



AEROSPACE INFORMATION REPORT

AIR5024™**REV. A**

Issued 1999-04
Reaffirmed 2021-02
Revised 2022-07

Superseding AIR5024

(R) Landing Gear Switch Selection Criteria

RATIONALE

This document revision update is to incorporate panel comments and current industry information and practices.

FOREWORD

This document is intended to provide the landing gear designer with switch and position sensing device information on appropriate technologies and means to achieve enhanced landing gear position sensing performance.

1. SCOPE

The scope of this document is to discuss the differences between electromechanical and proximity position sensing devices (sensor or switch) when used on landing gear. It also contains information which may be helpful when applying either type of technology after the selection has been made. The purpose is to help the designer make better choices when selecting a position-sensing device. Once that choice has been made, this document includes information to improve the reliability of new or current designs. It is not intended to replace recommendations from sensor manufacturers or actual experience, but to provide a set of general guidelines based on historic information of what is being used.

2. APPLICABLE DOCUMENTS

The following publications form a part of this document to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order. In the event of conflict between the text of this document and references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

2.1 SAE Publications

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Documents

Document Sharing Hub

- AIR1810 Design, Development, and Test Criteria - Solid State Proximity Switches/Systems for Landing Gear Applications
- AIR4004 Guide for Installation of Electrical Wire and Cable on Aircraft Landing Gear
- AIR4077 Mechanical Switch Usage for Landing Gear Applications

3. TECHNICAL DATA

3.1 Switch/Sensor and Target Description

A switch has two states, closed with electrical continuity allowing current to flow and open which blocks the current flow. A sensor has an output proportional to position.

Electromechanical switches consist of moving electrical contacts actuated by a mechanical connection to a monitored point such as a micro-switch or a magnet in close proximity such as in a magnet actuated reed switch. Electromechanical switches connect directly to electrical power and a load without any separate power needed.

Non-contacting proximity switches have been used on some aircraft as landing gear control and indication limit switches since 1965. There are two kinds of proximity sensing systems in common use: (1) proximity switches that have the switching electronics built into the sensing head and operate on the principle of eddy current losses or other proximity detection principles of a target material, and (2) proximity sensors that generally use variable reluctance and are connected to remote switching electronics contained in a separate electronics module. Proximity sensors produce an output that is a function of the distance between the sensor and its target, and this characteristic can be used to provide the maintenance technician with help during rigging. Proximity switches, on the other hand, provide a multistate output—"target near" or "target far." Proximity detection implementation can be a simple coil of wire or a Hall effect integrated circuit.

Targets are used with proximity devices to assure consistent operation; it is not recommended to use landing gear metal directly as a target. Coil-based devices may use a metal target or a magnet target. Hall effect devices use a magnet target. Typical metal targets are a ferromagnetic material such as 4130, 4340 steel, or 17-4PH CRES. A highly conductive metal without perm such as aluminum, brass, or copper is called an "anti-target" and, when placed in between the proximity sensor and the target, will cause the proximity sensor to change state from target near to target far, which can be useful as a setup technique to force a system fault.

Example images of proximity switches and proximity sensors follow. Note that many of these devices look very similar, so one cannot tell what it is by how it appears.

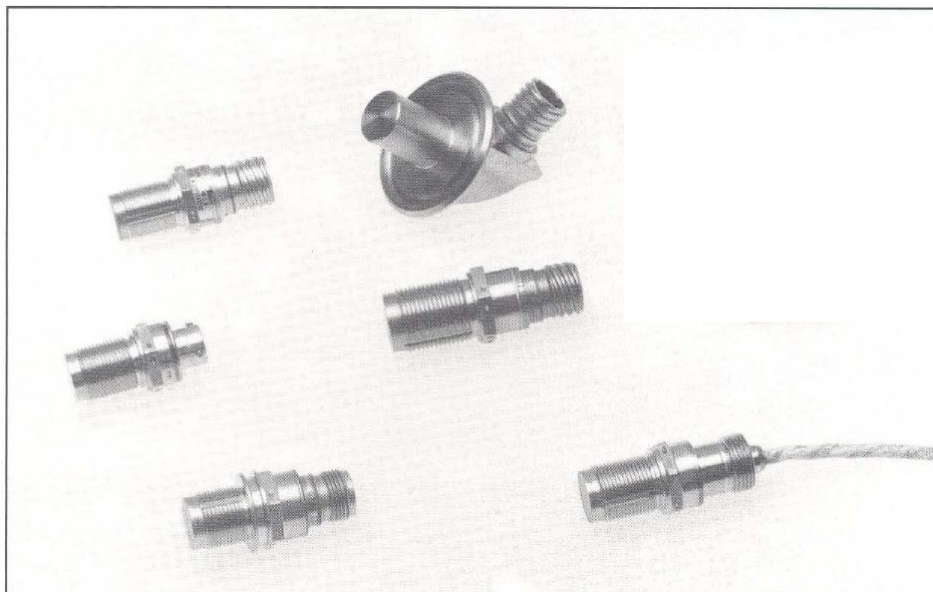


Figure 1 - Examples of one-piece proximity switches
Courtesy of Crane Aerospace and Electronics

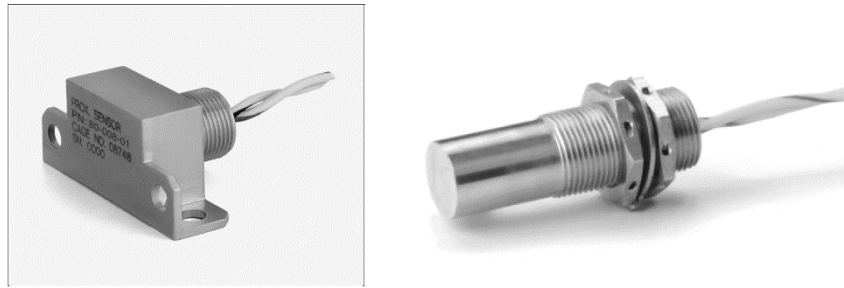


Figure 2 - Example proximity sensors
 Courtesy of Crane Aerospace and Electronics

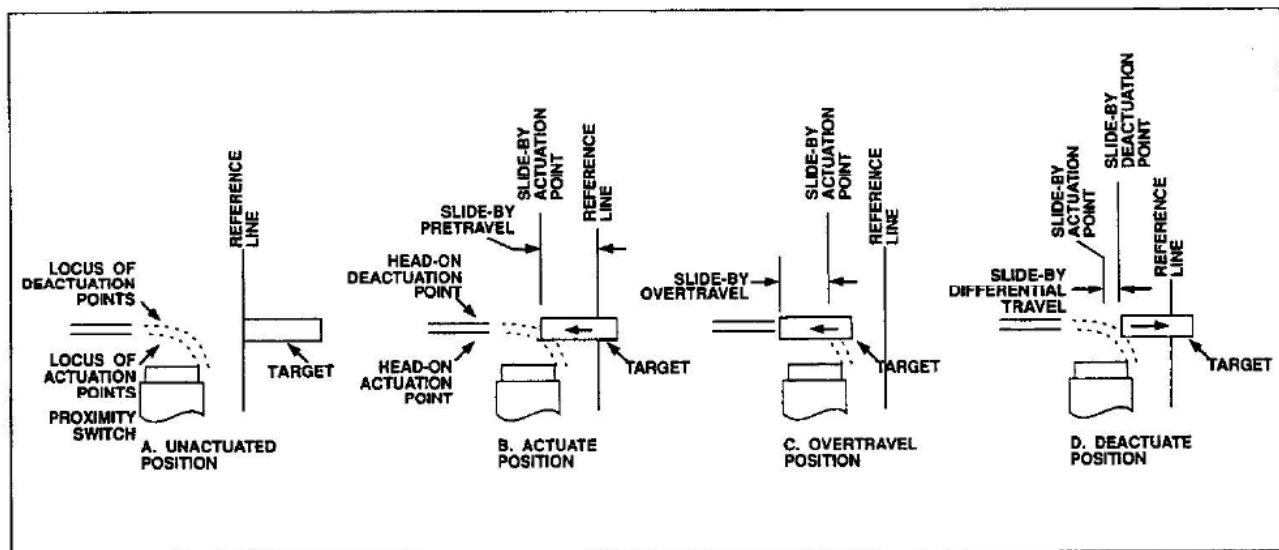
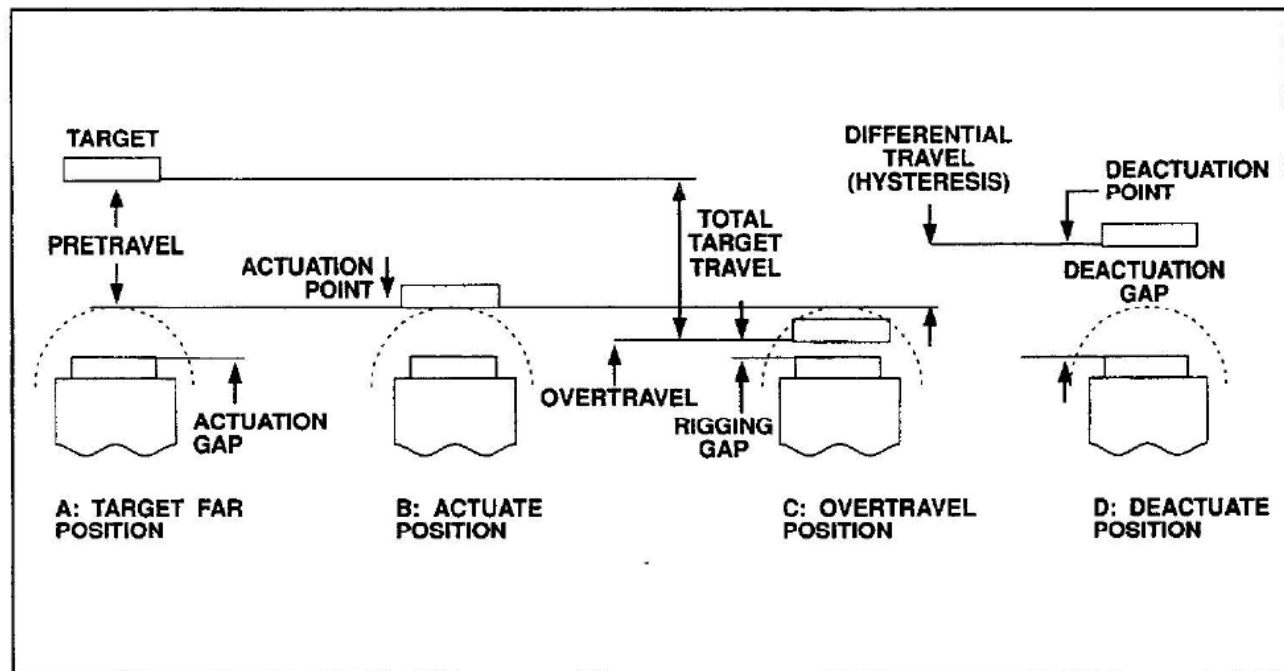


Figure 3 - Examples of target travel
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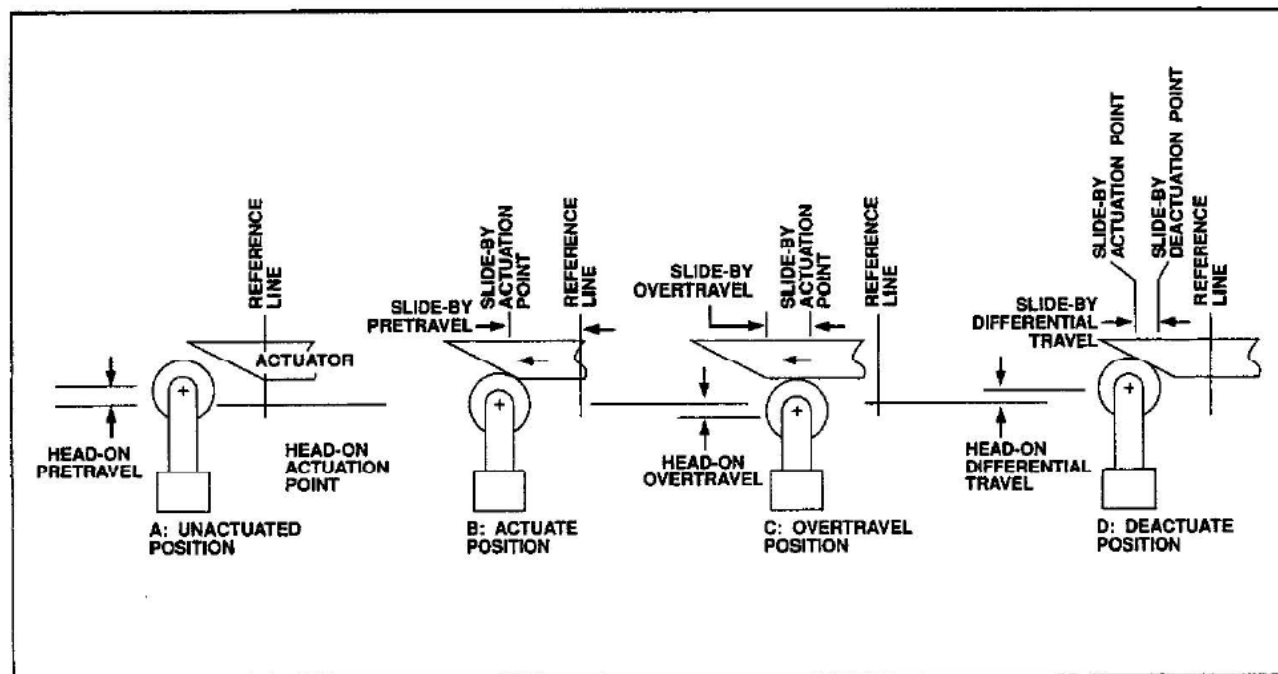
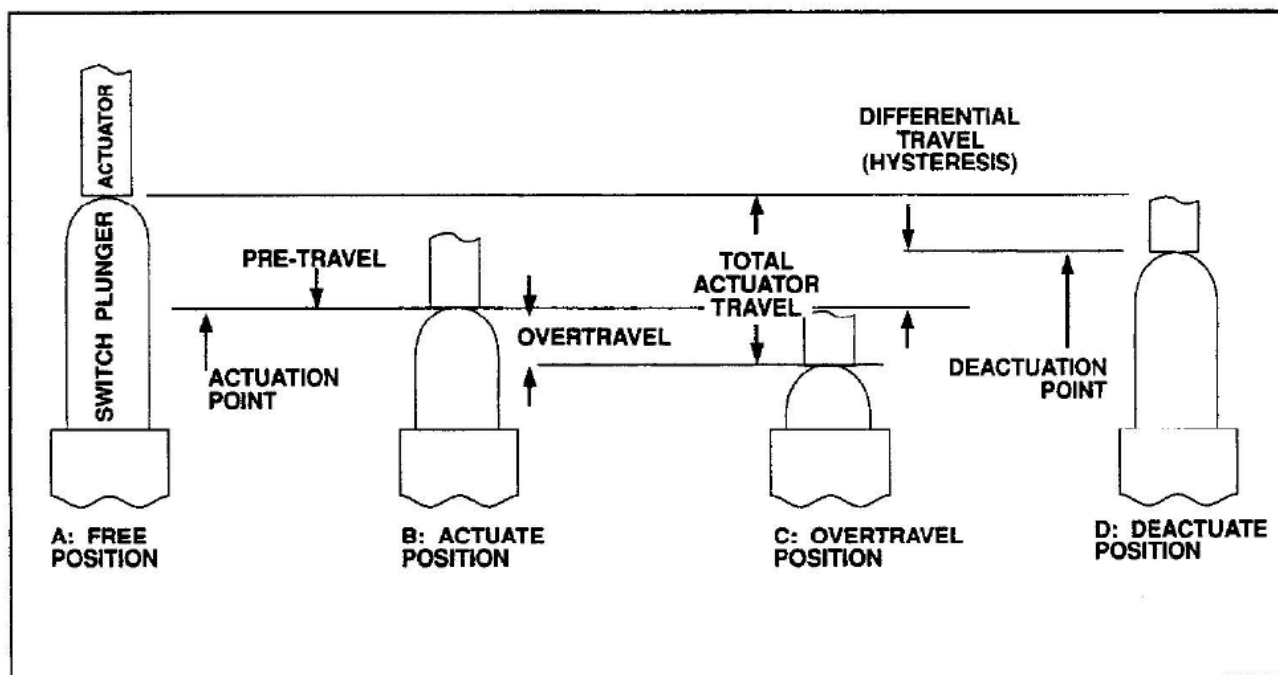


Figure 4 - Examples of mechanical switch actuation
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