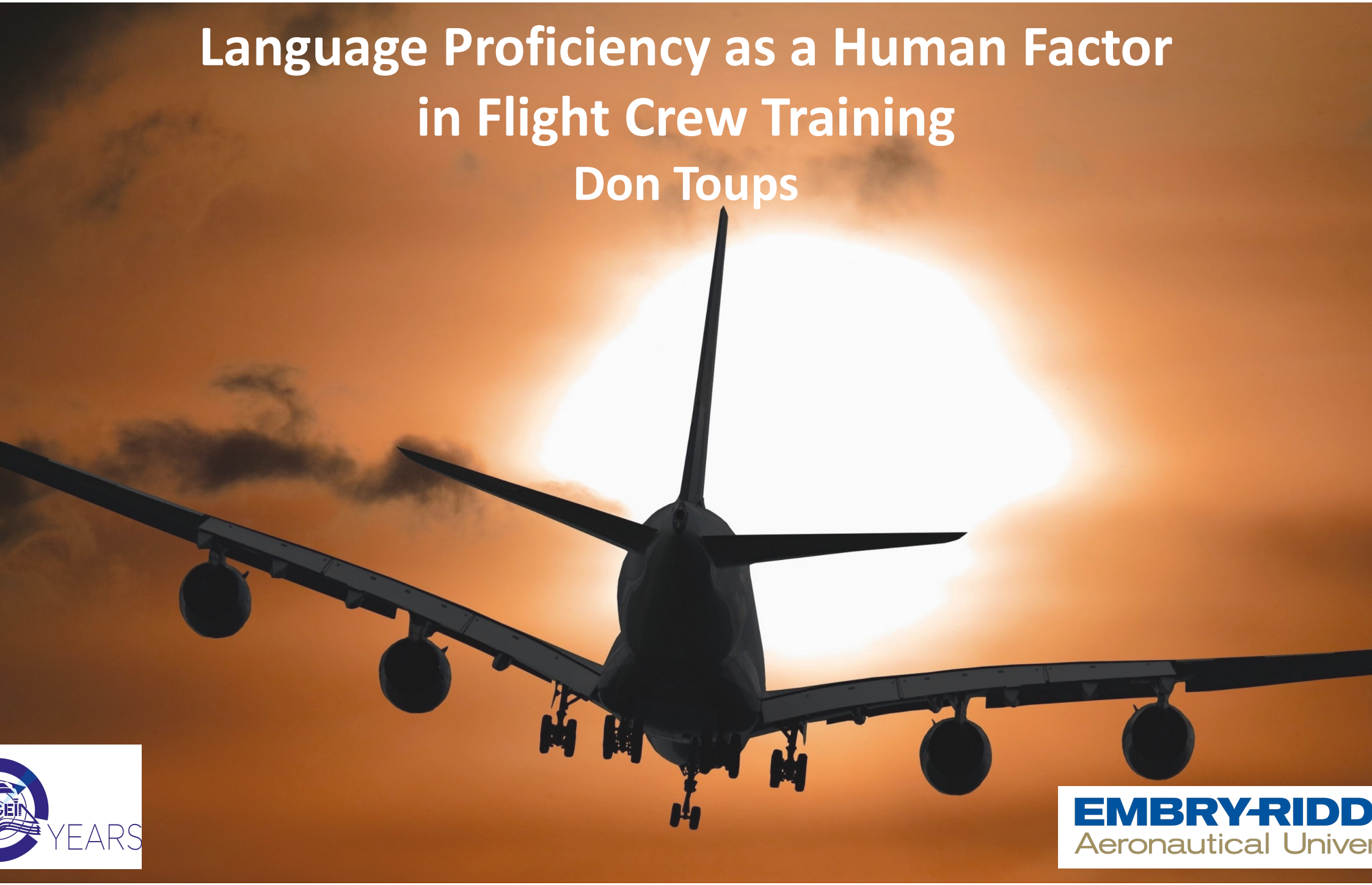
Language Proficiency as a Human Factor in Flight Crew Training

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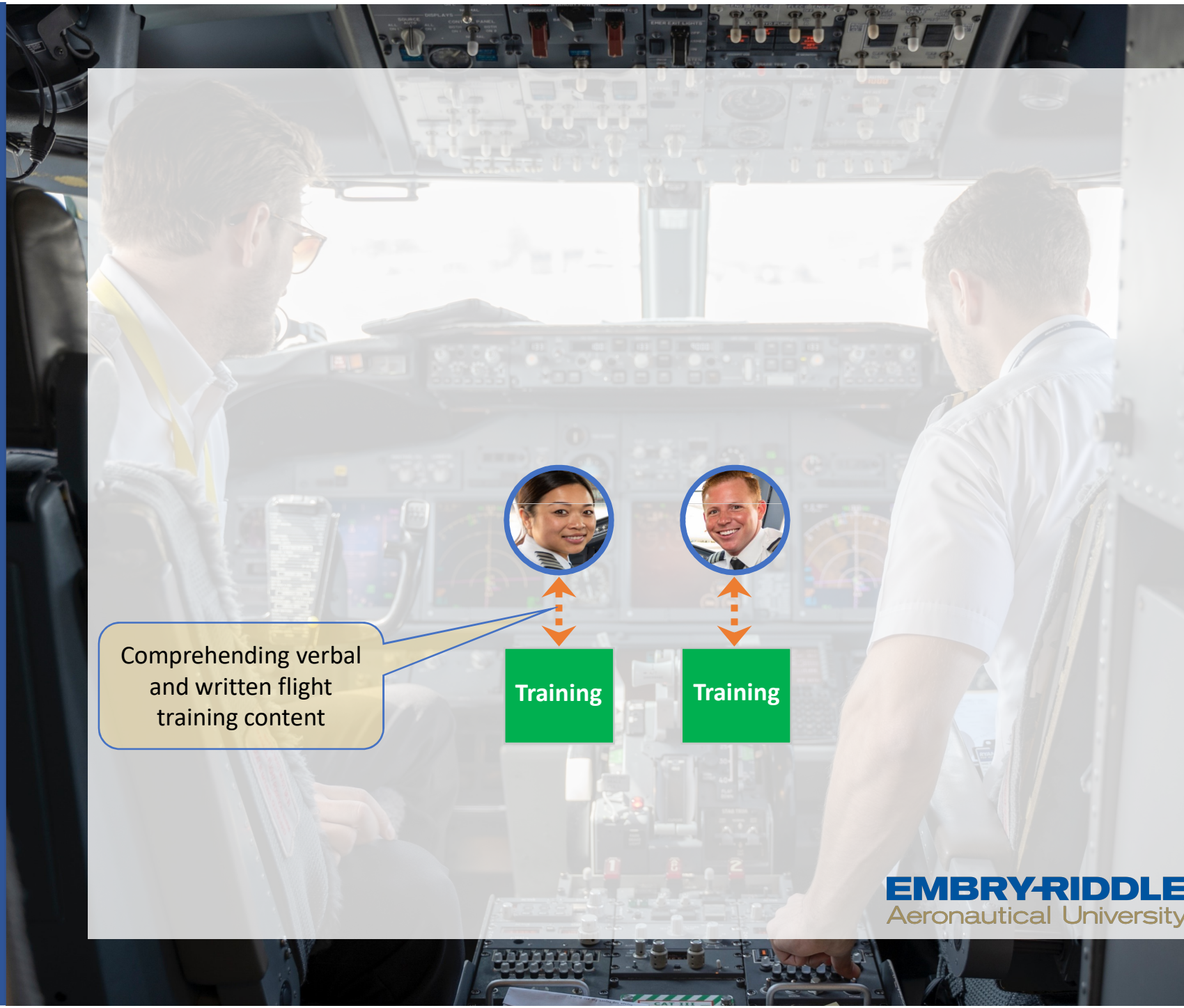
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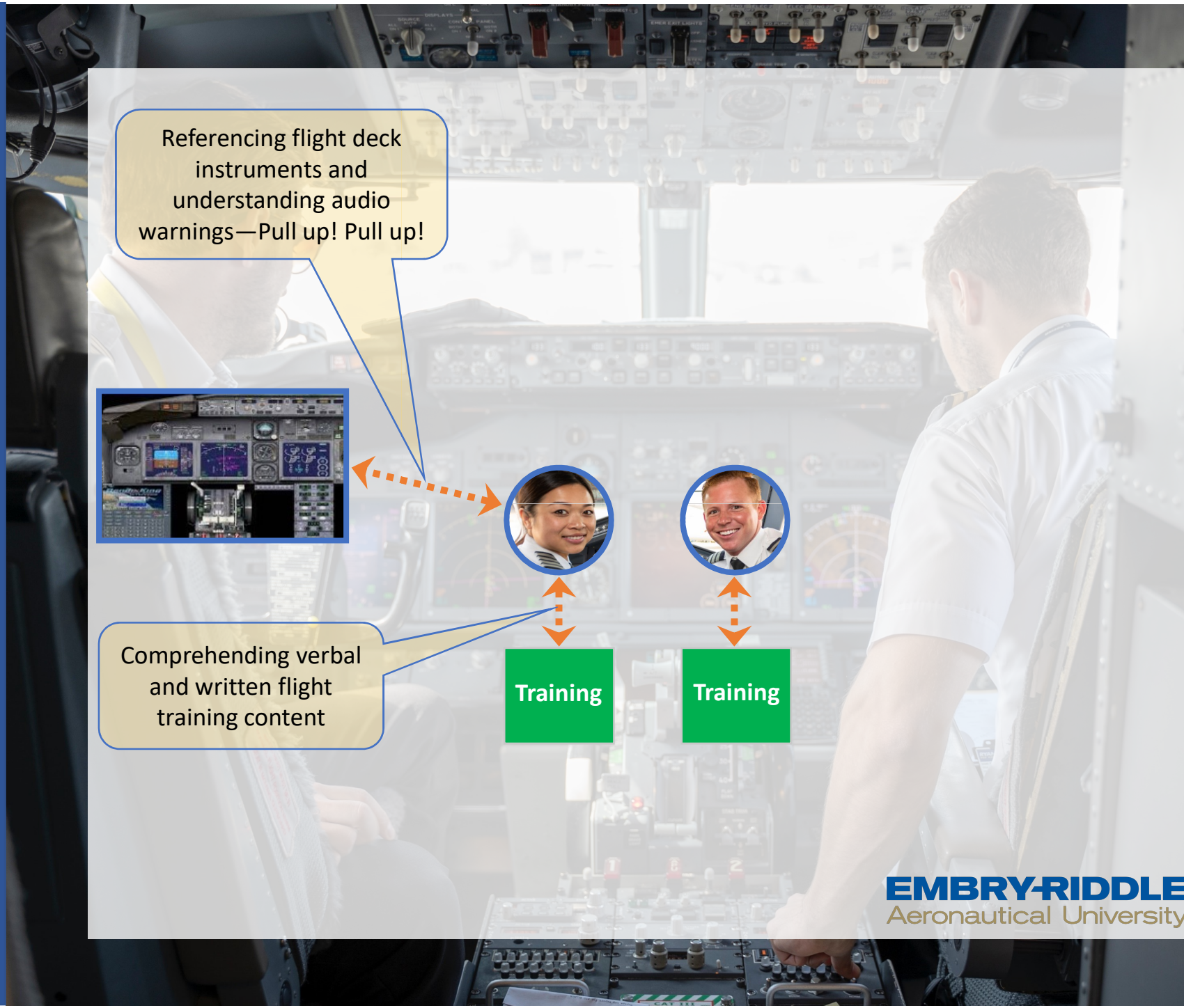
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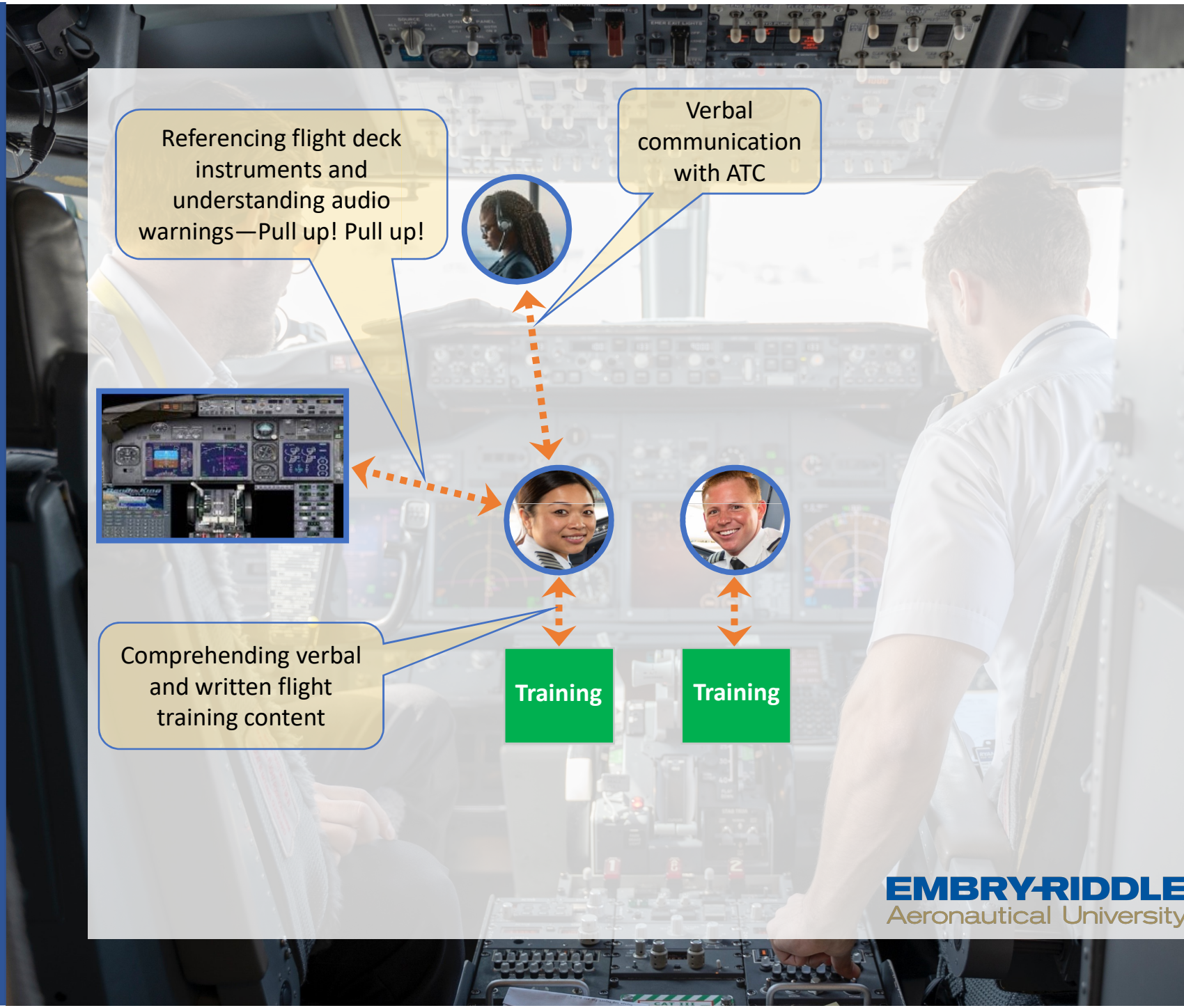
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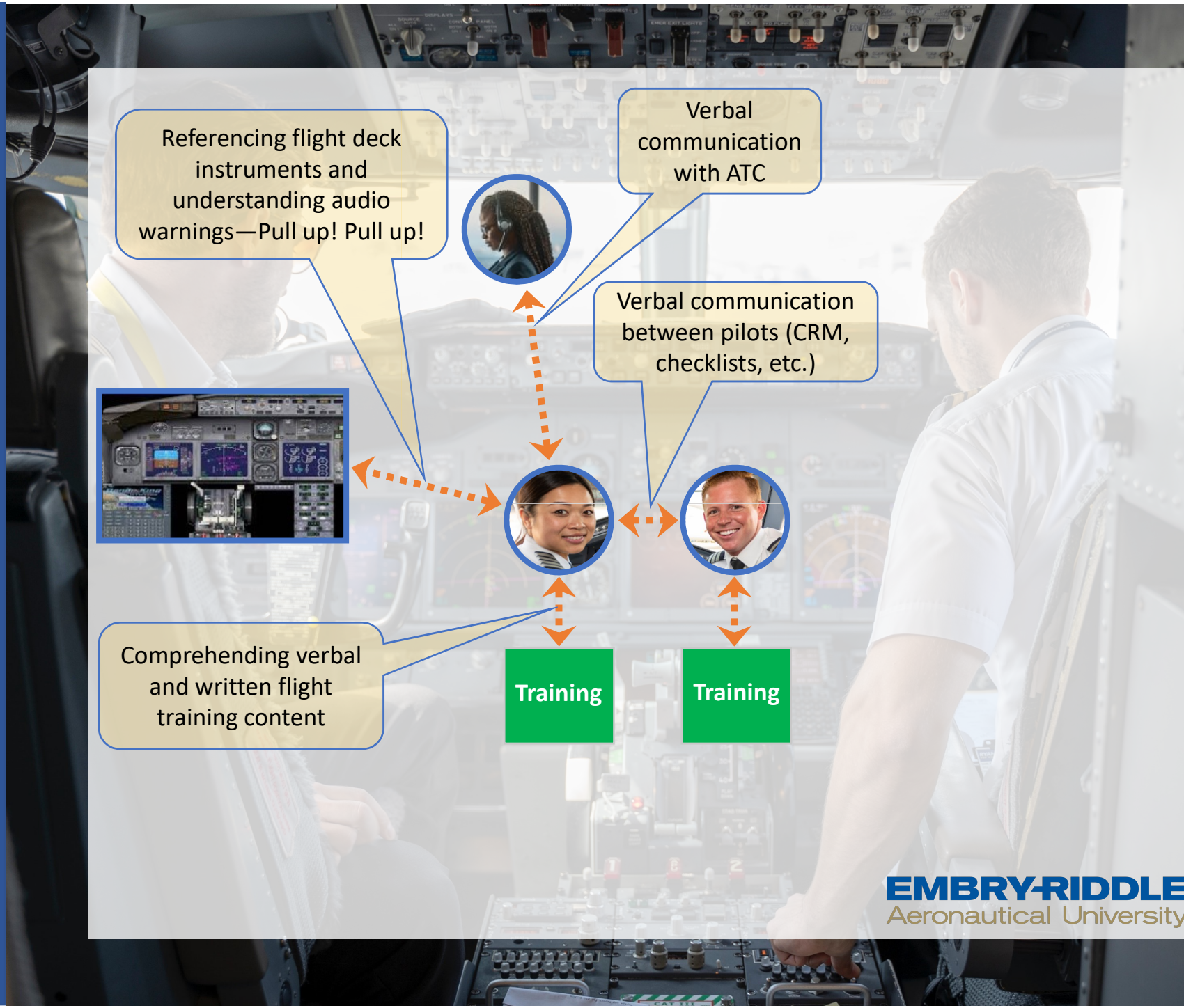
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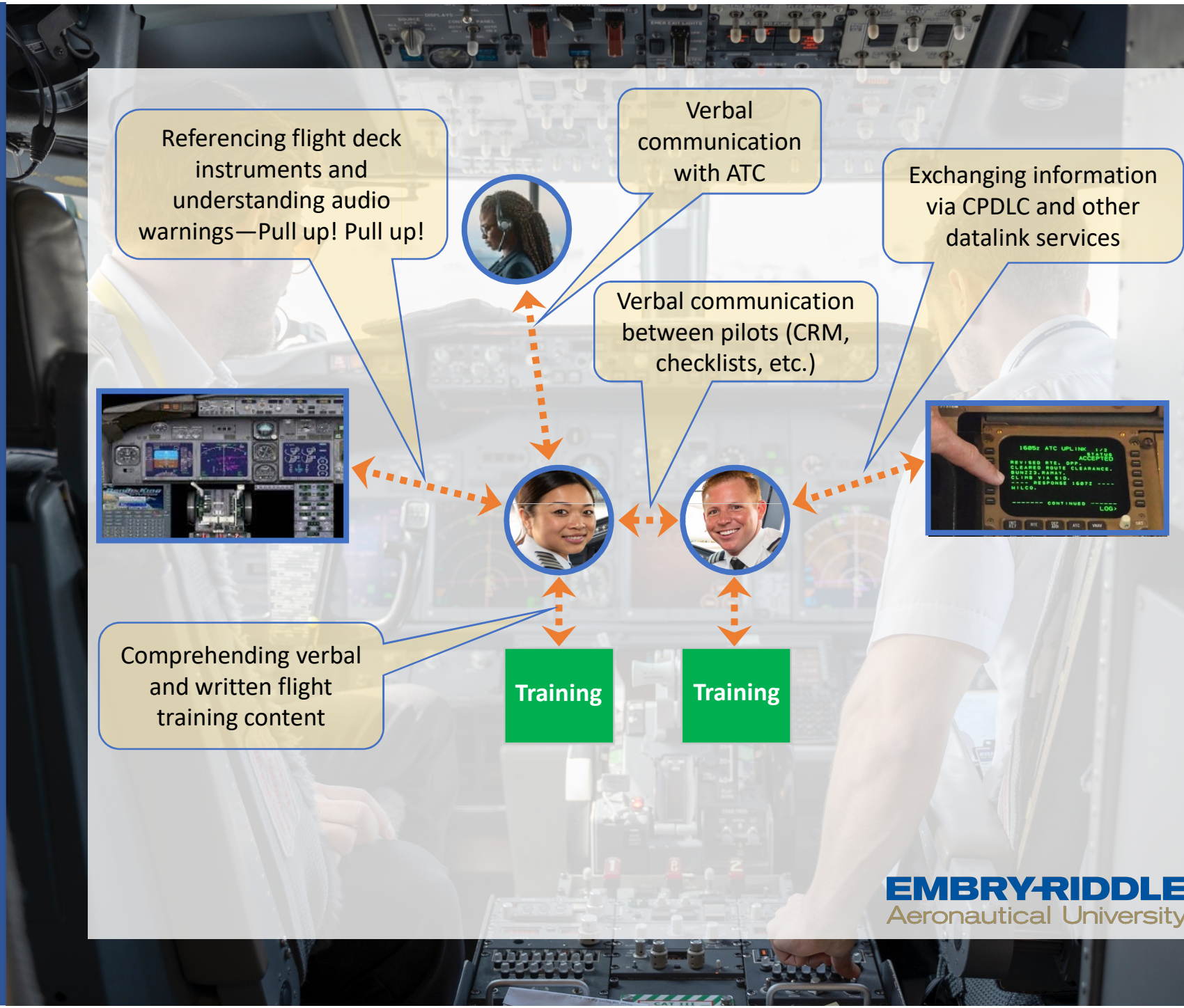
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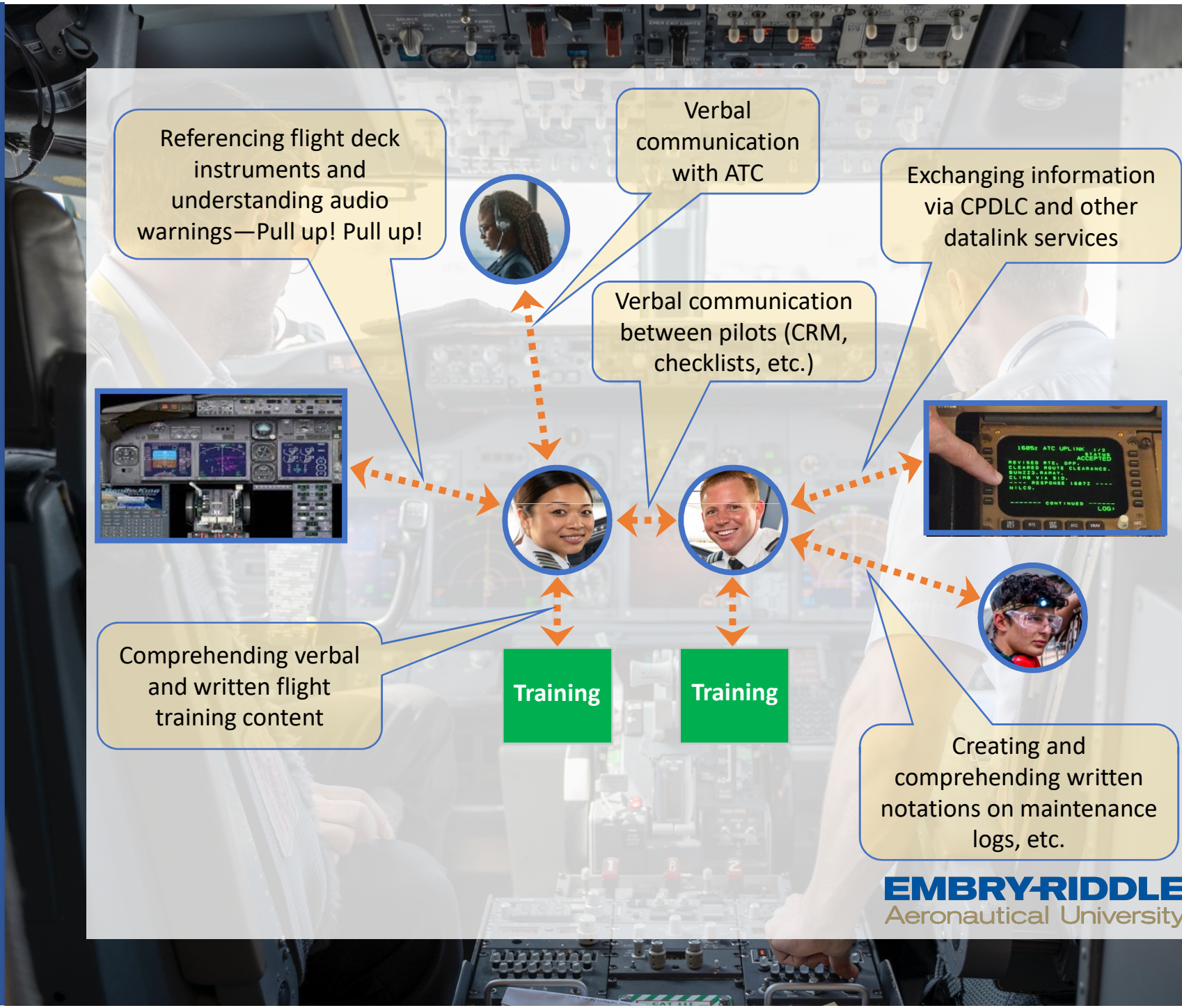


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There may be a risk to airlines when pilots with *limited English language proficiency* complete flight crew training in English.



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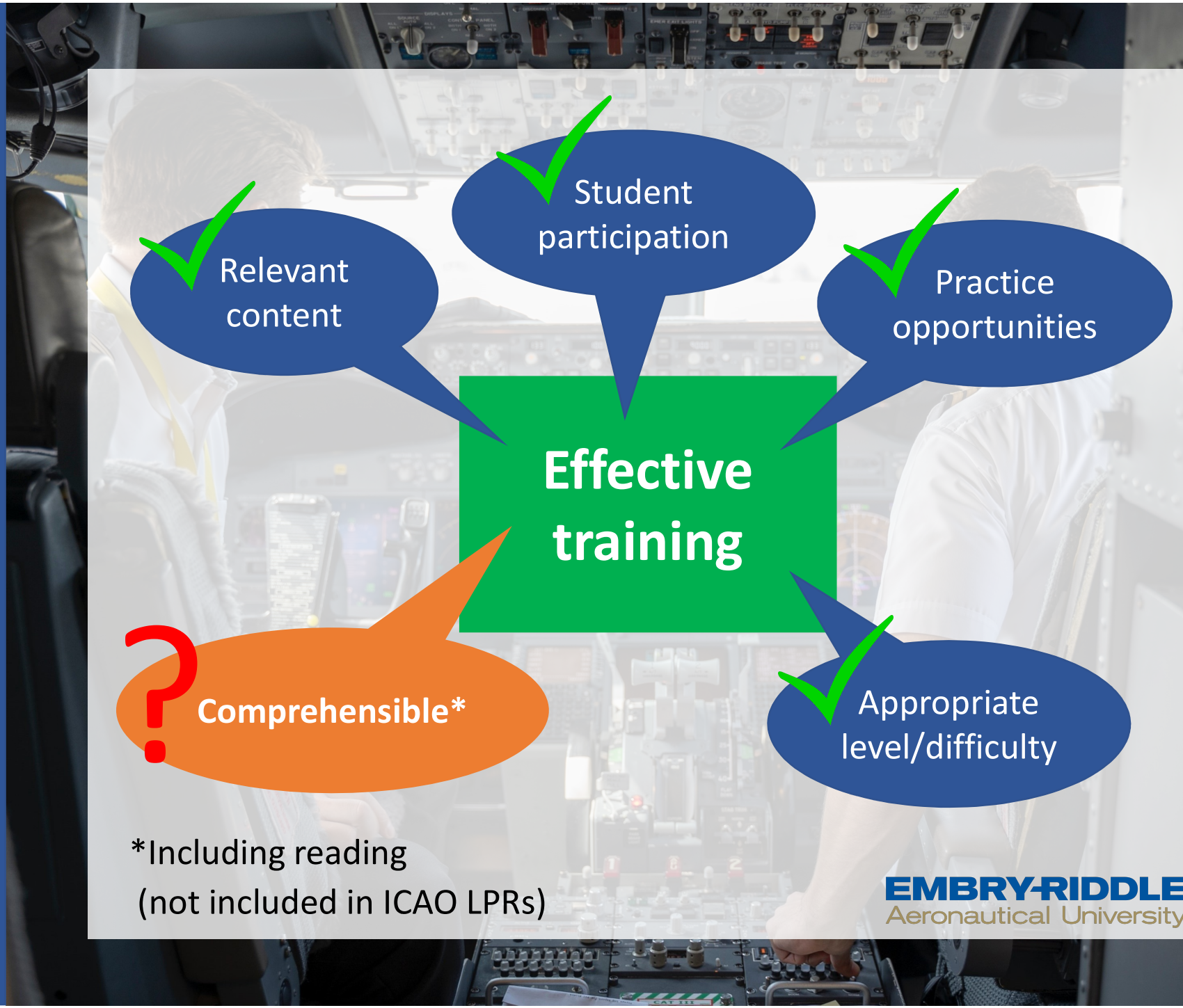
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Boeing 737-500

November 17, 2013

Kazan International Airport, Russia

Lives lost: 50

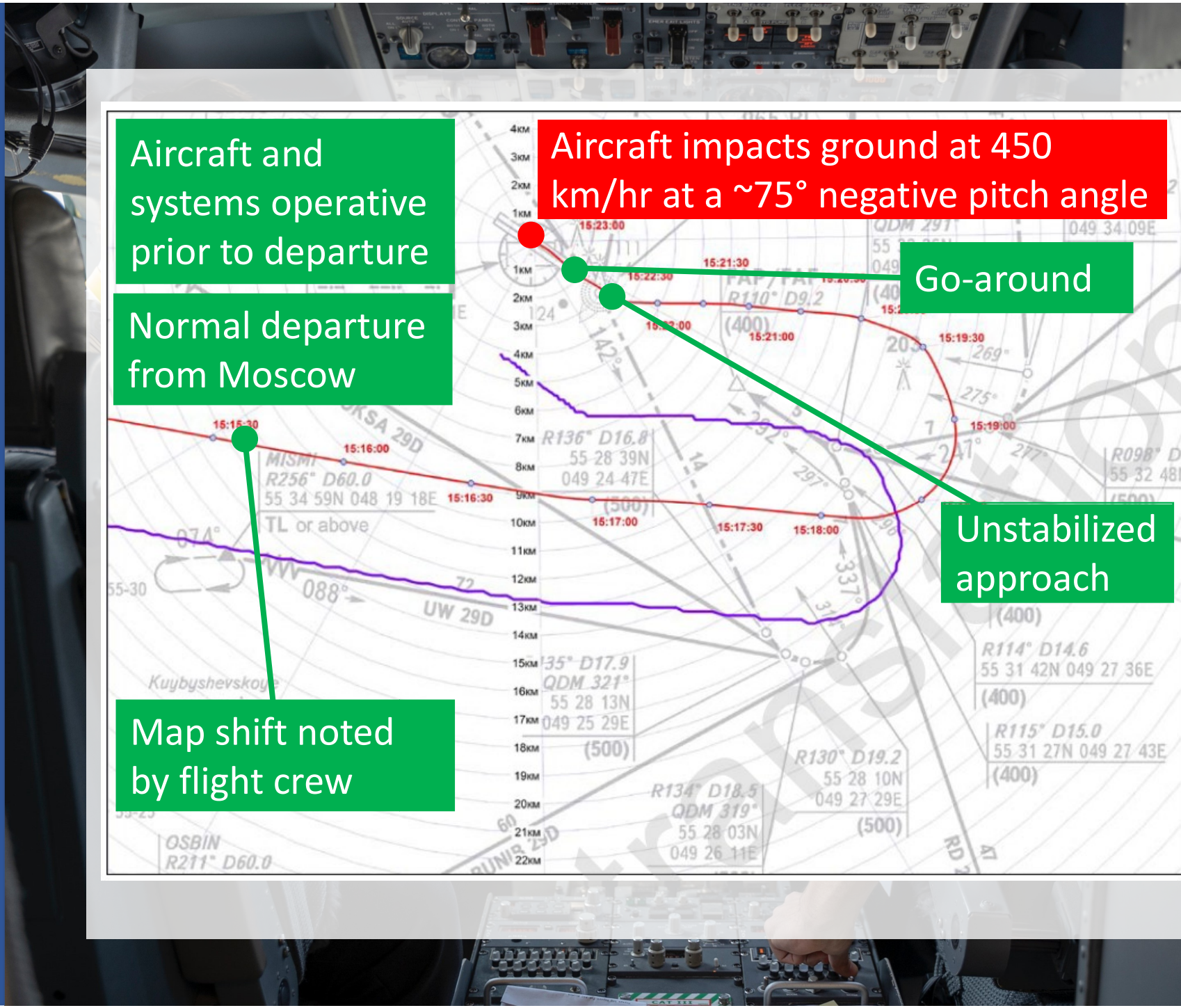


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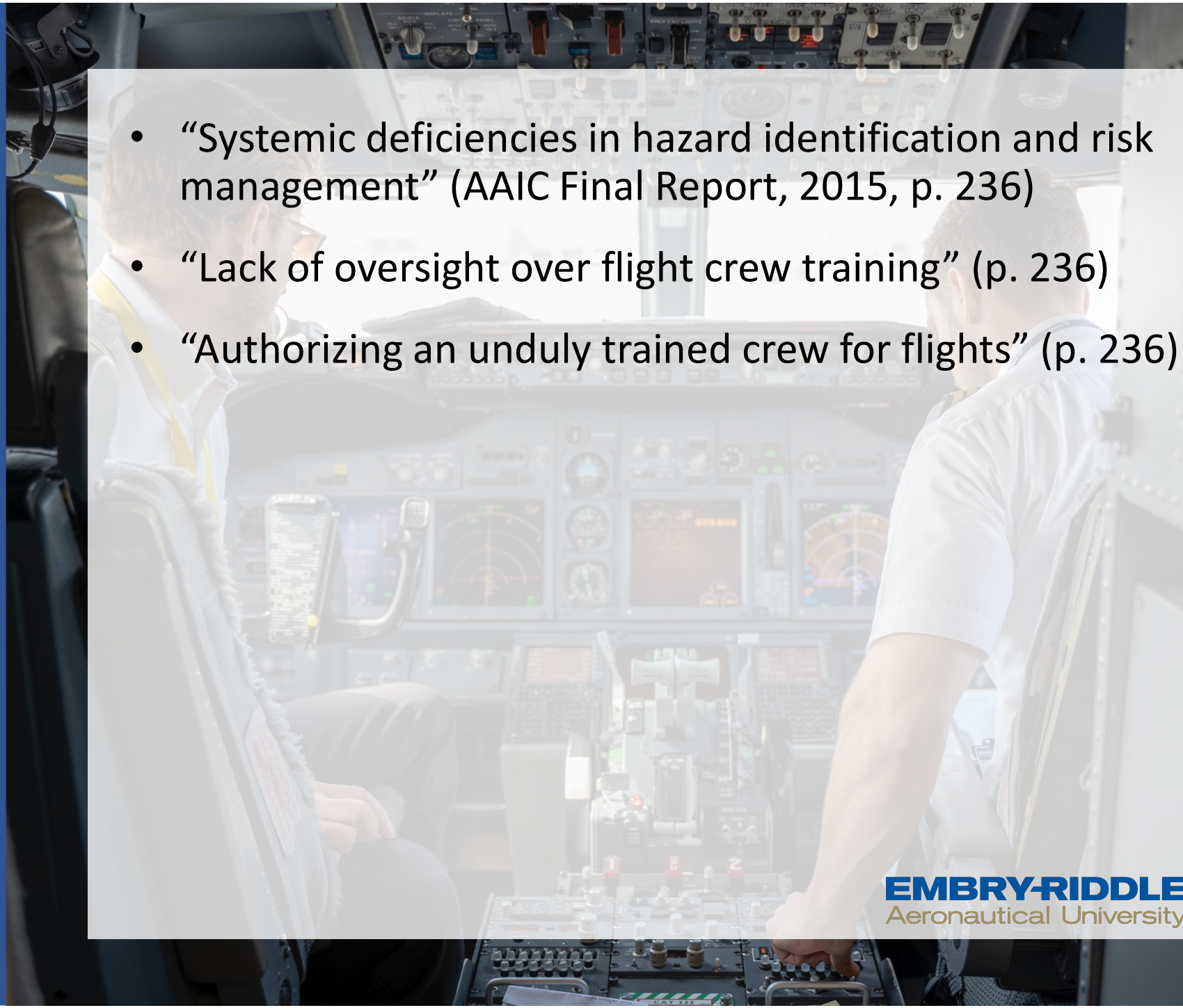
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- “Systemic deficiencies in hazard identification and risk management” (AAIC Final Report, 2015, p. 236)
- “Lack of oversight over flight crew training” (p. 236)
- “Authorizing an unduly trained crew for flights” (p. 236)

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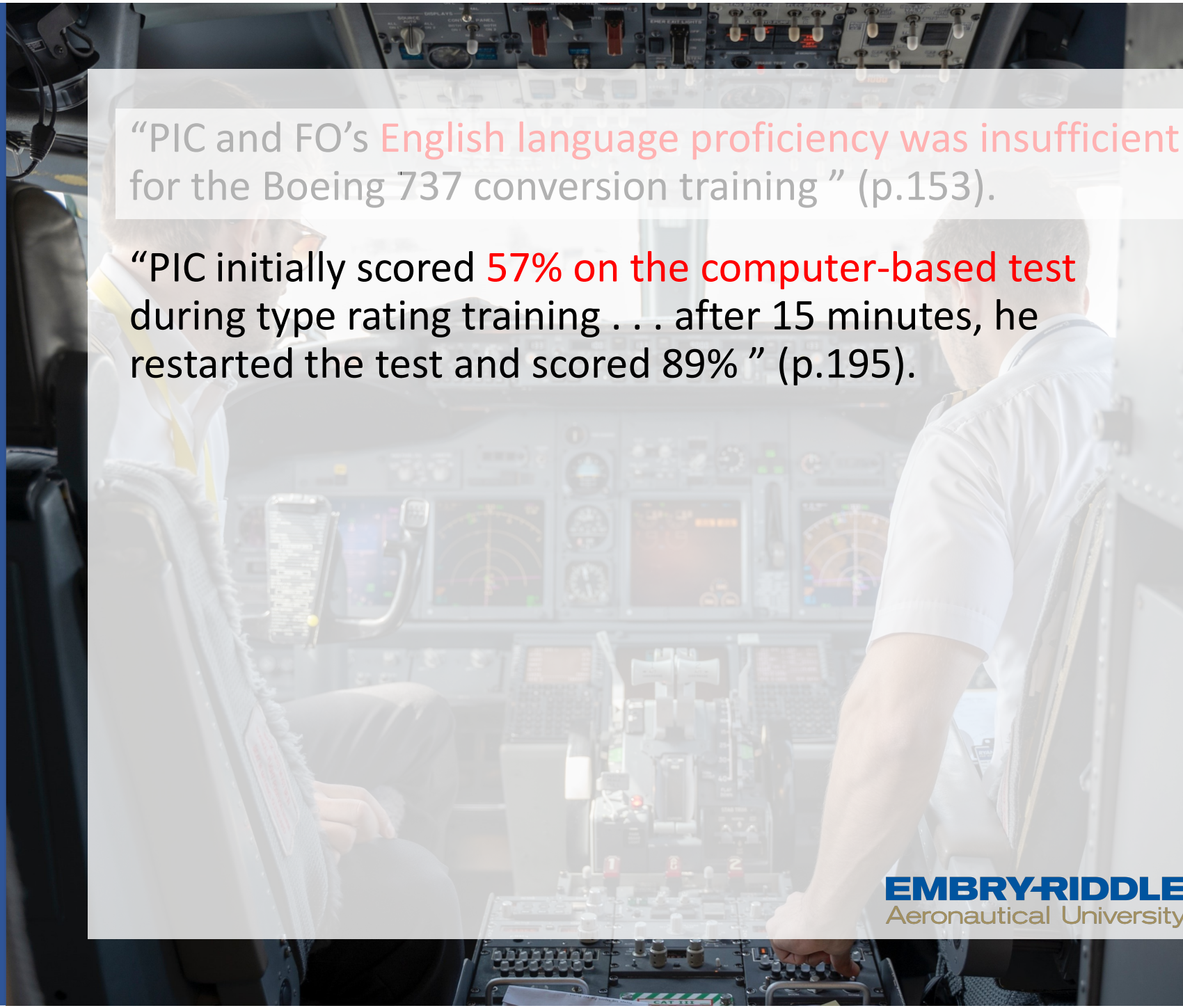
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"PIC and FO's English language proficiency was insufficient for the Boeing 737 conversion training" (p.153).

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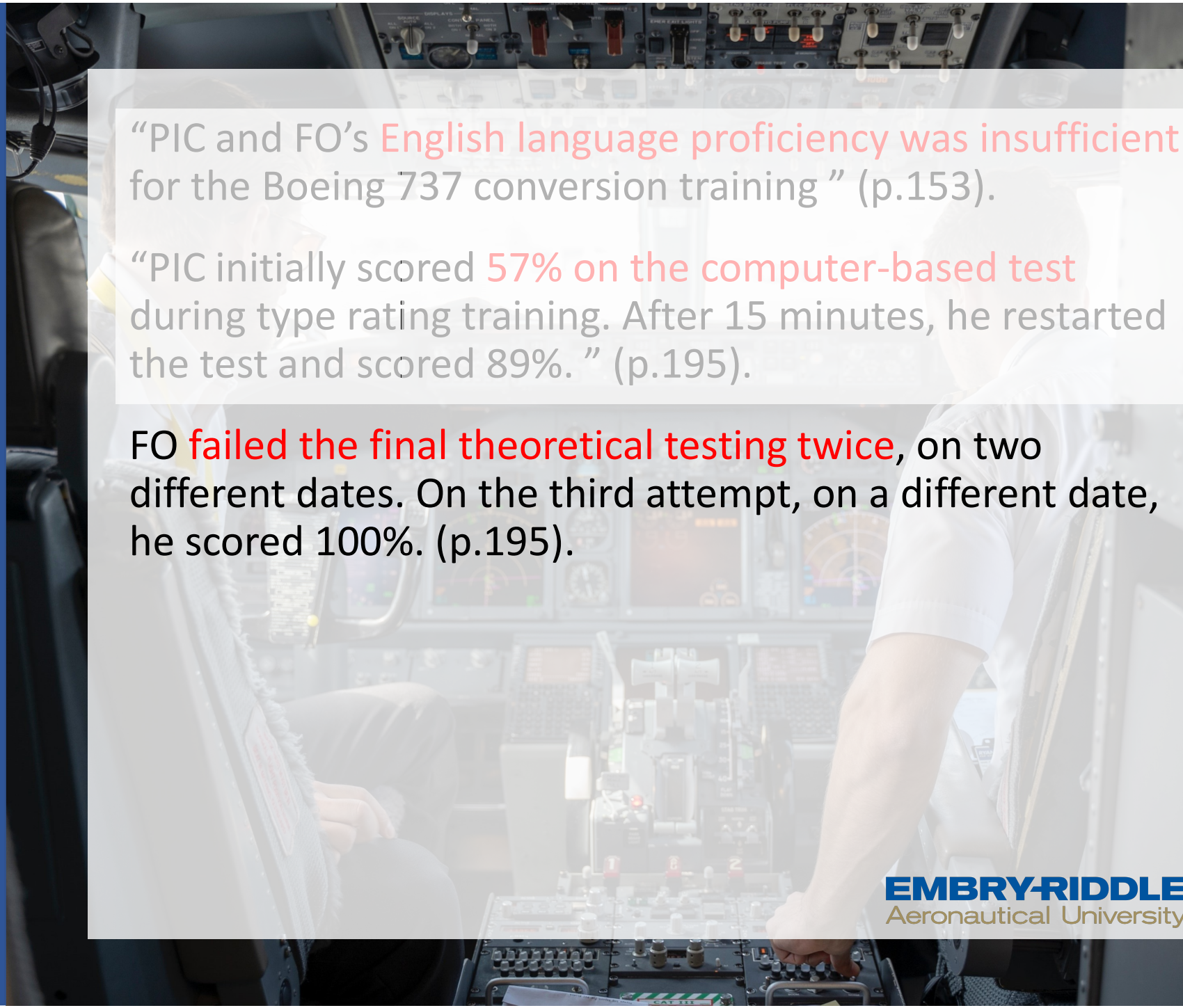


"PIC and FO's English language proficiency was insufficient for the Boeing 737 conversion training " (p.153).

"PIC initially scored 57% on the computer-based test during type rating training . . . after 15 minutes, he restarted the test and scored 89% " (p.195).

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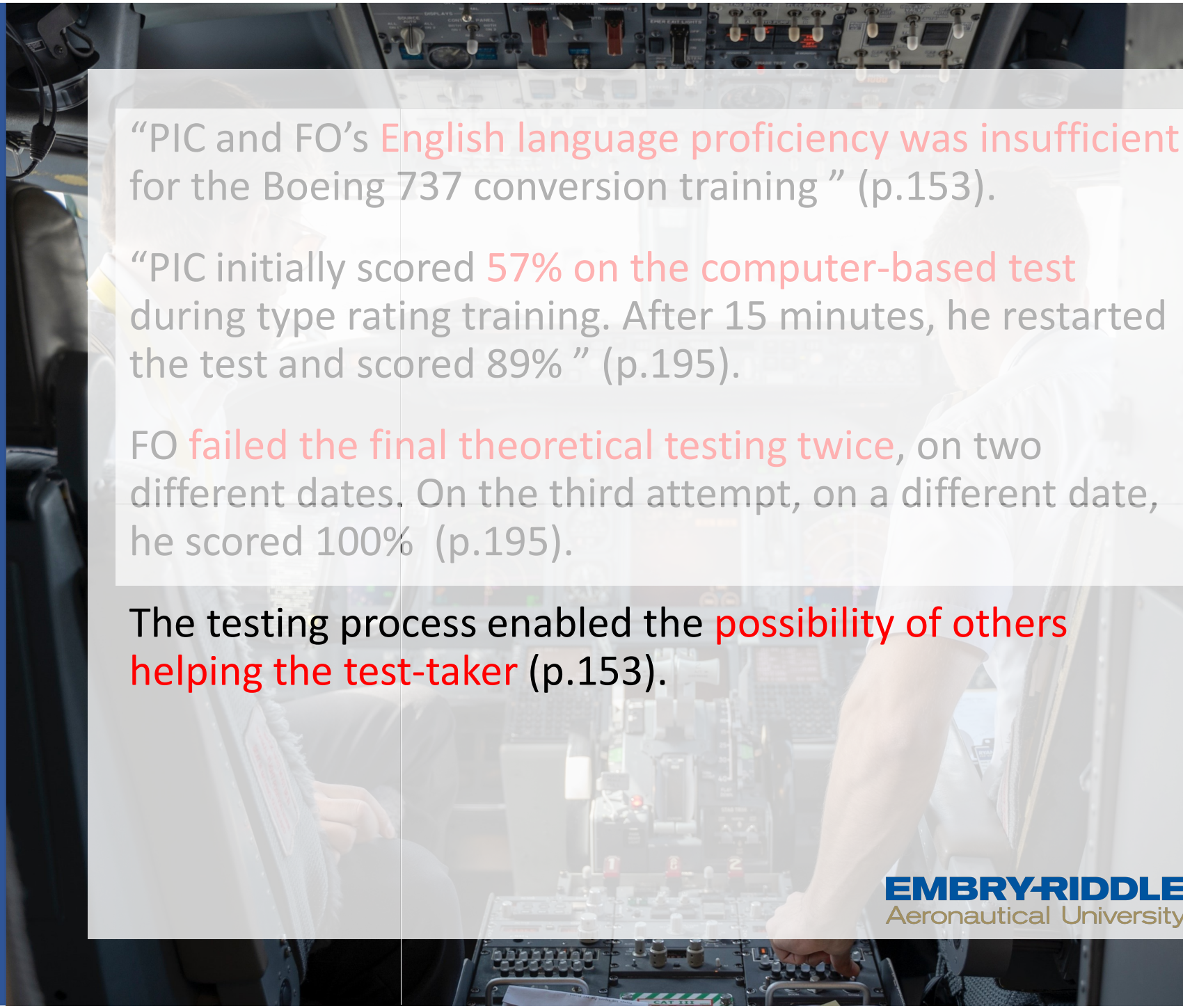
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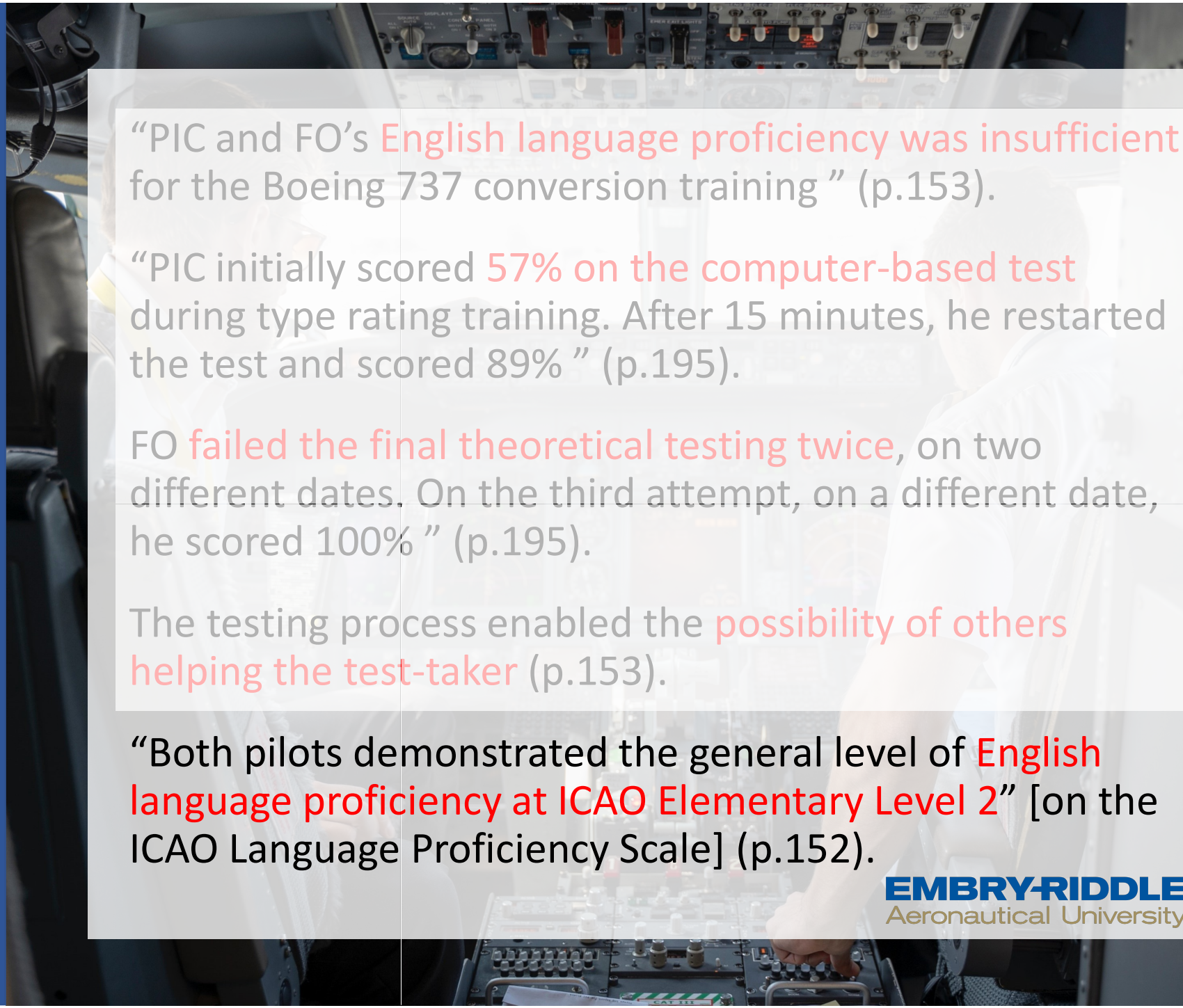
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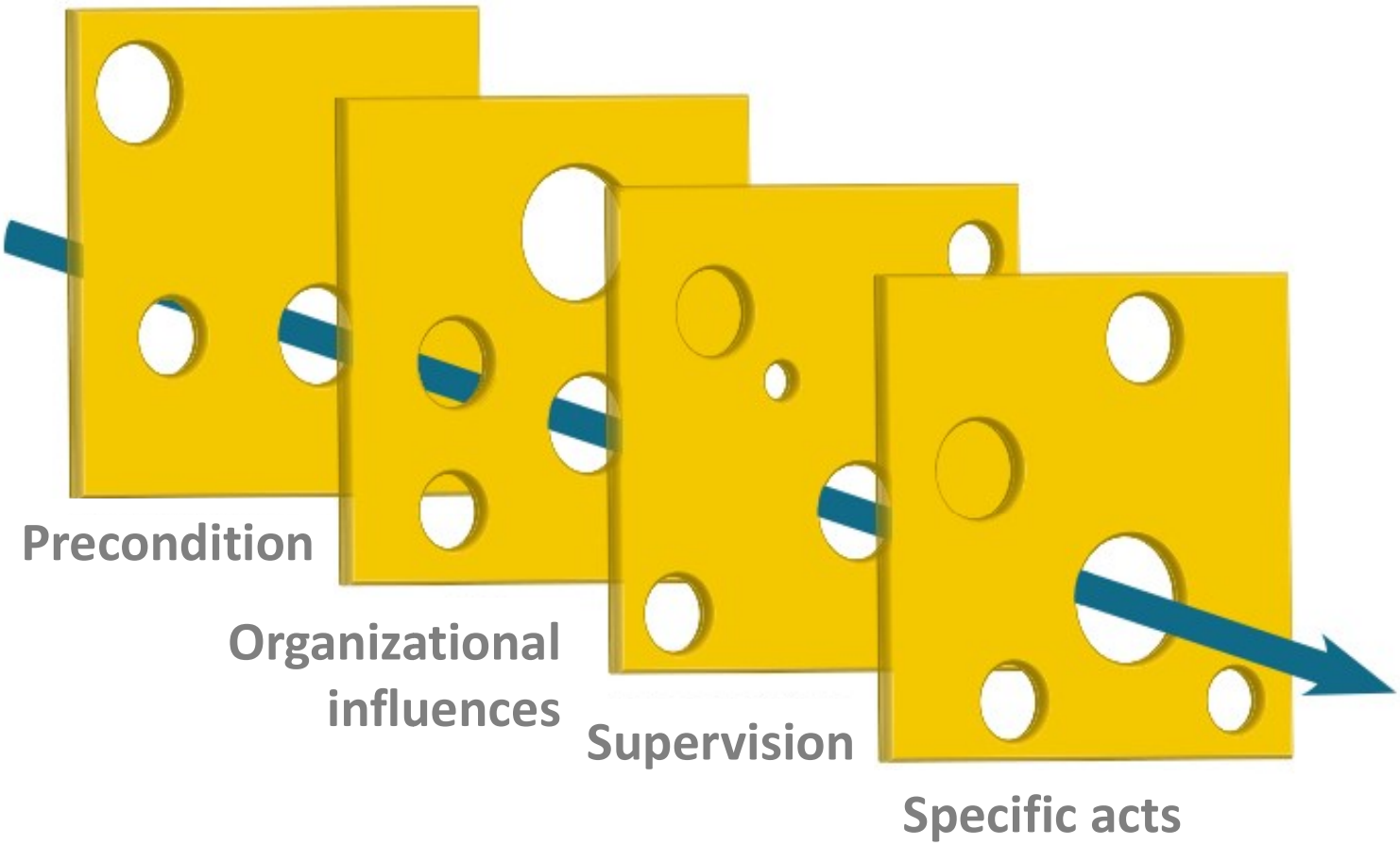
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"Both pilots demonstrated the general level of English language proficiency at ICAO Elementary Level 2" [on the ICAO Language Proficiency Scale] (p.152).

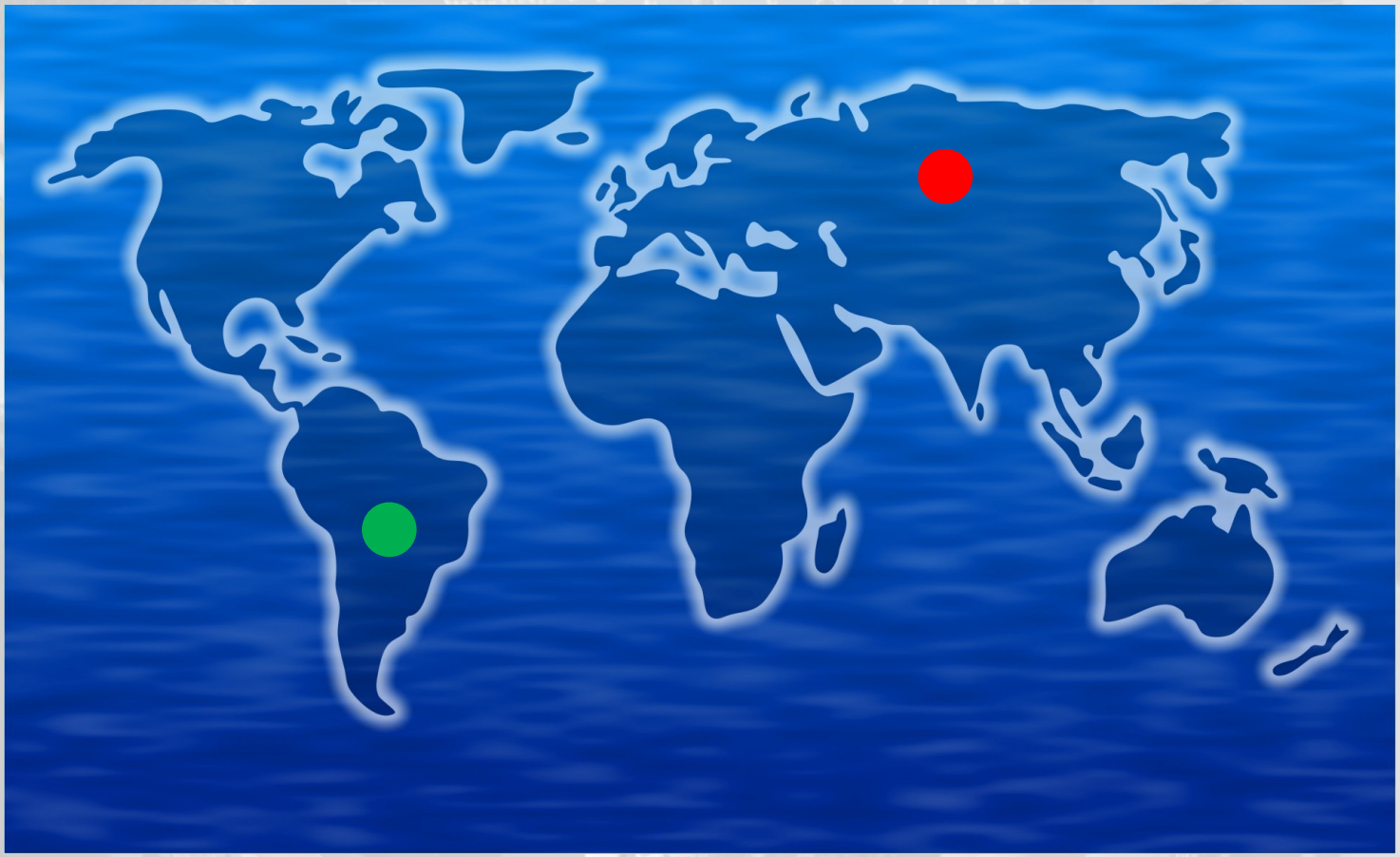
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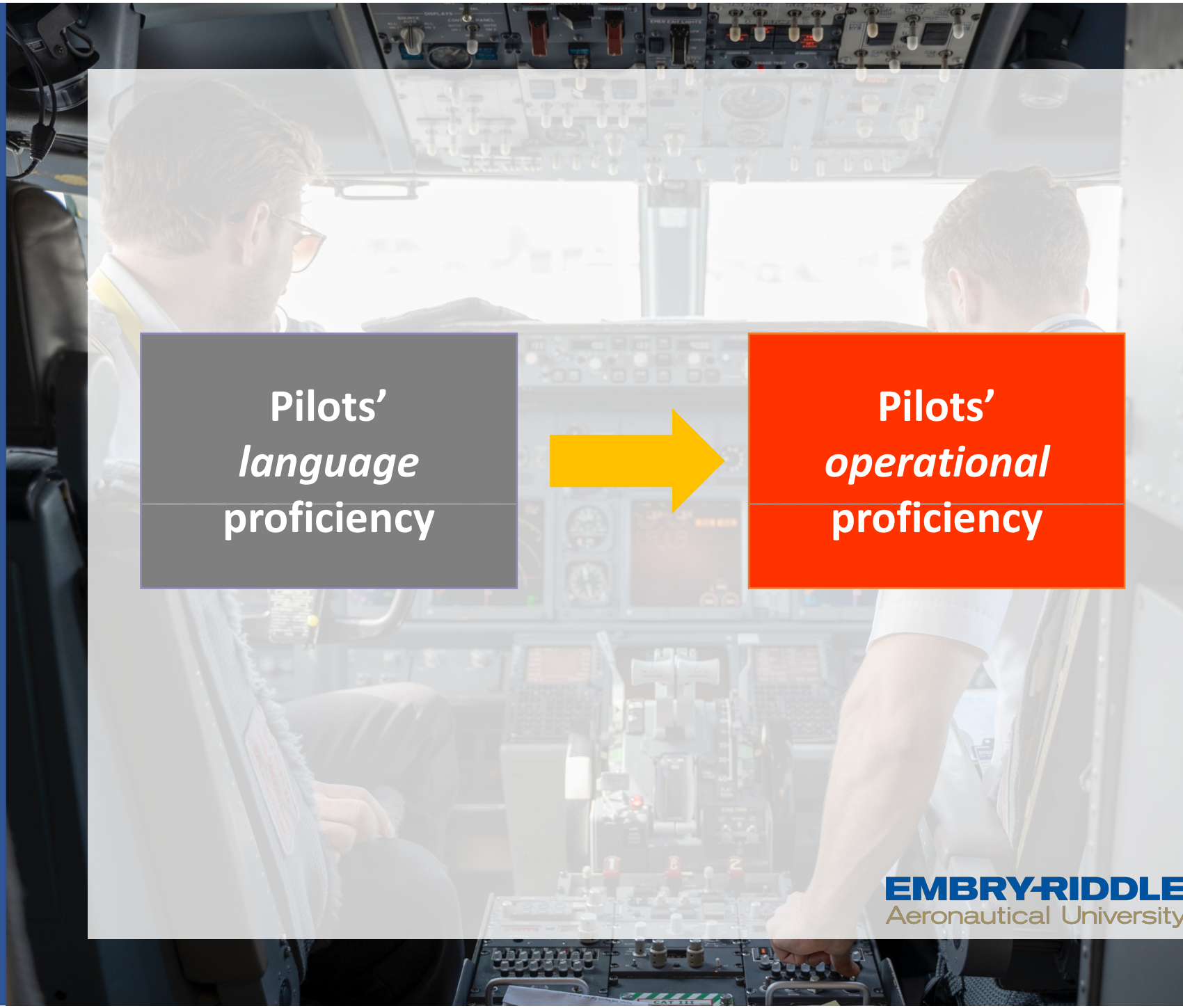
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Sergey Melnichenko

- Russian Federation's representative to the ICAO PRICESG
- Member of the ICAO EUR/NAT Training Task Force
- Developer of the Test of English Language Level for Controllers and Pilots
- **Participated in six aviation accident investigations in Russia between 1988 and 2016**

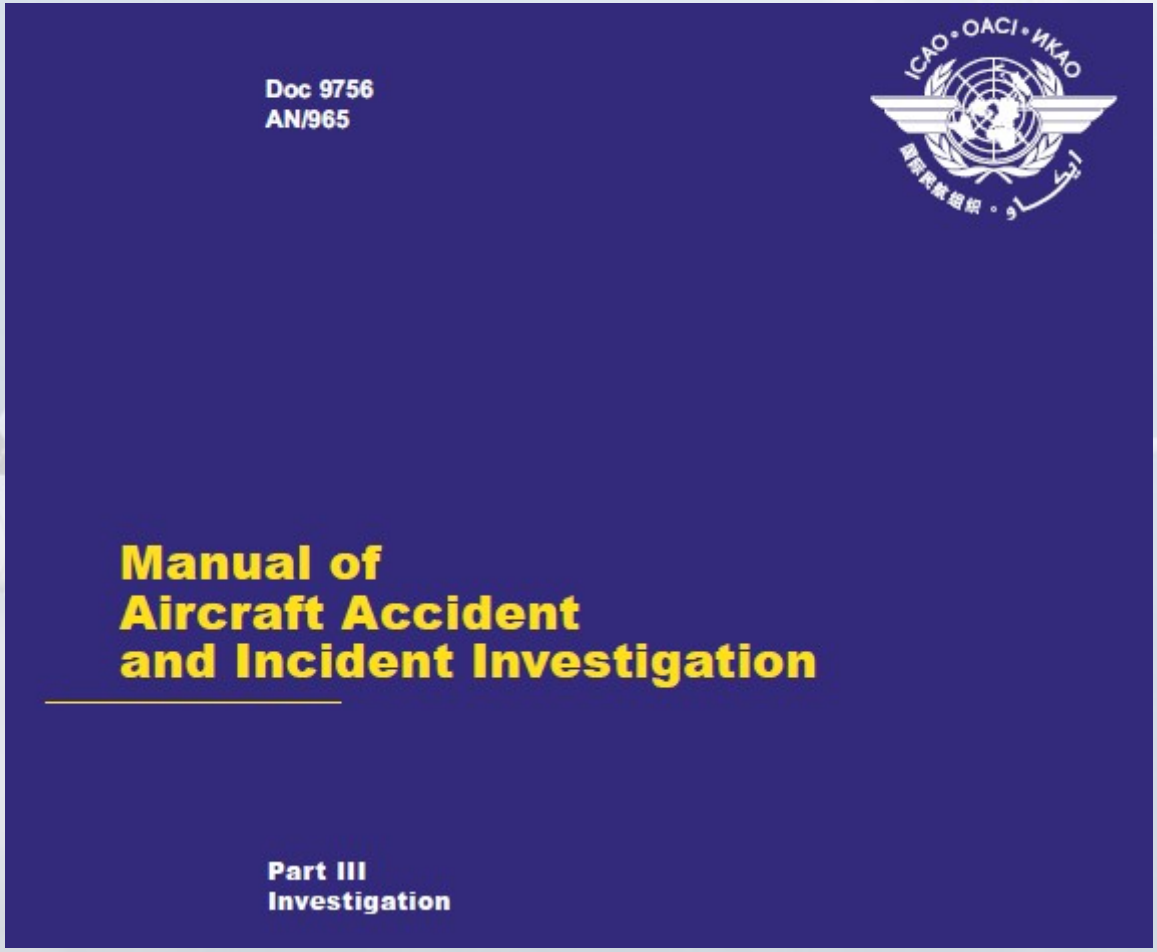
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AO idance on craft cident vestigation

ICAO Document 9756 does not provide guidance for exploring language as a contributing factor to accidents.



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1. **Pilots who speak English as a foreign language sometimes complete flight crew training in English.**

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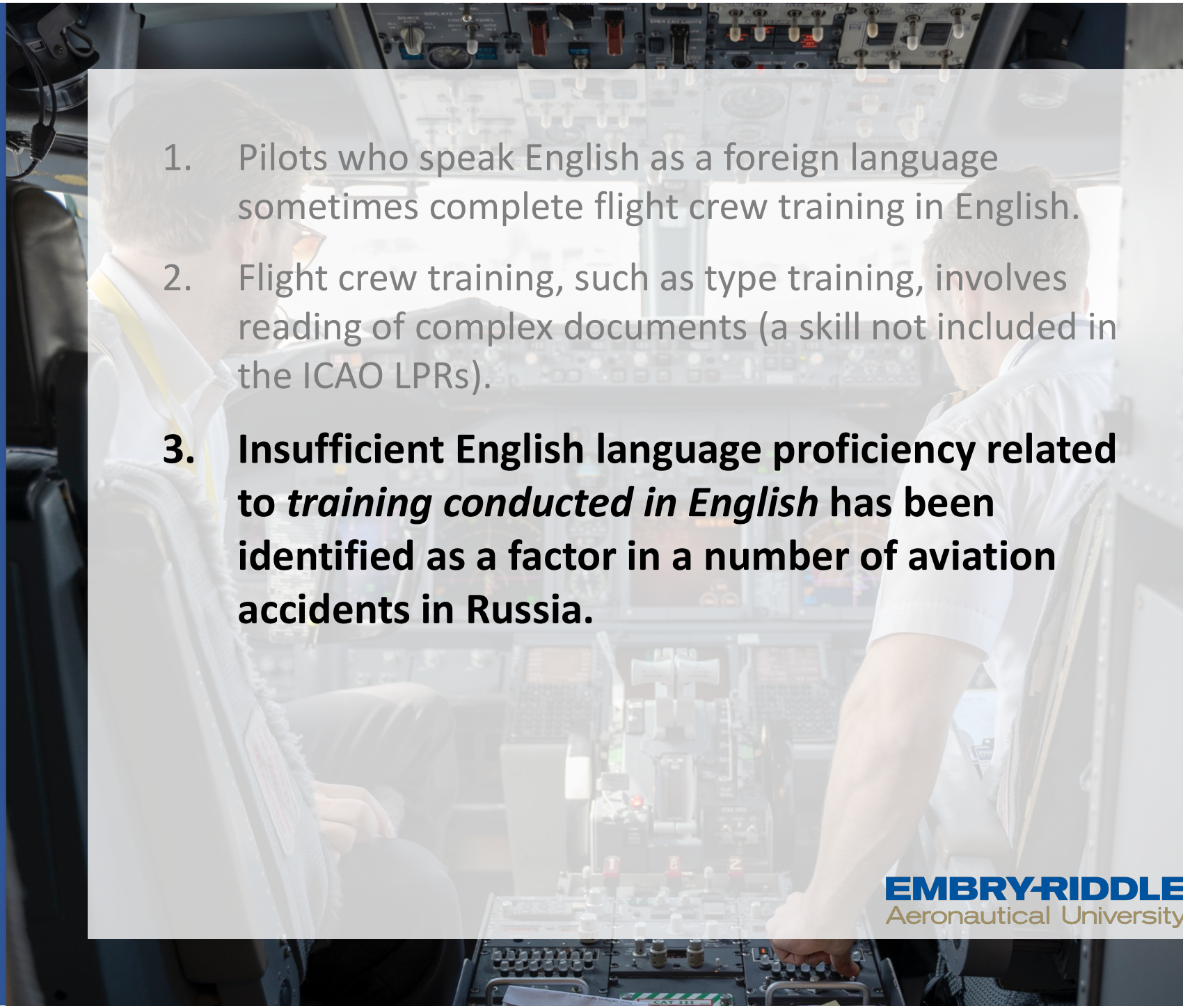
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1. Pilots who speak English as a foreign language sometimes complete flight crew training in English.
2. **Flight crew training, such as type training, involves reading of complex documents (a skill not included in the ICAO LPRs).**

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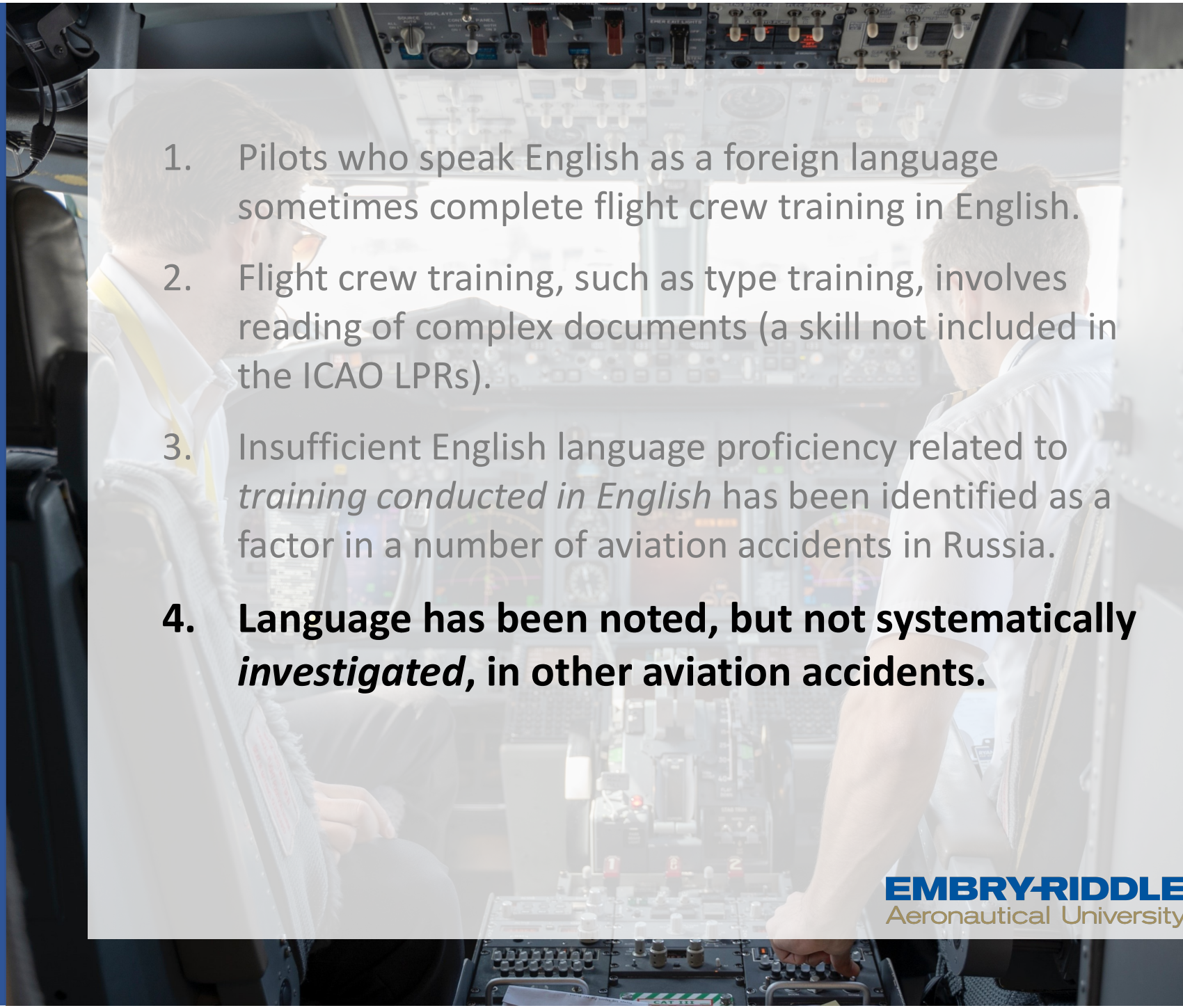
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1. Pilots who speak English as a foreign language sometimes complete flight crew training in English.
2. Flight crew training, such as type training, involves reading of complex documents (a skill not included in the ICAO LPRs).
3. **Insufficient English language proficiency related to *training conducted in English* has been identified as a factor in a number of aviation accidents in Russia.**

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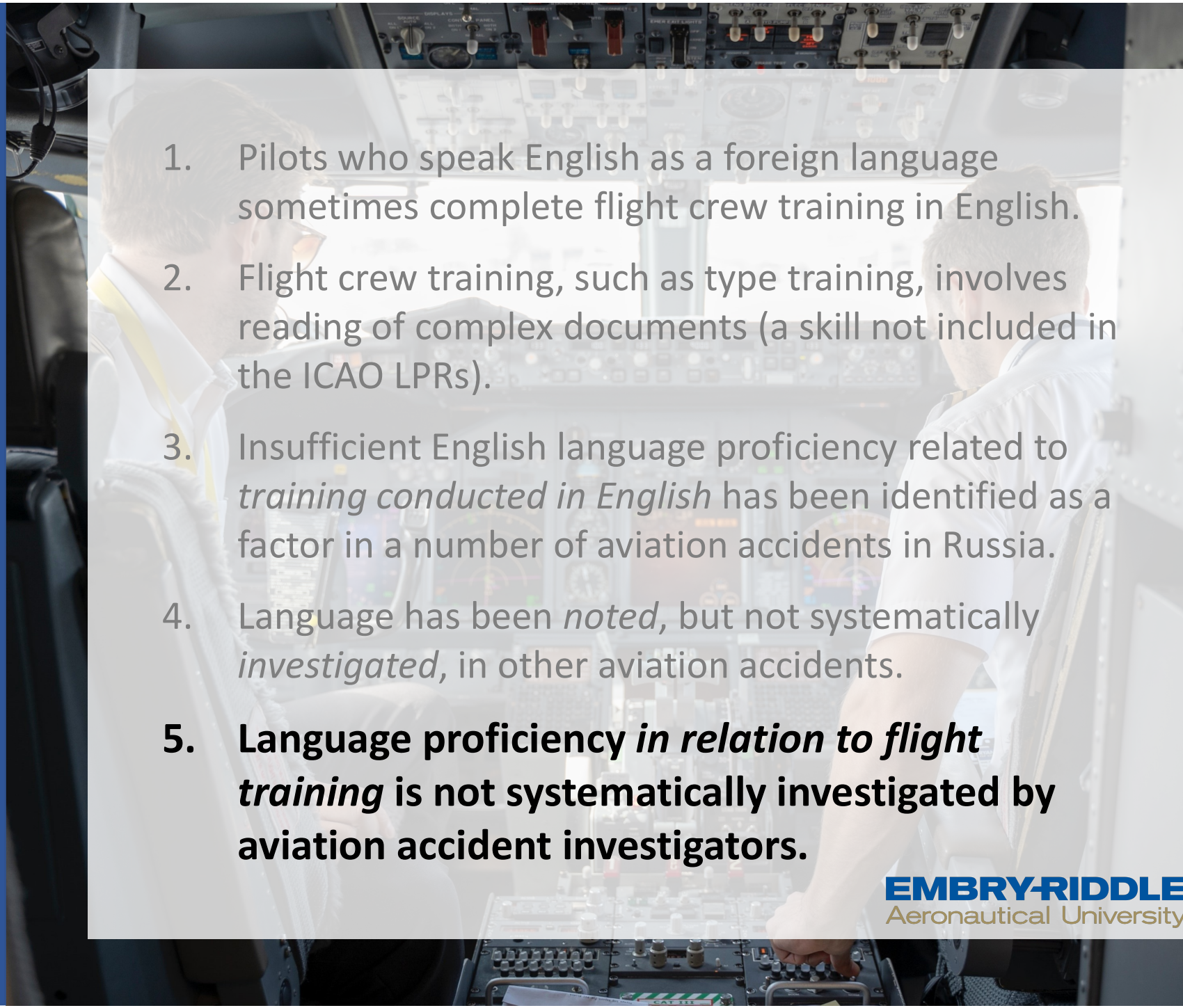
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4. **Language has been noted, but not systematically *investigated*, in other aviation accidents.**

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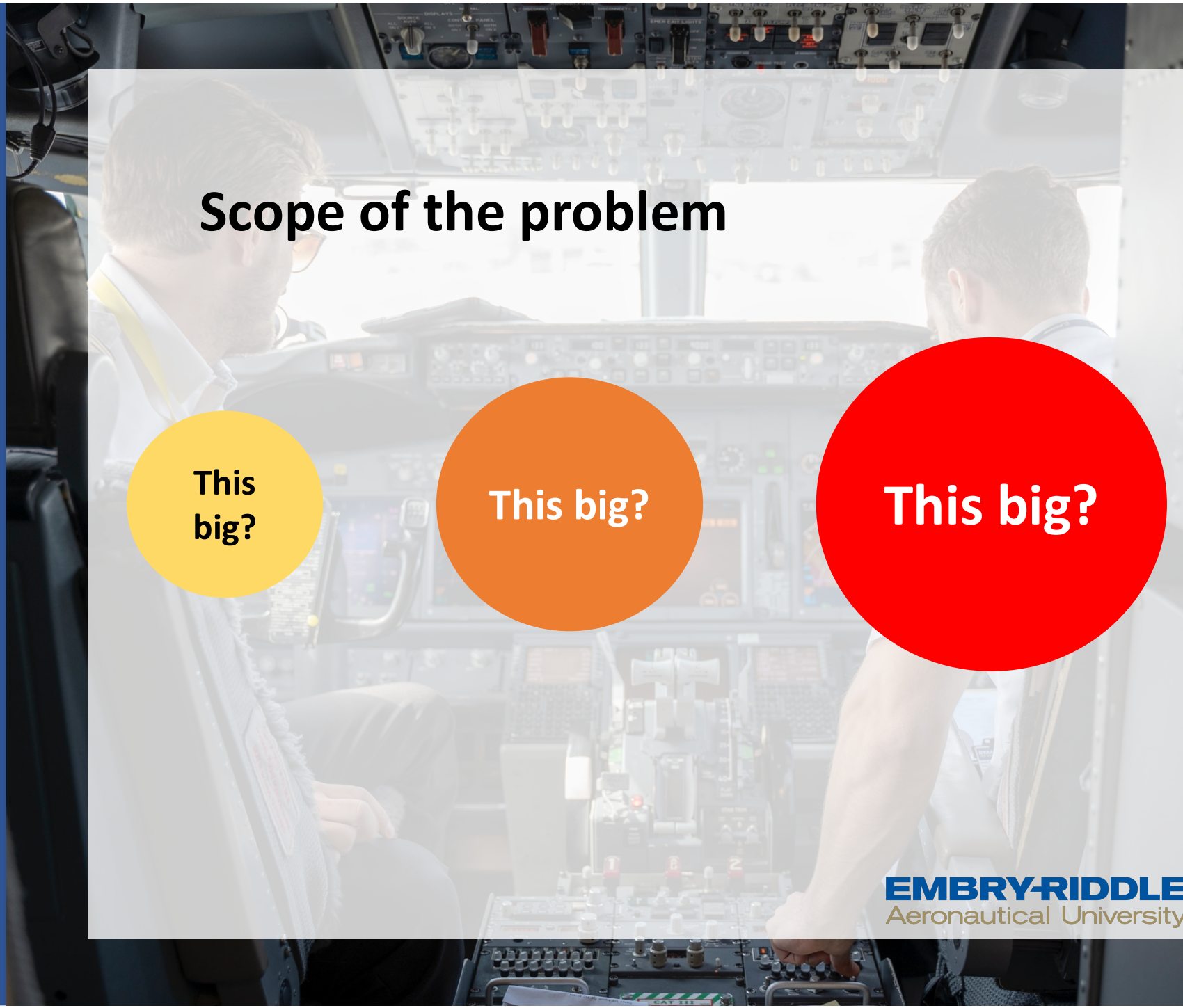
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1. Pilots who speak English as a foreign language sometimes complete flight crew training in English.
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4. Language has been *noted*, but not systematically *investigated*, in other aviation accidents.
5. **Language proficiency *in relation to flight training* is not systematically investigated by aviation accident investigators.**

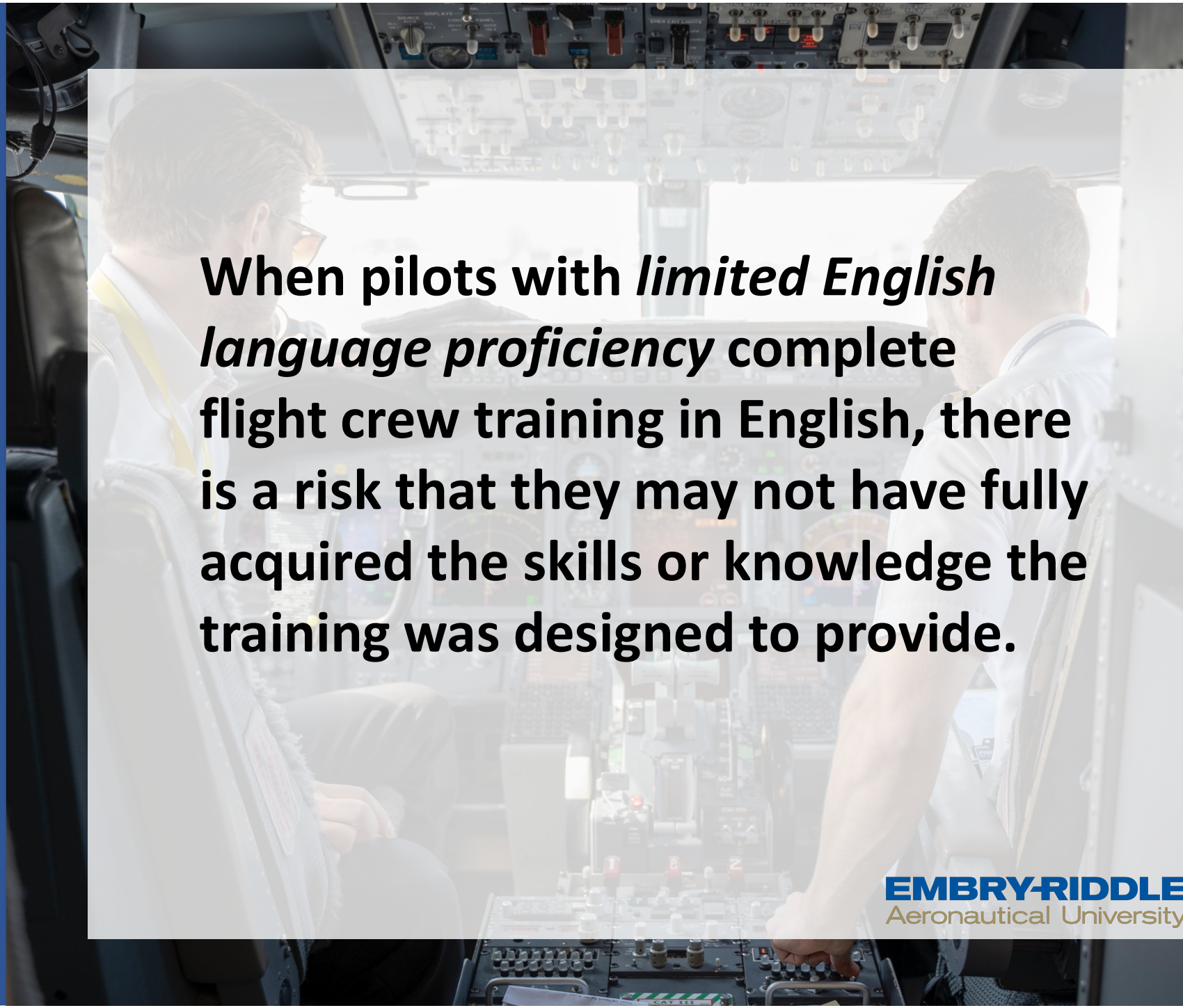
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When pilots with *limited English language proficiency* complete flight crew training in English, there is a risk that they may not have fully acquired the skills or knowledge the training was designed to provide.

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Flight crew training conducted in English

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Insufficient English language proficiency of pilots

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Uncertainty of training outcomes

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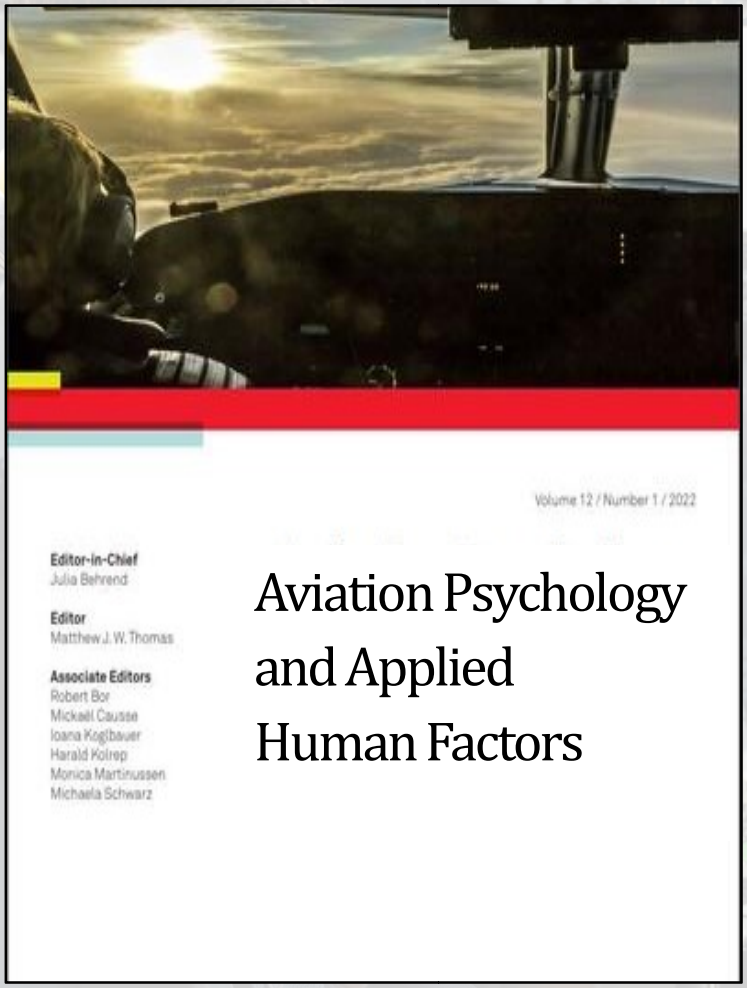
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Aviation English professionals who can communicate with aviation operational staff and leadership in familiar terms will be more effective in advocating for AE programs.

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Original Article

Investigating Language Factors in Aviation Accidents

Elizabeth Mathews[1], Joan Carson[2], Steven Singleton[3], Enrique "Rick" Valdes[4], and E. David Williams[5]

[1]Department of Applied Aviation Sciences, Embry-Riddle Aeronautical University, Daytona Beach, FL, USA
[2]Department of Applied Linguistics and TESOL and Assistant Provost, Georgia State University, GA, USA
[3]G2 Secure Staff, Irving, TX, USA
[4]United Airlines, West Palm Beach, FL, USA
[5]Department of Applied Aviation Science, Embry-Riddle Aeronautical University, Daytona Beach, FL, USA

Abstract: Linguistic and operational experts reviewed accident investigation reports covering a 22-year period (1990–2012) revealing that language factors impact aviation safety in a variety of ways, in contexts extending beyond pilot and air traffic controller communications. The investigation of possible language factors is not accorded the same degree of systematic and expert analysis as is given to the investigation of other human performance and operational factors.

Keywords: language, human factors, accident investigation

From an early focus on improving technology and implementing regulations, the industry approach to improving aviation safety shifted in the 1970s to encompass an understanding of the central role of human factors (International Civil Aviation Organization [ICAO], 2018). Models of human performance, including the ICAO SHELL model, James Reason's "Swiss cheese" model, and the Human Factors Analysis and Classification System (HFACS), inter alia, provide experts with a framework with which to understand, analyze, and respond to the impact of human performance. Common to all models of human factors is an acknowledgment of the importance of communication to flight safety.

The ICAO SHELL model centers the human at "the front line of operations," the most critical component in the system (ICAO, 2018, 2.2.7). Humans interact with the machines ("hardware"), with programs and procedures ("software,"), with one another ("liveware"), and with the environment in which the H-S-L systems function. In the SHELL model, the liveware–liveware interface concerns the interaction between humans, focusing on "the importance of communication and interpersonal skills" (ICAO, 2018, 2.2.7). No explicit reference to language is included.

The HFACS, developed by Shappell and Wiegmann (1997), was based on a review of commercial aviation accident reports archived on the National Transportation Safety Board (NTSB) and the Federal Aviation Administration (FAA) National Aviation Safety Data Analysis Center. Their initial analysis focused on the role of human factors in accidents, including those related to the "condition of operators or supervisory error" (Shappell & Wiegmann, 1997, p. 269). References to language can be inferred from a number of HFACS categories, including "Preconditions for Unsafe Acts: Personnel Factors: Communication, Coordination and Planning" (Shappell et al., 2007, p. 230). A language problem could be included under the category of "Unsafe Acts: Error: Skill-Based Errors" (Shappell et al., 2007, p. 230). However, language factors do not appear as a distinct category in the HFACS framework.

In the ICAO Accident and Incident Data Reporting System's (ADREP) Taxonomy of Explanatory Factors (2010), there are 62 references to communication(s) and four references to language. For example, "comprehension," a component of language proficiency, is listed within the category of "Psychological Limitations" (ICAO, 2010, p. 9). However, the ADREP Taxonomy includes examples of comprehension difficulties that range from "difficulties. . .associated with language or accent" (a language-related factor) to "difficulties . . . associated with understanding procedures" (ICAO, 2010, p. 9). The latter may be primarily a knowledge-based factor, but it could also be a language factor related to insufficient language proficiency in listening or reading comprehension.

Since the runway collision at the Tenerife airport in 1977 between two Boeing 747 aircraft in which accident

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ferences

Only one published work, the first article below, explores the occurrence and operational impact of inadequate language proficiency during flight crew training.

- **Mathews, E., Carson, J., Singleton, S., Valdes, E., and Williams, D. (2022). Investigating Language Factors in Aviation Accidents. *Aviation Psychology and Applied Human Factors, 12(2),* 99-108.**
- Air Accident Investigation Commission. Russia Interstate Aviation Committee. (2015). *Final report on results of investigation of accident*.
- ICAO Document 9756: Manual of Aircraft Accident and Incident Investigation, Part III: Investigation, First Edition. (2011).
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