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SME Coffee Hour: Human Factors: Dirty DozenNorms and Complacency

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Dirty Dozen- Complacency and Norms

What is the Dirty Dozen

- 12 most common human error preconditions
- Precursors to accidents and incidents
- Gordon Dupont 1993 Transport Canada
- Human factors in Aircraft Maintenance Training
- Brought forth training programs at a global level

- ICAO Circular 240-An/144
  - 300 human error precursors
  - You may find Dirty Dozen lists specific
    - Air traffic Controllers
    - Pilots
    - Ramp workers
    - Aircraft maintenance techs
    - Cabin Crew

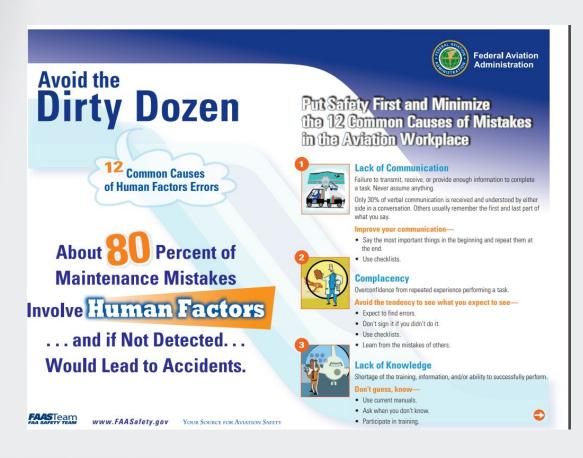**EMBRY-RIDDLE**
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The List

- Lack of Communication
- Distraction
- Lack of Resources
- Stress
- Complacency
- Lack of teamwork

- Pressure
- Lack of Awareness
- Lack of Knowledge
- Fatigue
- Lack of Assertiveness
- Norms

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FAA Maintenance

Complacency and Norms- keep in mind language and cultural barriers

- **Complacency**
  - Feeling of self-satisfaction
  - Loss of awareness-danger
  - Routine activities "Habits"
  - Relaxation
  - RELAXATION OF VIGILANCE AFTER INTENSITY
  - Lacuna-relaxed mental vigilance and awareness
  - Cultural awareness

- To much pressure over stress
- To little boredom and complacency
- Watch for simple, habitual task and when tired…
  - don't make assumptions
  - Have the right training
  - Current procedures
  - Teamwork and mutual cross checking

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Complacency and Norms

- **Norms**
  - Develop over time
  - Usually, unwritten
  - Deviate from the rules, procedures and instructions
    - Experience, influence of a culture
    - May be good, bad or ugly
    - Safe and unsafe
    - "well, that's how we do it here"

- Norms
  - Enforces through peer pressure
  - Force of habit
  - Not testes
  - Work arounds against threats to all
  - Assertiveness vs aggressiveness

Air traffic Control- Human factors Analysis

- ATC and ATM roles in accidents and incidents are not always fully examined as it happens infrequently
  - Usually involve local controllers
  - Interaction with multiple aircraft
  - Daylight
  - VFR

ATC related accidents and incidents- A human Factors analysis, 2002

Discussion

- HFACS analysis performed on the error data indicated that the most common type of ATC error was skill-based, indicating a breakdown in

- attentional or memory processes of controllers.

- Differences between ATC related accidents and incidents
  - ATC related Accidents-skilled based errors of ground controllers
  - GA aircraft
  - During nighttime
  - IMC conditions
  - Collison with objects vs airplane

Discussion continued

- ATC related incidents
  - ARTCC controllers
  - Failing to follow rules and procedures
  - FAR Part 121 ACFT in the air
  - Daylight
  - VFR
  - Midair collision

- Incidents and accidents are a heartbeat away from each other…

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Different types of information processing- is it the pilot or the controller?

- Incidents may stay incidents
  - More forgiving environment…
  - FAR Part 121 highly trained pilots-see and avoid
  - Ga pilots single low time pilot

- HFACS
- SHELL
- Supervisory ATC involvement
- More research is needed.

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Communication: Linguistic Factors Briefing note (BN)-English official language of aviation

- Influence of linguistic on <mark style="background-color:red;">communications</mark>

- Relates to flight safety

- Native speaker of the language used

- More speakers nonnative English

- Standard phraseology

- How English is heard

- English words have dual meaning

- ICAO 1976 and 2000 ASRS
  - 5000 reports
  - 10 category of pilot controller communications problems

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Communication: Linguistic Factors Briefing note (BN)-English official language of aviation

- Eurocontrol 2005 Campaign
  - Survey of pilots and controllers
    - Loss of communications
      - Frequency changes
      - VHF receivers
      - Similar call signs
      - Pilot or controller expectations
      - Linguistics speech rate
      - Ambiguous phraseology

Occurrence	Contributing factors
Similar call sign	Controller accent (34%), controller speech rate (28%), pilot distraction (22%), pilot expectation (25%) and pilot fatigue (20%)
Frequency change	Controller accent (51%), controller speech rate (42%), pilot distraction (43%), pilot fatigue (35%) and pilot workload (31%)
Non- standard phraseology	Controller (64%) and pilot (41%) use of non-standard phraseology, controller accent (49%), language problems (46%), ambiguous phraseology (41%)
Blocked transmission	Frequency congestion (63%), controller workload (33%), untimely transmission (27%), pilot workload (22%), long message (20%)

Communications Mishaps Occurrences and Contributing factors

- Linguistic factors
- Context and expectations (Pragmatics)
- Pragmatics-linguistics concerned with bridging the gap between a speaker's intended meaning for a phrase and the phrase's meaning to the hearer.

- In one real-life example of how expectations can affect safety, prior to a collision a tower controller said, "[airline] [flight number] you are cleared to the Papa Beacon, climb and maintain flight level nine zero, right turn after takeoff," but the pilot understood "you are cleared to take off." The controller intended the instruction to pertain to a takeoff clearance still to come, but the pilot was expecting a clearance and thought the instructions were to be acted upon immediately. This misunderstanding led to a collision with another aircraft.

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Pragmatics cont.

- Although speaking a common language is essential, pilots and controllers must also share the same context.
- Avoided if the expectations of the controllers and crews had been more aligned.

- One example of the impact of having different contexts occurred when a controller, noticing on his radar a decrease in altitude for a flight, radioed the flight crew, "How are things coming along up there?" in reference to the decreasing altitude. However, the crew had been preoccupied with a nose gear problem and had informed several controllers, but not the current one, about the issue during their flight. The crew responded "OK" to the controller's questions. The crew, unaware of the altitude problems, was referring to the nose gear problem it had just managed to fix. The controller interpreted OK as referring to the altitude problem. The aircraft subsequently crashed.

Code Switching- switching between two or more languages

- Bilingual families
- Complicated with standard phraseology
- Switching between technical jargon and vernacular English (normal spoken language)

- **Example-** Code-switching between a subject and its verb is much more likely because both English and French normally place the subject before the verb.

- A particular accident, a flight was cleared to land at the same time another flight was cleared to taxi into position for takeoff. The controller told the in-air flight to go around, but the captain asked for the permission to continue landing and inadvertently used the word "hold" to express his request while speaking to his first officer. Specifically, the pilot said "can we hold? Ask him if we can hold." In aviation jargon, "hold" always means to "stop what you are doing," but in ordinary English it means to continue on the same course. The controller agreed for the flight to "hold" intending for it to go around, but the flight continued with the landing and collided with the aircraft on the ground.

Speech Intelligibility- ICAO language proficiency requirements (

- languages share phonological and grammatical features with English

  - Japanese speakers have difficulty detecting the difference between "R" and "L" sounds in English, and Dutch and Spanish speakers have trouble differentiating "S" and "SH."(Fry 1977)

- ICAO, "native English speakers must familiarize themselves with the dangers of cross-cultural communications" (Mathews, 2004).

Complacency and Norms

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Paralinguistic factors change the form and meaning of sentences

- Voice intonation
- Stress
- Rate of delivery
- Pauses- excessive- masks/steps on

- Example In one particular instance that led to an accident, ATC did not perceive the severity of a flight's fuel crisis because controllers did not perceive a change in stress or pitch in communications with the crew (Fegyveresi, 1997). In turn, ATC did not give high priority to the situation, and the aircraft crashed.

Aviation Jargon leads to ambiguity

- Numbers used in Pilot controller communication
  - Flight level, heading airspeed, and flight number
    - High workload, stressful and time pressured situations
    - ATC message includes two or more sets of numbers that apply to separate actions.

- Runway incursions
  - USA 300 around 2003
  - English is the first language for many in the USA

- Example- aircraft is flying on a heading of 300 degrees at FL 270 the controller vectors the aircraft to "three one zero"; the pilot acknowledges "three one zero" and climbs to FL310 instead of turning to a course of 310 degrees. The pilot simply interpreted the request for a heading change as a flight level change command.

- Mitigation- full readback would eliminate problems related to jargon ambiguity

Homophones, homographs, homonyms and synonyms

- pilot-controller communication errors arise when words sound or look alike but have different meanings

- Example -An example of a communication error involving a homophone is: ATC cleared an aircraft for descent to "two four zero zero". The pilot read back, "ok. Four zero zero." The aircraft then descended to 400 feet instead of 2400 feet. The pilot mistook the number "two" to mean "to" and descended accordingly.

Homophones (same Sounds and Homographs (Same Spelling)

Table 2. Homophones (same sound) and homographs (same spelling)

Homophones	Homographs
Brake / Break	
One / Won	Content (accept) / Content (things inside)
Two / To	Refuse (disagree) / Refuse (rubbish)
Missed / Mist	Close (shut) / Close (near)
Right / Write	Right (direction) / Right (correct)
Hear / Here	

Homonyms (same sound and spelling but different meaning)

Expressions	Meanings
Taxi	Helicopter (hover taxi, air taxi) / To move
Aircraft	One or many aircraft
Flight	Apparatus / Persons
November	Name of letter N / Aircraft identification letter / Month
Tango	Name of letter T / Air taxi or Helicopter
Zulu	Name of letter Z / Time at Greenwich meridian
Contact approach	Type of approach to an airport / Command to radio the controller who handles approaches
Gate	Location at the terminal building / Point in the sky
Roll	Pivot in the air about longitudinal axis / Forward movement
Slot	A part of forward edge of some wings / Time interval for a takeoff
Remain	Localization / Radio frequencies
Flight deck	Top of an aircraft carrier / Cockpit of an airplane
Go ahead	Urge speaking / Forward motion
Stand by	Wait / standing

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Synonyms: Multiple FAA(could be other nations too) expressions for a single meaning

The meaning	Expressions
Fly around the airport	Circle the airport / Circle the runway / Go around
Turn around on the runway and travel toward the arrival end of the runway	Taxi back / Back taxi
To check information already given	Say / Verify / Confirm
For instant action	Immediately / Expedite / Without delay
Tell your speed	Say speed / Say Mach number
Signaling emergency	Mayday / Pan-pan
Balloon in the area	Derelict balloon / Unmanned balloon over
Paved area near the runway	Ramp / Apron / Tarmac
Time	Greenwich Mean Time / Zulu / UTC
Severe danger due to wind	Wind shear alert Wind shear/microburst alert Departure Wind shear/microburst alert Low level Wind shear advisories in effect Microburst alert Multiple Wind shear/ Microburst alert Possible Wind shear outside the system
Desisting from an action	Hold (FAA) / Stop (ICAO)
Moving away from something	Exit (FAA) / Vacate (ICAO)

Conclusion
Key points that show relevance between communication, language, complacency and norms

- Proficiency in English is essential to flight safety, but even native speakers of English have communication problems

- The confirmation/correction loop can protect against linguistics errors

- Context and expectations can lead the listener to hear what he or she expected to hear

- Code switching can occur when a pilot speaks two languages, or it can also occur when a pilot switches between technical and common language

- Flight crews need to be aware that non-native English speakers often cannot distinguish between certain sounds and therefore may not understand a communication

- Paralinguistic factors such as speech rate and pauses can negatively affect communication quality

- Aviation jargon, especially the use of numbers, can lead to confusion and errors

- Homophones, homographs and homonyms can negatively affect communication since words that sound or look alike may have different meanings

- There are 49 instances where FAA and ICAO use different words for the same meaning

- When in doubt, CONFIRM!

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Jones, 2003)

Questions??

- **Thank you very much**

Dr. Linda Vee Weiland received a Ph.D. in in Human Factors. Her dissertation was on *Implications between UAV and ATM systems in commercial airspace incorporation.* She also holds two master's degrees from ERAU, *Master of Science in Aeronautical Science* and the *Master's of Science in Business Administration.* Dr. Weiland's *Bachelor of Science in Professional Aeronautics* was also obtained from ERAU. She has been with Embry Riddle Aeronautical University for more than 25 years. Prior to academia she was a Liaison Engineer for a major airline. She is also a retired US Naval Officer with 26 years' experience between Air Traffic Management and Aerospace Maintenance Duty Officer.

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Sky brary

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3. ^ Transport Canada - Human Performance Factors for Elementary Work and Servicing TC14175

- **Categories**

- Human Behaviour, Human Factors Training

- **Related Skybrary Articles**

- Air-Ground Communication;

- Language;

- ATCO Language Skills.

- **Categories**

- OGHFA, Personal Influences, Human Factors

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Further Reading

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Related Articles

- Communication: Linguistic Factors (OGHFA BN)
- Complacency
- Cross-checking Process
- Commercial Pressures
- Stress
- Stress and Stress Management (OGHFA BN)
- Well-Being (OGHFA BN)
- Situational Awareness
- Attention and Vigilance (OGHFA BN)
- Group Norms