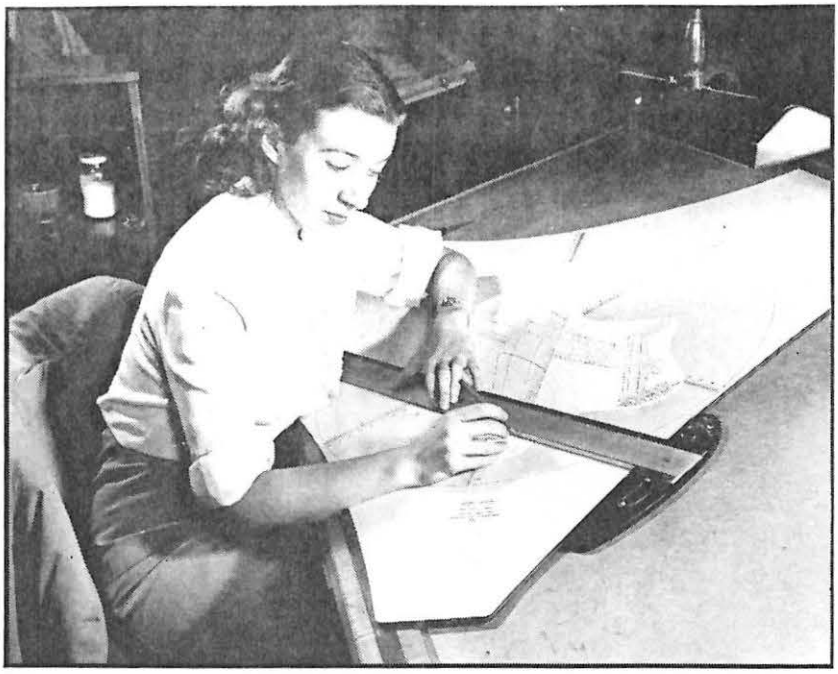
Clean line drawings with a minimum of "frills" are ideal for maintenance manuals and parts lists.

FIG. 72 FRONT CENTRE SECTION - FLYING CONTROLS - CONTROL COLUMN

Repair and Overhaul Manual: The Repair and Overhaul manual is a major publication, but is usually prepared only after the aircraft has been in service for some time and some idea has been gained on the life cycle of the various components. The extent of the coverage given by the overhaul manual varies considerably since overhaul procedures cannot be defined as closely as general maintenance procedures.

Other Publications: For all aircraft a set of Weight and Balance data must be provided to facilitate the loading of the aircraft. In modern jet fighters the load consists primarily of fuel and armament so that the problem is not acute, but with large transport aircraft where many different combinations of loads may be utilized this publication can become very substantial.

In addition to the principal publications which are provided by the Prime Contractor a multitude of small manuals are required to cover the individual component installed in the aircraft and which have been purchased by the Prime Contractor from



ARTIST'S AID: The perspective drawing board (above) is an ingenious device which greatly simplifies the preparation of line drawings.

Sub-Contractors. In some instances these are prepared by the Air Force, but usually the Prime Contractor is required to procure them.

Some of the larger component manufacturers maintain their own publicaiton departments which are miniatures of those established by prime contractors and which are often surprisingly efficient units, producing a profit no less than any manufacturing department of comparable size. This is particularly true in the case of electronics manufacturers.

To cover a modern fire control system from the servicing and overhaul aspects requires a set of publications almost as large as that required for all mechanical components put together. The preparation of Technical publications in the electronics field is becoming more and more important as this field increases in complexity. In the event of a war, radar serviceability might become a major factor in the nation's defence. To keep modern electronic equipment serviced, an adequate supply of technical literature is an absolute necessity. The days of supplying a few circuits and leaving the mechanic to sort the system out himself have long since passed.

Co-operation: Most subcontractors are co-operative and, with the assistance of the prime contractors, can produce publications on their equipment to the required standard. Rare cases of non-co-operation occur, particularly if the manufacturer is making a product which is in short supply and is unwilling to take skilled technicians off what he considers to be "productive" work. An amusing instance was of the prime contractor who purchased a piece of equipment which was in particularly short supply and received with it the manufacturer's own handbook. The prime contractor asked that this information be translated into official Engineering Order Form. The subcontractor refused. There was considerable correspondence, the prime contractor finally stating that "We are procuring components from over a hundred different firms and we always insist that the supplier prepare the Engineering Orders", to which the subcontractor replied "We are supplying this equipment to fifteen different companies and always insist that they produce their own." A compromise was eventually effected; nevertheless, this kind of incident can easily be prevented by making the purchase of the equipment conditional upon the required publications being produced also.

The increasing demand for technical publications on components has led in recent years to the founding of what is, to some extent, a new industry — firms, specializing in preparing technical publications as "package" deals. There are several small companies now operating in Canada which can undertake the preparation of complete handbooks, providing the necessary data is supplied in the form of blueprints, etc. Some U.S. firms have become very large; one such firm in Los Angeles employs over six hundred people.

The advent of these specialists is extremely welcome. Not only do they assist the small component manufacturer by relieving him of a task which is not really in his particular field but they can very often assist the aircraft manufacturer also by providing added capacity at peak periods. A particular recent example was when the RCAF decided to extend the life of some of its old World War II warhorses, refurbishing them and putting them back into service. None of the old maintenance manuals were available and they would in any event have been obsolete since they covered only the original British version of the particular aircraft.

Outside Assistance: Since the number of aircraft returned to service justified the preparation of a complete new set of publications, the original manufacturers were called upon to produce them. As the manufacturer's publications department, and particularly its illustration staff was busily engaged on publications for a new type aircraft this would have been difficult without outside assistance. Eventually, it was agreed that the manufacturer would prepare all the relevant text but that the necessary illustration work would be subcontracted. The liaison worked very effectively since the subcontractor had several distinct advantages. Unlike the manufacturer who was bound by established wage scales, the subcontractor could use much more discretion financially and could hire assistance on a "duration of contract" basis — an arrangement which is usually quite satisfactory to artists, whose ambition is to gain variety of experience rather than to stay with one firm. Also, the subcontractor could work steadily without interruption, unlike the manufacturer's publication department whose services were subject to a constantly fluctuating system of priorities. In this instance it would probably have been impossible to complete the project without the assistance of the subcontractor. Space being at a premium, as in most aircraft companies, this

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factor alone would probably have precluded the recruitment of sufficient staff.

Canadian technical publications groups are fortunate in that they have considerable freedom of action. The RCAF has wisely refrained from trying to tie down technical publications to a rigid format. Approval of any particular publication is left largely to the discretion of the incumbent officers. This contrasts with the U.S. procedure where, partly of course because of the greater volume of work to be controlled, the relevant Specifications are very comprehensive and publications are given more extensive scrutiny.

This results in a greater standard of uniformity which in some cases may be a very desirable feature, but it also tends to set a limit on progress. That the U.S. authorities are beginning to realize this is reflected in the recent order permitting aircraft manufacturers to print their own publications instead of only submitting reproducible copy for printing by a Government Agency. Canadian manufacturers have, since the outset, been permitted to carry out their own printing, only pausing at the reproducible copy stage to obtain final approval. Canadian manufacturers have been appreciative of this easy-going co-operation by the procuring agencies and have used the discretion afforded them to constantly improve their techniques. Technical publications produced by Canadian manufacturers are not inferior to any in use in the U.S. or U.K.

Expanding Field: The number of advertisements for technical writers and illustrators indicates that the technical publications field is expanding, probably more rapidly than any other single phase of the aircraft industry. The demand for technical publications has been reflected in the increased recognition given to workers in this particular field both financially and in other ways. There are now several Associations of Technical Writers and Editors and their meetings are attended by representatives who travel thousands of miles to be present.

Technical Writing is unique in that it offers the right type of men good remuneration for their services without making an Engineering degree a prerequisite to employment. The Engineering graduate, to make good progress, must almost usually specialize in a single narrow field. The technical writer covers the whole subject — and his main qualification is not a strong educational background but a variety of practical experience. The technical writer must have, metaphorically, a pencil in one hand and a wrench rather than a slide-rule in the other. Men with ten or fifteen years servicing experience who would like to enter the Engineering departments but are prevented from doing so by the lack of academic qualifications would do well to investigate the possibilities of this particular phase of the industry. It is not, nor so long as aircraft continue to become more and more complicated is it likely to become, an overcrowded profession.