



Air Accident Investigation Sector

Serious Incident

- Summary Report -

AAIS Case N° AIFN/0004/2023

Communication Failure

(Tuning Control Panel Malfunction)

Operator:	Gulf Air
Make and Model:	Boeing 787-9
Nationality and Registration:	Bahrain, A9C-FG
Place of Occurrence:	The United Arab Emirates Airspace, Approach to Dubai Airport
State of Occurrence:	The United Arab Emirates
Date of Occurrence:	10 March 2023



This Investigation was conducted by the Air Accident Investigation Sector of the United Arab Emirates pursuant to Civil Aviation Law No. 20 of 1991, in compliance with Air Accident and Incident Investigation Regulation, and in conformance with the provisions of Annex 13 to the Convention on International Civil Aviation.

This Investigation was conducted independently and without prejudice. The sole objective of the investigation is to prevent future aircraft accidents and incidents. It is not the purpose of this activity to apportion blame or liability.

The Air Accident Investigation Sector issued this Summary Report in accordance with national and international standards and best practice. Consultation with applicable stakeholders, and consideration of their comments, took place prior to the publication of this Report.

The Summary Report is publicly available at:

<http://www.gcaa.gov.ae/en/epublication/pages/investigationReport.aspx>

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Investigation Process

The occurrence involved a Boeing 787-9 aircraft, registration marks A9C-FG and owned by Gulf Air, Bahrain. The occurrence was reported to the AAIS Duty Investigator by phone call to the Hotline Number +971 50 641 4667.

After the initial investigation and risk assessment, the occurrence was classified as 'Serious Incident'.

The scope of this investigation is limited to the events leading up to the occurrence; no in-depth analysis of non-contributing factors was undertaken.

Notes:

1. Whenever the following words are mentioned in this Report with first capital letter, they shall mean the following:
 - (Aircraft) – The aircraft involved in this incident
 - (Commander) – The commander of the incident flight
 - (Copilot) – The copilot of the incident flight
 - (Incident) – This investigated Serious incident
 - (Investigation) – The investigation into this incident
 - (Operator) – Gulf Air
 - (Report) – This incident investigation Summary Report.
2. Unless otherwise mentioned, all times in the Report are 24-hour clock in Coordinated Universal Time (UTC), (UAE local time minus 4).
3. The structure of this Summary Report is an adaptation of the Annex 13 Final Report format.

Factual Information

History of the Flight

On 10 March 2023, a Boeing 787-9 Aircraft, registration marks A9C-FG, owned by Gulf Air, was scheduled to operate flight number GF504, for the sector Bahrain International Airport (OBBI) to Dubai International Airport (OMDB)¹, the United Arab Emirates. There were 193 persons on board, comprising 183 passengers and 2 flight crewmembers, and 8 cabin crewmembers.

The Commander was the pilot flying (PF) and the Copilot was the pilot monitoring (PM).

The DFDR data revealed that the Aircraft took off from runway 30R at time 1728:58. After takeoff and climb, the Aircraft cruised at flight level (FL) 250 for 26 minutes. At 1754:00 the flight crew commenced the decent. At this time, the crew experienced the failure of tuning control panel (TCP) right, left and center. followed by engine indicating and crew alerting system (EICAS) message loss of transponder, weather radar and traffic collision avoidance system (TCAS). The crew were unable to change the radio frequency.

While assessing the situation, the crew initiated the quick reference handbook (QRH) for non-normal checklist. They were able to communicate with on standby radio on frequency 119.3 with Dubai Approach controller. At 1756:23 they got the clearance for VUTEB waypoint and decent clearance to 13000 feet. At 18:03:57, the Aircraft descended to 13,000 feet at waypoint VUTEB, where it entered a holding pattern. Meanwhile, the flight crew initiated the non-normal checklist to troubleshoot the issue and awaited clearance from Dubai Approach to continue with the approach..

Dubai Approach controlled the decent by taking flight crew flight levels (altitude) over the frequency 119.3 as the transponder was inoperative Dubai Approach controller (DAC) was unable to see the Aircraft movement on radar monitoring screen.

As per the PM statement, he was trying to refer the QRH and Flight Crew Operations Manual (FCOM) on the company iPad located in the

¹ OBBI and OMDB are the ICAO four letter airport codes for Bahrain International Airport and Dubai International Airport, respectively



electronic flight bag (EFB) to check for any TCP reset procedures or if there is any Flight Crew Operations Manual Bulletin for TCP inoperative reset procedure but he was unable to find the procedures to reset or any bulletin.

As per the PF statement, while the Aircraft was holding over VUTEB at 1801:02 the flight crew tried to further troubleshoot before they could get the landing clearance from the DAC.

Both crewmembers did not discuss the *flight crew operations bulletin* relevant to TCP inoperative procedure.

Meanwhile DAC informed to crew to declare radio communication failure emergency for landing clearance and for emergency services on standby while landing.

At 1822:15 the flight crew declared radio communication emergency and decent the Aircraft for approach to Dubai airport, while DAC was coordinating with Dubai Tower Air Traffic Controller and flight crew to for landing clearance and Aircraft altitude.

The Aircraft landed at 1835:33 on runway 12L safely and vacated the runway on exit Mike 7 Alpha at 1836:15. The Aircraft continued taxiing via Mike taxiway, Lima 1, kilo and stopped on stand Charlie 41.

The fire commander declared full emergency cancelled at 1842:00.

Damage to Aircraft and Property

There was no damage to the Aircraft, property, or the environment.

Personnel Information

The Commander possessed an air transport pilot license (ATPL) issued by the Civil Aviation Affairs, Ministry of Transportation and Telecommunication of the Kingdom of Bahrain. The license was valid until 7 August 2025. Additionally, his Class 1 medical certificate was valid until 20 March 2023. As per the medical certificate, the Commander was required to wear prescription glasses to correct his near vision impairment.

The Copilot possessed an ATPL issued by the Civil Aviation Affairs, Ministry of Transportation and Telecommunication of the Kingdom of Bahrain. The license was valid until 1 October 2027. His Class 1 medical certificate was valid until 14 August 2023. As per the medical

certificate, the Copilot was not having any vision impairment.

The training records indicated that both flight crewmembers have already completed the Operator's required training.

Aircraft Information

The Boeing 787-9 is a long-range, wide-body aircraft, equipped with two Rolls-Royce Trent 1000 turbofan engines.

The Aircraft was manufactured in 2019 under serial number 39986, and delivered to the Operator on 16 August 2019.

The Aircraft time and cycles since new were 12,152:36 hours and 2,558 cycles.

The left engine cycles since new were 2,319. It has completed 135 cycles since installation on the Incident Aircraft. No overhaul or inspection was carried out since its installation. The right engine cycles since new were 2,317. It has completed 510 cycles since installation on the Incident Aircraft. No overhaul or inspection was carried out since its installation.

The last Aircraft heavy inspection was the C1 check which was carried out on 30 October 2022, at 10,051:06 hours, 2,101 cycles. The last A1 check was carried out on 26 Jan 2023, at 11,536:59 hours, 2,418 cycles. Since the last A1 check until the Incident date, the Aircraft operated 140 cycles.

The technical logs provided to the Investigation did not indicate deferred technical defects prior to the Incident. Additionally, no maintenance fault messages were reported post the Incident flight.

The maintenance personnel attended the inoperative TCP. As per the maintenance engineer statement, he reset the TCP and carried out a ground test with no engine indicating and crew alerting system (EICAS) messages appeared. Accordingly, the Aircraft was returned to service.

No technical anomaly was reported by the Pilot before and during the flight.

Radio System: Tuning and Control Panel (TCP)

The TCPs are used to tune and control the very high frequency (VHF) communication system, the high frequency (HF) communication system, the satellite communication (SATCOM) system, the selective calling (SELCAL) system, and other systems. The TCPs are designated left, center, and right (figure 1), and are normally associated with the respective VHF and HF radios.



Figure 1. TCP

Each TCP has a light sensor to automatically control display lighting. Lighting levels for all TCPs can be adjusted using aisle stand panel or master brightness controls.

The functions of the TCP are as follows (figure 2):

Frequency selection:

Allows the pilot to select the desired radio frequency for communication, navigation, or other aviation radio systems. Typically includes a frequency dial or buttons to increment/decrement the frequency.

Mode selection:

Enables the pilot to choose the operating mode of the radio system, such as COM (communication), NAV (navigation), or ADF (automatic direction finder).

Volume control:



Figure 2. TCP functions

Adjusts the audio volume level of the selected radio system. Provides a way for the pilot to control the loudness of the audio output.

Squelch control:

Adjusts the sensitivity of the radio receiver to filter out background noise. Helps the pilot to hear only the desired radio transmissions clearly.

Antenna selection:

Allows the pilot to choose the appropriate antenna for the selected radio system. Ensures optimal signal reception and transmission.

Power controls:

Enables the pilot to turn the radio system on or off. May include individual power switches for different radio components.

TCP failure:

The TCP malfunction can affect the operation of the TCAS, transponder, and weather radar systems in the following ways:

- **TCAS.** The TCP may be used to select the appropriate radio frequency for TCAS operation. The frequency selection on the TCP must match the frequency used by the TCAS to ensure proper communication with other aircraft's TCAS. The TCP may also be used to adjust the sensitivity or mode of the TCAS, such as selecting between "Traffic" and "Resolution Advisory" modes.
- **Transponder.** Set the transponder code (also known as the "squawk" code) that identifies the aircraft to air traffic control and other aircraft. The transponder code is selected and adjusted using the TCPI. The transponder also uses the radio frequency selected on the TCP to transmit and receive data.



- **Weather Radar.** The TCP may be used to select the appropriate radio frequency for the weather radar system. The selected must match the frequency used by the weather radar to ensure proper operation and data reception. The TCP may also be used to adjust the range, tilt, or other settings of the weather radar system.

Meteorological Information

The meteorological conditions of OMDB provided to the Investigation around the time of the Incident are shown in table 1.

Weather conditions were not a contributory factor to this Incident.

Table 1. OMDB Meteorological Conditions	
Time	1800 UTC (2200LT)
Wind	310 degrees/7 Knots
Visibility	10 kilometers
Clouds	CAVOK
Air temperature	29 degrees Celsius
Dew point	26 degrees Celsius
Pressure (Altimeter)	1015 Hectopascal

Aerodrome Information

Dubai International Airport, coordinates 25°15'10"N 55°21'52"E, is located 4.6 kilometers east of Dubai city. The airport elevation is 62 feet.

The Airport is equipped with two asphalt runways: 30R/12L and 30L/12R. Both asphalt runways are 4,447 and 4,351 meters long, respectively. Both runways are equipped with ICAO ILS CAT IIIB precision approach lighting systems.

The Incident took place in flight.

Flight Recorders

The Aircraft was fitted with General Electric flight recorders model EAFR 3254. The EAFR is capable of providing combination of the mandatory crash protected recorder functions in a single line replaceable unit (LRU). The EAFR include the digital flight data recorder (DFDR) and the cockpit voice recorder (CVR) functions.

The flight data recorder raw data was download by the Operator, whereas the CVR recordings were overwritten as the Aircraft returned to Bahrain and the CVR maximum

recording time is two hours and FDR data was downloaded in Bahrain.

The downloaded data was analysed at Abu Dhabi Flight Recorder Laboratory (AD-FRL).

Additional Information

Boeing Bulletins

According to Gulf Air Boeing 787 *flight crew operations manual (FCOM)*, Chapter 0 – *Preface*, Section 6 – *Bulletin Records*, the manufacturer issues bulletins to provide important information to flight crews prior to the next formal revision of the *FCOM*. The transmitted information may be of interest to only specific operators or may apply to all operators of this model airplane. Each bulletin will vary. The *FCOM* states:

"Bulletins are dated and numbered sequentially for each operator. Each new bulletin is recorded in this record when received and filed as instructed. A bulletin may not apply to all airplane models. When appropriate, the next formal *FCOM* revision will include an updated bulletin record page to reflect current bulletin status.

Bulletin status is defined as follows:

- **In Effect (IE)** – the bulletin contains pertinent information not otherwise covered in the Flight Crew Operations Manual. The bulletin remains active and should be retained in the manual.
- **Incorporated (INC)** – the bulletin operating information has been incorporated into the Flight Crew Operations Manual. However, the bulletin remains active and should be retained in the manual. The bulletin will be cancelled in a subsequent revision
- **Cancelled (CANC)** – the bulletin is no longer active and should be removed from the Flight Crew Operations Manual. All bulletins previously cancelled are no longer listed in the Bulletin Record

The person filing a new or revised bulletin should amend the Bulletin Record as instructed in the Administrative Information section of the bulletin. When a bulletin includes replacement pages for the Flight Crew Operations Manual or QRH, the included pages should be filed as instructed in the Flight Crew Operations Manual Information section of the bulletin.'

Bulletin GUL-38 R1



'TCP Inoperative, Uncommanded VHF Frequency Transfer or Change, and Uncommanded Transponder Code Change' issued on December 28, 2021, status IE.

'Reason: To inform flight crews of TCPs becoming inoperative, having uncommanded VHF frequency transfers or changes, and having uncommanded transponder code changes.

Background Information

TCP Inoperative: Boeing has received reports where tuning and control panels (TCPs) become

inoperative and show the message SYSTEM NOT AVAILABLE ON THIS PANEL. In all reported cases, two or three TCPs were inoperative; there are no reported cases where one TCP was inoperative.

These functions listed below continue to operate, however if all three TCPs are inoperative, they cannot be controlled until at least one TCP is reset:

- VHF
- HF
- SATCOM (SAT)
- CABIN INTERPHONE (CAB)
- GPWS
- WXR
- TCAS/XPDR
- ALTN NAV
- Alerting and transponder control panel (ATP)

All previous system selections are retained, but should be verified after the reset."

In the Incident, where all three TCPs were inoperative, the TCP retained the last tuned frequencies. Because the right VHF radio was previously tuned to 121.5 MHz, the crew was able to establish and maintain communication with ATC using this frequency. ATC continued to receive information from the transponder, however the IDENT switch on the ATP did not operate.

"Operating Instructions

TCP Inoperative: One or more TCPs can become inoperative. When a TCP is inoperative, it shows the message SYSTEM NOT AVAILABLE ON THIS PANEL. The flight crew can select a TCP off by pushing the PANEL OFF switch in

the lower-right corner of each panel for two seconds. Then, select the TCP on by pushing the PANEL OFF switch once.

If one or two TCPs are inoperative:

- Select each inoperative TCP off, then back on.
- If a TCP becomes inoperative again, select that TCP off and leave it off for the rest of the flight.
- If three TCPs are inoperative:
- Select all three TCPs off, then select only the right TCP on.

After a TCP has been reset, confirm that all system selections are set as desired, including the frequency and transponder code."

Based on the Copilot's statement, this bulletin was non-traceable as he was unable to recollect where to locate it bulletin.

The *Boeing Briefing Guide* states:

"Takeoff Briefing Guide

Normal Briefing:

- RTOW / RLD Check
- Review ATL, Documents Log
- Review NOTAMS/NSUPP
- Weather Impact on Departure & Arrival
- Takeoff alternate
- Review Airport Brief in OMC

(Any Special Procedure)

- Review Taxi, T/off Rwy, Departure Route (Use of CDU and MCP as a X-Check)
- Runway Incursion & Excursion Prevention
- (Review Hot Spots, NOTAMS, ATIS, etc...)
- Review Noise Abatement Procedure
- Discuss Threat Particular to the flight (ex. Terrain, Weather, Time Pressure, Technical)

As per the take-off briefing guide, the crew are supposed to check the applicable bulletins and notices. The Investigation believes that if the crew have followed this take-off briefing and check the bulletins the PM would have located the relevant bulleting to TCP inoperative reset procedures.



Analysis

Risk Analysis of Inoperative TCP

On a Boeing 787 aircraft, the inoperative TCP can pose several risks that need to be carefully managed. The TCP is a critical component in the flight communication and navigation systems, and its failure can affect several aspects of the aircraft's operations such as TCAS, Transponder and Weather radar.

If TCP fails, affecting the operation of radio and navigation systems, the potential risk that impact operations as the TCAS, transponder, and weather radar are non-functional:

TCAS:

Potential Risks:

Inability to Tune Frequencies: If the TCP failure affects the ability to tune frequencies, it could hinder communication with ATC, which may impact TCAS operation indirectly if it involves frequency adjustments for alerts or coordination.

Communication Issues: Though TCAS itself is not directly dependent on the TCP for its core functionality, any associated communication issues might affect how effectively the system is used or monitored by the crew. The TCP may also be used to adjust the sensitivity or mode of the TCAS, such as selecting between "Traffic" and "Resolution Advisory" modes.

Transponder:

Potential Risks:

Frequency Tuning Problems: The TCP is used to tune communication frequencies, including those used by the transponder. If the TCP failure affects frequency tuning, the aircraft may face issues with setting or communicating on the correct transponder frequency.

Invisibility to ATC: An inoperative transponder due to TCP failure could lead to loss of radar contact with ATC, increasing collision risk.

Weather Radar:

Potential Risks:

Radar control issues: The TCP controls various aspects of the weather radar system, including tuning and operation. A failure might prevent the crew from adjusting radar settings or viewing weather information accurately.

Reduced Weather Awareness: Without proper radar operation, pilots may struggle to detect and

avoid severe weather conditions, increasing the risk of encountering turbulence or storms.

In conclusion, the Investigation affirms the failure of the TCP affects the ability to tune and operate critical communication and navigation systems. The indirect risks to TCAS, transponder, and weather radar include:

TCAS: Potential communication issues affecting the usage and monitoring of TCAS alerts.

Transponder: Problems with frequency tuning could lead to invisibility to ATC and communication challenges.

Weather Radar: Difficulty in tuning and controlling the weather radar system, which impacts weather detection and avoidance.

Aircraft Airworthiness

The Aircraft maintenance records did not indicate deferred defects related to the serviceability of onboard navigation systems, and the Aircraft was released to the flight without reported defects.

Crew Performance

Both flight crewmembers were qualified and fit for the flight as per the regulatory requirements.

The flight crew contacted Dubai Approach at 1754:10 reporting the TCP failure and they were unable to change the frequency. The crew was able to communicate on standby radio frequency 119.3 MHz. Dubai Approach controller coordinated with crew for the decent clearance to VETUB3A waypoint.

At the same time, the PM initiated the *QRH* non-normal checklist and attempted to locate the electronic *FCOM* in the electronic flight bag (EFB). The PM stated that he was unable to find any pertinent details regarding the inoperative TCP reset procedure in the *FCOM*, nor could he find the *flight crew operations bulletin* for the TCP inoperative reset procedure.

At 18:01:02, the Aircraft was holding at waypoint VETUB while the crew coordinated with Dubai Approach for vectoring and a descent to 13,000 feet.

As per the statement of the Commander, who was acting as the PF, he and the Copilot the multipole attempts to reset and restore the TCP were unsuccessful.

The crew declared radio communication emergency at 1822:15 upon which Dubai



Approach controller declared emergency and provided landing clearance runway 12L to the crew. The Aircraft landed safely at 1835:33 on runway 12L.

The Investigation concludes that if the crew have followed the take-off briefing and checked that there is an existing relevant *flight crew operations bulletin*, number GUL-38 R1, that the crew were unable to identify its location in the electronic copy of FCOM installed on iPad that was placed in EFB.

If crew would have located the bulletin and followed the procedures to reset the inoperative TCP they would have recovered the communication to normal. Due to failure in communication system the PF or PM was unable to contact company Maintenance Control Center (MCC) to resolve the TCP issue.

The Investigation concludes that the crew were unable to locate the relevant bulletin to reset the inoperative TCP as they may not have checked the existing bulletins as per the procedures.

The Aircraft Maintenance performed a reset to all three TCPs and the TCPs were functional and ground test was conducted with no further failures reported. The EICAS messages were cleared.

Conclusions

From the evidence available, the following findings, causes, and contributing factors were made with respect to this Incident. These shall not be read as apportioning blame or liability to any particular organization or individual.

- **Findings.** Statements of all significant conditions, events or circumstances in this Incident. The findings are significant steps in this Incident sequence but they are not always causal or indicate deficiencies.
- **Causes.** Actions, omissions, events, conditions, or a combination thereof, which led to this Incident.
- **Contributing factors.** Actions, omissions, events, conditions, or a combination thereof, which, if eliminated, avoided or absent, would have reduced the probability of the Incident occurring, or mitigated the severity of the consequences of the Incident. The identification of contributing factors does not imply the assignment of fault or the determination of administrative, civil or criminal liability.

Findings

- (a) Both flight crewmembers were licensed and qualified for the flight in accordance with the requirements of the *Civil Aviation Regulations* of Bahrain.
- (b) Both flight crewmembers were well-rested and fit for the flight.
- (c) The Aircraft was certificated, equipped, and maintained in accordance with the requirements of the *Civil Aviation Regulations* of Bahrain.
- (d) The Aircraft was airworthy when released for the flight. There were no deferred or reported defects that could have contributed to the Incident.
- (e) The Commander was the pilot flying (PF) and the Copilot was the pilot monitoring (PM).
- (f) The Copilot, as the PM, was not aware about *flight crew operations bulletin*.
- (g) Dubai Approach and Tower controllers provided the essential information for safe landing.
- (h) Dubai Tower declared full emergency which was terminated by the ARFFS Commander after the Aircraft has landed and vacated runway 12L.

Causes

The Air Accident Investigation Sector could not determine the technical reason behind the malfunction of the three TCPs.

The crew was unable to restore the TCPs because the Copilot, acting as the PM, could not locate the information pertinent to resetting the inoperative TCP as outlined in the electronic *flight crew operations bulletin* stored in the electronic flight bag.

The non-adherence to the applicable take-off briefing procedure to check the current bulletins and NOTAM supplement, and their lack of knowledge in locating the relevant *flight crew operations bulletins* hindered the crew's ability to find the necessary information.

Safety Actions

Based on the letter from Ministry of Transport and Telecommunications, Bahrain, the Operator has implemented the following safety measures:



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- The FCOM bulletin is now included as a green flag item during the type rating course.
- A Flight Crew Operations Notice has been distributed to all pilots, informing them of the new or revised bulletin.
- The bulletin review is not part of the system knowledge validation during the LPC and OPC.”

The Investigation considers the safety actions are adequate. However, a safety recommendation is addressed in this Report, and its implementation as well as the effectiveness of the Operator's safety actions will be tracked and assessed by the AAIS's Safety Recommendations Tracking System.

Safety Recommendations

The Air Accident Investigation Sector recommends that:

Gulf Air

SR14/2024

The flight crew's non-adherence to take-off briefing and the consequent inability to locate the *flight crew operations bulletin* pertinent to the TCP inoperative reset procedures hindered them from restoring the TCP.

Therefore, it is recommended that Gulf Air take measures for improving the pilots' *flight crew operations bulletins* and NOTAM supplement check and adherence during the take-off briefing and utilizing the right procedures during the flight.

This Summary Report is issued by the:

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