The Ecology of Language Practices in Worldwide Airline Flight Deck Operations

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Launching the Boeing 787 as an airplane for the world's pilots

A cognitive question

- What can be done to make the 787 flight deck an effective working environment for all pilots?
  - Flight deck design
  - Operational procedures
  - Training

- What role do language and culture play in the organization of the behavior of airline pilots world-wide?

Regional Accident Rates

Figure 13.1 Regional comparison of cross-factor accident rates (1980–1989). (Redrawn from Wosner, 1990.)

Patterns of Language Use in the Global Pilot Population

- What are the observed patterns of language use?
  - When do pilots use their native language and when do they use some other language?

- What accounts for the distribution of language use?
  - Why do pilots sometimes use their native language and sometimes use some other language?

Field trips

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<tr>
<th>Region</th>
<th>Revenue Flights</th>
<th>FFS Training</th>
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<tbody>
<tr>
<td></td>
<td># of legs</td>
<td># of pilots</td>
</tr>
<tr>
<td>Europe</td>
<td>Aug 2005</td>
<td>22 legs</td>
</tr>
<tr>
<td>Asia (Japan)</td>
<td>Aug 2007</td>
<td>16</td>
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<td>Asia (New Zealand)</td>
<td>Apr 2006</td>
<td>11</td>
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<tr>
<td>Asia (Australia)</td>
<td>Oct 2006</td>
<td>11</td>
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Data Collection in Simulator

1. Record briefing/debriefing sessions (digital audio)
2. Record simulator sessions (digital video) with two lapel microphones (Captain and FO)
3. Digitize data to PC
   - From MiniDV to avi file to MPG
4. Transcribe using Excel (Japanese and English)
5. Analyze data
   - Analytical foci:
     - Language use
     - Coordination of information (e.g. loading FMS, performing non-normal checklist, etc)
     - Crew coordination

Data Collection in Actual Flights

- Each flight was observed by two researchers
- While observing:
  - Take notes and photos
  - Collect paperwork
  - Dispatch papers, ATIS printouts and written notes
  - Fill out EOI (event observation information) and paper distribution forms
- After the observation:
  - Audio record a debriefing with co-observer to discuss what we saw in the flight deck
  - Dictate audio annotations of the photos we took in the flight deck
- After the fieldwork:
  - Digitize all paper data
  - Transcribe audio debrief and annotations
  - Merge handwritten notes with debriefing and annotations to create the final field notes

Our Field Notes

1. Digitize (scanned) all related maps, charts, and collected papers.
2. Make hyperlinks to supporting documents
3. Combine everything we collected.

Patterns of Language Use in the Global Pilot Population

- When do pilots use their native language and when do they use some other language?
- What accounts for the distribution of language use?

Language use contexts

- English
- Spanish

Language use contexts (Mexico domestic)
The language ecology at work

- Individual pilots and pilot communities must adopt language practices that satisfy the complex mix of exogenous constraints
- We observe adaptive processes at work in institutions, communities, and in individual pilots

The Ecology of Language Use in Japanese Airlines

Linguistic contexts

- ATC communications
- Flight deck operations (flying the airplane)
- Dispatch paperwork and briefing
- ACARS communications
- Cabin crew
- Public address to cabin
- Ground/Maintenance/Fuel

For each context

- Register
- Lexicon
- Syntax
- Sanctions of violations of expectations
- Prosody (Speaking contexts)
## Exogenous Factors

- Policies of Nations
  - Education and language practices
  - ATC language
- International Agencies
  - ICAO’s “Aviation English” initiative
- Manufacturer and Airline Policies
  - Flight deck displays and labels
  - Operating and training manuals
  - Checklists (Electronic Checklist)

## Variability in ATC communications

- English is the world standard…but it is not used in all places and all contexts
  - English speaking nations use English language for all ATC Comms
    - All aircrews entering this space must speak English
  - Japan uses English for ATC comms
    - All aircrews entering this space must speak English
    - Many other regions provide English upon request
      - France, Latin America, most of Africa and Asia

## Dispatch paperwork and briefing

- Computer-assisted briefing in Japan
- Also briefing by flight dispatcher

## Language in the Japanese flight deck

- Most utterances in the flight deck at both ANA and JAL, are in Japanese
  - Formal Japanese from FO to C and by both for “official” topics
- English is used for
  - Communication with Air Traffic Control
  - Checklists, ACARS messages, and dispatch paperwork are composed in English and are read in English, but are discussed in Japanese
  - Some technical terms are spoken in English
  - Japanese is used for everything else
    - Conversations about how to fly an approach, where traffic or weather are located, how the airplane is performing, as well as casual conversations
  - Public address messages to the cabin
  - Communication with cabin crew
  - Communications with company personnel

## The integration of language, gesture, and cultural artifacts

- Departure and approach briefings
  - FO (PF) made the departure briefing while viewing the departure chart. Captain drew the shape of the departure path in the air using his finger while listening to FO. The shape of the departure path can be seen on FO’s navigation display.
  - Depth of processing in the distributed system.
Institutional adaptations
- Driven by political and economic forces.
- Shape the ecology of language use for communities and individuals.
  - ATC language
  - Flight deck labels
  - Airline training policies – which language practices are enforced and reinforced in training.
  - Translated checklists

Cultural adaptation
- Japanese popular culture borrowing from English.
- Japanese aviation culture borrowing from aviation English.
  - O-pai (Autopilot)
  - Binabuaruto (V Nav Alt)
  - Ereki Jene Ofu (Elec Gen Off)
  - Fueru Jesuchon (Fuel Jettison)

Individual adaptation
- Phonological transformations: accents, borrowing, and “English that sounds better”.
- Lexical transformation
  - Translation (heading numbers restated in Japanese) for self-regulatory speech
  - Embodiment (numbers and words re-represented as character shapes traced with the finger).
- Syntactic re-description: complex relational content expressed in Japanese to improve reasoning

Takeoff Briefing
- Context, at the gate getting ready to start engines and push back.
- Anticipates activity from engine start to early in departure and the possibility of stopping before takeoff or diverting to another field.
- Anticipates the linguistic contexts

Takeoff Briefing

Radical Code Mixing

Bold = displayed; Underline = number; Italic = Japanese in original
**Radical Code Mixing**

- Captain: では、Takeoff briefingでします。
- FO: はい。
- Captain (FO): 保護情報。Quebec、了解。ordinary braking action。
- FO: えー、weather information、Quebec、了解。えー、using runway three-four right。
- Captain: {FO}: わかりました。
- FO: はい。
- Captain: {FO}: えー、weather information、Quebec、了解。えー、using runway three-four right。
- FO: はい。
- Captain: えー、those braking action、poor。
- FO: えー、五十九万八千pound。
- Captain: {FO}: はい。
- FO: と、いうことで、plan weightとほぼ同様と。
- Captain: えー、fuel minus百ですけれども、{FO}: はい。
- FO: 現在recoverして、まぁ二万二千{FO}: はい、order fuel、同様。
- Captain: えー、performance、check。
- FO: はー、TOKYO HANEDAは、えー、above take-off、えー、below landing minimum{FO}: はい。
- Captain: Then, Let's do Takeoff briefing.
- FO: OK.
- Captain: {FO}: Let's see. Weather information. Quebec, Roger. Well, using runway three-four right. {FO}: Yes.
- Captain: {FO}: We have already checked the performance action. {FO}: Yes. Performance and manual braking:
- FO: using runway three-four right.
- Captain: {FO}: Yes, Quebec.
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