Guidance on root cause analysis and corrective action process to address CAA Nepal findings of non-compliance

1. Introduction

This Guidance Material (GM) provides information and guidance; it neither changes, creates, amends or permits deviations from regulatory requirements, nor sets minimum standards.

1.1 Purpose

1. This document explains the root cause analysis and corrective action process to address CAA Nepal findings of non-compliance.

2. This document incorporates ideas from experts in the field of causal analysis.

1.2 Applicability

This document applies to CAA Nepal personnel and to enterprises responding to CAA Nepal findings.

2. Reference and Requirements

2.1 Reference Documents

Use the following reference material with this document:

(a) CAA Nepal Discrepancy Reporting Form (Corrective Action Plan Section)

2.2 Definitions and Abbreviations

The following definitions apply to this document:

Causal chain: Ordered sequence of actions and conditions that led to the non-compliance.

Compliance: The state of meeting regulatory requirements.

Contributing Cause: Any cause under the control of the enterprise that may have contributed to the non-compliance but, if addressed, could not by itself have prevented the problem.

Corrective Action: Activities to address non-compliance and eliminate the cause(s) of non-compliance to prevent recurrence.

Corrective Action Plan (CAP): A plan submitted in response to findings. The CAP outlines how the organization proposes to address findings and ensure on-going compliance.

Finding: A factual account, supported by evidence, of how an organization is not in compliance with regulatory requirements.

Human and Organizational Factors: The relationship between people, their working environment, and the organization's system(s).

Non-compliance: The failure to meet regulatory requirements.

Organization: The holder of one or more CAA Nepal approval. For example, an organization holds the following certificates: Approved Maintenance Organization, Air Operator, Approved Training Organization and Approved Engineering Organization. The term denotes that surveillance is conducted on the whole organization.

Problem statement: A concise description of the specific problem that will be used as the basis to carry out root cause analysis.

Process: A group of inter-related or interacting activities that convert inputs into outputs.

Regulatory requirements: The Civil Aviation Regulation (CAR-2058 and its amendments), Nepalese Civil Airworthiness Requirements (NCAR) and standards as well as any documentation incorporated by reference.

Root Cause(s): Cause(s) under the control of the organization that, if addressed, could have prevented the non-compliance.

Root Cause Analysis: An analysis conducted to identify the cause(s) of a finding.

Safety performance: An organization's capability to ensure safe outcomes of their activities.

Surveillance: All activities directly related to CAA Nepal evaluating an organization's compliance with applicable regulatory requirements, including assessments, program validation inspections and process inspections.

System: A group of inter-dependent processes and people working together to achieve a defined result. A system comprises policies, processes and procedures. It is through systems that organization should achieve compliance to their regulatory requirements on an ongoing basis.

The following **abbreviations** are used in this document:

AM: Accountable Manager

CAA Nepal: Civil Aviation Authority of Nepal

CAP: Corrective Action Plan

GM: Guidance Materials

3. Background

Under the Civil Aviation Regulation Rule 84, the Director General has the authority to conduct inspections to monitor compliance, which is performed through CAA Nepal's surveillance procedures. Organization must maintain compliance on an ongoing basis.

If a CAA Nepal surveillance activity finds non-compliance, the organization is given an opportunity to submit a CAP which must include a root cause analysis. If the CAP is deficient, depending on whether the organization showed efforts to apply root cause analysis and understand the scope of corrective action needed to prevent recurrence, CAA Nepal may extend a maximum of two more opportunities for the organization to revise and re-submit their CAP. If the organization does not address the root cause(s) of non-compliance to prevent recurrence, the Director General may take more serious action.

4. Understanding Findings

CAA Nepal findings can be at a system level (from an assessment or program validation inspection) or at a process level (from a process inspection). System level findings identify both the system and the specific technical regulation(s) that failed, and process level findings identify the process that was not functioning.

To develop an effective CAP, the organization must understand the nature of the system or process deficiency which led to the finding. If the finding(s) did not identify which system or process allowed the non-compliance to occur, contact CAA Nepal for clarification before developing your CAP.

4.1 What is a System Level Finding?

System level findings group non-compliances that show a system-wide deficiency of an organization system. Examples of systems applicable in various aviation industry sectors include, but are not limited to:

a. Safety management system
b. Quality assurance program
c. Operational control system

d. Maintenance control system

e. Airworthiness control system

f. Training program

g. Heliport preventive maintenance program

4.2 What is a Process Level Finding?

Process level findings identify an organization process which did not function and resulted in non-compliance. Examples of processes applicable in various aviation industry sectors include, but are not limited to:

a. Documentation control process
b. Safety risk management process

c. Internal audit process

d. Tool calibration process

e. Service difficulty reporting process

f. Emergency response exercise process

g. Heliport self-inspection process.

5. Understanding Corrective Action Plans

CAA Nepal provides corrective action forms, instructions, and submission deadlines with the surveillance report to the organization.

For each finding, the organization is given the opportunity to submit a completed corrective action plan to CAA Nepal. **Appendix A** is a sample Corrective Action Plan Form (CAP Form) to be used by organization as internal document to complete root cause analysis and corrective action process to address CAA Nepal findings of non-compliance. **Appendix A** shows sample CAP Form with cross-references to the guidance below for completing it.

5.1 Completing the Corrective Action Form

1. The purpose of the 'Factual Review of the Finding' section of the CAP Form is not to repeat the finding, but to define the scope of the problem in the organization's system. CAA Nepal expects the organization to:

    a. Identify the policy/policies, process(es), procedure(s), and practice(s) involved (that allowed the non-compliance to occur). Processes and procedures are usually established through documentation; however, also consider undocumented practices, attitudes and tolerances that may have developed. Any or all of these factors may be involved.
    b. Define the problem (see sub-section 6.1 of this document); and

    c. State how widespread/far-reaching the non-compliance is in the organization's system. This means the level to which the non-compliance affects that system:

        i.   Is it isolated to one area/organizational level?; or
        ii. Does it spread or reach into other areas/organizational levels?

    Note: In explaining how widespread the problem is, don't use an output of a risk management system (e.g. a risk rating), or repeat CAA Nepal's classification of the finding severity (e.g. Minor, Moderate, Major).

2. The purpose of the 'Root Cause Analysis' section of the CAP Form is to clearly show the process the organization used and the factors it considered, to determine what caused the finding to occur. CAA Nepal expects the organization to:

    a. Name the process used for the root cause analysis;

b. Provide the root cause analysis (you may summarize the root cause analysis on the corrective action form, as long as the full root cause analysis is attached); and

c. Identify the root cause(s) and all contributing causes (see sub-section 6.2 of this document).

Note: CAA Nepal does not prescribe or recommend any specific method to conduct root cause analysis on findings. Organizations should use root cause analysis methods suitable for the size and complexity of their organization. CAA Nepal expects organizations that have a Safety Management System to use the root cause analysis process defined in their SMS documentation.

d. CAA Nepal does not require organizations to prepare the final product of root cause analysis with computer software (e.g. flowcharting programs). CAA Nepal will accept simpler methods (e.g. a handwritten diagram on a sheet of paper, or a digital photo of a diagram drawn on a whiteboard or brainstormed using peel and stick notes on a flipchart) as long as the information is legible and clearly shows the logical flow of the analysis.

3. The purpose of the 'Short-Term Corrective Actions' section of the CAP Form is to provide short-term solutions to address non-compliance quickly. CAA Nepal expects the organization to:

a. Review their internal processes associated with each finding to determine if other examples of non-compliance exist; and

b. Describe the short-term actions to address all examples of non-compliance, prioritized according to safety risk.

Note: If you have implemented some or all short-term corrective actions before submitting the CAP, document these actions as completed in this section of the form.

4. The purpose of the 'Long-Term Corrective Actions' section of the CAP Form is to provide long-term solutions to correct problems in the system/process that led to the finding, thus preventing recurrence. CAA Nepal expects the organization to:

a. Describe the long-term action(s) to correct the identified root cause(s), all contributing causes, and the system/process associated with the finding (see sub-section 6.3 of this document);

b. Identify the name and position of the person(s) in the organization responsible for implementing the corrective action(s); and

Note: The person(s) assigned this responsibility must have the necessary authority and access to resources to effectively complete the identified action(s).

c. Explain how any potential hazards or risks from implementing the corrective action(s) are assessed, and mitigated or eliminated.

5. The purpose of the 'Timelines for Implementation of all Corrective Actions' section of the CAP Form is to identify the shortest reasonable timeframe to implement each corrective action. CAA Nepal expects the organization to:

a. Identify timelines (day/month/year) to implement each corrective action, and the date the corrective actions will be complete (normally within 90 days of CAP acceptance, unless CAA Nepal specifies a different timeframe); and

b. State target dates for follow-up actions to determine effectiveness of the corrective actions, within a reasonable interval from their implementation (including who in the organization is responsible to conduct follow-up).

6. The purpose of the 'Managerial Approval' section of the CAP Form is to identify the person in the organization's management structure who has the authority to commit the necessary resources to fulfill the CAP. This may be the Accountable Manager (AM), or it may be another manager when the AM has delegated responsibility for the system/process(es) subject to corrective action. CAA Nepal expects the organization to:

a. Identify that individual by name; and

b. Have them approve the CAP; and date their signature.

6. Achieving effective corrective action

1. **Appendix B** uses an example problem to compare an effective and ineffective corrective action process.

2. The key steps in achieving effective corrective action are:

6.1 Define the Problem

Corrective action begins by clearly defining the real problem. Recurring findings often happen because an organization:

a. Solved the wrong problem;

b. Fixed the outcome only;

c. Fixed the symptoms only; or

d. Corrected only one problem, when two or more problems exist.

To define the problem, the first step is to clearly understand it and the process(es) involved. Gather facts about what did or did not happen. Don't jump to conclusions. Remember, assumptions, consensus or opinion are not evidence.

The more you define a problem, the easier it becomes to identify the cause(s) and the solution(s). Define the problem by answering:

a. **What?**

    i. What changed (from when your system/process was compliant before)?

    ii. What happened that shouldn't have?

    iii. What didn't happen that should have?

b. **When?**

    i. When did the problem begin (date/time)?

    ii. How often did the problem occur?

c. **Where?**

    i. Where did the problem physically occur (location)?

    ii. Where did the problem occur in your process/system (what work was being done)?

d. **How does the problem impact your organization?**

    i. How big is the problem?

    ii. How much bigger can it get?

    iii. How does the problem affect your safety performance?

6.2 Identify the Cause(s)

1. Without knowing the root cause(s) of a problem, effective solutions to prevent recurrence are unlikely. Experience shows that identifying the wrong cause(s) leads to taking the wrong corrective action.

2. Root cause analysis builds a clear causal chain by answering:

    a. How and Why?
    b. What conditions existed?
    c. What actions/inactions brought these conditions together to cause the problem?

3. Focus on cause-and-effect relationships to determine what was required for each effect to occur. Consider human factors, the environment, organizational factors and supervision (**Appendix C**).

4. Focus on how people work within your organization's system, not on individuals. The way to solve problems effectively is to connect the cause-and-effect analysis to your work processes. Simply put:

    a. Processes are how your organization gets work done;

    b. People carry out the steps of each process;

    c. Processes should give people the information and tools they need to do the job effectively;

    d. Problems result when a process breaks down; and

    e. Since cause(s) exist upstream from where the problem appeared, solutions must change work processes where the cause(s) originated.

5. Work processes often fail when:

    a. The process is not clearly documented;

    b. The process and its intended outcome are not clearly understood;

    c. The defined process is incorrect; or

    d. The defined process is not followed.

6. The root cause of each causal chain is reached when:

    a. You cannot identify any other cause; or

    b. The cause would be completely outside your organization's control.

7. Root causes are those for which your organization:

    a. Has control to fix; and

    b. Can adopt effective solutions to prevent recurrence.

8. **Appendix D** lists some techniques to analyze problems, identify causes, and/or find solutions. Examples of three techniques are shown in **Appendix E**, **Appendix F**, and **Appendix G**. These examples show that most system problems do not have a single cause, so do not have a single solution.

6.3 Develop Corrective Action

Effective corrective actions break the causal chain by fixing the contributing causes and the root cause. Ignoring a contributing cause, could produce a future root cause. Corrective actions should:

a. Correct each root cause and contributing cause;

b. Be specific actions to eliminate or control causes (i.e. 'adopt', 'begin', 'install', 'conduct', 'amend'; 'disable'; etc., rather than 'review', 'analyze', 'investigate', 'consider', 'assess', etc.);

c. Prevent recurrence of the problem statement with reasonable certainty; and

d. Not cause unintended consequences or introduce new problems.

6.4 Take Corrective Action

The organization is expected to implement their CAP when it is accepted by CAA Nepal. Taking corrective action includes:

a. Get resources (e.g. personnel, capital, equipment, tools, supplies) to carry out the CAP;

b. Organize and perform CAP activities; and

c. Determine evaluation activities.

6.5 Evaluate Corrective Action

1. Monitoring corrective actions is important so organizations know if the changes were adopted and if they worked as intended. Follow-up includes two steps:

   a. *Verify CAP activities* – To ensure the CAP was completed, verify that your organization:

   i. Amended all relevant documents, system requirements, and record-keeping requirements to reflect process and system changes;

   ii. Used effective communications and training methods to make sure that employees know about the changes and understand the reasons;

   iii. Is consistently applying the changes;

   iv. Has done everything set out in the CAP; and

   v. Adopted all corrective actions within the approved timeline.

   b. *Validate effectiveness* - To determine if corrective actions are effective, validate that:

   i. The solutions work as planned and deliver the expected results;

   ii. Corrective actions are truly eliminating or controlling causes, not simply reducing the likelihood of their recurrence;

   iii. The changes did not cause unintended consequences or introduce new problems; and

   iv. The problem has not recurred.

   Note: Depending on the complexity of the CAP, it may take a reasonable period of time before the organization sees the effectiveness of its corrective actions.

2. Analyse any discrepancy to identify the reasons for it. Return to the appropriate step of the corrective action process and take further action as necessary.

APPENDIX A — CORRECTIVE ACTION FORM

CORRECTIVE ACTION FORM

Company Name:		
Base Location:	**Date(dd-mm-yy):**	
System of Process of Interest(Worksheet)	**Associated Finding Number:**	**File:**

Factual Review of the Findings

Identify what happened, how widespread it is, where it occurred within your operations, and what type of problem it is

See 5.1(1)

Root cause Analysis

Identify what type of analysis was used, how it was used to derive root causes resulted from the analysis

See 5.1(2)

Proposed Corrective Action

1. Short Term Corrective Action

See 5.1(3)

2. Long Term Corrective Actions(Including an assessment of any induced hazards or risks associated to the implementation of the corrective action(s)

See 5.1(4)

Timeline for implementation of all Corrective Actions

See 5.1(5)

Managerial Approval/Name/Signature:	**Date(dd-mm-yy):**

See 5.1(6)

APPENDIX B — EXAMPLE OF EFFECTIVE VS INEFFECTIVE CORRECTIVE ACTION PROCESS

Situation: An operator was tasked to close Valve A; instead, the operator closed Valve B.

Corrective Action Process		
	Ineffective	**Effective**
Problem Statement	Emphasis on Who: • Operator Z closed the wrong valve	Emphasis on What, When, Where, Impact: • Valve B was closed on Pipe #3 in main plant during shift change at 6:31pm on Christmas Day, shutting off glycol for de-icing.
Analysis	• Did the operator make a mistake?	• Was the documented procedure followed? • Is the procedure correct? • Did the operator receive enough training? • Is the operator qualified to do the work? • Did shift handover take place? • Did shift supervisors give conflicting directions? • Was the equipment faulty? • Were the valves clearly labeled? • Are there measures in place to detect valve errors?
Causes	Operator error	• Unclear procedures • Incomplete training • Inconsistent supervision during shift change
Corrective Actions	• Retrain the operator on the procedure. • Remind all operators to be alert when closing valves.	• Revise the procedure to meet user needs. • Check that valve labels on equipment match the revised procedure. • Give update training on the revised procedure to staff. • Set up a supervisory shift handover process. • Evaluate effectiveness in 3 months.
Outcome	Unlikely to prevent recurrence	Likely to prevent recurrence

APPENDIX C — HUMAN AND ORGANIZATIONAL FACTORS

1. While human error is often cited as a cause of many failures, human factors expert Sidney Dekker believes that "human error is a symptom of trouble deeper inside the system". Human error is a symptom, not the cause; it is a starting point in root cause analysis, not the conclusion.

2. Dekker emphasizes that "the point is not to find out where people went wrong. It is to understand why they did what they did, by probing the connections between their assessments and actions, and the tools, tasks and environment that surrounded them". If it made sense to them, it could make sense to others, which means the problem may show up again and again.

3. There is a growing awareness that organizational factors create most of the conditions that can lead to human error. Yet most people have no control over these factors. Table 1 highlights some of the organizational factors that can contribute to the breakdown of a system/process and eventually result in an organizationally-induced human error. These factors are generally out of the control of the person; they require a management change in policy, process, procedure, working environment, etc.

Table 1 – Organizational Factors

Organizational Climate

Structure

- Chain of command
- Delegation of authority
- Communication
- Formal accountability

Policies

- Hiring & firing
- Promotion
- Drugs & alcohol

Culture

- Norms & rules
- Values & beliefs
- Attitudes & tolerances
- Organizational justice

4. The following resources address human and organizational factors that apply to various aviation industry sectors:

   a. Transport Canada TP14175 dated October 2003 - Human Performance Factors in Aviation Maintenance: *http://www.tc.gc.ca/eng/civilaviation/standards/maintenance-aarpe-humanperformance-menu-587.htm#pdf*

   b. Flight Safety Foundation European Advisory Committee - Operators Guide to Human Factors in Aviation: *http://www.skybrary.aero/index.php/Portal:OGHFA*

   c. Federal Aviation Administration (U.S. Department of Transportation*) -*
      i. *Human Factors in Airport Operations: http://www.faa.gov/about/initiatives/maintenance_hf/library/documents/media/support_documentation/opsman_ramp_final.pdf*
      ii. *Human Factors Awareness Course: http://www.hf.faa.gov/webtraining/Intro/Intro1.htm*

APPENDIX D — ANALYSIS TECHNIQUES

1. Some techniques to analyze problems, identify causes, and/or find solutions are listed below. Not all techniques are appropriate for every problem. Sometimes a combination of techniques may be more effective. Before using any technique, check that it is appropriate for the scope of the problem and the size/complexity of your organization. You can get information about these techniques from various sources, including the Internet:

a. Flight operations events – Procedural Event Analysis Tool

b. Maintenance events – Maintenance Error Decision Aid

c. Ramp events – Ramp Error Decision Aid

d. Cabin operations events - Cabin Procedural Investigation Tool

e. Multi-linear Events Sequencing

f. Timeline Analysis

g. Change Analysis

h. Reason Model

i. Five Why's

j. SHEL Model

k. Cause and Effect Diagram (Fishbone/Ishikawa)

l. Management Oversight and Risk Tree Analysis

m. Event and causal factor chart

n. Causal Mapping

o. Bow Tie Analysis

p. Energy Flow / Barrier Analysis

q. Fault Tree Analysis / Failure Event Tree

r. Failure Mode and Effects Analysis

s. Six Thinking Hats

t. Pareto Analysis

u. Matrix Diagram

v. Force-Field Analysis

APPENDIX E — FIVE WHY'S

1. Advantages:

    i. Explores cause-and-effect relationships underlying a problem.

    ii. Answers to the 'Why' questions form a causal chain leading to the root cause(s).

    Note*: 'Why?' may need to be asked fewer or more times than five to find the root cause(s) of a problem.*

2. Limitations:

    a. The most simplistic causal analysis method; inappropriate for complex problems.

    b. Identifies only one root cause, unless the organization explores multiple causal chains.

3. Example:

    a. *Situation* - An apprentice engineer at an aircraft maintenance organization installed the landing gear pins in the main landing gear so the aircraft could be jacked up for a retraction test of the nose gear. When the gear switch was selected up, the main and nose gear retracted. The main jacks (which had been lowered but not removed) punched through the bottom of the wings as the aircraft came to rest on its belly on the hangar floor. The incident took place at 3:00 AM and the aircraft was to be on line at 6:00 AM.

    b. *Problem Statement* – At 3:00 AM on March 1 this year, both aircraft wings on C-ABCD were punctured by the maintenance jack stands during a retraction test of the nose gear at Prairie Hangar, even though landing gear safety pins had been installed.

    c. *Causal Analysis* – Table 2 shows how the organization used the Five Why's method to explore human and organizational factors in the causal chain.

Table 2 – Five Why's

1. Why did the main gear retract with the pins installed?

A: The apprentice engineer installed the landing gear pins in the wrong hole.

2. Why did the apprentice install the pins in the wrong hole?

Organizational Factors	Supervision	Environment	Human Factors
A: These holes had not been filled, as recommended by the aircraft manufacturer's service bulletin (SB).	A: The apprentice had never been shown the correct location for the pins and was completing the work without supervision.	A: The lighting in the hangar was not adequate for night working conditions.	A: The apprentice was working under pressure.
3. **Why** was the SB not complied with?	3. **Why** was the apprentice completing unsupervised work without adequate direction?	3. **Why** was the lighting in the hangar inadequate?	3. **Why** was the apprentice working under pressure?
A: It was in a pile of SB's that had not been assessed.	A: The supervising engineer was on vacation that week. The apprentice had	A: The lights were more than 20 years old and some of the fixtures	A: The aircraft had to fly at 6:00 AM, the aircraft maintenance manual required the retraction

	completed similar tasks to this before and felt qualified to complete this task.	were broken.	test to be done, and the apprentice was fatigued.
4. **Why** had the SB's not been assessed?	4. **Why** were there no arrangements to ensure alternate supervision?	4. **Why** were the fixtures not repaired or replaced?	4. **Why** was the apprentice fatigued?
A: The company did not have a documented procedure for assessing SB's.	A: Management did not foresee the schedule conflict in time to correct the omission.	A: Management did not upgrade the lighting when the hangar was purchased 15 years ago, and did not act on complaints made about poor lighting.	A: The apprentice was finishing a 12-hour graveyard shift, and did not recognize the cumulative effect of fatigue and pressure on work performance.
5. **Why** was there no procedure for assessing SB's?	5. **Why** did management not foresee the schedule conflict in time to compensate?	5. **Why** was the lighting not upgraded when complaints were received?	5. **Why** did the apprentice not recognize the effect of these factors on work performance?
A: The Director of Maintenance was over-tasked due to a staff shortage.	A: Although staff must get approval for vacation time, no one in Scheduling followed up to see if there was a conflict.	A: Senior management did not feel there was a need to upgrade the lighting, citing expense reasons.	A: Human factors training had not been provided.

d. *Corrective Action* - Solutions adopted by this organization were:

   i.   Short-term –

- Issue direction that aircraft remain jacked for gear swings, regardless if pins are in place, until the service bulletin is complied with;
- Plug the holes as recommended by the service bulletin;
- Document the procedure, and assign responsibility, for ensuring all service bulletins are assessed for each type of aircraft; and
- Conduct training in human factors.

   ii.   Longer-term -

- Install new lighting in the hangar;
- Implement process to monitor leave requests for scheduling conflicts and to ensure that alternate supervision arrangements are provided; and
- Staff vacant position(s)

APPENDIX F — FISHBONE DIAGRAM

1. Advantages:

   a. Helps teams brainstorm possible causes of a problem and avoid tunnel vision.

   b. Relevant cause categories (the bones) can be added as needed.

2. Limitations:

   a. Mixes factual causes with possible causes.

   b. Disrupts the cause-and-effect relationships underlying a problem by grouping causes into categories.

3. Example:

   a. Situation – An airport operator did not have an effective system to identify, notify, and control conditions affecting aviation safety in the airport environment, evidenced by:

      i. Trees and an unmarked tower obstructed the runway approach slope;

      ii. Operator did not notify pilots, Nav Canada or Transport Canada about these obstacles;

      iii. Operator did not adjust the PAPI and runway threshold location to compensate for obstacles;

      iv. Operator did not conduct obstacle surveys at intervals adequate for natural growth rate;

      v. Operator conducted airside safety inspections with differing checklists – some versions did not include obstacle checks; and

      vi. Staff did not realize the impact such obstacles outside the airport boundary could have on the airport's certification.

   b. Problem Statement – Since July 15 last year, the airside safety program was not conducted in compliance with regulatory requirements, leading to uncontrolled and unreported conditions hazardous to aviation safety around the airport.

   c. Causal Analysis – The organization used a fishbone diagram to brainstorm possible factors and causes, as shown in Figure 1.

Figure 1 – Fishbone Diagram

Figure 1 – Fishbone Diagram
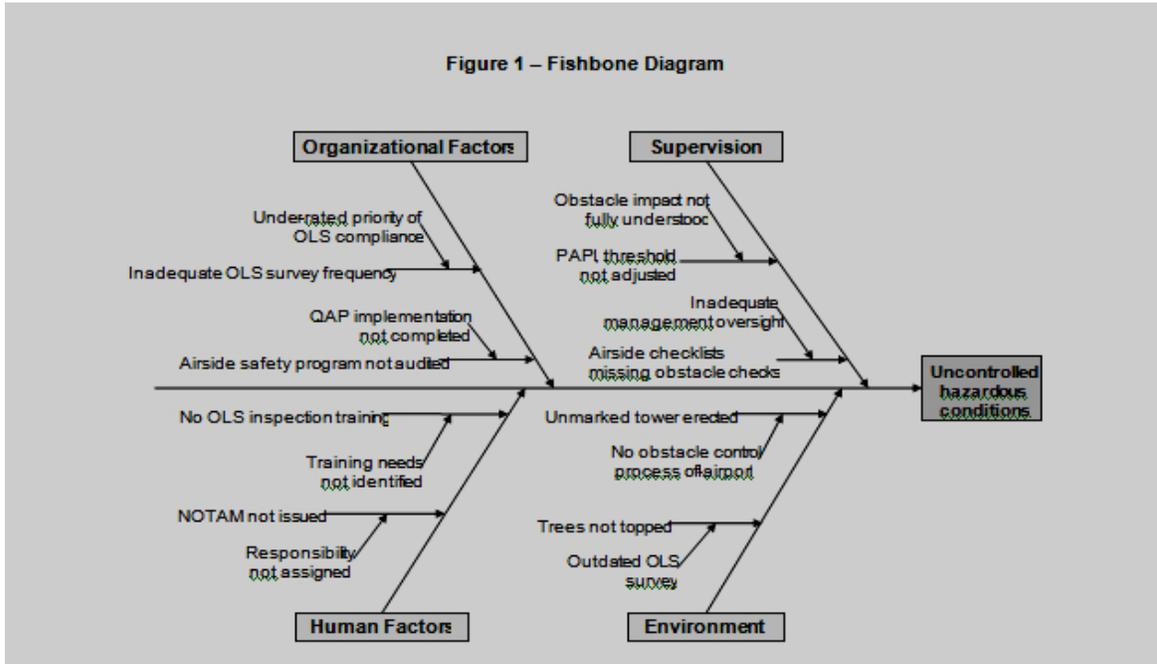
d. *Corrective Action* – Solutions adopted by this organization were:

    i. Short-term –

- Issue NOTAM;
- Notify CAA NEPAL and Nav Canada;
- Displace threshold;
- Turn off PAPI;
- Top trees;
- Work with tower owner to implement marking and lighting requirements;
- Document the process for taking immediate safety actions to correct obstructions;
- Update Operations Manager job description to document responsibility for managing impacts of obstructions;
- Standardize airside inspection checklists to include obstacle checks, and establish forms control process; and
- Develop audit checklists for, and audit, the airside safety program.

    ii. Longer-term -

- Analyze training needs for staff with airside safety responsibilities;
- Develop training to monitor and assess potential obstacles; deliver to airside safety staff and include in initial training for new hires;
- Conduct new obstacle survey;
- Change frequency of obstacle surveys from 5 years to 2 years; and
- Review corrective action to determine effectiveness during management review process.

APPENDIX G — CAUSE MAP

1. Advantages:

   a. Helps identify multiple causes of a problem.

   b. Connects multiple causal chains to show the system of causes underlying a problem.

2. Limitations:

   a. Needs a well-defined problem statement to prevent the cause map from becoming unmanageable.

3. Example:

   a. *Situation* – An air operator did not have an effective system to maintain compliance with requirements for an aircraft ground and flight training program, evidenced by:

      i. Incomplete initial and recurrent aircraft training;

      ii. Training program syllabus did not contain certain initial and recurrent training requirements; and

      iii. Unapproved revisions to the training program.

   b. *Problem Statement* – Since May 1 this year, the aircraft training program and training records for Beech 1900 flight crew members at North Base were not maintained in compliance with regulatory requirements, resulting in expired qualifications for four flight crew members.

   c. *Causal Analysis* – The organization used a cause map to explore possible conditions and actions/inactions in the causal chain, as shown in Figure 2.

Figure 2 – Cause Map

Figure 2 – Cause Map
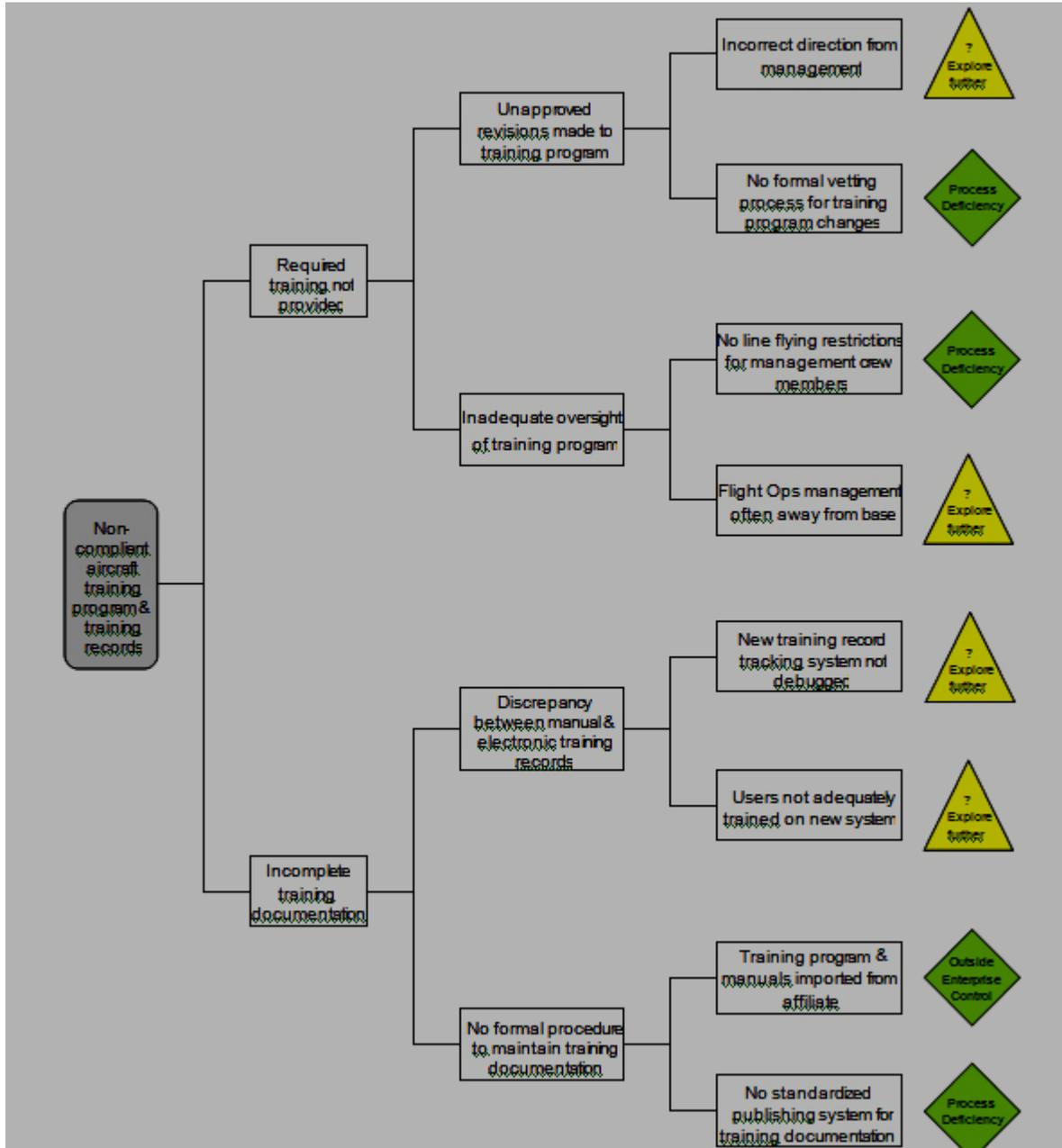
d. Corrective Action –Solutions adopted by this operator were:

  i. Short-term –

  ▪ Amend training manuals to include all requirements and submit to CAA NEPAL for approval;

  ▪ Restrict flight duty time for management crew members to 30 credited hours per month;

  ▪ Designate office time as time on duty for management flight crew;

  ▪ Audit training records (manual vs. electronic) to identify and correct all discrepancies; and

  ▪ Provide missing training.

ii. Longer-term -

- Develop matrix to cross-reference training program documentation to CARs and standards;

- Debug electronic training records system;

- Develop and deliver training on electronic training records system;

- Format all manuals into a standardized publishing system; and

- Review corrective action at quarterly safety meetings to determine effectiveness.