

when the Comets got started they found it necessary to get far more information from their air and ground crews.

At the time of BOAC's first Comet service, Phil Halsey was with the parent de Havilland Company in England, and intimately connected with these difficult days. He therefore had access to the multitude of forms and reports on instrument readings, maintenance troubles, flight delays, and engineering information that kept the Comet's "flight engineer so busy he had to work his fingers to the bone." On top of all this there was the standard Complaint & Defect Form that the aircraft's Captain handed in. All these were collected with similar forms put in during regular inspections, and the whole system fed into the de Havilland Service Department for analysis and action.

**Paying Off:** The paper pyramid, of special forms — signed, countersigned, and with approval signatures as it progressed up and down the administrative machine — were all part of the Comet I's birth. However, as Halsey said, "With all this information as ammunition, and the results of many special investigations that were reported on, the contractor and operator held monthly or bi-monthly meetings to ensure that a constant check was kept on the operation of the aircraft, and that the appropriate action was taken as rapidly as possible." The paper pyramid paid off. With this as a link between the airline and the builder, the Comet I went quickly into service and compared favourably with BOAC's piston engined transports. The Comet's daily utilization was somewhat lower, but with its higher block speed it finally covered more passenger miles than any other airliner in the fleet.

However, disaster struck. On January 10, 1954, the prototype Comet had just taken off from Rome's Ciampino Airport and was climbing for altitude. The captain was talking over the radio to another BOAC captain of a nearby Argonaut about the tops of the cloud cover. He started a sentence: "Did you get my . . ." But he never finished it. The Comet's pressurized fuselage ripped asunder. Three months later a similar crash occurred near Naples, Italy. And the Comets were grounded until the Royal Air

### MORE CF-100's OVERSEAS

The RCAF's second CF-100 squadron to leave Canada for NATO duty with No. 1 Air Division in Europe, will fly overseas in February of next year. The squadron chosen to follow 445 overseas is No. 423, currently based at St. Hubert, P.Q.

No. 423 will be based in Europe at Grostenquin, France, where it will replace 416, a Sabre squadron. No. 416 is to be disbanded and will reform later as a CF-100 unit, based at St. Hubert. The first CF-100 squadron to go overseas, 445, is now based at Marville, France. Two others will go over later and will be based respectively at Zweibrücken and Baden-Soellingen, both in Germany.

craft Establishment finally pieced together the cause of the failure in a master stroke of aeronautical detective work. But for this unfortunate event, the Comet would no doubt be piling up an impressive record of service today — and largely through a paper recording system that was a bridge to quick corrective action.

The airlines are not the only ones that have built paper administrative systems with success. I talked to E. H. Higgins, Chief Project Engineer for Canadair Ltd., and one of Canada's leading aeronautical engineers, as well as being, I believe, an expert on engineering organization. As Ed Higgins pointed out, a "one man" organization, where all decisions and papers are funneled through this key man, is undoubtedly the most efficient way of doing things. It reduces the volume of paper in the pyramid. But there are limitations to what one man can handle. Higgins believes that the engineering staff in such an organization must be small — not more than 200 people — and all of these must be engaged on one project. Moreover, the head man must have outstanding technical and administrative abilities.

### delegation of authority

**I**N RECENT years," Ed Higgins says, "the engineering task of a single airplane project has expanded so tremendously that the one-man system is no longer adequate. Now decision authority must be delegated to several people. The effect of growth, beyond the capacity of the one-man organization, is the need for more complicated paper aid such as Schedules. Progress Reports, Minutes

of Meetings, and Formal Technical Reports."

It is readily apparent, then, that the size and complexity of a modern airplane are key factors in adding to the size of any paper pyramid. Moreover, the increased numbers of engineers adds a further burden. Says Higgins, "In the one-man set up, the head man knows just about everything that is going on so that he can also act as an expeditor. But in a large organization, with distributed authority, another group of people must be created and assigned the task of searching out the sources of delay. You can never count on each man always doing what he is expected to do and doing it on time, so that a system of cross-checks must be provided."

All this, of course, merely aggravates the paper work problem since the new staff for cross-checking the working staff, also originate a number of papers. One way of cutting down on this is to have committees on the various subjects that need co-ordination. The RCAF has developed a system of co-ordinating and Steering Committees for all major development projects. A similar system is used by Canadair on the RCAF's maritime reconnaissance version of the Britannia. There is, for example, a Canadair Joint Co-ordinating Committee. This is a group from both the engineering department and the manufacturing department. They meet on call and exchange information of such general interest as data on a new drawing number system, non-standard material sizes, decimal dimensions, and material stock sizes.

**Limitations:** Committees, however, have limitations: they must turn out minutes of their activities and they must assign work to designated members and then ensure that the work is carried out.

Whether decision, co-ordination, and follow-up are left with a committee or as a routine staff job they all added to the paper work. But neither the airlines nor the aircraft companies have run into such criticism of their paper systems and committee structures as have the government organizations. Wesley V. Hurley, former USAF Deputy for Research & Development Programs and presently on the management staff of Avro Canada, summed it up last May at a banquet of the Photographic Engineers: "It is somewhat discouraging," he said,