TITLE OF INVENTION

A METHOD FOR DISPLAYING HYDRAULICS SCHEMATIC DISPLAY

BACKGROUND OF THE INVENTION

(a) Field of the Invention

The present invention relates generally to Multi Functional Colour Display (MFCD), and in particular, a method of displaying a hydraulic display page on the MFCD used in aircraft to provide an overall view of the hydraulics power system.

(b) Description of the Prior Art

Heretofore, no hydraulics pages on the MFCD of an aircraft has been implemented or designed for military combat aircraft. The hydraulic power system is designed for combat and maintainability purposes.

The hydraulic power system for combat aircraft includes two independent systems to supply power for operation of flight control surfaces and utility functions. The first system is dedicated to flight controls and flight essential functions and the following systems are governed by the first system: Leading Edge Flaps, Rudder Control, Horizontal Tails, Flaperons, Speedbrakes, and Fuel Flow Proportioner (FFP). The system is to supply power for flight controls and power for all utility functions. The second system governs the following systems: Landing Gear System, Nosewheel Steering, Gun System, Air Refueling System, Brake System, and Jet Fuel Starter System. All these systems are crucial to the safety of the flight.

Recently, the hydraulic system is only displayed in the form of conventional analog gauges, which does not provide a good indication of the status concerning the hydraulic system, this is critical during a mission or in combat, where the lost of hydraulic power could occur and level flight could not be maintained. In

high-intensity air combat scenarios; it is crucial to know the status of the primary/essential flight controls to ensure the full maneuvering capabilities of the aircraft could be utilized.

In an event of a hydraulic failure, with only two analog hydraulic gauges and a warning light on the right hand console of the aircraft is clearly not sufficient to maintain full situation awareness and to determine which systems or controls have been lost. Therefore it is essential to provide the pilot with an overall perception of the systems that are available or unserviceable which are governed by the hydraulic power system.

In view of the above, it is an object of the present invention to provide a method for displaying hydraulic schematic display to mitigate the drawbacks of the conventional method.

SUMMARY OF THE INVENTION

Accordingly it is an object of the present invention to provide a method for displaying hydraulics schematic display in the MFCD, wherein the hydraulic schematic diagram greatly enhances the situation awareness of the pilot of the aircraft.

Yet another object of the present invention is to provide a method for displaying hydraulics schematic display, wherein the hydraulic schematic diagram can instigate appropriate actions that could be taken to replace a failure system as a result of the hydraulic failure.

A further object of the present invention is to provide a method for displaying hydraulics schematic display, wherein the hydraulic schematic diagram lessens workloads of the pilot.

These together with other object features and advantages of the present invention will become more readily apparent from the following detailed description when taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 shows a multi function hydraulic schematic display page in accordance with the present invention.

Fig. 2 shows a multi function hydraulic schematic display decluttered page in accordance with the present invention.

Fig. 3 is a multi function hydraulic scale display page in accordance with the present invention.

Fig. 4 is a multi function hydraulic scale display decluttered page in accordance with the present invention.

DETAILED DESCRIPTION OF THE PRESENT INVENTION

A method of displaying hydraulic schematic display according to a preferred embodiment of the present invention will now be described with reference to the accompanying drawings.

In accordance with the present invention, the implementation of a hydraulic schematic display page on the Multi Functional Color Display (MFCD) can provide the pilot of an aircraft an overall view of the hydraulic systems as well as the status of various secondary system that are related to the hydraulic system.

As shown in Fig. 1, there is shown a multi function hydraulic schematic display page which is implemented with the existing MFCD pages on the aircraft under the mnemonic "HYD" which abbreviates for hydraulic system. In accordance with the present invention, when the hydraulic page is selected, the "HYD" mnemonic will be highlighted on the MFCD. The schematic diagram of the aircraft hydraulic system will be displayed on the MFCD.

In accordance with the present invention, as shown in Fig.1, the pressure for both System A and System B are displayed, for example, in a digital clock scale reading, and/or as numeric value in terms of Pounds per Square foot Inch (PSI), and the readings indicate the

pressure in each of the system. In normal operating conditions, the indicator readings in both system will be green in colour, which indicate that all systems of the aircraft are running smoothly with the pressure readings of System A and System B. If a system has a low hydraulic pressure, the indicator will be in the amber zone and an amber coloured numeric reading will come on, indicating that the particular system is running low on pressure. If the system has no hydraulic pressure, the indicator will be in the red zone and a red coloured numeric reading will come on, indicating that the system is already in the danger zone. Accordingly, the method according to the present invention alerts the pilot to land the aircraft as soon as possible. Again, referring to Fig. 1, the "HYD/OIL PRESS" warning light is located at the top of the MFCD page in between the two digital clock scales reading. This warning light will be lighted when hydraulic pressure of System A or System B drops below 1000PSI. In the present preferred embodiment, the method of displaying hydraulics schematic display on MFCD pages of an aircraft comprising the steps of: selecting a hydraulic page from the MFCD pages and "HYD" mnemonic being highlighted on the MDCD; displaying pressure of both first and second system in a digital clock scale reading as well as numeric value in Pounds per Square foot Inch (PSI), indicating the pressure in each of the two systems; displaying in green color for indicator readings indicating all systems being running smoothly with the pressure readings of both systems; and showing the mnemonic "HYD/OIL PRESS" warning light located at the top of the MFCD page when both the first and the second system pressure drops below 1000PSI. As mentioned earlier, if a system has a low hydraulic pressure the indicator will be in the amber zone and a amber colored numeric reading will appear and if the system has no hydraulic pressure, the indicator will be in the red zone and a red numeric reading will appear on the MFCD page.

The systems governed by the hydraulic system A and B are listed in the center of the MFCD page as follows: Leading Edge Flaps (LEF's),

Rudder, Horizontal Tail, Flaperons, Speedbrakes, Fuel Flow Proportioner (FFP), Landing Gear (LG) System, Nosewheel Steering (NWS), Gun System, Air Refueling (AR) System, Brake System, and Jet Fuel Starter (JFS) System. These systems are then linked to other key components, such as the hydraulic reservoirs, engine driven pump, flight controls accumulators (FLCS ACC), brake and jet fuel starter accumulators (JFS ACC), and the dump and relief manifold.

Under normal operational conditions, green lines displayed on MFCD will indicate the flow of the hydraulic fluid to the various systems. In case of low hydraulic pressure, amber lines will appear and in conditions of malfunction or failure of hydraulic pressure, red lines will appear on the MFCD. The pilot of the aircraft will take appropriate actions when the various systems are in the amber conditions so as to prevent further damages or total lost of those systems. When the various systems are in the red or danger conditions, immediate actions have to be taken, for instance, to land the aircraft as soon as possible. In the figure, the button with the abbreviation "BRT" denotes BRIGHTNESS, "SMS" denotes STORES MANAGEMENT SYSTEM, "FCR" denotes FIRE CONTROL RADAR, and "CON" denotes CONTRAST. These buttons are used to control the function of the MFCD.

Fig. 2 shows a multi function hydraulic schematic display decluttered page in accordance with the present invention. The declutter option provides the pilot with a simplified/comprehensive version of the affected systems. By glancing the MFCD, the pilot could tell the specific system or systems which are the systems had failed (red) or going to fail (amber). For instance, the pilot knows through the hydraulic display page that he will be losing the speedbrakes soon if nothing was done to rectify the system. The pilot may take appropriate action by, for instance, switching off the speedbrakes, but he may apply them only when necessary such as in landing the aircraft. Accordingly, the MFCD provides awareness to the pilot with respect to the situation of the hydraulic systems currently he is in.

Fig. 3 shows a multi function hydraulic scale display page and Fig. 4 shows a multi function hydraulic scale display decluttered page of the present invention. Similarly, these figures indicate the conditions of hydraulic systems of the aircraft. The only difference between these figures with figures 1 and 2 is that the system is displayed in a scale format. In accordance with the present invention, green indicates normal operation, yellow/amber indicates caution, and red indicates danger.

It is to be understood that even though a specific embodiment and advantages of the present invention have been set forth in the foregoing description, the above disclosure is illustrative only, and changes may be made in detail, and yet remain within the broad principles of the invention. Therefore, the present invention is to be limited only by the appended claims.

CLAIMS

1. A method of displaying hydraulics schematic display on MFCD pages of an aircraft comprising the steps of:

(a) selecting a hydraulic page from the MFCD pages and "HYD" mnemonic being highlighted on the MDCD;

(b) displaying pressure of both first and second system in a digital clock scale reading as well as numeric value in Pounds per Square foot Inch (PSI), indicating the pressure in each of the two systems;

(c) displaying in green color for indicator readings indicating all systems being running smoothly with the pressure readings of both systems;

(d) showing the mnemonic "HYD/OIL PRESS" warning light located at the top of the MFCD page when both the first and the second system pressure drops below 1000PSI.

2. A method of displaying hydraulics schematic display on MFCD pages of an aircraft comprising the steps of:

(a) selecting a hydraulic page from the MFCD pages and "HYD" mnemonic being highlighted on the MDCD;

(b) displaying pressure of both first and second system in a digital clock scale reading as well as numeric value in Pounds per Square foot Inch (PSI), indicating the pressure in each of the two systems;

(c) displaying in amber color for indicator readings (in amber zone) indicating a particular system being running low on pressure; and

(d) showing the mnemonic "HYD/OIL PRESS" warning light located at the top of the MFCD page when both the first and the second system pressure drops below 1000PSI.

3. A method of displaying hydraulics schematic display on MFCD pages of an aircraft comprising the steps of:

(a) selecting a hydraulic page from the MFCD pages and "HYD" mnemonic being highlighted on the MDCD;

(b) displaying pressure of both first and second system in a digital clock scale reading as well as numeric value in Pounds per Square foot Inch (PSI), indicating the pressure in each of the two systems;

(c) displaying in red color for indicator readings (in red zone) indicating a particular system being no hydraulic pressure; and

(d) showing the mnemonic "HYD/OIL PRESS" warning light located at the top of the MFCD page when both the first and the second system pressure drops below 1000PSI.

4. The method of displaying hydraulics schematic display as set forth in Claim 1, 2 or 3, wherein the displaying is a digital scale display of the first and the second hydraulic systems.

5. The method of displaying hydraulics schematic display as set forth in Claim 4, wherein in the hydraulic schematic display, green color indicates normal, amber color indicates caution, and red indicates danger.