Language Skills to Improve Safety in Aircraft Maintenance

Addressing Authority Gradient and Failure to Follow Procedure (FFP)

Denis Manson – Ten Hammers Digital

with thanks to

Anne Lomperis – Language Training Designs

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The Pacific and Australasian CRM Developers' and Facilitators' Forum

The lesson:

- **Aggression** creates resistance
- **Passivity** gives away ground
- **Assertiveness** seeks a constructive outcome

Anne Lomperis (USA)

- Thought-leader in English for Occupational Purposes (EOP)
- Specialist in language proficiency for aircraft maintenance training
- Thrives on co-mentoring and collaboration
- For EOP, provide meaningful tasks

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Some (Related) Safety Issues in Aircraft Maintenance

1. English language proficiency
2. Authority gradient
3. Failure to follow procedure (FFP)

Authority Gradient

We KNOW what it is!

- Command and decision-making power hierarchy
- In a team, crew or group situation

Authority Gradient in Maintenance

We KNOW why it happens

- Cultural
- Hierarchical
- Personality factors
- Language proficiency

Authority Gradient in Maintenance

AME ⇨ Pilot
AME ⇨ Cabin crew
AME ⇨ Supervisor
AME ⇨ Other AME
AME ⇨ Ops

Interpersonal situations involving negotiation, efficiency, safety

Failure to Follow Procedure (FFP)

What is it?

- Working outside of approved guidelines
- ‘Violation’
- Sometimes justifiable? (like continuing an unstable approach)

Failure to Follow Procedure (FFP)

Why does it happen?

- Norms
- Workarounds
- Experienced judgement
- Organisational issues
- Misunderstandings
- Laziness
- Anarchy

Failure to Follow Procedure (FFP)

When witnessing FFP, it is often hard to say “No”

(from Jop Dingemans)

Challenging the Authority Gradient and FFP

We want trainees:

- To speak up in unsafe situations
- To challenge unsafe norms
- To resist workarounds

This means building:

- Assertiveness **(as a safety skill)**
- Persistence
- Conviction
- Accuracy
- Respect
- Language proficiency

If We Train for Assertiveness … ?

- Assess using behavioural markers

- Analyse language to highlight unsafe situations and human reactions

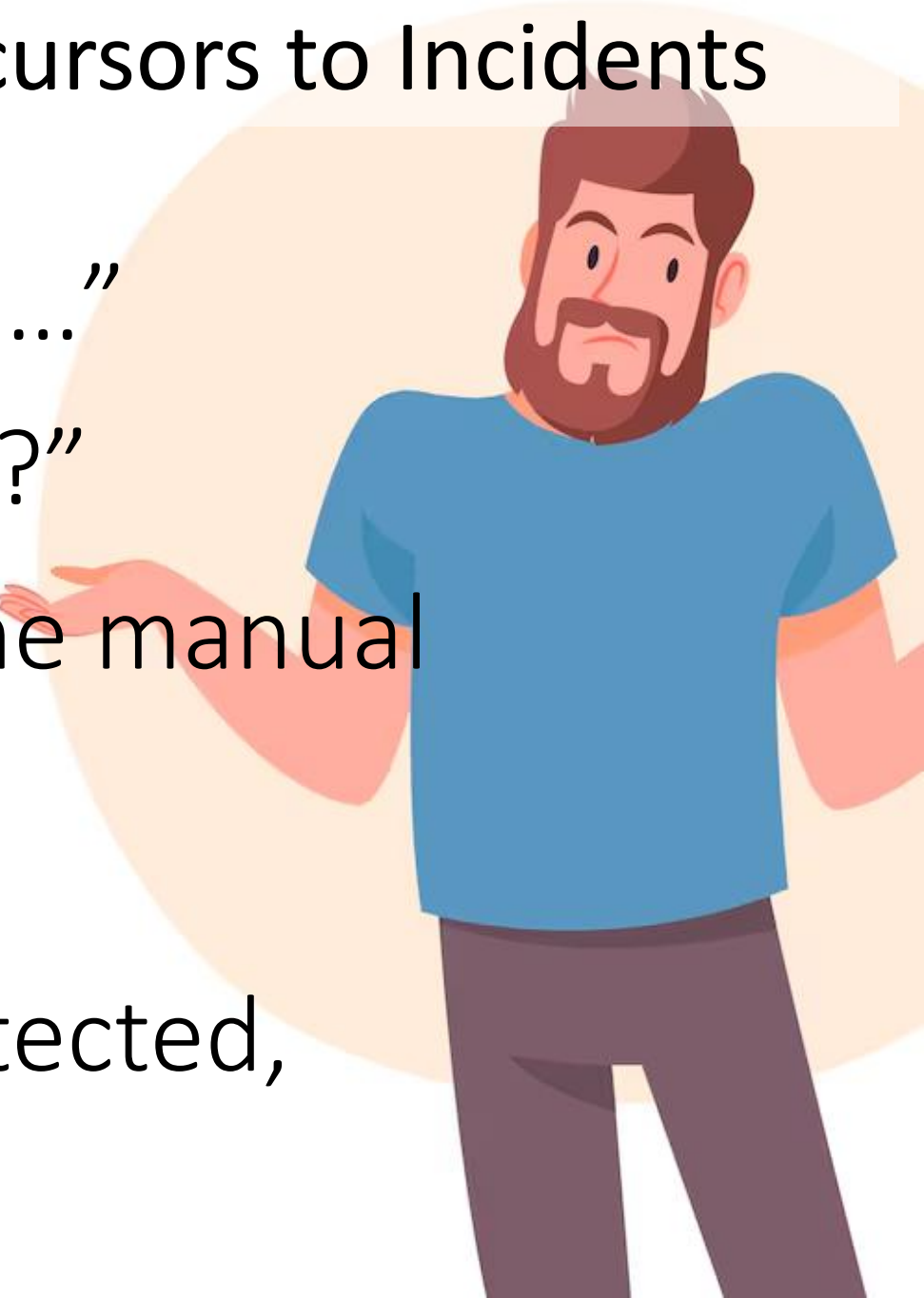
Analysis of Language Patterns

- Discloses power dynamics
- Reveals hesitation, deference, lack of assertiveness
- Highlights ambiguity, vague phrasing
- Provides evidence of direct challenge or escalation

Example Language Patterns as Precursors to Incidents

- “It’s probably nothing, but …”
- “Err … maybe we should …?”
- “Should we just do what the manual says?”

Language patterns can be detected, measured and corrected



Case Study 1: Authority Gradient – Burnt Smell

Assertive

Vague

Silent

Meh. It's probably nothing.

Sam, when I parked the brakes, I noticed a burnt smell that could be coming from the avionics bay. It's not strong, but it's unusual. I recommend we open up and investigate further before you sign-off.

I understand it might be minor, but given the location and our safety focus, I believe we need to take a closer look. Can we just take 10 minutes to verify?

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Case Study 1: Authority Gradient – Burnt Smell

Assertive

Vague

Silent

Hey Sam, there's kind of a weird smell in the cockpit. Maybe it's nothing, but thought I'd mention it.

Yeah, these older aircraft sometimes smell funny. I'll make a note of it in the handover book. Let's move on.

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Case Study 1: Authority Gradient – Burnt Smell

Assertive

Vague

Silent

Sam probably already noticed it. I'm still new, I don't want to seem overcautious or waste time.

…

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Case Study 1: Outcome from the Burnt Smell

	Assertive	Vague	Silent
Engaging Superior?	YES	YES	NO
Evidence?	YES	YES	NO
	Specific	Less specific	
	A smell, a burnt smell	Weird smell	
Location?	Specific	General	NO
	Avionics bay	Under cockpit	
Dilution of Evidence?	NO	YES	NO
		Maybe it's nothing,	
		but I thought I'd mention it.	
Persistence?	YES	NO	NO
	Restate recommended action	No disagreement with ignoring	
	Conviction of need	need to investigate	
Call to Action?	YES	NO	NO
	Emphasise minimal time to check	Agrees with entry in handover book	
	Small opportunity cost		

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Case Study 1: Outcome from the Burnt Smell

Language Notes	**Used clear observations and safety-based justification**	**Language lacked clarity and urgency**	**No communication**
	Provide rationale, with both minimization and justification (applying emotional intelligence)		
	Specify action (step to take)		
	Specify purpose		
	Specify timeframe for rectification (minimal compared to potential for future disruption)		

Specific words and phrases captured

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Case Study 1: Outcome from the Burnt Smell

Potential Outcome?	Fault identified and resolved before flight	Issue missed, delayed fault detection and rectification	Issue missed, fault became apparent at worst possible time
	Minor electrical arcing found in a wire bundle.	Smell dismissed.	Smell dismissed.
	Maintenance action taken.		
	Aircraft released with confidence.	Aircraft signed off.	Aircraft signed off.
		Sam makes a note of Alex's concern in the shift handover book.	No record anywhere of concern for smell.
		Next flight experiences intermittent system failures due to worsening arcing.	Next flight experiences intermittent system failures due to worsening arcing.
		Because of the mention in the shift handover book, further investigation made during turnaround at main base and aircraft grounded due to electrical fault that was known but not acted upon.	Aircraft grounded in outport due to pilot unwilling to fly with recurring faults. Investigation reveals the issue could have been caught during previous night inspection.
	Next day ops: Normal.	Next day ops: Two flights cancelled and passengers disrupted.	Next day ops: Five flights cancelled or severely delayed.
			Technicians, spare parts and tooling flown to outport.
			Multiple tens of thousands of dollars in extra cost,
		Lost revenue and passenger goodwill.	plus lost revenue and passenger goodwill.

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Case Study 2: Norms – Torqueing the Bolt

Graded Assertiveness

Voicing Safety Concerns

Clarification

Observation

Silent Compliance

AMM

After installation of pump, torque the mounting bolts to 120 ± 5 foot-pounds using calibrated torque wrench.

Certify completion of task in maintenance log.

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Language Patterns in Incidents

Intervention for assertiveness can include models of progressive intervention

CUSS Step	Example
Concerned	“I’m concerned about walking under this suspended load.”
Uncomfortable	“I’m uncomfortable continuing without pulling the right circuit breakers.”
Safety Issue	“In my opinion, this has escalated into a safety issue.”
Stop	“We need to stop work now.”

Assertiveness

- Should not be about confrontation
- Is about clarity, confidence and, ultimately, safety
- Allows even young and junior AME to voice concerns clearly and respectfully

We can:

1. Develop strategies for the ‘Inferior’ Party

2. Focus on objective evidence, data and technical language
   - (Power distance is emotional, data is unemotional)

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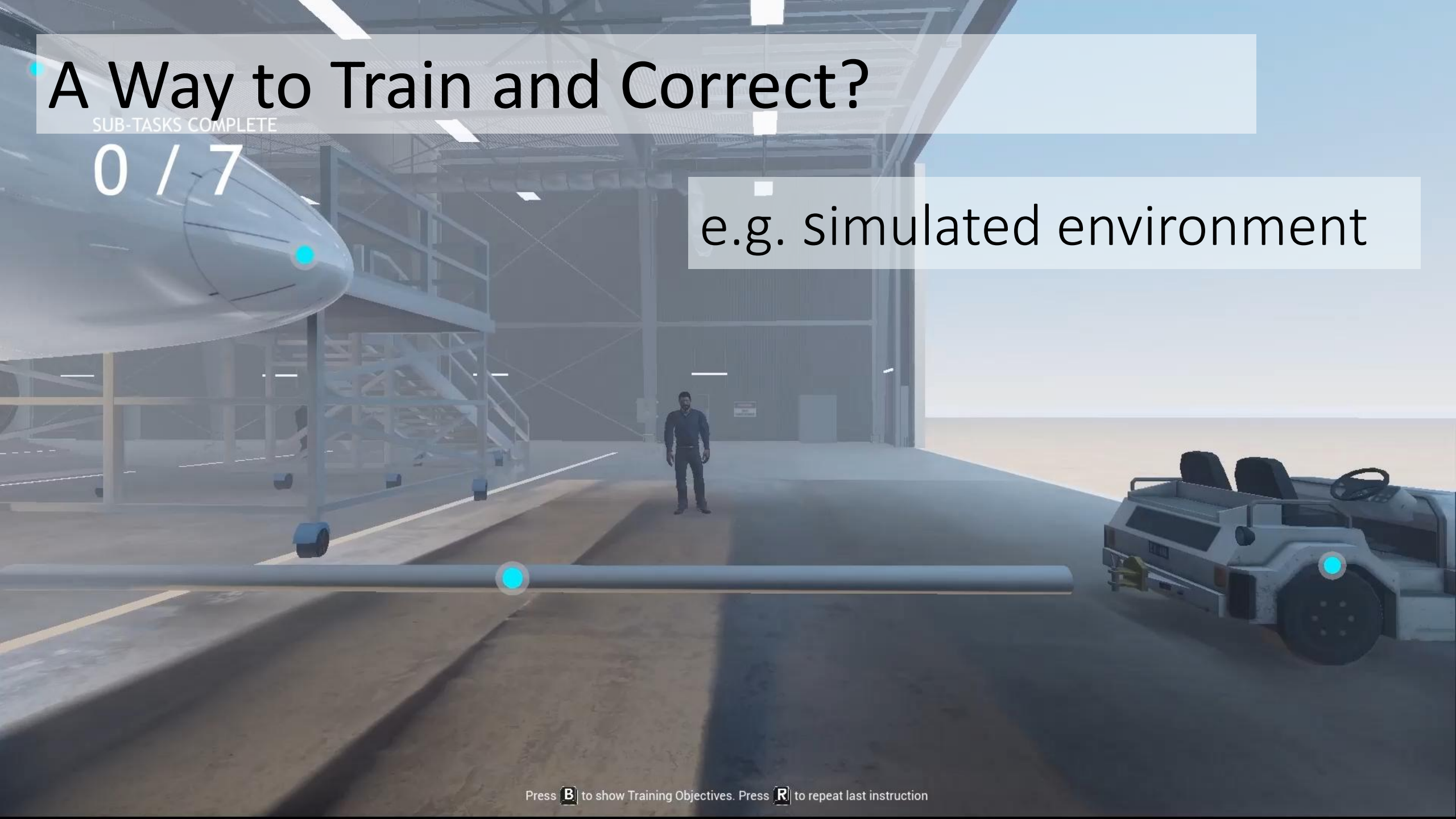
A Way to Train and Correct?



e.g. simulated environment

A Way to Train and Correct?

Digital twin simulation:

- Safe, risk free
- Meaningful and repeatable scenarios
- Targeted mentoring and support (could be via AI)
- Feedback, rephrase, retry, timeline replay
- Emotional detachment, data driven

Limitations of the Simulated Environment

- Limits of AI (currently) for nuance and emotion for meaningful mentoring
- Realism vs psychological safety
- Other ethical issues e.g. potential biases, data security
- Hesitance from senior people

Summary

- A cultural change for engineers … but …
- Communication is a safety tool
- Flattening the gradient saves lives
- Assertiveness to challenge authority, when necessary, promotes safety and efficiency
- Simulation gives us time and space

Thank you!

Assertive Language to Improve Safety in Aircraft Maintenance

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