Ramp Event Decision Aid (REDA)©

User's Guide©

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Ramp Event Decision Aid (REDA) User's Guide©

1. Introduction

The Ramp Event Decision Aid (REDA) tool is a structured process used to investigate events caused by worker performance. One or more components of the system may fail during the process of receiving, unloading, servicing, maintaining, uploading, and dispatching aircraft in the ramp (a.k.a. apron) environment. REDA is a way for an organization to learn from its mistakes. Over the past several years, we have moved away from calling REDA an "error" investigation process to calling it an "event" investigation process. The reason for this is that it has become increasingly clear that events caused by ramp worker performance can contain both an error component as well as a component involving non-compliance with regulations, policies, processes, and/or procedures. This non-compliance will be referred to as a "violation" in the remainder of this material. Thus, we have changed the REDA "error" model to be the REDA "event" model, and we have updated this User's Guide to reflect this new thinking.

Ramp errors and violations are a result of contributing factors in the work place. In many cases, other ramp workers confronted with the same contributing factors might well make the same error or violation that lead to the event. We estimate that 80%--90% of the contributing factors to errors/violations are under management control, while the remaining 10%--20% are under the control of the ramp worker. Therefore, management can make changes to reduce or eliminate most contributing factors to an error or violation and thereby reduce the probability of future, similar events.

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 in the event to find out (1) what errors and violations occurred and (2) the contributing factors to the errors and violations. 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:

2. Definition of a ramp system
3. Definition of a ramp system failure
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9. How to carry out the REDA investigation interview.

2. Definition of the Ramp System

REDA is designed to investigate events that occurred during the receiving, unloading, servicing, maintaining, uploading, and dispatching of commercial aircraft at an airport. REDA considers all companies, organizations, people, facilities, tools, and equipment involved in the above activities as elements of a single system referred to as the Ramp System (a.k.a 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 ramp for REDA investigations. In addition to a specific geographic location these areas have associated facility items such as:

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

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

- Airline
- Ground service providers
- Maintenance providers
- Airport authority
- Aviation authority
- Security and customs authority.

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

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

- Marshalling
- Baggage handling
- Aircraft servicing (cabin cleaning, fueling, potable water/lavatory service, catering, de-ice/anti-ice)
- Line maintenance

- Cabin crew operations
- Flight Crew operations
- Gate staff operations
- Security and customs operations
- Ground control.

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

- Motorized Equipment
  - Bag tug
  - Beltloader
  - Catering truck
  - Cleaning truck
  - Container loader
  - De-ice truck
  - Electric (golf) cart
  - Forklift
  - Fuel truck
  - Lavatory truck
  - Lift trucks
  - Maintenance vehicles
  - Passenger loading bridge
  - Pick up vehicles
  - Pushback tractor
  - Snow removal equipment
  - Stairs truck
  - Sweeper/vacuum
  - Towbar less tractor
  - Van
  - Water truck

- Non-motorized ground equipment
  - Air conditioning cart
  - Airstart cart
  - Baggage carts/dollies
  - Fuel cart
  - Gate services cradle/basket
  - Ground Power Unit (GPU)
  - Lavatory cart
  - Maintenance stands
  - Mobile stairs
  - Rolling bag rack
  - Tail stand

    - Towbar
    - Unit load device (ULD)
        - Container
        - Pallet (bag, cargo strap)
        - Container sort platform
        - ULD transfer ball mats
    - Water cart
- Conveyers
- Maintenance tools.

The ramp 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 ramp system element affects the performance of other system elements and the performance of the system as a whole.

3. Definition of a Ramp System Failure

In section 2, we defined the Ramp System as all the facilities, tools, equipment, companies, organizations, and people involved in safely receiving, unloading, maintaining, servicing, uploading, and dispatching a commercial aircraft in the required time. We also discussed how any component in the system can affect the performance of the rest of the system. A ramp event occurs when one or more of the system component(s)' performance is degraded to a point where the entire ramp system cannot meet its requirements.

Humans play a central role in the ramp system. As discussed in section 2, they do a wide variety of jobs and fulfill a number of functions. Occasionally however, a worker does not, or is not able to, do his or her job correctly or in the required time. In turn, these human performance failures may result in an overall ramp 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 unintentionally deviates from the expected action (or behavior).

Some theorists, such as Professor 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 used 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 Foreign Object Damage (FOD) on ramp
- Material left on ramp.

In using specific error descriptions, all of the error types discussed above are 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 intentionally 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 is 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 and 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 consider time pressure as a contributing factor to the error or violation. Again in order to classify a ramp system failure as an **inability to complete a task in the required time** there must be no associated errors or violations.

Some REDA users want to be able to use REDA as a tool to identify the party that is responsible for a late departure, when there are no obvious contributing factors can be tied to the personnel on the ramp. For example, there was a late departure because a catering truck arrived late, line maintenance was unable to finish its work in time for the on-time departure, or the pushback was late because no equipment was available. Thus, the system failures occurred without any obvious human error or violation by the personnel on the ramp. These are failures of the other components of the ramp system such as equipment, facilities, or organizational policies and procedures.

4. Definition of a Contributing Factor

In REDA the term "contributing factor" is used to describe conditions that contribute to a ramp 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 ramp system component failures that contribute to the ramp system failure.

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

- A **contributing factor** to a ramp system failure is anything that negatively affects how the ramp system functions. When looking at human performance issues some things are obvious, like—poor lighting in the area where the task is to be carried out, not 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 ground operations 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 socio-technical model:

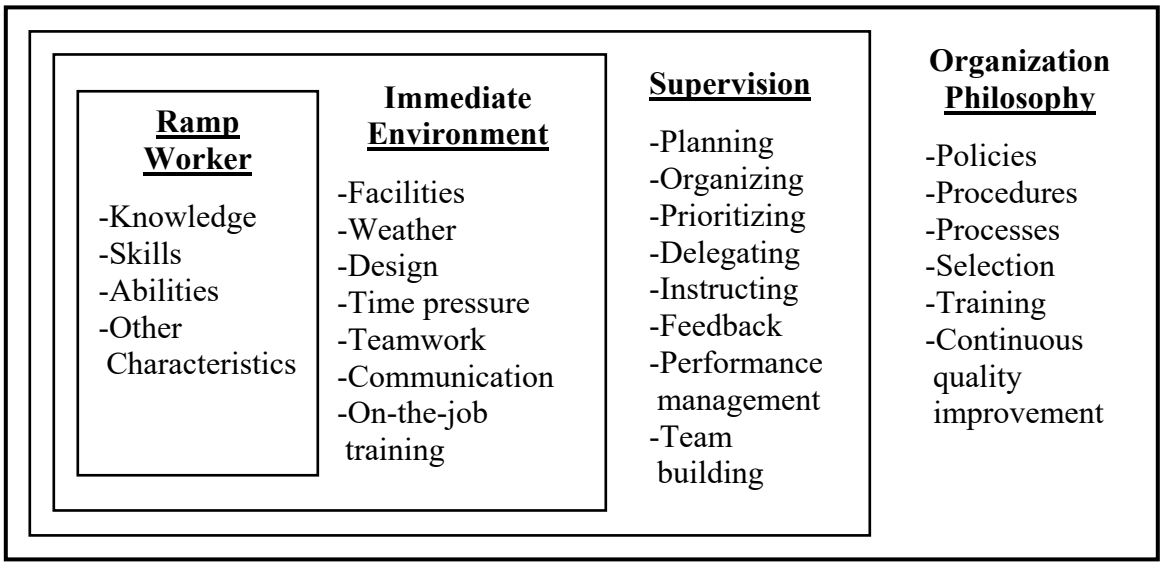

Figure 1. Contributing Factors to Ramp Performance

In this model, an individual works within an immediate work environment under supervision and under an organization's policies, processes, and procedures. 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 system failure. In Section 8.4 we will define all of the terms above and discuss how they can contribute to a system failure.

5. The REDA Event Model

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

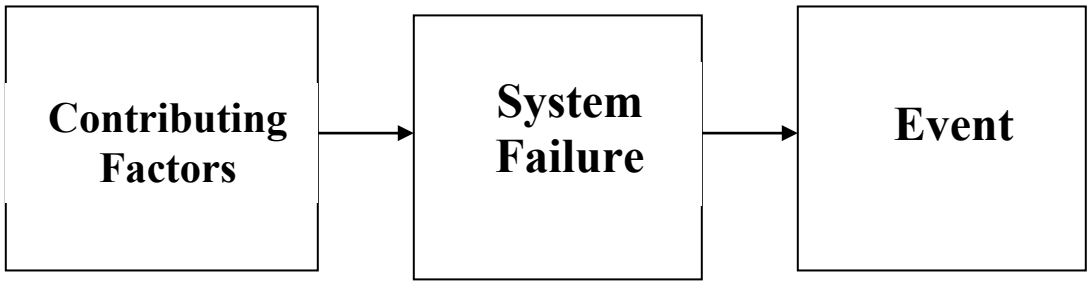

Figure 2. Simplified REDA Event Model

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 ramp 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 (see Figure 3).

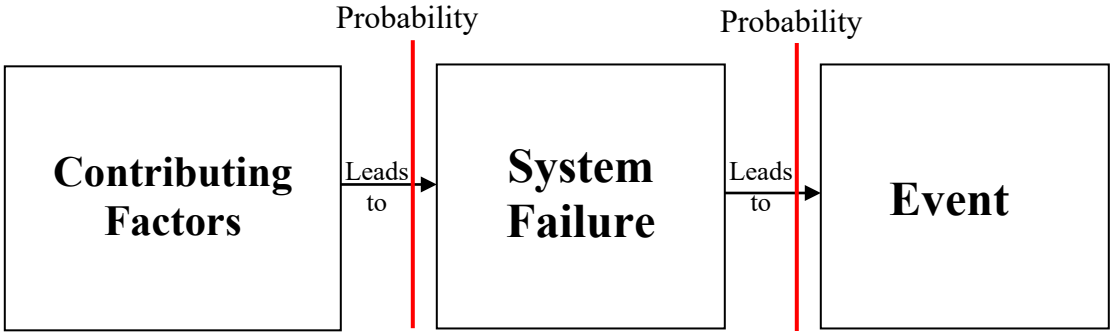

Figure 3. Probabilistic REDA Event Model

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

failure and an event. Based on research and experience, we now know that there are typically three to five contributing factors to each system failure. In fact, there are also contributing factors to contributing factors.

Now let us consider a violation in this model. There are at least three ways that a violation can contribute to an event. The first is given in Figure 4. A real-world example to fit the Figure 4 model is:

- Equipment left in the aircraft's path (this is a violation), which contributes to a system failure (aircraft driven into equipment).
- The wing tip hits the equipment when the aircraft pulls into the gate (this is an event).
- There are reasons why (contributing factors) the violation occurred (e.g., time pressure and lack of situation awareness).

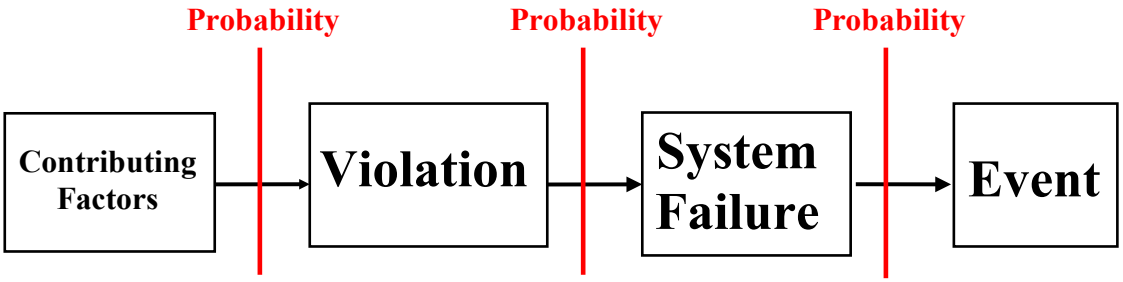

Figure 4. Event Model 1 with a Violation Leading Directly to a System Failure

In some cases, violations and errors jointly lead to the system failure (see Figure 5). For example, ramp worker #1 parked a baggage tug with two carts in the jet blast zone at an adjacent gate (a violation); and ramp worker #2 forgot to check for clearance before giving the OK to power the aircraft (an error); both lead to a system failure (equipment left in wrong place, i.e., jet blast zone). Consequently, the jet blast blew one baggage cart into the air, and it landed on another ground vehicle (an event). Ramp worker #1 had to park the baggage card and rush off to fetch a belt loader since there was none available at the gate (a contributing factor). It was a dark rainy night, and ramp worker #2 could not see very well (another contributing factor).

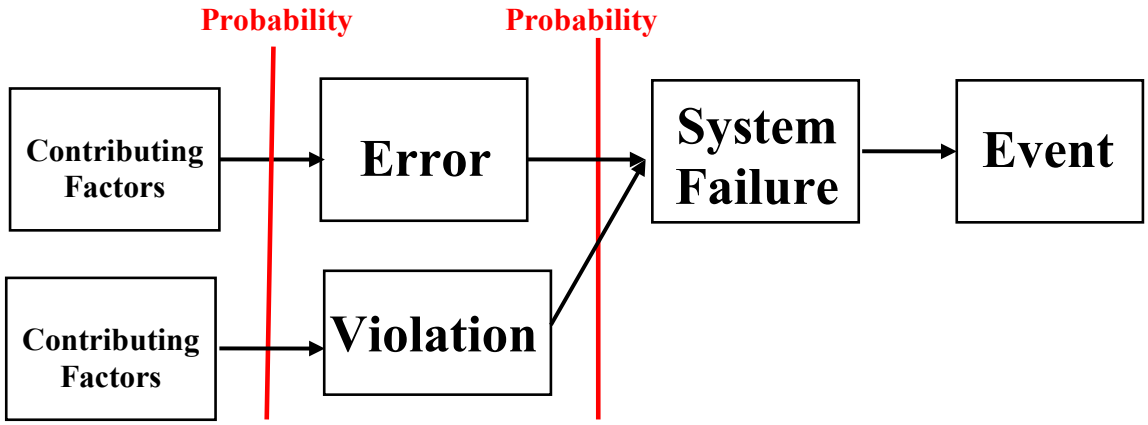

Figure 5. Event Model 2 with a Violation Causing the Ramp Worker Not to Catch an Error-Caused System Failure

There is one other way in which a violation can directly contribute to an event. It is possible that there are multiple violations that directly and indirectly lead to an event (see Figure 6). Here is an example:

- Due to a shortage of staff (a contributing factor), the ramp worker operated the air stair by himself although the Ground Operations Manual requires two people to move it (a violation).
- This leads to losing situation awareness and having his left foot struck by the air stair wheel (a system failure). The ramp worker did not wear protective footwear (a violation) because the protective footwear is clumsy and uncomfortable (a contributing factor).
- The ramp worker's left foot was injured by the air stair (an event).

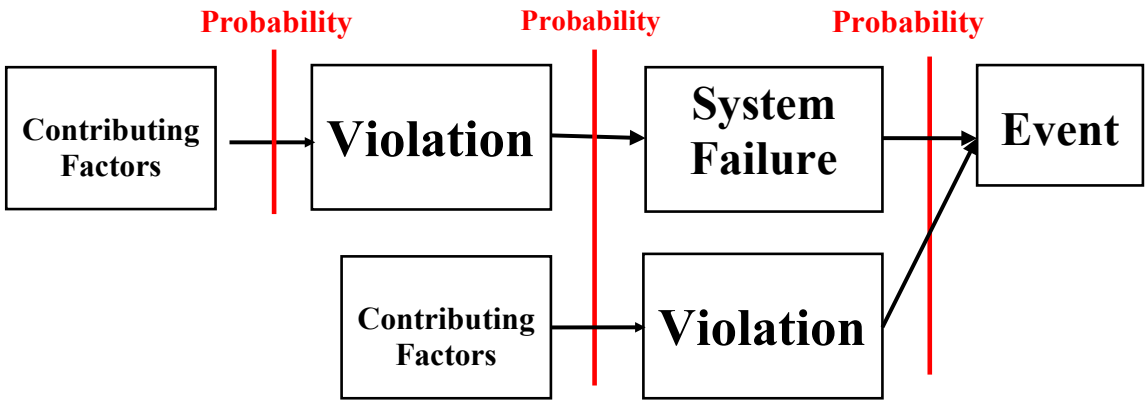

Figure 6. Combined Violation Model

Then we can put all of these models together to have a final event causation model that includes errors and violations. This is shown in Figure 7.

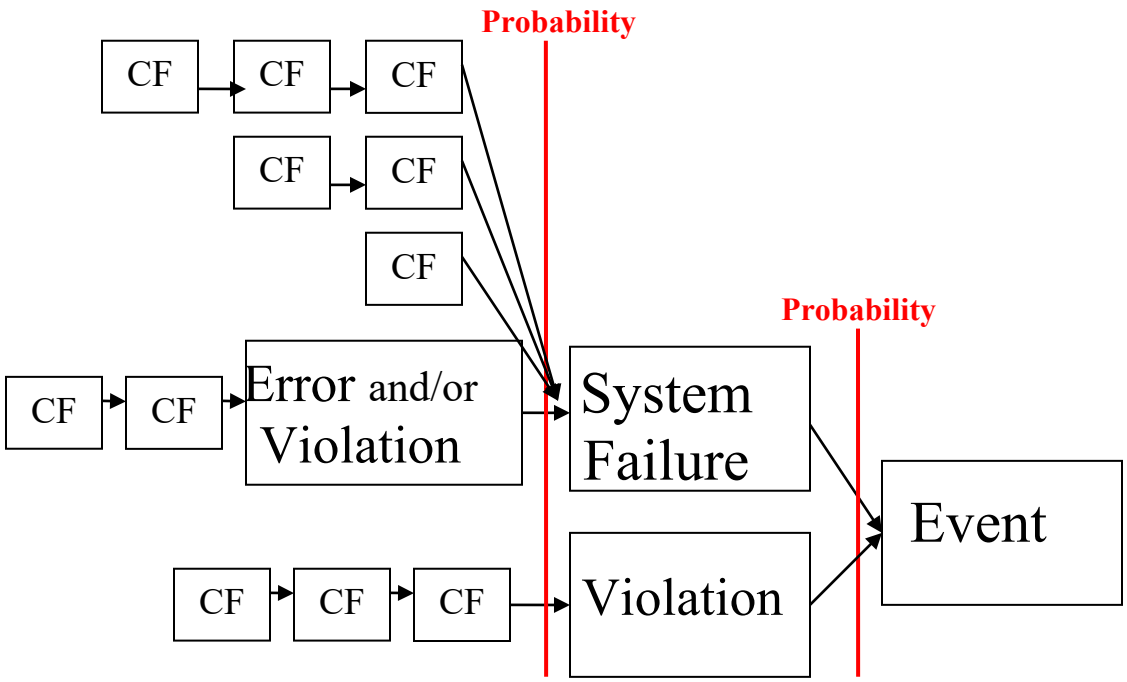

Figure 7. Final REDA Event Model

6. The REDA Philosophy

The REDA philosophy is explained using the final REDA event model in Figure 7. The fundamental philosophy behind REDA is:

- A ramp operations-related event can be caused by an error, by a violation, or by an error/violation combination.
- Ramp errors are not made on purpose.
- Ramp errors are caused by a series of contributing factors.
- Violations, while intentional, are also caused by contributing factors.
- Most of these contributing factors are part of an organization's process and under the control of management, and, therefore, can be improved so that they do not contribute to future, similar events.

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. If a ramp worker does a violation, e.g., not use hearing protection according to the ramp operations manual, and that violation is a work group norm, the other ramp staff are likely to violate in that situation, also.

Typically an error (or violation) does not occur due to a single contributing factor. During the field test of the REDA process, the field test airlines found that there were, on average, about four contributing factors to each ramp error. So, we say that errors result from a series of contributing factors. Violations are also due to a contributing factor or a series of contributing factors, including peer pressure, time pressure, and existing normative behavior.

Most of these contributing factors are under management control. In order to change the probability that an event 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 marking. 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.

While not based on the event 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 one part of the system, and
- Addressing the contributing factors to lower level events helps prevent more serious events.

From the systems perspective, the ramp worker is a system component of the ramp operations. 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.

7. The REDA Investigation Process

The purpose of this REDA User's 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 8 is a diagram of the REDA investigation processes.

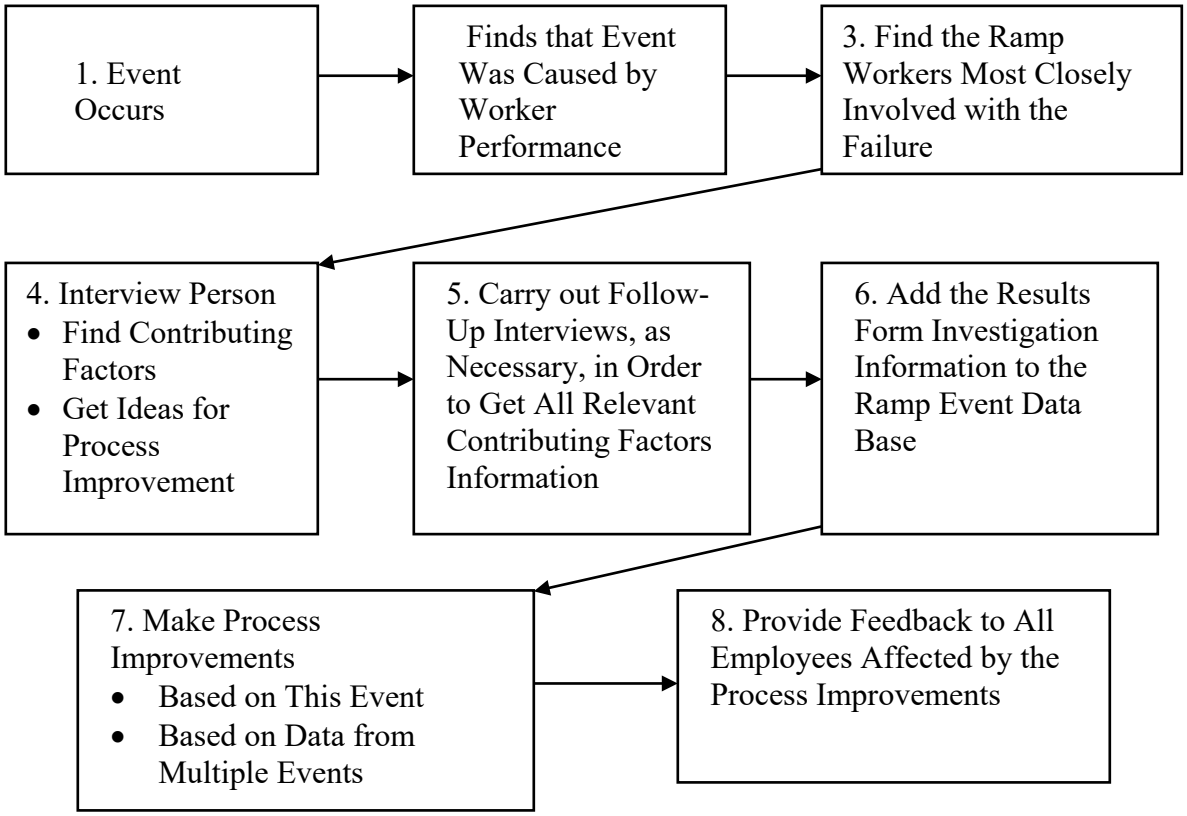

Figure 8. The REDA Investigation Process

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 worker performance contributed to the event. If worker performance was involved and there was an error and/or violation 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 event. In this case the workers involvement could fall into to two general categories:

- A human performance failure where the worker committed an error, violation, or was not able to do his/her job in the required time.
- However, sometimes there are no obvious contributing factors can be directly tied to the personnel on the ramp. For example, ground equipment breakdown. In this case, the worker operating the equipment would be considered the one most closely involved with the event.

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

- What the error(s) and/or violation(s) were that lead to the event
- What the contributing factors were to the error(s) and/or violation(s), 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 and event. 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 system failures and events. 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 who caused the event."

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 of one investigation, if there are obvious and relatively straightforward contributing factors that need to be fixed (like improved lighting or marking). 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 an 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.

8. Using the REDA Results Form

The REDA Results Form is a six-page form consisting of six sections:

- Section I—General Information
- Section II—Event
- Section III—Ramp System Failure
- Section IV—Contributing Factors Checklist
- Section V—Failure Prevention Strategies
- Section VI—Chronological Summary of the 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 ramp event from occurring again. Section VI provides a chronological summary of the event including how some contributing factors lead to additional contributing factors.

8.1 Section I. General Information

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 system failure 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

8.2 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 event
6. Weight & balance/cargo event

It is entirely possible that there is more than one event checked in 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.

Section II – Event

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/flaps/slats/ailerons
( ) f. Engine/cowl
( ) g. Landing gear/doors
( ) h. Antenna/masts
( ) i. Other (explain below)

2. Equipment Damage Event
( ) a. Bag tug/cart
( ) b. Loading bridge/(jetbridge)
( ) c. Belt Loader
( ) d. Container loader
( ) e. Trucks (lav/fueling/water/etc.)
( ) f. Other (explain below)

3. Operational Process Event
( ) a. Flight delay
( ) b. Flight cancellation
( ) c. Ground interrupt/gate return/ rejected takeoff
( ) d. Air Interrupt (return to field/diversion)
( ) e. Other (explain below)

4. Personal 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. Weight & Balance/Cargo Event
( ) a. Exceeded weight/Center of Gravity (CG) limits
( ) b. Cargo shifted
( ) c. Cargo release in aircraft
( ) d. Live animals (death, escape, etc.)
( ) e. Dangerous goods incorrectly shipped
( ) f. Unit Load Device (ULD) failure/used unserviceable ULD
( ) g. Technically unairworthy conditions (reported after takeoff, reported on Offload)
( ) h. Spill in aircraft
( ) i. Contamination of aircraft
( ) j. Other (explain below)

7. Other Event (explain below)

Describe the specific ramp system failure.

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.*

8.3 Section III. Ramp System Failure

In the REDA model, the ramp system failure is the failure that directly leads to the event. The system failures listed are very specific and relate easily to worker performance. There are eight different major failure types listed:

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

A tenth box is provided for "Other" in case the specific error of interest was not listed in 1-9 above.

Step 1 is to select the type of ramp 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 ramp 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 ramp 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 ramp system failure and a # by the second ramp system failure. Then you could place a * by the factors that contributed to the first ramp 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 ramp system failure in the open space below the errors.

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

8.4 Section IV. Contributing Factors Checklist

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

A. Information
B. Equipment/Tools/Safety Equipment
C. Aircraft Design/Configuration/Parts
D. Job/Task
E. Knowledge/Skills
F. Individual Factors
G. Environment/Facilities/Ramp
H. Organizational Factors
I. Leadership/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 ramp 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 ramp 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 ramp 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 ramp system failure analysis to assist you in filling out the Results Form.

8.4.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, load plans, alerts, HAZMAT paperwork, live animal paperwork, 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 in the Results Form.

To determine that information was a contributing factor to the ramp 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 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
   - Alerts not understood

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, or lost, or incorrectly filled out

7. *Incorrectly modified manufacturer's maintenance manuals/service bulletins*
    - 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

10. *Inefficient procedure*
    - Too many steps to carry out the task

11. *Uncontrolled*
    - The ramp worker used an uncontrolled copy of technical documentation, and the differences between the uncontrolled documentation and the controlled documentation contributed to the error.
    - The ramp worker used his/her "black book," and the information was no longer correct.

12. *Other*
    - Operator cannot use digital information

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

Ground Support Equipment/Tools/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 (PPE), such as ear plugs and safety vests, as well as collective safety equipment (CPE), 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 a ramp system failure include mis-calibrated instruments, use of unreliable equipment, or equipment or tools with no instructions for use.

Examples to look for:

1. *Defective/unserviceable*
    - Defective/unserviceable Unit Load Device (ULD)
    - Belt loader with a nonfunctioning brake

2. *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 PPE is missing
    - Power sources are not labeled or protected

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

4. *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

5. *Not used*

- Equipment, tools, and/or safety equipment were available but were not used

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

7. *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

8. *Incorrectly used*
   - Torque wrench adjusted for the wrong torque
   - Work stand positioned incorrectly

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

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

11. *Too complicated*
    - Tool or equipment usage requires too many simultaneous movements and/or readings

12. *Incorrectly labeled/marked*
    - Hand marked labeling or operating instructions are incorrect
    - Tool or equipment has incorrect scale readings

13. *Not labeled/marked*
    - Tarmac markings not present
    - Directional markings missing
    - Instructional placards missing or faded

14. *PPE/CPE not used*
    - PPE/CPE available but not used, e.g.,
      - Ear protection not worn
      - Hi-visibility vests not worn
      - Safety barriers not used
      - Fall protection devices not used

15. *PPE/CPE used incorrectly*

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

16. PPE/CPE unavailable

- PPE/CPE not used because it was unavailable

17. Mis-calibrated

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

18. No instructions

- Tool usage instructions not available

19. Inaccessible

- Not in usual location (possibly being used on other task or aircraft)
- Too far away from the worksite

20. Past expiration date

- Certification of the equipment/tool has expired

21. Other

- System protection devices on tools/equipment not available

8.4.C. Aircraft Design/Configuration/Parts/Equipment/Consumables

An aircraft should be designed/configured so that cargo doors and cargo, for instance, are accessible for ramp tasks. The ramp worker 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 ramp 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. *Not user friendly*
   - Lack of feedback provided by component or system
   - Can be easily installed with wrong orientation
   - Direction of flow indicators do not exist

7. *Other*

- Components/cargo are too heavy for easy removal/downloading and installation/uploading

8.4.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 critical step sequence
   - 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 different
   - 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)

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

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

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

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

10. *Other*
    - The workgroup performs the task differently than specified in the written information

8.4.E. Knowledge/Skills

Technical skills 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 ramp 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 (i.e., airline, vendor, airport) 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 training and 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, ramp 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 training and discussions with peers, it may also be acquired from equipment placards, design characteristics, or even other ramp personnel when working as a team.

English language proficiency refers to a ramp worker's ability to speak and read English.

Teamwork skills refer to an individual ramp worker's skills with regard to working on a team. The worker may lack the skills needed just to participate on a team—e.g., active listening, questioning/assertiveness, persuading, respecting, helping others, sharing, and participating. The team may also lack the skills needed to carry out team tasks—e.g., setting clear goals, being results driven, gaining consensus, and leadership.

Computing skills refer to a ramp worker's skills in using a computer. This includes—e.g., finding information on a computer, generating requests, and entering information into a computer (such as employee identification information, task completion information).

Examples to look for:

1. Technical Skills

- Lack of control of baggage carts trains
- Inability to backup baggage tug
- 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
- Airport 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 whose principal language is not English is unable to understand written or verbal instructions given in English

10. Teamwork skills

- Ramp workers arguing with each other about how to carry out/continue a task
- One ramp worker ignoring another worker's input on what to do next
- One ramp worker does not trust another worker to do what was promised

11. Computing skills

- Ramp worker cannot access technical documentation on the local intranet
- Ramp worker cannot generate loading information in related computing system
- Ramp worker does not enter HAZMAT information into the correct database because he/she cannot access the database and/or enter the data correctly.

12. Other

- Worker knowledge/skills not accurately tracked/measured

8.4.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 cause 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

3. *Time pressure*
    - 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.
5. *Peer pressure*
    - Unwillingness to use written information because it is seen as a lack of technical knowledge
    - Lack of individual confidence
    - Not questioning other's processes
    - Not following safe operating procedures because others do not follow them

6. *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. Task distractions/interruptions
- Confusion or disorientation about where one is in a task
- Missed steps in a multi-step task
- Not completing a task before the shift ends
- Working environment is too dynamic

9. Memory lapse
- Forgot

10. Visual perception
- Misread dial/display because of parallax issues
- Misjudged distance
- Could not easily tell whether airplane was following marking into hangar because of visual angle

11. Lack of assertiveness
- Did not speak up and suggest a different solution
- Quickly gave up trying to get their position across

12. Stress
- Medical symptoms
- Ramp workers who get irritated easily
- Unable to concentrate

13. Situation awareness
- Ramp worker gets injured by passing vehicles
- Ramp worker gets hit by nose landing gear wheel during pushback

14. Workload/task saturation

- Too much work or too many tasks for too little time
- Work overload and work underload for an extended period of time

14. Other

- Absenteeism
- Vacations
- Medical leave
- Risk-taking behavior

8.4.G. Environment/Facilities/Ramp

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 ramp system failures. Concerns about health and safety issues could also contribute to ramp worker errors or 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 mouth
   - Makes using written material difficult

8. Lightning
- Lightning storm coming, so staff rushes to get work done.

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
- PPE limits motion or reach
- Exposure causes general or sudden fatigue
- Exposure causes general concern about long-term effect on health

13. 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
- Cause burning or itching eyes
- Cause shortness of breath
- Cause sudden fatigue

14. Inadequate blast protection
- Result in equipment damage
- Result in personal injury

15. Markings
- Ramp marking (e.g., ramp parking zone) are worn and hard to see
- Insufficient ramp marking

16. Lighting

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

17. Labels/placards/signage

- Warning signs regarding hazardous substances not posted
- Serviceable/unserviceable tags not hung on ground equipment or parts

18. Confined space

- Hard to enter
- Hard to move around
- Need watch person
- Need breathing equipment

19. Other

- Area(s) not organized efficiently (difficult to find safety equipment, tools, etc.)
- Area too congested with ground equipment and/or other ramp personnel

8.4.H. Organizational Factors

The organizational culture can have a great impact on ramp 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 ramp operations 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 ramp 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 do not 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/procedure*
   - Incorrect standard operating procedures (SOPs)
   - Outdated general ramp manuals
   - Local/organizational "norms" negatively influence the task
   - Inadequate inspection allowed
   - Process/procedure does not obtain the desired outcome

9. *Work process/procedure not followed (e.g., use tribal knowledge)*
   - Failure to use wing walkers
   - Required PPE or CPE not used
   - Load plan or alerts not followed
   - Ramp cargo load not checked or reconciled
   - Ramp cargo load final not confirmed
   - Central Load Planning (CLP) process not followed

10. *Work process/procedure 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 do not follow it
    - Undocumented procedure – most people do it

12. *Failure to follow ground guidance*
    - Ground equipment/service vehicles entered aircraft movement zone without authorization

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

14. Team building

- Management does not provide team building training to staff
- Management does not encourage staff to work on teams to solve process issues

15. Other

- Company is acquired by another company
- Work previously accomplished in-house is contracted out

8.4.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 workers 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 planned 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 task*
   - 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. *Does not assure that approved process/procedure is followed*
   - Supervisor sees ramp worker not following process or procedure, but does not correct the behavior.

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

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

8.4.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*
   - Incomplete or vague written communication
   - 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

   Load plan not shared
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 ramp 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
   - 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 ramp staff*
   - No guidance to flight crew while taxing into jet way
   - No confirmation that gear pin is not pulled

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

8. *Between vendors*
   - Confusion during ramp operations

9. *Between airline and airport*
   - Airline does not contact airport about faded markings
   - Airline does not contact airport regarding need for driving classes

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

8.4.K. Other Contributing Factors

This section was put into the User's 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 in 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 in the form just in case there may be a need some day.

8.5 Section V. Failure Prevention Strategies

This section is subdivided into two subsections. The purpose of Section A is to identify 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 event. For example, if a ramp policy was not a good policy or was not followed, then you would check "Ramp Operation Policies or Processes" and write down 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, Functional Check or Safety Check" and indicate what the inspection was.

Section B asks, *"List recommendations for failure 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 down the proposed improvement to address 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. The following four strategies specifically discuss error (not violation) prevention strategies.

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, keeping ramp equipment in good repair, and using Simplified English procedures to reduce the potential for misinterpretation. 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 Foreign Object Damage (FOD) walk, Ground Safety Equipment (GSE) daily 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 ramp worker performance-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. An example of error tolerance in ramp operations is double chocking two wheels of ramp equipment.

Audit Programs: Audit programs refer to an approach that does not 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.

8.6 Section 6. Chronological Summary of the Event

The purpose of this section is to provide you with some space to describe and summarize the event in a chronological order and what you found regarding contributing factors during the interview. If any of the identified contributing factors lead to additional contributing factors, make sure you document those causal relationships here as well. If there is not enough room provided, continue the description on another piece of paper and submit it with the rest of the REDA Results Form.

9. 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 ramp worker in order to find out the contributing factors to the error. Interviewing is a skill just like driving a towing tug 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.

9.1 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. Hopefully, that is training provided by Boeing, but it could be training provided by your training organization. Even if you receive the Boeing 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 and/or violation occurred. This person should bring two things, in addition to interviewing skills, to the interview:

- He should have the respect of the ramp worker being interviewed
- He should be technically knowledgeable about the work that was being done that led to the event.

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.

9.2 Guidelines for the REDA Investigation Interview

Once the team has been chosen, it is time to carry out the REDA investigation interview. Our suggestions for carrying out the interview are based on a method of interviewing called "Cognitive Interviewing." The Cognitive Interview technique is a systematic information retrieval strategy that has been shown to increase the amount of information that is recalled. More specifically, it typically elicits 30-70% more correct information than conventional interviewing procedures (e.g., police accepted practice), and leads to an equivalent or slightly higher accuracy level (proportion of statements that are accurate) when compared to conventional interviewing procedures.

Cognitive Interviewing is based on a method for interviewing witnesses of criminal events developed by Ronald Fisher and Edward Geiselman (Fisher, R.P., & Geiselman, R.E. (1992). Memory-enhancing techniques in investigative interviewing: The cognitive interview. Springfield, IL: Thomas). It is a systematic approach to interviewing cooperative interviewees based on scientific principles of memory and communication. The principles of cognition are converted into a number of specific techniques to help interviewees improve their memory performance, including:

- Encouraging the interviewee to concentrate
- Recreating the event context
- Explicitly requesting detailed descriptions

- Focusing on obtaining as much information as possible about a topic before moving on to another topic.

Cognitive Interviewing is consistent with the guidelines provided in other sources. Below we will first discuss general principles of cognitive interviewing followed by the specific stages/steps to follow to conduct the interview.

9.2.A. General Principles of Cognitive Interviewing

There are some general principles of investigative interviewing that should be followed throughout all stages of the interview. These include:

- Develop and maintain good rapport.
- Encourage the interviewee to be actively involved.
- Help the interviewee concentrate.
- Use open, simple, and unbiased questions.
- Listen actively.
- Use a communication style to suit the interviewee.
- Work as a team with other interviewers.

Develop and maintain good rapport. Rapport building should be considered an investment of time and not a waste of time. The better the rapport that you build with the interviewee, the more that they trust you; the more that they trust you, the more they are likely to provide you with needed information. If the interviewee is acting especially stressed, make some small talk to begin your conversation—like last week-end's football game or whatever is of interest to the interviewee. Put yourself in their place—nobody wants to do a ramp task incorrectly causing some event (like a flight delay). Act relaxed. Use a neutral tone of voice. Have your eyes at the same level as the eyes of the interviewee—never look downward at the interviewee, because this puts you in the superior position and puts them in the inferior position, which is disconcerting. Use neutral body language—i.e., do not cross your arms and your legs, because that is body language for "I do not want to hear what you have to say." Finally, make eye contact and interview the person like you would talk to a friend. Avoid arguments, judgmental comments, and criticism like:

- "You did not know what the correct procedure was?"
- "You were not using the approved GSE for that task?"
- "I cannot believe that you did that!"
- "We do not want our ramp guys doing those kinds of things."

If you say these kinds of things, the interviewee may quit answering your questions for fear of being criticized again.

Encourage the interviewee to be actively involved. At suitable times at the beginning and during the interview, make it clear to the interviewee that they are the ones with the information and that they will be doing most of the talking. At appropriate times during the interview, explain that you would like the interviewee to…

- Volunteer information whenever they think of it.
- Tell things in their own words and at their own pace.
- Give as much detail as possible.
- Not guess or make up answers.

The above should not all be done during the Introduction, because you do not want to be doing that much talking.

Help the interviewee concentrate. Minimize distractions and disruptions during the interview. Turn off your cell phone so that it does not ring during the interview. NEVER answer your cell phone during the interview. Close the door to the interview room to provide privacy and to minimize distractions from people walking by in the hallway. If there is an active view out the window that might distract the interviewee, close the curtains to minimize those distractions. Finally, ask all of your questions on the same topic before moving on to another topic.

Use open, simple, and unbiased questions. Use broad, open questions and then moved to framed (more narrow) open questions about a particular area. Only used closed questions to fill in any missing details that you cannot obtain through open questions. Closed questions are questions that can be answered with a simple "yes" or "no" response. Open questions require more than a "yes/no" response. "Did you do two stops as you approached the aircraft with the belt loader?" is a closed question. The open version of that question could be, "What kind of safety precautions did you take when you approached the aircraft with the belt loader?" It is harder to ask open questions than closed questions, but you will get better with practice.

Keep questions simple. Use short sentences, and ask just one question at a time. Avoid jargon and the use of long words. Ask your questions calmly, slowly, and clearly. Avoid questions that lead the interviewee. Two examples of leading questions are:

- "Then you probably did ____, right?"
- "At that point, you probably asked for help, didn't you?"

Listen actively. Be other-directed; focus on the person communicating. Follow and understand the speaker as if you were walking in their shoes. Listen with your ears but also with your eyes and other senses. Do not interrupt the interviewee unless they get well off of the subject. Stop yourself and others from talking while the interviewee is talking. Use pauses after the interviewee stops talking. The pause allows the interviewee time to add additional information that they might think of. Give feedback to the interviewee to indicate that you are listening and understanding what they are saying—such as a nod, "uh huh," "OK," and "I've had that problem myself." Repeat back to them in your own words what they have just told you. Try not to act surprised by anything that the interviewee says. Maintain eye contact with the interviewee, unless it is distracting. Lean toward the interviewee to indicate interest in what they are saying. If you think of a question while the interviewee is talking, write it down and ask it later. Keep an open mind about what you expect to hear. Leave your causal biases "at the door."

Interviewer biases can be very detrimental to the interview process. A poor interviewer allows their biases to drive the questions and to get the answers that they are expecting (from their biases). REDA has failed at several airlines because the interviewers were biased ("I don't need to go do the REDA interview, I already know what the problem is."). In the 1970s, some social psychologists, working in the field of Attributing Theory, studied how people attribute blame when something goes wrong. Unfortunately the social psychologists found that a majority of people attribute blame in the following manner. "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, most people bring this attribution bias with them to their job. REDA investigators must realize that this bias exists and work actively to overcome it. There are numerous other biases that interviewers can have and must overcome. These include:

- 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 do not 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."

Use a communication style to suit the interviewee. Use terms that the interviewee is familiar with. If the interviewee is speaking too fast, soft, or incoherently, model the desired behavior. Alternatively, specifically request the interviewee to slow down, speak louder, etc. If the interviewee appears to have a high anxiety level, deal with it immediately. Switch to simple factual questions or ask about background issues to help build up confidence. Get the interviewee a drink or take a short break. If the interviewee appears not to be lying, proceed with the interview and try to clarify the issue of concern later on.

Tape record or not? Many of the Air Safety Investigators use tape recorders when interviewing pilots and witnesses who were involved with/saw the incident/accident. We do not believe that a REDA investigator should use a tape recorder during the REDA interview/investigation. The problem with a tape recorder is that it makes the interview seem like a criminal investigation, which can cause the interviewee to limit what they tell you about the incorrectly performed ramp task. The benefit of a tape recorder is that it records everything that is said, which is better than you will be able to do taking notes during the interview. However, if you are not using a tape recorder, do not hesitate to tell the interviewee that you "need a second to write down" what you were just told. During the interview, one of the most important things that you are doing is listening for information that needs to be followed up with more focused questions. You cannot wait until after the interview to listen to the tape recording to determine your follow-up questions. If you do use a tape recorder, you need to get the interviewee's permission to tape record. It is also recommended that you offer to provide the interviewee a copy of the recording within a few days of the interview.

Work as a team with other interviewers. Section 9.1 gave guidance on how many people should be on the interview team and what their qualifications should be. If there are two or more people on the interview team, then one person must act as the Team Leader. Before the interview, ensure that all interviewers know their roles and that there is a plan regarding...
- Who is leading the Introduction,
- Who is asking questions, and
- Who is writing down the responses.

Introduce the other interviewer(s) into a specific conversation if they have relevant experience. If you are leading the questioning, check with the other interviewer(s) before moving to the next topic. Help other interviewer(s) if they are having difficulty.

9.2.B. Stages of the Interview

There are specific stages of the interview that should be followed. These stages include:

1. Pre-Interview Preparation and Planning
2. Interview
    a. Introduction
    b. General Account of Event/Task
    c. Detailed Account of Parts of the Event/Task
    d. Background Information
    e. Conclusion
3. Post-Interview Evaluation and Follow-up.

These stages are discussed below.

Pre-Interview Preparation and Planning. It is important that you (and other team members) prepare yourself before carrying out the interview. 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 system failure was that caused the event. If any engineering investigations have taken place, read that information, also, before the interview. Before interviewing, obtain additional background information:

- About the task that was being carried out that was done incorrectly and led to the event. This would include getting and studying copies of the ground operations manual or other procedure noting the tools and equipment that were to be used, etc.
- About the interviewee. How many years of experiences does the ramp worker have on the task? On this specific aircraft?

Determine aims of the interview—types of information sought. Determine the location of interview. 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. Do not carry out the interview with you sitting behind a supervisor's desk and the ramp 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 *versus* supervisor), and the interview could start to feel like an interrogation or cross-examination to the ramp worker. Pick a neutral location like a private room or a quiet corner that is free from distractions.

Determine when the interview will take place. The interview should take place as soon as possible after the event, since the ramp worker will begin to forget what happened over time. Allow plenty of time for the interview. REDA interviews can last only 15-20 minutes up to 1 ½ to 2 hours, depending on the complexity of the task. Determine who will be involved. The interviewee may want a friend or union representative present. Allow these people to attend the interview.

If more than one person was involved in the ramp task (e.g., one tug driver and two wing walkers), then interview each person separately. Many times there will only be one ramp worker to interview, so this would not be an issue. However, if more than one ramp worker was involved in the system failure, 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 ramp worker does not 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 ramp workers, follow-up interviews may need to be conducted.

Finally, you need to determine the interview plan (how interview will proceed). If there is more than one interviewer, then ensure interviewer roles are clearly defined. Ensure that the interview procedure is clearly understood by all of the interviewers. Develop a specific topic list to help guide some of your follow-up questions. Get plenty of notebooks, paper, pens, and a tape recorder, if you are going to use one. Finally, take along some water and perhaps some other refreshments, like coffee or soda.

Interview—Introduction. Provide a positive greeting. Use some minimal physical contact, like a handshake or a touch on the shoulder. Then determine the interviewee's preferred name and use it. Thank the interviewee for making the time available. Introduce everyone to each other. Provide a brief introduction of yourself and the other interviewer(s). [Do not talk a lot at this point—some of the below information can be stated during the interview at appropriate times.] Explain the role of your organization, the purpose of the investigation, confidentiality provisions, and other relevant policies/processes/ procedures. In order to help put the person at ease, ask them what they know about REDA. 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. If they say they have not heard about REDA, then take a few minutes to explain fully the REDA process and philosophy.

Discuss the interview process. Explain your organization's interviewing protocols. Emphasize the importance of the interviewee and encourage them to be actively involved. Outline the types of topics you will cover. Explain that you are just gathering information at this stage. Tell them that remembering the information may be difficult and will require concentration on their part. Tell the interviewee that they can ask questions at any time.

The ramp workers may be afraid that they will be punished for making the error and/or violation 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. If you want to use a tape recorder, explain why, ask permission, and tell the interviewee that it can be turned off at any time per their request.

Interview—General Account of the Task. Recreate the general context of the event or task. Speak slowly and distinctly from memory (not notes) and say something like…

- *"What I would like is for you to tell me the sequence of events as you saw them. Start from wherever you think is relevant. Before starting, just try to put yourself back in the same situation. Don't say anything just yet—just think about the situation you were in."*

Allow the interviewee time to recreate the context before questioning them. Keep quiet during this period. Request a general description. After the interviewee has had time to recreate the context of the event or task, then say something like…

- "Would you please tell me about what was happening before and during the time you were doing the maintenance task." or
- "Tell me everything that you can remember, even the things you think are not important and even if you cannot remember something completely."

Do not interrupt unless the person gets off of the subject. Do not interrupt to ask specific questions. Take notes. When they have appeared to finish talking, pause for a moment before asking another question. This will allow the interviewee to add some information that they may not have stated earlier. Then encourage the interviewee to keep talking about what happened by saying something like, "What else can you remember?" Develop a probing strategy for follow-on questions—based on the general description, develop a list of specific issues that you want more in-depth information about.

Interview—Detailed Account of Parts of the Task. Recreate specific context. Explain that you would like more details on several issues. Let us assume that the ramp worker said something about having trouble using the ground operations manual. Use the interviewee's own words and say something like...

- *"We'd like to get some more information and clarify some issues. I'd like to start when you were reading through the ground operations manual and trying to understand what to do next. Take a few seconds and think about that part of the task. It might be easier if you close your eyes, as this often helps you to concentrate and remember things more clearly."*

Then ask for more detailed information about the relevant factors that they mentioned. Paraphrase—put key points in your own words and repeat them. Say something like…

- *"I think I heard you say that you had some difficulty getting the belt loader positioned in front of the cargo door. Please tell me what the issues were."*

Paraphrasing assures that you understood what was said. Also, because you say "I *think* I heard you say…" this gives the interviewee a chance to easily correct a detail. If you said, "I heard you say…" the interviewee would have to get up their courage to contradict what you just said. The paraphrase also shows *active* listening. Respond to statements in a positive manner. Say things like…

- "I have had problems positioning belt loaders, too."
- "I agree with you—that is an error prone task."

Then continue to probe the item, using open questions, for further clarification. Encourage interviewees to use something they are familiar with (e.g., giving distances in terms of a baseball path or football field).

If relevant to the investigation, find out what contributed to a causal factor. Example—the interviewee says that they did not put up the railing on the belt loader. Find out why. If they said that the tried but could not put up the railing, find out why. Maybe they will tell you that bottom of the railing was rusted, and there was no other belt loader available at that and nearby gates. If they tell you that they decided simply not to set up the railing (even if it worked fine), find out why. Maybe they will tell you that they had done the task a lot, so did not think he needed the railing.

Keep asking "why" (open-ended questions) until you reach a natural stopping point. For example, if the interviewee says that they did not set up the railing because the railing was rusted at the bottom and could not used, then stop questioning this issue there, because it is not ramp worker's issue why the railing was rusted. If they said that no other belt loader in good working condition was available at that and nearby gates, so they did not have enough time to get another belt loader, and then ask about time constraints and the trade-offs the interviewee made. If they said that they simply decided they did not need to use the safety railing because they had done the task a lot, then ask how often they do that task and when the last time was he did the task.

Review your understanding of what the interviewee has told you. First, check with the other interviewer(s) regarding whether they had any specific questions about the issue. Then restate the interviewee's recollection of an issue in detail and using their own words where possible. Ask them to correct any mistakes you make, and to also add anything new that they think of. Identify any discrepancies in the interviewee's account or between the interviewee and other data. If these are minor discrepancies deal with them at this time. If they are major discrepancies, deal with them at the Conclusion.

Then move on to the next issue/topic area by linking it (if possible) to the issue that you were just discussing. Continue until all specific topic areas (areas you want to probe further following the general account) have been covered.

After you have gotten the detailed information about issues raised during the general account of the task, then ask about contributing factors that have not been mentioned. Review the contributing factors categories on the REDA Results Form that were not mentioned. Check the Not Applicable (N/A) line if you determine that the contributing factors category did not contribute to this event.

After you have gotten all of the contributing factors information, then ask the interviewee how they would improve the causal (contributing) factors in order to prevent future incidents. Record these improvement suggestions in Section V.B of the REDA Results Form.

Interview—Background Information. There are at least two types of people that you could have been interviewing about the task. One type is the person or persons who were involved in carrying out the task, like ramp workers. The second type is a person who witnessed the task being carried out without actually helping with the task. For witnesses, you should obtain information that will help evaluate the interviewee's ability to have seen the events they described. Much of this information will already have been obtained during the interview, but some issues will need further clarification. Explain that such questions are routine. Ask the witness about…

- Exactly where they were at the time they were observing the task, their distance away from where the task was being done, and their visibility due to obstructions and weather, if they were working outside, and visibility due to obstructions if they were working inside.
- Interviewee's state of mind at the time.
- Whether they wear eye glasses and, if yes, whether they had them on at the time.
- How often they had seen this type of task being carried out before.

Getting this type of information is best done toward the end of the interview in case it makes the interviewee feel that his/her integrity and is being questioned.

The background information for interviewees who were carrying out the task is different from above. If you do not already have this information, obtain information about the interviewee's experience, how many years they have been a ramp worker, etc.

Interview—Conclusion. Review your interview plan and make sure that your questions have been asked for all topics. Check with other interviewer(s) to make sure they have asked all of their questions. Make final check of your understanding of any of the issues. Now is the time to deal with any of the larger discrepancies that you did not want to deal with earlier for fear of making the interviewee feel uncomfortable and unwilling to talk. Present the discrepancy as a problem that you have and that you want them to help you resolve, and then ask about it. Clarify the issue as much as possible without shutting down the interviewee.

Then complete any administrative requirements. Make sure that you have all relevant administrative information—names, dates, contact details, etc. You may want to emphasize that no names or contact details will be recorded in the REDA Result Forms. Say that this is an official requirement for all interviews. Find out if the interviewee wants a copy of the tape recording (if a tape recorder was used) or of the filled out interview form.

Ask interviewee if they have any questions. Tell the interviewee what their further involvement might be (if any). Provide a summary of the progress of the investigation.

End on a positive note. Ask if the interviewee was happy with the interview and the way it was conducted. Give the interviewee your contact details. Tell the interviewee, "I **know**

that you will think of other details after your leave, so please contact me when this happens." Make sure that it is OK with the interviewee for you to contact him/her in the near future (to ask more questions). Thank the interviewee for their assistance. Create a positive, lasting impression.

Post-Interview Evaluation and Follow-up. After you are done with the interview and are back at your desk, it is time to write up the "record of interview." This would be completely filling out the REDA Results Form or entering the information into your web-based form or database. While you are doing this, you should evaluate the completeness and accuracy of the obtained information. If there are some immediate issues that should be resolved, call the interviewee up and ask your questions. At some point in time you should also evaluate the quality of the interview. What did you and the team do well? What did you and the team not do well? For the things you did not do well, work up a plan for improving these areas. Finally, contact the interviewee again (within a week) to see if they have remembered any other relevant information.

9.3 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—Each human error must have a preceding cause.
Rule 2—Each procedural deviation must have a preceding cause.
Rule 3—The relationship between the contributing factor and the error must be clearly written down.
Rule 4—Negative descriptors, such as "poorly" or "inadequate," may not be used.
Rule 5—Failure to act is only a contributing factor when there is a pre-existing duty to act.
Rule 6—Causal searches must look beyond that which is within the control of the investigator.

Let us discuss these in a little more detail.

Rule 1—Each human error must have a preceding contributing cause.

The investigation must search beyond the error to why the error has occurred. Most mishap investigations tend to stop at the mere identification of the human error. However, we need find out the contributing factors that led to the human error in order to find the best way to correct the error. Some common human errors include:

- Failure to wear headset properly when performing ramp tasks
- Inattention to detail/complacency
- Incorrectly connect towbar to the aircraft.

Rule 2—Each procedural deviation (violation) must have a preceding cause
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 make required safety stops before approaching the aircraft
- 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 airline or ground service organization for workers to deviate from this procedure
5. The procedure is a good one, but it has become the normal practice at this airline or ground service 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 3—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 system failure.

Rule 4—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 ground operations 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 5—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 ramp worker to come to work 30 minutes early just in case there is rush work to be performed.
- We do not expect a ramp worker to carry out a FOD walk twice just in case the first walk was not enough.

It is important to know in these situations exactly what pre-existing duties ramp workers 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?

Rule 6—Causal searches must look beyond that which is within the control of the investigator.

If the investigators are not in a position to change the contributing factor, they have the tendency to stop the investigation at factors only within their control. There is a belief that there is no reason to identify as causal what you cannot change. However, what might not be changeable from a single investigation might in fact be changeable if it is present in an entire class of events. Thus investigative conclusions should not be controlled by the investigator's perceived extend of control.

Key points for conducting effective cognitive interviews (Section 9.2) and six rules of causation (Section 9.3) are summarized in Appendix A.

10. Conclusion

The REDA process has been adopted world-wide since its inception in the mid-1990s. When a Safety Management System (SMS) regulation is in place among all of the national aviation authorities, there will be a regulatory requirement to do "reactive" event investigation in all aircraft maintenance organizations around the world. Since REDA is a reactive ramp-caused event investigation process, REDA use should continue to increase into the near future.

Appendix A. Key Points for REDA Interview and Six Rules of Causation

Interviewing Outline

1. **Introduction at start of interview—develop good rapport.**
    a. Introduce self/team
    b. Tell them why you are doing this interview.
    c. Ask what they know about the REDA process. Explain to them the REDA philosophy.
    d. Say something like, "**You are the person who knows all of the important information. So, you will be doing most of the talking. I will be asking you some questions, but I would like you to volunteer information whenever you think of it, tell me about the event in your own words, and be as specific as possible. You can ask me questions at any time. OK?"**
2. **Ask for a general account of the task/event**
    a. Say something like, **"What I would like is for you to tell me the sequence of events as you remember them. Start from wherever you think is relevant. Before starting, just try to put yourself back in the same situation. Do not say anything yet—just think about the situation that you were in."**
    b. After 5 to 10 seconds, say something like, **"OK, would you please tell me everything that you can remember."**
    c. While they are talking, listen for them to mention contributing factors. Write this information down on the REDA form or on a blank piece of paper.
3. **Ask for detailed accounts of parts of the task/event.**
    a. Use the paraphrase (**I think I heard you say that**…) and open-ended questions (can't be answered "yes" or "no"), to ask for more detailed information about potential contributing factors brought up during the interviewee's general account of the task/event.
    b. Ask about other REDA contributing factors categories that were not mentioned during the general account.
    c. Review your understanding of everything that you have heard.
    d. Deal with minor discrepancies here.
    e. **Get the interviewee's input** on how to improve the contributing factors that were uncovered during the interview.
4. **Background information**
    a. Collect background information, especially from witnesses to the event.
5. **Conclusion**
    a. Make sure that you and the team have asked all of your questions.
    b. Deal with large discrepancies here.
    c. Provide a positive ending.
6. **Post-interview evaluation and follow-up**

a. Finish your paperwork
b. Call the interviewee back if you have any questions.

General Principles of Interviewing

1. **Develop and maintain good rapport**—Avoid arguments, judgmental comments, and criticism.
2. **Encourage the interviewee to be actively involved**. Respond to their statements in a positive manner. Say such things as,
    a. "I know what you mean."
    b. "I have done that myself"
    c. "Sometimes those procedures are hard to understand and follow."
    d. "I agree with you, that is an error-prone task."

    Do NOT say things that would put the interviewee on the defensive, such as:
    a. "You did WHAT?!?"
    b. "I can't believe that you did that."
    c. "You didn't use the calibrated tool for that task?"
    d. "A good mechanic/engineer would not have done that."

    Try NOT to ask questions that can be answered with a simple "yes" or "no" response.
3. **Help the interviewee concentrate**. Minimize distractions during the interview.
4. **Use open, simple, and unbiased questions**.
    Try NOT to ask questions that can be answered with a simple "yes" or "no" response.
    Do NOT asking "leading" questions like
    a. "At that point you probably asked for help, didn't you?"
    b. "Then you probably did…"
5. Go into the interview with no biases regarding culpability/blame. **Listen actively**.
6. **Use a communication style to suit the interviewee**.
7. **Work as a team with other interviewers**.

When/Where/How Many People to Do the Interview

When: As soon as possible after the event.
Where: Pick a neutral location like a private room or a quiet corner.
How many people on the interview team: 1-3.

Rules of Causation

1. Each human error must have a preceding cause.
2. Each procedural deviation must have a preceding cause.
3. Causal statements must clearly show the "cause and effect" relationship.
4. Negative descriptors (such as poorly or inadequate) may not be used in causal statements.
5. Failure to act is only causal when there is a pre-existing duty to act.
6. Causal searches must look beyond that which is within the control of the investigator.