

NZ60 Approach And Relationship Between EFIS And Standard Ground-Based Precision Approach

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Executive Summary

In the year 2000, a New Zealand jet aircraft flying for Apia avoided becoming an incident through better situational awareness of the pilots and crew members. They all demonstrated high-quality teamwork. We'll see what the factors that brought the aircraft close to an accident and how the pilot and crew responded to the situation. The relationship between the EFIS system and the ground-based precision approach has been discussed. The different components of EFIS have provided facilities to pilots and crew members. Now pilots have more choices, these choices are displayed through data buses, they can choose from the range of displays. Advances have been made in the EFIS system, and now it provides more efficiency. We have also reviewed how a change in color helped pilots. Also, we have discussed how the green needles show the navigation on the ground. Moreover, the safety systems have significantly prevented the CFIT accidents that happened in the past.

Introduction

With the right approach used by the pilot and crew members, the New Zealand Jet Aircraft prevented an incident. There are a number of contributory factors in this regard. The decision and responses contain the lesson for the other pilots. The ground-based precision approach still exists. One of the most important aspects of aviation is the *relationship between EFIS and ground-based precision approach and how safety systems prevent CFIT accidents*.

NZ60 Approach

In 2000, New Zealand's jet aircraft, B767, flying for Apia, faced a mistaken ILS signal while approaching there. During that time, airfield works were in progress. Also, nine written notifications were issued to pilots about the serviceability of different nav aids at the airport.

The crew gave a briefing on an ILS viewpoint with the VOR concept as support. The airport staff cleared the flight for the arrival 15-mile trajectory for ILS (Instrument Landing System) 08. In this regard, a low drag concept of 10 knots with the wind blowing in the direction of travel was used. A radio transmitter was intercepted with FLAP 1 at the speed of 220 knots and 14nm. The auto-flight

system captured the glideslope after one second of arming of approach mode. The signals indicated the aircraft was at the right flight profile with no warning flags and without the identification of ILS. After capturing the glideslope, the pitch motion of the aircraft was lower than the routine with high speed and increased descent level (YouTube). The crew came forward to focus on the power and resistance of the aircraft by using speed brake, swing and gear. A flying pilot observed the irregularity of altitude and DME. Also, the monitoring pilot noticed that the visual cues were not in alignment with the image in his mind. Therefore, all the pilots called a go-around and finished at 6 nm from the threshold of the runway. Moreover, the 2nd approach was utilized as a localizer concept, discrediting the signal of the glideslope (YouTube).

Contributory Factors

The authorities that issued the written notices to the pilots termed the Glide path as non-monitored. The crew had no idea about the meaning of the term.

1. For the purpose of radiating the signal of the Glide path with the selection of an unserviceable transmitter, the installation of ILS was allowed.
2. The only Localizer carried the ILS's ident, not Glide Path, which is why there was no integration of Gide Path as per the assumption of the crew.
3. The warning flags were not present that give indications to the crew in case of wrong signals.
4. The lack of awareness concerning erroneous or mistaken transmissions.
5. The clearance of the crew and aircraft for complete ILS system by Air Traffic Control unit.

Explanation Of The Scenario

With the help of the Swiss Cheese Model, this is how different barriers were broken.

1. There was a breach of the first defense due to a lack of awareness of the NOTAM term.
2. A false indication was given to the crew, which resulted in the breach of the second signal.
3. In the absence of warning signals or flags, there was a breach of third defense on the flight floor for the alertness of the crew about the wrong glide path.
4. The fourth defense was also broken at the time when they didn't complete the height check.
5. As the warning of the GPWS system kept silent, the fifth defense was also violated.
6. The sixth defense remained intact- The crew had developed an awareness of the situation as a result of the glideslope capture, excessive workload, approaching island lights and the difference in the DME or Altitude check.

Preventive Factors For NZ 60:

The following are the factors that prevented NZ 60 from becoming an incident

1. All of the crew members displayed CRM (Customer Relationship Management)
2. A comprehensive and planned approach to the briefing was used. A substitute briefing about the use of the VOR approach gave the next level of planning. This enabled all of the crew members to share the same model which was present in their minds.
3. There was a constant inquiry concerning the aircraft state that led to the Altitude check/DME differences.
4. For the purpose of enhancing situational awareness, outer visual aids such as island lights were used
5. The right decision of a Go Around
6. The deployment of automation to minimize workload
7. The demonstration of effective communication and teamwork
8. The decision to use Localizer

Following Are The Can Also Serve As Preventive Measures In Case Of False / Erroneous ILS

1. Alertness regarding the possibility of false signals, including the absence of warning flags.
2. Checking and understanding the terminologies used in the written notices to the pilot, i.e., NOTAMS, to examine the operational level of ILS
3. Carry out a complete briefing including all the relevant points, for example, MSA, terrain location, objects made by man, expected ground and vertical speeds to grasp the overall idea of the approach.
4. Deploying a mature approach to minimize workload would help to detect further anomalies through careful analysis.
5. Always maintain situational awareness, it can be achieved through questioning in case of any confusion.
6. Alertness while carrying out different approaches to uncontrolled situations at airports, especially when ATC is not protecting the ILS area of the airport. At such airports, there is every likelihood that an ILS signal and an erroneous signal combine together to give a false indication.
7. Carry out a cross-check of the altimeter against the crossing altitude of the glideslope at the FAF. Also, perform the continuous distance and height check to ensure the correct profile is flying.
8. For the purpose of cross-checking, use the sources of raw data to note that the aircraft is on the right course of the localizer.
9. Put a Query to Airport traffic control (ATC) in case there is any doubt in ILS or the clearance of approach. This is the tool for cross-checking to ensure the correct assignment approach.

10. If the crew is facing any contradictory indications, perform a “Go Around. “

The Relationship Between EFIS (Electronic Flight Instrument System) And Ground-Based Precision Approach

The instrument of a large aircraft cockpit system that displays the flight data through electronic means rather than electromechanically is known as an Electronic flight instrument system. Generally, EFIS comprises primary flight information, various function displays and a comprehensive system that indicates the engine and alerts the crew. The installations of EFIS differ to a great extent. There might be one display in the light aircraft unit that shows the flight and navigation data. However, a big commercial aircraft may have six or more display units. Normally, the controls can be viewed at the website for technical information. Displays, Controls, and Data processors are its three modules (Wiegmann et al.). A primary EFIS may provide all the functions in a single unit.

The display units are the most significant parts of the overall system of EFIS and are the characteristics that direct to the glass cockpit. The unit that serves as the replacement for ADI is known as the primary flight display (PFD). Also, the navigation display replaces the HSI as a separate display. The function of PFD is to display all the information regarding flight which also includes calibrated airspeed, vertical speed, and yaw. The primary purpose of PFD is to enhance the situational awareness of pilots by giving alerts to aircrew about an unexpected or hazardous situation such as low speed of air or high descent. The PFD changes the color or shape of the display to enable the pilot to detect any hazard; it also provides audio alerts. The multifunction displays make separate or disintegrated navigation displays insignificant. In this regard, they have another option of a large screen to display navigation and PFD. The navigation display, PFD, and multifunction display have the same physical structure. The system interface determines the information that is displayed.

Control Panels

Through EFIS, pilots have the controls that choose a range of displays such as a compass. The data buses display the pilot's choices, whereas other tools use the inputs from the pilot. The pilot chooses the required altitude on the control panel; the EFIS repeats this on the PFD and then by making a comparison with the real altitude, it then displays an altitude error. The automatic control systems of flight use the same option of altitude for leveling off. Appropriate warnings are given by the altitude alerting system.

Data Processors

The symbol generator produces the visual displays of EFIs. The pilots provide the inputs of data and signals received from sensors, and they also make a selection of the format of EFIS. The symbol generators can have other names, such as display electronics units. The symbol generators perform functions besides generating symbols. It provides monitoring facilities along with a display driver. The controls and sensors give inputs through data buses, and then their validity is examined. The relevant calculations are then performed and then display drivers and graphics generators generate input to display units.

Human Elements

The pilot requires a different combination of data at different phases of the flight. For this purpose, the pilot must view the electromechanical instrument. Normally, some of the indications may not be displayed by EFIS, such as the vibration of the engine. However, the system shows the reading in case some parameter goes beyond its limits. In the same way, EFIS displays the scale of glideslope in the ILS approach. If there is a case of input failure, an additional indicator is added by an electromechanical instrument. Also, an invalid information is removed by EFIS from the display and replaces a proper warning.

Colors

Conventional systems have used color in the past, but they didn't have the capacity to change color to signal some conditional change. The EFIS has electronic display technology, and it doesn't have any such limitations, which is why it uses colors at a wide scale as the plane comes near to glide slope, and it displays an indication through a blue caption that the glideslope is equipped. To show the type of navigation, the navigation needles are coded by a typical EFIS system. The Green needles show the navigation on the ground, such as ILS systems and Localizers. GPS navigation is demonstrated by Magenta.

Advantages Of EFIS

EFIS doesn't have the physical constraints of conventional equipment. The pilot has different options, he can choose the display that indicates a planned track given by the system of flight management. The pilots can select to overlay the picture of weather on the route that is displayed.

Prevention Of CFIT Accidents Through EFIS

Ground-based approaches still exist, therefore, for effective flight operation EFIS integrates with the ground-based precision approach and give pilot many options and clarity. Through effective systems of EFIS, multifunction displays and navigation needles, CFIT and also the situational awareness by pilots and crew avoid CFIT accidents that happened in the past. The go-around option is also a significant approach by the pilot to avoid CFIT accidents.

Conclusion

The factors that prevented NZ60 from becoming an incident was the wise approach from the pilot, he used a “go around” tactic. Also, the crew members displayed customer relationship management (CRM). The comprehensive approach of the briefing was effectively used, and an alternate briefing gave the next level of planning. Effective communication and teamwork also proved to be useful. The decision to use Localizer also played a role in an important preventive measure. Further, the relationship between EFIS and the ground-based precision approach enhances the situational awareness of the pilot and other members of the crew. There are a lot of advantages of the EFIS system as it doesn't have the physical limitations that traditional equipment has. Also, he can select the display he wants, and he can also over impose the weather picture on the radar route. Also, through the control panels of EFIS, pilots have the choice to choose the range such as compass etc. Over the years, many advances have been made in the EFIS system.

Recommendations

The pilot and the crew members should rely on the EFIS system for precision. The relationship between the modern EFIS system and the ground-based approach provides a lot of facilities for pilot and crew members. The pilot choices are displayed through data buses. It also provides an enhanced level of monitoring level. Finally, the relationship between EFIS and the ground-based precision approach prevents CFIT accidents that happened in the past.

References

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