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TIMED APPROACHES AND UTILIZATION OF RADAR IN SPACING OF AIRCRAFT ON FINAL APPROACH

(Reduction of Intervals between
Successive Approaches and Landings)

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F O R E W O R D

The purpose of ICAO Circulars is to distribute information bearing upon the progress of ICAO's work more widely than would be possible for the ordinary series of documents.

The present circular publishes informative material, drafted by the fourth session of the RAC Division (November - December 1950), on two possible methods which can be used to reduce the time interval between successive approaches and landing.

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PART I

TIMED APPROACHES

1. PREAMBLE

1.1 Increasing air traffic is creating congestion at many aerodromes throughout the world during IFR weather conditions. This congestion is resulting in excessive delays to arriving aircraft awaiting their turn to land or in the diversion of the aircraft to a less congested aerodrome at great inconvenience and cost to passengers and the operator.

1.2 This problem does not exist to any appreciable extent during periods in which aircraft can execute their entire approach to an aerodrome in accordance with Visual Flight Rules, since traffic separation is not required nor is it necessary to execute the complicated manoeuvres associated with an instrument approach. During such weather conditions, aircraft can be landed at intervals of only a little longer than the time required for an aircraft to travel from the point of touch-down to the point at which it clears the runway. At locations where adequate runway turn-offs exist, aircraft can be landed at intervals of approximately one minute.

1.3 When aircraft cannot approach an aerodrome in accordance with VFR, however, it is necessary that traffic separation be provided to aircraft by an air traffic control service unit and that aircraft follow a predetermined path which will provide appropriate terrain clearance during the descent to the aerodrome. These approach paths are established for each aerodrome at which instrument operations are contemplated and are, in general, based on criteria contained in Part V of the Final Report of the Operations Division, Third Session. These flight paths are known as "Instrument Approach Procedures" and specify the flight path to be used with the various types of landing aids. At aerodromes where more than one type of landing aid is in operation, an "instrument approach procedure" is established for use with each facility, such as "ILS," "BABS," "RADIO RANGE," etc. The aircraft

manoeuvres associated with each of the procedures are somewhat different, since some require an "initial approach", an "intermediate approach" and a "final approach," whereas other procedures specify only the "initial" and "final" approaches.

1.4 The time consumed by an aircraft in executing an instrument approach procedure varies considerably. For the purpose of illustration, the time required for the execution of an instrument approach using present procedures (from arrival over the terminal navigation aid at initial approach altitude to arrival over this aid on final approach) will normally be as follows:

a) Intermediate approach - outbound track from the terminal navigation aid - four minutes.

b) Procedure turn - reversal of course from outbound track to inbound track - two minutes.

c) Final approach - return to navigational aid on inbound track in line with axis of runway - four minutes.

It can be seen from the above that a total of at least ten minutes is required for the execution of a full instrument approach.

1.5 Due to the many manoeuvres associated with an instrument approach as illustrated above and the lack of knowledge by the air traffic control service unit as to the exact location and altitude of the aircraft during intermediate and final approach, only one aircraft can be cleared for an approach at a time. The use of such instrument approach procedures, therefore, limits the capacity of an aerodrome to approximately six aircraft per hour.

1.6 Many aerodromes have a traffic density in excess of six aircraft per hour during inclement weather conditions and since only six aircraft can be accepted, the time limitation imposed by the instrument approach procedure results in delay to arriving aircraft. Since the aircraft acceptance rate of a runway during good weather conditions is far in excess of that during bad weather when full instrument approach procedures must be executed, it is necessary to develop procedures for use at these aerodromes which will make it possible to decrease the interval between approaches.

1.7 Procedures have been developed by the United States to accomplish this result and have been in use for several years. These procedures utilize the "final approach" portion only of the full instrument

approach procedure, together with improved and precise air traffic control procedures. Two different methods are employed, i.e., vertical separation procedures and longitudinal separation procedures, the application of which requires:

- 1) Instantaneous and direct two-way communication between the controller and the pilots.
- 2) Adequate navigational aids for instrument approach and holding purposes, including
 - a) a navigational aid serving the instrument runway,
 - b) a navigational aid providing a holding point or "gate" on the approach course.
- 3) An approved instrument approach procedure, utilizing the "final approach" portion only.

1.8 Application of the "vertical" separation procedure provides standard vertical separation between all aircraft in an approach sequence, without regard to their position in relation to the "gate". When the first aircraft in the sequence has reported in visual reference to the ground, the second aircraft is released from his assigned altitude to descend for landing. When the second aircraft reports vacating his flight level, the third aircraft is cleared to descend to the vacated level and to pass the "gate", etc.

1.9 The application of the "longitudinal" separation procedures provides altitude separation between all holding aircraft outside the "gate" and only longitudinal (time) separation between aircraft on final approach between the "gate" and the runway. The outer marker of an ILS is considered as being a "gate", since this procedure generally is used at locations served by an Instrument Landing System.

1.10 In the use of either "vertical" or "longitudinal" separation procedures, pilots are instructed to leave the "gate" at a predetermined time. The interval between these times is variable and is determined by the controller on the basis of current local conditions, such as weather, relative speed of the aircraft, and distance of the "gate" from the airport. The application of either of these procedures should make it possible, under normal conditions, to reduce the interval between successive approaches to approximately three minutes; however, their use requires the issuance of precise air traffic control instructions directly to the pilot and precise adherence thereto.

2. TERMINAL AREA AIR TRAFFIC CONTROL PROCEDURES EMPLOYING
DIRECT COMMUNICATION BETWEEN APPROACH CONTROLLERS AND PILOTS

2.1 INTRODUCTION

The procedures contained herein are for use in units providing approach control service to aircraft by communicating directly with pilots over two-way radiotelephone channels.

2.1.1 Coordination of arriving and departing traffic is effected by the approach controller, who normally is in a position to see the aerodrome and aircraft in the vicinity and is able, therefore, to take advantage of every opportunity to expedite the flow of traffic on and around the aerodrome.

2.1.2 The operational requirements for implementing these procedures are:

- a) an adequate navigational facility for instrument approach and holding purposes,
- b) established instrument approach procedures,
- c) one or more radio channels available to the approach controller for direct communication with the pilot.

2.2 COORDINATION

The control of IFR traffic shall be coordinated between units providing approach control service and area control centres as follows:

2.2.1 The centre shall clear aircraft to a holding point, including in such clearance holding information and expected approach time. The unit providing approach control service shall assume control of the aircraft at a point (time or fix) established by agreement, or earlier if specified in an air route clearance.

2.2.2 The centre shall provide separation between all aircraft within a control area, except that the unit providing approach control service shall: