

# PROXIMITY SENSORS; A SOLUTION FOR AIRCRAFT LANDING GEAR SYSTEM

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**Abstract** –Aircraft use report data, reported by airlines always includes a problem related to Aviation power units, landing gear systems, and navigation systems. Among them, the failure of the landing gear system is likely to cause abnormal events such as aircraft return flight, backup landing, etc., which will bring economic losses to the company and bring hidden dangers to aviation safety. The best solution for this is to use proximity sensors for the proper landing of aircraft.

The basic principle behind this is to send the sensor signal to the control unit and send control signals to the executing part. After comprehensive calculation and accurate comparison the margin is controlled. Nowadays the landing gear of modern civil aircraft includes two systems i) normal retracting ii) emergency releasing. The landing gear control system uses telex control in the control mode and is cross-linked with other systems. Proximity sensors are widely used to detect the position of the landing gear. The current

position of the gear is judged by an inductance type proximity sensor according to the position of a metallic part mounted on gear and proper landing is done.

**Key Words:** *Proximity sensors , sensor body, sensor excitation plate, Aviation power units, landing gear systems*

## 1. INTRODUCTION

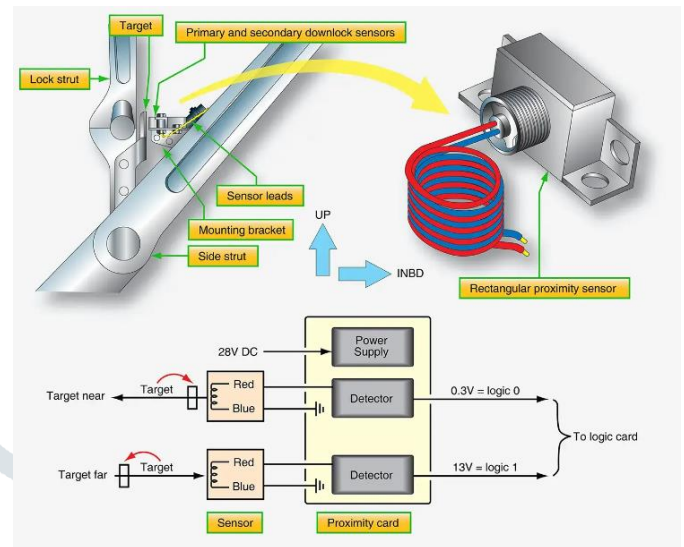
There are two sensors that each landing gear comprises of ; namely the lock-up sensor and the drop-down sensor, which are used to switch on the transmission position signal when the lock-up and lock-down are completed. These type of sensor are magneto-resistive proximity sensor; which is mainly composed of two parts: the sensor body and the sensor excitation plate.

The sensor body converts electrical energy into a magnetic field and the excitation sheet mainly plays the role of increasing the magnetic permeability. When the landing gear and the excitation plate approach a certain distance

the magnetic permeability increases and the sensor sends a signal to warn the component to indicate the landing gear position. The distance between them directly affects the accuracy of the indication and the general adjustment requirements are also stricter. The inductive proximity sensor is used to detect the position of the landing gear which increases the life of the sensor. In addition the control computer facilitates information transmission and information sharing with the avionics system.

Landing gear position indicators are located on the instrument panel adjacent to the gear selector handle. They are used to inform the pilot about the gear position status. There are many arrangements for gear indication. Usually, there is a dedicated light for each gear. The most common display for the landing gear being down and locked is an illuminated green light. Three green lights means it is safe to land. All lights out typically indicates that the gear is up and locked or there may be gear up indicator lights. Gear in transit lights are used on some aircraft as barber pole displays when a gear is not up or down and locked. Blinking indicator lights also indicate gear in transit.

## 2. CONCEPTUAL FRAMEWORK



**Fig :** Block diagram of the system

First step: sets target, then is connected by twisted pair conductors with sensor acquisition chip by proximity transducer.

Second step: sensor acquisition chip sends sine wave exciting signal to the magnetic test coil of proximity transducer.

Third Step: When target and proximity transducer induction end face are in proximity state, if during magnetic test coil does not have fault, sensor acquisition chip receives a big inductance quantity signal and export low level at state output end, malfunction output terminal exports low level.

If when magnetic test coil has a fault, sensor acquisition chip does not receive signal and export high level at state output end, malfunction output terminal exports high level.

When target and proximity transducer induction end face are in away from state, if during magnetic test coil non-fault, what sensor acquisition chip received is small inductor amount signal, and exports high level at state output end, malfunction output terminal output low level; If when magnetic test coil has a fault, sensor acquisition chip does not receive signal, and export high level at state output end, malfunction output terminal exports high level.

### 3. ADVANTAGES

- It is capable of detecting metals as well as nonmetals.
- Good stability.
- High speed and High switching rate.
- Operates in harsh environmental conditions.
- Low cost and power consumption.
- A capacitive sensor is good in terms of power usage.
- They are useful and can help with many security problems.

### 4. DISADVANTAGES

- Temperature and humidity have an effect on them.
- Creating a design is difficult.
- There is a possibility that the operational range will be restricted.
  - Capacitive proximity sensors are less precise than inductive ones in most cases.

### 5. APPLICATIONS

A wide variety of applications and conditions are suitable for proximity sensors. Any application that requires the detection of an object within a specific range can benefit from these devices. Among the possibilities are:

1. Standard object position detection
2. Transportation, logistics, and supply chain
3. Inspection and quality assurance
4. Process control
5. Level detection
6. Food processing and manufacturing
7. Agriculture

### 6. CONCLUSION

It can be thus concluded from the paper that proximity sensors help in safe landing of the aircrafts. The proximity sensors provide a pilot with a fault alert on landing approach to warn if the landing gear is not completely deployed.

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