

THE UN-QUANTIFIED RISKS IN AIRCRAFT MAINTENANCE

An AAIB Perspective

Alan Simmons
Senior Inspector - AAIB

AAIB PURPOSE

TO IMPROVE AVIATION SAFETY BY

**DETERMINING THE CAUSES OF AIR ACCIDENTS
AND SERIOUS INCIDENTS**

**AND MAKING SAFETY RECOMMENDATIONS INTENDED
TO PREVENT RECURRENCE**

exbyte.net



Most human activities are hazardous...



Aviation is no exception...

THE UNQUANTIFIED RISKS IN AIRCRAFT MAINTENANCE



The risks inherent to flying are mitigated during design, manufacture and certification.

THE UNQUANTIFIED RISKS IN AIRCRAFT MAINTENANCE

A photograph of a male maintenance technician wearing a white short-sleeved shirt, sunglasses, and a lanyard with an ID badge. He is looking upwards and touching the underside of a large aircraft component, possibly a wing or fuselage section. The background shows a hangar with other aircraft parts and a large black tire in the foreground.

The risks incurred at maintenance are mitigated by procedures

Risks are quantified and made to meet acceptable levels



"The next procedure will be invasive. We'll be removing your wallet."

ASSESSING THE REAL RISKS IN AIRCRAFT MAINTENANCE

EVOLVING CONCEPTS OF BLAME, ERROR AND RISK TAKING

In the 80's and 90's we stopped blaming mechanics – it was human error!

But violations were taking place – the error was often in misjudging the outcome of a violation!

Validity of the 'Just' culture rather than 'blame' or 'no-blame'.

The substitution test – if another mechanic would have done the same thing, then the issue is an *organisational problem*.

ASSESSING THE REAL RISKS IN AIRCRAFT MAINTENANCE

Normalised Non-Compliance

Non-compliance is the norm in many situations in daily life.

It is human nature to resolve conflicts pragmatically.

Pragmatic solutions become 'Norms'.

Norms become 'the way we do things around here'.

Non—compliance becomes part of the culture.

The non-compliance may continue for years before the risk emerges.



ASSESSING THE REAL RISKS IN AIRCRAFT MAINTENANCE

BUT – there are hidden risks of rule-breaking

If your organisation experiences rule-breaking, then it is exposed to an unknown level of risk.

Dual risk –

- 1 the risk that the rule was intended to prevent:
(when we bend the rule, we do not know the extent of our exposure)
- 2 The risk of being caught out. (Fines, litigation, Insurers deny claims)

OLD STYLE ERROR MANAGEMENT



1958 Vickers Viscount
crash near Frimley, Surrey

OLD STYLE ERROR MANAGEMENT (PUNISHMENT OF THE GUILTY).

- 1958 Vickers Viscount 732 crash near Frimley, Surrey
- Air test following major overhaul
- Maintenance replaced elevator spring tab skew bar
- Baulking device cut off by engineer
- Inspections failed to detect the error
- Severe control difficulties in pitch,
aircraft crashed after a wing broke off

OLD STYLE ERROR MANAGEMENT (PUNISHMENT OF THE GUILTY).

- The AIB's 10 page report report stated:
- *"The accident was due to the elevator spring tab operating in the reversed sense. This involved the pilot in involuntary manoeuvres which overstressed the aircraft and caused the wing to break off. Work done to the spring tab mechanism during overhaul had been carried out incorrectly and the persons responsible for inspection failed to observe the faulty operation of the tab because they were neglectful in the performance of their duty"*
- One of the engineers subsequently went to prison

NEW STYLE ERROR MANAGEMENT

(HUMAN PERFORMANCE BASED – AVOID THE RISK).

Selection

Training

Approvals

Procedures

Tools, equipment, manuals

Well-being

Environment (heat, light,

Duty time limitations?

ASSESSING THE REAL RISKS IN AIRCRAFT MAINTENANCE

All these measures will be invalidated if there is deliberate risk taking and rule breaking.

Recent examples from AAIB investigations into actual incidents:

A technician assembled propeller de-icer boots without the required sealant materials, which were difficult to obtain. The boot detached causing injury and damage.

A mechanic assembled a helicopter rotor head without the required shims, because the job was urgent. The helicopter suffered severe vibration and blade cracking.

After major maintenance, an engineer stamped up a number of job cards to close all remaining open panels, but not all the panels were open at the time. One of the closed panels was not properly closed and latched. The panel came off and penetrated the cabin.

ASSESSING THE REAL RISKS IN AIRCRAFT MAINTENANCE

WHAT MAKES PEOPLE USE BOGUS PROCEDURES?

Incorrect procedures may be used because of:

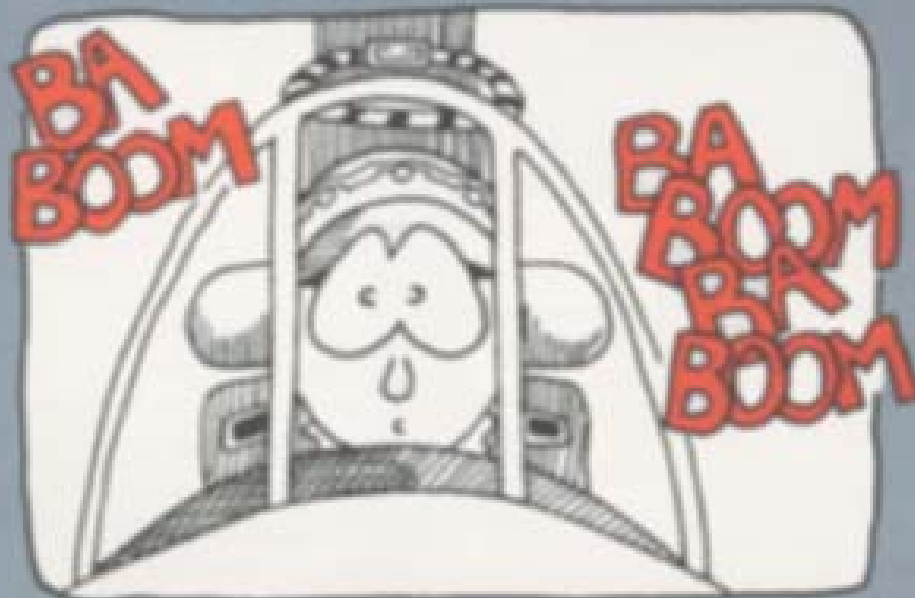
Malevolence; (sabotage)

Laziness;

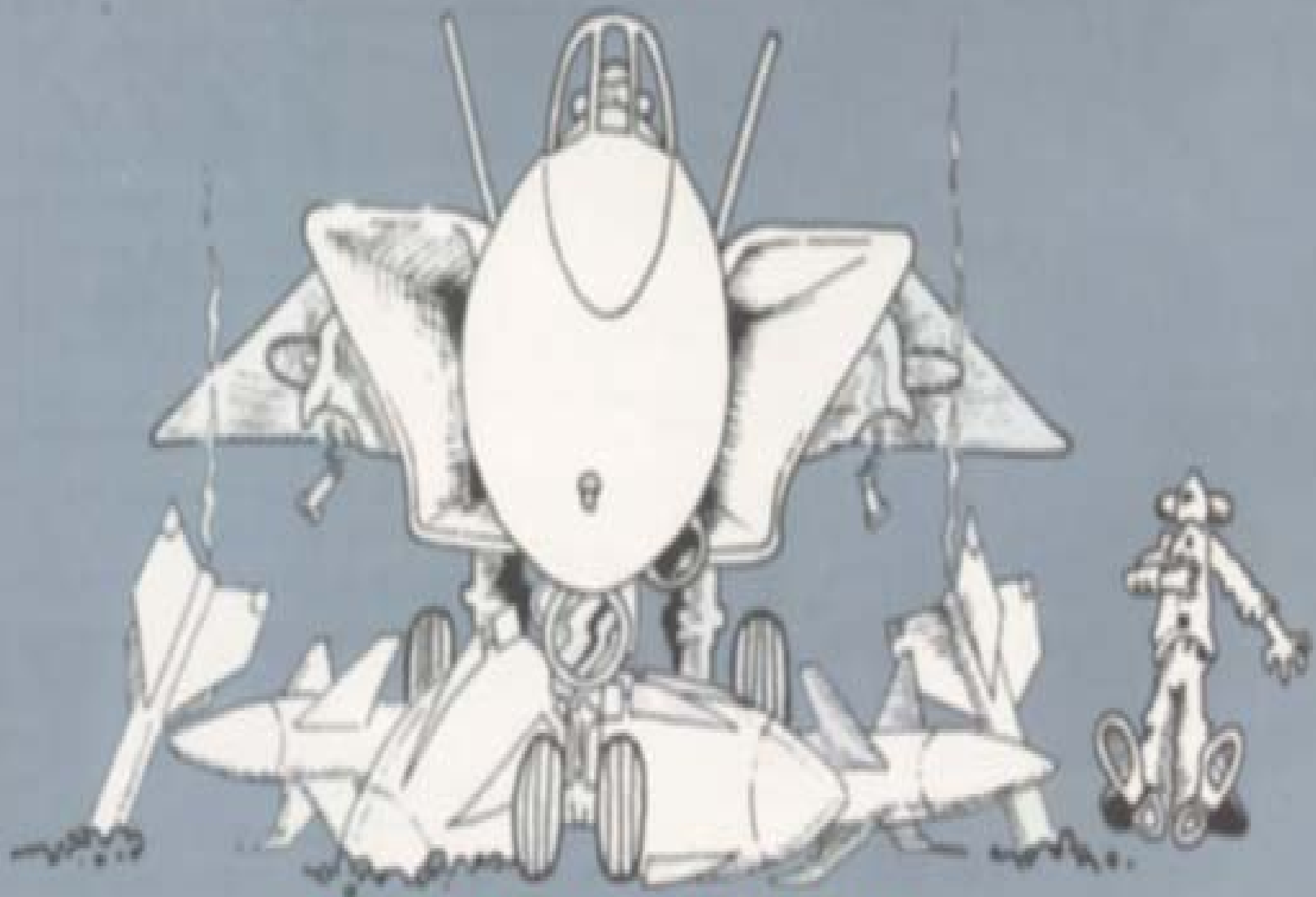
Lack of understanding;

'Normal' human error

Expediency (Lack of parts, tools, materials, time)



There's more than one way to dearm an F-14...



**but only one right way,
NAVAIR 01-F14AAA-75**

ASSESSING THE REAL RISKS IN AIRCRAFT MAINTENANCE

Unexpected consequences!

'XXX' was the mechanic who fitted a non-standard titanium strip to a Continental DC-10...

'He allegedly fixed the titanium alloy part instead of a softer metal strip in Continental's plane maintenance unit in Houston, Texas, even though its use was not sanctioned by US civil aviation authorities.

'His supervisor at Continental was questioned on June by the judge but has thus far not been put under criminal investigation.

'Continental itself was placed under investigation for manslaughter and injuries in March, but has vowed to fight any charges that may ensue'.



In 1994 AAIB stated:

'The Civil Aviation Authority should formally remind engineers of their responsibility to ensure that all work is carried out using the correct tooling and procedures, and that they are not at liberty to deviate from the Maintenance Manual but must use all available channels to consult with a design authority where problems arise; if full compliance cannot be achieved the engineer is not empowered to certify the work'.

[Airbus A320, G-KMAM AAIB Report 2/95, Safety Recommendation 94-41]

This is still the only way forward.

Questions?

