



**KOMITE NASIONAL KESELAMATAN TRANSPORTASI
REPUBLIC OF INDONESIA**

FINAL
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Aircraft Accident Investigation Report

PT. Garuda Indonesia

Airbus 330-200; PK-GPO

Inflight from Melbourne to Jakarta

22 August 2015



2016

This Final report was produced by the Komite Nasional Keselamatan Transportasi (KNKT), Transportation Building, 3rd Floor, Jalan Medan Merdeka Timur No. 5 Jakarta 10110, Indonesia.

The report is based upon the investigation carried out by the KNKT in accordance with Annex 13 to the Convention on International Civil Aviation Organization, the Indonesian Aviation Act (UU No. 1/2009) and Government Regulation (PP No. 62/2013).

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ABBREVIATIONS AND DEFINITIONS

ACARS	:	Aircraft Communication Addressing and Reporting System
ATPL	:	Airline Transport Pilot License
BOM	:	Basic Operation Manual
°C	:	Degree Celsius
C of A	:	Certificate of Airworthiness
C of R	:	Certificate of Registration
CB	:	Circuit Breaker
CPL	:	Commercial Pilot License
DGCA	:	Directorate General of Civil Aviation
°F	:	Degree Fahrenheit
FA	:	Flight Attendant
GCS	:	Glasgow Coma Scale
ICAO	:	International Civil Aviation Organization
K	:	Kelvin
KNKT	:	<i>Komite Nasional Keselamatan Transportasi</i> (National Transportation Safety Committee)
m	:	Meter
p	:	Pressure in Pascal
Pa	:	Pascal
PIC	:	Pilot in Command
psi	:	Pound square inch
T	:	Absolute temperature in Kelvin
UTC	:	Universal Time Coordinated
V	:	Volume

INTRODUCTION

SYNOPSIS

On 22 August 2015, an Airbus 330-200 aircraft, registered PK-GPO, was being operated by PT. Garuda Indonesia on a scheduled passenger flight from Tullamarine International Airport, Melbourne, Australia to Soekarno-Hatta International Airport, Jakarta, Indonesia with flight number GIA 717. There were two pilots, 11 flight attendants and 187 passengers on board.

During cruise and after the flight attendants served lunch, one of the flight attendants put pieces of dry ice inside an empty mineral water bottle and loaded it into the refrigerator unit in the middle galley.

Approximately 3 minutes after the dry ice was inserted into the refrigeration unit, the unit door burst. The refrigeration unit door was thrown towards and injured one of the Flight Attendant (FA).

The other FA made an announcement and found doctor and a paramedic to administered first aid to the injured FA. The doctor advised the PIC that the injured FA's condition was stable, the bleeding had stopped and it was safe to continue the flight to Jakarta.

The aircraft landed safely at Soekarno-Hatta International Airport, Jakarta. The injured FA was transferred to the airport health facility and thereafter to the hospital in town. The injured flight attendant was the only person injured in this occurrence.

The investigation concluded that the burst of the refrigeration unit door was due to a result of pressure build-up that exceeded the capacity of the safety relief valve due to dry ice being placed in the refrigeration unit compartment. The door burst resulted in serious injuries to the flight attendant.

PT. Garuda Indonesia has put in several safety actions following this occurrence. Komite Nasional Keselamatan Transportasi (KNKT) considered that the safety actions were relevant to improve safety and prevent reoccurrence. Therefore, KNKT did not issue safety recommendation to PT. Garuda Indonesia.

KNKT issued one safety recommendation addressed to the Directorate General of Civil Aviation (DGCA).

1 FACTUAL INFORMATION

1.1 History of the Flight

On 22 August 2015, an Airbus 330-200 aircraft, registered PK-GPO, was being operated by PT. Garuda Indonesia on a scheduled passenger flight from Tullamarine International Airport, Melbourne, Australia to Soekarno-Hatta International Airport¹, Jakarta, Indonesia with flight number GIA 717. There were two pilots, 11 flight attendants and 187 passengers on board.



Figure 1: The archive of PK-GPO aircraft

During the preparation for flight at Melbourne, the flight attendants conducted the routine briefing, then prepared and checked the services and emergency equipment. The standard meals and beverages were loaded during the preparation, including ice cream packed with dry ice underneath that was loaded into middle (Business Class) galley.

At 0400 UTC, the aircraft departed Melbourne. During cruise and after the flight attendants had served lunch, one of the flight attendants put pieces of dry ice inside an empty mineral water bottle and loaded it into the refrigerator unit in the middle galley.

At about 0700 UTC, or approximately 3 minutes after the dry ice was inserted into the refrigeration unit, the unit door burst. The refrigeration unit door was thrown towards and hit the face of one of the Flight Attendant (FA) who was standing in the galley (Figure 2). The FA fell down onto the floor with a bleeding face and remained conscious. The injured FA was assisted by a passenger and another FA to be seated on a passenger seat.



Figure 2: The location of the blown out refrigeration unit door

At the time of the refrigeration unit door failure, the aircraft position was near IFR

¹ Soekarno - Hatta International Airport, Jakarta, Indonesia will be named Jakarta for the purpose of this report.

waypoint DEENO² which was under Brisbane Air Traffic Control airspace (Figure 3).

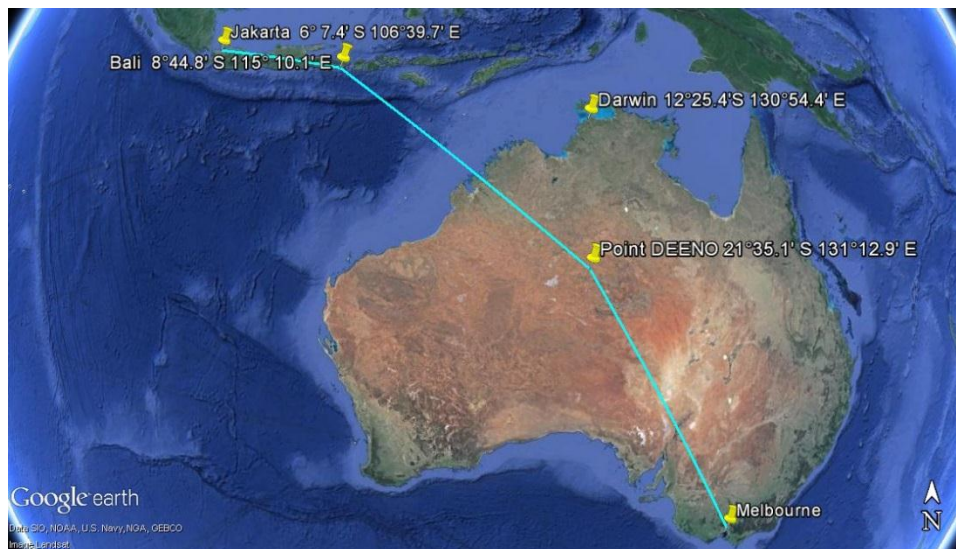


Figure 3: The flight route and estimated position of waypoint DEENO

The other FA stated that after the refrigeration unit burst, champagne bottle, juice and milk scattered on the floor. One of the FA's pulled the circuit breaker (CB) for the refrigeration unit to prevent any electrical short circuit.

At 0705 UTC, the other FA reported the occurrence to the pilots and the PIC mentioned that the failure of the refrigeration unit door was not associated to security issues.

The FA made an announcement to find medical assistance from the passengers. Among the passengers were an internist doctor and a paramedic. They were then requested to check the condition of the injured FA. The doctor and the paramedic treated the injured FA.

At approximately 0745 UTC, the Pilot in Command (PIC) coordinated with the flight operation staff of Garuda Indonesia in Ngurah Rai International Airport³ in Denpasar in regard to the possibility to land there if the injured FA's condition deteriorated and required immediate assistance.

At 0748 UTC, the doctor advised the PIC that the injured FA's condition was stable, the bleeding had stopped and it was safe to continue the flight to Jakarta. Referring to the doctor's statement, the PIC decided to continue the flight to Jakarta and requested medical assistance from the flight operation staff of Garuda Indonesia in Jakarta. All communications with the flight operation staff was conducted by the Aircraft Communication Addressing and Reporting System (ACARS). The PIC also requested the doctor to monitor the condition of the injured FA and to inform the PIC of any significant information.

The PIC considered that diversion to Darwin would likely increase the complexity of the continuation of the flight in relation with passenger handling, flight approval and refueling as Garuda Indonesia did not have a representative in Darwin. The PIC also

² DEENO is a waypoint in Australia airspace which located on Northern Territory, approximately 1,200 Nm on heading 319° from Tullamarine Airport, Melbourne with coordinate 21°35' 6.00"S 131°12'54.00"E

³ Ngurah Rai International Airport, Denpasar, Indonesia will be named Denpasar for the purpose of this report.

considered that the burst refrigerator unit was not associated with a security issue. The SIC prepared a secondary flight plan in case a diversion to Darwin or Denpasar was required.

For the remaining of the flight, the injured FA felt dizzy and vomited several times.

At approximately 1100 UTC, the aircraft landed safely at Soekarno-Hatta International Airport, Jakarta. The injured FA was transferred to the airport health facility and thereafter to the hospital in town.

The injured flight attendant was the only person injured in this occurrence.

1.2 Personnel Information

1.2.1 Pilot in Command

The Pilot in Command was 57 years old, male Indonesian pilot, held a valid Airline Transport Pilot License (ATPL) and first class medical certificate that was valid until 2 October 2015.

The PIC joined the company in 1980 and qualified as an Airbus A330 pilot with a total flight time of approximately 23,000 flight hours including 2,000 hours on type. For the last 90 days, the PIC had performed 139 flight hours, while on the last 60 days performed 87 flight hours including 7 hours 33 minutes on this flight.

The PIC had performed his last proficiency check on 8 July 2015 and a last line check on 13 March 2015.

1.2.2 Second in Command

The Second in Command was 25 years old male Indonesian pilot, held a valid Commercial Pilot License and first class medical certificate. The SIC joined the company in 2012 and qualified as Airbus A330 pilot with a total flight time of approximately 2,100 flight hours including 351 hours on type. For the last 90 days, the SIC had performed 140 flight hours, while on the last 60 days performed 112 flight hours including 7 hours 33 minutes on this flight.

The SIC had performed his last proficiency check on 3 February 2015 and a last line check on 11 May 2015.

1.2.3 Flight Attendant

The flight attendants held valid licenses and medical certificates.

1.3 Aircraft Information

1.3.1 General

The Airbus 330-243 with the serial number 1288 was manufactured in France in 2012, and had a valid Certificate of Airworthiness (C of A) and Certificate of Registration (C of R). The aircraft was operated within the weight and balance envelope.

1.3.2 Refrigeration Unit

The aircraft was equipped with a self-contained vapour cycle system refrigeration unit (chiller/refrigerator/freezer) that provides forced cooling air within an insulated refrigeration compartment. The refrigeration unit, part number 600-1 and serial number 0942 manufactured by B/E Aerospace, which consisted of a cooling system,

compartment and front panel display.

The following information was taken from the Garuda Indonesia, Flight Attendant Service Guide Book 2nd Edition Rev.6, chapter Galley System that stated that the refrigeration unit is used for chilling wines and champagne only and is not permitted to cool other products. The unit had a volume capacity of approximately 31 liters. The door size is 22.1 inch x 11.2 inches.

The refrigeration compartment temperature can be selected to three different modes. The three selection modes of operation and the temperature were:

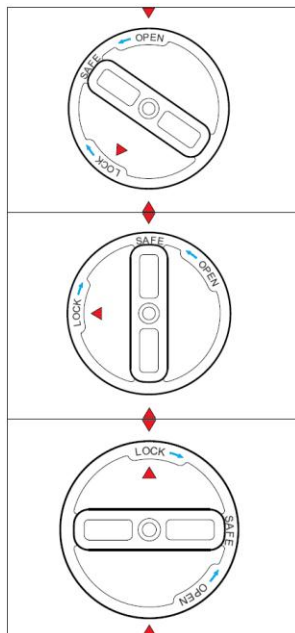
- Wine Chiller: 46°F (7.8°C);
- Refrigerator: 39°F (3.9°C);
- Freezer: 0°F (-17.8°C).

USAGE:

Operated only by Flight Attendant who is in charge of the F & J Class galley and for chilling only wines and champagne rapidly to their optimum serving temperature.

Do not put anything other than wine and champagne.

The unit was equipped with a locking device or door knob. The operating instruction of the door knob is as follows:



- To OPEN the door:
Turn door knob in OPEN position and hold.
- SAFE position:
Door is mechanically latched or not ready for operation.
- To LOCK the door:
Turn door knob from SAFE position to LOCK position. Door knob has to be in LOCK position during operation.

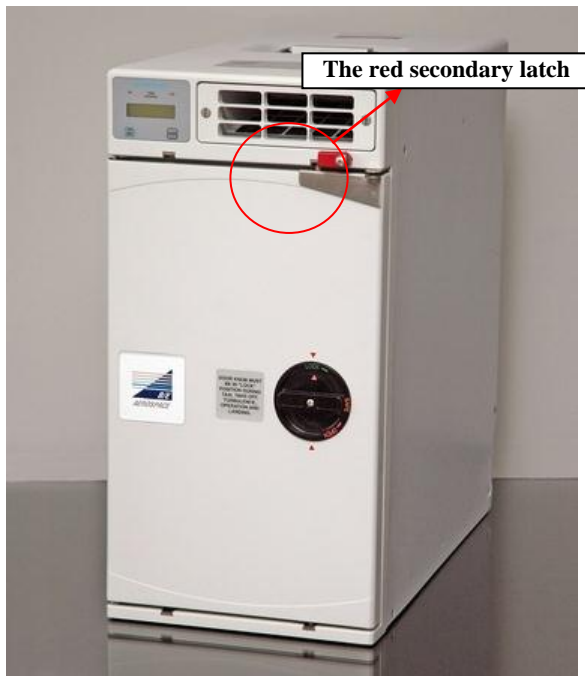


Figure 4: The refrigeration unit

The door was fitted with a red secondary latch should be put in the LOCK position during take-off and landing (Figure 4). The door was also fitted with a pressure relief valve, which would open to relieve pressure differences between the inside and outside of the unit.

The refrigeration unit was equipped with a display at the front panel showing the active mode selection, warning and failure indication (Figure 5).



Figure 5: The front panel display

The refrigeration unit warning and failure indications are as follows:

- Temperature Warning
 - This is an indication of degraded performance of the unit.
 - The unit will continue to operate.
 - The unit will illuminate the Amber Temperature Warning lamp and display the compartment and target temperatures.
 - This is usually caused by overstocking the compartment with boxes or cartons; i.e., ice cream etc., or if the door is open or ajar during operation.

- If the problem persists, refer to maintenance for correction.
- Unit Failure
 - This indicates the unit is not operating, (It has been shut down due to an internal fault).
 - The Red FAIL Lamp will illuminate, The ON Lamp will extinguish and the display will show Unit Failed.



Figure 6: The location of the refrigeration unit in middle galley

After the aircraft landed at Jakarta, the failed refrigeration unit was brought to Garuda Maintenance Facilities for further test and inspection. A functional test on the refrigeration unit revealed that the refrigeration system operated normally.

1.3.3 Data Memory Module

The refrigeration unit was equipped with a Data Memory Module which recorded the operation performance data for maintenance purposes.

The KNKT downloaded the Data Memory Module of the refrigeration unit in the Garuda Maintenance Facility Aeroasia. The memory module contained good data of 40 operating cycles. The first operating cycle was logged as 2472 and the last was 2512. The refrigerator had total operating hours of 26034.1. The compressor motor had run 16444.5 hours, the evaporator fan had run 15854 hours and the condenser fan had run for 16542.1 hours.

In normal operation, every three minutes the memory will record the status of the refrigerator. If there was no other event, the memory will record the status "Periodic". At this time the temperature was recorded 45°F.

The last logged data indicated that the refrigeration unit had operated for 5 hours, 58

minutes and 14 seconds before the power was disconnected.

The last logged data revealed information as follows:

- Since the beginning of the last recording, the refrigeration unit was operated in Wine Chiller mode with a target controlled temperature of 46°F (7.8°C);
- At time stamp 05:44:14, the memory module recorded the status “Door Open”, the target controlled temperature was 46°F (7.8°C), the compartment temperature was 44°F (6.7°C) and the ambient temperature was 74°F (23.3°C).
- At time stamp 05:44:18, the memory module recorded the target controlled temperature was 46°F (7.8°C) while the compartment temperature dropped to 31°F (-0.5°C) and the ambient temperature decreased to 71°F (21.6°C);
- At time stamp 05:58:37, the memory module recorded the refrigeration unit power disconnected.

1.4 Damage to the Refrigeration Unit

- The refrigeration unit door detached and bent in a U shape;
- The refrigeration unit compartment bulged outwards (Figures 7 and 8).



Figure 7: Bulging on the refrigeration unit



Figure 8: The deformation of the separated door (note: the time stamp was the camera time and was not set correctly)

1.5 Medical and Pathological Information

The injured flight attendant was treated by a doctor and a paramedic on-board the aircraft. The doctor and paramedic monitored the injured FA's condition until the aircraft arrived at Jakarta.

The aircraft landed at the Soekarno-Hatta International Airport Jakarta, an ambulance was standing by on the gate to transport the injured FA to the airport health facility. After the aircraft parked, the injured FA transferred to the airport health facility. After approximately 15 minutes, the injured FA was then transferred to the Royal Taruma Hospital where the FA's condition remained stable. At the hospital, cranial surgery was conducted, which was initiated approximately 11 hours since the time of the accident. The injured FA remained in hospital under medical care for 18 days.

According to the neuro surgeon, the condition of the injured FA was classified as a serious injury which required appropriate medical assistance within the golden period of less than 6-8 hours after the occurrence.

1.6 Organizational and Management Information

The aircraft was owned and operated by PT. Garuda Indonesia that held a valid Air Operator Certificate number 121/001. Garuda Indonesia operated to several airports in Australia including Melbourne, Sydney, Perth and Brisbane.

Garuda Indonesia had several manuals that were approved by the Directorate General of Civil Aviation. The followings are the relevant issue taken from the Garuda Indonesia manuals.

1.6.1 Basic Operation Manual

4.1.2 COMMUNICATION

07 DISTRESS COMMUNICATION

An aircraft is in distress condition, when it is threatened by serious and/or imminent danger and requires immediate assistance. The RTF distress signal is the word "MAYDAY", spoken three times on the air/ground frequency in use.

Other ways of indicating a distress condition are:

- *The activation of the appropriate SSR mode and code, i.e. mode A or B and code 7700;*
- *Transmitting the distress message on the emergency frequency 121.50 MHZ.*

Circumstances and time permitting the following information should be given in the distress message:

- *name of station addressed*
- *identification of the aircraft*
- *nature of distress condition*
- *intentions of person in command*
- *Present position, level and heading.*

Distress communications have absolute priority over all other radio traffic; other stations shall not transmit on the frequency concerned until the distress communication is ended or transferred to another frequency, unless a station has to render assistance.

As soon as the distress condition is ended, the aircraft or the controlling station shall cancel the distress phase.

08 URGENCY COMMUNICATIONS

This type of communication concerns the safety of an aircraft or other vehicle, or of a person on board or in sight, not requiring immediate assistance.

The RTF urgency signal is the word PAN-PAN, preferably spoken three times on the air/ground frequency in use. The following information should be given in the urgency message: 1) name of station addressed; 2) Identification of the aircraft; 3) nature of urgency condition; 4) present position, level and heading; and, 4) any other useful information.

5.2 HEALTH

5.2.1 Sickness and Accidents on Board

(5) Action To Be Taken When Flight Attendant Incapacitated

- *First Step*
 - *One FA report to cockpit crew using cabin – cockpit communication protocol;*
 - *PIC declare URGENCY or EMERGENCY whichever is applicable;*
 - *Have the incapacitated crewmember seated with recline position. Assistance of other crewmember or passengers might be required.*
- *Second Step*
 - *Take care of the incapacitated crew member by trying to provide first aid treatment with prior consultation if (and ask for presence) doctor or the other medical persons are aboard;*

- Arrange a landing as soon as practicable after considering all pertinent factor (condition of the incapacitated, remaining flight time and suitability of en-route airport for emergency landing);
- Arrange medical assistance after landing – giving as many details about the condition of the affected crew member as possible.
- **Third Step**
 - Prepare for landing (cockpit and cabin), but do not press for hasty approach;
 - Perform approach checklist earlier than normal (request assistance from other crew members or “Capable” persons);
 - Request radar vectoring and make an extended approach – where possible – to reduce workload;
 - Depending on the situation, have the incapacitated crew off-loaded from the airplane and to the ambulance as quickly as possible.
 - Complete the air safety reporting and other required form.
 - Arrange for the parking of the aircraft.

1.7 Additional Information

1.7.1 Material Safety Data Sheet – Dry Ice

The Continental Carbonic Product, Inc. in 2009⁴ developed a material safety data sheet related for the dry ice. The relevant excerpts were as follows:

REACTIVITY DATA

Dry ice sublimates; if confined in a gas tight container, it will build up a pressure of 850 psi at 70° F. Do not put dry ice in an airtight container or confined space.

Stability: Yes

Conditions to Avoid (Stability): Moisture

Materials to Avoid: Carbonic acid/salt/corrosive chemicals

Hazardous Polymerization Occurrence: No

PRECAUTIONS FOR SAFE HANDLING AND USE

Steps if Material Released/Spill:

Ventilate indoor areas well to avoid hazardous CO₂ concentrations. Ventilate area well and avoid contact with cold vapors/dry ice. CO₂ is heavy gas and will remain in low spots without assisted ventilation.

Special Precautions for Handling of Solid Carbon Dioxide

Do not handle solid Carbon Dioxide with bare hands. Use heavy gloves, dry ice tongs or plastic scoop or shovel. Handle blocks of dry ice carefully, as injuries can occur if one is accidentally dropped on the feet. Containers of solid Carbon Dioxide should be stored upright and be firmly secured to prevent falling or being knocked over. Containers should be vented, to prevent the build-up of Carbon Dioxide gas.

⁴ The Material Safety Data Sheet can be read online on http://education.jlab.org/frost/msds/dry_ice.pdf

Carbon Dioxide sublimates at -78.5°C (-109.3°F); containers should be thermally insulated and kept at the lowest possible temperature to maintain the solid and avoid generation of Carbon Dioxide gas. Storage containers and equipment used with Carbon Dioxide should not be located in sub-surface or enclosed areas, unless engineered to maintain a concentration of Carbon Dioxide below the TLV (TLV=5000 ppm) in the event of a release. Solid consignment of dry ice in a gas-tight vessel can lead to catastrophic failure of the vessel by over-pressurization. Storage of dry ice should never occur in a gas-tight container.

1.8 Useful or Effective Investigation Techniques

The investigation was conducted in accordance with the KNKT approved policies and procedures, and in accordance with the standards and recommended practices of Annex 13 to the Chicago Convention.

2 ANALYSIS

Based on the factual information of failed refrigeration unit, the analysis will focus on the following issues:

- The refrigeration unit damage;
- The pilot decision to continue the flight.

2.1 The Refrigeration Unit Damage

After flying for approximate three hours and near the way point DEENO, the refrigeration unit door was thrown towards and hit the face of one of the Flight Attendant (FA) who was standing on galley, seriously injuring the FA.

The Data Memory Module of the refrigeration unit revealed that it recorded a total of 5 hours, 58 minutes, and 14 seconds of operation before the power disconnected. The refrigeration unit operated normally in wine chiller mode with a target temperature of 46°F (7.8°C).

At time stamp 05:44:14, the memory module recorded “Door Open” followed by compartment temperature dropped of 13°F (44°F to 31°F) in 4 seconds. According the manufacturer, the recorded “Door Open” was the time when the refrigeration unit burst and the door was thrown towards. The flight attendants stated that after the occurrence the champagne bottles, juice, and milk scattered on the floor.

The damage showed that the door was severely deformed and thrown towards. The refrigeration unit walls were bulged, indicating that the damage was caused by a build-up of pressure from inside the unit.

The refrigerator unit was functioning normally as indicated by the record of memory module. The functional test was also performed at the GMF indicated that the refrigerator functioned normally. From this evidence, it can be concluded that the origin of the pressure build up was not from the refrigeration system.

The only substance on board the aircraft that could initiate an increase in pressure was dry ice and it was established that it was inserted into the refrigeration unit prior to the failure.

In reference to the Material Safety Data Sheet (MSDS) of dry ice, it stated that dry ice starts to sublime at -78.5 °C (-109.3 °F) and if stored in confined gas tight container, it will build up to a pressure of 850 psig at 70° F.

The presence of dry ice in the refrigerator compartment at a temperature of 46° F, would therefore lead to dry ice sublimation, and a subsequent increase of the pressure in the refrigeration unit compartment.

A safety relief valve was fitted in the refrigeration unit door to relieve pressure differences between the inside of the compartment and external pressure. However, if the pressure build-up was too rapid, the safety relief valve would not have the capacity to relieve the pressure and a pressure build up would occur within the compartment to the point of failure of the compartment door. The investigation was unable to establish the peak pressure obtained within the compartment that leads to the door failure.

2.2 The Pilot Decision to Continue the Flight

At the time of the refrigeration unit failure, the aircraft had been flown for approximately three hours and was near waypoint DEENO, which was under Brisbane Air Traffic Control.

After the occurrence, a Flight Attendant informed the PIC that one of the FA's had been injured. After first aid had been administered to the injured FA, at approximately 48 minutes after the occurrence, the PIC consulted with the doctor regarding the condition of the injured FA. The doctor stated that the injured FA condition was stable, the bleeding had stopped and that it was safe to continue the flight to Jakarta. Referring to the doctor's statement, the PIC decided to continue the flight to Jakarta and the PIC requested the doctor to inform him of any significant changes.

Assuming that the aircraft was cruising with a ground speed of 550 knots, at the time the PIC consulted to the doctor, the aircraft was approximately 458 Nm from waypoint DEENO. The suitable airports near that position were Denpasar and Darwin. The distance from this point to Denpasar was approximately 740 Nm and approximately 440 Nm to Darwin. The flight time to Darwin would take approximately 50 minutes and to Denpasar would take approximately 80 minutes.

The PIC considered the possibility of diverting to Denpasar if the injured FA's condition required further immediate medical assistance and had coordinated with the flight operation staff in Denpasar airport.

The PIC did not elect to divert to Darwin as he considered that the injured FA was stable and that a 30 minute difference would not significantly affect the injured FA's condition. Diverting to Darwin would also likely increase the complexity of the continuation of the flight in relation with passenger handling, flight approval and refuelling as Garuda Indonesia did not have representative in Darwin. Other consideration was that the failure of the refrigeration unit did not relate to security issue.

After communicated with the Flight Operation Staff in Denpasar, the pilot received information from the doctor that the FA condition was stable, the bleeding had stopped and it was safe to continue the flight to Jakarta. The pilot decided to continue the flight to Jakarta.

The operator's Basic Operation Manual (BOM) 5.2.1 Sickness and Accidents on Board point (5) Action To Be Taken When Flight Attendant Incapacitated, contained the procedure in the case a flight attendant becomes incapacitated and unable to perform their job. Practically all items described in the above mentioned manual were executed by the crew, except the item that was the PIC transmission of an urgency or emergency message.

By not communicating the urgency or emergency message as required by the BOM, the PIC reduced the possibility of utilising additional resources (in this case ATC) to assist make a decision to either divert or continue to Jakarta. In hindsight, the injuries sustained by the FA were more serious than initially indicated and required more immediate attention.

3 CONCLUSION

3.1 Findings⁵

1. The crewmembers held valid licenses and medical certificates.
2. The aircraft had a valid Certificate of Airworthiness (C of A) and Certificate of Registration (C of R), and was operated within the weight and balance envelope.
3. The aircraft was equipped with self-contained vapour cycle system refrigeration unit (chiller/refrigerator/freezer) that provides forced cooling air within an insulated refrigeration compartment.
4. While cruising after about three hours after departure, a refrigeration unit in the pantry number 2 of galley number 4 (middle galley) burst. The refrigeration unit door was thrown towards and hit the face of one of the Flight Attendants, resulting in serious injuries.
5. The injured FA was treated by a doctor and a paramedic. The doctor stated to the PIC that the injured FA condition was stable, the bleeding had stopped and that it was safe to continue the flight to Jakarta. Referring to the doctor statement, the PIC decided to continue the flight.
6. The PIC considered the possibility of diverting to Denpasar if the injured FA condition required further immediate medical assistance and had coordinated with the flight operation staff in Denpasar.
7. The PIC did not elect to divert to Darwin considering that the injured FA was stable and the differences in distance between Denpasar and Darwin would not significantly affecting the injured FA condition. Diverting to Darwin would likely increase the complexity of the continuation of the flight.
8. The PIC did not declare the event to the ATS either by urgency or emergency message as required by the operators BOM.
9. The observation of the damage showed that the door folded and the bulging on the refrigeration unit indicated that the damaged was caused by the significant build-up of pressure inside the refrigeration unit.
10. The refrigeration unit was surrounded by oven and the galley wall, therefore, the gas pressure would direct to the weakest area which was the refrigeration door.
11. During the flight, dry ice was inserted into the refrigeration unit. The dry ice sublimed and created excessive built up of pressure in the refrigeration unit. The pressure relief valve on the refrigeration unit was unable to relief the built up pressure.

⁵ Findings are statements of all significant conditions, events or circumstances in the accident sequence. The findings are significant steps in the accident sequence, but they are not always causal, or indicate deficiencies. Some findings point out the conditions that pre-existed the accident sequence, but they are usually essential to the understanding of the occurrence, usually in chronological order.

3.2 Contributing Factors⁶

The burst of the refrigeration door was a result of pressure build-up that exceeded the capacity of the safety relief valve due to dry ice being placed in the refrigeration unit compartment. The door burst resulted in serious injuries to the flight attendant.

⁶ Contributing Factors is defined as events that might cause the occurrence. In the case that the event did not occur then the accident might not happen or result in a less severe occurrence.

4 SAFETY ACTION

At the time of issuing this Final report, the Komite Nasional Keselamatan Transportasi (KNKT) had been informed safety actions resulting from this occurrence by PT. Garuda Indonesia.

On 26 August 2016, PT. Garuda Indonesia issued safety notices to all Cabin Crew to remind to the company policies and procedures. The safety notices are as follows:

1. Temporary de-activated refrigeration unit with same part number;
2. Prohibition to put dry ice in the refrigeration unit.

5 SAFETY RECOMMENDATIONS

Komite Nasional Keselamatan Transportasi (KNKT) acknowledged the safety action taken by the aircraft operator and considered them relevant to prevent similar occurrence. Therefore, KNKT did not issue safety recommendation to the aircraft operator.

KNKT issued one safety recommendation to the Directorate General of Civil Aviation.

- **04.R-2016-82.1**

To enforce the development of cabin crew procedures by the operators to adequately handle the dry ice on board the aircraft.

6 APPENDICES

6.1 Safety Notice of PT. Garuda Indonesia



PENGUMUMAN
No.JKTCC/PE/60009/15

tentang

**LARANGAN PELETAKKAN *DRY ICE* DI DALAM
*GALLEY REFRIGERATOR***

Mengacu pada Pengumuman sebelumnya No.JKTCC/PE/60006/15 tentang *De-Activated Galley Refrigerator* pada tanggal 24 Agustus 2015, dengan ini kepada seluruh Awak Kabin, kami sampaikan sebagai berikut:

1. Tidak diperkenankan untuk meletakkan *Dry Ice* di dalam *Galley Refrigerator (Wine Chiller)*.
2. Terlampir ketentuan mengenai *dry ice* untuk diketahui.

Demikian disampaikan untuk diketahui dan dilaksanakan. Terima kasih dan selamat bertugas.

Dikeluarkan di: Jakarta
Pada tanggal : 26 Agustus 2015

6.2 Accredited Representatives Comments

BEA and Airbus Comments and proposals Reviewed

Item	Report KNKT	Extract commented	Comment	Proposal	KNKT Review
1	Synopsis (page iv)	On 25 August 2015, an Airbus 330-200 aircraft, registered PK-GPO, was being operated by PT. Garuda Indonesia	The date of incident mentioned in the KNKT notification is the 22 August 2015, which is also the reported event date from Airbus Customer Services.	Please consider updating the paragraph.	Accepted. The paragraph has been updated
2	Synopsis (page iv)	Approximately 3 minutes after the dry ice was inserted into the refrigeration unit, the unit door burst. The refrigeration unit door detached and injured one of the Flight Attendant (FA).	Clarification of the event.	Approximately 3 minutes after the dry ice was inserted into the refrigeration unit, this last one burst. The refrigeration unit door was thrown towards and injured one of the Flight Attendant (FA).	Partially accepted. The paragraph has been updated
3	Synopsis (page iv)	The investigation concluded that the separation of the refrigeration door was due to unavailability of the procedure to handle dry ice resulted in the dry ice being placed in the refrigeration unit compartment.	Clarification of the event.	The investigation concluded that the projection of the refrigeration unit door was due to unavailability of the procedure to handle dry ice resulted in the dry ice being placed in the refrigeration unit compartment.	Partially accepted. The paragraph has been updated
4	Synopsis (page iv)	The door separation resulted in serious injuries to the flight attendant.	Clarification of the event.	The door projection resulted in serious injuries to the flight attendant.	The paragraph has been updated
5	Synopsis (page iv)	PT. Garuda Indonesia had performed safety actions following this occurrence. Komite Nasional Keselamatan Transportasi (KNKT) considered that the safety actions were relevant to improve safety.	The proposed wording is for clarification of the sentence.	PT. Garuda Indonesia has put in place several safety actions following this occurrence. Komite Nasional Keselamatan Transportasi (KNKT) considered that the safety actions were relevant to improve safety and prevent reoccurrence.	Accepted. The paragraph has been updated
6	Synopsis (page iv)	KNKT issued safety recommendation addressed to the Directorate General of Civil Aviation (DGCA).	Clarification	KNKT issued one safety recommendation addressed to the Directorate General of Civil Aviation (DGCA).	Accepted. The paragraph has been updated
7	1.1 (page 1)	At about 0700 UTC, or approximately 3 minutes after the dry ice was inserted into the refrigeration unit, the unit door	Clarification of the event.	At about 0700 UTC, or approximately 3 minutes after the dry ice was inserted into the refrigeration unit, this last one burst. The refrigeration unit door was thrown towards and hit the face of one of the Flight Attendant	The paragraph has been updated

		burst. The refrigeration unit door detached and hit the face of one of the Flight Attendant (FA) who was standing in the galley (Figure 2).		(FA) who was standing in the galley (Figure 2).	
8	1.1 (page 2)	The other FA stated that after the refrigerator unit burst, [...]	Clarification	The other FA stated that after the refrigeration unit burst and the refrigeration unit door was thrown towards...	Accepted. The paragraph has been updated
9	1.3.2 (page 4)	The door size is 22.1 inch x 11.2 inches.	During the meeting with B/E Aerospace (31st of May 2016), the following values were provided by email by Mr David Wang QUOTE · 2 pictures to show the built-in door seals (silicon in white color, 16.2” height x 9.3 inches width). UNQUOTE	The door size (measure based on the built-in seals) is 16.5 inch height x 9.3 inch width	The data is based on the Flight Attendant Service Manual.
10	1.3.2 (page 5)	The door was fitted with a red secondary latch should be put in the LOCK position during takeoff and landing (Figure 4). The door was also fitted with a pressure relief valve and opening to relieve pressure differences between the inside and outside of the unit.	The proposed wording is for clarification of the sentence.	The door was fitted with a red secondary latch which should be put in the LOCK position during take-off and landing (Figure 4). The door was also fitted with a pressure relief valve, which would open to relieve pressure differences between the inside and outside of the unit.	Accepted. The paragraph has been updated
11	1.4 (page 7)	The refrigeration unit door detached and bent in a U shape;	Clarification of the event.	The refrigeration unit door was thrown towards and bent in a U shape;	This section was related to damage to aircraft.
12	2.1 (page 12)	After flying for approximate three hours and near the way point DEENO, the refrigeration unit door burst and hit the face	Clarification of the event “door”	After flying for approximate three hours and near the way point DEENO, the refrigeration unit burst and the refrigeration unit door was thrown towards and hit the face	Accepted. The paragraph has been updated
13	2.1 (page 12)	According the manufacturer, the recorded “Door Open” was the time the door bursting and detached.	Clarification of the event.	According the manufacturer, the recorded “Door Open” was the time when the refrigeration unit burst and the door was thrown towards.	Accepted. The paragraph has been updated
14	2.1 (page 12)	The damage showed that the door was severely deformed and detached.	Clarification of the event.	The damage showed that the door was severely deformed and thrown towards.	Accepted. The paragraph has been updated
15	2.1	The presence of dry ice in the	The proposed wording is for	The presence of dry ice in the refrigerator compartment	Accepted.

	(page 12)	refrigerator compartment at a temperature of 46° F, would expect to sublime and increase the pressure in the refrigeration unit compartment.	clarification of the sentence.	at a temperature of 46° F would therefore lead to dry ice sublimation, and a subsequent increase of the pressure in the refrigeration unit compartment.	The paragraph has been updated
16	2.2 (page 13)	The suitable airports near that position were Denpasar and Darwin. The distance from this point to Denpasar was approximately 740 Nm and approximately 440 Nm to Darwin. The flight time to Darwin would take approximately 50 minutes and to Denpasar would take approximately 80 minutes.	As the final Captain's decision was to continue the flight to destination (and not to divert), it is interesting to provide the time and distance information with regards to the destination (Jakarta).	Please consider adding the distance and time to reach the destination (Jakarta)	The analysis 2.2 has been updated to describe the pilot decision to continue the flight to Jakarta.
17	2.2 (page 13)	The suitable airports near that position were Denpasar and Darwin. The distance from this point to Denpasar was approximately 740 Nm and approximately 440 Nm to Darwin. The flight time to Darwin would take approximately 50 minutes and to Denpasar would take approximately 80 minutes.	Clarification of the flight times to Jakarta	The distance between Denpasar and Jakarta is around 500 Nm, approximately 55 minutes with a ground speed of 550 knots. So according to the report, it seems that at 07h48 UTC the flight time to Jakarta was around 136 minutes. Now, the aircraft landed at Jakarta at around 11h00 UTC, that is to say 192 minutes. Did the aircraft met some delay or other issues?	The analysis 2.2 has been updated to describe the pilot decision to continue the flight to Jakarta.
18	3.1 (page 14)	The refrigeration unit door detached and hit the face of one of the Flight Attendants, resulting in serious injuries.	Clarification of the event.	The refrigeration unit door was thrown towards and hit the face of one of the Flight Attendants, resulting in serious injuries.	Accepted. The paragraph has been updated
19	3.1 (page 14)	The observation of the damage showed that the door folded and the bulging on the refrigeration unit indicated that the damaged was caused by the significant build-up of pressure inside the refrigeration unit.	Clarification of the findings	The observation of the damage showed that the door was thrown towards and bent in a U-shape and the bulging on the refrigeration unit indicated that the damaged was caused by the significant build-up of pressure inside the refrigeration unit	This finding was related to the damage to aircraft component.
20	3.2 (page 15)	The separation of the refrigeration door was due to unavailability of the procedure to handle dry ice resulted in the dry ice being placed in the	Clarification of the event.	The projection of the refrigeration door was due to unavailability of the procedure to handle dry ice resulted in the dry ice being placed in the refrigeration unit compartment. This led to a build-up of internal	The paragraph has been updated

		refrigeration unit compartment. This led to a build-up of internal pressure that exceeded the capacity of the safety relief valve. The door separation resulted in serious injuries to the flight attendant.		pressure that exceeded the capacity of the safety relief valve. The subsequent door projection resulted in serious injuries to one flight attendant.	
21	4 (page 16)	At the time of issuing this Draft Final report, the Komite Nasional Keselamatan Transportasi (KNKT) had been informed safety actions resulting from this occurrence by PT. Garuda Indonesia.	Clarification	At the time of issuing this Draft Final report, the Komite Nasional Keselamatan Transportasi (KNKT) has been informed of the safety actions put in place by the Operator as a result of this occurrence by PT. Garuda Indonesia.	The paragraph has been updated
22	5 (page 17)	Komite Nasional Keselamatan Transportasi (KNKT) acknowledged the safety action taken by the aircraft operator and considered relevant to prevent similar occurrence. Therefore, KNKT did not issue safety recommendation to the aircraft operator.	Clarification	Komite Nasional Keselamatan Transportasi (KNKT) acknowledged the safety actions taken by the aircraft operator and considered them relevant to prevent similar occurrence. Therefore, KNKT did not issue any safety recommendation to the aircraft operator.	Accepted. The paragraph has been updated
23	5 (page 17)	KNKT issued safety recommendation to the Directorate General of Civil Aviation.	The proposed wording is for clarification of the sentence.	KNKT issued one safety recommendation to the Directorate General of Civil Aviation.	Accepted. The paragraph has been updated
24	5 (page 17)	To enforce the other operator for developing procedure to handle the dry ice on board the aircraft.	The proposed wording is for clarification of the sentence.	To enforce the development of cabin crew procedures by the operators to adequately handle the dry ice on board the aircraft.	Accepted. The paragraph has been updated

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