

## AIRCRAFT GROUND FAULT DETECTION AND PROTECTION

Leach International, the innovator of the "Smart Contactor" in response to the need for ground fault protection, has developed several contactors with capabilities to detect and isolate ground faults. As aircraft become more electrical *and*, as existing aircraft age, the problems with wiring and wire harnesses become more significant. Incidents resulting in catastrophic loss of aircraft have been attributed to faults of this category. Conventional electromechanical protection devices, *i.e.*, circuit breakers are not suitable for detecting and isolating this type of fault. The use of a Ground Fault Sensing Contactor (GFSC) provides protection for personnel and equipment against this type of fault.

### Ground Fault Concept

The concept of ground fault detection is an established and proven technique. A common method of fault detection is to compare the total electrical current flowing to the load with the current that returns from the load. A difference between these two values indicates that the current is returning to the source through an unexpected path, *i.e.*, ground fault.

Several configurations of these devices have been designed and developed for airborne applications and are currently flying on a number of commercial aircraft. These units have the capability to compare the load current through the device versus current measured by an external sensor and trip (open) the contactor if the difference between the current values exceeds a predefined level. The external sensor is normally used on the return path of the current to its source; therefore comparison is performed between the input current (to the load) and the output current (from the load).

### LEACH Ground Fault Protection

The Ground Fault Protection (GFP) feature may be incorporated into existing Leach International products. The "H" contactor, for example, is a 3PDT device that is used extensively in aircraft and military vehicle electrical systems. This device, rated for

60 amperes, is fairly compact and light. Leach, using miniaturization techniques and exotic magnetic material has managed to incorporate the GFP within this assembly with minimal impact to its size. The interface and the footprint of this unit remains intact, allowing direct replacement of existing units with units featuring GFP. The height of the unit is increased by .40" and its weight is increased by only 2 ounces.



H Type Contactor with GFP

H Type Contactor

One of the major achievements with this design is the reduction in "release" time of the contactor. Due to potential danger of a fault, it should be expeditiously interrupted and isolated. The normal release time of the contactors (greater than 20 ms) is not acceptable for this application. Personnel injury (electrocution) and substantial damage to the wiring or aircraft equipment could occur within this period. It is imperative that the fault be detected and interrupted within 10 ms or faster to minimize the damage. Leach, with the aid of a proprietary circuit, has managed to reduce the release time of the contactor to less than 8 ms

without any degradation to its performance.

The GFP circuit can be incorporated in a majority of Leach International products including smaller relays. Obviously, the determinant for the size of the relay is the potential fault current.