Ramp Error Decision Aid (REDA)©

Users Guide©

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Introduction

The REDA tool is a structured process used to investigate failures of the system that receives, unloads, unloads, services, maintains and dispatches aircraft in the apron environment. It is a way for an organization to learn from its mistakes.

Apron failures can result of contributing factors in the work place. In many cases, any apron system confronted with the same contributing factors might well suffer the same failure. We estimate that 80%--90% of the contributing factors to apron system failures are under management control, while the remaining 10%--20% are under the control of the worker. Therefore, management can make changes to reduce or eliminate most contributing factors to an error and thereby reduce the probability of future, similar failures.

The purpose of this REDA User's Guide is to provide the information that is needed to carry out a REDA investigation. The investigation is, essentially, an interview with workers who were involved with the failure to find out the contributing factors to the failure. The REDA Results Form is the main tool that was developed for helping with the investigation. It is a six page document used by the investigator during the interview. To help prepare someone to carry out a REDA investigation, the remainder of this document is arranged, as follows:

1. Definition of an apron system
2. Definition of an apron system failure
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1. Definition of the Apron System

REDA is designed to investigate incidents that occurred during the receiving, unloading, loading, servicing, maintaining, and dispatching of commercial aircraft at an airport. The REDA processes approaches all companies, organizations, people, facilities, tools and equipment involved in the above activities as elements of a single system referred to as the **Apron System**.

From a geography standpoint these activities generally take place at or near the gate or at a location on the airport specifically dedicated to these activities. Both locations are considered part of the apron for REDA investigations. In addition to a specific geographic location these areas have associated facility related items such as:

- Jet ways
- Equipment marshaling areas
- Lighting
- Markings and signage

One characteristic of those activities that take place on the apron is the relatively large number of different organizations and companies involved such as:

- Airline
- Maintenance providers
- Service providers
- Airport authority
- Aviation authority
- Security authority

Though all are considered parts of the apron system, these organizations have their own policies, procedures and work processes that can affect the overall performance of the apron system

In addition, the people who work for these organizations possess a wide range of skills and perform a number of jobs in the apron environment such as:

- Line maintenance
- Baggage handling
- Aircraft servicing
- Cabin crew operations
- Flight Crew operations
- Gate staff operations
- Security operations

- Ground control
- Marshalling
- Cabin cleaning

Finally, these people operate and use a wide variety of tools and equipment including:

- Tugs
- Baggage carts
- Jet ways
- Service vehicles
- Conveyers
- Maintenance tools
- Cleaning equipment
- Fuel trucks and equipment
- Servicing equipment

The apron system's elements must work together to ensure that the system safely fulfills its basic requirement in the required time. As in other systems, the performance of each individual apron system element affects the performance of other system elements and the performance of the system as a whole.

2. Definition of an Apron System Failure

In section 1, we defined the Apron System as all the facilities, tools, equipment, companies, organizations and people involved in safely receiving, unloading, loading, maintaining, servicing and dispatching a commercial aircraft in the required time. We also discussed how any component in a system can affect the performance of the rest of the system. An apron system failure occurs when one or more of the system's component's performance is degraded to a point where the entire apron system cannot meet its requirements. REDA divides apron system failures in two general categories:

- Human performance failures
- Other Apron system failures

Human Performance Failures

Humans play a central role in the apron system. As discussed in section 1, they do a wide variety of jobs and fulfill a number of functions. Occasionally however, a worker does not, or is not able do his or her job correctly or in the required time. In turn, these human performance failures may result in an overall apron system failure. The REDA process divides human performance failures into three categories:

- Errors
- Violations
- Inability to complete tasks in required time

What is an error? For simplicity, we will define an error in this way:

- An **error** is a human action (or human behavior) that <u>unintentionally</u> deviates from the expected action (or behavior).

Some theorists, such as Profession James Reason, distinguish among different types of errors, such as errors of omission and commission or slips, lapses, and mistakes. In the REDA system, we will work with more specific error descriptions, such as:

- Equipment not for the intended use
- Equipment left in the wrong location
- Material dropped into open system
- Equipment driven too fast for conditions
- Failure to see FOD on ramp
- Material left on ramp

In using specific error descriptions, all of the error types discussed above is included. For example, not latching an access door would be called an error of omission and a lapse or using inappropriate equipment would be an error of commission and a (possible) slip. Thus, using specific error descriptions precludes the need to determine the specific error type, which simplifies the task for the REDA investigator.

Sometimes there is confusion between an error and a violation. We define a violation in this way:

- A **violation** is a human action (or human behavior) that <u>intentionally</u> deviates from the expected action (or behavior).

So, the obvious difference between an error and a violation is whether the behavior was intentional on the part of the ramp worker. As we will discuss later, contributing factors and violations sometimes act together in causing an error that leads to an event.

The third category of human performance failures does not result from some intentional or unintentional deviation from expected action but the inability of a worker to complete their task in the required time.

- The **inability to complete task in the required time** assumes that the task was done properly or that no error or violation occurred. It is possible however to have a situation where there was a deviation, either an error or violation, as the result of time pressures. In this case we would we would consider time pressure as a contributing factor to the error or violation. Again in order to classify an apron system failure as an **inability to complete a task in the required time** there must no associated errors or violations.

Other Apron System Failures

The other class of Apron System Failures occurs without any obvious human error or violation. These are failures of the other components of the Apron System such as equipment, facilities, or organizational policies and procedures. Some examples of **Other Apron System Failures** are:

- Equipment breakdown
- Lack of tools and equipment
- Company policies that result in insufficient resources
- Procedures that don't achieve the desired results

3. Definition of a Contributing Factor

In REDA the term "contributing factor" is used to describe conditions that contribute to an apron system failure. In the Human Factors technical literature the term "performance shaping factor" is used when referring to issues concerning human performance. However, we use the term contributing factor because we are referring to both human performance and other apron system failures.

What is a contributing factor? We simply define contributing factor in this way:

- A **contributing factor** to an apron system failure is anything that negatively affects how the apron system functions. When looking at human performance issues some things are obvious, like—lighting in the area where the task is to be carried out, having the correct equipment to do the job, distractions or interruptions during task accomplishment, and hearing job instructions incorrectly from a supervisor. Other things are not so obvious, like—decisions about staffing levels made by the management three years ago and thousands of miles away, errors made by a production planner that affects the individual task performance, and a supervisor who assigns a task to an unqualified worker.

It is easier to understand the concept of contributing factor using a model:

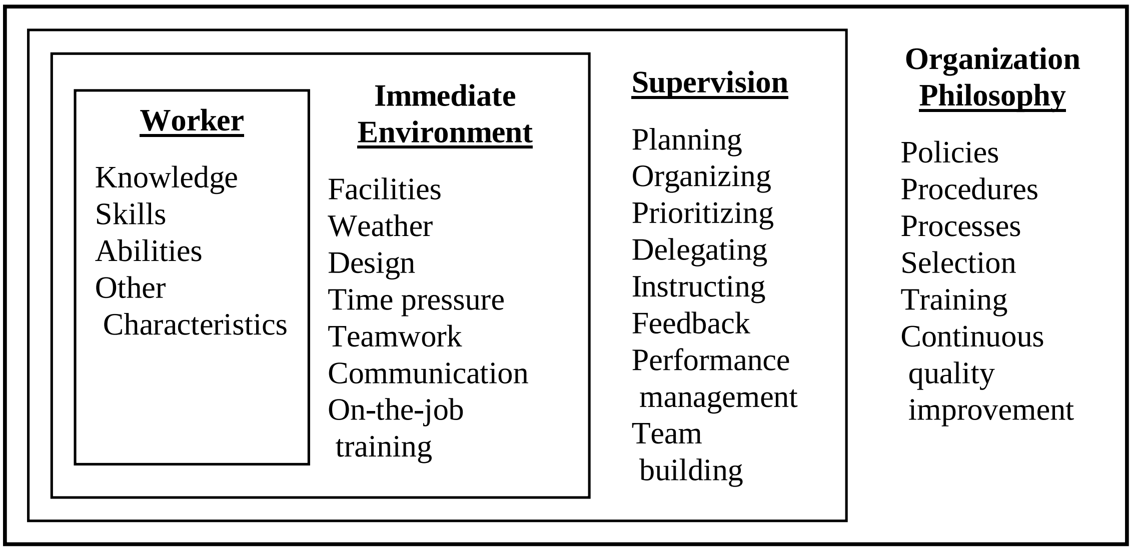

Figure 1. Contributing Factors to apron system failure

In this model, an individual works within an immediate environment under supervision within an organization. Any of these levels or any of the listed items in the model can affect how a ramp worker does his/her job and, therefore, could contribute to a failure. In Section 5.4 we will define all of the terms above and discuss how they can contribute to a system failure.

4. The REDA Apron System Failure Model

In its simplest form, the REDA failure model is shown in Figure 2.

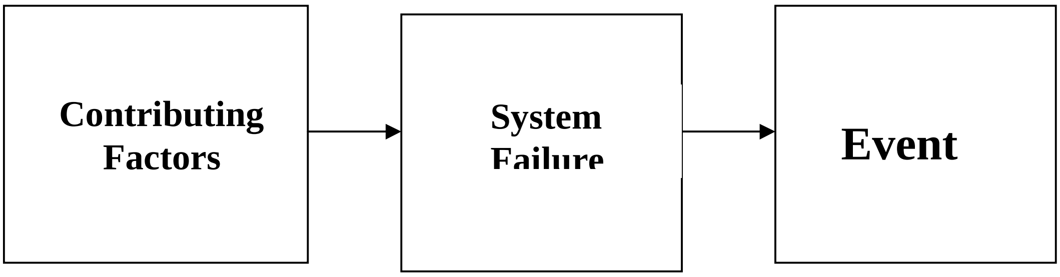

Figure 2. Simplified REDA Apron System Failure Model

In this simple model, contributing factors cause system failures that cause events. However, cause is a "strong" word. We need to think about two meanings of "cause."

- Cause-in-fact: If "A" exists (occurred), then "B" will occur.
- Probabilistic: If "A" exists (occurred), then the likelihood of "B" increases.

We will find that in the apron world there are relatively few "cause-in-fact" occurrences, especially with regard to contributing factors causing system failures. For the "contributing factor—system failure," almost all causes are "probabilistic." For the "system failure—event," it is possible to have some "cause-in-fact" instances. For example leaving a landing gear pin in will always result in an inability to retract the landing gear. However, as an investigator, you will find that even for the system failure—event relationship that most causes are probabilistic in nature. This causal thinking leads to a more complex REDA system failure model.

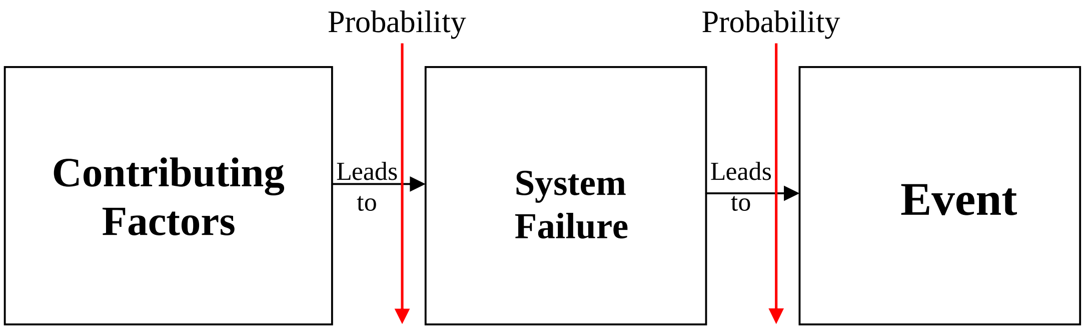

Figure 3. REDA Apron System Failure

This system failure model shows explicitly that there is typically a probabilistic relationship between contributing factors and an error and between an error and an event.

5. The REDA Philosophy

The REDA philosophy is based on this failure model. The fundamental philosophy behind REDA is:

- Apron system failures do not happen on purpose
- Apron system failures result from a series of contributing factors
- Most of these contributing factors are part of an organization's process, and, therefore, can be improved so that they do not contribute to future, similar system failures.

A central concept of the REDA process is that people do not make errors on purpose. Nobody comes to work and says "I'm going to make a mistake today!" Some errors do result from people engaging in behavior they know is risky. Often, however, errors are made in situations where the person is trying to do the right thing, and others in the same situation could make the same mistake. For example, if an error is made because the ramp procedures manual is difficult to understand, then others using that same procedure could make the same error.

Typically an error does not occur due to a single contributing factor. During the field test of the Maintenance Error Decision Aid (MEDA) process, the field test airlines found that there were, on average, about four contributing factors to each maintenance error. So, we say that errors as well as other system failures result from a series of contributing factors.

Most of these contributing factors are under management control. In order to change the probability that a system failure will occur in the future, the contributing factors must be addressed (i.e., changed or fixed). For example, if a person parks a baggage cart outside of the approved parking area because the zone marks were worn and hard to see, another worker could make the same error. If you wish to change the probability that the error will occur in the future, you need to repaint the zone marks. Too often, when an error occurs the ramp worker is punished and no further action is taken. That does not reduce the probability that others will make the same error. REDA is a structured process for finding these contributing factors in order to address the contributing factors to the errors and other apron system failures.

While not based on the system failure model per se, there are two other aspects of the REDA philosophy:

- The ramp organization must be viewed as a system where the ramp worker is but one part of the system, and
- Addressing the contributing factors to lower level events helps prevent more serious events.

The apron is a system, and the apron worker is part of that system. This fact is illustrated in Figure 1 where we showed that a worker worked in an immediate work environment under supervision following the policies and procedures developed by the management in order to run the business. This is called a "socio-technical" system, which indicates that both technical issues (e.g., tooling, technical documentation, and aircraft systems) and social issues (e.g., teamwork) affect the ramp worker in doing his/her job.

Finally, we have seen good data from the U.S. Navy that showed that the contributing factors to low cost/no injury events were the same contributing factors to high cost/personal injury events. Thus, addressing the contributing factors to lower level events can prevent higher level events.

6. The REDA Investigation Process

The purpose of this REDA Users Guide is to provide information to the REDA investigator. In order for the REDA investigator to do his/her job correctly, he/she should understand their role as investigator within the whole investigation process. Figure 4 is a diagram of the REDA investigation processes.

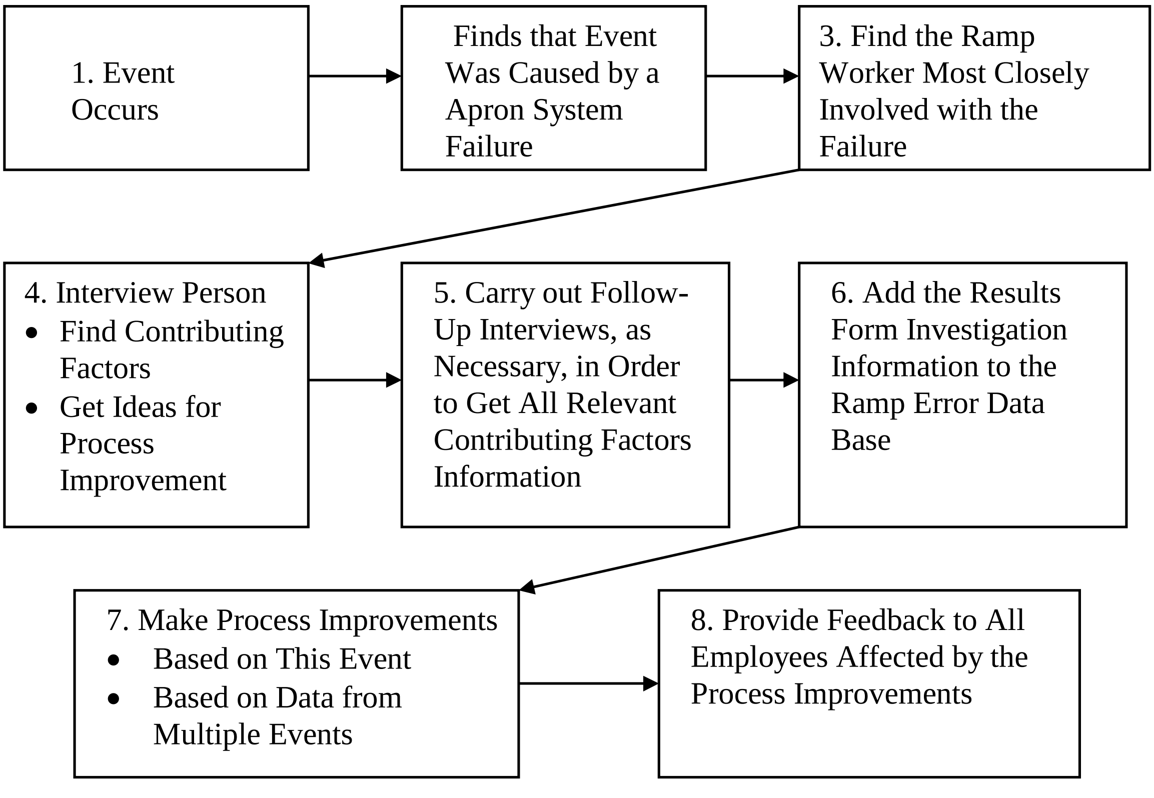

Figure 4. The REDA Investigation Process

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1. REDA is an event-based process. That is, a REDA investigation is carried out after an event occurs in order to find out why the event occurred.

2. Therefore, after an event occurs, the next thing that is done is an initial investigation to determine whether there was failure in the apron system that contributed to the event. If there was a system failure that caused or contributed to the event, then a REDA investigation would follow.

3. The next thing that must be done is to find the ramp worker who was most closely involved with the system failure. In this case the workers involvement could fall into to two general categories of apron system failures:

- A human performance failure where the worker committed an error, violation or was not able to do his/her job in the required time.
- Other apron system failures such as equipment breakdown. In this case the worker operating the equipment would be considered the one most closely involved with the failure.

4. Then you interview the ramp worker/inspector, using the REDA Results Form, in order to find out two things:

- What the contributing factors were to the apron system failure, and
- What ideas the ramp worker has for improving/fixing the contributing factors.

Obviously, using the interview to understand the contributing factors to error is the primary purpose of the REDA investigation. The ramp worker is, at that time, probably the world's expert on the contributing factors to that specific system failure. It is your job to find out what those contributing factors are. In addition, the ramp worker is also probably the world's expert on what changes need to be made to the contributing factors in order to keep them from contributing to future, similar failures. So, another task of the investigator is to get ideas for improvements to the contributing factors from the ramp worker. Note that this helps make the ramp worker part of the continuous improvement process, so they are no longer just "the person involved in the failure."

5. During the interview with the ramp worker you may obtain information that requires follow-up in order to gain full knowledge about the contributing factors or other circumstances. This may include follow-up interviews with other ramp personnel in the same work group. Or, it may include inspecting something like a tool that the ramp worker said was hard to use or the lighting in an equipment marshalling area.

6. Once all of the interviews/investigation has taken place, the Results Form data would be added to a database. Analysis can then be done to find trends in errors or contributing factors. This type of analysis will probably not be that useful until a number of investigations have been done—probably 20 or more—because trends might not be visible.

7. It is time to make improvements to the contributing factors. Management would typically make these types of decisions, since improvements to some contributing factors might cost money or manpower to implement. These decisions are often made at an existing meeting of managers, such as at the weekly/monthly QA audit findings meeting. Also, decisions about improvements might be made on the basis on one investigation, if there are obvious and relatively straightforward contributing factors that need to be fixed (like improved lighting or labeling). These decisions could also be made based on the analysis of several like events, if the improvements are less obvious or are expensive to make so that additional data are necessary to make a important, high-cost decision (like changing the shift handover procedure).

8. It is important to provide feedback to the ramp personnel to let them know what improvements are being made. This will show them that the process is being used to make improvements and is not being used to punish ramp personnel.

7. Using the REDA Results Form

The REDA Results Form is a four-page form consisting of six sections plus a separately attached summary of contributing factors, apron system failures and events:

- Section I—General Information
- Section II—Event
- Section III—Apron System Failure
- Section IV—Contributing Factors Checklist
- Section V—Error Prevention Strategies
- Summary of Contributing Factors, Apron System Failures, and Event

Sections I, II, and III establish what happened (the incident), Section IV establishes why the incident happened (the contributing factors), and Section V lists the system barriers that failed to prevent the system failure and recommendations for prevention strategies to prevent the apron system failure from occurring again.

7.1 Section I. General

This section is for collecting specific information about when, where, and to what the incident occurred. Your organization may have other or additional information that should be collected. We encourage organizations to change this section in order to collect the information that is most useful to you. This information often includes the variables that you would like to use when you sort the data or summarize the data

Reference #: Two letter airline designator plus three sequential numbers (e.g., BA001, BA002, etc.)

Airline: Two or three letter airline designator

Station of Error: Station where the error occurred NOT where it is being reported (if different)

Aircraft Type/Registration #: Manufacturer and model (e.g., B747-400, DC10-30, L1011-100, A320-200)

Equipment Type: Manufacturer and model (e.g., Stinar SRC-2000A Refrigeration Cart)

Ref. # of previous related event (If applicable) : If this investigation is a repeat of a similar event, use this field to reference to the previous investigation's data

Interviewer's Name/Interviewer's Telephone #: This information is required in case the REDA focal in your organization needs clarification or more detailed data

Date of Investigation: Date the investigation starts

Date of Event: Date the event occurred

Time of Event: Time of the event, if known

Shift of Error: Shift during which the error occurred, if known

Date Changes Implemented: Date that recommended and approved prevention strategies were implemented and documented

7.2 Section II. Event

An event is an unexpected, unintended, or undesirable occurrence that interrupts normal operations. REDA can be used to investigate five major types of events:

1. Aircraft damage events
2. Equipment damage event
3. Operational process event
4. Personnel injury event
5. Environmental impact events

It is entirely possible that there is more than one event checked on the form. For example, a collision between a baggage cart and an aircraft can cause both damage to the cart and the aircraft.

Step 1 in the Event section is to select the events that apply to this investigation.

Please select the event (check all that apply)

1. Aircraft Damage Event
( ) a. Cargo door
( ) b. Passenger door
( ) c. Tail
( ) d. Nose/radome
( ) e. Wing
( ) f. Engine/cowl
( ) g. Landing gear
( ) h. Other (explain below)

2. Equipment Damage Event
( ) a. Baggage cart/tug
( ) b. Loading bridge (jetway)
( ) c. Belt loader
( ) d. Container loader
( ) e. Truck (lav, fueling, or water)
( ) f. Other (explain below)

3. Operational Process Event
( ) a. Flight Delay
( ) b. Flight cancellation
( ) c. Gate return
( ) d. Other (explain below)

4. Personnel injury Event
( ) a. Strain
( ) b. Sprain
( ) c. Laceration
( ) d. Contusion
( ) e Fracture
( ) f. Other (explain below)

5. Environmental Impact Event
( ) a. Spill
( ) b. Release
( ) c. Contamination
( ) d. Other (explain below)

6. Other Event (explain below)

Step 2 is to write a description of the damage/injury/environmental impact (e.g., damage to left engine nacelle) that caused the event in your own words. It is important that you not just check the box to indicate which event(s) occurred. You should write additional information in the blank space in the block.

Example: *Baggage cart struck the left engine nacelle resulting in a 10 inch dent in the nacelle.*

7.3 Section III. Apron System Failure

In the REDA model, the apron system failure is the failure that directly leads to the event. The system failures that are listed are very specific failures related to apron system. There are eight different major Failure types listed:

1. Equipment/Tools
2. Foreign object damage (FOD)
3. Aircraft servicing
4. Aircraft operations
5. Aircraft handling
6. Maintenance
7. Fault Isolation/Test/Inspection
8. Personal injury

A ninth box is provided for “Other” in case the specific error of interest was not listed in 1-8 above.

Step 1 is to select the type of apron system failure by putting a check mark (✓) in the correct box or boxes. NOTE: Sometimes several errors combine to cause an incident. It is important to keep track of which contributing factors and apron system failure prevention strategies listed in Sections IV and V relate to which errors identified in Section III. This could be done in several ways. For example, you could fill out one Results Form for each error. Alternatively, you could check one error box with a red pencil and the second with a blue pencil. Then the factors that contributed to the apron system failure could be written in red and the factors that contributed to the second system failure could be written in blue. Or, you could put a * by the first apron system failure and a # by the second apron system failure. Then you could place a * by the factors that contributed to the first apron system failure and a # by the factors that contributed to the second system failure.

Step 2 is to write a brief written description of the apron system failure in the open space below the errors.

Example:
While being towed, the aircrafts left wing tip struck a catering truck.

7.4 Section IV. Contributing Factors Checklist

This checklist will help the analyst identify the contributing factors that contributed to the apron system failure. [Remember, if two or more apron system failures combined to cause the event, it is important to identify which factors relate to which apron system failure.] There are ten major categories of contributing factors in the checklist:

A. Information
B. Equipment, tools, and safety equipment
C. Aircraft design, configuration, and parts
D. The job or task
E. Technical knowledge and skills
F. Individual factors
G. Environment/facility/ramp
H. Organizational factors
I. Leadership and supervision
J. Communication

There is also an eleventh category (K) “Other” that is to be used in case the contributing factor cannot be found in A through J. We included this category just in case the contributing factor was not found in the checklist. However, our experience to date is that the “Other” category is never used. That is, the ten categories have been inclusive of all contributing factors.

Step 1 is to put a check mark by all of the applicable contributing factors for the apron system failure(s) identified in Section III.

Step 2 is to provide a written description of how each factor that was identified actually contributed to the apron system failure in the open space in the contributing factors box.

Step 3 is to put a check mark by N/A (Not applicable), which is located to the left of each of the ten categories, if you determine that no contributing factors from that category contributed to the apron system failure(s).

Contributing Factors Checklist Examples

The following pages contain additional information about each contributing factor from Section IV of the REDA Results Form. Each lettered section heading corresponds to a lettered block on the Results Form, and each numbered item beneath that heading corresponds to a numbered item on the Results Form. Use this supplemental material during your apron system failure analysis to assist you in filling out the Results Form.

7.4.A. Information

Information refers to the written or computerized source data that a ramp worker needs to carry out a task or job. It includes manuals, procedures, and other manufacturer supplied or internal resources. Information does not include verbal instructions from supervisors, shift handover logs, etc., which are considered to be Communication on the Results Form

To determine that information was a contributing factor to the apron system failure, either the information itself must be problematical (e.g., hard to understand, not complete, conflicting), or the information should have been used but was not (e.g., it was not available, it was ignored). If it is expected that the ramp worker has this information memorized, then refer to the Technical Knowledge/Skills section.

Examples to look for:

1. *Not understandable*
   - Unfamiliar words or acronyms
   - Unusual or non-standard format
   - Poor or insufficient illustrations
   - Not enough detail or missing steps
   - Poorly written procedures

2. *Unavailable/inaccessible*
   - Procedure does not exist
   - Not located in correct or usual place
   - Not located near worksite

3. *Incorrect*
   - Missing pages or revisions
   - Does not match aircraft or equipment configuration
   - Transferred from source document incorrectly
   - Steps out of sequence

- Not the most current revision
- Procedure does not work

4. *Too much/conflicting information*
   - Similar procedures in different resources do not agree (e.g. organizational procedures vs. airport authority procedures)
   - Too many references to other documents
   - Configurations shown in different resources do not agree

5. *Insufficient information*
   - Information does not exist
   - Information is not complete

6. *Update process is too long/complicated*
   - Requested revisions have not been incorporated yet
   - Configurations changed by Service Bulletins or Engineering Orders have not been updated in applicable ramp procedures
   - Document change requests are not submitted, lost, or incorrectly filled out

7. *Incorrectly modified manufacturer's operators/maintenance manuals*
   - Intent of manufacturer's procedure is not met
   - Non-standard practices or steps are added
   - Format does not match rest of procedure or other procedures

8. *Information not used*
   - Procedure available but the worker did not have enough time to get it
   - Worker thought that he did not need the procedure because he had done the task many times before

9. *Other*

- Operator cannot use digital information

7.4.B. Equipment/Tools/Safety Equipment [Personal Protective Equipment (PPE) and Collective Protective Equipment (CPE)]

Equipment, tools and safety equipment are the tools and materials necessary for the safe performance of a task. Equipment and tools refer to things such as tugs, baggage carts, service carts and belt loaders. Safety equipment includes both personal protective equipment, such as ear plugs and safety vests, as well as collective safety devices, such as hazard barriers and safety railings.

Unsafe equipment and tools may cause a ramp worker to become distracted from the task due to concern for personal safety. If equipment or tools are not available or are inaccessible, the ramp worker may use other equipment or tools that are not fully suited for the job. Other factors that can contribute to an apron system failure include mis-calibrated instruments, use of unreliable equipment, or equipment or tools with no instructions for use.

Examples to look for:

1. *Unsafe*
    - Platform moves and is unstable
    - Brakes or safety devices inoperative
    - Non-skid material worn or missing
    - A lock-out mechanism is missing or faulty
    - Placards (warnings or cautions) are missing or faded
    - Sharp edges are exposed or personal protective devices are missing
    - Power sources are not labeled or protected

2. *Unreliable*
    - Intermittent or fluctuating readings on dials or indicators
    - Damaged or worn out
    - Expired use limits
    - History of defects

3. *Layout of controls or displays*
    - Easy to read wrong display or use wrong control
    - Awkward locations, hard to reach
    - Too small to read or control
    - Directional control of knobs or dials is not clear

4. *Not used*
    - Tools available but were not used

5. *Unavailable*
    - Is not owned or in stock
    - Not available for procurement

6. *Inappropriate for the task*
    - Standard hand tools used for leverage
    - Not capable of handling weights, forces, or pressures required for the task
    - Connections or grips not the right size

7. *Incorrectly used*
    - Torque wrenched adjusted for the wrong torque
    - Work stand positioned incorrectly

8. *Cannot be used in intended environment*
    - Not enough space to operate tool
    - Requires level surface where one is not available

9. *Incorrectly used in the existing environment*
    - Driving a tug too fast in conditions of reduced visibility

10. Too complicated

- Tool or equipment usage requires too many simultaneous movements and/or readings

11. Incorrectly labeled/marked

- Hand marked labeling or operating instructions are incorrect
- Tool or equipment has incorrect scale readings

12. Not labeled/marked

- Tarmac markings not present
- Directional markings missing
- Instructional placards missing or faded

13. PPE/CPE not used

- PPE/CPE available but not used
- Ear protection not worn
- Hi-visibility vests not worn
- Safety barriers not used
- Fall protection devices not used

14. PPE/CPE used incorrectly

- Respirator face masks not adjusted for fit
- Reflected vests worn under clothing

15. PPE/CPE unavailable

- PPE/CPE not used because it was unavailable

16. *Mis-calibrated*

- Gages that read incorrectly due to calibration
- Torque wrenches mis-calibrated

17. No instructions

- Tool usage instructions not available

18. Other

7.4.C. Aircraft Design/Configuration

An aircraft should be designed/configured so that cargo doors and cargo, for instance, are accessible for apron tasks. The apron worker should be able to see and reach a control or cargo, should be able to access it from a reach and strength standpoint, and should be able to easily manipulate it in the correct orientation. When reviewing accessibility as a contributor to apron system failure, it must be seen as a real contributor to the system failure and not just as an inconvenience to the ramp worker.

Configuration variability between models and aircraft can contribute to error when there are small differences between the configurations that require ramp tasks to be carried out differently or require slightly different parts.

Examples to look for:

1. *Complex*
   - Multiple similar connections exist on the system or components (hydraulic, pneumatic, etc)
2. *Inaccessible*
   - Components or area to be serviced is surrounded by structure
   - No access doors accessible from the ramp area
   - Area lacks footing space or hand-holds
   - Small or odd-shaped area
3. *Aircraft configuration variability*
   - Similar parts on different models are installed differently
   - Aircraft modifications have changed installation or other ramp procedures between aircraft
4. *Parts (antenna, masts) hard to see*
   - Same color as existing structure
   - Masked by existing structure

5. Poorly marked

- Hand marked labeling incorrect
- Wrong part number on part

6. Other

- Components/cargo are too heavy for easy removal/installation
- Lack of feedback provided by component or system
- Direction of flow indicators do not exist

7.4.D. Job/Task

A ramp worker's job can logically be separated into a series of tasks. If the interviewer feels the task was a contributing factor, he should analyze the combination or sequence of tasks. The interviewer, when examining the task sequencing, should also determine whether written information was being used, what technical skills and knowledge were expected of the ramp worker, and what communication took place.

Examples to look for:

1. *Repetitive/monotonous*
    - Similar steps are performed over and over
    - The same task performed many times in multiple locations

2. *Complex/confusing*
    - Multiple other tasks are required during this task
    - Multiple steps required at the same time by different ramp personnel
    - Long procedure with step sequences critical
    - Task requires exceptional mental or physical effort

3. *New task or task change*
    - New ramp requirement
    - Revision to a procedure
    - Engineering modification to existing fleet
    - New aircraft model
    - New equipment

4. *Different from other similar tasks*
    - Same procedure on different models is slightly differently
    - Recent change to aircraft configuration has slightly changed task
    - Recent change to equipment has slightly changed task
    - Same job at different worksites is performed slightly different

5. *Requires forceful exertions*
    - Lifting greater that 25 lbs (12 kg) from ground level
    - Pushing or pulling, initial force greater than 35 lbs (16 kg)
    - Hand grip greater than 3 lbs (1 kg) lbs force

6. *Requires kneeling/bending/stooping*
    - Lifting objects off the ground

7. *Requires twisting*
    - Position required to perform task

8. *Long duration*
    - *Task greater than 2 hours per shift*

9.

10. *Awkward position*
    - *Repetitively raised hands above head*
    - *Repetitively raised elbows above shoulders*
    - *Requires neck flexion greater than 30 degrees*
    - *Requires kneeling*
    - *Requires twisting*

10. *Other*

7.4.E. Technical Knowledge/Skills

Technical skills (sometimes also referred to as abilities) refer to tasks or subtasks that ramp personnel are expected to perform without having to refer to other information. Technical skills include such things as driving a tug. For (lack of) technical skills to be a contributing factor to error, the worker must not have skill that was generally expected of him/her.

Technical knowledge refers to the understanding of a body of information that is applied directly to performing a task. Technical knowledge, in order to be a contributing factor to error, is knowledge that is supposed to be known (memorized) by the ramp worker. Three broad categories of knowledge are required of a worker: airline process knowledge, aircraft systems knowledge, and ramp task knowledge. These are discussed in more detail below.

Organizational process knowledge refers to knowledge of the processes and practices of the organization in which the ramp worker works. Examples include shift handover procedures, and safety procedures. While this knowledge is generally acquired through general ramp operating procedures and on-the-job discussion with peers, it may also be acquired from other sources such as employee bulletins and special training.

Aircraft or support equipment system knowledge refers to knowledge of the physical aircraft systems or support equipment. Examples include location and function of hydraulic pumps and location of fueling and lavatory servicing ports. While this knowledge is generally acquired from the aircraft design characteristics, training, apron operations manuals, and on-the-job discussion with peers, it may also be acquired from other sources such as trade journals and ramp tips.

Ramp task knowledge refers to the specific knowledge required to perform a unique task. Examples include the procedure for pushback or operating a belt loader. While this knowledge is generally acquired through ramp instructions or on-the-job discussions with peers, it may also be acquired from equipment placards, design characteristics, or even other ramp personnel when working as a team.

Examples to look for:

1. *Skills*
   - Lack of control of baggage carts trains
   - Inability to backup baggage tugs
   - Inability to pushback aircraft in a straight line

2. *Task knowledge*
   - Slow task completion
   - Worker change of ramp responsibilities
   - Task performed by ramp worker for the first time
   - Task performed in wrong sequence

3 *Task planning*
   - Frequent work interruptions to get tools or equipment
   - Failure to perform preparation tasks first
   - Too many tasks scheduled for limited time period
   - Task necessary for safety not performed first

4. *Airline process knowledge*
   - Worker new to airline or to type of work
   - Vendor or airport worker unfamiliar with airline processes
   - Airline processes not documented or stressed in training

5. *Vendor process knowledge*
   - Worker new to vendor organization or to type of work
   - Worker unfamiliar with other vendor processes
   - Vendor processes not documented or stressed in training

6. *Airport process knowledge*
    - Worker new to airport organization or to type of work
    - Airline or vendor worker unfamiliar with airport processes
    - Vendor processes not documented or stressed in training

7. *Aircraft system knowledge*
    - Worker changes aircraft types or major systems

8. *Aircraft configuration knowledge*
    - Worker changes aircraft configuration

9. English language competency
    - Worker who principal language is not English is unable to understand written or verbal instructions given in English

10. *Other*
    - Worker performance/skills not accurately tracked/measured

7.4.F. Individual Factors

Individual factors vary from person to person and include body size/strength, health, and personal events and the way that a worker responds to things such as peer pressure, time constraints, and fatigue caused by the job itself.

Physical health includes the acuity of human senses as well as physical conditions and physical illnesses. Human senses, especially vision, hearing, and touch, play an important role in ground operations. Workers are frequently required to perform tasks that are at or near the limits of their sensory capabilities. For example, tasks being performed under conditions of low ambient light.

Physical conditions, such as headaches and chronic pain, also have been shown to relate to errors. Alcohol/drug use, as well as side effects of various prescription and over-the-counter medicines, can negatively affect the senses. Physical illness, such as having a cold or the flu, can also negatively affect the senses and the ability to concentrate. Illnesses can also lead to less energy, which can affect fatigue.

Fatigue has been defined by the U.S. Federal Aviation Administration (FAA) as a depletion of body energy reserves, leading to below-par performance. Fatigue may be emotional or physical in origin. Acute fatigue may be caused by emotional stress, depletion of physical energy, lack of sleep, lack of food, poor physical health, or over excitement. Fatigue may also be caused by the work situation itself. The time of the day, the length one has been working, and complex mental tasks or very physical tasks can cause fatigue.

A worker's response to time constraints or time "pressure" is an individual factor. The need to finish a ramp task so an aircraft can be released from the gate often causes workers to feel pressure to get their tasks done. Studies have linked too little time with increased error. There is a well-known speed/accuracy trade-off, in that the faster one tries to finish a task the more likely an error is to happen. This trade-off also holds for speed and safety.

A worker's response to peer pressure can also influence their performance. For example, there may be peer pressure not to use ramp manuals because it is seen as a sign of lack of technical knowledge. Peer pressure may also influence a worker's safety-related behavior.

Complacency is over-contentment with a situation that may lead to a failure to recognize cues that indicate a potential error.

Body size and strength are two obvious factors that affect a ramp worker's ability to perform a task. If someone is too small to reach a plug or if someone is unable to let down a heavy bag from an upper rack of a baggage cart, this can contribute to error.

Examples to look for:

1. *Physical health*
   - Sensory acuity (e.g. vision loss, hearing loss, touch)
   - Failure to wear corrective lenses
   - Failure to use hearing aids or ear plugs
   - Restricted field of vision due to protective eye equipment
   - Pre-existing disease
   - Personal injury
   - Chronic pain limiting range of movement
   - Nutritional factors (missed meals, poor diet)
   - Adverse affects of medication
   - Drug or alcohol use
   - Complaints of frequent muscle/soft tissue injury
   - Chronic joint pain in hands/arms/knees

2. *Fatigue*
   - Lack of sleep
   - Emotional stress (e.g. tension, anxiety, depression)
   - Judgment errors
   - Inadequate vigilance, attention span, alertness
   - Inability to concentrate
   - Slow reaction time
   - Significant increase in work hours or change in conditions
   - Excessive length of work day
   - Excessive time spent on one task
   - Chronic overloading

3. *Time constraints*
   - Constant fast-paced environment
   - Multiple tasks to be performed by one person in a limited time
   - Increase in workload without an increase in staff
   - Too much emphasis on schedule without proper planning
   - Perceived pressure to finish a task more quickly than needed in order to release the aircraft from the gate

4. *Peer pressure*
   - Unwillingness to use written information because it is seen as a lack of technical skills/knowledge
   - Lack of individual confidence
   - Not questioning other's processes
   - Not following safe operating procedures because others don't follow them

5. Complacency
- Hazardous attitudes (invulnerability, arrogance, over-confidence)
- Task repetition leads to loss of mental sharpness or efficiency

6. Body size/strength
- Abnormal reach, unusual fit, or unusual strength required for the task
- Inability to access confined spaces

7. Personal events
- Death of a family member
- Marital difficulties
- Change in health of a family member
- Change in work responsibilities/assignment
- Change in living conditions

8. Workplace distractions/interruptions during task performance
- Confusion or disorientation about where one is in a task
- Missed steps in a multi-step task
- Not completing a task
- Working environment is too dynamic

9. Memory lapse
- Forgot

10. Other
- Absenteeism
- Vacations
- Medical leave
- Risk-taking behavior

7.4.G. Environment/Facilities

The working environment/facilities can contribute to error. For example, temperature extremes (either too hot or too cold), high noise levels, inadequate lighting (reflection/glare, etc.), unusual vibrations, and dirty work surfaces could all potentially lead to apron system failures. Concerns about health and safety issues could also contribute to ramp worker errors of violations.

Examples to look for:

1. *High noise levels*
   - High noise impacts the communication necessary to perform a task
   - Extended exposure to noise reduces ability to concentrate and makes one tired

2. *Hot*
   - Work area is too hot so the task is carried out quickly
   - Extremely high temperatures cause fatigue
   - Long exposure to direct sunlight
   - Exterior components or structure too hot for ramp personnel to physically handle or work on

3. *Cold*
   - Work area is too cold so the task is carried out quickly
   - Long exposure to low temperature decreases sense of touch and smell

4. *Humidity*
   - High humidity creates moisture on aircraft, part and tool surfaces
   - Humidity contributes to fatigue

5. *Rain*
    - Causes obscured visibility
    - Causes slippery or unsafe conditions

6. *Snow*
    - Causes obscured visibility
    - Causes slippery or unsafe conditions
    - Protective gear makes grasping, movement difficult

7. *Wind*
    - Interferes with ability to hear and communicate
    - Moves stands and other equipment (creates instability)
    - Blows debris into eyes, ears, nose or throat
    - Makes using written material difficult

8. *Lighting*
    - Insufficient for reading instructions, placards, etc.
    - Insufficient for visual inspections
    - Insufficient for general ramp activity
    - Excessive - creates glare, reflection, or eye spotting

9. *Vibrations*
    - Use of power tools fatigues hands and arms
    - Exposure to whole body vibration from equipment causes fatigue
    - Makes standing on surfaces difficult
    - Makes instrument reading difficult

10. Cleanliness

- Loss of footing/grip due to dirt, grease or fluids on parts/surfaces
- Clutter reduces available/usable work space
- Inhibits ability to perform visual inspection tasks

11. Hazardous/toxic substances

- Reduces sensory acuity (e.g. smell, vision)
- Exposure causes headaches, nausea, dizziness
- Exposure causes burning, itching, general pain
- Personal protective equipment limits motion or reach
- Exposure causes general or sudden fatigue
- Exposure causes general concern about long term effect on health

12. Power sources

- Not labeled with caution or warning
- Guarding devices missing or damaged
- Power left on inappropriately
- Circuit protection devices not utilized or damaged
- Cords chafed, split, or frayed

13. Inadequate ventilation

- Strong odor present
- Burning or itching eyes
- Shortness of breath
- Sudden fatigue

14. Inadequate blast protection

- Equipment damage
- Personal injury

15. markings

- Apron marking worn and hard to see
- Insufficient apron marking

16. Other

7.4.H. Organizational Factors

The organizational culture can have a great impact on apron system failure. Factors such as internal communication with other organizations, trust level between management and ramp personnel, management goals and worker awareness and buy-in of those goals, union activities, and attitudes, morale, etc., all affect productivity and quality of work. The amount of ownership the worker has of his/her work environment and the ability to change/improve processes and systems is of key importance to worker morale and self esteem, which in turn, affects the quality of task performance.

Examples to look for:

1. *Quality of support from technical organizations*
   - Inconsistent quality of support information
   - Late or missing support information
   - Poor or unrealistic apron plans
   - Lack of feedback on change requests
   - Reluctance to make technical decisions
   - Frequent changes in company procedures and ramp programs

2. *Quality of support from airport vendors*
   - Inconsistent quality of information
   - Late or missing information
   - Lack of feedback on change requests
   - Frequent changes in vendor procedures and ramp policies

3. *Quality of support from airport organizations*
   - Inconsistent quality of information
   - Late or missing support information
   - Poor or unrealistic apron policies
   - Frequent changes in airport procedures and ramp policies

4. *Company policies*
    - Unfair or inconsistent application of company policies
    - Standard policies do not exist or are not emphasized
    - Standard system failure prevention strategies don't exist or are not applied
    - Inflexibility in considering special circumstances
    - Lack of ability to change or update policies

5. *Not enough staff*
    - Not enough trained personnel
    - Not enough trained personnel at the time

6. *Corporate change/restructuring*
    - Layoffs are occurring
    - Early retirement programs drain experience
    - Reorganizations, consolidations and transfers cause more people to be in new jobs
    - Demotions and pay cuts
    - Frequent management changes

7. *Union action*
    - Contract negotiations create distractions
    - Historical management/labor relations are not good
    - Positive or negative communication from union leadership
    - Strike, work slowdown, or other labor action creates a disruption

8. *Work process/procedures*
    - Standard operating procedures (SOPs) incorrect
    - General ramp manuals outdated
    - Local/organizational "norms" negatively influence the task
    - Inadequate inspection allowed
    - Process/procedure does not obtain the desired outcome

9. *Work process/procedures not followed*
    - Failure to use wing walkers
    - Required protective equipment not used

10. *Work processes/procedures not documented*
    - No procedure for radio check before towing operations
    - No procedure for proper use of safety equipment

11. *Work group normal practice (norm)*
    - Documented procedure – most people don't do it
    - Undocumented procedure – most people do it

12. *Failure to follow ground guidance*
    - Aircraft departure from taxiways

13. *Failure to follow airport authority guidance*
    - Aircraft departure from taxiways

14. *Other*
    - Company is acquired by another company
    - Work previously accomplished in-house is contracted out

7.4.I. Leadership/Supervision

Even though supervisors normally do not perform the tasks, they can still contribute to ramp error by poor planning, prioritizing, and organizing of job tasks. Delegation of tasks is a very important supervisory skill and, if not done properly, can result in poor work quality. Also, there is a direct link between the management/supervisory attitudes and expectations of the ramp worker and the quality of the work that is performed.

Supervisors and higher-level management must also provide leadership. That is, they should have a vision of where the ramp function should be headed and how it will get there. In addition, leadership is exhibited by management "walking the talk", that is, showing the same type of behavior expected of others.

Examples to look for:

1. *Planning/organization of tasks*
    - Excessive downtime between tasks
    - Not enough time between tasks
    - Paperwork is disorganized
    - Tasks are not in a logical sequence

2. *Prioritization of work*
    - Workers not told which tasks to carry out first
    - Important or safety related tasks are scheduled last

3. *Delegation/assignment of tasks*
    - Assigning the wrong person to carry out a task
    - Inconsistency or lack of processes for delegating tasks
    - Giving the same task to the same person consistently
    - Wide variance in workload among ramp personnel or departments

4. *Unrealistic attitude/expectations*
    - Frequent dissatisfaction, anger, and arguments between a supervisor and a worker about how to do a task or how quickly a task should be finished
    - Pressure on ramp personnel to finish tasks sooner than possible or reasonable
    - Berating individuals, especially in front of others
    - Zero tolerance for errors
    - No overall performance expectations of ramp staff based on management vision

5. *Amount of supervision*
    - "Look over the shoulder" management style
    - Frequent questioning of decisions made
    - Failure to involve employees in decision-making

6. *Other*
    - Meetings do not have purpose or agendas
    - Supervisor does not have confidence in group's abilities
    - Management doesn't "walk the talk" and thereby sets poor work standards for ramp staff

7.4.J. Communication

Communication refers to the transfer of information (written, verbal, or non-verbal) within the ramp organization. A breakdown in communication can prevent a ramp worker from getting the correct information in a timely manner regarding a ramp task.

Examples to look for:

1. *Between departments*
   - Written communication incomplete or vague
   - Information not routed to the correct groups
   - Department responsibilities not clearly defined or communicated
   - Personality conflicts create barriers to communication between departments
   - Information not provided at all or not in time to use

2. *Between staff*
   - Failure to communicate important information
   - Misinterpretation of words, intent or tone of voice
   - Language barriers
   - Use of slang or unfamiliar terms
   - Use of unfamiliar acronyms
   - Failure to question actions when necessary
   - Failure to offer ideas or process improvement proposals
   - Personality differences

3. *Between shifts*
   - Work turnover not accomplished or done poorly or quickly
   - Inadequate record of work accomplished
   - Processes not documented for all shifts to use

4. *Between apron staff and lead*
    - Lead fails to communicate important information to crew
    - Poor verbal turnover or job assignment at the beginning of a shift
    - Unclear roles and responsibilities
    - Lead does not provide feedback to crew on performance
    - Crew fails to report problems and opportunities for improvement to lead person
    - Communication tools (written, phones, radios, etc.) not used

5. *Between lead and management*
    - Little or no communication exists
    - Goals and plans not discussed regularly
    - No feedback from management to lead on performance
    - Lead does not report problems and opportunities for improvement to management
    - Management fails to communicate important information to lead

6. *Between flight crew and apron staff*
    - No guidance to flight crew while taxing into jet way
    - No confirmation that gear pin is pulled

7. *Between airlines and vendors*
    - Confusion at shared jet ways.

8. *Between vendors*
    - Confusion during apron operations

9. *Other*
    - Computer or network malfunctions lead to loss of information
    - E-mail not used or ignored

7.4.K. Other Contributing Factors

This section was put into the Users Guide in case a REDA investigator found a contributing factor that did not fit into one of the ten contributing factors categories. During the REDA field test of the Results Form, several investigators used Section K. However, upon inspection of what they wrote into the section, they had clearly failed to put the contributing factor into the correct category A-J that was already on the form. This suggested that the training needed to be improved.

Since the field test, we have never seen the “Other” category used, but we have left it on the form just in case there may be a need some day.

7.5 Section V. Failure Prevention Strategies

This section is subdivided into two subsections. The purpose of Section A is to indicate organizational barriers that were in place but failed to prevent the error from occurring.

Section A asks, *"What current existing procedures, processes, and/or policies in your organization are intended to prevent the incident, but didn't?"*

The investigator needs to think about which of the listed items were involved or contributed to the failure. For example, if a ramp policy was not a good policy or was not followed, then you would check "Apron Policies or Processes" and write in which policy was not good or not followed. If an inspection was performed, but the inspector missed the fault, and the fault later caused the event, then you would check "Inspection or Functional Check" and indicate what the inspection was.

Section B asks, *"List recommendations for error prevention strategies."*

This section has three columns. The left most column (Recommendation #) is for you to put a serial number (1, 2, 3, etc.) in order to simply number the recommendation, so that it is easier to refer to it. The middle column (Contributing Factor #) is for you to put the number of the contributing factor that you are addressing (e.g., A.1. for Information Not Understandable). The right most column is for you to write in the proposed improvement to be made to the contributing factor that you listed (e.g., replace the antiskid surfaces on the work stand.)

Types of Error Prevention Strategies

In order to help you think through Error Prevention Strategies, the following material describes the four major types of strategies that you should consider:

1. Error reduction/error elimination
2. Error capturing
3. Error tolerance
4. Audit programs.

These strategies are discussed in more detail below.

Often, the individual error investigation does not yield contributing factors with strong linkages to the error under investigation. Sometimes the effect of certain contributing factors is not fully understood until a number of events are investigated with the same contributing factor(s) related to them. The difficulty for the front-line manager performing an investigation is the pressure to take action resulting from a single event investigation. The dilemma, however, is how to decide on a prevention strategy when you do not have any strong identifiable contributing factors leading to the error. What if the error had safety implications? Somehow, the error must be addressed.

Error Reduction/Error Elimination

The most often used, and most readily available, error prevention strategies are those that directly reduce or eliminate the contributing factors to the error. Examples include increasing lighting, replacing worn non-slip pads, and using Simplified English procedures to reduce the potential for mis-interpretation. These error prevention strategies try to improve task reliability by eliminating any adverse conditions that have increased the risk of ramp error.

Error Capturing

Error capturing refers to tasks that are performed specifically to catch an error made during a ramp task. Examples include a post task inspection, an operational check, or a verification step. Error capturing is different than error reduction in that it does not directly serve to reduce the "human error". While error capturing is an important part of error management, new views point to a general over-confidence in the error capturing strategy to manage ramp error. In theory, adding a post-task inspection will require two human errors to occur in order for a maintenance-induced discrepancy to make it onto a revenue flight. In recent years, however, there has been a growing view that the additional inspection to ensure the integrity of an installation will adversely impact the reliability of the basic task. That is, humans consciously or subconsciously relax when it is known that a subsequent task has been scheduled to "capture" any errors made during the primary task. It is not unusual to hear an airline manager say that the addition of an inspection did little to reduce the in-service experience of the error. For example, several major carriers are pulling inspections out of ramp tasks, in the hopes of improving quality.

Error Tolerance

Error tolerance refers to the ability of a system to remain functional even after an error. The classic illustration of this is the 1983 Eastern Airlines loss of all three engines due to O rings not installed on the chip detectors. As a strategy to prevent the loss of multiple engines, most regulatory authorities granting ETOPS (extended twin operations) approval prohibit the application of the same maintenance task on both engines prior to the same flight. The theory is that even if a human error is made, it will be limited to only one engine. This was not the case in the Eastern loss of all three engines. One type of human error, the same incorrect application of a task applied to all three engines, nearly caused an aircraft to be lost.

Error tolerance, as a prevention strategy, is often limited to areas outside the control of the first line investigator. However, it is important for the first line supervisor or interviewer to be aware of this type of prevention strategy, and consider it when it may be the best way to effectively deal with the error.

Audit Programs

Audit programs refer to an approach that does not to directly address a specific contributing factor. An audit is a high-level analysis of the organization to see if there are any systemic conditions that may contribute to error.

7.6 Summary of Contributing Factors, Failures, and Event

Write out a brief summary of what happened and what you found regarding contributing factors during the interview on a separate piece of paper and submit it with the rest of the Results Form.

8. How to Carry Out the REDA Investigation Interview

By now it should be clear that the most important part of the investigation is the interview with the involved apron worker in order to find out the contributing factors to the error. Interviewing is a skill just like using a torque wrench is a skill. You will get better at interviewing the more interviews that you carry out. There are four purposes of this section:

1. To discuss who should be on the interview team
2. To provide guidelines for how to carry out the interview,
3. To provide some specific rules of causation, and
4. To discuss interviewer biases, so that the interviewer can try to overcome them.

8.1 The REDA Interview Team

How many people should be on the interview team? We have seen successful programs use 1 or 2 people on the interview team. How do you decide how many people to use?

The advantage of one person doing the interview is that one person is typically less threatening to the worker than several people. However, this person must be a good interviewer, since he has to do all of the work himself. You may find that you start off with a 2-person interview team, but as the interviewers gain experience, you can move to a smaller team.

The advantage of a 2-person team is that one person can be asking questions while the second person is writing down information. In addition, the second person may think of additional questions to ask. When an organization first implements REDA, they often start with a 2-person interview team.

We typically suggest that 3 people are too many on the interview team. The worker could start to feel outnumbered, and, therefore, uncomfortable and unwilling to tell everything that he knows. However, a 2-person team with a union observer has proven useful at unionized ramp organizations. The union observers job is to let the ramp worker know that the union supports the REDA process and to encourage the ramp worker to cooperate during the interview.
Who should be on the interview team? First, whoever is on the team should have some form of REDA training. Additional training on interviewing is helpful, especially if the training includes practice at interviewing that is possibly videotaped for audio and visual feedback.

The organization that is responsible for the REDA process at the affected organization should be most concerned that good information is being gained from the REDA investigations. Perhaps the best way to make sure good information is being collected is for the organization to assign one of their members as a REDA investigation team member so they can make sure quality interviews are being carried out. Therefore, the team should include a person from this organization. So, for example, if QA "owns" the process, one of the interviewers would be a QA auditor.

A second team member could be a respected, senior ramp worker from the area where the error occurred. This person should bring two things, in addition to interviewing skills, to the interview:

- He should have the respect of the apron worker being interviewed
- He should be technically knowledgeable about the work that was being done when the error occurred.

One person should act as the team leader. This most likely would be the person from the organization that "owns" the process. His job would be to introduce the team members, lead off on the questioning, keep the interview moving if it starts to bog down, make sure that everybody gets to ask questions, end the interview when no more useful information is forthcoming, and thank the ramp worker for providing the information.

8.2 Guidelines for the REDA Investigation Interview

Once the team has been chosen, it is time to carry out the REDA investigation interview. We suggest eight steps for carrying out the interview. They are:

1. Get as much information as possible about the error and the event before the interview
2. Interview people separately if more than one person is involved
3. Interview in an appropriate place
4. Put the person being interviewed (the interviewee) at ease
5. Determine the interviewee's knowledge of the REDA process
6. Get the interviewee's view of what happened
7. Give the interviewee some feedback on what they said
8. End on a positive note.

These eight steps are described in more detail below.

1. Before carrying out the interview, gather as much information as possible about what happened. Going into the interview, you should know the event that started the investigation, and you will probably know what the error was that caused the event. If any safety investigations have taken place, read that information, also, before the interview.

2. Many times there will only be one worker to interview, so this would not be an issue. However, if more than one worker was involved in the error, they should each be

interviewed, and the interviews should be done separately. You are not doing this to see if you can catch someone up in a lie. You are doing this so that one worker doesn't influence the information provided by a second (or third, etc.) worker. No one has perfect memory, so one person's statement could influence what a second person said ("I don't really remember what happened, so Joe's view must be correct"). If you find that you get wildly differing stories from the workers, follow-up interviews may need to be conducted.

3. It is important where the interview takes place. It should be an area that is quiet so that you can talk easily with the person. It is also helpful if you can find a place so that you can sit down to carry out the interview. It should be a place where the interviewer and the interviewee can talk as two people on an equal level. Try not to carry out the interview with you sitting behind a supervisor's desk and the worker sitting in a chair in front of the desk. This will appear to the interviewee to put him on a lower personal level (employee vs. supervisor), and the interview could start to feel like an interrogation or cross-examination to the worker.

4. It is very important that you put the worker at ease for the interview. If the worker is worried about the incident, it may affect his memory and willingness to answer certain questions.
   a. Put yourself in their position—they probably feel that the incident reflects poorly on them and they may be concerned about punishment.
   b. So, you need to act relaxed and use a neutral tone of voice in the interview.
   c. To maintain the feeling of equality, the interviewer's and interviewee's eyes should be on the same level (for example, the interviewer should not be standing while the interviewee is sitting).
   d. The interviewer should also use neutral body language—that is, arms and legs should not be crossed.
   e. Look the worker in the eyes while asking questions. Act like you would act when you're talking to your friends.
   f. Finally, respond in a positive manner. If someone says that they had trouble understanding the ramp manual, say something like, "Yeah, those manuals are sometimes hard to understand." Don't say something like, "Nobody else has that problem," or "Boy, I'd never do that." Those are not positive responses.

5. In order to help put the person at ease, determine their knowledge about the REDA process. Ask them what they know about REDA.
   a. If they say that they are familiar with the process, then ask them to explain to you what they know about REDA. Then correct any misperceptions that they might have and provide additional information to them, as necessary.
   b. If they say they have not heard about REDA, then take a few minutes explaining fully about the REDA process and philosophy.

c. The worker may be afraid that they will be punished for making the error and might ask you about it. If they do, tell them that you are not involved with decisions about punishment. Your job is to gather the facts, not make punishment decisions.

6. Get the workers version of what happened. Start the interview with, "Would you please tell me about what was happening before and during the time leading to the error." Then let them talk about what happened.
   a. Do not interrupt unless the person gets off the topic.
   b. Do not use a tape recorder, but use the REDA Results Form to write down notes about possible contributing factors.
   c. When the worker has told you what he knows, then ask specific questions about contributing factors that you think you heard him talk about when he was telling you what happened.
   d. Review the other contributing factors categories to make sure that they were not contributory to the error.
   e. Do not ask questions or make statements that lead the interviewee, like, "After that, you probably went to the other side to see if the fastener had broken off. Correct?"
   f. Don't ask questions that put the interviewee on the defensive, like, "So how long after that stupid decision did you wait to talk to your supervisor?"
   g. Try to ask questions that require more than a simple yes or no answer.
   h. Again, don't make statements of judgment, like
      - That was stupid.
      - I would never do that.
      - No worker that I know of has ever done that.
      - You did WHAT!?!

      Those types of statements will quickly shut the interview down.

7. Give the person feedback on what they said. The purpose of this is to make sure you heard/interpreted what the worker said correctly. Use the <u>paraphrase</u> to do this. Put the key points in your own words and say, "I think that I heard you say that (x is the case)." The word "think" is very important here, because it gives them the opening to disagree with what you said. This process also shows active listening, which is also a very important communication tool.

8. End the interview on a positive note.
   a. One way to do this is to ask the worker to help you think through possible corrective actions for the contributing factors that were uncovered in the interview. Now the worker is part of the improvement process rather than just the person who committed the error that lead to the event.
   b. Thank them for their time and the useful information.

c. Commit to giving them feedback about possible corrective actions. Feedback helps to show the workers that you are using the REDA process to solve problems rather than to punish workers.

Often contributing factors themselves have causes that are important to an investigation. For example, you may determine that one contributing factor to a worker error was that the worker did not use the ramp procedures manual while carrying out the task. It is important to find out why he did not use the manual, so find out the contributing factors to that decision. Maybe he didn't use the manual because:

- It was unavailable because the manuals are all on microfiche and the microfiche printer did not work.
- It was too far away to get in time to use for the apron task
- The worker thought that he had done the task often enough that he didn't need the manual.

Note that the various reasons why the manual was not used have widely differing corrective actions. If you do not find out why the manual was not used, you will have difficulty in coming up with an appropriate corrective action.

A commonly given "rule of thumb" is to "ask why five times." This will help assure that you would get the whole contributing factors causal chain. Then what you look for is the correct level to stop asking "why." For example:

- Person says that they did not use the apron operations manual. Find out why…
  - Not available (find out why)
    - The manuals were only on microfiche, and the microfiche printer was not working. Stop asking "why" here, because it is not the apron worker's issue why the printer was broken
  - Ramp area was not close to manuals, so apron worker did not have enough time to get the manual. Keep asking questions...
    - Ask about time constraints (when was the flight out?) and
    - The trade-off the apron worker made on working without manual vs. turning aircraft in time (what is their training on this and what is the company policy).
  - Decided not to use (find out why)
  - Had done the task a lot, so did not think he needed manual. Keep asking questions…
    - Ask how often he has done the task
    - Ask when the last time was he did the task.

8.3 Rules of Causation

Filling out the REDA Results Form correctly, so that the collected information provides maximum value to the organization, is not an easy task. We have found that if the interviewer keeps four "rules of causation" in mind, then the task can be made easier. These rules are:

Rule 1—The relationship between the contributing factor and the error must be clearly written down.

Rule 2—Negative descriptors, such as "poorly" or "inadequate," may not be used.

Rule 3—Each procedural deviation must have a preceding contributing factor.

Rule 4—Failure to act is only a contributing factor when there is a pre-existing duty to act.

Let us discuss these in a little more detail.

Rule 1—The relationship between the contributing factor and the error must be clearly written down.

This is one of the most important rules for filling out the REDA Results Form. You must write in the appropriate contributing factors section how the contributing factors that you checked actually contributed to the error.

Rule 2—Negative descriptors, such as "poorly" or "inadequate," may not be used.

If you just say that something was done "poorly" in "in an inadequate fashion," it is not clear what the corrective action is. Saying that the operator manual was written "poorly" does not tell someone how to rewrite the manual. We must be specific about what the real issue is. For example, "the manual did not state that the emergency stop switch must be reset each time the equipment is operated."

Rule 3—Each procedural deviation must have a preceding contributing factor.

Procedural deviations are a common contributing factor to error. However, in order to determine the best way to "fix" the procedural deviations, we need to know why the deviation occurred. Therefore, it is important, when you determine during the interview that a procedural deviation occurred, to find out why the worker deviated. Some common procedural deviations include:

- Failure to use wing walkers
- Failure to use torque wrench or other calibrated equipment
- Failure to carry out a check at the end of a procedure.

In each of these cases, it is important to find out why the worker decided to deviate from the accepted procedure. There are several possible reasons, including:

1. The procedure does not really work, so all workers have to deviate from the procedure to get the task done
2. The worker, for this one time only, decided to deviate from the procedure for some reason (e.g., was running out of time and wanted to get the task done, so he took a short cut)
3. This one worker often deviates from any procedure, even though none of the other workers do
4. The procedure is a good one, but it has become the normal practice at this ramp organization for workers to deviate from this procedure
5. The procedure is a good one, but it has become the normal practice at this ramp organization for workers to deviate from most procedures, and this is just one example of it
6. The procedure is a local "practice," and it is not written down, so the worker deviated from the procedure because he had not been trained on it and did not know of its existence.

It is important to find out why the deviation occurred, so the Results Form can be filled out correctly and a proper "fix" can be proposed. For example:

1. If the reason for the deviation was 1. above, then you would check boxes "H.9. Work process/procedure not followed" and "H.8. Work process/procedure" on the Results Form and write in the space "the worker did not follow the procedure because it does not work, because (and give the reason)."
2. If the reason for the deviation was 2. above, then you would check box "H.9. Work process/procedure not followed" and give the reason that the worker gave you for not following the procedure.
3. If the reason for the deviation was 3. above, then you would check box "H.9. Work process/procedure not followed" and give the reason that "This worker regularly deviates from acceptable procedures, and this is another example of that behavior."
4. If the reason for the deviation was 4. above, then you would check box "H.9. Work process/procedure not followed" and box "H.11. Work group normal practice (norm)" and give the reason "The procedure was not followed, but this is the accepted practice (norm) in this work group."
5. If the reason for the deviation was 5. above, then you would check box "H.9. Work process/procedure not followed" and box "H.11. Work group normal practice (norm)" and give the reason "The procedure was not followed, but not following procedures is a normal practice for most workers in this organization, and this is just one example of that."
6. If the reason for the deviation was 6. above, then you would check box "H.9. Work process/procedure not followed" and box "H.10. Work process/procedure not documented" and give the reason "The procedure was not followed, because the procedure is not documented, and the worker had never been trained on the procedure

or told of its existence." [You would probably also check box "E.4. Airline process knowledge" and give the reason "The worker was not provided training on this airline process."]

Rule 4—Failure to act is only a contributing factor when there is a pre-existing duty to act.

This is an important rule of causation that comes from the legal field. We should not expect someone to do something unless there is a pre-existing duty to do that thing. For example:

- We do not expect you to leave home for work 30 minutes earlier than usual just in case there is an unexpected traffic problem.
- We do not expect a worker to come to work 30 minutes early just in case there is rush work to be performed.
- We do not expect a worker to carry out a functional task twice just in case the first test was not enough.

It is important to know in these situations exactly what pre-existing duties workers/inspectors have. For example:

- Before closing an access panel, does the worker have a clearly stated duty to do a visual inspection of the area before closing the panel?
- If the worker is not sure how to proceed on a task, does he have a clearly stated duty to get help from the lead/supervisor before proceeding?
- If the worker deviates from a procedure, does he have a clearly stated duty to document the deviation?

8.4 Overcoming Interviewer Biases

Attribution Theory was developed in the 1960s in the Social Psychology literature. One of the major findings from those doing research in Attribution Theory is **attribution bias**:

- When I make an error, I attribute my making the error to (external) contributing factors
- When you make an error, I attribute your making the error to factors internal to the person (e.g., lazy, complacent, or careless).

Thus, unfortunately, it is "human nature" for someone to blame another's misfortune on that person's internal factors, such as being lazy, complacent, or careless. An investigator must overcome their built-in attributions and, in an open-minded fashion, search for the "true" contributing factors.

There are other types of biases of which the interviewer must be aware. Some of them are listed and defined below. The interviewer should like for these biases in themselves and try to overcome them.

- Experience/knowledge can have a positive or negative effect. It has a negative affect when the investigator thinks things like, "I don't even need to do the interview—I know what he did wrong," or, "All errors are a result of poor training."
- Sometimes we believe that big events must have had a big cause. "Joe made a major error because the airplane was out of service for 2 days." This is not necessarily true. Remember, one of the U. S. shuttle flights crashed and killed everyone on board because of a 50-cent O-ring seal.
- Sometimes an investigator only identifies those contributing factors that are within their ability to change. However, your job is to determine all of the contributing factors, even if some of them are hard or impossible to improve.
- Factors that are close in time or space to the error will more likely be labeled as causal. While these factors may be causal, do not end your search for contributing factors with these items. Sometimes decisions about staffing or spare parts, which were made months before the event, are contributing factors to the error.
- Factors that first draw the attention of the investigator will more likely be labeled as causal. While these may be true contributing factors, you must keep an open mind about other contributing factors so that you don't stop your search after the first one or two that caught your attention.
- Sometimes an investigator sees an error-caused event that is similar to an historical error event and assumes that they both had the same contributing factors since the outcomes were similar. Do not make this leap of faith—determine the specific contributing factors to the event at hand.
- Sometimes an investigator enhances or discounts a contributing factor explanation based on the presence of another contributing factor. For example, "Joe was tired, therefore the ramp manual was confusing." Even if Joe is tired, you have to show what there was about the ramp manual that confused Joe.
- A very common bias that must be guarded against is blaming an error on a person's dispositions. For example, "Joe has a history of skipping functional tests, therefore, he must have skipped the functional test when he made this error." Do not guess at contributing factors. If you have a guess, check it out by the questions that you ask.
- Sometimes an investigator describes first what should have been and then compares the actual events to determine what is causal. "Joe should have gotten a wing walker before moving the aircraft. He did not, so not getting the wing walker was a contributing factor." Remember, the failure to act is only a contributing factor when there is a pre-existing duty to act.

Thus, as you can see, an interviewer's task is not an easy one. Not only should the interviewer follow the steps listed above in section 7.1 in order to carry out the interview, the interviewer must be able to recognize his/her interviewing biases and overcome them in order to come up with the true contributing factors to the error that lead to the event.