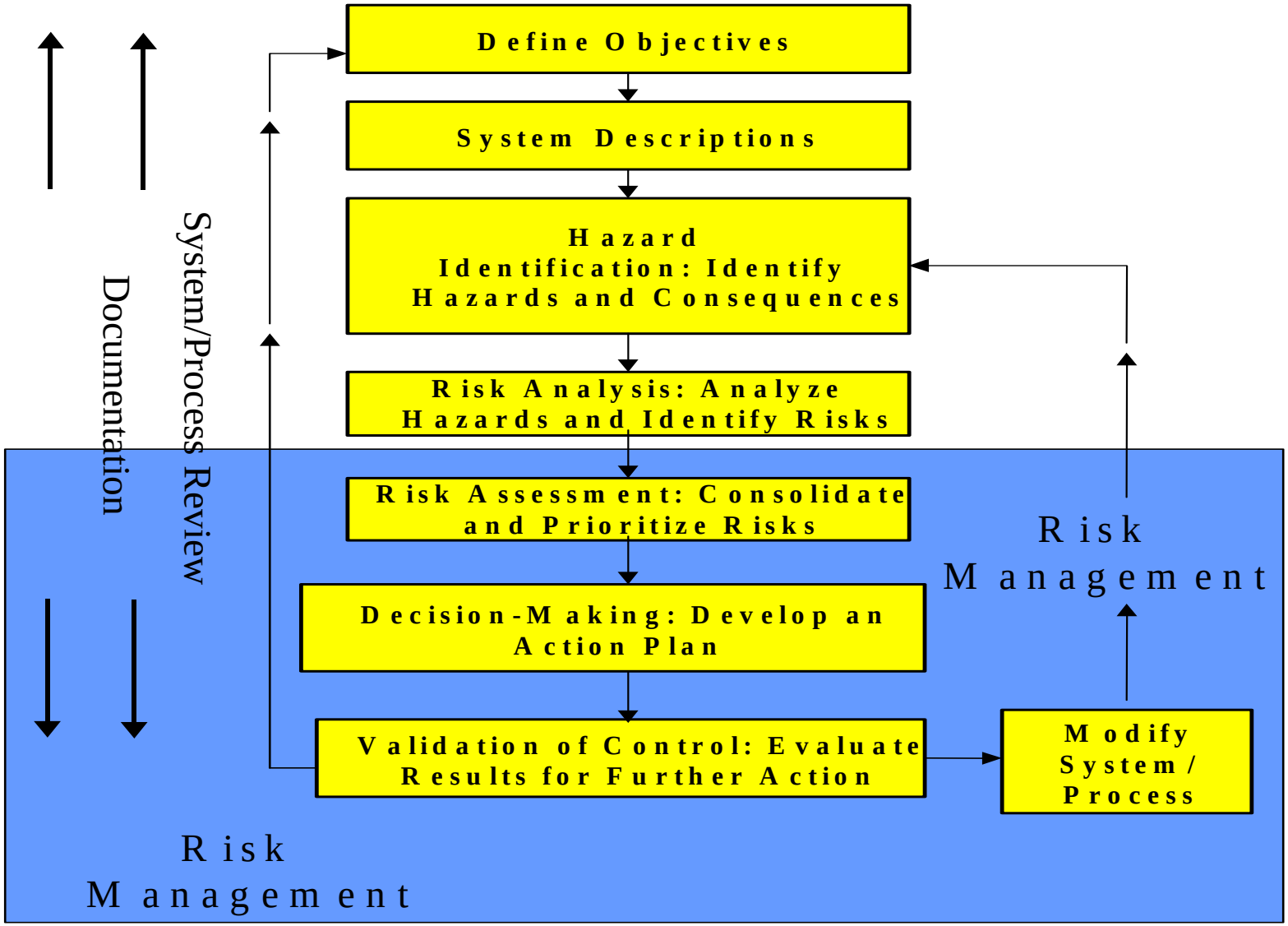
# The New Zealand Aviation Safety Management System

## Civil Aviation Authority of New Zealand

**Richard White**
**Manager Safety Investigation**

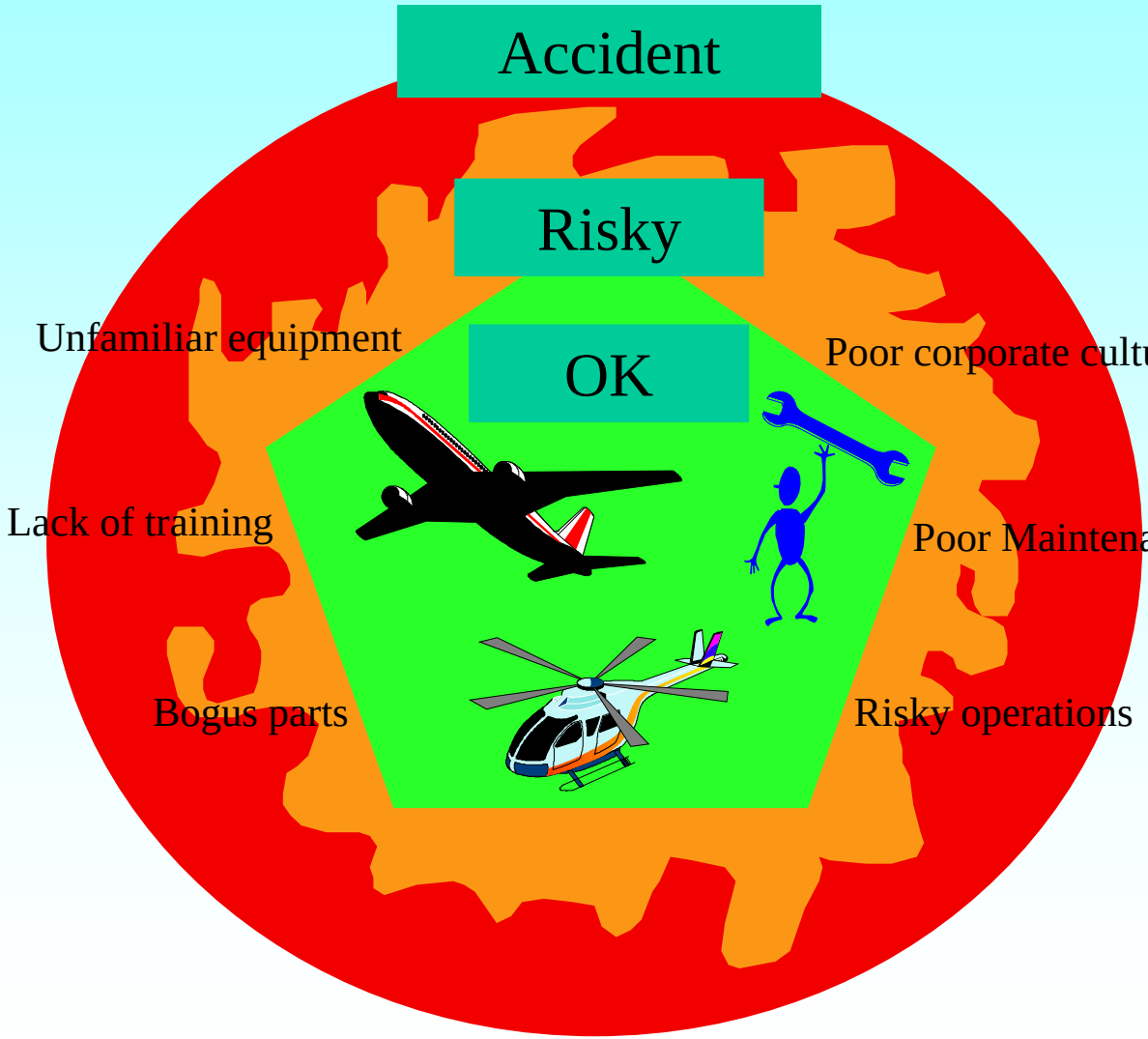
# System Safety Process



# CIVIL AVIATION AUTHORITY
# POLYGON OF CERTAINTY

# CIVIL AVIATION AUTHORITY
# POLYGON OF CERTAINTY

# CIVIL AVIATION AUTHORITY
# POLYGON OF UNCERTAINTY



# Just Culture

- **Purposeful Behaviour :-** Behaviour carried out with the intent of causing an incident or injury, or to mislead the investigation.
- **Behaviour with knowledge of outcome :-** Behaviour where something has occurred (eg. an error) that the person is aware of, and which the person knows will (likely) lead to an incident, or mislead the investigation.
- **Behaviour under influence of drugs or alcohol :-** Any behaviour that leads to an incident where the behaviour follows the intentional consumption of alcohol or other drugs.
- **Reckless Behaviour :-** Behaviour carried out with conscious disregard that the behaviour will significantly and unjustifiably increase the probability of an incident occurring.
- **Negligent Behaviour :-** Situation where the person should have known that his/her behaviour would significantly and unjustifiably increase the probability of an incident occurring.
- **Multiple acts of Negligent Behaviour :-** Do the multiple acts indicate a general lack of care and professionalism?

# AVIATION SAFETY

# MANAGEMENT SYSTEM

# A S M S

ICAO

CIRCULAR

CIRCULAR 253.AN/151

1993

# HUMAN FACTORS DIGEST
# No. 10
## HUMAN FACTORS, MANAGEMENT AND ORGANIZATION

*Approved by the Secretary General and published under his authority*

INTERNATIONAL CIVIL AVIATION ORGANISATION
MONTREAL - CANADA

ICAO

CIRCULAR

CIRCULAR 253.AN/151

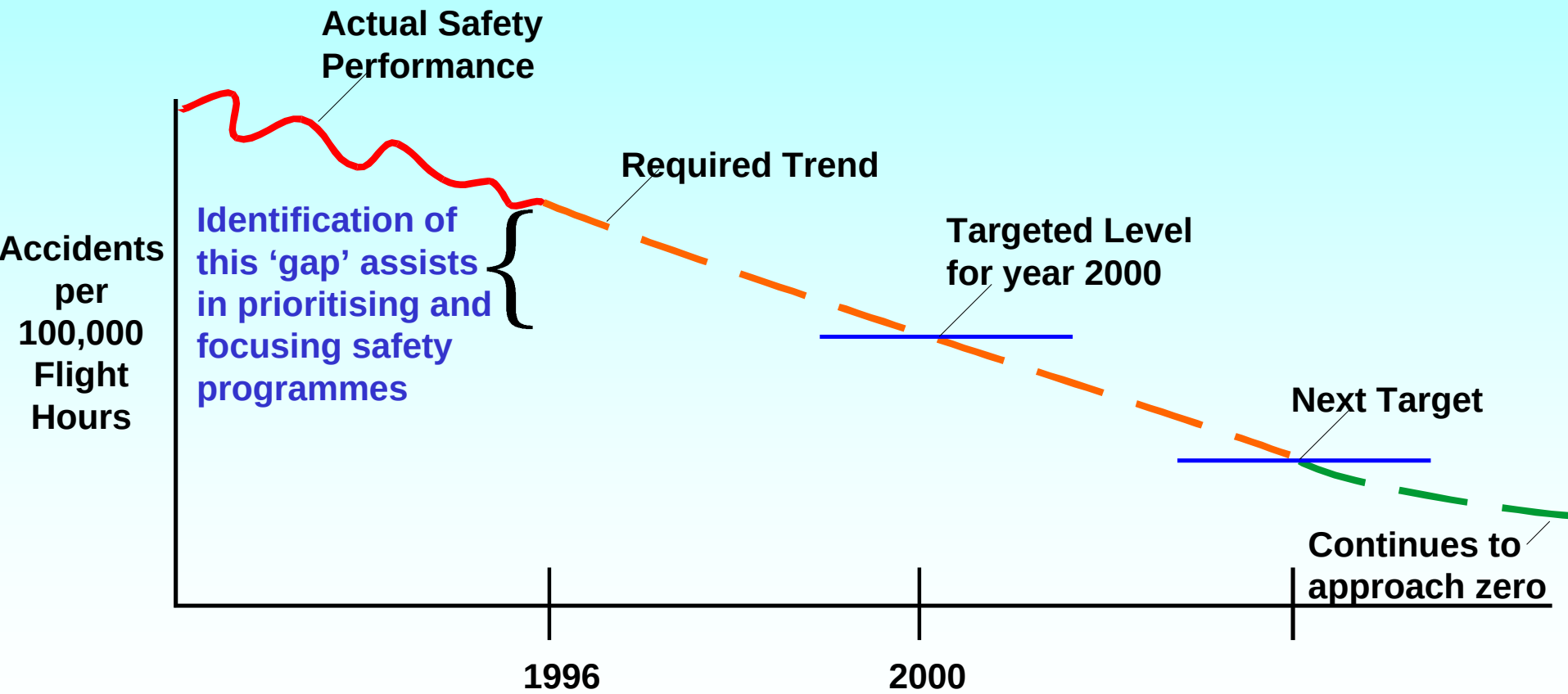
1995

# HUMAN FACTORS DIGEST
# No. 12
## HUMAN FACTORS, AIRCRAFT MAINTENANCE AND INSPECTION

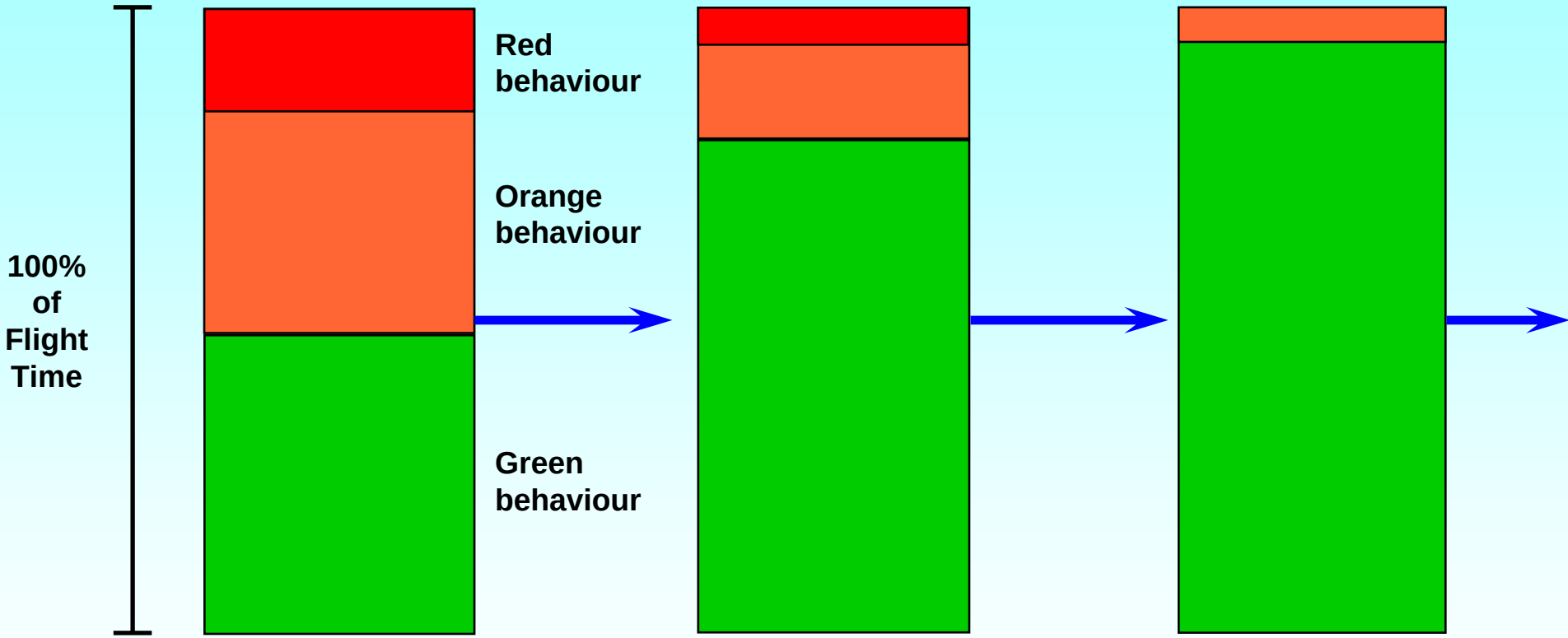
*Approved by the Secretary General and published under his authority*

INTERNATIONAL CIVIL AVIATION ORGANISATION
MONTREAL - CANADA

# Safety Outcome Targets Set For Each Industry Sector



# In Terms of the Polygon of Certainty




**Improvement over time reflects**

- better compliance by industry with rules
- rules improved by CAA
- better safety knowledge of industry + CAA

# CONTROL STEPS

1. **Decide what is to be controlled**

2. **Select units to measure it with**

3. **Choose the desired target standard**

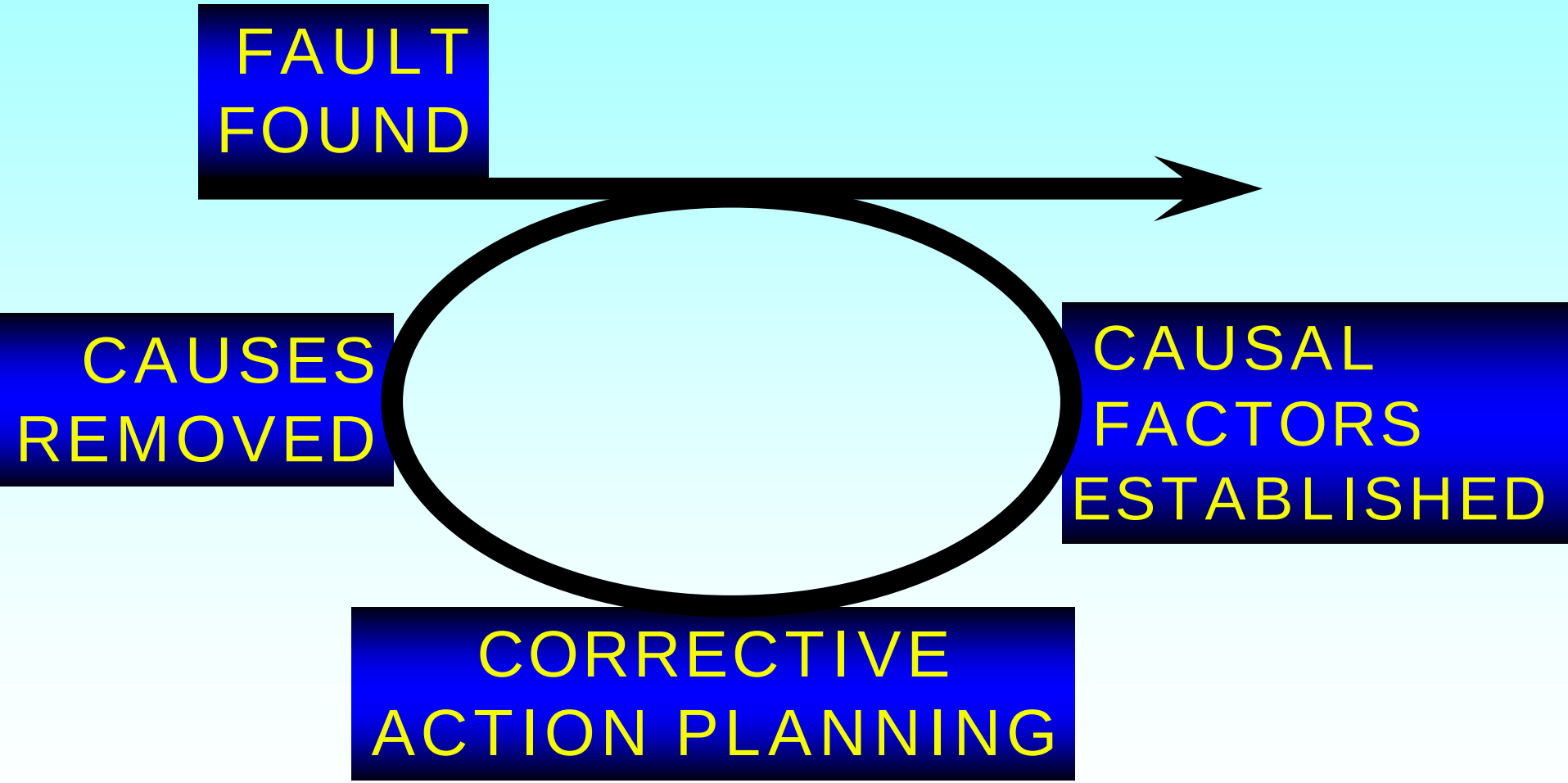
4. **Devise a way to carry out this measurement**

5. **Carry out the measurement**

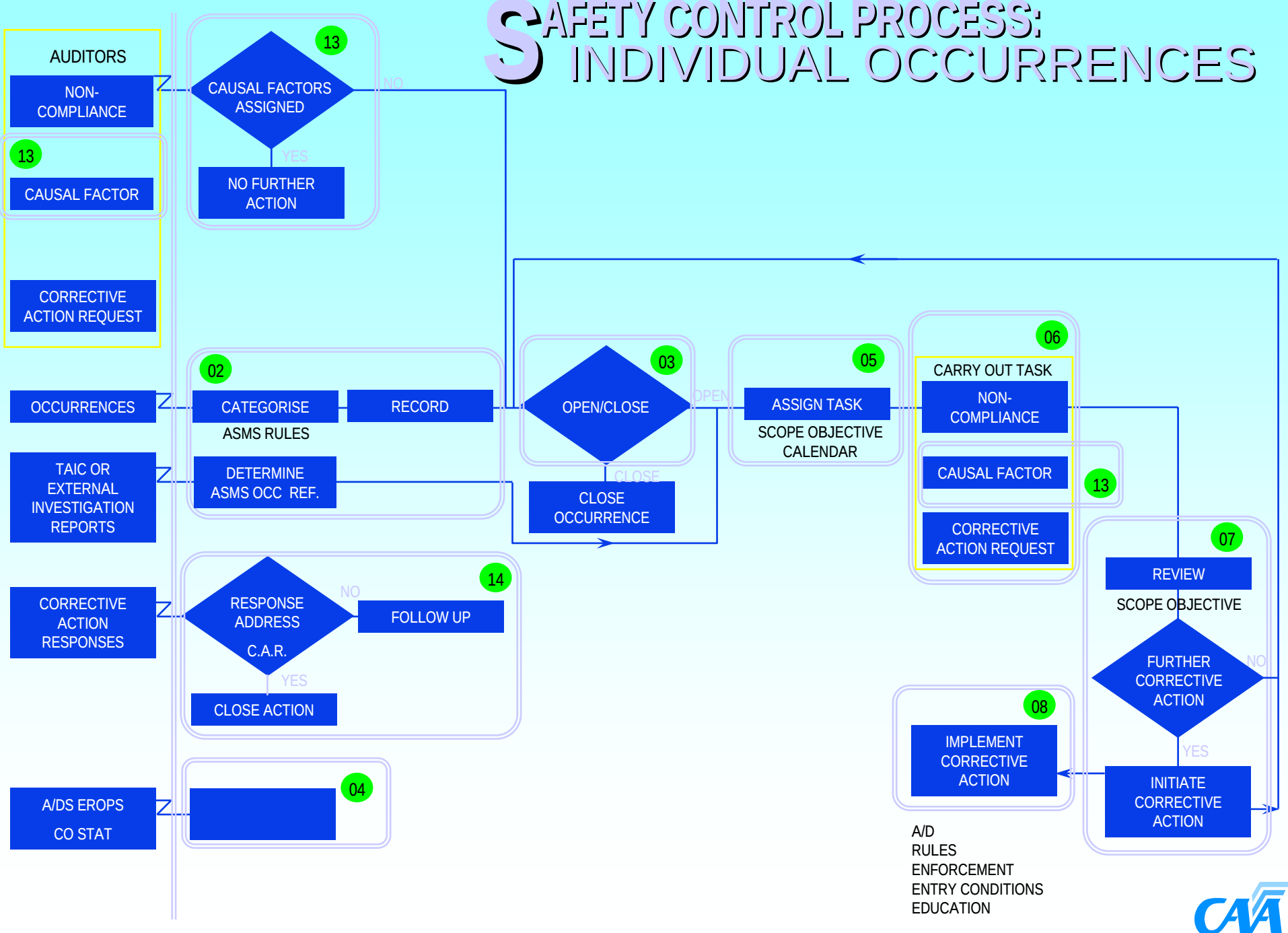
6. **Compare the measured results to target standard, and**

7. **Take steps to adjust actual measured performance to target standard**

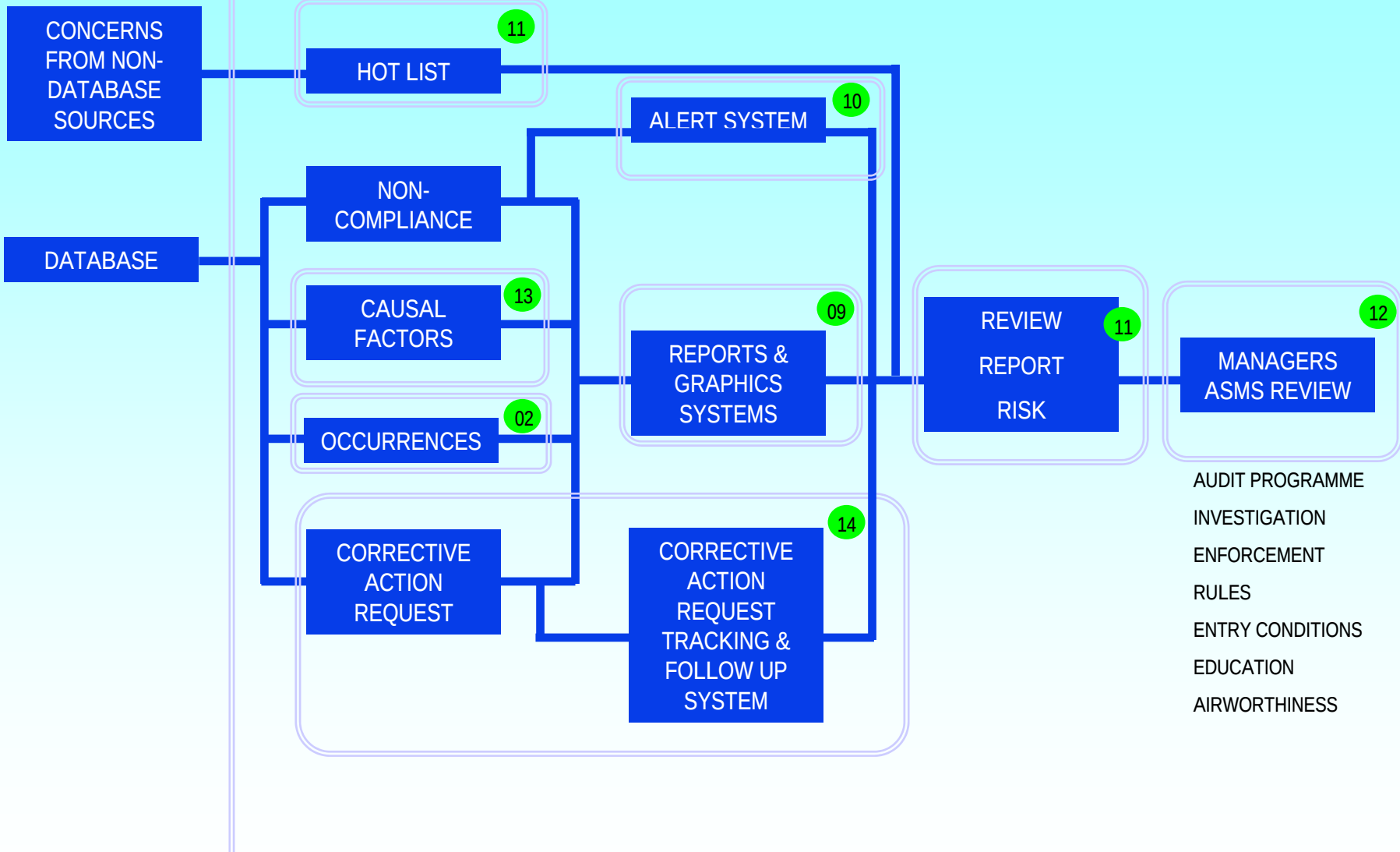
# SAFETY CONTROL LOOP



# SAFETY CONTROL PROCESS: INDIVIDUAL OCCURRENCES



# SAFETY CONTROL PROCESS: COLLECTIVE OCCURRENCES



# Proactive Surveillance

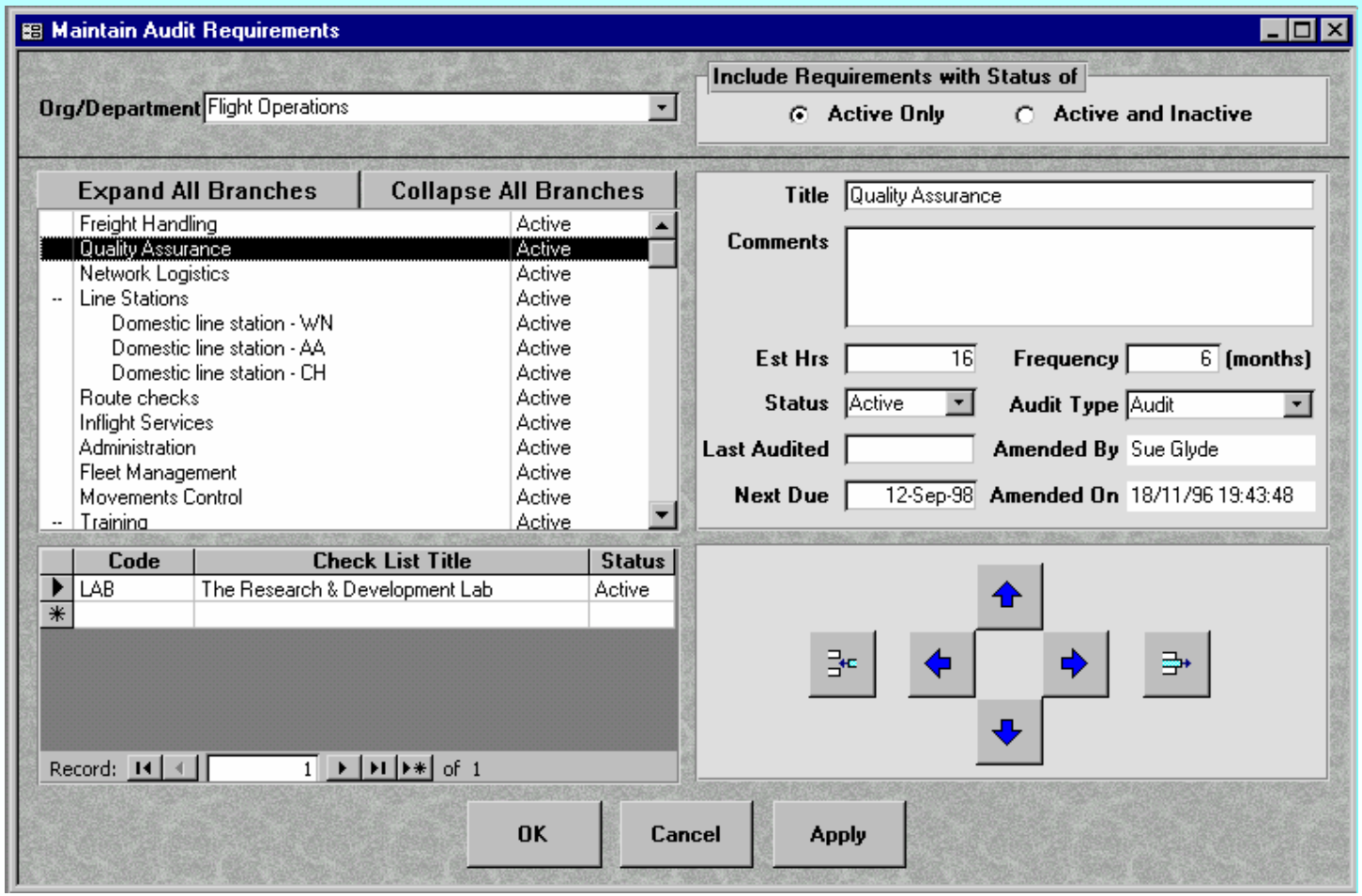
Auditing

Spot Checks

Enforcement

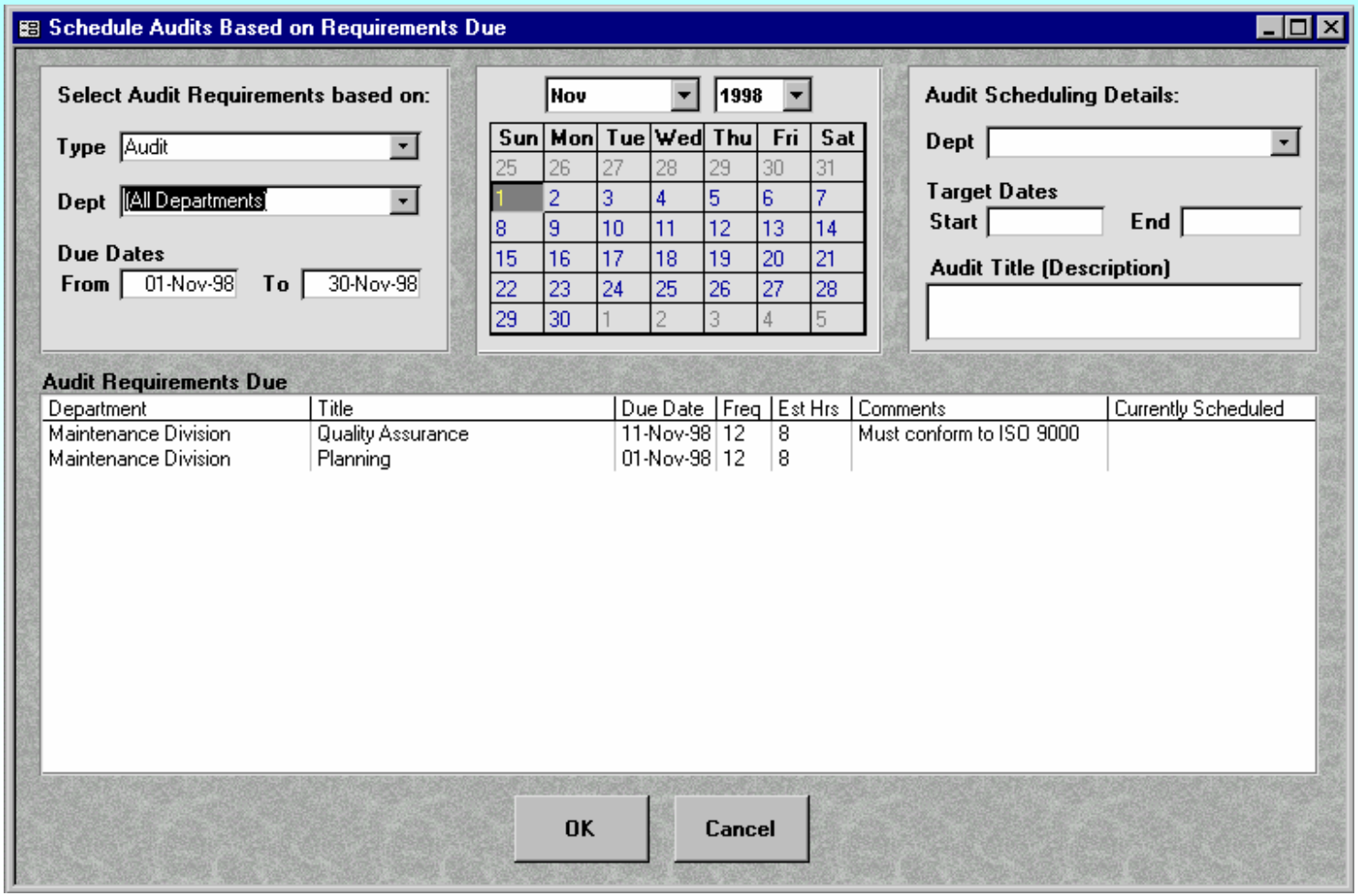
# Audit Requirements

A series of modularised audit requirements can be loaded against each department, identifying what is required to audit that department. This includes the check lists required. Scheduling details such as the auditor skills, the estimated hours and the frequency of audit must also be specified. These details can then be used as the basis for scheduling and conducting the audit.



# Audit Scheduling

Calendar based audit scheduling is used to review all audit modules (requirements) due to be audited in a specified period, based on the audit frequency and when that module was last carried out. From this list of requirements, an audit is created, specifying target start and end dates and a brief description.

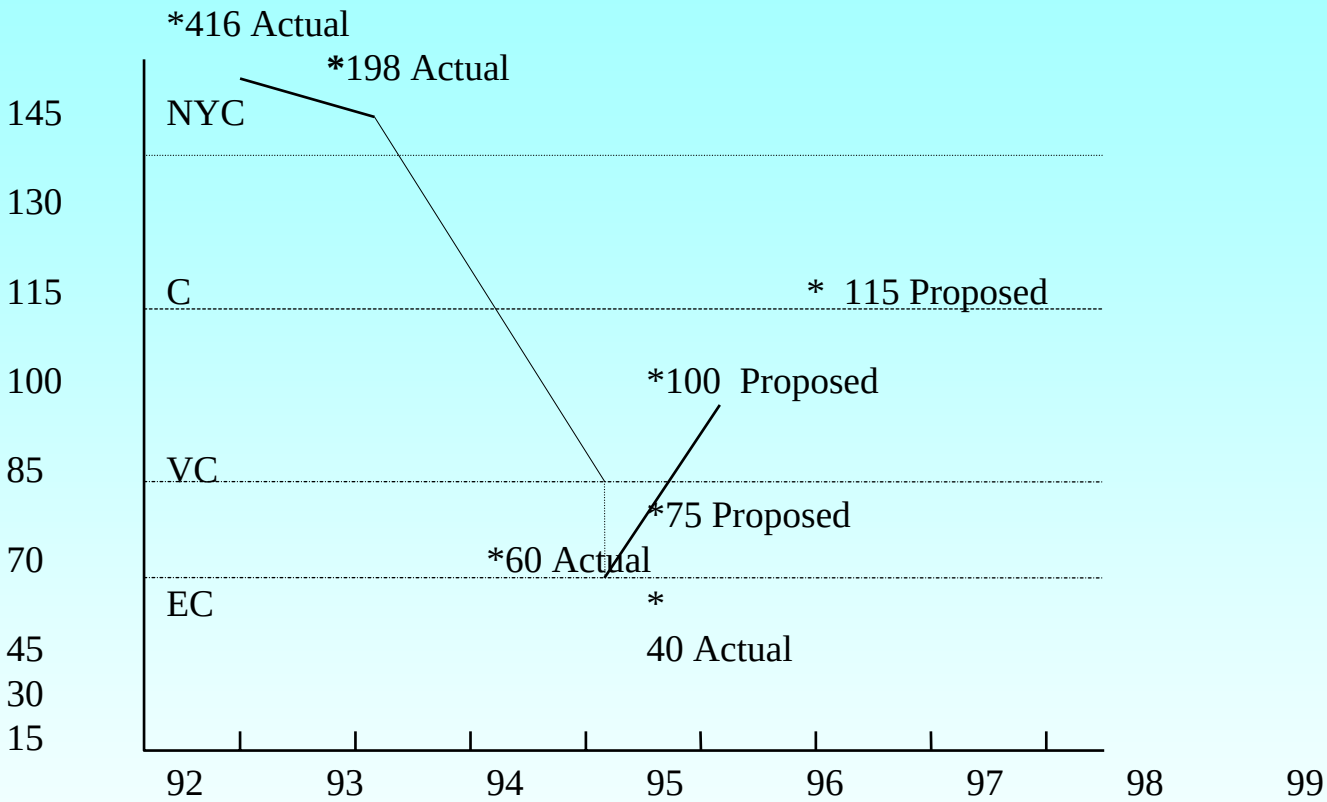


# THE AUDITOR

**The typical auditor is a man past middle age, spare, wrinkled, intelligent, cold, passive, non-committal, with eyes like codfish, polite in contact, but at the same time unresponsive, calm and as damnable composed as a concrete post or a plaster-of paris cast; a human petrifaction with a heart of feldspar and without charm, minus bowels, passion or a sense of humour. Happily they never reproduce; and all of them finally go to Hell.**

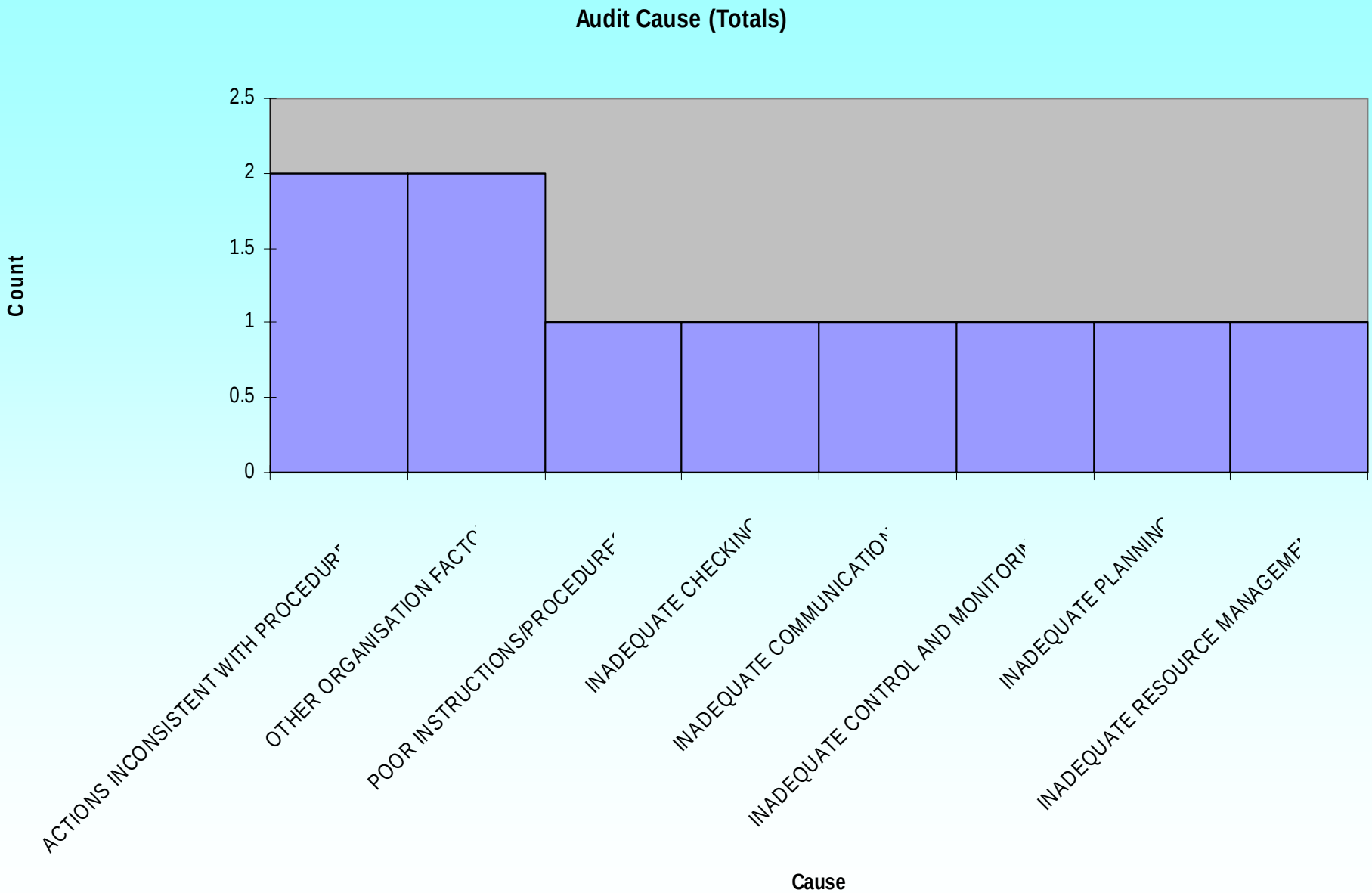
| Subject for Review | | Comments | Confidence Level |
|---|---|---|---|
| 1. | Financial/Labour/Manage-ment Difficulty | ANZ Auckland are up-to-date with payments to the CAA. | Confident |
| 2. | Change in Company Capability | Since Part 145 issue B737-300 added. | Very Confident |
| 3. | Change in Key Personnel | The Engineering Business Unit has recently been restructured. | Confident |
| 4. | Internal Audit Reports | The Internal Audit Reports have been sampled. These are to a high standard. | Very Confident |
| 5 | Occurrence Reports | Occurrence reports for 1993 are 57, most of which are minor in nature, | Very Confident |
| 6 | Honesty Weighting | Air New Zealand continue to deal with the CAA in an honest and professional manor. | Very Confident |
| 7. | Previous CAA Audit History | Part 145 compliance audit shows that Tech Services had most problems followed by component maintenance. The audit program for 1994 focussed on sampling plans | Very Confident |

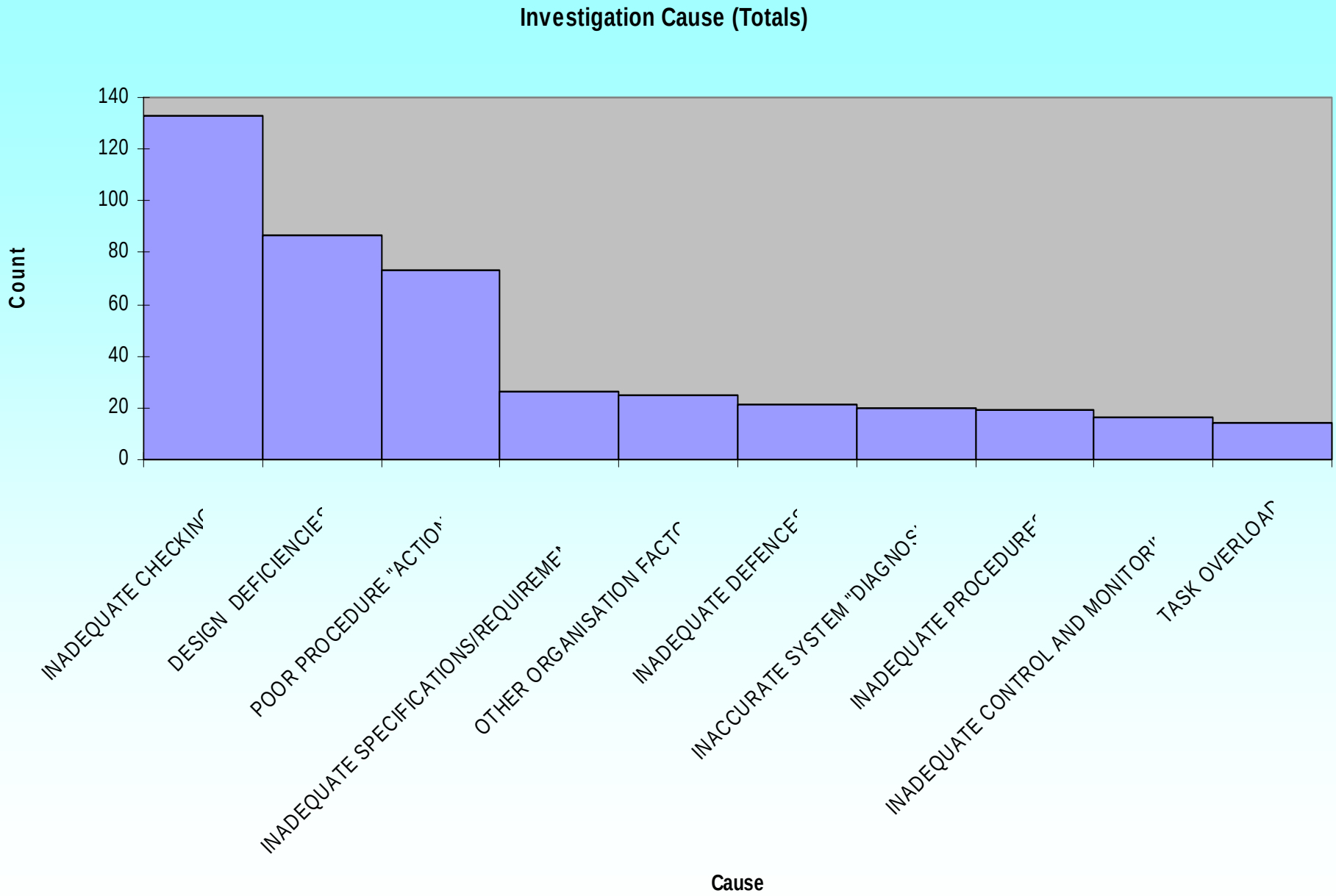
**AUDIT HRS GRAPH**




**ANSETT STAFF = 125**

| | | | |
|---|---|---|---|
| Extremely Confident | x .4 | = | 50 |
| Very Confident | x .6 | = | 75 |
| Confident | x .9 | = | 112 |
| Confidence not Yet Established | x 1.17 | = | 146 |


Audit Cause (Totals)
Count
2.5
2
1.5
1
0.5
0
ACTIONS INCONSISTENT WITH PROCEDUR
OTHER ORGANISATION FACTO
POOR INSTRUCTIONS/PROCEDURE
INADEQUATE CHECKIN
INADEQUATE COMMUNICATIO
INADEQUATE CONTROL AND MONITORI
INADEQUATE PLANNIN
INADEQUATE RESOURCE MANAGEME
Cause


Investigation Cause (Totals)
Count
140
120
100
80
60
40
20
0
INADEQUATE CHECKIN
DESIGN DEFICIENCIE
POOR PROCEDURE "ACTIO
INADEQUATE SPECIFICATIONS/REQUIREME
OTHER ORGANISATION FACT
INADEQUATE DEFENCE
INACCURATE SYSTEM "DIAGNOS
INADEQUATE PROCEDURE
INADEQUATE CONTROL AND MONITOR
TASK OVERLOA
Cause

# *Risk Profile* 3 / RAT / 117

*03-Dec-2002* *41508* *Air Adventures New Zealand Limited*

*Reason for profile* Request from within the CAA - 3/roug/56

| Criteria | Assessment | Comments |
|---|---|---|
| Operator Profile | 4 | Has non-145 maintenance provider (10786), unsched pax, est > 12 mths. |
| Operator Management | 9 | Two ppl each hold 2 or more positions: J Williams is OI, QA & Maint., M Bannerman is Ops & Trg. |
| Management Stability | 0 | No recent changes. |
| Operational Stability | 2 | Added NCA - PA31, type previously operated. |
| Occurrence Evaluation | 0 | Nothing remarkable. Stats 3q01-2q02: 555 hrs, 2 occ's, 1-2 expected gives 82.1%. 0 occ since 1/7/2002. |
| Financial Status | 4 | Bad debtor once in last year - 4/02 for $2792. |
| Conditions Imposed | | Not used as from 1/4/00 |
| Last Audit Quality Evaluation | | None in the lst year. |
| Non-compliance Evaluation | 4 | Moderate NCI of 60 from 1 major, 1 minor non-compliances and 5 hrs audit in last year. |

*Actual Profile Score:* **23**

*Possible Profile Score:* **70.00**

*Profile Percent Score:* **32.86** % *Profile Level:* Moderate

***Profile History for the 12 months prior to this profile***

06-May-2002 Change in Credit Status with the CAA 38.57 %

# Reactive Surveillance

Mandatory Occurrence Reporting (MOR) and Safety Investigation

# Legislative Requirements

- Civil Aviation Act - Section 26
  - Establishes general requirement to report accidents and incidents
- Civil Aviation Act - Section 72B
  - Functions of the Authority
  - To investigate and review civil aviation accidents and incidents in its capacity as the responsible safety and security authority,subject to the limitations set out in section14(3) of The Transport Accident Investigation Commission Act 1990
- Rule Part 12
  - Identifies what must be reported, by who, and when
- Advisory Circular to Rule Part 12
  - Defines an acceptable means of compliance

# Initial Notification of Accidents

Rule Part 12 requires that a notification to the Authority is required of an accident and lists the information required.

# Investigative Process

**Notification**

- Accidents and serious incidents
  : as soon as practicable

**Provision of details**

- Accidents, serious incidents and all other incidents
  : within 10 days of the occurrence

**Investigation**

- by CAA and / or by operator of own occurrences

**Reporting**

- by operator of own occurrences
  : within 90 days

**Recording of information**

- on the CAA database

# CAA requirements (our needs)

- Data - Covering the reporting requirements of Rule Part 12 in a form that we can use at minimum cost, both to us, and to you the industry. To minimise our data entry costs we need to have it:-
  - If on paper either
    - on our own form, or
    - one with substantially the same layout, or
    - as computer reports set out along the lines of our form
  - If electronically
    - In a format that matches our computer system's data requirements.
  - Reports - That give us confidence that the operator not only recognises the occurrence of a reportable safety event but responds to that event by conducting an appropriate investigation which identifies the cause/s and corrective actions necessary to prevent recurrence…
    and implements those corrective actions.

# Investigation Requirements

Holders of certain aviation documents *(the requirement is identified in the appropriate operating Rule)* are required to investigate incidents which they have reported and submit their findings to the Authority. This provision will ensure that organisations will take timely corrective action when such a need is identified in the course of their investigations. The Authority, on receiving investigation reports, will assess if any further preventative and corrective action is required.

The investigation requirement placed on these holders of aviation documents does not derogate or replace the statutory responsibilities of TAIC or the Authority with respect to the investigation of incidents.

# Notification Channels

- CAA 005 Form.
- AFTN Message.
- Fax.
- Phone.
- Letters and Email in some circumstances.
- Electronic Data Interchange (EDI) - AQD. systems at client sites (About 10 Aviation Quality Database (AQD) sites currently in New Zealand).

# ICAO Reports

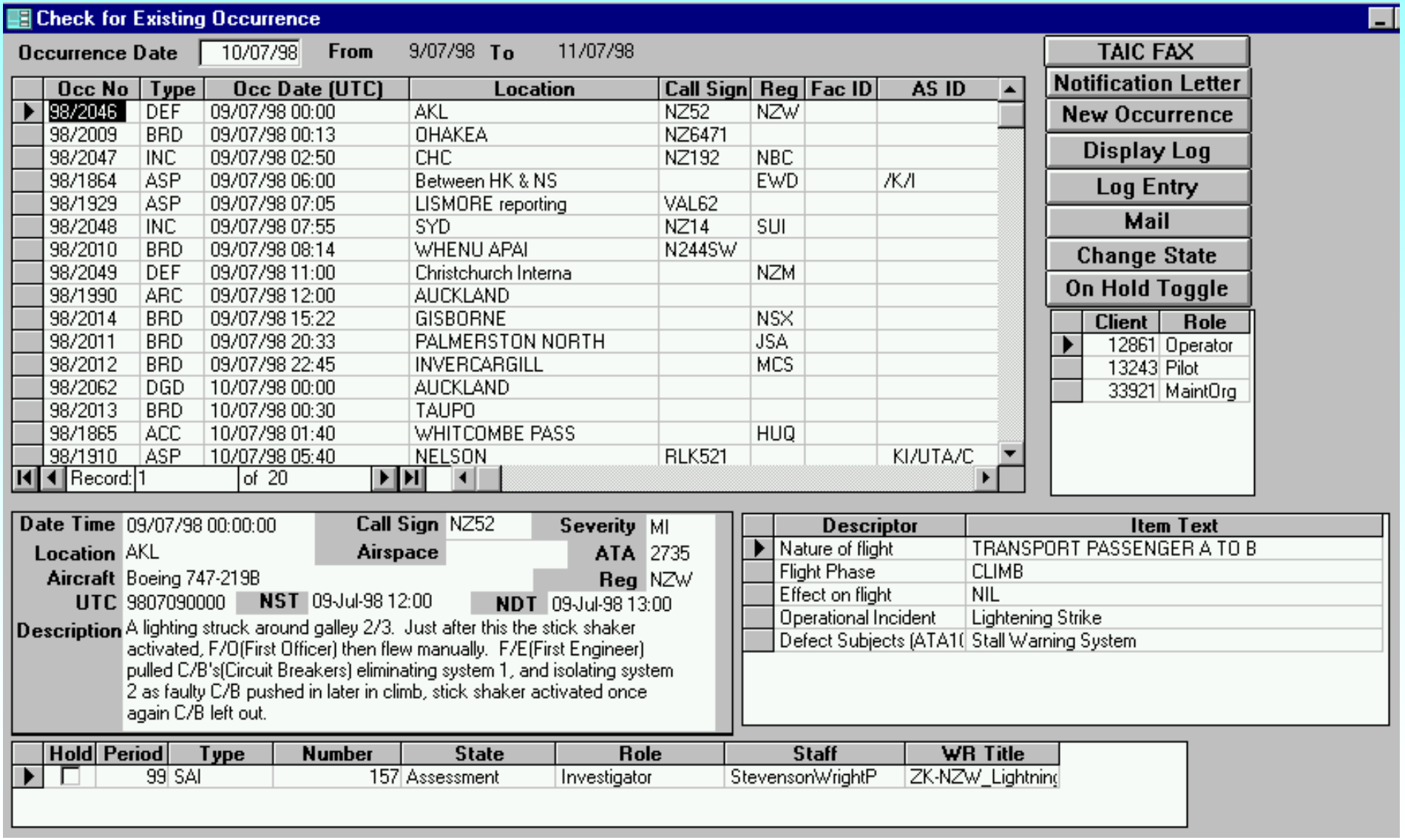
## Annex 13 Report

## Annex 8 Report

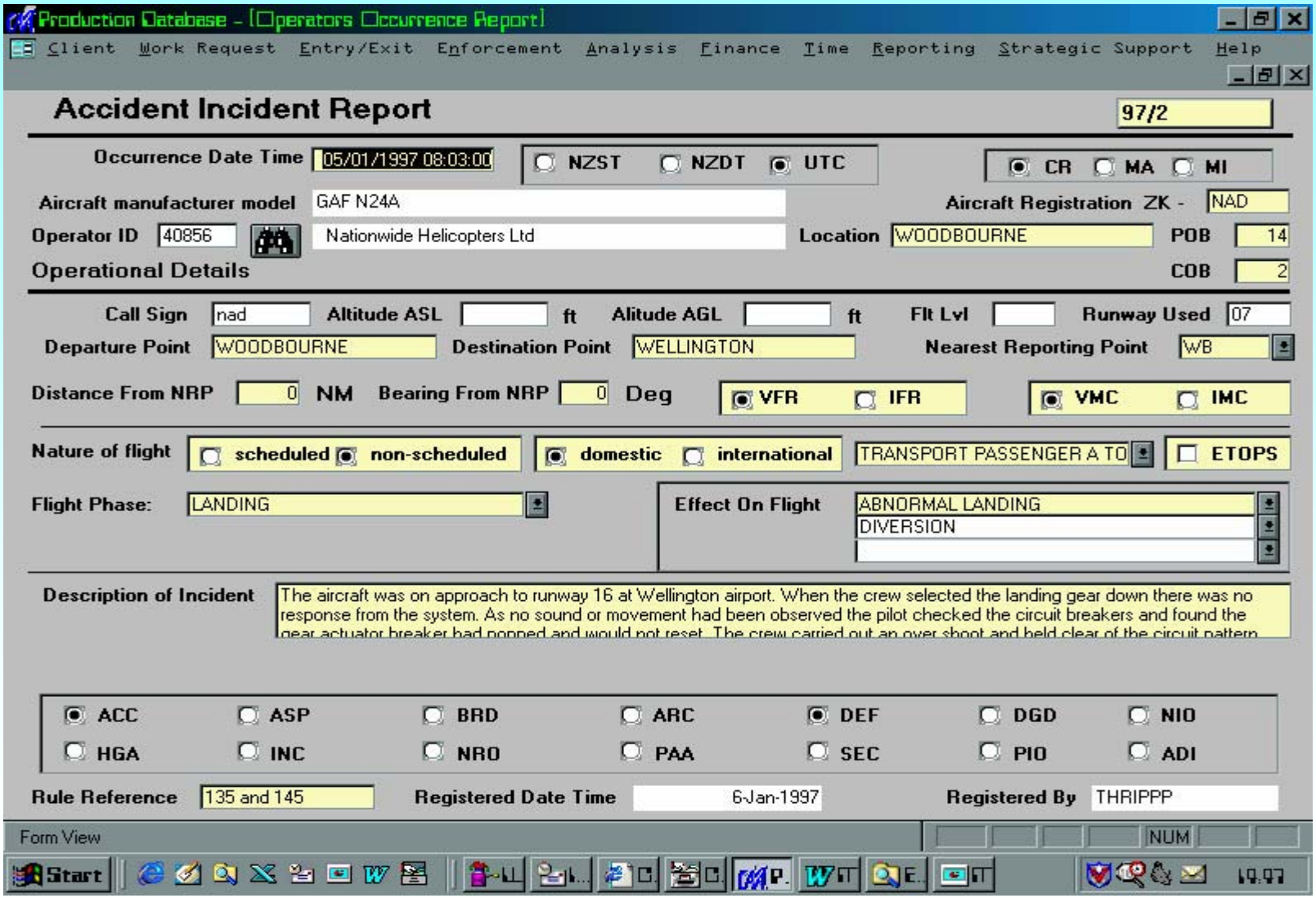
# Aviation Quality Database - (AQD)

- Written by Superstructure Development Ltd.
- The system is based on the same design concepts as the CAA Systems and has been written to be compatible with these systems.
- The system is seen as a valued tool to assist in safety in that it is selling internationally as well as nationally.

# Notification Capture:- Pre Add Check



# Accident Report



- This example used the “Accident Incident” form.  If this was an airspace occurrence then the Airspace form would have been used.
- The forms are shared between registration and investigation processes.
- The yellowing of fields indicate the required fields for the occurrence type.
- The initial switch board form used by the investigators has additional buttons giving access to Findings, Cause, Actions (FCAs) and the entry of an occurrence synopsis.

# Occurrence Type

- ACC - Accident
- ARC - Aviation Related Concern
- ASP - Airspace Incident
- BRD - Bird Incident
- DEF - Defect Incident (SDR)
- DGD - Dangerous Goods Incident
- INC - Aircraft Incident
- NIO - Navigation Installation Occurrence
- PIO - Promulgated Information Occurrence

# Initial Processing of EDI Reports

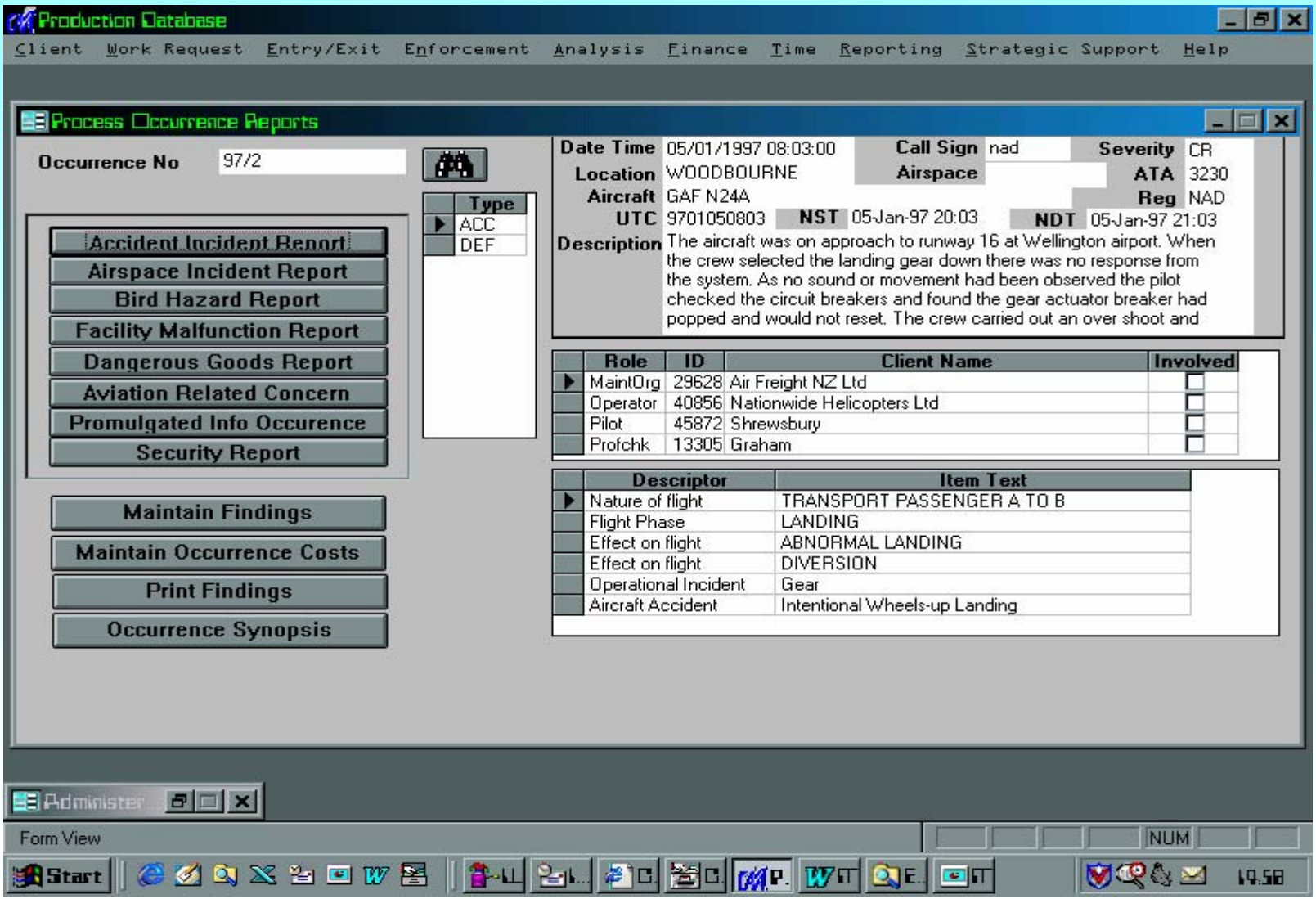
Specification published on CAA's
WEB site.

# The interface

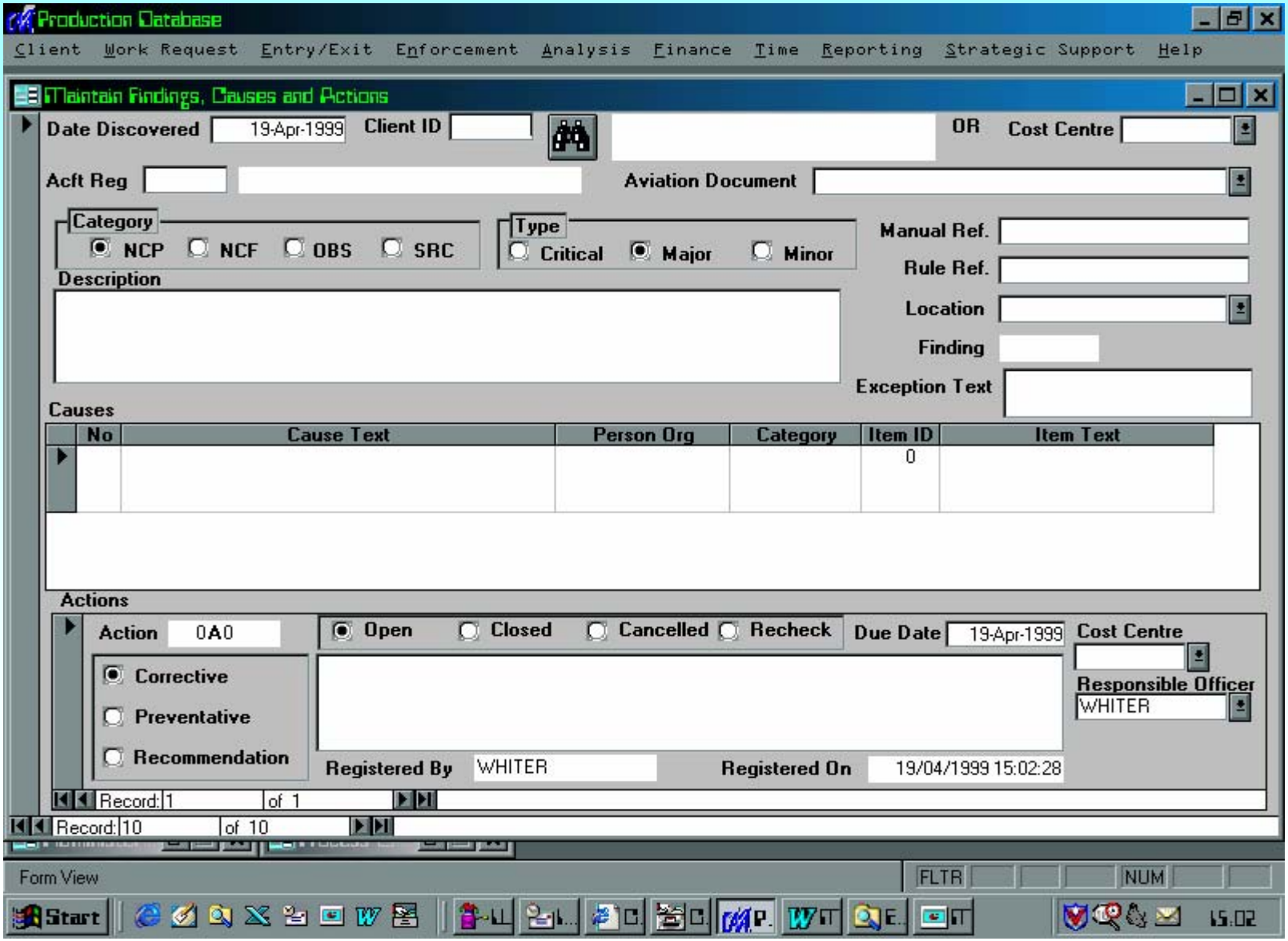
- Developed in partnership with Superstructure Development Limited to facilitate the sending of Occurrence Reports, FCAs and Client Safety Investigation Report from AQD to the CAA's systems.
- The information is sent as email over the internet and automatically processed into tables in the corporate database.

- The information is retained as a record of the clients view of the occurrence and their actions to prevent re-occurrence pursuant with Rule Part 12.
- The new items in this list are reviewed daily by the occurrence registration function either linking the report occurrence to an existing recorded occurrence in the CAA System or raising a new occurrence in the CAA system.
- Report - Rule Part 12
- Record and track - Quality System - required by Rule Part Part 119 .

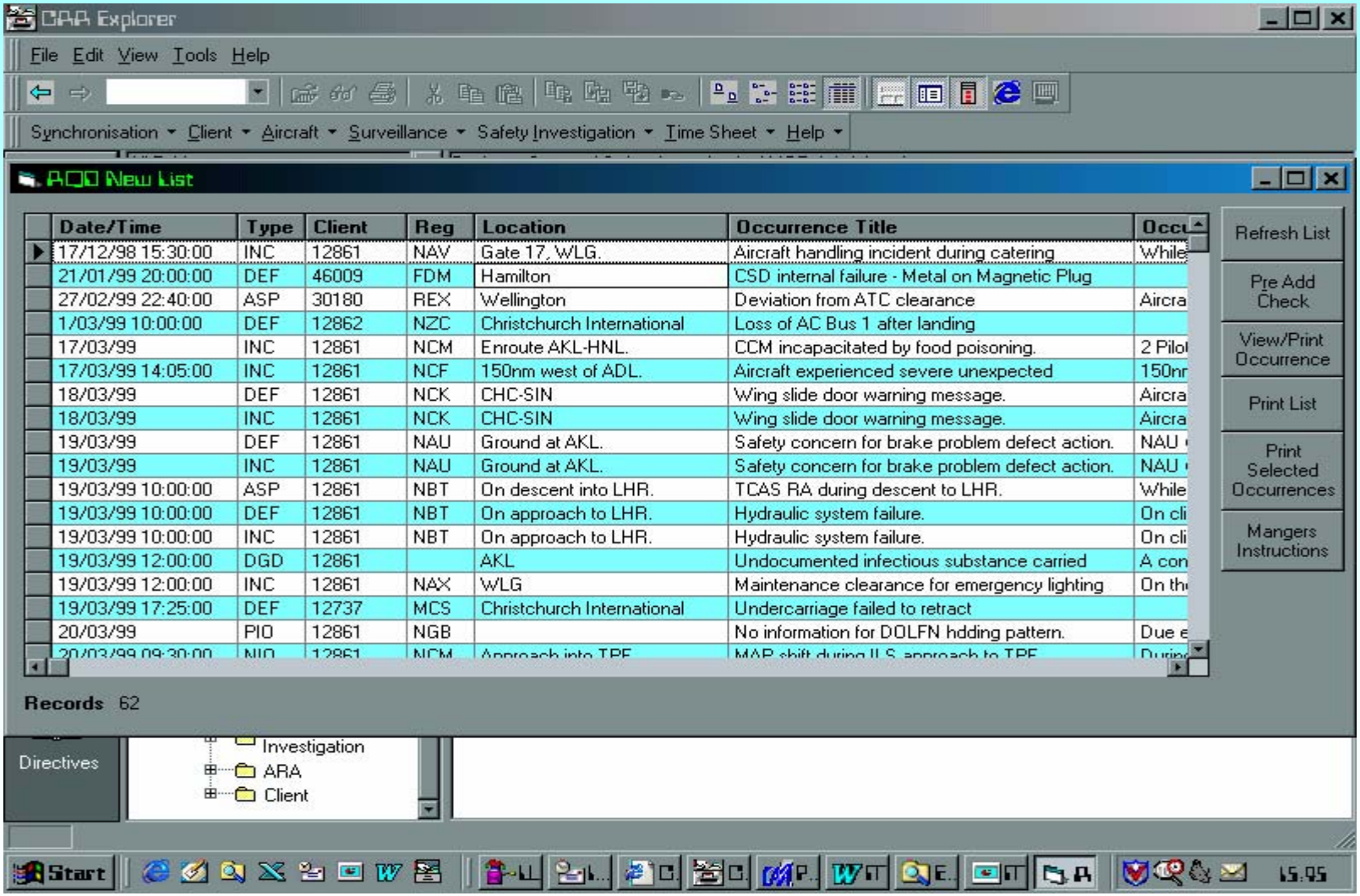
# Process Occurrence



# Findings

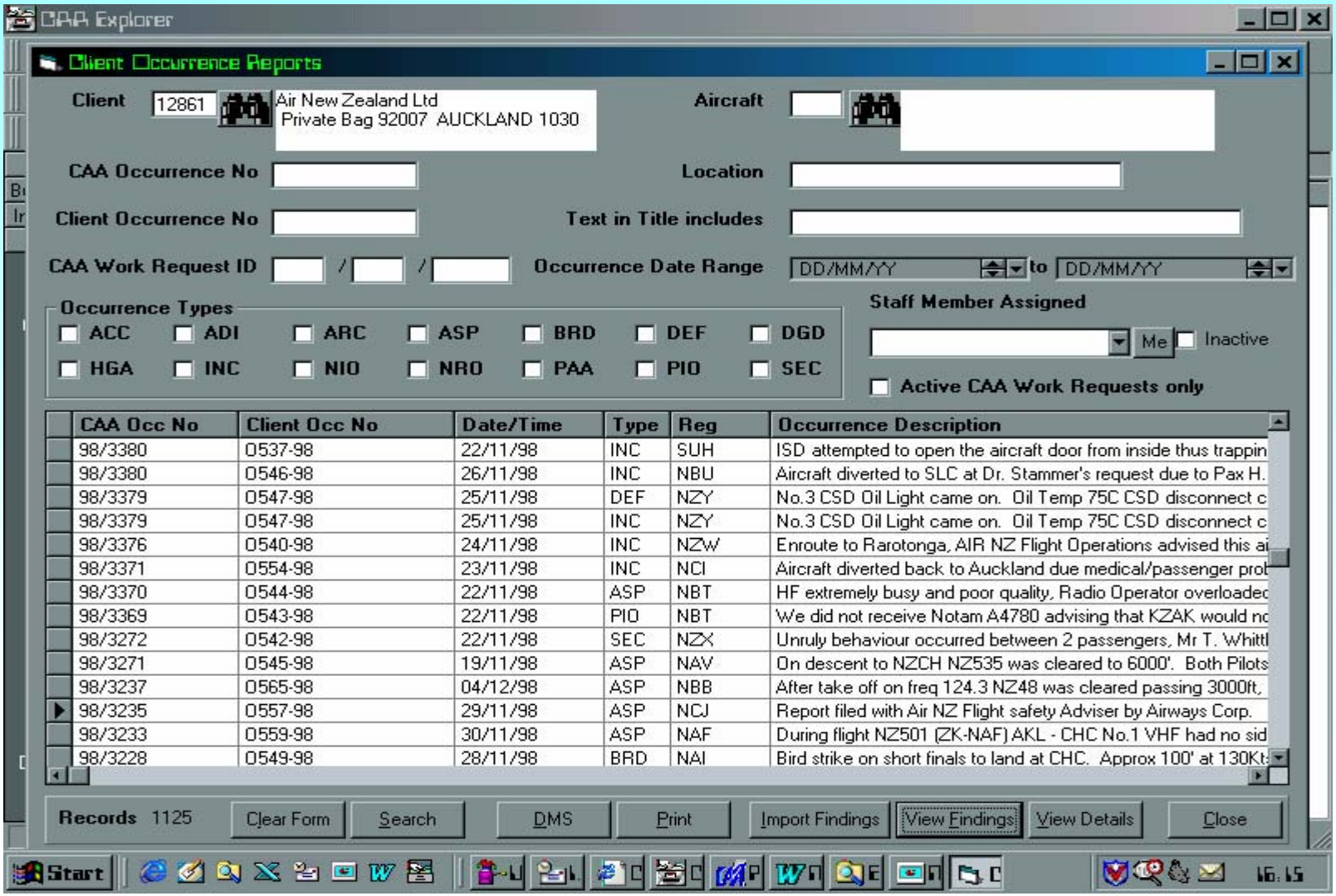

Production Database
Client Work Request Entry/Exit Enforcement Analysis Finance Time Reporting Strategic Support Help
Maintain Findings, Causes and Actions
Date Discovered 19-Apr-1999
Client ID
OR
Cost Centre
Acft Reg
Aviation Document
Category
NCP NCF OBS SRC
Type
Critical Major Minor
Manual Ref.
Rule Ref.
Location
Finding
Exception Text
Description
Causes
No
Cause Text
Person Org
Category
Item ID
Item Text
0
Actions
Action 0A0
Open Closed Cancelled Recheck
Due Date 19-Apr-1999
Cost Centre
Responsible Officer
WHITER
Corrective
Preventative
Recommendation
Registered By WHITER
Registered On 19/04/1999 15:02:28
Record: 1 of 1
Record: 10 of 10
Form View
FLTR
NUM
Start
15:02

# AQD New List




| Date/Time | Type | Client | Reg | Location | Occurrence Title | Occu |
|---|---|---|---|---|---|---|
| 17/12/98 15:30:00 | INC | 12861 | NAV | Gate 17, WLG. | Aircraft handling incident during catering | While |
| 21/01/99 20:00:00 | DEF | 46009 | FDM | Hamilton | CSD internal failure - Metal on Magnetic Plug | |
| 27/02/99 22:40:00 | ASP | 30180 | REX | Wellington | Deviation from ATC clearance | Aircra |
| 1/03/99 10:00:00 | DEF | 12862 | NZC | Christchurch International | Loss of AC Bus 1 after landing | |
| 17/03/99 | INC | 12861 | NCM | Enroute AKL-HNL. | CCM incapacitated by food poisoning. | 2 Pilot |
| 17/03/99 14:05:00 | INC | 12861 | NCF | 150nm west of ADL. | Aircraft experienced severe unexpected | 150nr |
| 18/03/99 | DEF | 12861 | NCK | CHC-SIN | Wing slide door warning message. | Aircra |
| 18/03/99 | INC | 12861 | NCK | CHC-SIN | Wing slide door warning message. | Aircra |
| 19/03/99 | DEF | 12861 | NAU | Ground at AKL. | Safety concern for brake problem defect action. | NAU |
| 19/03/99 | INC | 12861 | NAU | Ground at AKL. | Safety concern for brake problem defect action. | NAU |
| 19/03/99 10:00:00 | ASP | 12861 | NBT | On descent into LHR. | TCAS RA during descent to LHR. | While |
| 19/03/99 10:00:00 | DEF | 12861 | NBT | On approach to LHR. | Hydraulic system failure. | On cli |
| 19/03/99 10:00:00 | INC | 12861 | NBT | On approach to LHR. | Hydraulic system failure. | On cli |
| 19/03/99 12:00:00 | DGD | 12861 | | AKL | Undocumented infectious substance carried | A con |
| 19/03/99 12:00:00 | INC | 12861 | NAX | WLG | Maintenance clearance for emergency lighting | On th |
| 19/03/99 17:25:00 | DEF | 12737 | MCS | Christchurch International | Undercarriage failed to retract | |
| 20/03/99 | PIO | 12861 | NGB | | No information for DOLFN hdding pattern. | Due e |
| 20/03/99 09:30:00 | NIO | 12861 | NCM | Approach into TPE | MAP shift during ILS approach to TPE | Durin |

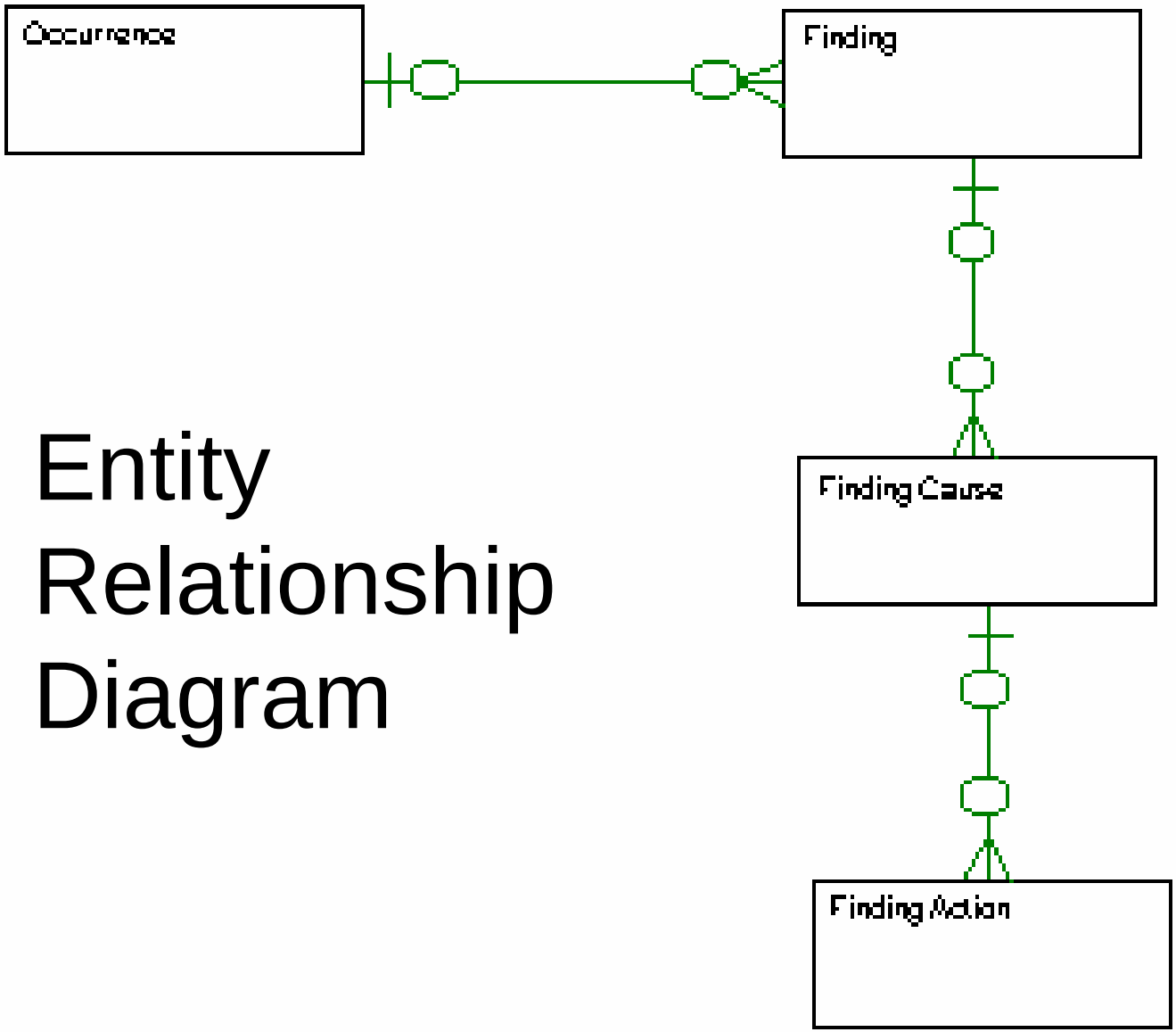
# AQD Client Reports



# Findings, Causes and Actions

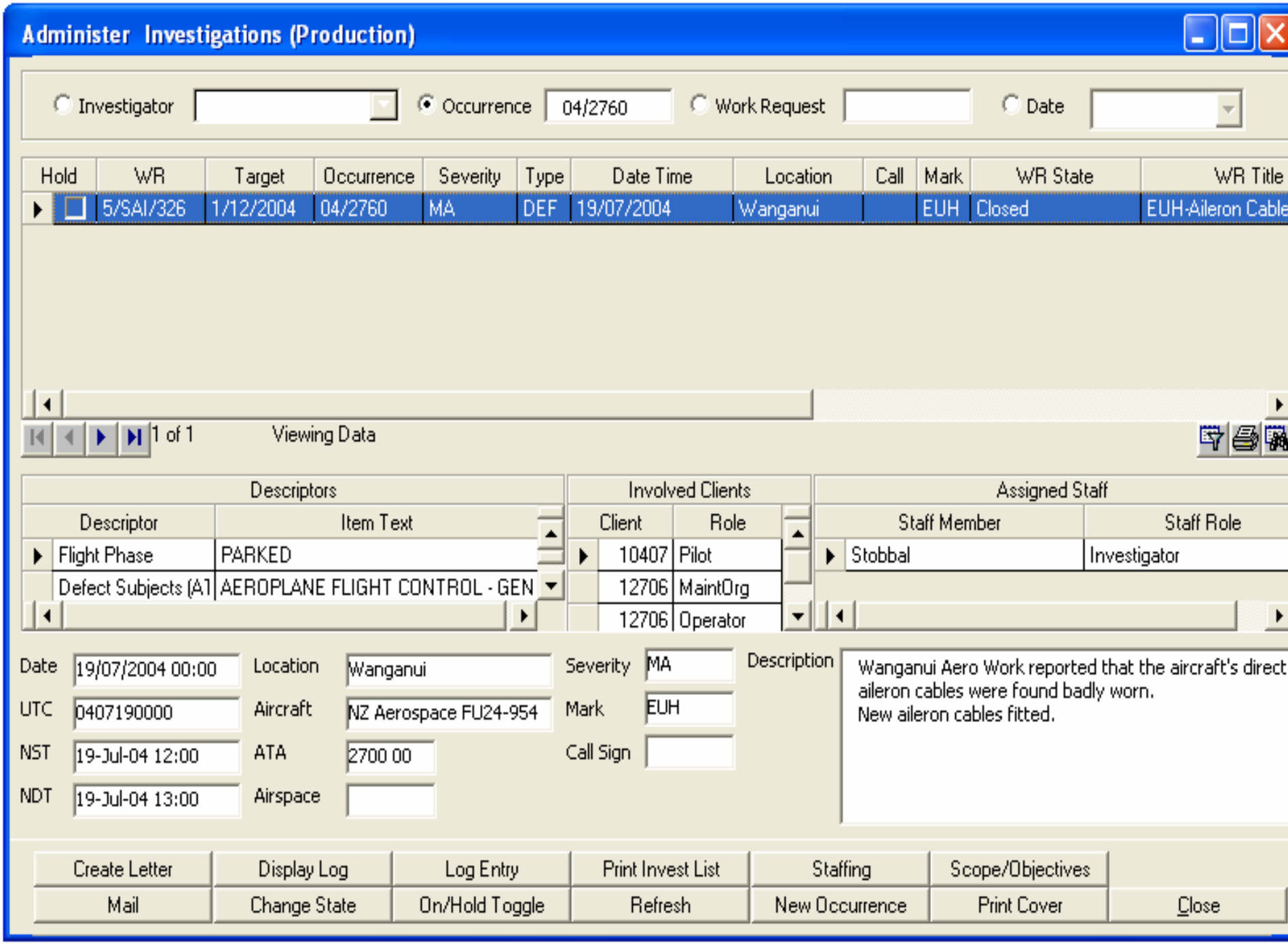
- Finding: - The problem that has been discovered.
- Cause: - Why the problem exists. Is human factor based. Structured on the “James Reason” model for human factor classification and analysis.
- Action: - An action that needs to be implemented to address or partly address a cause.

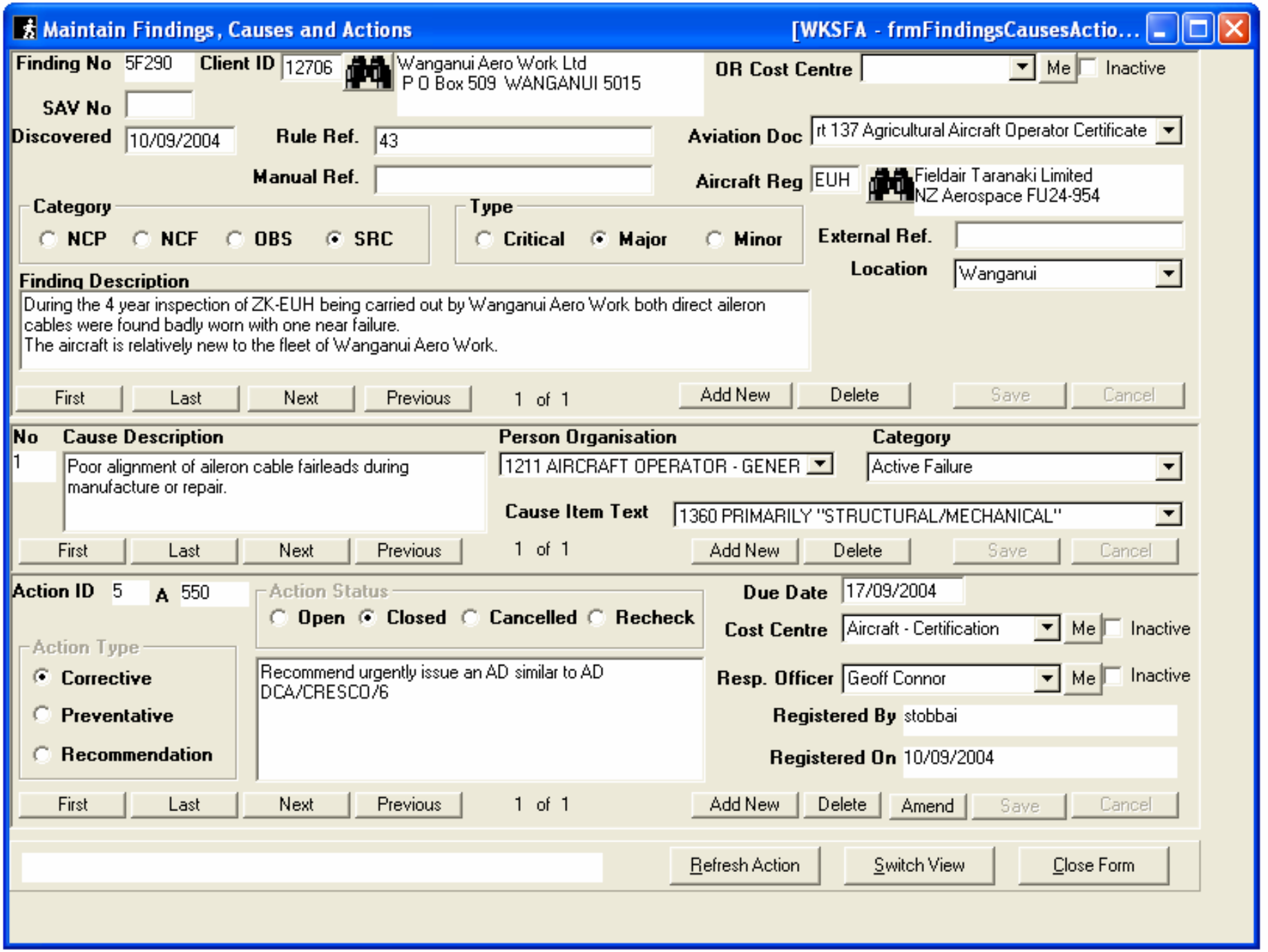
# Entity Relationship Diagram



# Cause Coding

- Basically three elements:
  - Person/Organisation
  - Cause Category
    - Active Failure
    - Local Violation
    - Local Error
    - Organisation Failure
  - Cause Descriptor
- Local violation, local error and organisation failure are all latent failures working back into the organisation.


Administer Investigations (Production)
Investigator
Occurrence
04/2760
Work Request
Date
Hold
WR
Target
Occurrence
Severity
Type
Date Time
Location
Call
Mark
WR State
WR Title
5/SAI/326
1/12/2004
04/2760
MA
DEF
19/07/2004
Wanganui
EUH
Closed
EUH-Aileron Cable
1 of 1
Viewing Data
Descriptors
Descriptor
Item Text
Flight Phase
PARKED
Defect Subjects (A1
AEROPLANE FLIGHT CONTROL - GEN
Involved Clients
Client
Role
10407
Pilot
12706
MaintOrg
12706
Operator
Assigned Staff
Staff Member
Staff Role
Stobbal
Investigator
Date
19/07/2004 00:00
Location
Wanganui
Severity
MA
Description
Wanganui Aero Work reported that the aircraft's direct aileron cables were found badly worn.
New aileron cables fitted.
UTC
0407190000
Aircraft
NZ Aerospace FU24-954
Mark
EUH
NST
19-Jul-04 12:00
ATA
2700 00
Call Sign
NDT
19-Jul-04 13:00
Airspace
Create Letter
Display Log
Log Entry
Print Invest List
Staffing
Scope/Objectives
Mail
Change State
On/Hold Toggle
Refresh
New Occurrence
Print Cover
Close

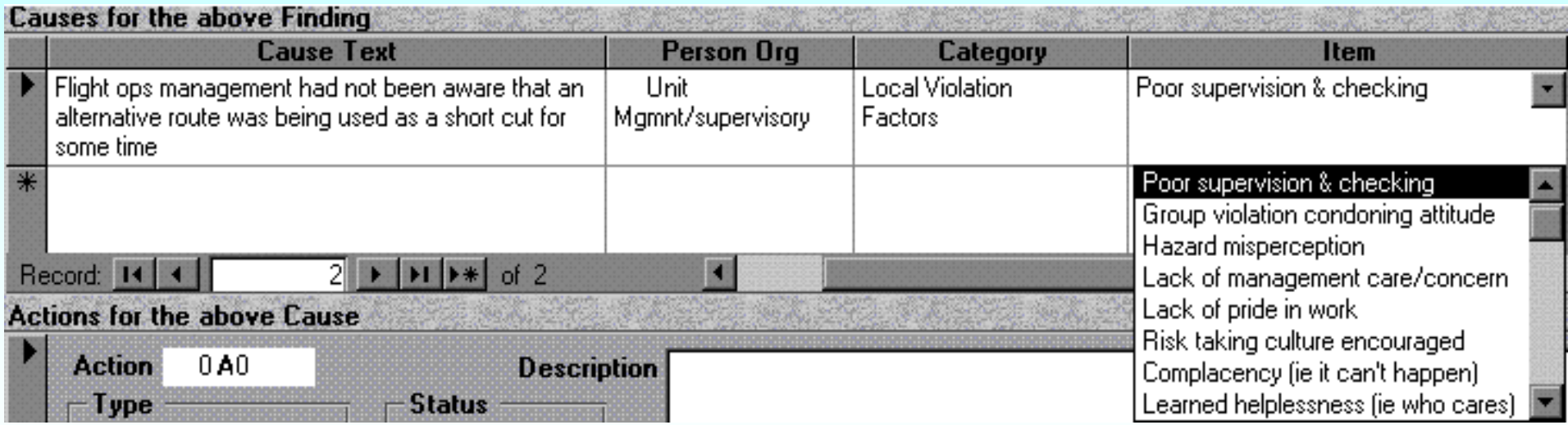

Maintain Findings, Causes and Actions
[WKSFA - frmFindingsCausesActio...
Finding No 5F290
Client ID 12706
Wanganui Aero Work Ltd
P O Box 509 WANGANUI 5015
OR Cost Centre
Me
Inactive
SAV No
Discovered 10/09/2004
Rule Ref. 43
Aviation Doc rt 137 Agricultural Aircraft Operator Certificate
Manual Ref.
Aircraft Reg EUH
Fieldair Taranaki Limited
NZ Aerospace FU24-954
Category
NCP NCF OBS SRC
Type
Critical Major Minor
External Ref.
Location Wanganui
Finding Description
During the 4 year inspection of ZK-EUH being carried out by Wanganui Aero Work both direct aileron cables were found badly worn with one near failure.
The aircraft is relatively new to the fleet of Wanganui Aero Work.
First Last Next Previous 1 of 1 Add New Delete Save Cancel
No
Cause Description
1
Poor alignment of aileron cable fairleads during manufacture or repair.
Person Organisation 1211 AIRCRAFT OPERATOR - GENER
Category Active Failure
Cause Item Text 1360 PRIMARILY "STRUCTURAL/MECHANICAL"
First Last Next Previous 1 of 1 Add New Delete Save Cancel
Action ID 5 A 550
Action Status
Open Closed Cancelled Recheck
Action Type
Corrective
Preventative
Recommendation
Recommend urgently issue an AD similar to AD DCA/CRESCO/6
Due Date 17/09/2004
Cost Centre Aircraft - Certification
Me
Inactive
Resp. Officer Geoff Connor
Me
Inactive
Registered By stobbai
Registered On 10/09/2004
First Last Next Previous 1 of 1 Add New Delete Amend Save Cancel
Refresh Action
Switch View
Close Form

# Identifying Causes

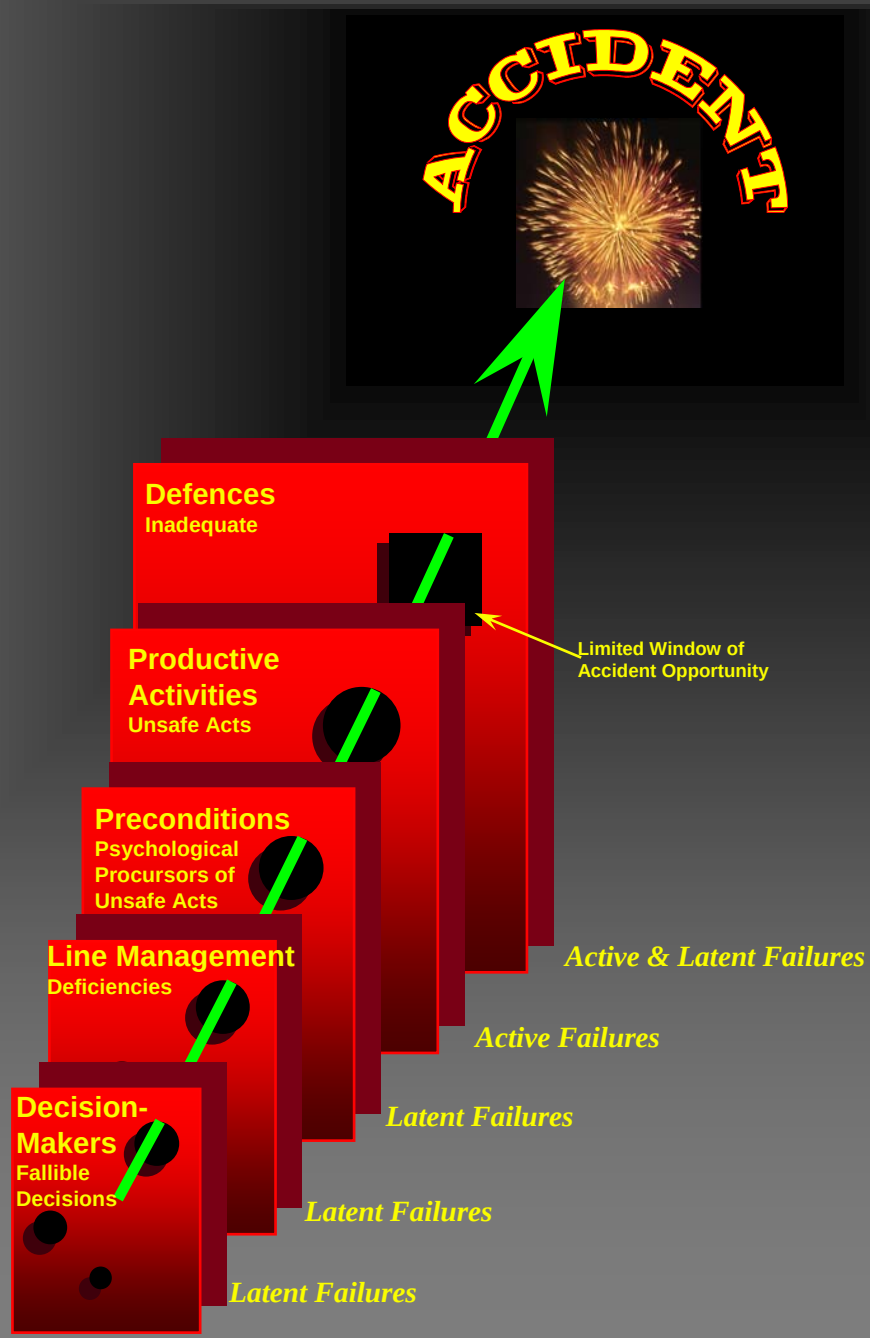
The Civil Aviation Authority has used the work of Prof James Reason and Dr David O'Hare, as the basis for determining the causes of accidents, incidents, defects and other occurrences, taking organisational and human factors into account.

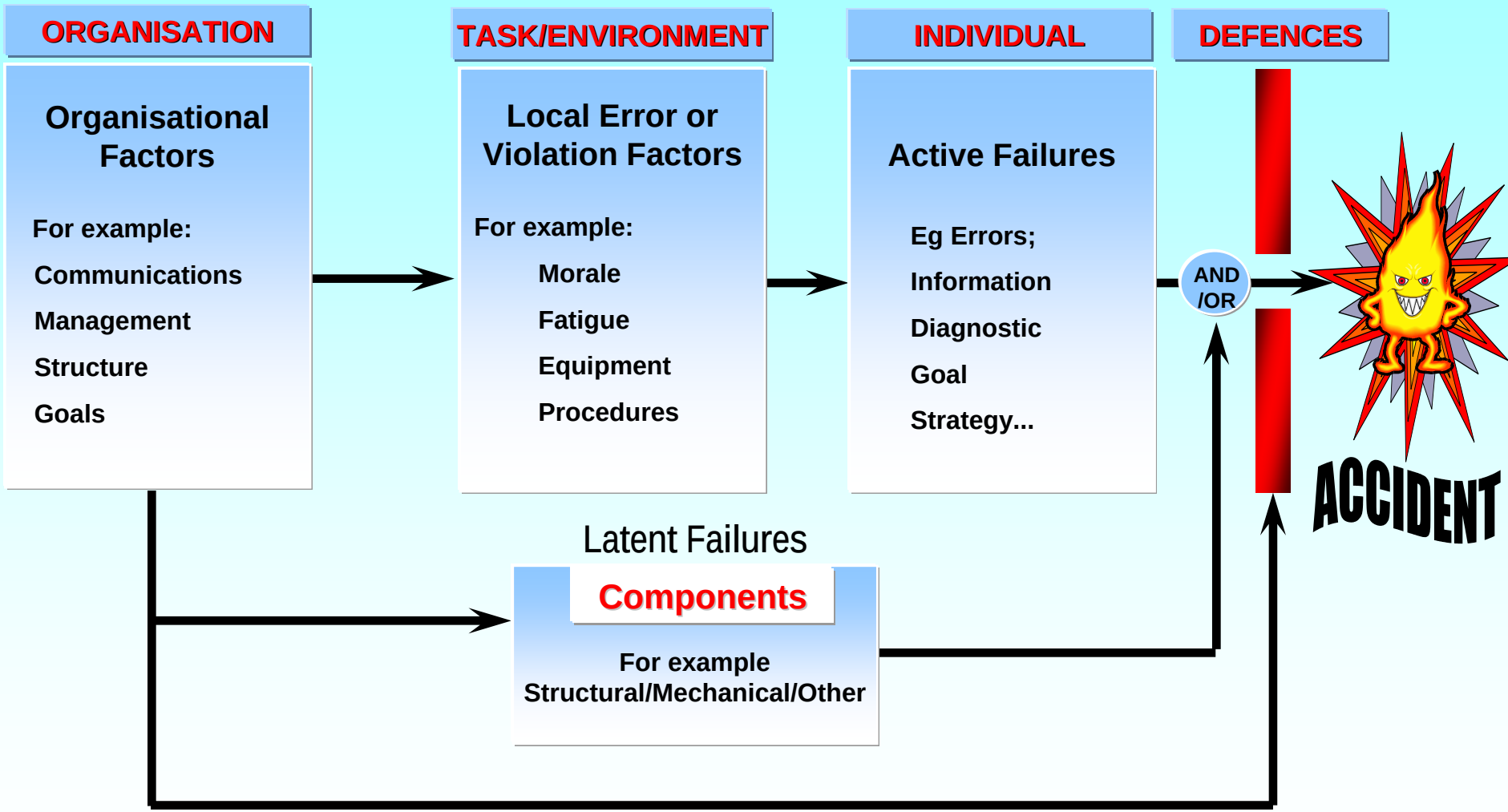
To enable these to be recorded in a fashion which can be analysed by the computer, the causes have been codified. The NZ CAA has given Superstructure approval to implement these codes within the Aviation Quality Database system.

When recording the causes, the "codes" are selected via drop down lists, as shown below:



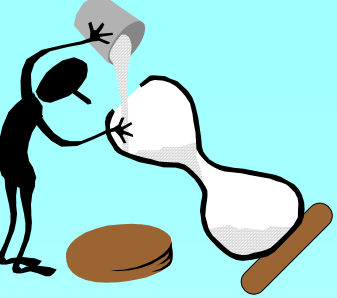

The following slides show the James Reason Model, and David O'Hare's method for determining active failures, both of which have been used as the basis for determining the codes used to classify the causal factors.


ACCIDENT
Defences
Inadequate
Productive Activities
Unsafe Acts
Preconditions
Psychological Procursors of Unsafe Acts
Line Management
Deficiencies
Decision-Makers
Fallible Decisions
Limited Window of Accident Opportunity
Active & Latent Failures
Active Failures
Latent Failures
Latent Failures
Latent Failures


ORGANISATION
Organisational Factors
For example:
Communications
Management
Structure
Goals
TASK/ENVIRONMENT
Local Error or Violation Factors
For example:
Morale
Fatigue
Equipment
Procedures
INDIVIDUAL
Active Failures
Eg Errors;
Information
Diagnostic
Goal
Strategy...
DEFENCES
AND /OR
ACCIDENT
Latent Failures
Components
For example
Structural/Mechanical/Other

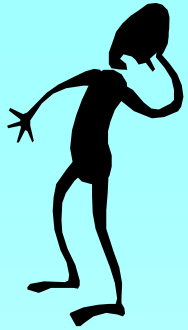
# ORGANISATION FAILURE ITEMS

- Inappropriate Goals or Policies
- Organisation Structural Deficiencies
- Inadequate Communications
- Poor Planning
- Inadequate Control and Monitoring
- Design System Deficiencies
- Inadequate Defences
- Unsuitable Materials
- Unsuitable Equipment
- Poor Procedures
- Poor Training
- Poor Coordination
- Inadequate Regulation
- Other Organisation Factor



# ERROR ITEMS

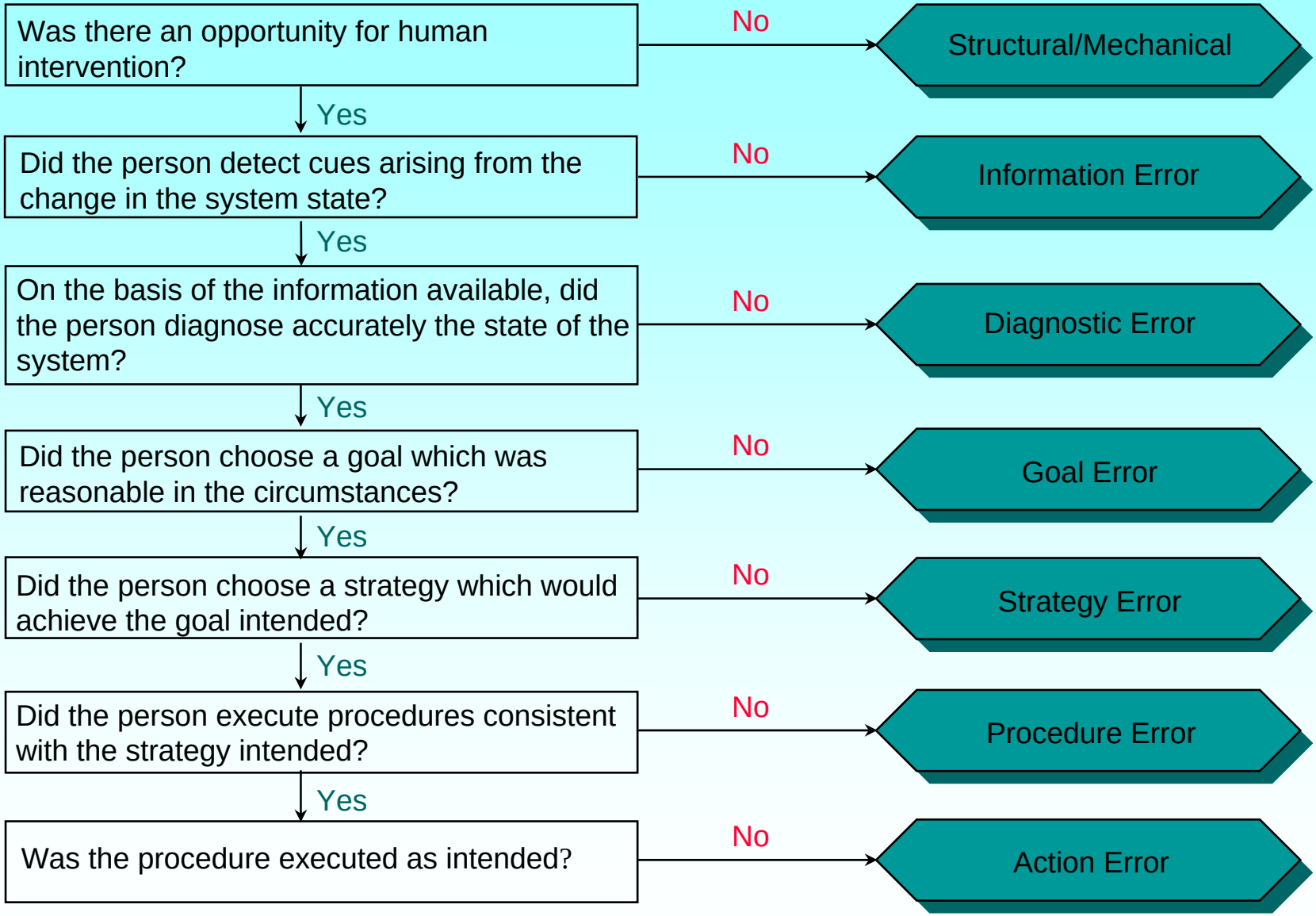
- Task Unfamiliarity
- Time Shortage
- Poor Signal: Noise
- Poor Human-System Interface
- Designer User Mismatch
- error Irreversibility
- Information Overload
- Negative Task Transfer (Habits)
- Task Overload
- Risk Misperception
- Poor System Feedback
- Inexperience (Not Lack of Training)
- Lack of Knowledge
- Task/Education Mismatch
- Poor Instructions/Procedures
- Inadequate Checking
- Hostile Environment
- Other Environmental Factor (e.g. Weather)
- Interpretation difficulties
- Disturbed Sleep Patterns
- Fatigue - Other
- Drugs/Alcohol
- Visual Illusion
- Disorientation/Vertigo
- Physiological Other
- Monotony/Boredom
- Lack of Confidence
- Poor Attention Span
- Psychological Other
- Other Error Enforcing Condition



# VIOLATION ITEMS

- Lack of Safety Culture
- Management/Staff Conflict
- Poor Morale
- Poor Supervision & Checking
- Group Violation Condoning Attitude
- Hazard Misperception
- Lack of Management Care/Concern
- Lack of Pride in Work
- Risk Taking Culture Encouraged
- Complacency (i.e.. It Can't Happen)
- Learned Helplessness (i.e... Who Cares)
- Perceived License to Bend Rules
- Age/Sex Factor
- Other Violation Enforcing Condition

# Active Failure Classification

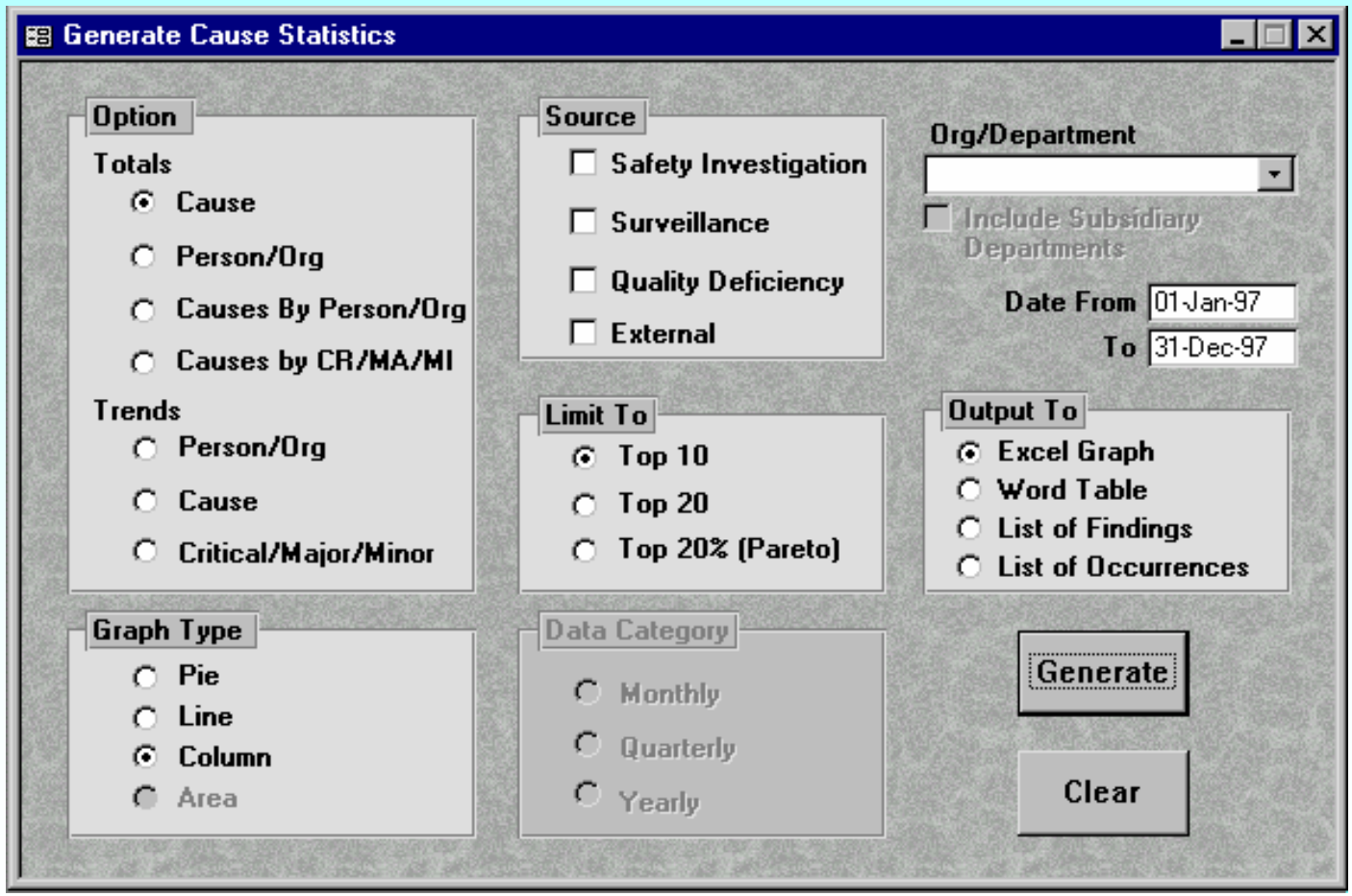



The values shown in the green boxes are the codes loaded into the AQS system for active failures.

# Analysis Tools

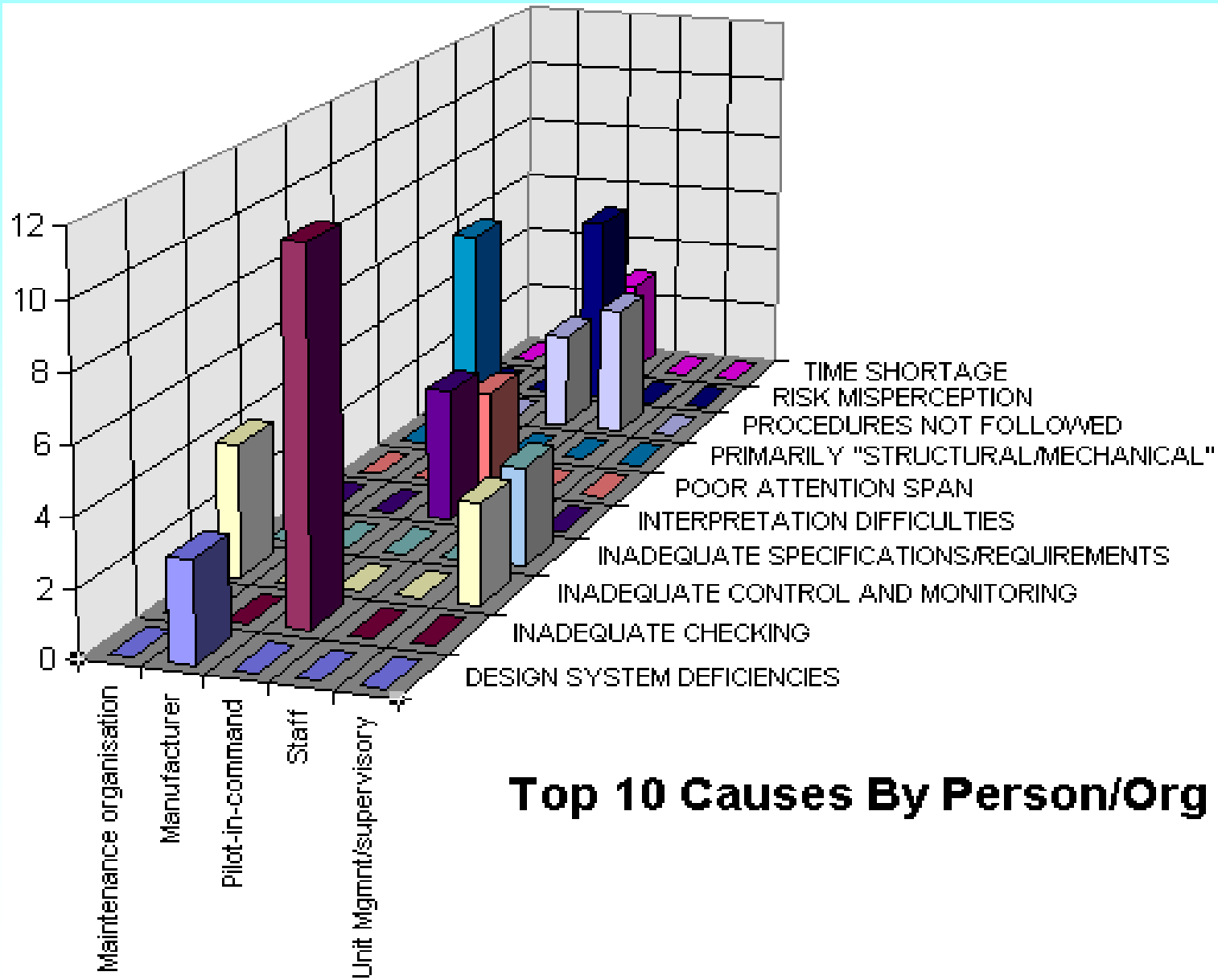
The analysis tools allow you to select the data to be analysed, and the method by which you want the output to be presented. The data is extracted and passed to Microsoft Excel to produce the appropriate graph. The tools within Excel can then be used, if desired, to alter the appearance of the graph and to apply trend lines.

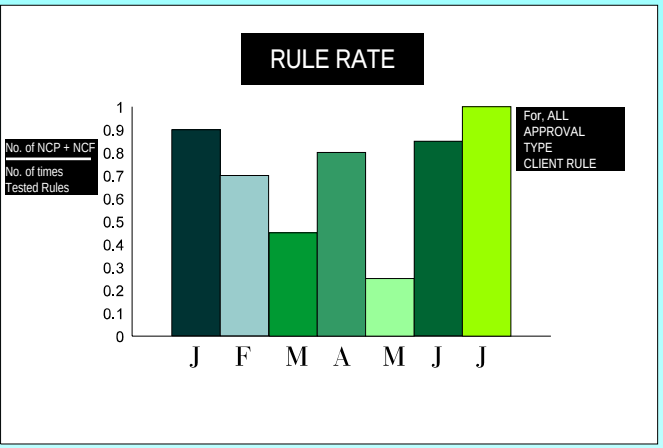
You go from this:

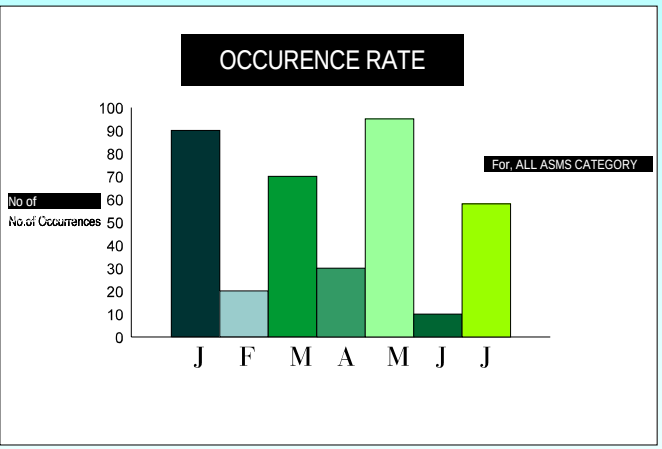


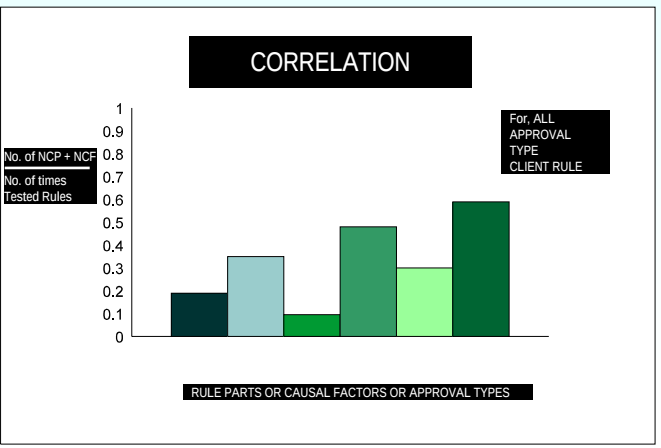
# Analysis Tools contd.

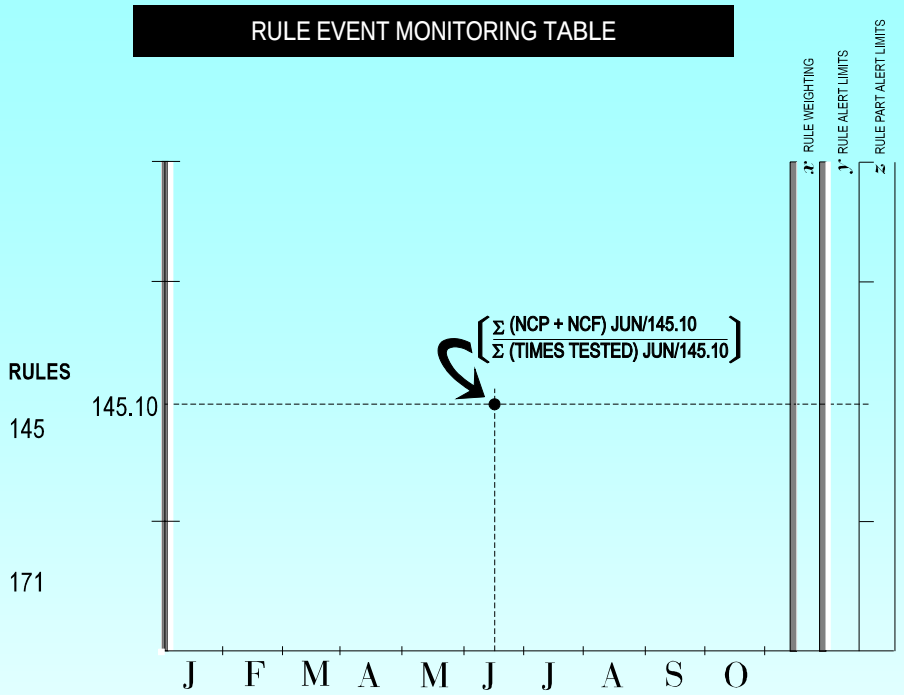
To this:





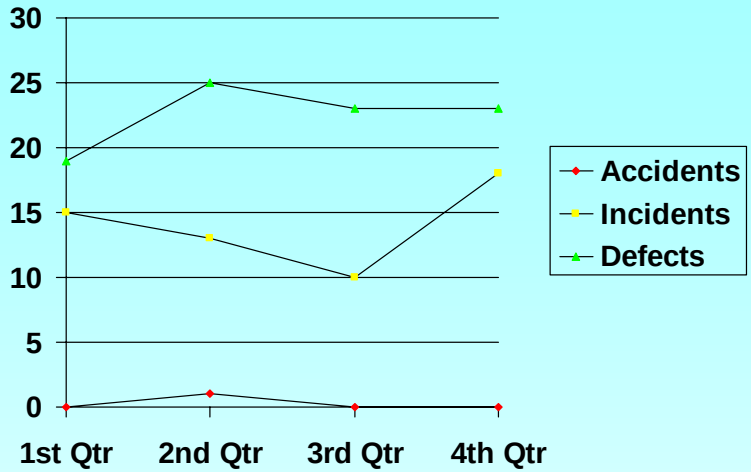



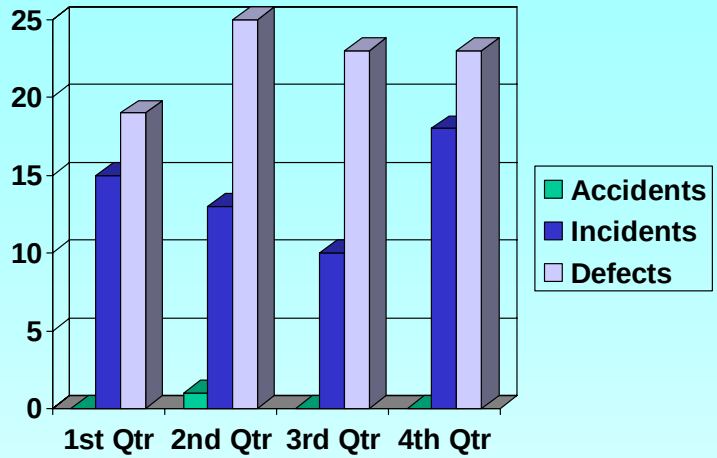

(a) $$\text{IF}\left[\frac{\Sigma(\text{NCP} + \text{NCF})\ \text{JUN}/145.10}{\Sigma(\text{TIMES TESTED})\ \text{JUN}/145.10}\right] \text{C}^{*} \quad x\ 145.10 > y\ 145.10\ \text{THEN ALERT}$$

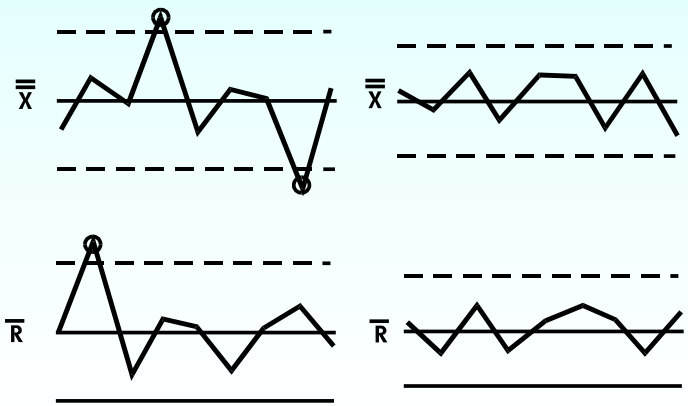
(b) $$\text{IF}\left\{\left[\frac{\Sigma(\text{NCP} + \text{NCF})\ \text{JUN}/145 - j}{\Sigma(\text{TIMES TESTED})\ \text{JUN}/145 -}\right] \text{C}^{*} \quad x\ 145 - j\right\} > z\ 145\ \text{THEN ALERT}$$

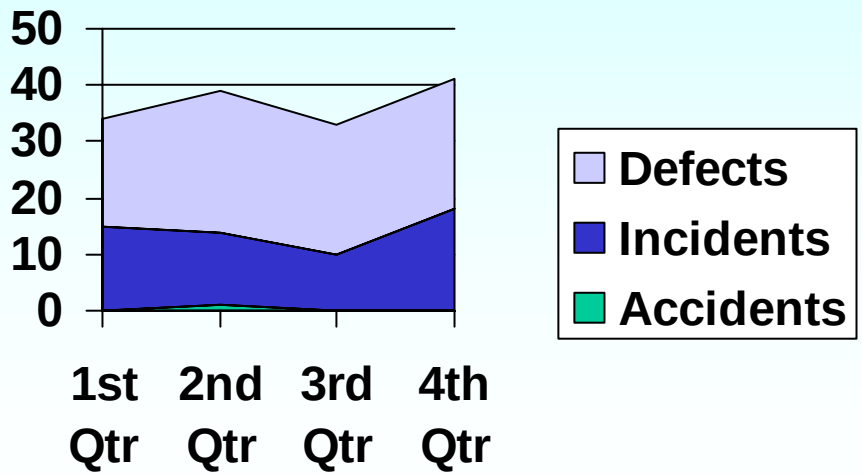
j

# Graphs and Control Charts

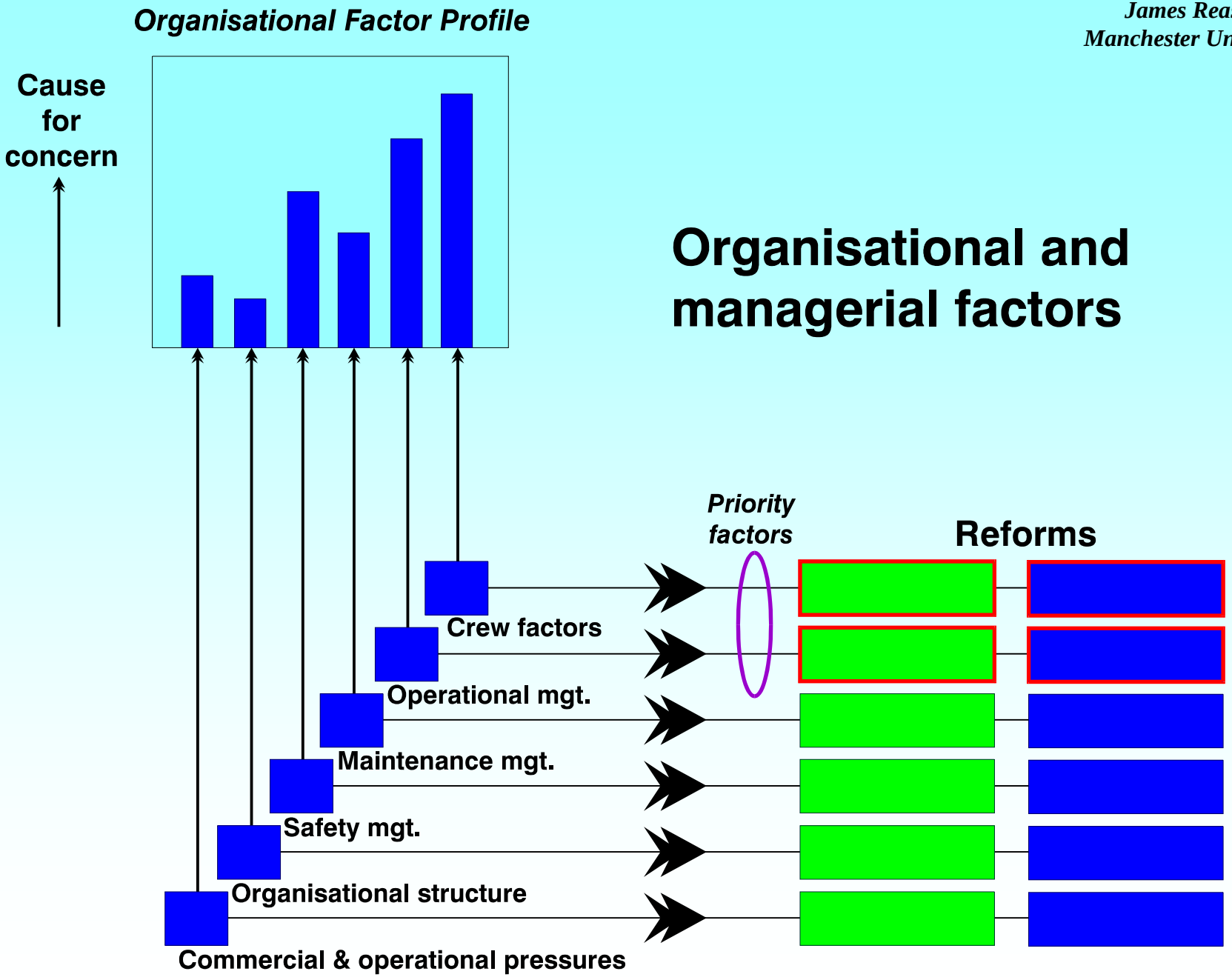


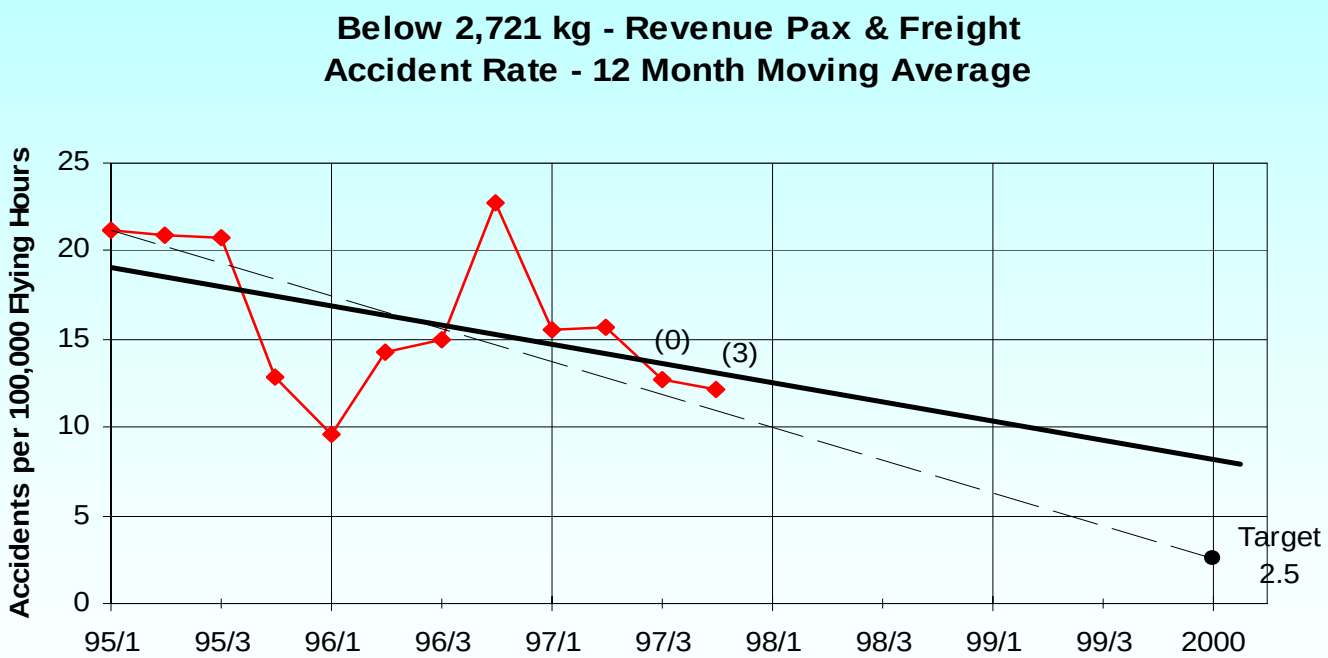



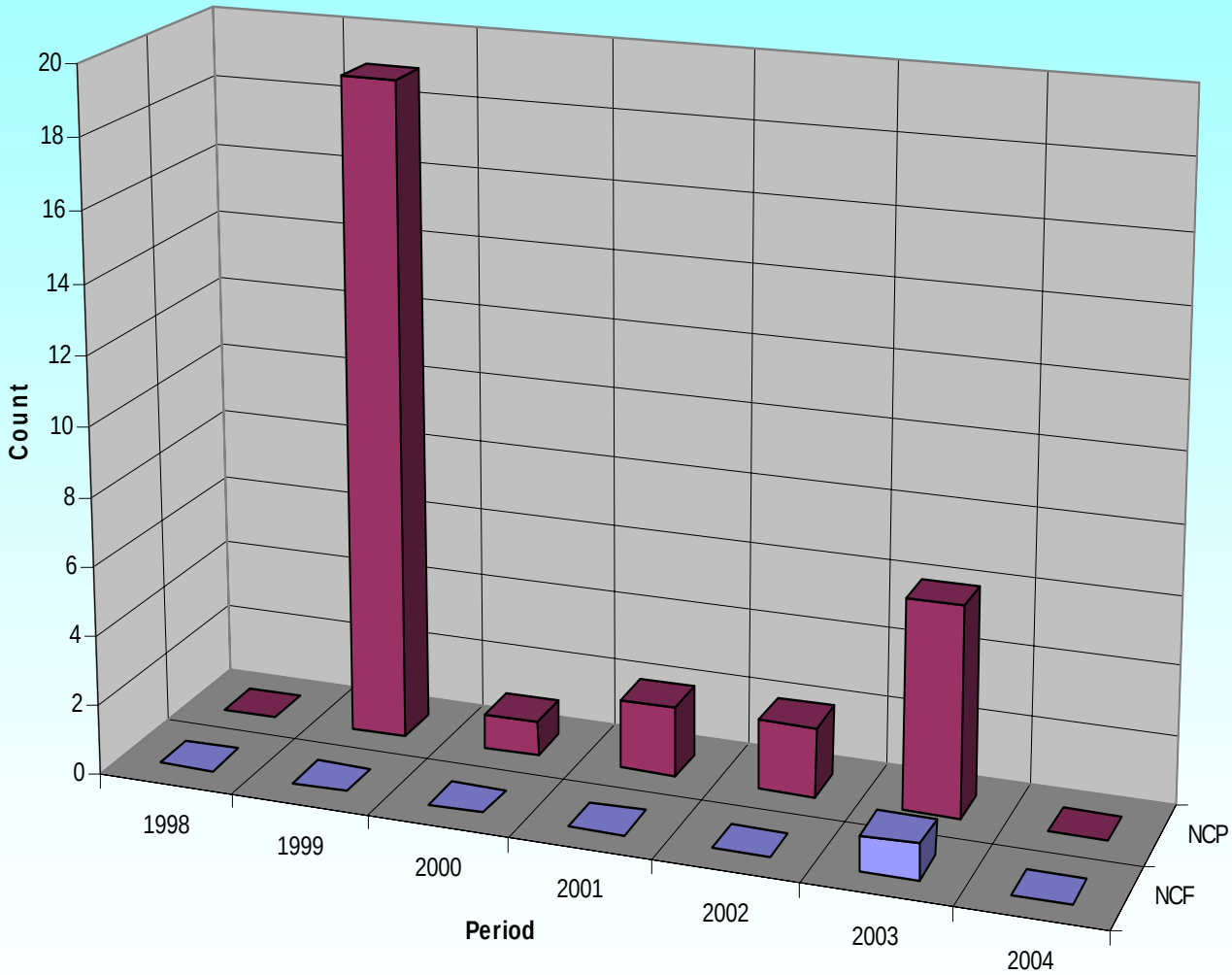
*Courtesy*
*James Reason*
*Manchester University*



# Below 2,721 kg - Revenue Pax & Freight

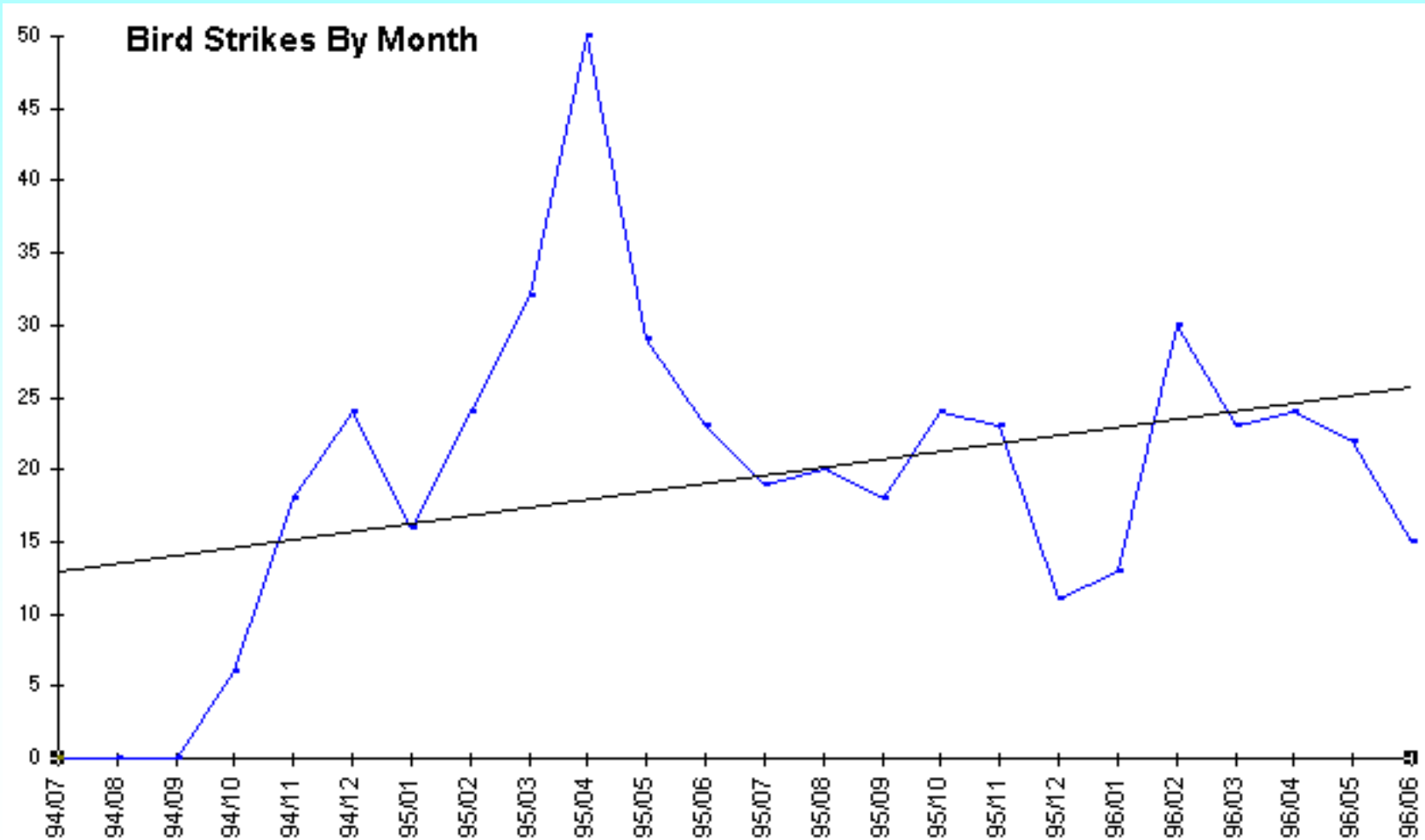


## Audit 98-2004 NCP, NCF, OBS and SRC Trend



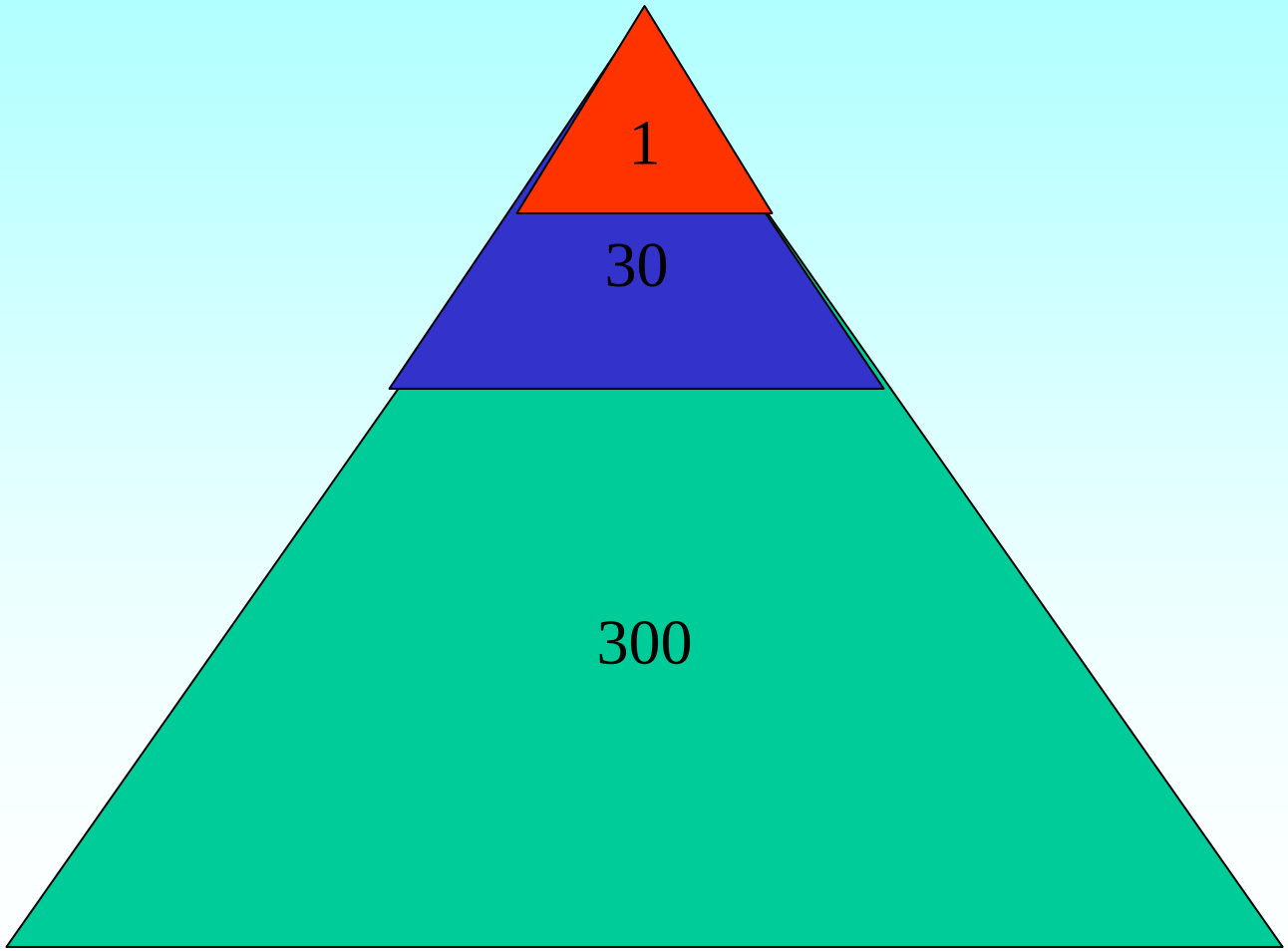
# Analysis Tools contd.

Once the graphs are in Excel, trend lines can be applied using the standard Excel regression analysis tools. The graph below shows a linear trend line applied to the number of bird strikes.

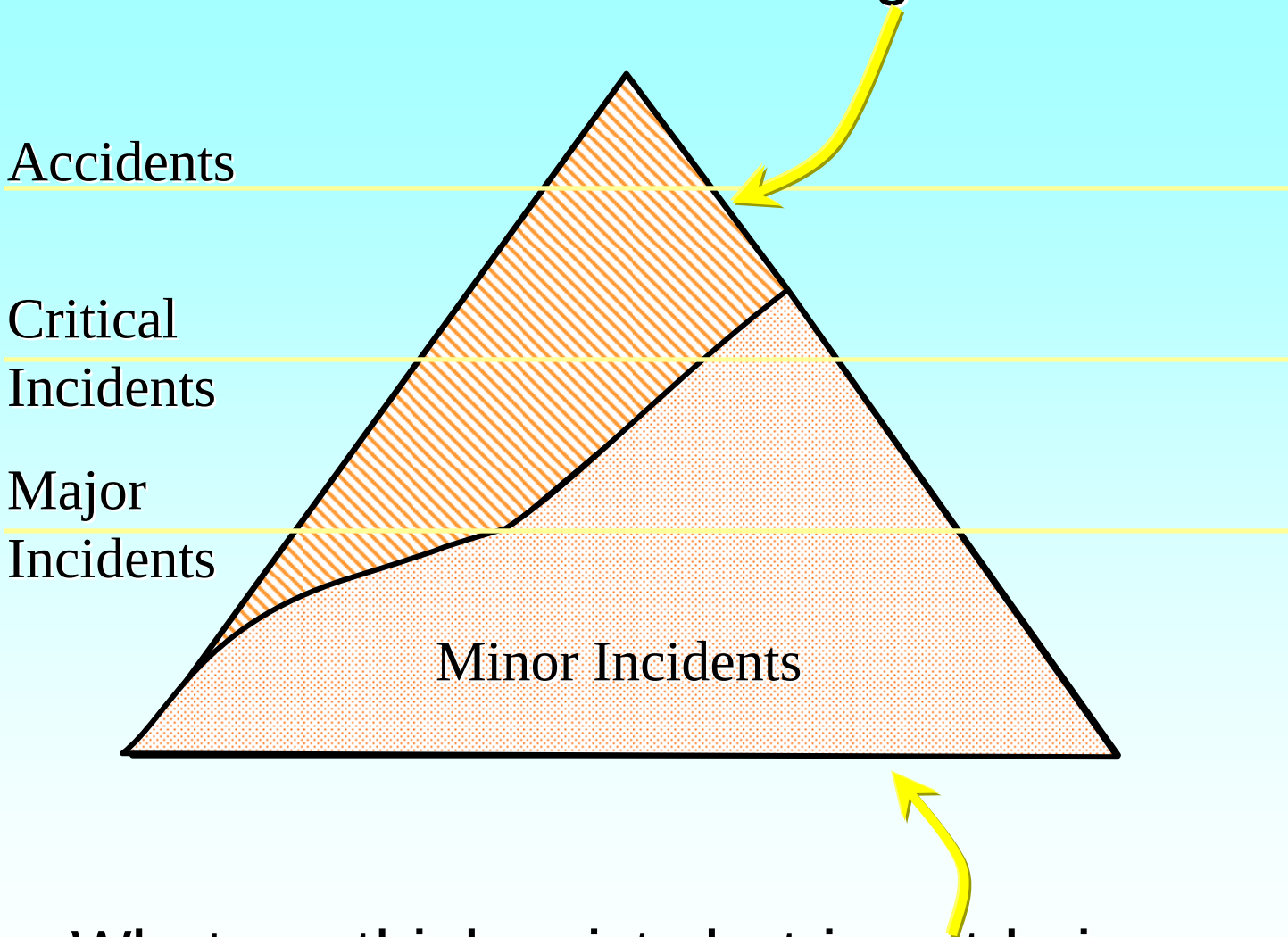



CNN

# Effective incident reporting programme

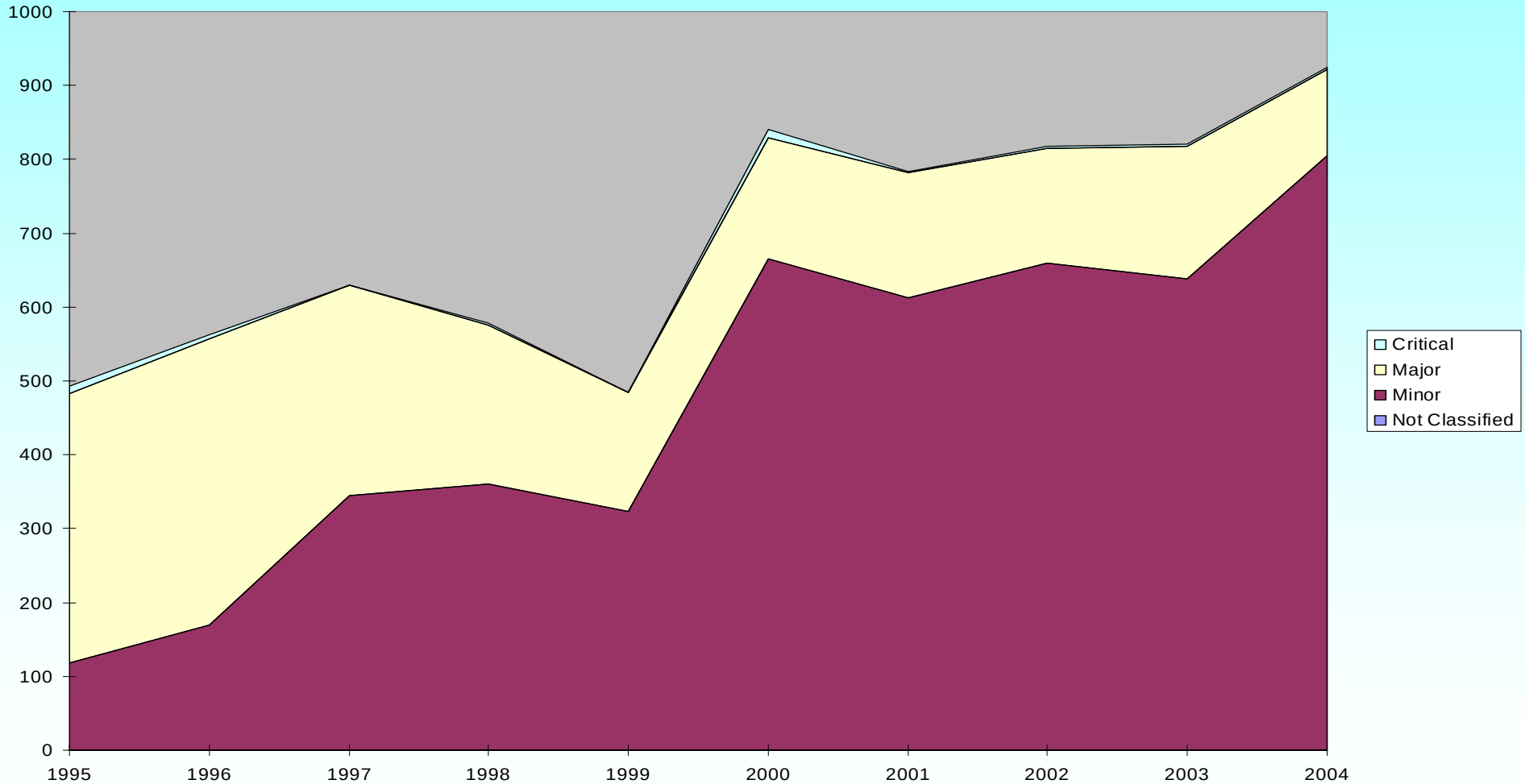


What we are seeing

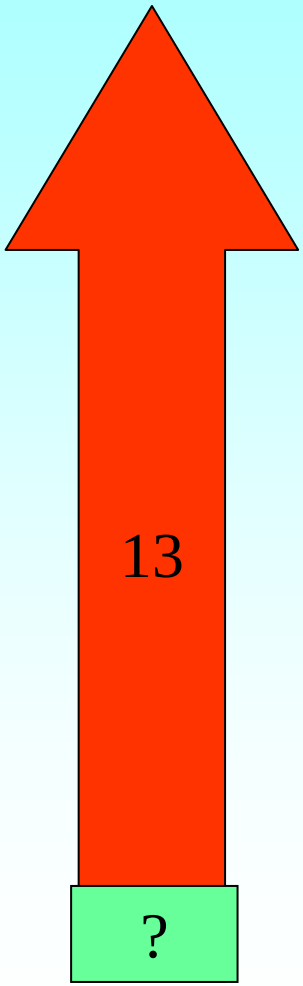



What we think exists but is not being reported

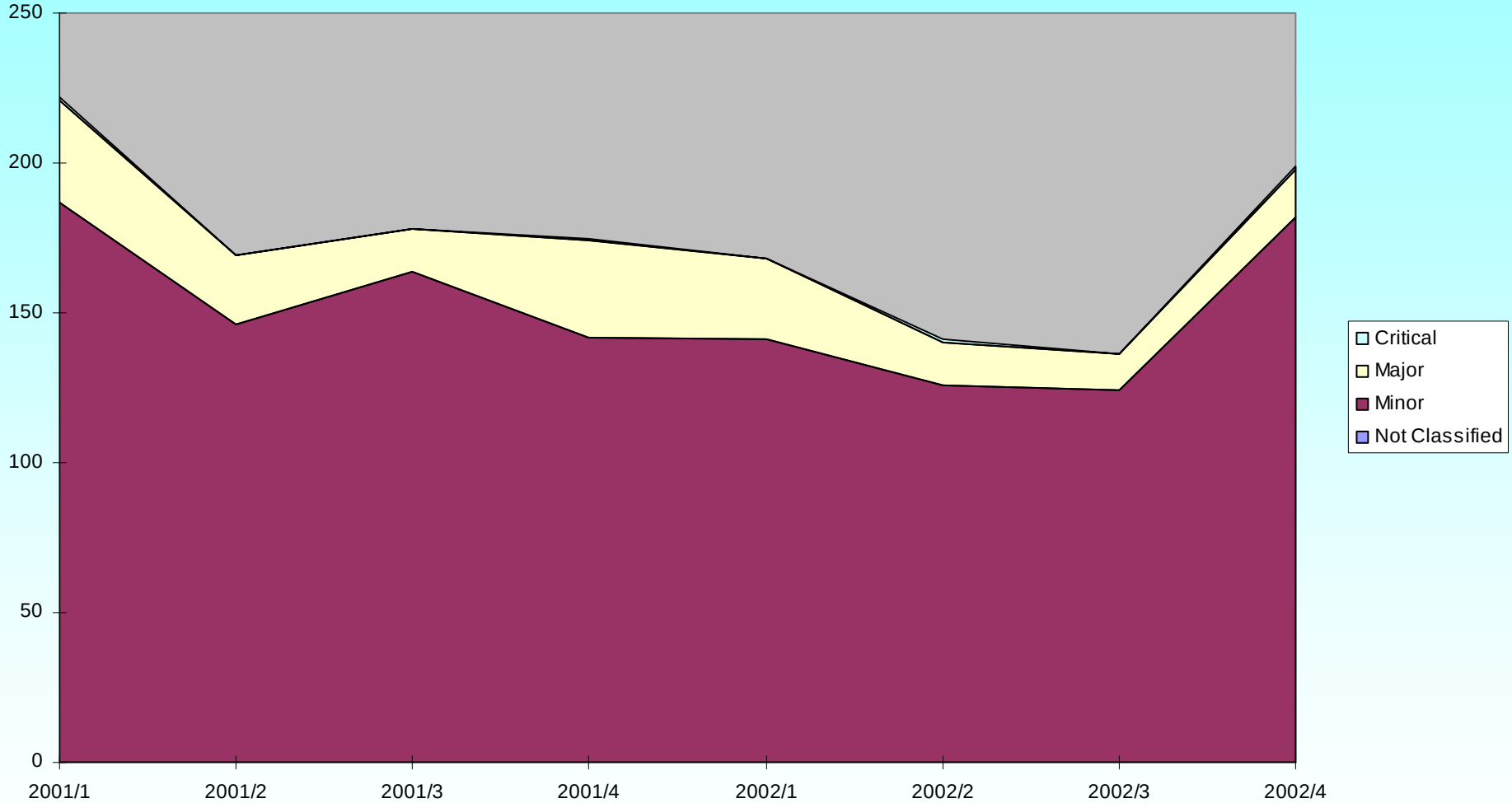
# DEFECT CRITICALITY TREND

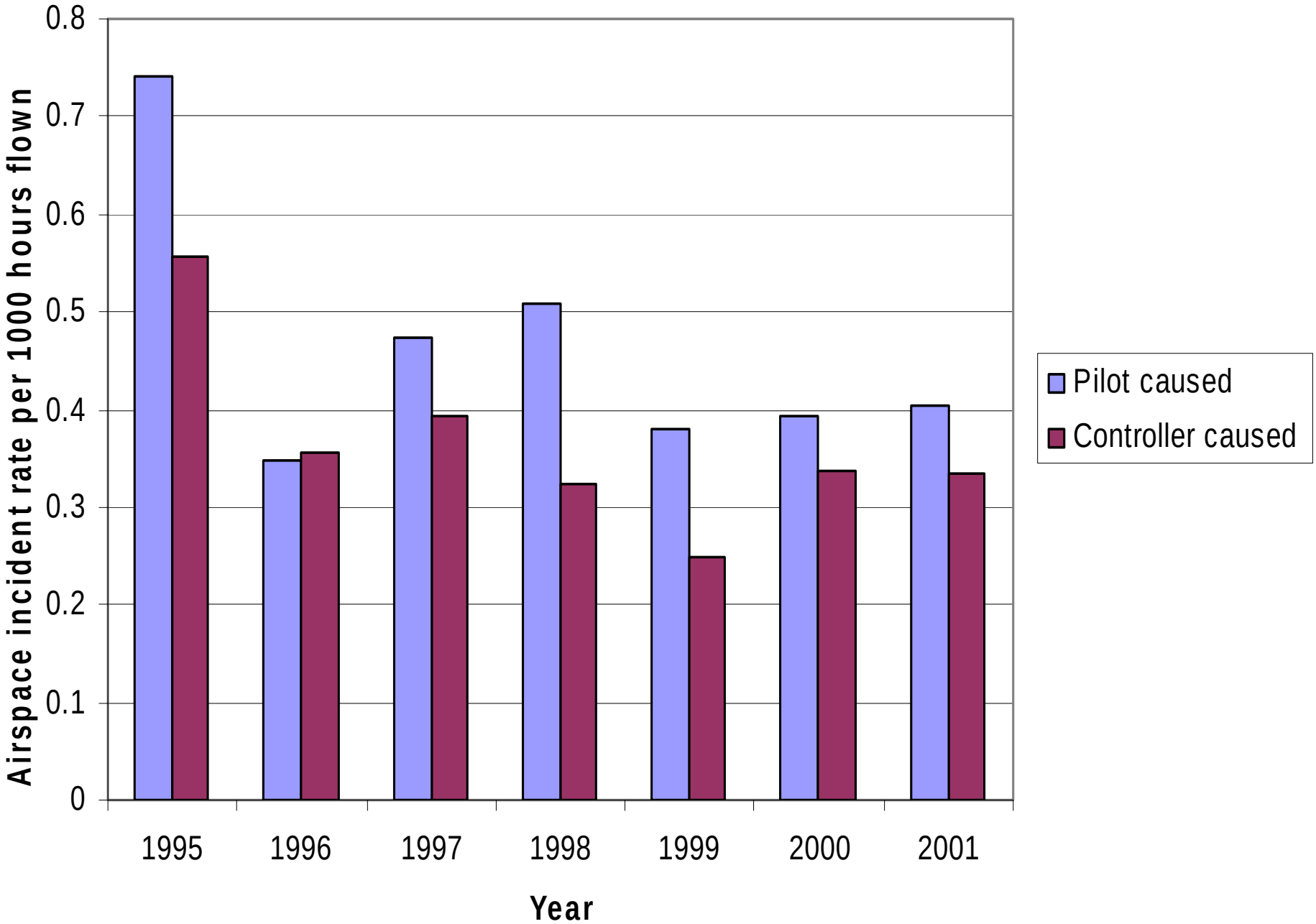


# Ineffective incident reporting



# AIRSPACE CRITICALITY TREND




Airspace incident rate per 1000 hours flown
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1995
1996
1997
1998
1999
2000
2001
Year
Pilot caused
Controller caused

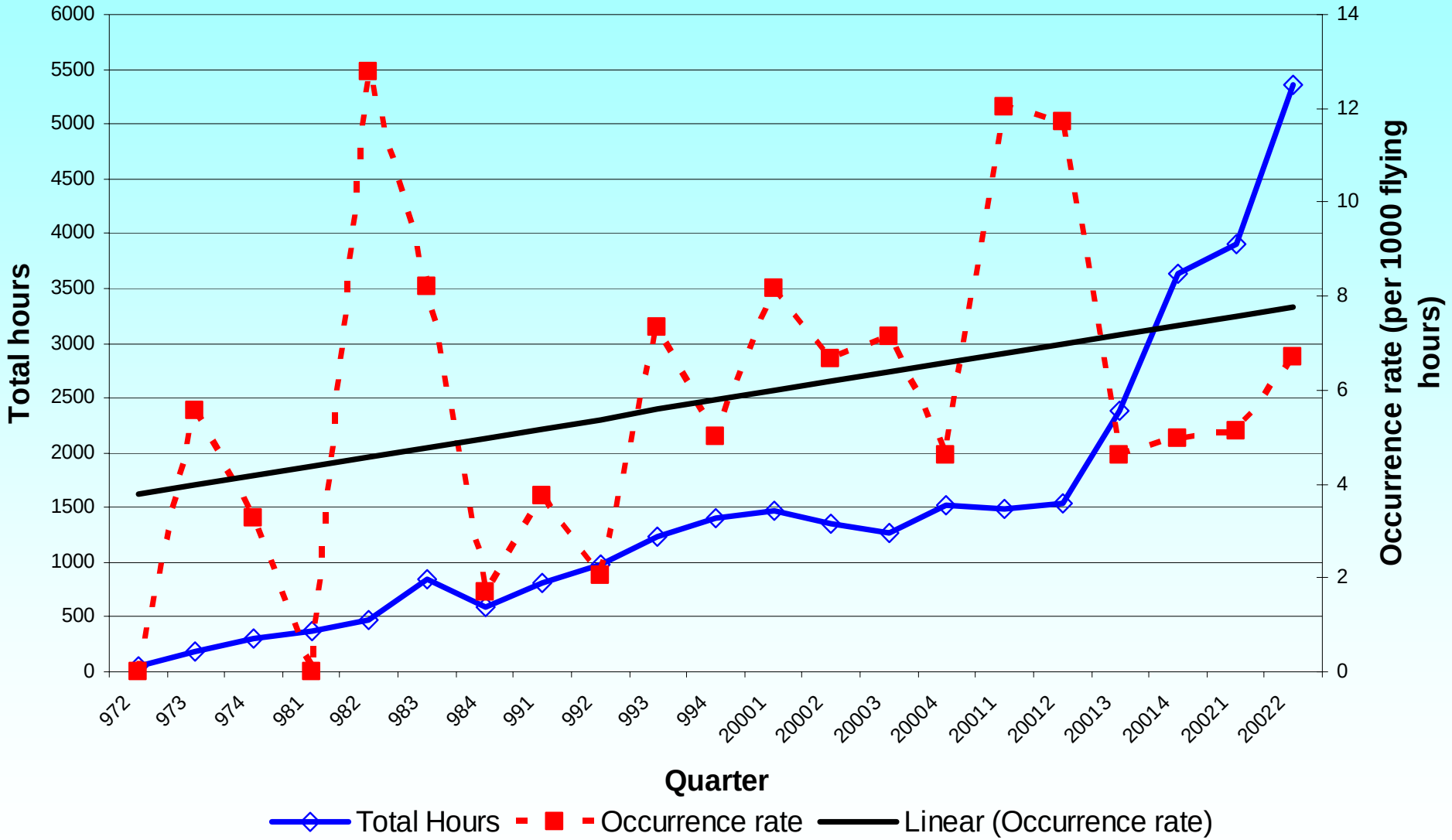
# Dominant factors for pilot caused airspace incidents.

| INCIDENT | DOMINANT FACTORS | | |
|---|---|---|---|
| | **Active** | **Local** | **Organisation** |
| **Unauthorized Airspace Incursion** | Actions inconsistent with procedures, i.e. execution errors. | Inadequate checking, risk misperception, and inexperience. | Poor planning |
| **Unauthorised Altitude penetration** | Actions inconsistent with procedures, i.e. execution errors. | Inadequate checking, high workload factors, and poor concentration/ lack of attention factors | Inadequate control and monitoring |
| **Near Collision** | Diagnosis, Procedural and actions inconsistent with procedures, i.e. execution errors almost equal. | Inadequate checking, interpretation difficulties. | Not Enough Data |
| **Pilot Position Reporting Deficiency** | Not Enough Data | Inexperience. | Not Enough Data |
| **Breach of Other Clearance** | Inaccurate system diagnosis, i.e. diagnostic errors. | Inadequate checking and interpretation difficulties. | Not Enough Data |
| **Flight Assist** | Not Enough Data | Inadequate checking | Not Enough Data |
| **Pilot Flight Planning Deficiency** | Not Enough Data | Risk misperception and poor concentration/ lack of attention. | Not Enough Data |

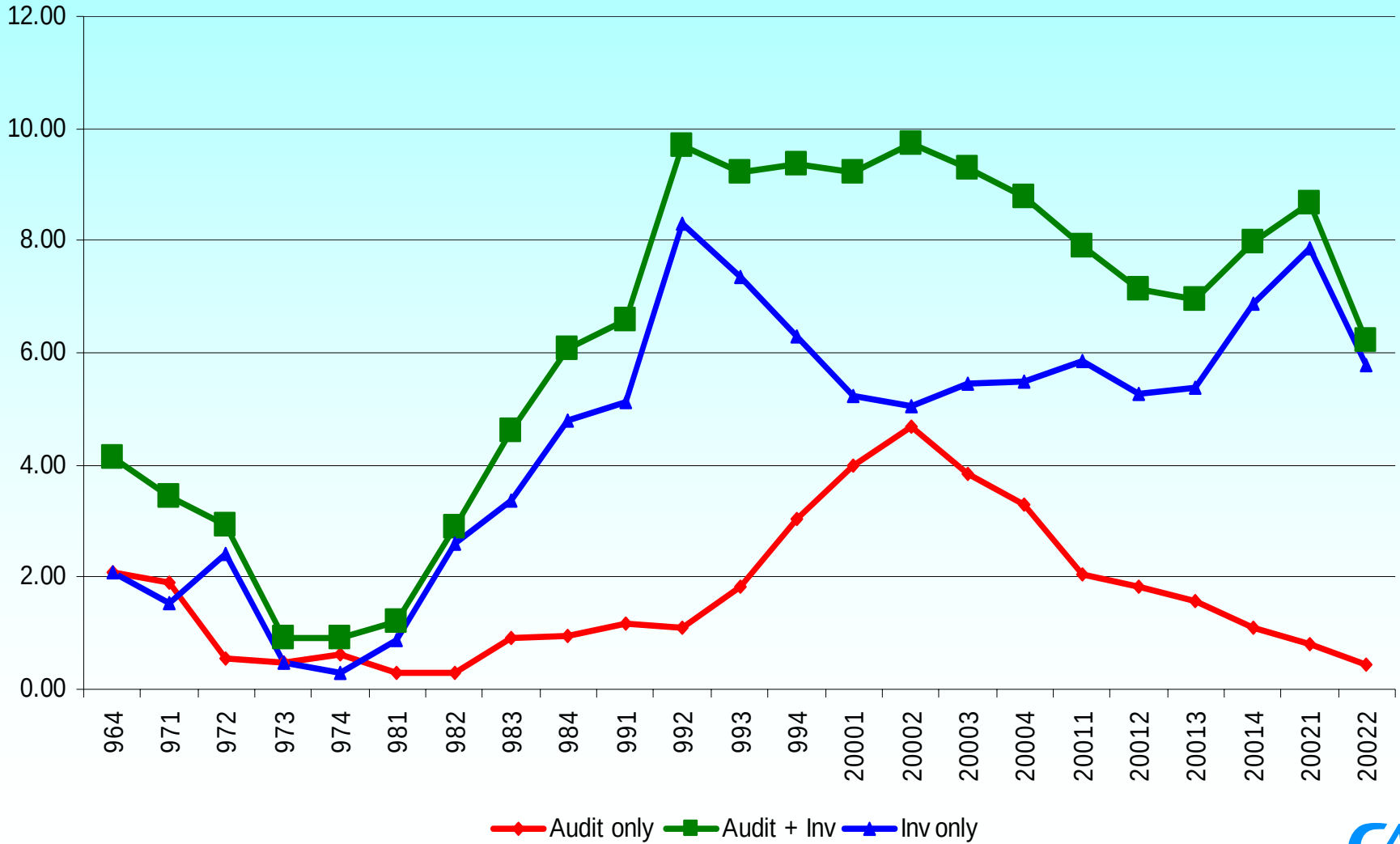
## Dominant factors for controller caused airspace incidents.

| INCIDENT | DOMINANT FACTORS | | |
|---|---|---|---|
| | **Active** | **Local** | **Organisation** |
| **Loss of separation** | Actions inconsistent with procedures, i.e. execution errors. | High controller workload factors and poor concentration / lack of attention factors. | Inadequate control and monitoring, inadequate specifications or requirements. |
| **ATS Coordination Deficiency** | Actions inconsistent with procedures, i.e. execution errors. | Poor instructions and procedures and poor concentration/ lack of attention factors | Design system deficiencies and inadequate specifications or requirements |
| **Near Collision** | Diagnosis, Procedural and actions inconsistent with procedures, i.e. execution errors almost equal. | Psychological factors. | Poor resource management and inadequate defences. |
| **ATS Clearance/ Instruction Deficiency** | Actions inconsistent with procedures, i.e. execution errors. | Inadequate checking and poor concentration/ lack of attention. | Poor resource management and inadequate control and monitoring. |
| **ATS Flight Planning System Deficiency** | Actions inconsistent with procedures, i.e. execution errors. | Inadequate checking and poor concentration/ lack of attention | Design system deficiencies and inadequate specifications or requirements |
| **ATS Flight Information Deficiency** | Inaccurate system "diagnosis" errors. | Inadequate checking and poor concentration/ lack of attention | Poor procedures and inadequate control and monitoring. |

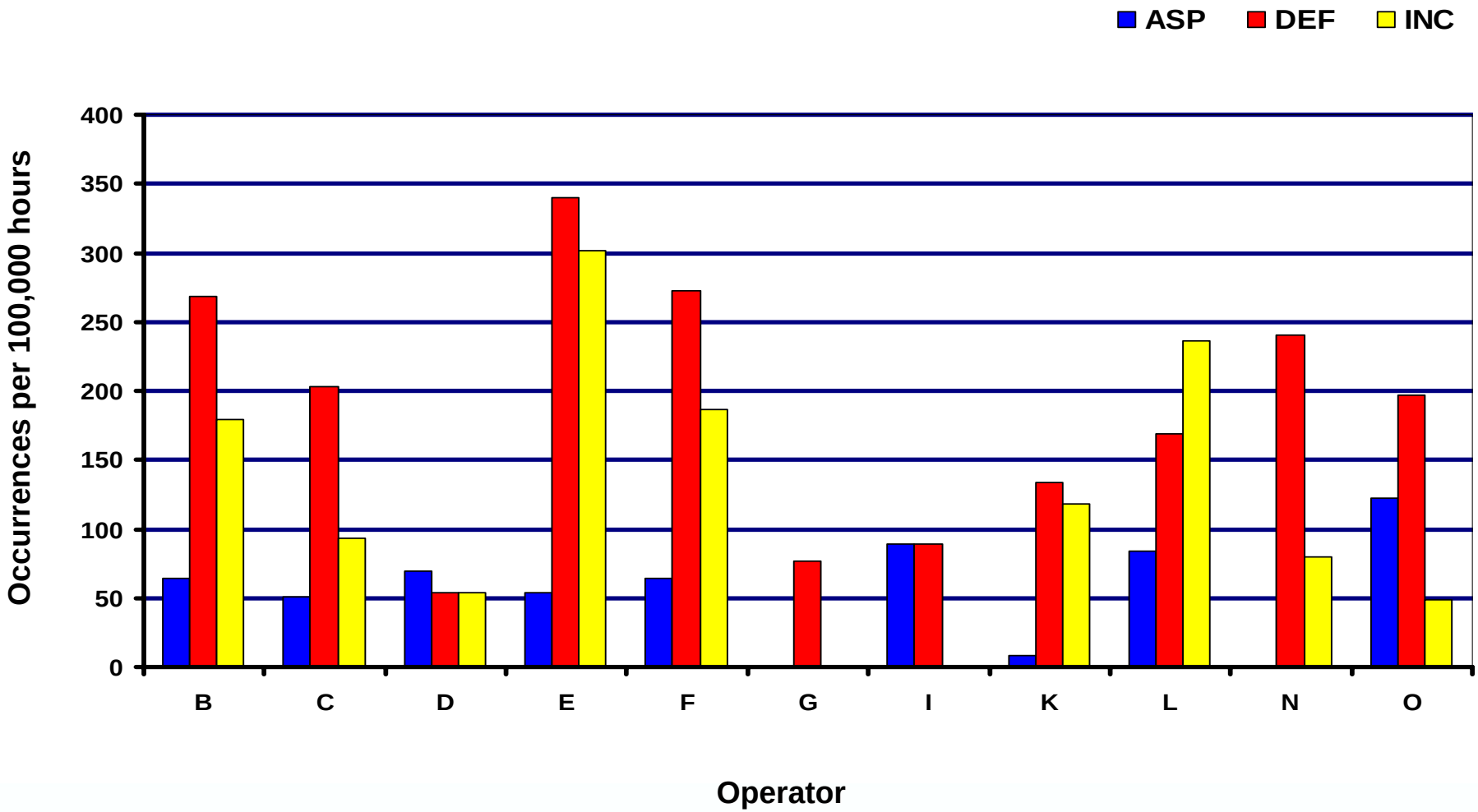
# Occurrence Rate / Hours flown



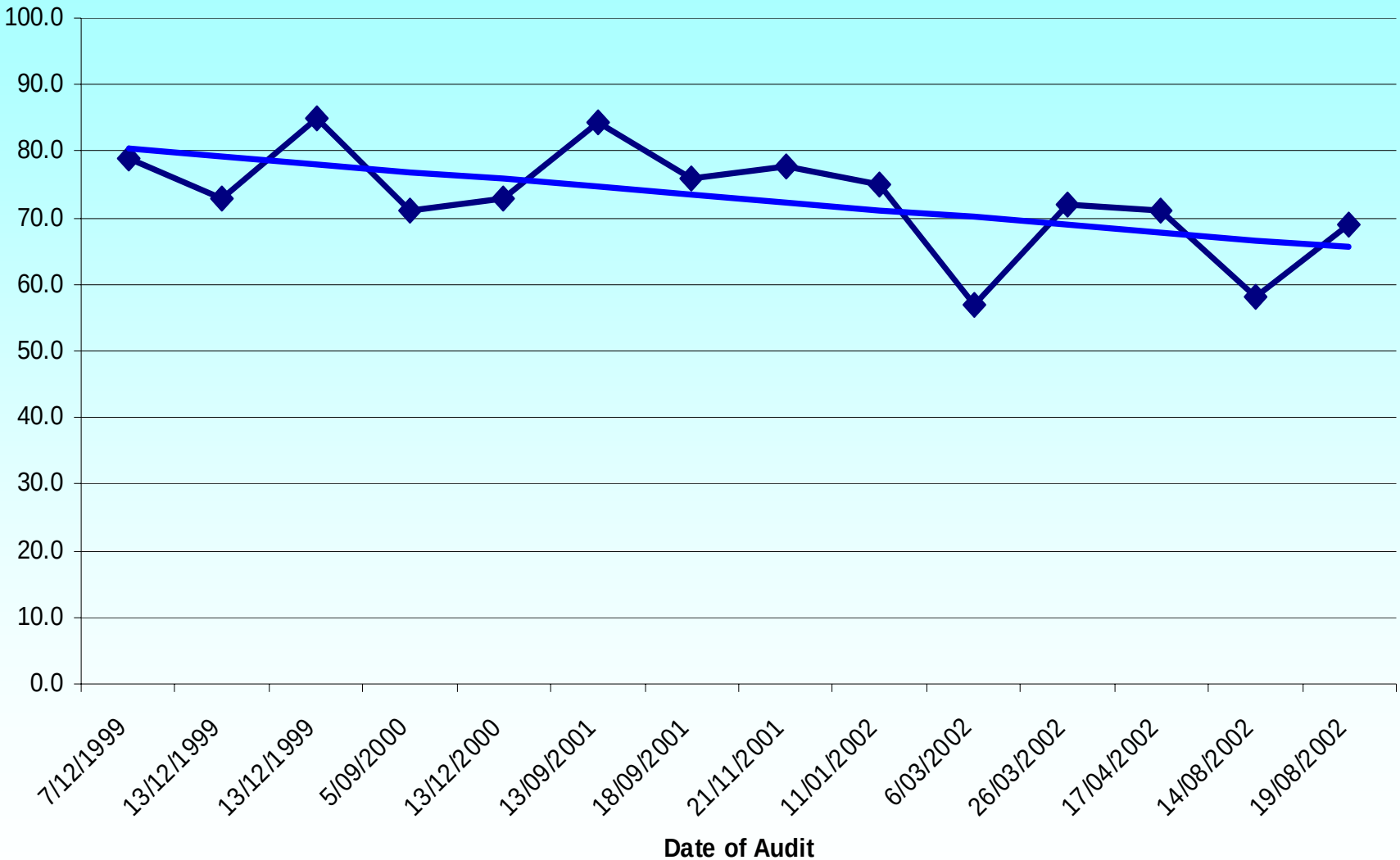
# Non-Compliance Index
# (Audit and Investigation)



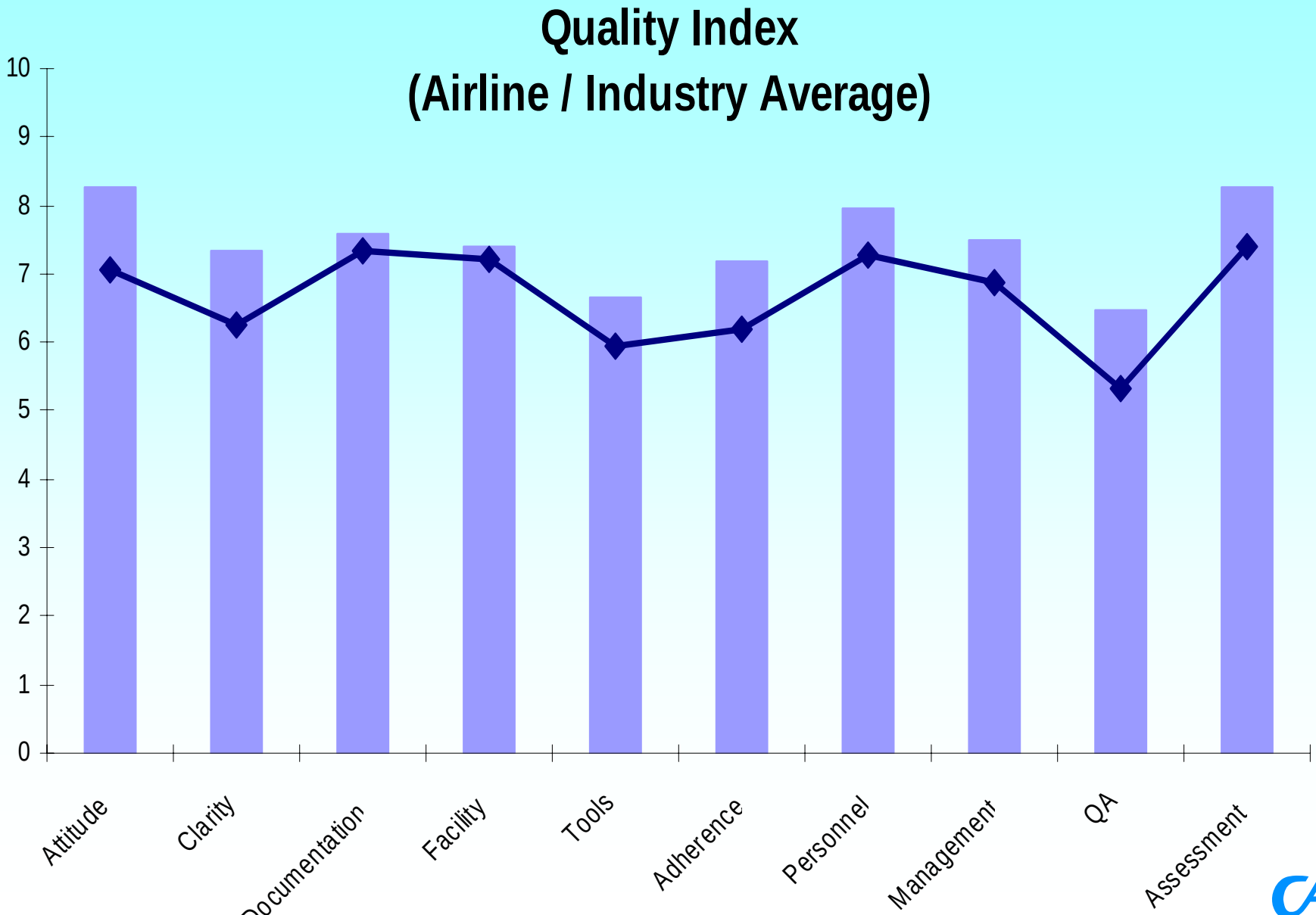
# Occurrence Rate Comparison by Operator



# Quality Index Performance



Management and staff attitude towards safety;
Clarity of quality management system;
Documentation;
Facility suitability & upkeep;
Tools/equipment/materials;
Adherence to standards and specifications;
Personnel skills, knowledge and numbers;
Control/management system effectiveness;
Corrective and preventive actions; and
Auditor assessment.


Quality Index
(Airline / Industry Average)
10
9
8
7
6
5
4
3
2
1
0
Attitude
Clarity
Documentation
Facility
Tools
Adherence
Personnel
Management
QA
Assessment

# CAA Enforcement Unit

- Outside of Part 12 reporting, the CAA Enforcement unit receives about 200 to 250 complaints a year most of which come from members of the public and other operators operating within the rules who are being disadvantaged by those who are not. From 1 July 2000 to 30 June 2001 184 alleged offences were reported outside of Part 12, 136 enforcement investigations were carried out. 53 enforcement actions were taken of which 51 (96%) were successful.
- This is outside of and separate from the 4000+ of safety failures reported under Part 12.

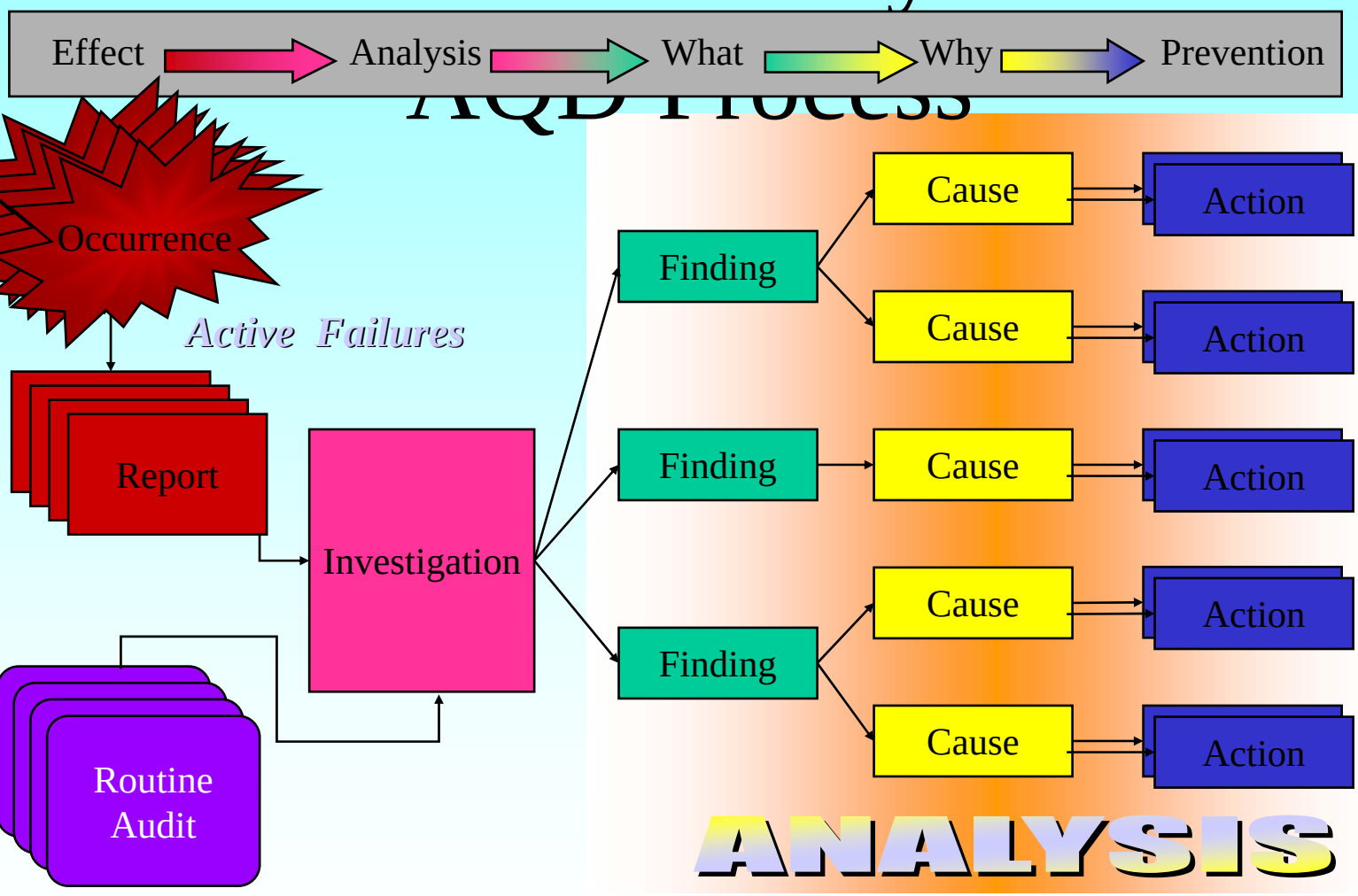
# Barriers to reporting by industry: “Fear of prosecution”

- Information on incidents reported to the CAA’s Safety Investigation Unit may not be used or made available for the purpose of an investigation to establish whether an offence has been committed, or for prosecution action, unless:
  - the information reveals an act or omission that caused unnecessary danger to any other person or to any property;
  - or false information is submitted.
  - The CAA will not release the information gathered under Part 12 to any other person, unless a statutory requirement exists so ordered by the courts.

# Examples of unnecessary danger

- Pilot operating a helicopter at an unnecessarily low altitude carrying out an unnecessary 45 degree banked turn resulting in a collision with the ground. One of the two passengers, who were both seriously injured, was not provided with a proper safety harness.
- The logbook entries relating to a set of tail rotor blades were altered to conceal the history to enable the engineer to refit them whilst actually time expired.
- A person knowingly allowed illegal repairs to be carried out to tail rotor blades and intentionally did not pass this information on to the engineer that installed the blades and certified for the installation. These illegal repairs caused the blades to disintegrate in flight resulting in the deaths of the pilot and crew member.
- The overseas engineers carried out a repair to a damaged main rotor blade. The repair was not in accordance with the manufacturers repair limits and was hidden with filler. The main rotor blade cracked in service potentially leading to total blade failure.

# Causal Factor Analysis - The AQB Process




***Search for Latent Conditions***

# James Reason quote

***"Data without a theory is like a body without a skeleton.***

***All you can do is carry it around in a bucket."***

# The New Zealand Aviation Safety Management System

## Civil Aviation Authority of New Zealand

**Richard White**
**Manager Safety Investigation**