Flight Automation 3° ILS

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ABSTRACT

In our Automation we control all the three axes with a suitable controller. We will connect stick control (for Pitch and Roll) with most efficient servos to level the directions along with live feedback and low processing dependency over the system. Connection will be made with the “gear and pulley technique (Chain)”. For Yaw controller rudder pedals feedback system will be synced with the appropriate former controller (Not live- in case of Manual feedback system override and standby/CMD overridden for Ruder (CWSorCMD).

This Project otherwise stated the research oriented work is intended to develop a theoretically and later practically a auto-pilot system with easiest and less complicated procedure.

Former was theoretically

possible but practical approach shall be done with the help of PLC controller and best suitable highly efficient servos & hydraulic

INTRODUCTION

Overview:

This project is detailed research into auto pilot techniques and also a new inter connected studied and designing of new system for commercial and CAT-III eligible aircrafts.

The Wright Brothers used completely hand controlled chain and pulley type controls to navigate their aircraft but changing the roll using Wing Wraping made the equilibrium unbalanced and made aircraft

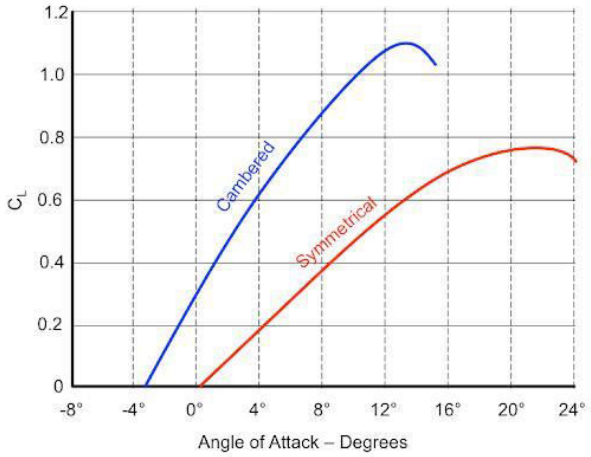
turn into unintentional direction, often this process is now termed as steering reversal problem(unwanted yaw change).

Following up The process -

1. Taxying - FMS is Linked with the controller and synced with the converter and a pre controller will be used before the main controller. Pre-controller will get data From FMS Flight plan and get take-off details and process it with a quick response measurement for the main controller. Also tuned antennas will be linked to CAT-IIIb 3 outbursting systems for synching of actual position.

2. Take-off (CWS Avail) - Prior to To/Ga, MATR, Main controller will be updated using all the take off measures and once updated plan can not be modified for one flight duration but can only be overridden and changed to complete manual take-off (Off). In default of take off plan (13° Max with 2° vertical increment approach)- AOA sensor, altimeter and calibrator will be directly connected with the Sensing-controller and further

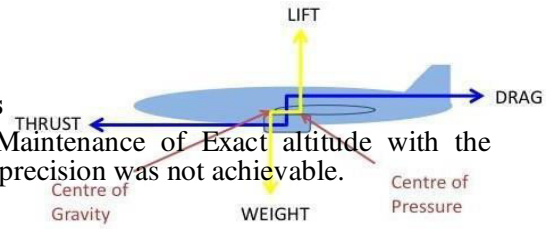
connects with the mani controller. (Only for the fault in values and compatible for the auto correction)



Also it can be noted here that using the **Lift to Drag** ratio our pre-station controller will continuous monitor the total lift producing per unit of time at per unit of the aircraft body area and also the total drag is produced at each moment. Although this lifts and drag statistics will be displayed but can not be directly alterable as they are definite character depends on aircraft to aircraft.

But they are nevertheless used and will be suitable in using and interpret in main FMS controls, as aforementioned.

Other Drawbacks of manual controls



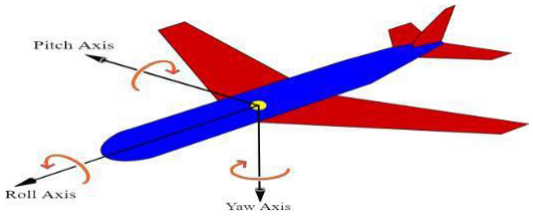
Maintenance of Exact altitude with the precision was not achievable.

Pitch and Angle of Attack of the air cannot be determined leading to human prediction and uncontrolled operation of aircraft

Unbalanced equilibrium.

What is three axis & Rudder Control?

The controlling axis - Roll, Pitch and yaw are the three axes.



Our process

In our Automation we control all the three axes with a suitable controller. We will connect stick control (for Pitch and Roll) with most efficient servos to level the directions along with live feedback and low processing dependency over the system. Connection will be made with the "gear and pulley technique(Chain)". For Yaw controller rudder pedals feedback system will be synced with the appropriate former controller (Not live- in case of Manual feedback system override and standby/CMD overridden for Ruder (CWSorCMD).

Approach

Approach and further landing is the process where there is most of the potential is required and along with the aircraft's precision both pilots alertness is necessarily required. Even nowadays, we follow the visible runways landing method where pilots acknowledge the visibility.

Cat-||| b

To overcome this low visibility issue and avoiding high risk situation due to high fog and Smog conditions. This system advocating the Category-|||b

landing approach. With the help of DVOR (DVOR

- Very High Frequency (VHF)Omni directional Range (VOR)) antennas near to the radar stations and UHF antenna in aircraft will get the precise data and feed into the pre and

main controller to maintain aircraft into LS position. This must be annexed to ILS system maintaining 3 degree approach.

Ai in airplanes

For starters, AI software would need to recognize when sensor readings are incorrect, just as the pilots of Lion Air must have known judging by their fight against the MCAS software. The task would be to keep the aircraft under control despite those incorrect readings, as the crew in the Air France crash was unable to do.

The aviation industry leverages AI with Machine Learning, Computer Vision, Robotics, and Natural Language Processing. Key benefits include – Predictive Maintenance, Pattern Recognition, Auto-Scheduling, Targeted Advertising, and Customer Feedback analysis to improve overall customer experience

AUTOPILOT UTILITIES & BENEFITS

Coming to the utility/purpose of Autopilot in aircrafts and commercial flights; A simple one-liner to define it- "An autopilot is a device in aircrafts which can perform very time intensive tasks without any direct assistance of the pilot".

This not only helps the pilots to focus on other situations on the flight but also allows them to look after the overall status. The most important and primary use of this system is - it helps automate the process of guiding and controlling the aircraft.

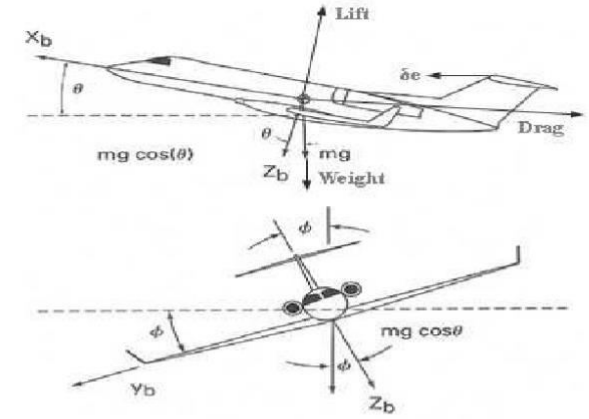
What is FMS?

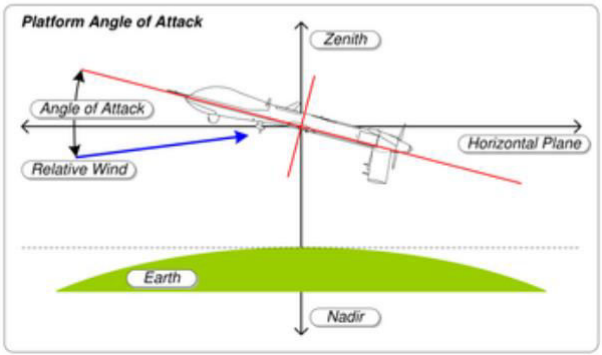
A flight management system (FMS) is a fundamental component of a modern airliner electronic system. An FMS is a specialized computer system that automates a wide variety tasks on/in aircrafts, reducing the workload on the pilots.

The FMS uses instrument readings and radio signals from fixed points on the ground to figure out what adjustments are needed to meet the flight plan.

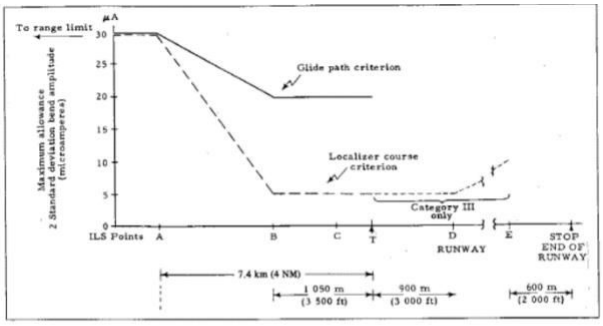
The primary function of a FMS is to facilitate navigation.

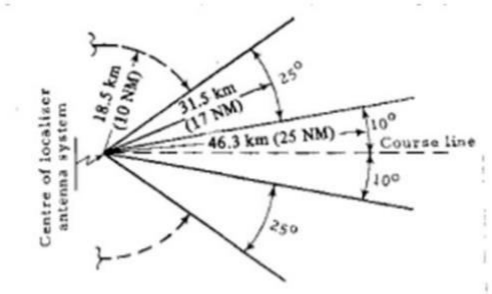
Analysis & Outputs-



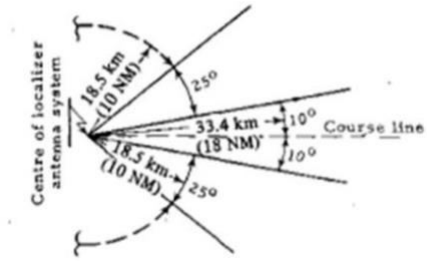


ILS Data & Efficiecy output-





When topographical features dictate or operational requirements and alternative navigation facilities permit, the following coverage may be provided:



DGCA Guidelines and follow up protocols-

For Facility Performance Category

III localizers, the minimum field strength on the ILS glide path and within the localizer course sector shall be not less than 100 μ volts per meter (minus 106 dB W/m2) at a distance of 18.5km (10 NM), increasing to not less than 200 μ volts per meter (minus 100 dB W/m2) at 6 m (20ft) above the horizontal plane containing the threshold. From this point to a further point 4 m (12ft) above the runway centre line, and 300m (1000ft) from the threshold in the direction of the localizer, and thereafter at height of 4m (12ft) along the length of the runway in the direction of the localizer, the field strength shall be not less than 100 μ volts per meter (minus 106 dB W/m2). This field strength is necessary to provide the signal to noise ratio required for improved integrity.

Conclusion

Hence studying all the various protocols and major research done in this domain carried out along woth the DGCA guidelines which have played envitably efficient role in safety and measurement of the operations and maintaining standards. I/we hope with this research which is more specific in ILS landing domain will work and help in maintaining and fabrication of practical system. Envisaging an Cat-III systems compatible runways and aircrafts with all reliable and credible systems circuitry and proper usagae of AI and ML with all varients updating timely.

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