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OPERATIONAL CONTROL

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FOREWORD

The technical meetings of ICAO, whether of a world-wide or regional character, in making recommendations for the provision of air navigation facilities and services, have been faced from time to time with requests from the operators to assist them in the exercise of operational control. To satisfy these requests would have appeared, in many cases, to duplicate the facilities and services already established and, on occasion, there has not been produced conclusive evidence of their necessity from the point of view of safety and efficiency. In many cases, this doubt as to whether the expressed operational requirement was necessary has been due to lack of understanding or appreciation of the basic philosophy of operational control and to the lack of any firmly established principles to govern the exercise of such control by the operator.

In commercial air transport today, some measure of operational control is necessary to enable operators to conduct their operations safely and efficient However, the degree of control exercised by an operator will depend upon the operating procedures promulgated in the regulations of a State or practised by the operator, the geographical or physical conditions governing any particular operation and the air navigation facilities and services available. Therefore, it is extremely important that there should be a complete understanding of operational control by everyone concerned in order that the realistic needs of the operator might be satisfied, due regard being given to the economic and practical problems of the supplier.

The following description of operational control, prepared by the ICAO Secretariat in co-operation with IATA, was produced as a basis for a study of this problem by the Air Navigation Commission during 1955. In view of the importance of operational control in future planning by States and operators, the Air Navigation Commission considers that the description will be found of considerable value to aviation interests and has, therefore, recommended its publication.

It must be emphasized, however, that the decision to publish this materia does not indicate that it represents ICAO policy or that all the procedures set out herein are considered by ICAO as essential for the safe and efficient conduc of operations. They merely reflect the most completely developed procedures at present in force in some parts of the world. For this reason, the information contained in this publication should be regarded only as a basis for continuing study of the problem.

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OPERATIONAL CONTROL

1. - HISTORY

1.1 Operational Control is defined in Annex 6 to the Convention on International Civil Aviation (International Standards and Recommended Practices - Operation of Aircraft) as the exercise of authority over initiation, continuation, diversion or termination of a flight. Annex 6 also specifies, in paragraph 3.3, that an operator or his designated representative shall have responsibility for operational control. The requirement for operational control has come into prominence due to the development of civil aviation accompanied, as it has been, by an increase in the size of commercial aircraft able to operate over longer distance, at greater heights and in adverse weather conditions, by a considerably increased traffic density, particularly in the neighbourhood of the main air terminals, and by increased competition between the various international airlines. In the early days of civil air transport operations, the operator was responsible for operational planning and carried out such supervision as was possible through his local representatives at the main terminals, acting in consultation with the air traffic control and meteorological staffs. Due to the limitations imposed on the aircraft by their size, range and inability to operate at more than moderate altitudes, thereby rendering them dependent to a large degree on the prevailing weather conditions; due also to the restricted point-to-point communications and lack of aids to navigation, the degree of supervision so exercised was limited and much was left to the initiative of the pilot-in-command to commence, complete or discontinue flights. On the other hand, the volume of traffic was considerably less than it is today, and the air traffic controller had little difficulty in keeping track of the aircraft leaving or approaching his aerodrome and was able to give each aircraft individual attention, within the limited resources at his disposal and also to keep the operator or his representative informed of aircraft movements. Nevertheless this ad hoc method of operation had many drawbacks. It was uncertain and in many cases, resulted in delays which were both costly to the operator and inconvenient to the passengers. It became increasingly obvious that last minute decisions were to be avoided if the operation was to provide reasonable services and at the same time show a profit.

1.2 As a result of the demand for better service, aeronautical facilities improved and operators sought ways of providing better planning for the purpose of increasing regularity of service and of improving the quality of information exchanged between departments within their organization. In many cases, it was found that it was not adequate to await decisions of the pilot-in-command concerning the feasibility of operations. Also, while en route, the pilot-in-command did not always possess sufficient information in the cockpit to assess changing circumstances. This situation became further intensified by the advent of faster and more complex aircraft, and accompanying requirements for greater pilot attention to flying technique itself.

1.3 As the frequency and complexity of operations increased, so did the factors that had to be considered. Eventually it became, in many cases, either impractical or impossible for the pilot-in-command to assess alone all the various factors requiring consideration prior to and during a flight operation. This resulted in advice being given or, to some extent, the duties of the pilot-in-command being assumed to a much greater degree, by qualified personnel on the ground. Such pre-flight planning included, among other things, assessment of weather information, determination of loading and fuel requirements, establishment of alternative plans when necessary, and provision of advice to other departments of the Company. Sometimes a flight plan was prepared for the pilot's examination and approval upon arrival at the airport. (Such pre-flight planning by the ground organization also enabled any difficulties encountered in the flight planning to be dealt with early enough to reduce or prevent delay in commencement of the flight). In most cases, however, approval of the flight plan required joint agreement by the pilot-in-command and the qualified ground personnel. This system of advice or shared responsibility for pre-flight planning increased the efficiency of flight operations by relieving the pilot-in-command of a considerable burden and allowing consultation and decision on critical issues with personnel who had available to them all factors bearing on an operation and who were able to keep under constant review and analyze a whole network of operations of which any particular flight was only a part.

1.4 Co-operation between the pilot-in-command and qualified ground personnel in the pre-flight phase did not cease, however, when the aircraft became airborne. The continued assessment of weather information, monitoring of adequacy of fuel, recommendation of alternative plans such as diversion, etc., necessitated an extension of the pre-flight duties throughout the course of the actual flight operation. Thus, teamwork between the pilot-in-command of the aircraft, who is ultimately responsible for its safety, and the person on the ground who should have a broader view of the operation from the traffic angle, contributed considerably to the safety and regularity of air transport operations. The advent of improved ground/air communications allowed the ground personnel to relay additional information received after the aircraft was airborne thus increasing the value of the "in-flight" assistance. Pre-flight assistance and in-flight assistance were not in all cases established simultaneously. In fact, in the case of some operators, pre-flight assistance is still the only type provided.

1.5 The situation throughout the world, therefore has developed in most cases into a concept of shared advice and responsibilities between the pilot-in-command and ground personnel, the extent of the co-operation depending on many factors such as the size of the operation, the facilities available and the system of operation set up by the operator. The concept varies from simple pre-flight despatching, where the ground personnel's primary function is to assist the pilot-in-command in his pre-flight planning,

to pre-flight, en route and post-flight assistance to the pilot-in-command, where many of his duties for the operation are shared by the ground personnel. In some cases however, the pilot-in-command is empowered to exercise all the functions of operational control.

1.6 The ground personnel carrying out these duties were sometimes called "despatchers", but of late various terms have come into use such as "flight operations officer", "operator's local representative", "Operational control officer", "operator's designated representative", "Ground Agency", "station officer", "pilot-in-command's designated representative", and so on. Owing to the confusion that can arise by the indiscriminate use of these terms, it is intended throughout this document to use the title Operational Control Officer (OPCO), to describe the person on the ground responsible for assisting the pilot-in-command in his duties, irrespective of the extent of his shared responsibility, or of the delegation of some or all of his duties to others.

2.- OPERATIONAL CONTROL

2.1 The operator of any air transport undertaking, no matter what its size, is primarily responsible for conducting his operations with safety and efficiency. The corollary of the operator's responsibility is his inherent right to conduct his operations in a manner which he deems best so long as he conforms to the laws and regulations of the State of Registry of his aircraft and those of other States in which he operates.

2.2 An operator can assign the responsibility for "operational control" solely to the pilot-in-command or he may employ a system of shared responsibility between the pilot and personnel on the ground. The measure of assistance or shared responsibility between the pilot and the operational control officer is determined by the operator from operating and economical factors related to the services he is providing. The method employed to conduct these shared responsibilities may also vary among operators and may indeed vary on different portions of an individual operator's routes. Basically, the factors which may determine these variations include utilization of aircraft and flight crews, complexity and density of flight operations, proper passenger accommodation and protection, necessity for advance planning, operational maturity, geographical scope of operations, etc.

2.3 In general, operators delegate the responsibility for operational control to various individuals or offices within their organizations. Where in-flight control is also exercised these individuals or offices are alloted an "area of operational responsibility" that is, an area within which the individual or office is assigned responsibility. Continuous areas of responsibility cover the operator's network of operations and ensure coordinated assistance and directions to the pilot-in-command throughout his flight. The whole of an operator's network is divided into contiguous areas

of responsibility so that co-ordinated assistance and advice are assured to the pilot-in-command throughout his flight.

2.4 Areas of responsibility vary widely in size and shape due to operational considerations such as route structure, flight frequency, weather information availability, weather characteristics, air-ground and point-to-point communications facilities, equipment, administrative co-ordination, geographical factors, etc. The term "area of operational responsibility" applies equally to all operators, regardless of what method they use to exercise operational control. This is necessary since any form of delegated operational control responsibility - even if given solely to the pilot - has definite geographical boundaries. It might consist of one route to one airport; in other cases, it might encompass several routes traversing a rather broad area.

2.5 The "area of operational responsibility" does not necessarily define the extent of the services required. For example, an OPCO may have no requirement for information from certain aerodromes within his area because such aerodromes are not significant in relation to the routes over which the operations extend. Yet he may require service or information beyond his area for planning purposes in order to initiate a flight beyond his boundary and to allow co-ordination between different areas of responsibility. This is as important for the OPCO receiving an aircraft into his area as for the OPCO who is passing the aircraft over to another area.

2.6 The operational control officer may be situated at the same aerodrome as the MET Office serving that phase of the flight for which he is responsible. However, where the operator designates considerable responsibility to his operational control officer, and there is a considerable density and complexity of operations, "centralization" of operational control is generally found necessary to assure adequate co-ordination in the interest of flight regularity and the provision of accurate information to other departments of the operator's Organization. Centralization as compared to decentralization (see Figs. 1 and 2) consists in reducing the number of control points at which the OPCO's have responsibility for comparatively small areas and establishing a centre control point with a correspondingly larger area of responsibility. Centralization, therefore, results in flight operations officers not always being located at the same aerodrome as the meteorological office serving a phase of a flight for which he is responsible. The OPCO may then be said to be remotely situated (Remote OPCO).

2.7 This system of centralization reduces the number of OPCO's through which co-ordination is necessary and for many operators has the effect of increasing efficiency and regularity and of assuring integrated and co-ordinated planning while allowing for reduction in the number of operation staff. The choice of position of a centralized control is dependent on many factors such as the facilities already established in the area, the probability

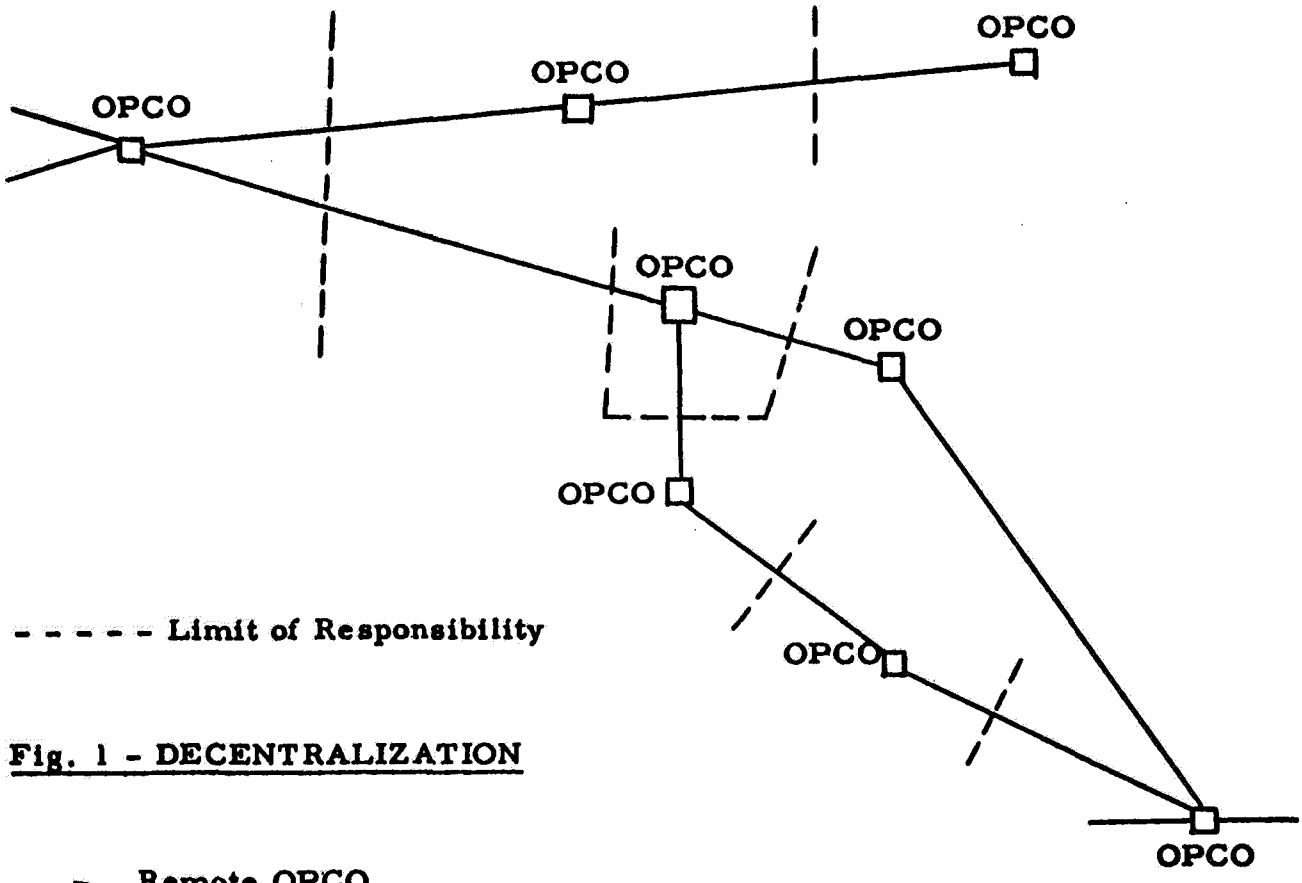


Fig. 1 - DECENTRALIZATION

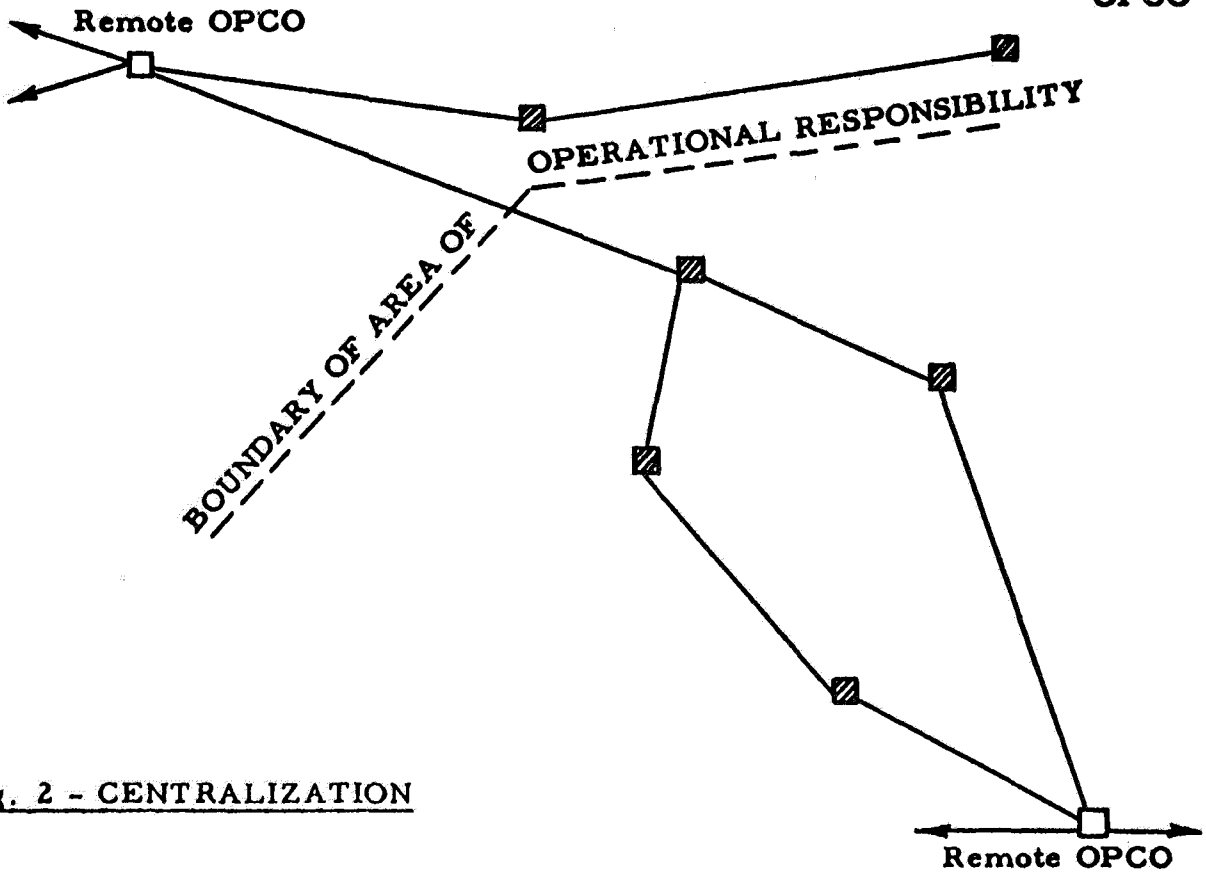


Fig. 2 - CENTRALIZATION

of the establishment of new facilities, the frequency and route structure of the operations, the frequency of diversions and cancellations in the area and the probability that additional facilities and services will be necessary.

2.8 However, there is normally a point of diminishing return in so far as centralization is concerned. When a stage is reached where the responsible operational control officer is so far removed in time or space from the source of flight information, or his contact with flights or agencies with whom he must co-ordinate is inadequate, then the value of centralization diminishes or even vanishes completely.

3.- OPERATIONAL CONTROL OFFICER

(Note:- For simplicity, the title "Operational Control Officer" (OPCO) is used to denote the person or office authorized to receive and distribute all incoming and outgoing information, advice and directions in relation to operational control.)

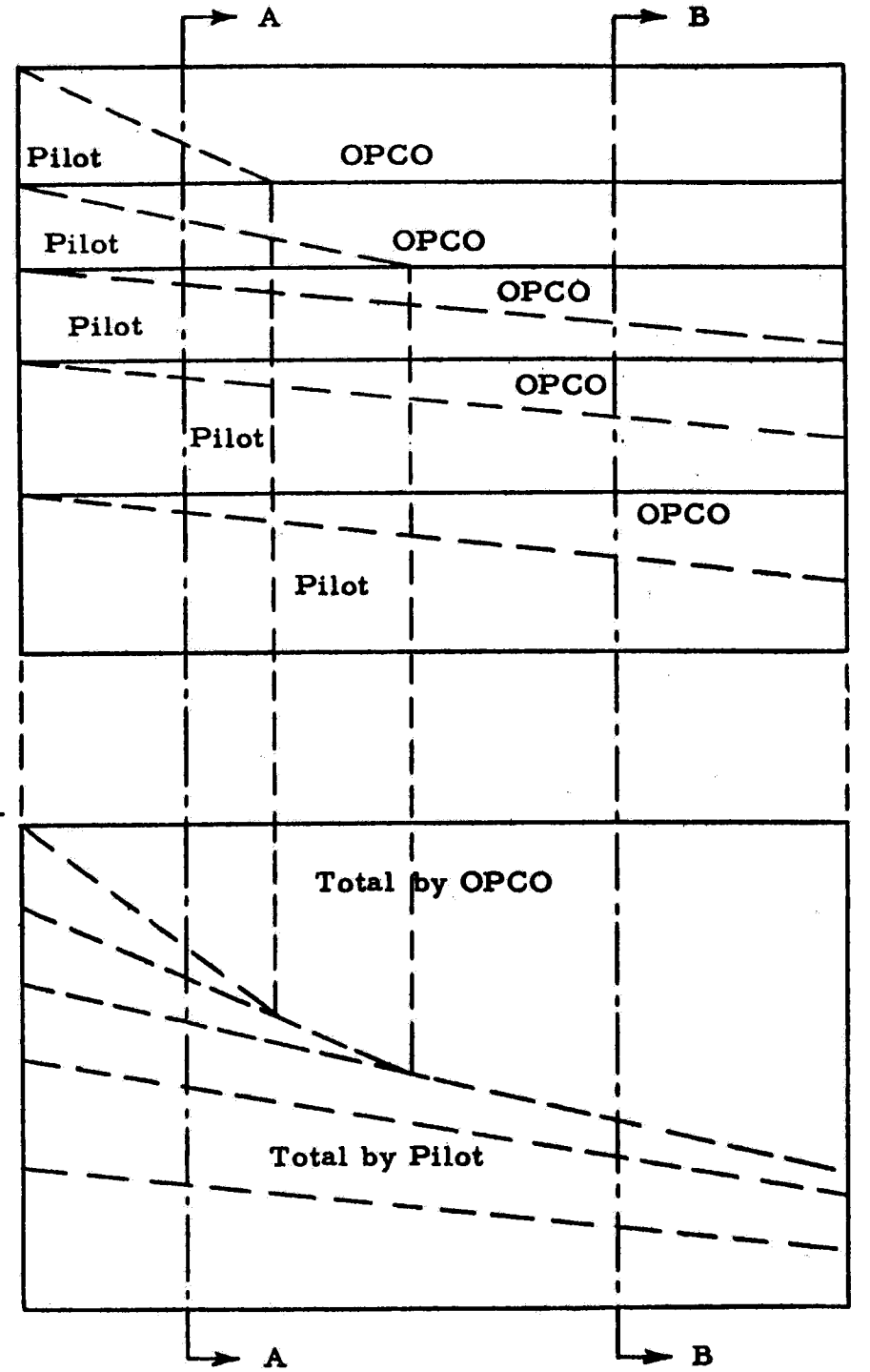
3.1 The operational control officer (OPCO) is the individual on the ground to whom the operator delegates responsibility for the exercise of operational control in conjunction with the pilot-in-command. This responsibility may vary from the very limited co-ordination with, and assistance to the pilot-in-command to a considerable measure of co-ordination, assistance and direction. (See Fig. 3.) In order to cover the maximum requirements of the OPCO for operational control purposes, it is proposed to set out his maximum duties and requirements. It is emphasized, however, that the operational control exercised by some OPCO's may be only a fraction of the duties and responsibilities set out hereafter.

3.2 The OPCO is concerned with safety regularity and efficiency of operations. It must be emphasized, however, that the pilot-in-command holds final responsibility for the safe operation of his aircraft and safety of his passengers and cargo. The OPCO also provides the pilot-in-command's main contact with other activities of the operator's organization and this also contributes to the safety of the flight.

3.3 The OPCO not only contributes to safety, but by his assistance to the pilot-in-command, makes a positive contribution to economy inter alia, by improvement in pay load, reduction of excessive fuel reserve, and the saving of flying hours by reducing the number of abortive flights.

3.4 There must be a close integration of the functions of the pilot-in-command with those of the OPCO and vice versa if this co-ordination is to be successful. One cannot function efficiently without the full co-operation of the other and team-work must be developed and maintained by complete understanding of each others' problems. For example, complete agreement should be reached between the pilot-in-command and the OPCO on

Fig. 3 - OPERATIONAL CONTROL PRE-FLIGHT



Key

A - An operator who has designated a considerable amount of operational control responsibility to the pilot- in-command.

B - An operator who has designated a considerable amount of operational control responsibility to the ground personnel.

details with respect to the planning and dispatch of a flight before it is cleared. The pilot-in-command has the authority to delay a flight when, in his opinion, conditions are unsuitable for starting or continuing a flight. He also has the authority to initiate a change in flight plan before or during a flight when, in his opinion, such a change is necessary. Chiefly because of the "operational planning" factors involved, the OPCO has sometimes the same authority to delay, originate, consolidate or cancel flights at any time this action is deemed necessary. He may also have the authority to initiate a change in flight clearance prior to or at any time flights are en route when, in his opinion, such change is necessary. When this procedure is used, it is the more conservative opinion which governs the decision.

3.4.1 The OPCO must constantly know the position and monitor the progress of all flights in his area and must be alert to conditions or circumstances which may affect the safety or efficiency of these flights. He must also co-ordinate with adjacent OPCO's. This involves a constant process of analysis, evaluation, consultation and decision.

3.5 The OPCO must have a thorough knowledge of basic meteorology, particularly with regard to the effect of weather on air operations and should have knowledge of the weather map, weather forecasting, and weather abbreviation symbols and nomenclature. He must know the characteristics of the operator's aircraft, the routes flown and the Flight Operations Regulations in complete detail. He must be thoroughly acquainted with all phases of regulations and procedures of the States in which his aircraft are operated. Since he has a close functional relationship with nearly every other department in the Company it is necessary for him to have a good working knowledge of these departments. From the knowledge and experience acquired by the OPCO, it is of the utmost importance that he develop sound judgement and a good understanding and constant awareness of the limitations of air transportation - human, mechanical and physical.

3.6 The very nature of air transportation makes the OPCO more subject to errors of omission than errors of commission. He must be alert to rapidly changing conditions and circumstances, methods and procedures and adapt himself accordingly. The job demands that he have the courage of his convictions and let nothing influence him contrary to his better judgement.

3.7 From a practical standpoint, it is not convenient to divide the various phases of the operational control officer's duties into more than two main stages as regards time relationship with a given flight operation. These two stages might be termed "pre-departure" and "in-flight" for convenience. Relating these terms to meteorological language, it can be said that advance, preliminary, and pre-flight operational planning are included under "pre-departure" stage, and that in-flight operational planning coincides with "in-flight" stage.

3.7.1 In paragraphs 3.8 and 3.9 following, duties and responsibilities relating to each of these two stages are outlined. This outline is not necessarily complete in every detail, because of variations in operators' practices, even at the "maximum duty and requirement" level, but the outline is considered to be representative.

3.7.2 It should be noted in connection with the following that, irrespective of stages, when an operational control officer commences a tour of duty, he will require to receive from the operational control officer preceding his tour of duty a thorough meteorological briefing, a thorough study of current notices to aircrew, together with other related information, and a briefing on current operational problems. It should also be noted that, in both stages, there are three things which have to be kept in mind by the operational control officer. He must:

a) Plan conservatively.

b) Failing normal operation, plan so as to give the best alternative service.

c) Keep flights operating on schedule in so far as possible.

These rules have been found, through years of experience, to be essential to maintaining maximum service, utilization of equipment, and economy of operations during adverse conditions. For example, in addition to the paramount consideration of "safety first", it is necessary, owing to the unpredictable variables of weather, to plan an operation conservatively in order to be certain the flight will arrive at the aerodrome to which it is cleared, thereby providing maximum possible service to passengers and cargo. The inevitable results of over-optimism in planning operations are further delays, inconvenience to passengers and uneconomical utilization of the aircraft.

3.8 Pre-departure stage

(Duties and procedures are not necessarily performed in the order outlined. They also refer to OPCO's of one operating company only.)

3.8.1 For the efficient operational planning of flights which operate through more than one area of responsibility, co-ordination of plans between OPCO's is essential. Some of the main reasons why this is essential are:

a) It provides a double check on the operation;

b) it more definitely ensures efficient and accurate planning of "through flights";

c) it assures greater accuracy in issuance of flight forecasts, as the plans of one OPCO can seriously affect or alter the plans of the adjacent OPCO.

3.8.2 Generally, co-ordination and discussion of an operation between the OPCO's concerned is initiated by the OPCO in whose area the flight is operating at or before the regular pre-flight check periods. The "discussion" is normally carried out by means of teletype messages or radio, or, if the occasion warrants, long distance telephone may be utilized.

3.8.3 Discussions between OPCO's revolve, for the most part, around the following subjects:

a) En route and terminal weather conditions;

b) the "alternates" to be used for various terminals;

c) explanation of plans and the offering of suggestions in order to reach unity of effort.

3.8.4 Establishing fuel requirements for flights is one of the most exacting responsibilities of an OPCO and the pilot-in-command; it is one that has a tremendous bearing on the economies of operations. When determining the fuel requirements, the amount must be calculated as accurately as possib in order to obviate later large decreases or increases, particularly the latter It is not always possible for the pilot-in-command to be responsible for all such arrangements which are very necessary in the preparation of a flight. Therefore, one of the OPCO's basic duties is to determine operating conditions and requirements for each flight well in advance of departure so that all is in readiness for final flight planning.

3.8.5 Generally, the OPCO must undertake the following:

a) Consult with the meteorological office and refer to meteorological information, as necessary;

b) issue information to departments of the operator's organization concerning operations plans;

c) issue such instructions as are necessary to appropriate depart ments of the operator's organization concerning aircraft and crew utilization;

d) ascertain load requirements;

e) determine load availability;

f) outline to the pilot-in-command what he considers the pilot may expect in the way of en-route and terminal weather. He explains how other flights have been planned or what they have encountered en route, their altitude, procedure, ground speed, etc., and offers suggestions that may be of help to the pilot-in-command in his flight planning;

g) advise the pilot-in-command on the routes, altitudes, tracks and technical stops that will be necessary and what alternate aerodromes are considered suitable for the various terminals, and why;

h) determine fuel requirements and aircraft gross weight (the pilot-in-command makes an independent calculation);

i) bring to the pilot-in-command's attention any irregular operation of airport, airway, navigation or communication facilities;

j) outline what may be expected in the way of delays or irregularities to the flight while en route or what is expected of other flights operating over the route at the same time.

3.8.6 In addition to the above, where the operational control officer is located at the airport of flight departure, he normally carries out the following duties:

a) Prepares such flight documents as are required by the operator;

b) attends the pilot meteorological briefing when time and other duties permit;

c) signs and approves the operational flight plan.

3.9 In-flight stage

(Duties and responsibilities are not necessarily performed in the manner outlined.)

3.9.1 The OPCO may be called upon to assist the pilot-in-command in the in-flight stage as follows:

a) By continued co-ordination of plans with other operational control officers to meet changing circumstances;

b) by continued consultation with the meteorological office and reference to meteorological information, as necessary, to assess effect of weather developments on plans established at pre-departure stage;

c) by continued issuance of information to departments of the operator's organization concerning flight progress or revised plans;

d) by issuance of such instructions as are necessary to appropriate departments of the operator's organization concerning revised plans for aircraft and crew utilization, if a diversion, flight return, en-route delay or cancellation occurs;

e) by recommending revised routes, altitudes, alternates and operating techniques to meet changing circumstances;

f) by monitoring adequacy of remaining fuel;

g) by supplying or arranging for the supply to the pilot of supplementary information (including significant weather information, irregularities in operation of navigation and communication facilities, etc.).

3.10 Irrespective of the stage involved, when flights are either diverted, delayed, returned or cancelled, the routine functioning of the following departments is affected:

Flight Operations;
Traffic (Passenger Service);
Space Control;
Maintenance;
Stations;
Cargo;
Communications.

3.11 When irregularities in flight operations occur, the operational control officer must look far ahead and consider the many factors involved in order to determine the most practical plan or solution. Some of the main factors are as follows:

a) How long will the flight be delayed, or when may they expect it to operate?

b) How long can the flight be delayed?

c) In the event that the flight is delayed beyond the maximum limit established, or is cancelled, what is the best alternative for passengers and cargo?

d) How will the delay affect other sections of the airline and can they be kept operating on schedule?

e) Is there an aircraft available to originate the flight at the next terminal ahead and what is the most practical time to so originate?

f) What is the second best point to originate the flight?

g) What is the latest time the flight can originate and still allow necessary placement of aircraft?

h) Is there revenue available at the time origination is most desired?

i) If necessary to cancel, what is the best time in order to fit in with alternative transportation?

j) Is it necessary to cancel an equal number of flights in the opposite direction in order to balance equipment?

k) How will the plans of one OPCO affect the next OPCO?

(Note:- In this context, a flight is said to "originate" when it commences operation from an aerodrome other than the aerodrome from which it is regularly scheduled to depart.)

3.12 Delays and irregularities of operation often upset crew and aircraft cycles very considerably. Therefore, it is necessary for the operational control officer to check closely with the operator's departments responsible for crew and aircraft routing in order to maintain well-balanced crew and aircraft for the operation of all flights.

3.13 Except where indicated as applying only to the situation where the operational control officer is located at point of departure, all of the duties and requirements set forth in the foregoing paragraphs apply to both situations (i.e., OPCO at point of departure or OPCO remote from point of departure). In those instances where maximum duties are performed and the operational control officer is at the same time remote from point of departure, the operator obviously must have established that adequate communications were either available or could be made available for such purpose, or that a representative of the operator at the departure point is directed by the operational control officer at the central point to carry out the purely manual functions, the operational control officer retaining the responsibility for decisions and advice.

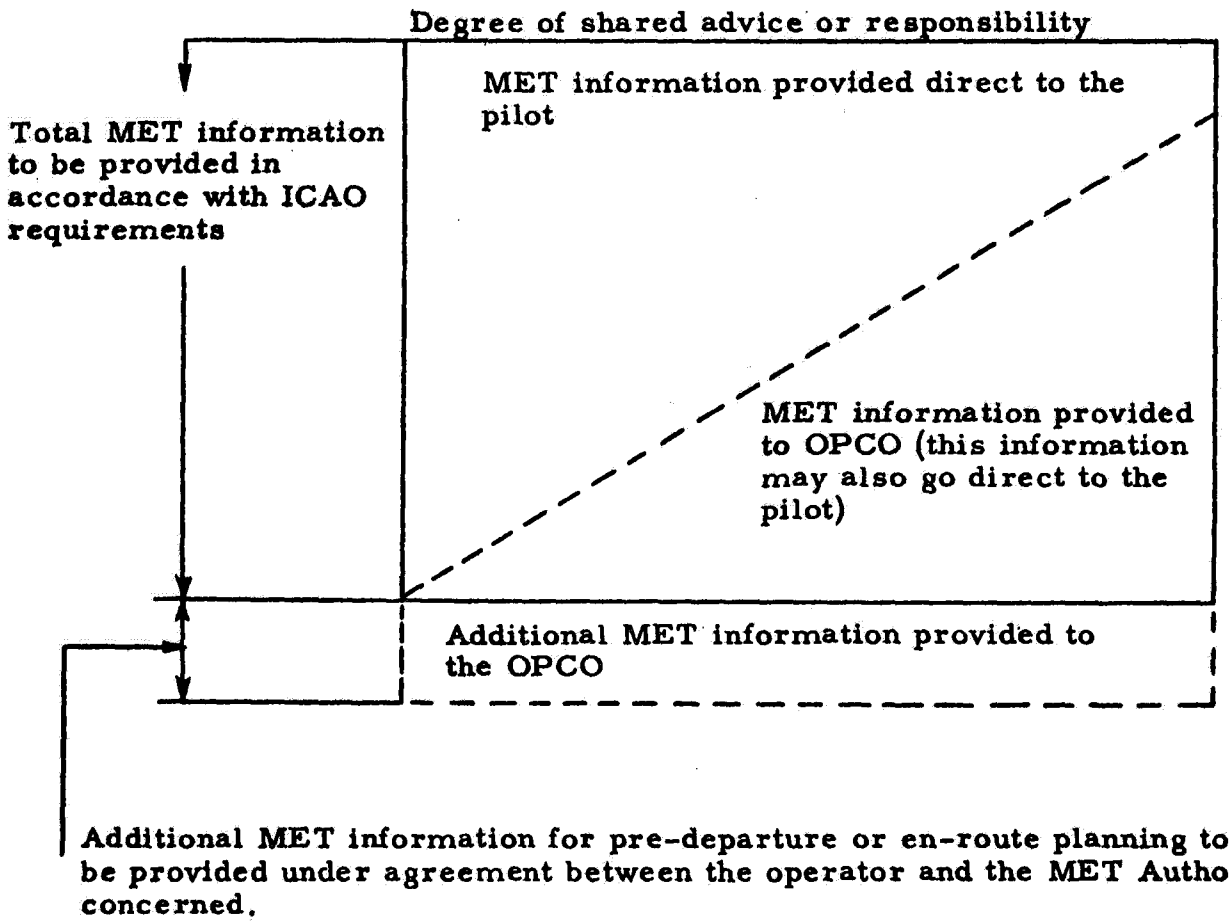
4.- REQUIREMENTS OF THE OPCO

(Note:- The question of how the requirements are to be met is of great importance and will need, as a practical matter, to be taken into account in any ultimate determination of requirements.)

4.1 Meteorology

4.1.1 The most important information necessary for the OPCO to carry out his operational planning duties is meteorological information. The OPCO maintains his familiarity with meteorological conditions so that he may generally be as well informed as the pilot with whom he shares responsibility or is assisting in order to formulate decisions or recommendations concernin flights yet to depart or which are en route.

Fig. 4 - OPERATIONAL CONTROL
USE OF MET INFORMATION



4.1.2 The meteorological information required to carry out these duties may be as follows. This list is considered to be a representative example of the meteorological requirements of operators. Some OPCO's may require considerably less than that listed, depending on the operator's practices and requirements.

AERONAUTICAL METEOROLOGICAL INFORMATION NEEDED
TO FULFILL THE REQUIREMENTS OF THE FLIGHT OPERATIONS OFFICER

1. The following information should be available in cases where an operational control officer has responsibility for flight operations. The same information is needed for pre-departure and in-flight planning, the only difference being that information is required over a larger period, if the operational control officer carries out both pre-departure and in-flight planning.

Operational Need	Purpose
a) Hourly Meteorological Reports	
From regular (including technical stops) and alternate aerodromes and significant weather reporting stations within the area of responsibility of the operational control officer. (See Note 1.)	i) To provide an indication of the actual meteorological conditions at aerodromes and the current trend of those conditions. ii) To determine the trend of meteorological conditions existing along or adjacent to the route, using the reports from significant stations, to meet the requirements respecting flight planning, weather conditions, and fuel and oil supply. iii) To afford a basis of reference for aerodrome forecasts and for the monitoring of them. iv) To determine: Whether surface wind, cloud height and visibility permit a landing; Available alternates; Whether en-route weather conditions permit procedure as originally planned; Allowable gross weight at take-off or landing.

b) Aerodrome Forecasts	
i) For the aerodrome of destination and its alternates, valid up to the expected time of arrival at the furthest alternate plus two hours.	i) To provide information on expected meteorological conditions in order to determine: a) allowable gross weight at take-off or landing; b) whether cloud height, visibility or surface wind will permit a landing or take-off; c) available alternates.
ii) For intermediate stops and alternates until a landing at one or other has taken place or is no longer expected, valid up to expected time of arrival at furthest alternate plus two hours.	
iii) For significant en route alternates as appropriate while a landing at such an alternate may still take place, valid up to expected time of arrival there plus two hours.	ii) To meet the requirements respecting flight planning, weather conditions and fuel supply.
iv) For the aerodrome of departure and its alternates and for any intermediate stop and alternates until the half-way point or point of no return, which ever is the further, on the appropriate segment of the flight, valid up to expected time of arrival at furthest alternate plus two hours.	
c) Amendments to Aerodrome Forecasts	
Amendments to the above-mentioned aerodrome forecasts up to valid time.	To ensure that the aerodrome forecasts are kept up-to-date and that the latest information on expected weather conditions at aerodromes is thus available for determining the probability of landing.
d) Special Meteorological Reports	
For the aerodrome where operational control officer is located.	To ensure that significant current information concerning weather for take-off or landing is available.
e) Selected Special Meteorological Reports	
From all aerodromes from which hourly reports are supplied in accordance with a) above. (See Note 1.)	To ensure that operationally significant changes of weather conditions are made known during intervals between routine reports.

f) Flight/Route Forecasts

i) Needed as far as the aerodrome of next intended landing where new briefing and documentation is to be provided to the flight. In addition, a provisional statement of meteorological conditions expected between the latter aerodrome to one alternative aerodrome designated by the operator.

To provide information concerning meteorological conditions on which the flight can be planned and operated.

ii) If required, briefing and documentation up to a further aerodrome.

g) New or Amended Flight Forecasts

For pre-departure planning and needed on request, at any stage of flight for balance of route including possible diversions or selection of new destinations. (This may include any or all of the following: forecasts of winds, temperatures and significant en-route weather.) (See Note 2.)

To provide information on the changes in expected meteorological conditions which may affect the planning or progress of the flight.

h) Aircraft Reports

All reports from aircraft applicable to the route which are received at the local meteorological office and other meteorological offices. (See Note 3.)

These are required to supplement information on meteorological conditions at altitudes along the route or routes.

i) "Advisory and Warning" messages of important meteorological phenomena

All texts applicable to the route which are received at the local meteorological office and which relate to existance or expectation of the following:

1) Active thunderstorm area
2) Violent line squall
3) Conditions of severe turbulence or rapid icing
4) Unusual condition of wide-spread snowfall extending rapidly

To ensure that the operational control officer has available all information concerning especially significant en-route conditions.

i) "Advisory and Warning" messages of important meteorological phenomena (Cont'd)

5) Violent wind aloft over mountainous regions
6) Duststorms or sandstorms.

(See Note 3.)

j) Analyses

Access to and briefing on actual and prognostic surface and upper air charts appropriate to altitudes to be flown, and covering area for which the OPCO is responsible.	To indicate the synoptic situation on which the forecast is based and to assist in an understanding of any deviations from the forecast which may become apparent.

Note 1: Occasionally, reports may be required from beyond the area of responsibility.

Note 2: When the OPCO is not located at the point of departure, it is not essential that he receive an exact copy of the flight/route forecast provided to the pilot. However, some operators may desire to make arrangements locally for the receipt of this information via appropriate communications channels. Normally, the requirement may be satisfied through the means set forth in paragraph 2.

Note 3: Occasionally, additional reports may be required.

2. Additionally the operational control officer may require consultation with the local MET Office at various intervals for the purpose of obtaining information in general or specific terms relating to existing meteorological conditions or expected developments in meteorological conditions. Such consultation may concern flight operations which do not originate, terminate, or operate, in the State in which the local MET Office is located.

Consultations may concern any phase of operational planning, advance, preliminary, pre-flight, or in-flight, according to the responsibilities designated to the operational control officer by the operator.

Note: In applying the requirements of this paragraph, it is not intended that the local MET Office will have to obtain additional information not normally available to that office for the purpose of fulfilling other requirements.

3. It should be noted that requirements of the operational control officer involving exchange of meteorological information are normally satisfied to a large extent as a result of the established requirements of the ATS, the MET Office itself, and the collective pilot requirements. The remaining unsatisfied requirements, which normally constitute a relatively small portion of the total requirement of the OPCO would be a matter for negotiation between the operator and the supplier. These unsatisfied requirements do not concern categories of information, but the distance, area or place from which information is required. The collective pilot requirement referred to above encompasses the same categories of information as are listed in paragraph 1. The distance requirement over which certain of these categories should be made available to

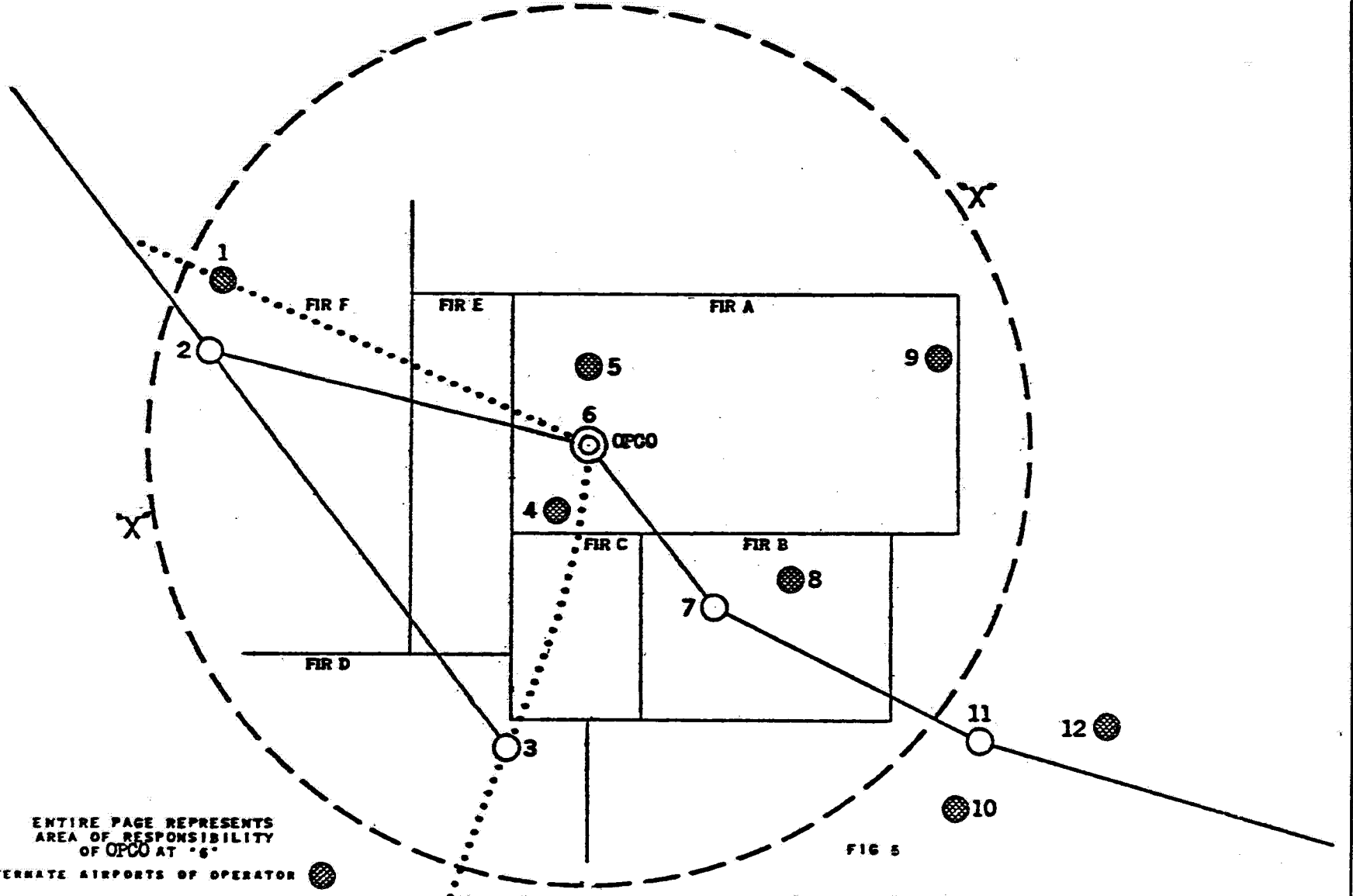


FIG 5

Note. - The requirements for hourlies and selected specials are indicated by the numbered aerodromes. The requirement for aerodromes 7 and 8 is satisfied as the result of established exchange of information between adjacent FIRs. The requirement for aerodromes 4, 5 and 9 is satisfied as the result of established exchange of information within the FIR for FIC purposes. (The FIC is at the same location as the Operational Control Officer in this example.) The requirement for aerodrome 6 is satisfied as the result of it being at the same location as the Operational Control Officer. The requirement for aerodromes 1, 2 and 3 is satisfied as the result of established exchange of information to meet pilot requirements of pilots departing from the Operational Control Officer location since they are within the "x" range. The requirement for aerodromes 10, 11 and 12 is unsatisfied. Satisfactory achievement is a matter of negotiation with States.

the pilot are generally agreed to in regional meetings in terms of "x" hours of flying time at an agreed rate of speed. The time "x" up to which hourly MET reports, selected special reports, aircraft reports, and advisories of important MET phenomena are required for pre-departure and in-flight purposes will have a common value in respect of all these categories on any particular flight. However, the time x is dependent on: -

a) The nature of the route, including availability of en-route aerodromes;

b) the extent of synoptic information available for preparation of aerodrome forecasts and amendments;

c) the climatic weather conditions over the area, and the prevailing weather conditions over the route;

d) the situation of alternates in relation to the destination;

e) the type of aircraft equipment, and allowable payload;

f) the type of fuel reserve required in order to operate safely and economically.

In view of these factors, it is not practicable from the operators' standpoint, to state the time "x" as a precise figure on a world-wide basis since this would lead to overstatement of requirements on some routes and understatement on others. It is believed, however, that in the majority of cases this value of "x" lies within the limits of 2-4 hours; in particular cases it might well be above 4 hours but in no case is it likely to be less than 2 hours.

4.1.3 It will be seen that when the OPCO is at the point of flight departure, he will receive information identical to that provided to the pilot. When the OPCO is not at the point of flight departure he may not necessarily receive information identical to that provided to the pilot. In both cases, certain information additional to that available may be required. When this occurs, satisfactory achievement would be a matter for negotiation between the operator and the suppliers.

4.2 Air Traffic Services

4.2.1 Aircraft Movement Information

The following information is required by the OPCO in the circumstances indicated:

Operational Need	Circumstances
Flight Plan Message Cancellation Message	When all or part of the flight path lies within the area of responsibility of the OPCO.
Departure Information Delay Information	When the flight departs (delays) from an aerodrome within the area of responsibility

	of the OPCO and when the flight departs (delays) from an aerodrome outside this area if thereafter it is to enter the area.
Arrival Information	When the flight arrives at an aerodrome within the area of responsibility of the OPCO.
Position Reports	During the time that the flight is within the area of responsibility of the OPCO and shortly prior to its entering the area.
Other ATS Instructions/ Messages	Pertinent ATS Instructions/Messages which will substantially affect the operation or safety of the flight (e.g. instructions to pilots which will affect the originally planned route or which will result in subsequently delayed departures or arrivals).

4.2.2 Aeronautical Information Services

These include pertinent information concerning the establishment, condition or change of any aeronautical facility, service, procedure or hazard (NOTAMS). This is important to the OPCO for the proper functioning of operational control. The OPCO needs access to whatever information is available locally, as a result of established exchange of information. The OPCO may require more information, in which event this may be a matter for negotiation between the operator and the supplier.

4.3 Communications

4.3.1 Adequate and rapid communications are essential for the efficient collection and dissemination of information necessary for operational control. The communication services required may, for the convenience of this paper, be classified as:

a) Communication services provided solely to meet OPCO requirements;

b) communication services provided for MET, ATS or other aeronautical purposes independently of OPCO requirements and through which requirements of the OPCO can be met;

c) communication services provided between offices or units of the MET, ATS or other services which would not have been provided in the absence of OPCO requirements.

4.3.2 Communication services in Class a) above fall into three principal categories:

a) Point-to-point communications between neighbouring OPCO's, between the OPCO and pilots and between the OPCO and other departments/locations of the operator with whom co-ordination and receipt/dissemination of information is necessary;

b) ground/air communications between OPCO and the operators' flights for which the OPCO is responsible. (Point-to-point relays may be necessary to carry out this function);

c) local communications between the OPCO and appropriate State agencies in order to permit efficient liaison with the MET and ATS services.

4.3.3 Communication services in Class b) above are those services used by the MET Service and ATS in fulfilling their responsibilities.

4.3.3.1 In the case of MET Information, the MET Offices collect data from a considerable area from MET Observing Stations, aircraft and ships. The value of the exchange of the MET Information is dependent on the speed of coverage accomplished and resultant speed of availability to the user. This is especially the case with operational control where the OPCO must constantly evaluate MET Information in order to properly fulfill his responsibilities. Lack of information or delay in transit can seriously impair the safety or efficiency of flight operations.

4.3.3.2 As has already been stated under "Meteorology", in the majority of instances, the MET Information requirements of the OPCO can be met by information received in the MET Offices to meet requirements of others, e.g. pilots-in-command, ATS, and MET Office itself. The Communication services are thus already established for the MET Office receipt of information required by the OPCO. However, to show the functional relationship between the specific OPCO requirements of the MET Services and the associated communications requirements, the following tabulation is presented:

Functional Requirements	Communication Requirements Class b)
a) Hourly reports and selected special reports	a) A communications link between the local MET Office and weather reporting stations serving regular and alternate aerodromes and other significant stations within the area of responsibility of the OPCO. See Note 1, page 21.

b) Aerodrome forecasts and amendments	b) A communications link between the local MET Office and MET Offices at i) aerodromes of destination and alternates ii) intermediate stops and alternates iii) significant en-route alternates iv) alternates for aerodromes of departure
c) Advisory and warning messages	c) A communications link between the local MET Office and neighbouring MET Offices
d) Aircraft reports and selected reports	d) A communications link between the local MET Office and neighbouring MET Offices.

4.3.4 Communication services in Class c) are those which relate to MET and ATS information which is primarily required only by the OPCO and which would not normally be received by the local MET or ATS unit if an OPCO were not at that location.

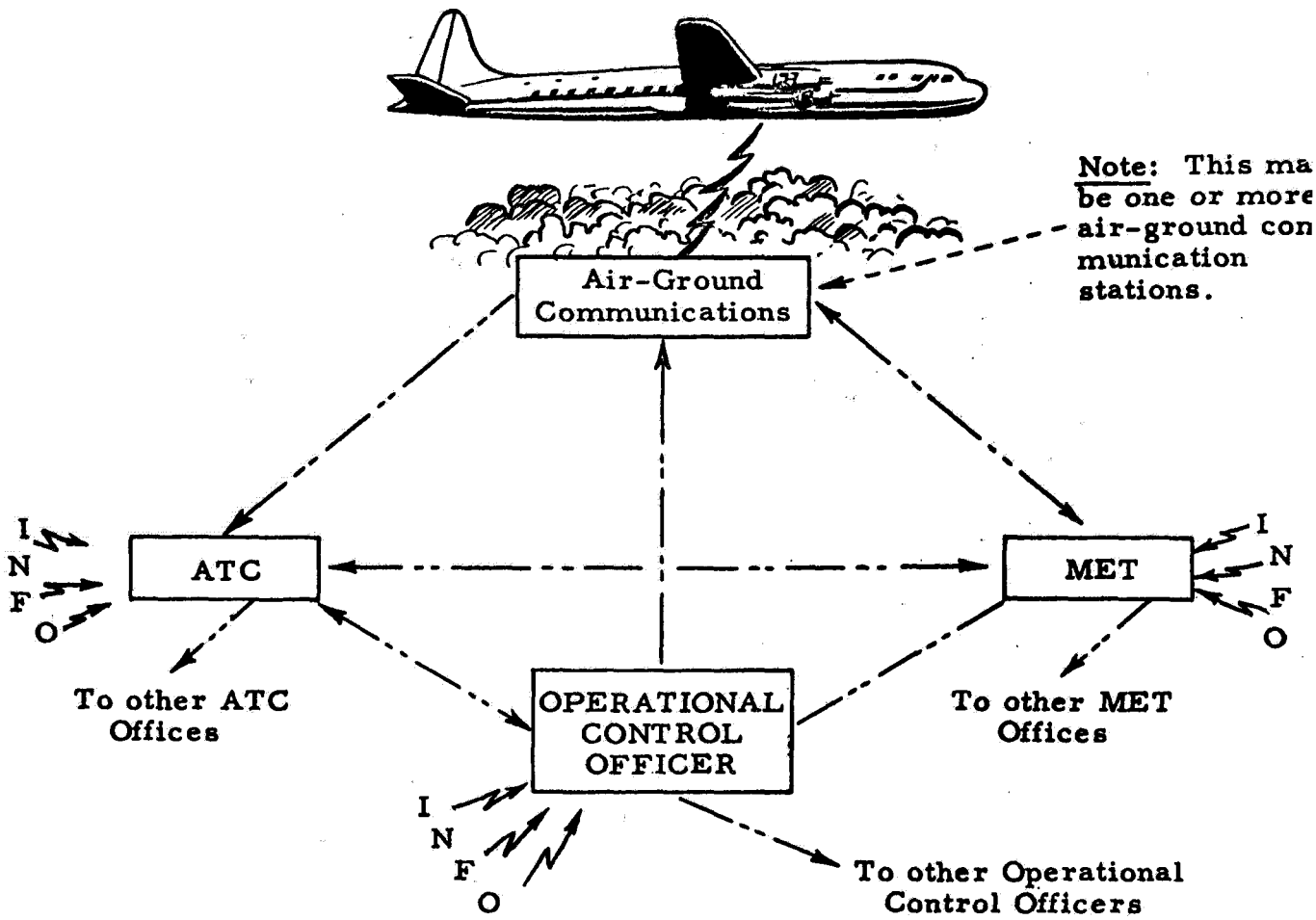
The Communication requirements in respect of this Class of Services will depend on MET and ATS information requirements of the OPCO in relation to the information requirements of the local MET and ATS to meet requirements of others e.g. pilots, ATS and MET Office itself. Information requirements in excess of the MET and ATS requirements for others may not necessarily increase Communication Service requirements but in some instances special Communication links may need to be established to meet the full requirements of the OPCO.

4.3.5 The Communication requirements relative to the Air Traffic Services is self-evident from the previous tabulation. However, there is a need for communications between air traffic services units and flight operations officers in case of an emergency phase being declared. In this case it is sometimes important that air traffic services units are given specific information on the conditions under which the aircraft could proceed in the face of the emergency and particularly on the endurance of such aircraft as from the point where the state of emergency is declared.

4.3.6 In respect of the foregoing outline of communication services required, it should be appreciated that the terms Communication Services or Communication links are intended to denote any type of Communication facilities

or services that may be appropriate to the functional requirement, e.g. The Aeronautical Fixed Telecommunication Network, Exclusive MET or ATS circuits, Air-Ground-Radio telegraphy, telephony, Public Telecommunications Messengers, etc.

4.3.7 For illustrative purposes the services, facilities and lines of communication essential to permit the attainment of the objectives of operational control are indicated in the following functional diagram and can be implemented by means of several communications arrangements:



Lines of communication shown -------- --- ------- --- -- ---- may be telephone, teletype, inter-com, etc., or a connecting doorway, depending upon local requirements and disposition of facilities. A number of factors govern the physical location of those functions relative to a particular airport - e.g., they are all not necessarily situated at that airport.

- END -

ICAO TECHNICAL PUBLICATIONS

The following summary gives the status, and also describes in general terms the contents of the various series of technical publications issued by the International Civil Aviation Organization. It does not include specialized publications that do not fall specifically within one of the series, such as the ICAO Aeronautical Chart Catalogue *or the* Meteorological Tables for International Air Navigation.

INTERNATIONAL STANDARDS AND RECOMMENDED PRACTICES are adopted by the Council in accordance with Articles 54, 37 and 90 of the Convention on International Civil Aviation and are designated, for convenience, as Annexes to the Convention. The uniform application by Contracting States of the specifications comprised in the International Standards is recognized as necessary for the safety or regularity of international air navigation while the uniform application of the specifications in the Recommended Practices is regarded as desirable in the interest of safety, regularity or efficiency of international air navigation. Knowledge of any differences between the national regulations or practices of a State and those established by an International Standard is essential to the safety or regularity of international air navigation. In the event of non-compliance with an International Standard, a State has, in fact, an obligation, under Article 38 of the Convention, to notify the Council of any differences. Knowledge of differences from Recommended Practices may also be important for the safety of air navigation and, although the Convention does not impose any obligation with regard thereto, the Council has invited Contracting States to notify such differences in addition to those relating to International Standards.

PROCEDURES FOR AIR NAVIGATION SERVICES (PANS) are approved by the Council for worldwide application. They comprise, for the most part, operating procedures regarded as not yet having attained a sufficient degree of maturity for adoption as International Standards and Recommended Practices, as well as material of a more permanent character which is considered too detailed for incorporation in an Annex, or is susceptible to frequent amendment, for which the processes of the Convention would be too cumbersome. As in the case of Recommended Practices, the Council has invited Contracting States to notify any differences between their national practices and the PANS when the knowledge of such differences is important for the safety of air navigation.

REGIONAL SUPPLEMENTARY PROCEDURES (SUPPS) have a status similar to that of PANS in that they are approved by the Council, but only for application in the respective regions. They are prepared in consolidated form, since certain of the procedures apply to overlapping regions or are common to two or more regions.

The following publications are prepared by authority of the Secretary General in accordance with the principles and policies approved by the Council.

ICAO FIELD MANUALS have no status in themselves but derive their status from the International Standards, Recommended Practices and PANS from which they are compiled. They are prepared primarily for the use of personnel engaged in operations in the field, as a service to those Contracting States who do not find it practicable, for various reasons, to prepare them for their own use.

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AIR NAVIGATION PLAN documents detail requirements for facilities and services for international air navigation in the respective ICAO Air Navigation Regions. They are prepared on the authority of the Secretary General on the basis of recommendations of regional air navigation meetings and of the Council action thereon. The plans are amended periodically to reflect changes in requirements and in the status of implementation of the recommended facilities and services.

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Annex 3 — Meteorology.
(4th edition - Incorporating amendments 1 to 41)..... In preparation

Annex 5 — Dimensional units to be used in air-ground communications.
(2nd edition) May 1952 (incorporating amendments 1 to 11)
12 pp. $0.15

Annex 6 — Operation of aircraft — International commercial air transport.
(4th edition) May 1953 (incorporating amendments 1 to 134)
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Annex 10 — Aeronautical telecommunications.
(4th edition) April 1955 (incorporating all amendments prior to 1 January 1955). 126 pp..... $2.00

Annex 11 — Air Traffic Services.
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PROCEDURES FOR AIR NAVIGATION SERVICES

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April 1955. 34 pp. Letterpress..... $0.50

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