



Example Application  
of  
Cabin Procedural Investigation Tool  
(CPIT)

*Prepared by:*

**Mike Moodi & Steven Kimball**  
**BSMS Project Manager**  
**Boeing Company**  
**P.O. Box 3707 MC 20-89**  
**Seattle, Washington 98124-2207**  
**Tel: +1 (206) 662-7542**  
**Fax: +1 (902) 662-7812**  
**E-mail: mike.m.moodi@boeing.com**

*In Conjunction with:*

**GAIN Working Group B, Analytical Methods and Tools**

**September 2004**



## **Preface**

This example application has been prepared by the Boeing Company in conjunction with the Global Aviation Information Network (GAIN) Working Group B (Analytical Methods and Tools) (WGB) as one of a number of such examples of the use of analytical methods and tools described in the “*Guide to Methods & Tools for Airline Flight Safety Analysis*”. The intent of these example applications is to illustrate how various tools can be applied within an airline flight safety department, and provide additional information on the use and features of the tool and the value of such analysis. GAIN WG B hopes that these example applications will help increase the awareness of available methods and tools and assist the airlines as they consider which tools to incorporate into their flight safety analysis activities.

Each example application of an analytical method or tool is posted on the GAIN website ([www.GAINweb.org](http://www.GAINweb.org)). Readers are encouraged to check the website periodically for a current list of example applications, as further examples will be added as they become available.

### **Disclaimers; Non-Endorsement**

All data and information in this document are provided “as is,” without any expressed or implied warranty of any kind, including as to the accuracy, completeness, currentness, noninfringement, merchantability, or fitness for any purpose.

The views and opinions expressed in this document do not necessarily reflect those of the Global Aviation Information Network or any of its participants, except as expressly indicated.

Reference in this document to any commercial product, process, or service by trade name, trademark, servicemark, manufacturer, or otherwise, does not constitute or imply any endorsement or recommendation by the Global Aviation Information Network or any of its participants of the product, process, or service.

### **Notice of Right to Copy**

This document was created primarily for use by the worldwide aviation community to improve aviation safety. Accordingly, permission to make, translate, and/or disseminate copies of this document, or any part of it, *with no substantive alterations* is freely granted provided each copy states, “Reprinted by permission from the Global Aviation Information Network.” Permission to make, translate, and/or disseminate copies of this document, or any part of it, *with substantive alterations* is freely granted provided each copy states, “Derived from a document for which permission to reprint was given by the Global Aviation Information Network.” If the document is translated into a language other than English, the notice must be in the language to which translated.

## **Cabin Procedural Investigation Tool**

### **1 Introduction**

The Cabin Procedural Investigation Tool (CPIT) is a tool for investigating cabin operations system failures and is part of a set of reactive tools developed to augment an airline Safety Management System (SMS). In support of the industry effort to implement safety management systems at airlines, Boeing has developed tools and processes to help airlines manage safety risks associated with human error.

#### **1.1 OVERVIEW OF THE TOOL FUNCTIONALITY**

The objective of CPIT is to establish cause and effect in the analysis of operational incidents involving cabin services system failures which are often manifested in crew procedural deviations/errors. Since cabin crew errors can contribute to the flight safety, security and efficiency, an effective tool is needed to further lower those areas of risk. CPIT is a process for event data collection and analysis to improve overall cabin crew operations.

CPIT relies on a cognitive approach to identify the underlying reasons for crew performance. It is well established that cabin crew procedural deviations/errors have resulted in serious safety or loss events (e.g., personal injury, equipment damage). The underlying reasons for the cabin crew errors are called contributing factors.

Contributing factors are normally defined as conditions under management control that lead to procedural non-compliance. Procedural non-compliance is broadly defined as any action that the cabin crew should or should not have taken. CPIT was specifically developed to investigate serious cabin operational events.

Whether or not an act of non-compliance may be intentional, it is rare a non-compliant crewmember expects a potentially negative outcome. In most cases, multiple contributing factors beyond the crewmember's control lead to erroneous actions. Obviously, cases of intended consequences or reckless disregard for possible consequences are not considered human error in the context of CPIT analysis.

The CPIT analysis form contains 4 main categories of contributing factor types. These include Procedural/Training, Equipment/Work area, Individual/Performance Shaping, and Crew Coordination/Communication Factors. An open communication or "Just Culture" policy is essential to an effective CPIT investigation of those factors.

#### **1.2 INTRODUCTION TO THE EXAMPLE APPLICATION**

In the event described in section 3.2, a CPIT investigation was conducted to gain an in-depth understanding of factors that contributed to cabin crew actions which led to an unintended slide deployment at the gate.

### **2 Input Data**

In addition to the collection of general event information, the essential data for the CPIT process are gathered from structured interviews with cabin crews who were involved in the event. The overall objective of the investigation is to learn how similar errors can be prevented in the future.

## Example Applications of Analytical Tools for Airline Flight Safety

After a preliminary review of factual incident information and interview preparation, the CPIT investigator will arrange for an interview with each of the crewmembers involved. The first step in the process is to ask the crewmember for recommendations that, in his/her opinion would prevent that type of incident in the future. This approach of soliciting crewmember recommendations further empowers the crewmember and sets the stage for determining what actions (i.e., procedural errors) led to the event and, most importantly, what the conditions (i.e. contributing factors) were that influenced cabin crew decisions.

In summary, the purpose of the interview is to understand and record the errant crew member actions and the underlying reasons for their actions. Once the causal relationships are established between the crew errors and the contributing factors, it is possible for the investigator to develop a set of general recommendations aimed at reducing or eliminating the effect of the validated contributing factors initially identified from the discussion with the cabin crew.

The events and procedural deviations are preventable through the management of the contributing factors. See Figure 1 for the model of a CPIT event investigation. Note that all procedural deviations were necessary to make this event occur. All the depicted factors contributed to the procedural deviations.

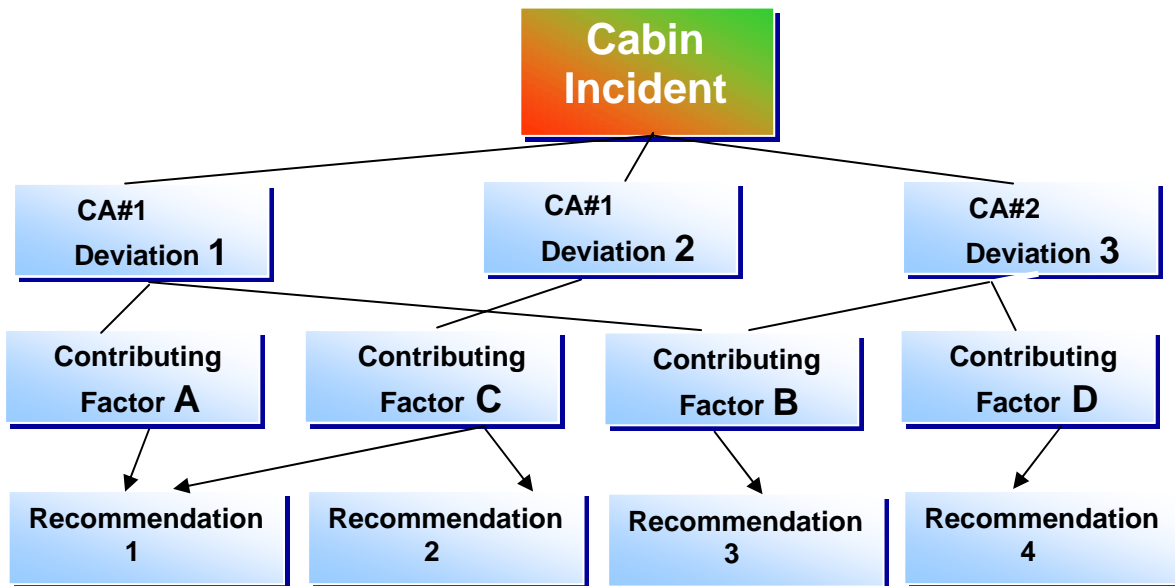


Figure 1 Cabin incident investigation model

Because of the complex relationship that exists between factors and deviations in the event, CPIT analysis doesn't apply Root Cause method or a "Blame" approach.

### 3 Analytical Process

With the use of the Cognitive Process, the task of identifying contributing factors is primarily the responsibility of the employee who actually experienced those factors and made decisions that led to the incident. The investigator is not the author of the story, just systematic organizer and describer of the story. Obviously, this process can *rarely* be applied to incidents in which the crewmember is under jeopardy.

### **3.1 PROCESS STEPS**

After an event happens and a preliminary event summary is assessed,

1. Cabin management determines if amnesty will be granted to each crewmember involved. The CPIT philosophy maintains this should automatically be the case with most events that are contained within the airline's jurisdiction. Cabin management then authorizes the CPIT investigation.
2. The investigator/manager assigned to the event will prepare for the structured interview by reviewing:
  - a. Preliminary event information
  - b. Procedures that should have prevented the event
  - c. Initial employee reports, if any

The investigator will develop a list of potential errors that the Cabin crew may have committed, *but will avoid speculating about the contributing factors to those errors*. This list may be helpful to the crewmember as he recreates the event description during the interview.

3. The investigator should arrange an interview time and location that is as comfortable as possible for the crewmember.
4. As mentioned already, the investigator should start by asking the employee:
  - a. What company/management should do to prevent this incident in the future?
  - b. What the crewmember (as well as other employees) should do to prevent this kind of incident in the future.
5. Given those recommendations, the investigator should identify what contributing factors the crewmember's recommendations would address. Crewmember recommendations may or may not effectively remedy the effects of contributing factors. However, the process of proposing recommendations/improvements naturally leads the crewmember to think about the contributing factors to his errors.
6. Given the initial list of contributing factors identified by the crewmember, the investigator will organize those contributing factors by the crew decision errors they induced. A skilled CPIT investigator will emphasize that the focus of the investigation is not on the crewmember ability, but on how those contributing factors "worked together" to induce the errors.
7. The investigator should use the actual Cabin crew procedural errors to completely describe the event. The investigator may find that he and the crewmember will need to thoroughly review the sequence of procedural steps that applied to this event. The product will be a factual sequence of actions leading to the outcome called the "event summary".
8. The investigator should thank the crewmember for his help and maintain an avenue for follow-up contact with the employee.
9. Based on the event summary and list of contributing factors, the investigator will provide general recommendations aimed at reducing or eliminating the effect of contributing factors in the incident to relevant managers. While the investigator's report alone may often be sufficient, the investigator should be available to facilitate the development of specific recommendations with the applicable managers.

### **3.2 EXAMPLE CASE**

The Cabin Manager was informed about a recent inadvertent slide deployment incident which occurred while the airplane was at the gate. The preliminary incident report stated prior to departure the main cabin door slide was deployed into a jet way. One passenger service agent received injuries which will require approximately two months recovery. Another passenger service agent was slightly injured. The jet way received minor damage and the airplane was delayed for 5 hours due to repairs. The crew for this sector was replaced due to duty time limitations. Direct costs totaled \$35,000.00. Additional indirect costs were estimated at \$5,000.00.

1. Because the event was contained and the involved crewmembers passed an administrative investigation, the Cabin Manager determined a CPIT investigation should be conducted with the appropriate level of amnesty.
2. A Flight Safety Investigator and Cabin Services Supervisor reviewed the reports of both the Captain (designated PF) and the cabin attendant (designated CA#1) who deployed the slide. The passenger service agents were also interviewed. The investigative team's preliminary understanding was:
  - a. The passenger service agent was attempting to deliver an updated version of the flight manifest. An error had been made on the original manifest because a new computer system was being used.
  - b. The aircraft was about to push back when Dispatch called the flight crew and notified them to delay pushback until the new papers were on board. There were some hazardous materials on board that had not been previously accounted for.
  - c. The cabin attendant had forgotten to disarm the door prior to opening the door.
  - d. This was the last sector of a 4 sector day.
3. The Flight Safety Investigator and Cabin Services Supervisor arranged to meet with the Captain and cabin attendant together.
4. While both crewmembers were interviewed, this example will primarily reflect the cabin attendant's remarks. The cabin attendant (CA#1) made the following recommendations:
  - a. Passenger service agents should not knock on the aircraft doors except in cases of emergency.
  - b. Cabin attendants should take special care to ensure children are properly secured to their seats prior to pushback.
  - c. Cabin attendants should feel free to request assistance from one another when their work load is high.
  - d. Captains should remind cabin attendants to disarm the doors if the flight crew requests the doors to be opened in non-emergency situations. Especially if the flight crew cleared the doors to be armed in the first place.
5. During the interview, the cabin attendant described the contributing factors to the decisions/errors in the event (listed below).
6. The primary procedural error was the cabin attendant did not disarm the door prior to opening it. The contributing factors are numbered (CF#1-5) in the following narrative:

*"After closing the doors, the flight crew notified the cabin to 'secure the cabin.' According to normal procedures the cabin crew subsequently armed the doors for push back. Just prior to brake release, the flight crew received a message from*

## *Example Applications of Analytical Tools for Airline Flight Safety*

*dispatch to wait for an updated manifest describing hazardous materials. The original manifest was inaccurate because the agents were still getting used to the new dispatch software and had missed an important line item (CF#1).*

*The Captain instructed me to open the door (CF#2) to exchange the manifests with the passenger service agent. I acknowledged and was about to disarm the door when I noticed a passenger's child running toward me in the aisle (CF#3). I returned the child to his mother and proceeded to my station after the distraction.*

*Upon returning to my station, I was startled by the passenger service agent knocking on the main door window. Normally they knock well after the doors are disarmed (CF#4), so I might have fallen into routine when I just opened the door. The other cabin attendant (designated CA#2) was also standing by the door and the red flag had been removed so I assumed she had also disarmed the door (CF#5). I realized my mistake immediately.”*

7. It is also a procedure at this airline for the flight crew to remind the cabin crew to disarm the doors in this situation and during parking. The PEAT investigation will discover what influenced the flight crew to not remind the cabin crew to at least disarm the main door (CF#6).
8. At the close of the interview, the Flight Safety Investigator and Cabin Services Supervisor asked the cabin attendant to call either of them if she remembered any additional information relevant to the event. The Cabin Services Supervisor assured the cabin attendant the investigative findings would be shared with the cabin attendant.
9. General Recommendations:

Prior to suggesting recommendations aimed at preventing a similar event, here is a detailed explanation of the effect of the contributing factors:

- CF#1: The passenger service agents made an error with the original manifest causing them to interrupt the flow of the pushback. This was due to the company's newly acquired manifest printing software.
- CF#2: The flight crew normally advises the cabin crew to disarm the all the doors before and after taxiing. The flight crew understood the procedure to remind the cabin crew about disarming was not necessary for single door operation. The cabin attendant had become dependent on this reminder because opening the doors separately was not a common occurrence.
- CF#3: It is rare for a passenger to become unseated prior to taxi. However, this child seemed particularly unruly and the mother was also traveling with an infant, which was crying loudly at the time.
- CF#4: Due to customs rules in certain countries, upon arrival it is normal for the cabin crew to unlock the main door but keep the door closed until passenger service agents knock. Any other time, the door is opened as soon as it is unlocked. In this case, the passenger service agent was trying to expedite the manifest exchange in order to avoid being blamed for a delay. But the cabin attendant was rushed by the knocking behavior.
- CF#5: The other cabin attendant (CA#2) moved to the main door to assist CA#1. CA#2 was in the process of disarming the door, but had not completed the procedure. Her warning to CA#1 about the door status came too late as C/A#1 was trying to support an on-time departure.

The general recommendations for contributing factors 3, 4, and 5 may be directly addressed by cabin/flight attendant management for the purpose of CPIT analysis. The recommendations for

### *Example Applications of Analytical Tools for Airline Flight Safety*

contributing factors 1, 2, and 4 apply to other organizations and would be addressed by those organizations.

#### Recommendations:

- CF#1: The passenger service manifest software situation should be assessed to prevent work flow interruption.
- CF#2: Whenever flight crews authorize cabin crews to open the doors, they should remind the cabin crews to disarm the doors.
- CF#3: This kind of passenger behavior cannot be controlled, but it should be anticipated. Examples of unruly passenger behavior should be reviewed during recurrent training.
- CF#4: Passenger service personnel should not knock on the doors except in an emergency or if customs rules apply. Cabin attendants should not feel rushed by passenger service staff. This is a team effort.
- CF#5: Cabin attendants should apply cross checking procedures whenever they can.

A sample of CPIT investigator findings using the “CPIT Interview Form” is shown below. This form addresses one of the cabin attendant’s (CA# 1) procedural deviations/error and depicts how the interview information is captured. After completion of the analysis, the General and Specific Recommendations are also documented.



**CPIT Interview Form**

**Procedural Error #1:** CA#1 opened main door without disarming slide.

**Reference # 03-737-22**

Related specific procedure steps or tasks and source:

1. Ensure door area is clear and jet way is in place.
2. Remove red flag from window.
3. Disarm door (move girt bar) and open door.

Section V:

**A. Contributing factors** (include CPIT classification code):

CF#4: Cabin attendant was rushed to open the door by the passenger service agent. Code: **C6**

CF#5: Cabin attendant #1 (CA#1) thought Cabin attendant #2 (CA#2) had disarmed the main door. Code: **C4**

**B. Rational for contributing factor(s):**

CF#4: The passenger service agent knocked on the door to expedite manifest transfer. This is normally done when the door is disarmed, unlocked, but still closed. So this was a miscue to the cabin attendant (CA#1).

CF#5: The other cabin attendant (CA#2) moved to the main door to assist CA#1. CA#2 was in the process of disarming the door, but had not fully completed the procedure due to distraction. Her warning to CA#1 about the door status came too late as CA#1 was trying to help an on-time departure.

Section VI:

**A. General Recommendation(s):**

CF#4: Cabin attendants should not feel rushed by passenger service staff. This is a team effort.

CF#5: Cabin attendants should apply cross checking procedures whenever they can.

**B. Specific Recommendation(s):**

CF#4: The factors of this event will be discussed briefly in annual recurrent training. Cabin attendants will be reminded they are team players with passenger service staff, but not under their authority.

CF#5: The following cross check procedure should be considered by the standardization and training departments: During non-routine door openings and when two cabin attendants are present, a verbal verification of door arming status should be exchanged between the attendants.

\*\*Similar documentation will be completed for the other procedural deviations in this event.\*\*

## **4 Tool's Output**

While the procedural deviations or errors are necessary to link the contributing factors to the outcome, the key output is an organized description of the contributing factors and general recommendations for how to address those factors. The contributing factors to errors constitute threats, hazards, or system imbalances managers will want to consider in their risk management processes. Additionally, the output will include a complete event summary that presents the "whole story" of what happened.

Once the investigation has been completed the investigation information can be documented on the CPIT Form. While the CPIT doesn't currently have an electronic data storage, interested airlines, may develop or use an existing database for the purpose of the data storage and analysis.

## **5 Application of the Analysis Results**

In this particular example, Cabin management will continue to promote the company policy regarding "Working Together". Promotion will include a "30 second handoff" briefing between the lead passenger service agent and the purser (CA#1) before and after taxi in. The process of the dispatch office accounting for delays by function will be maintained for quality assurance purposes. However, the Working Together philosophy discourages using those data for blame. Senior management will continue to pass this message down the chain of command so employees do not feel the need to "protect" their management.

Applying the Working Together policy to cabin crew crosschecking will allow any cabin attendant to politely interrupt another cabin attendant, regardless of position, to ensure critical steps were accomplished. Even when there is doubt, interruptions, as well as normal duties will be accomplished with a smile. The customer expects it.

The above example highlighted the value of using open communication with limited amnesty to obtain an in-depth understanding of the contributing factors to errors that led to an incident. By seeing the relationships between the errors and the factors, Cabin management can take more precise actions to prevent the effects of significant contributing factors in the future. The effects of contributing factors are procedural non-compliance errors that cover up or lead to system inefficiencies, not to mention serious incidents or breaches in security.

### **What might have happened without CPIT**

Due to injury and financial loss, the crewmembers might have been disciplined and the problem of Cabin crew coordination, and cross check procedures would have remained undetected. One significant side effect of such inferential (or "unjust") administrative action could be a further drain on efficiency. Because of fear those Cabin crew, as well as other employees, might resort to career-protecting behaviors that may not be in the interest of the airline's safety.