INTERNATIONAL STANDARD 482

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION • МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ • ORGANISATION INTERNATIONALE DE NORMALISATION

Aircraft — Propulsion units and components — Methods of numbering and describing direction of rotation

Aéronefs — Éléments de propulsion et composants — Méthodes de numérotage et définition de leur sens de rotation

First edition — 1977-02-01

UDC 629.7.026 **Ref. No. ISO 482-1977 (E)**

Descriptors : aircraft industry, aircraft, propellant engines, piston engines, gas turbine engines, engine cylinders, combustion chambers, aircraft propellers, numbering, direction (of movement), rotation.

Price based on 4 pages

FOREWORD

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO member bodies). The work of developing International Standards is carried out through ISO technical committees. Every member body interested in a subject for which a technical committee has been set up has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 482 was drawn up by Technical Committee ISO/TC 20, *Aircraft and space vehicles*, and was circulated to the member bodies in November 1975.

It has been approved by the member bodies of the following countries :

Australia	Italy	Spain
Belgium	Japan	Turkey
Czechoslovakia	Netherlands	United Kingdom
France	Poland	U.S.S.R.
Germany	Romania	Yugoslavia
India	South Africa, Rep. of	

The member bodies of the following countries expressed disapproval of the document on technical grounds :

Canada
U.S.A.

This International Standard cancels and replaces ISO Recommendation R 482-1966, of which it constitutes a technical revision.

Printed in Switzerland

Aircraft — Propulsion units and components — Methods of numbering and describing direction of rotation

1 SCOPE AND FIELD OF APPLICATION

This International Standard specifies the methods of numbering aircraft engines, engine cylinders and combustion chambers, on drawings, for example, and the methods of describing the direction of rotation of main shafts and rotors and of propellers.

2 NUMBERING OF ENGINES

2.1 Principle

The numbering of engines shall be according to the engine location in the airframe, in that the numbering order shall correspond to that in which the axis of each engine is encountered by a plane parallel to the plane of symmetry of the aircraft and moving from port to starboard. When this plane simultaneously meets the axes of several engines, they shall be numbered from front to rear or from bottom to top, as appropriate. No two engines in a given airframe shall bear the same number.

2.2 Horizontal thrust engines (see figure 1)

Horizontal thrust engines, including those which also have a vertical thrust capability (i.e. dual-purpose engines) shall be numbered 1, 2, 3, etc., in accordance with the principle in 2.1, the numbers of the dual-purpose engines being based on their relative positions in cruising flight.

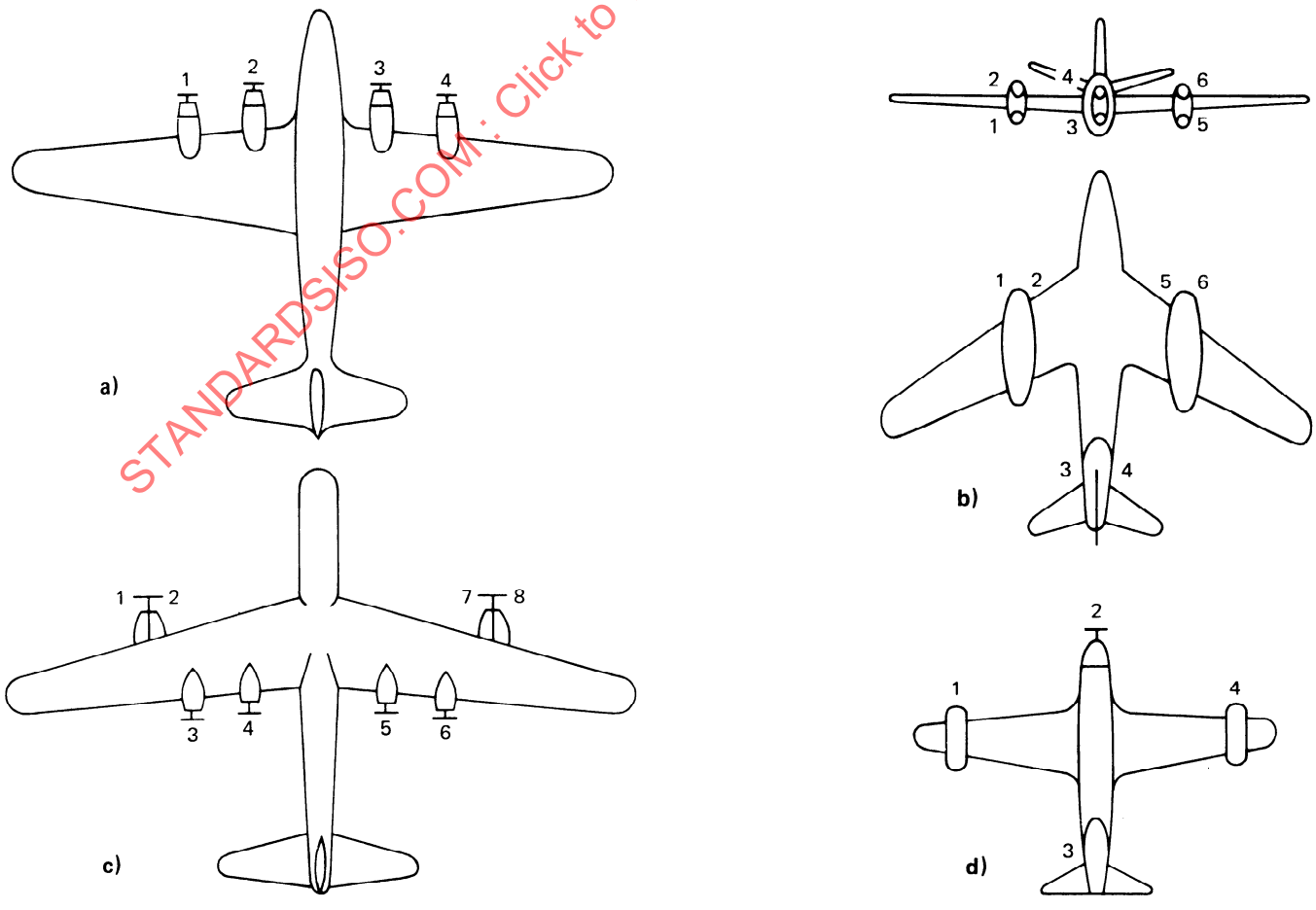


FIGURE 1 — **Numbering of horizontal thrust engines**

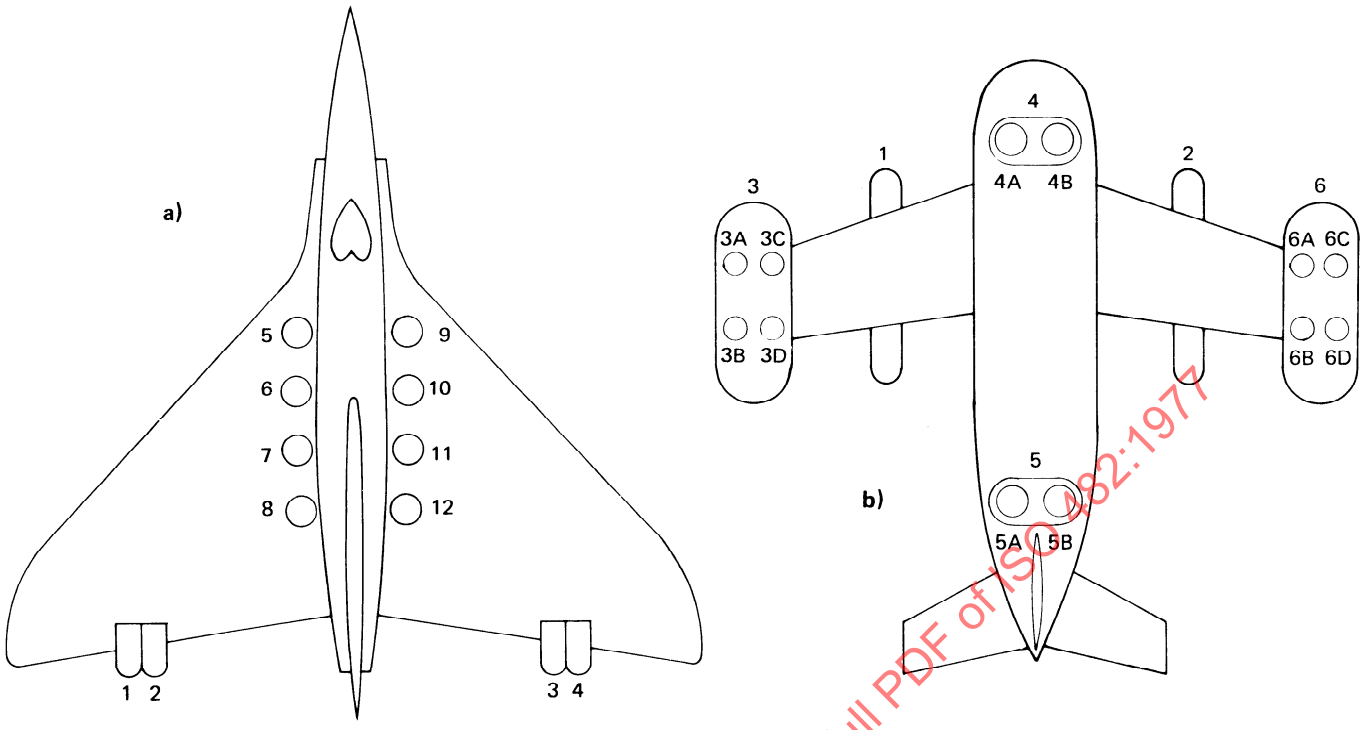


FIGURE 2 — **Numbering of vertical thrust engines**

2.3 Vertical thrust engines

2.3.1 Except as specified in 2.3.2, engines having a purely vertical thrust capability shall be numbered, in accordance with the principle in 2.1, in a sequence continuing after that of engines covered by 2.2 (see figure 2a)).

2.3.2 Alternatively to 2.3.1, where a group of engines has a single control, that group shall be numbered in accordance with 2.3.1 and the engines in the group shall be designated by the suffixes A, B, etc. The suffixes shall be allocated in accordance with the principle in 2.1 (see figure 2b)).

2.4 Take-off booster engines

Take-off booster engines shall be numbered, in accordance with the principle in 2.1, in a sequence continuing after that of all other engines covered by 2.2 and 2.3.

3 NUMBERING OF CYLINDERS IN PISTON ENGINES

NOTE — For the purposes of this clause, the observer is regarded as viewing the engine from the end remote from the propeller, or from the end remote from the shaft transmitting the greatest part of the power of the engine.

3.1 In-line piston engines

3.1.1 *Single-bank engine* (see figure 3a))

The cylinders of an engine having one bank of cylinders in line shall be numbered 1, 2, 3, etc., beginning with the cylinder nearest to the observer.

3.1.2 *Double- and multi-bank engines* (see figures 3b), 3c) and 3d))

The rows of cylinders on an engine having two or more banks of cylinders shall be designated by the letters A, B, C, etc., applied respectively to each bank in the order in which its centre line would be encountered by a semi-plane, centred upon the main shaft of the engine and rotating in a clockwise direction, starting from the twelve o'clock position.

Each cylinder shall be designated by a letter followed by a number, the letter indicating the bank, as described above, and the number indicating the position of the cylinder in the bank, when counted from the cylinder nearest to the observer.

3.2 Radial piston engines

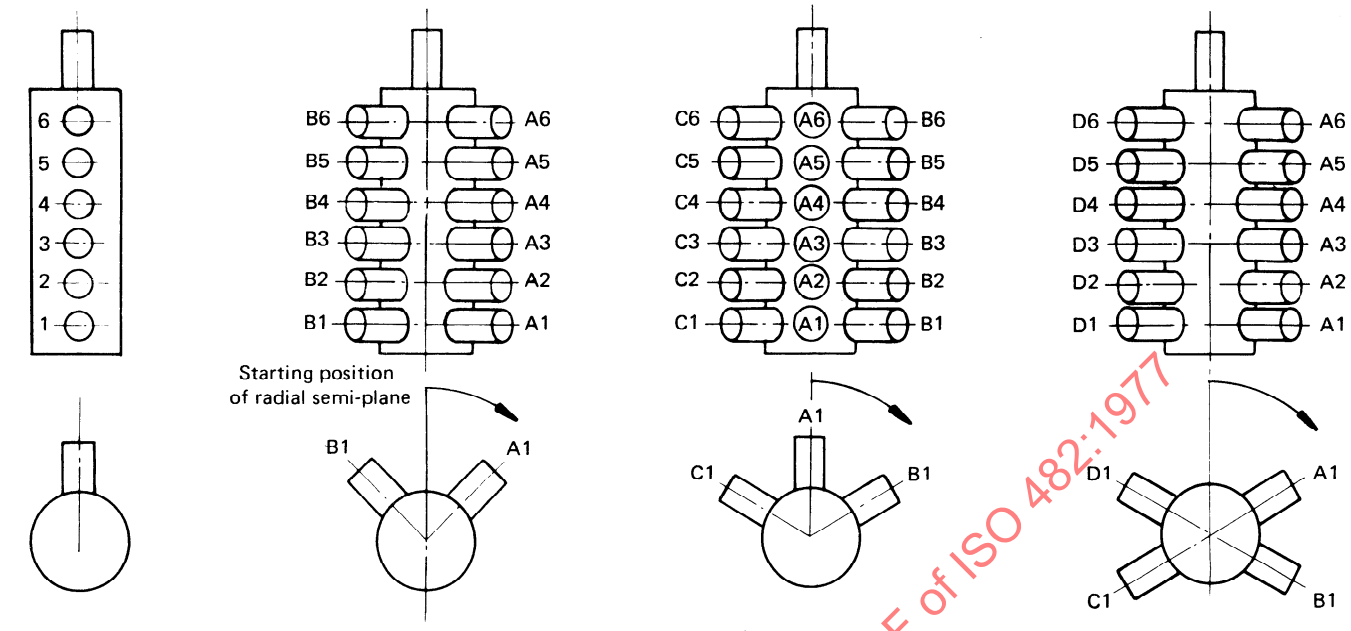
3.2.1 *Single-row and staggered double-row engines* (see figures 4a) and 4b))

The cylinders of single-row and staggered double-row engines shall be numbered 1, 2, 3, etc., in the order in which their centre lines would be encountered by a rotating semi-plane as described in 3.1.2.

3.2.2 *Staggered multi-row engine* (see figure 4c))

The rows of cylinders in a staggered multi-row engine shall be designated by the letters A, B, C, etc., beginning with the row nearest to the observer.

Each cylinder shall be designated by a letter, followed by a number, the letter indicating the row, as described above, and the number indicating the position of the cylinder in the row when counted by the method described in 3.2.1.



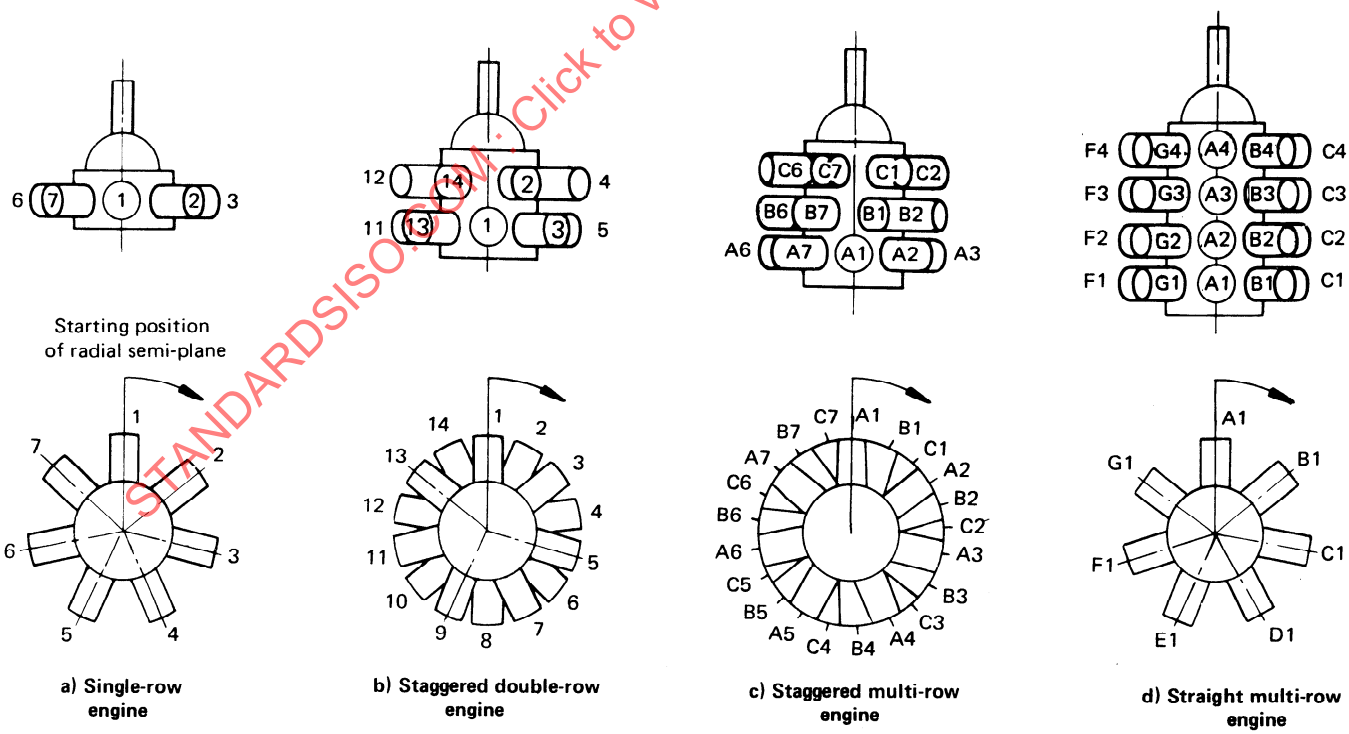
a) Single-bank engine

b) Double-bank engine

c) Multi-bank W engine

d) Multi-bank X engine

FIGURE 3 – **Numbering of cylinders of in-line piston engines**



a) Single-row engine

b) Staggered double-row engine

c) Staggered multi-row engine

d) Straight multi-row engine

FIGURE 4 – **Numbering of cylinders of radial piston engines**

3.2.3 *Straight double-row and multi-row engines* (see figure 4d))

The cylinders of double-row and multi-row engines with the cylinders in straight lines shall be numbered in the same way as those of multi-bank in-line piston engines (see 3.1.2).

4 NUMBERING OF COMPONENTS IN TURBINE ENGINES

NOTE — For the purposes of this clause, the observer is regarded as viewing the engine from the end opposite to the component which includes the compressor.

The combustion chambers, flame tubes, burners or other similar components placed around a turbine engine shall be numbered 1, 2, 3, etc., in the order in which their centre lines would be encountered by a semi-plane centred upon the main shaft of the engine and rotating in a clockwise direction, the semi-plane being initially at the twelve o'clock position (see figure 5).

5 NUMBERING OF COMPONENTS IN ROTORCRAFT ENGINES

The components in an engine installed in a rotorcraft with the axis of the main shaft sensibly vertical, and in an engine intended specifically for rotorcraft, shall be numbered in accordance with the requirements of clause 3 or clause 4, as appropriate, except that the starting position of the rotating semi-plane shall be selected by the constructor. In such cases, the cylinders and combustion chambers shall be clearly marked with letters and numbers, visible when the engine is installed.

6 DIRECTION OF ROTATION OF MAIN SHAFTS AND ROTORS

The direction of rotation of the main shaft and rotor of an engine shall be described by reference to the direction of rotation of the shaft transmitting the greatest part of the power of the engine. It shall be expressed as clockwise or counter-clockwise, as appropriate, a piston engine being viewed from the end remote from the shaft, and a turbine engine being viewed in the direction opposite to the general flow of air in the engine.

7 DIRECTION OF ROTATION OF PROPELLERS

7.1 The direction of rotation of a propeller shall be described by reference to its rotation as seen from the end of the propeller shaft remote from the propeller. It shall be expressed as clockwise or counter-clockwise as appropriate.

7.2 The description of a propeller shall be completed by an indication of the direction of its axial force in relation to the engine, i.e. tractive or propulsive, as follows :

a) clockwise tractor propeller;

b) counter-clockwise tractor propeller;

c) clockwise pusher propeller;

d) counter-clockwise pusher propeller.

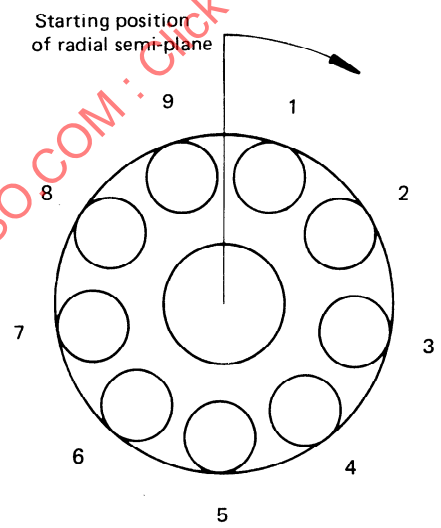


FIGURE 5 — **Numbering of turbine engine combustion chambers**