United States Airline Transport Pilot International Flight Language Experiences Report 2: Word Meaning and Pronunciation

O. Veronika Prinzo
Civil Aerospace Medical Institute
Federal Aviation Administration
Oklahoma City, OK 73125

Alan Campbell
Johns Creek, GA 30022

Alfred M. Hendrix
Ruby Hendrix
Hendrix & Hendrix Consulting Service
Roswell, NM 88201

April 2010

Final Report

OK-10-0077-JAH

NOTICE

This document is disseminated under the sponsorship
of the U.S. Department of Transportation in the interest
of information exchange. The United States Government
assumes no liability for the contents thereof.

_____

This publication and all Office of Aerospace Medicine
technical reports are available in full-text from the Civil
Aerospace Medical Institute's publications Web site:
www.faa.gov/library/reports/medical/oamtechreports

Technical Report Documentation Page

1. Report No. DOT/FAA/AM-10/7	2. Government Accession No.	3. Recipient's Catalog No.
4. Title and Subtitle United States Airline Transport Pilot International Flight Language Experiences Report 2: Word Meaning and Pronunciation		5. Report Date April 2010
		6. Performing Organization Code
7. Author(s) Prinzo OV,[1] Campbell A,[2] Hendrix A,[3] Hendrix R[3]		8. Performing Organization Report No.
9. Performing Organization Name and Address [1]FAA Civil Aerospace Medical Institute, P.O. Box 25082 Oklahoma City, OK 73125 [2]Alan Campbell, Johns Creek, GA 30022 [3]HCS Consulting , Roswell, NM 88201		10. Work Unit No. (TRAIS)
		11. Contract or Grant No.
12. Sponsoring Agency name and Address Office of Aerospace Medicine Federal Aviation Administration 800 Independence Ave., S.W. Washington, DC 20591		13. Type of Report and Period Covered
		14. Sponsoring Agency Code

15. Supplemental Notes

Work was accomplished under approved task AM-B-06-HRR-516.

16. Abstract

In 1998, the International Civil Aviation Organization (ICAO) took a heightened interest in the role of language in airline accidents. Its Air Navigation Commission was directed to strengthen relevant ICAO provisions concerning language requirements. Member states agreed to take steps to ensure air traffic control (ATC) personnel and flight crews involved in flight operations in airspace where the use of the English language is required were proficient in conducting and comprehending radiotelephony communications in English. Since then, ICAO developed its English Language Proficiency (ELP) requirements and urged its members to document their ELP test implementation plans by March 8, 2008. Until all ATC personnel and flight crews involved in flight operations obtain a passing level of ELP, the language-based problems international pilots face is not known. This report is a compilation of written responses and comments by a small focus group of 48 U.S. pilots of their difficulties in international operations. The focus group consisted of 12 international U.S. pilots each from American, Continental, Delta, and United Airlines. Each focus group met with two interviewers to discuss their language experiences flying into countries where English may or may not be the local or national language among its radio operators, controllers, and pilots. In this report, the pilots' responses to questions 24-30 and their comments from discussions of those questions with interviewers are presented as a compiled narrative. The pilots' responses had eight major thrusts: (1) Once pilots get past the controller's accented English, understanding is not a problem during routine operations; (2) the lack of standardized pronunciation of NAVAIDs, waypoints, intersections, etc. complicates understanding what was said; (3) Currency in flight time in the theater of operation is critical to understanding accented English and will influence how easily controllers from different countries are understood; (4) Poor radios and transmission quality contribute to the unintelligibility of some controller transmissions; (5) Variations in pronunciation can detract from flying, as pilots must listen intently to clearances; (6) Training is essential for crews lacking currency going into a foreign country; (7) Differences associated with U.S. and ICAO phraseology need to be resolved and procedural ambiguities eliminated; and (8) Technological advancements such as controller pilot datalink communications (CPDLC) and automatic dependent surveillance (ADS) can mitigate some of the problems associated with accented English. We offer 10 recommendations to improve communication practices, which include development of a standardized phraseology, its presentation, delivery technique, and meaning, training, and implementation of ICAO's ELP by all member states.

17. Key Words Communications, ATC Communication, Air Traffic Control	18. Distribution Statement Document is available to the public through the Defense Technical Information Center, Ft. Belvoir, VA 22060; and the National Technical Information Service, Springfield, VA 22161		
19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this page) Unclassified	21. No. of Pages 44	22. Price

Form DOT F 1700.7 (8-72)   Reproduction of completed page authorized

ACKNOWLEDGMENTS

CONTENTS

EXECUTIVE SUMMARY

This is the second of several reports that present the findings from in-depth interviews with pilots who fly internationally for major U.S. air carriers. The first series of reports are from small focus group discussions with 48 U.S. pilots. A second series used the same format and questions with pilots flying internationally for Aeroflot, Alitalia, China Air, and LAN Chile airlines.

English language proficiency is a safety concern, as noted by the International Civil Aviation Organization (ICAO 2004). Given that international flight operations are increasing, it is important to know more about the language experiences U.S. pilots encounter when flying into countries where English may or may not be the local or national language among their radio operators, air traffic controllers, and pilots.

We asked several major U.S. airline companies to solicit volunteers from among their pilots who fly internationally to serve as paid subject matter experts in a structured interview constructed to assess the language difficulties encountered during international flights. Twelve pilots represented American, Continental, Delta, and United Airlines for a total of 48 airline transport pilots (ATPs). These pilots were assumed to be representative of typical U.S. airline pilots flying internationally as to English language proficiency, familiarity with ICAO and aviation procedures, terminology, and standard air traffic phraseology. We limited the size of each focus group to include no more than four pilots. There were morning and afternoon sessions that took place over several days at each company's designated location.

The structured interview was divided into 10 sections: (1) Background Information, (2) Pre Flight Preparation, (3) Air Traffic Control (ATC) Procedures, (4) Word Meaning and Pronunciation, (5) Language Experiences in Non-Native English-Speaking Airspace/Airports, (6) Non-Native English-Speaking Controllers Communicating With Native English-Speaking Pilots, (7) Language Experiences In Native English-Speaking Airspace/Airports, (8) Native English-Speaking Controllers Communicating With Non-Native English-Speaking Pilots, (9) Communication Problems, and (10) Technological Intervention. A copy of the interview questions appears in Prinzo and Campbell (2008).

The first report summarized the U.S. pilots' oral and written responses to the questions contained in Sections 1-3. This report is the second in the series, continues with Section 4, and summarizes the pilots' responses to questions 24-30. It provides a wealth of ideas related to the international flight experiences of the pilots who participated in the focus group discussions. The pilots' answers to the questions and discussions during the interviews were their perceptions of the situations they encountered. This report is based on those perceptions. Many stories were anecdotal and some were relayed in third person. The pilots' discussions and written responses are summarized and presented as if from one pilot's diary containing a compendium of flight experiences. This was done to preserve the richness and integrity of the information given during the interviews. No effort was made to influence the pilots' perception of a procedure, phraseology, etc.

The pilots' responses had eight major thrusts:

1. The pilots' responses indicated that once they get past the controller's accented English, understanding is not generally a problem during routine operations. With time and experience, pilots learn to distinguish between sounds produced in the primary language and those same sounds produced in accented English by non-U.S. controllers. Some sounds are difficult to parse correctly into syllables because they are not heard by the non-native speaker of the language. For example, /p/ followed by /a/ to create /pa/ varies for English and Spanish. Also the location of syllabic stress affects how words are pronounced. These differences hinder language decoding by the listener. Pilots often ask themselves and other crewmembers, "What did he say?"

2. The lack of a standardized pronunciation of NAVAIDs, numbers, and call signs can detract from flying, as pilots must listen intently to understand clearances. There are some fixes that sound similar and are in close proximity to one another. Pilots will look them up on their charts and talk among themselves to determine which one the controller said. When in doubt, they may ask the controller to spell it phonetically. The same problem exists for the pronunciation of numbers in that some controllers have difficulty pronouncing numbers and words containing the letter "L," "R," "J," or "W."

3. Some controllers would benefit from training in radio broadcasting where one standard is applied to pronunciation, timing, and speech rate. Also, there is a vast difference in controllers' mastery of the English language. When a controller's accent is notably strong and speech production is poor, all pilots in the cockpit listen intently to what is being said to understand what ATC wants them to do. Add to that a fast speech rate and there is a greater probability that the pilot will miss a part of the message content. Furthermore, controllers who speak before depressing the microphone key or release it before they are finished talking transmit partial messages. These examples of poor delivery technique result in a failure to receive the entire message on the flight deck, which can change the entire meaning of a phrase. Also, many pilots reported that controllers with high-pitched voices are difficult to understand.

4. Poor radios and transmission quality in some areas of the globe contribute to the unintelligibility of controllers. Transmissions from ATC might be weak and sound scratchy, hollow, or distorted. Some radios might be 60 yrs old or older. When controllers use these radios, it sounds like they are using a carbon or poor-quality microphone because of the hollow sound and background echo.

5. Differences associated with U.S. and ICAO phraseology and procedural ambiguities need to be resolved for pilots and controllers to reach a common ground of understanding. The pilots provided examples to support their feeling that not all words and phrases universally convey the same meaning for pilots and controllers. The most common examples provided by the discussants involved the interpretation of cleared direct and runway surface operations. Phrases such as "after the arriving aircraft" and "after aircraft of the moment" appended to "line up and wait," and "into position and hold," although intelligible, understood, and read back correctly, are difficult instructions to follow, as the pilot cannot determine when to safely execute the procedure. Several complained that different phrases were used to indicate the same action, the two most frequently mentioned being "into position and hold" and "line up and wait." A single, global phraseology standard should be adopted.

6. Language and procedure familiarization training is essential for flight crews lacking operational recency and multiple trips into a foreign country. Flying into a country with a check airman is not enough with the variability in ATC procedures, airspace structure, airport operations, geography, languages, cultures, and communications. Classroom instruction and experience in simulators provide pilots with added knowledge for international flights. With ever-increasing international flights, training in ICAO phraseology and procedures that differ from domestic ones becomes essential. Pilots should know the meaning of various words and phrases before leaving the U.S. Unfortunately, many pilots learn these things while on the job.

7. The number of flights, coupled with recency of flight time in the geographical area (i.e., theater), is critical to understanding accented English, and will influence how easily controllers from different countries are understood. The more often pilots fly to a particular international airport, the greater their knowledge and skill set become. Associations between how a word appears in print and its pronunciation are formed based on experience listening to accented-English pronunciation of these words. Pilots expect particular words and phrases and understand their meanings. When other words are substituted, pilots may not understand and may question the meaning and controller intent. All of this knowledge is then applied each time the pilot flies to that airport. Prior knowledge allows for more flexibility when abnormal situations arise.

8. Technological advancements such as digital communications (CPDLC and ADS) may mitigate problems associated with accent, pronunciation, and speech rate, especially when reprogramming the FMS. Pilots who have access to datalink applications report their benefits and encourage their expansion. Receiving clearances, reroutes, radio frequencies, clearances, instructions, radio frequencies, and other information via a datalink as text (or synthesized voice) would bypass language barriers associated with a lack of English language proficiency.

Finally, we present 10 recommendations derived from the pilots' responses to the interview questions and discussions. They are: (1) Adopt and adhere to the phraseologies contained in Doc4444 by all of the ICAO member states and the aviation community. Lack of standardization in phraseologies, procedure execution, and inconsistencies in language proficiency can lead to misunderstandings and unsafe acts. (2) Resolve the disparities that currently exist in the intentions (meaning) expressed by some words and phrases (e.g., cleared direct clearance, prepare to overshoot). (3) Develop additional phraseologies for inclusion into Doc4444 if the existing phraseologies cannot explain adequately an event involving the safety of an aircraft, provide actions, or offer solutions. (4) Develop one standard order for the presentation and delivery of ATC phraseology[1] by ATC, and require that ATC personnel adhere to it. For example, "cleared for approach, maintain your altitude" may violate pilot expectations to descend and lead to confusion. (5) Transmit no more than two speech acts in an ATC message (excluding speaker and receiver identifiers). Analysis of ATC voice tapes have repeatedly demonstrated that messages containing more than two speech acts (e.g., clearances, instructions, request, or their combination) can lead to radio frequency congestion and the production of readback errors. (6) Develop and implement one universally accepted and agreed upon standard accent, dialect, speech rate, cadence, and pronunciation for aviation telephony. Inherent differences between speakers' and listeners' languages impede decoding ATC Communication. (7) Develop aviation training courses that address plain language proficiency, cultural differences, and appropriate phraseology to declare an emergency, indicate the degree of emergency, assisted handling requests, and assistance during unexpected or unusual situations or events. (8) Adopt standardized testing standards, instruments, and testing procedures by all of the ICAO member states. This would help assure better global communication standards. (9) Require at least a Level 4 Language Proficiency in

---

[1] The words, phrases, and clauses used to deliver clearance items, requests for information, issue reports, etc. and the order in which these communication elements appear in the transmission.

Common English, as defined by ICAO in Doc9835 for ATC personnel and crews involved in flight operations. ATC personnel and flight crews will/must demonstrate more than a limited understanding of the concepts of "emergency fuel," "minimum fuel," "expedited handling" because of low fuel and other safety-related phraseologies to retain their certification. Although the interviews and discussions focused on pilot and controller communications, some of the examples provided by the pilots also involved safety personnel (e.g., firefighters, emergency rescue technicians). Pilots and controllers must demonstrate the ability to extract and relay the words necessary to indicate the extent of the emergency, i.e., "declare an emergency" (Doc4444) in minimum fuel, emergency fuel, or requests for expedited handling. (10) Adopt minimum ICAO hardware/software standards that assure appropriate voice/data communication quality and coverage to enhance the safety of ATS operations now and into the future. ICAO member states should be encouraged to cooperate in upgrading their hardware, software, and communications equipment for the benefit of global aviation.

UNITED STATES AIRLINE TRANSPORT PILOT
INTERNATIONAL FLIGHT LANGUAGE EXPERIENCES

First learn the meaning of what you say, and then speak.
— Epictetus

INTRODUCTION

In a report released by the National Bureau of Economic Research (NBER, 2008), the United States economy has been in recession since December 2007. Since then, other countries have reported economic downturns, indicating the existence of a global recession. The U.S. is working diligently with other countries to limit its effects both within the U.S. and internationally. In light of this recession, the Federal Aviation Administration (FAA) updated its projections in the number of passengers arriving into, and departing from, the U.S. through the year 2025 (FAA 2008a). That report notes, "The worldwide recession drives international passengers down 0.9 percent in 2009, but a rebound in economic growth leads to a 4.2 percent growth in passengers in 2010. For the balance of the forecast period, stable worldwide economic growth leads to international passenger growth averaging 4.6 percent a year and totaling 310.0 million in 2025" (p35). As shown in Figure 1, the largest percentage of growth will involve the Asia/Pacific area, followed by the Latin America.

As the volume of U.S. and foreign flagship carriers increases, so too will the number of transmissions necessary to provide air traffic control (ATC) services. These services include clearances and instructions, as well as traffic and weather advisories, reports, and requests. Given that the present air-ground communications system is reaching pre-9/11 saturation levels during peak traffic periods, it is common for some controllers to send longer and more complex messages to reduce the number of times they need to communicate with individual aircraft (Prinzo, Hendrix, & Hendrix, 2006) and to use nonstandard phraseology to decrease the amount of time on frequency (e.g., go fast). The ability to quickly decode, understand, read back, and comply with these messages can be a problem for all pilots, especially those who are unfamiliar with how ATC services are delivered by controllers in a particular region.

Airline transport pilots (ATPs) who have English as their second or third language may have difficulty understanding local nuances and lengthy clearances delivered at rapid rates. Likewise, native English-speaking pilots may encounter difficulties understanding the English spoken by English-speaking controllers or by non-native speakers of English. Reports from Brazil (Associated Press, Feb. 19, 2007) in recent months have pointed increasingly at controller error as the leading likely cause of an accident involving a Legacy business jet and a Boeing 737 that resulted in the deaths of 154 people in 2006. Accident transcripts revealed that the business jet pilots apparently had trouble understanding the English spoken by the Brazilian controllers. On three separate occasions, they asked for clarification without receiving a satisfactory response. The final accident report issued by Centro de Investigação e Prevenção de Acidentes Aeronáuticos (CENIPA) and National Transportation Safety Board (NTSB) concur with each other on many of the basic facts and findings, but they disagree in their interpretations of these facts and offer different conclusions. Whereas
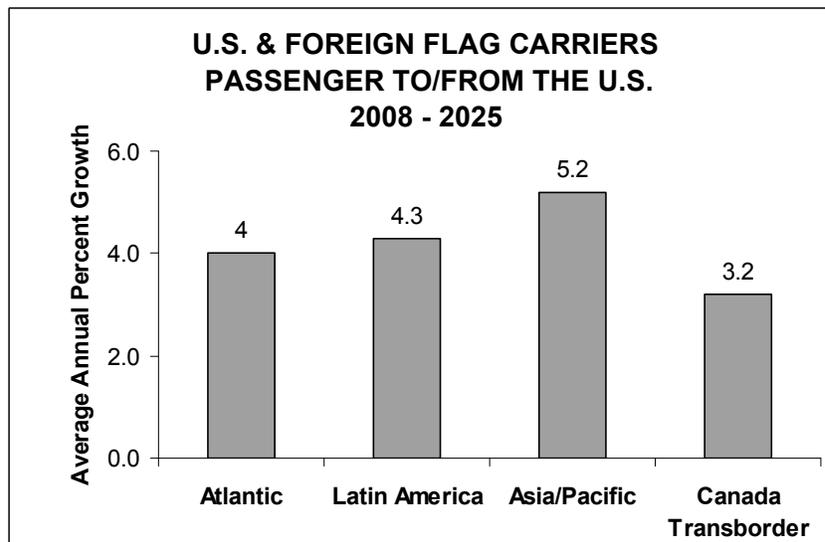

**U.S. & FOREIGN FLAG CARRIERS
PASSENGER TO/FROM THE U.S.
2008 - 2025**

Figure 1. Projected Average Annual Growth in Passengers

CENIPA attributes the accident to mistakes made by the pilots and controllers, NTSB places the fault upon the controllers and the ATC system. Appendix 1 of that report contains the following probable causes issued by NTSB (CENIPA, 2008).

> The evidence collected during this investigation strongly supports the conclusion that this accident was caused by N600XL and GLO1907 following ATC clearances which directed them to operate in opposite directions on the same airway at the same altitude resulting in a midair collision.

> The loss of effective air traffic control was not the result of a single error, but of a combination of numerous individual and institutional ATC factors, which reflected systemic shortcomings in emphasis on positive air traffic control concepts.

> Contributing to this accident was the undetected loss of functionality of the airborne collision avoidance system technology as a result of the inadvertent inactivation of the transponder on board N600XL.

> Further contributing to the accident was inadequate communication between ATC and the N600XL flight crew.

These findings are relevant to a recent content analysis of the communication between Thai controllers and local Thai pilots, native English (e.g., U.S., British) and non–native English- (e.g., Korean, Japanese) speaking pilots (Tiewtrakul, 2007). The results of that study found that the local Thai ATC accent affected pilot understanding. In particular, there were more communication problems (readback errors, requests for repeats, and no responses) among the non–native English pilots, followed by native English pilots, and the least problems occurred among the Thai/local pilots. Tiewtrakul concluded that the Thai controllers' native language may have influenced their English pronunciation to the point that non–native Thai-speaking pilots were at a disadvantage in understanding what was spoken.

Likewise, controllers may have difficulty understanding the English spoken by native and non-native English-speaking pilots. For example, Kanu Gohain, Director General of Civil Aviation (DCGA) in India, told reporters that in 2006 India 'sent home' between 20-25 pilots (mainly from the Commonwealth of Independent States and Eastern Europe) because their English posed safety concerns (Reuters, Feb. 15, 2007). The DGCA did not clear these foreign pilots to fly in India because they did not demonstrate proficiency in English on the oral exams.

A content analysis of U.S. ATC en route communications performed by Prinzo, Hendrix, and Hendrix (2008) revealed that when an aircraft was registered to a foreign airline with a language other than English as its primary or official language, not only did the pilots spend more time on the radio communicating with ATC, but also more transmissions were exchanged, and more communication problems were present within their transactions. In these situations, the pilots' English proficiency — especially their accents — often resulted in the controller not being able to completely understand what the pilot was attempting to say. Rarely did the U.S. controllers express difficulty understanding a native English-speaking pilot.

Lack of proficiency in the English language among pilots and controllers who are non-native English speakers has resulted in fatalities,[1] mishaps and unsafe acts. In response, the International Civil Aviation Organization (ICAO), an agency of the United Nations, published *Manual on the Implementation of ICAO Language Proficiency Requirements* (ICAO, 2004). The implementation of the ICAO language proficiency requirement was slated for March 2008.[2] Specifically, 'Aeroplane and helicopter pilots and those flight navigators who are required to use the radio aboard an aircraft shall demonstrate the ability to speak and understand the language used for radiotelephony communications.'[3] Similarly, 'Air traffic controllers and aeronautical station operators shall demonstrate the ability to speak and understand the language used for radiotelephony communications.'[4]

English language proficiency educational materials, training programs, and testing programs are being developed and implemented to meet the ICAO mandate. Clearly, the concern for aviation safety continues to be a global concern. Given that what is known about language-based communication problems is derived from accident, incident, and mishap reports, what is absent is an understanding of how prevalent these problems are during normal air traffic operations.

The available reports that describe operational communications between pilots and U.S. controllers were derived from voice tapes provided by tower (Cardosi, 1994; Burki-Cohen, 1995), terminal radar approach control (Cardosi, Brett, & Han, 1996; Prinzo, 1996), and air route traffic control centers (Cardosi, 1993). Unfortunately, the existing reports (written a decade ago) do not provide any indication as to the magnitude or severity of communication problems that involve non-native English-speaking pilots who fly international flagships into the U.S. or by U.S. pilots who fly to international destinations. Consequently, an operational shortfall exists in our understanding of international operational communications as it occurs within the National Airspace System (NAS), in foreign countries, and its perceived impact on safety by airline transport pilots.

Likewise, there is a lack of baseline data regarding the flight experiences of pilots who fly internationally. It comes as no surprise then, that research is needed to identify and fill the gaps in communications data that

---

[1] As an example, in 1990, Avianca Flight 51 was making its third approach into JFK Airport and failed to inform air traffic control they had a fuel emergency and crashed.

[2] In November 2007, the Assembly of ICAO drafted a resolution to precede Resolution A32-16 that would urge up to a 3-yr extension of the provisions in A32-16 and Article 40 of the Convention.

[3] Appendix A, Manual on the implementation of ICAO language proficiency requirements.

[4] Ibid.

would contribute to the understanding of some of the language issues, communication problems, and procedural differences airline transport pilots encounter when flying internationally. Also, as digital voice communications systems and their applications emerge, it is important to know which messages may present a problem for non-native English-speaking pilots.

Therefore, the purpose of this study was to identify language issues that can become barriers to efficient and effective communication between the airline transport pilots (one group of native English-speaking pilots, one group of non-native English-speaking pilots) and air traffic controllers (who may or may not be fluent in English). A total of 64 international airline transport pilots participated in small focus group meetings to discuss the types of communication problems they encounter during international flights. There were 48 pilots who flew for four U.S. air carriers and 16 pilots who flew for four foreign air carriers. The U.S. pilots were interviewed separately from the foreign pilots.

We attempted to preserve the richness and breadth of the information given during the interviews in a series of reports. The first report (Prinzo & Campbell, 2008) provided an analysis of the first two sections of the structured interview: 1) Background Information related to the recency of international flight experiences among the pilot-participants and 2) General/Preflight Preparation. It covered the U.S. pilots' responses and discussions of questions 1-23.

This second report provides a continuation of the analysis of the U.S. pilots' flight experiences during times when they experienced language issues that became a barrier to efficient and effective communication between themselves and air traffic control. It covers the pilots' responses and discussion for questions 24-30. These questions ask about 1) the frequency with which they experience problems related to word meanings, 2) problems related to how words are pronounced, 3) problems that affect them the most that are related to the differences in the word(s) used to describe clearances, instructions, advisories, and requests, 4) problems related to the same word(s) used to describe different actions, 5) problems related to accents or dialects, 6) the extent

to which nonstandard terminology was confusing, and 7) the extent to which they experienced language-related difficulties when programming their FMS to comply with ATC. When possible, the content was tabulated and presented in tables. Their verbal discussions are combined, condensed, edited, and presented as a narrative from the perspective of a hypothetical, albeit typical ATP-rated pilot.

RESULTS

Section 4: Word Meaning and Pronunciation (how words are spoken)

24. How often during a flight do you experience problems related to word meanings?

As shown in Table 1, 58% of the pilots reported they "rarely" experienced problems related to word meanings, while another 33% reported they "occasionally" experienced problems. Only 8% indicated they "frequently" experienced problems. Approximately 40% of the respondents provided examples of the types of problems they experienced.

Rarely Do I Experience Problems Related to Word Meanings Explanation

Of the 28 pilots who reported less than 10% of their interactions with controllers involved problems related to word meanings, 36% provided comments (written, oral, or both). Presented below is a compilation of their experiences.

Accent

For me, the three big-ticket items are: (1) transmissions going too fast; (2) transmissions being clipped; and (3) heavy accent being transmitted across the airwaves. It happens when we're trying to understand what we're supposed to be doing. I've had times when I've had to ask for a repeat four or five times; and we're in the cockpit listening intently and trying to, word-by-word, figure out what our departure is. But generally, it's because of accents, and it rarely happens. Maybe it's because I grew up in New York and heard a lot of eclectic voices, which allows me to pretty much understand what ATC wants.

Table 1. Frequency of Problems During Flights Resulting from Word Meanings.

Frequency of In-flight Problems Resulting from Word Meanings	Number of Pilots	Issues Discussed
Rarely (less than 10% of my interactions with controllers)	28	Accent; Pronunciation; Radio Technique; Speech Rate; Variability in Language Proficiency; Word Meanings
Occasionally (between 10-24% of my interactions with controllers)	16	Culture; Pronunciation; Radio; Speech Rate; Word Meanings
Frequently (between 25-74% of my interactions with controllers)	4	Pronunciation
Often (between 75-90% of my interactions with controllers)	0	
Without fail (more than 90% of my interactions with controllers)	0	

Pronunciation

As far as the pronunciation, it rarely is a problem. I know the words when they say them. I do have a problem with pronunciation, mostly in one country in Asia. When we're starting down, that's my danger zone. They'll say, "Cleared to so and so," and in the cockpit I will say, "Cleared to so and so" because I want the other pilots' opinions – "Is that what he really said, go to so and so?" It's hard sometimes for me to understand what fix we're supposed to go to. But once we've deciphered the word, rarely does the meaning call into question what you're supposed to do. The problem is in understanding what the word is.

Radio Technique

Transmissions that are clipped can change the whole meaning of a phrase.

Speech Rate

Well, with the word meanings, it's just a matter of the transmission going too fast. A lot of the real hard stuff is down in Central and South America, and I speak the language so it's not greatly different. Every now and then, I'm not sure what he's talking about if I'm not looking at the guide. It's hard to understand because to me they talk fast.

Variability in Language Proficiency

It's interesting that in one city in South America, it seems that the clearance delivery person is the most difficult person of everyone, at least in my experience down there, to understand. It's not the tower controller or the ground controller or the approach or departure person. We wonder why.

Word Meaning

Take the whole MAYDAY[5] thing that is pounded into us. I don't think that an emergency means the same thing to some foreign controllers as it does to me. We're going to say MAYDAY, and use the ICAO phraseology. It may just be that it's a word spoken that another person doesn't understand. I've never had a situation where I say one thing, and they know exactly what I said, and yet they think I'm going to do something completely different.

There was a problem when a controller said, "Line up and wait after the arriving aircraft." That's not used at all domestically in the States. Lufthansa is on final approach and the controller clears us to line up and wait after the landing airplane. You'd better make sure you hear *after the landing airplane*; because, if all you hear is *line up and wait*, you've just taxied out in front of Lufthansa. In the U.S., the arriving airplane is on the ground before you're cleared into position using the phrase *position and hold*.

Occasionally I Experience Problems Related to Word Meanings Explanation

Sixteen respondents reported they occasionally experience problems related to word meanings. Approximately 62% of them provided comments (written and interview) that were edited, compiled, grouped, and are presented alphabetically.

Culture

Declaring an emergency in one country in South America doesn't get the adrenaline flowing in them like it does us, even if we use the ICAO code word.

Pronunciation

In Europe and South and Central American, pronunciation is much more of an issue for me. What will happen is that I will understand completely or not at all. I think the controllers in one country in Asia are very predictable once my ears get used to their pronunciation of "R's" and "L's." I occasionally have to ask them to "say again" for the word meaning, but it's not a biggie.

And sometimes, when I used to fly the triple seven in South America, if we had a Spanish speaker onboard, he could almost always pick up what they were saying the first time because his ear was tuned to the rolling R's and any other thing that we weren't tuned to. By the time we came back, we would be picking it up too. But the person's pronunciation, diction and enunciation, the way they do it, along with the speaking rate, make understanding more difficult for me.

Going to one city in South America, one night they wanted us to hold at, and his words were "Tango Romeo Mike;"[6] and we couldn't find "Tango Romeo Mike" anywhere. I think it is the THERMAL VOR to be honest with you; but we put it in there[7] and it's thousands of miles away. And so we kept asking him, "Where do you want us to hold?" and he kept saying, "Tango Romeo Mike." We finally gave up after six tries. We told the controller, "We'll go to a place called ROMAX and hold." The next morning, we asked the on-duty controller what "Tango Romeo Mike" was, and he goes, "Oh that's the TORIM intersection – That's T, O, R, I, M." That is probably the only time I had a problem with something that was said that turned out to actually be a problem. So it does happen.

Radio

Part of the issue is with the equipment the other person's using – bad radios. That compounds a problem.

Speech Rate

To me, some controllers speak to fast and I'll miss some things. My perception is that they expect us

---

[5] Implied lack of understanding the meaning of MAYDAY (distress).

[6] It may be that the controller used the fix name TORIM, that sounded like T, R, M (instead of the phonetic Tango Romeo Mike).

[7] Aircraft Flight Management System (FMS).

Table 2. Frequency of Problems During Flights Resulting From Pronunciation.

Frequency of In-flight Problems Resulting From Pronunciation	Number of Pilots	Issues Discussed
Rarely (less than 10% of my interactions with controllers)	10	Culture; Pronunciation
Occasionally (between 10-24% of my interactions with controllers)	20	Pronunciation; Radio
Frequently (between 25-74% of my interactions with controllers)	15	Accent; Culture; Pronunciation
Often (between 75-90% of my interactions with controllers)	3	Pronunciation
Without fail (more than 90% of my interactions with controllers)	0	

to know exactly what their plan is because of how they do it every day. But, I get up there once every two years. I can be farther behind in the Northeast Corridor than I can be in one city in Central America.

Word Meaning

In the approach clearances, my experience has been that *cleared approach* means one thing in one area and something else in another area. Some of the differences are subtle nuances, but they exist. Even going to another country in North America, there are some small differences. It may be that ATC uses the terminology *radar identify* in one area and *radar contact* in another.

In one city in South America, you're *cleared to line up and wait after the arriving airline*. We watch the airplane touching down, as the guy told us this. That is not the arriving airplane. It's the airplane out there on a nine-mile final. How do we know which airplane the controller is referring to? Through experience, we learn to ask, "You mean I can go on the runway after the guy who just landed?" And they'll say, "Oh no, no, no, after the one out there on final," which we can't see because of the clouds.

Frequently, I Experience Problems Related to Word Meanings Explanation

Four respondents reported that they frequently experience problems related to word meanings. Although all of these respondents made comments, one did not fully understand the question and reported that he experienced problems more frequently because he doesn't fly as many trips. For the three remaining pilots, their comments from both the written and interview portions of the questionnaire were edited, compiled, and are presented below.

Pronunciation

It is a problem for me in one country in Asia, while in Europe there are definite, different dialects that can really cause us to say, "What was that he's saying?" Words that are similar can be confusing. I can look at my chart and know what I'm expecting when I'm told, "You're cleared direct Patoka." But, I have to verify that he means *proceed present position direct Patoka*; and sometimes there are several waypoints that are close to each other that sound very similar. In some cases, I have to ask multiple times to make sure that we're going to Onvost and not Harvest, or was that Léon or Dijon? The same problem happened

in the U.S. a couple of years ago with the arrivals. The names had to be changed because they sounded too similar on different corner posts.

25. How often during a flight do you experience problems related to how words are pronounced?

Of the 48 U.S. pilots who participated in the interviews, 21% rarely experienced problems with how words were pronounced, 42% occasionally experienced problems, 31% frequently experienced problems, and 6% often experienced problems. The distribution of their response selections is presented in Table 2, along with a list of the issues they discussed. Fifty-six percent provided comments.

Rarely Do I Experience Problems Resulting From How Words are Pronounced

Ten pilots reported that they rarely experience problems related to how words were pronounced. Sixty percent provided comments from the written and interview portions of the questionnaire.

Culture

I only have trouble understanding the controllers in one country in Europe. My experience has been that they expect us to understand their dialect and know what fixes they're talking about, even though the names are pronounced differently than I expect. To me they speak quickly, and they're going from their language to speaking English, and it's kind of tough for me to mesh.

Pronunciation

To an extent, the pronunciation detracts from the primary task. The first experience with pronunciation problems might be an initial inconvenience to try to figure out the word; and I might have to ask them a couple of times to repeat what was said. Or, we go to the FMS to find it and it'll be another transmission to verify we got the right one. I may go back to spelling phonetically to make sure that we have the right understanding. Sometimes I get the feeling that because I couldn't understand what was said, they get disgusted. But we usually end up getting what they want us to do.

It would be ideal, if we got our clearance via ACARS;[8] it's really nice – the clearance just pops

---
[8] Aircraft Communications Addressing and Reporting System.

up. I'd say the majority of the time – 90% plus – overseas we get our clearance via the radio. And depending where we are, it can be a challenge. If we can understand the words that are said in one city in Asia, we usually understand the clearance.

Occasionally I Experience Problems Resulting From How Words Are Pronounced Explanation

Twenty respondents reported that they occasionally experience problems related to how words are pronounced. Of these pilots, 55% provided comments that were edited, compiled, and grouped alphabetically according to common themes.

Pronunciation

The difficulty I have experienced is increased by accent, dialect and the way it's presented. The most common examples would be the names of intersections. The controller will say it, and I look down and try to find the routing, I read all the words to try to figure out what word it was that was just said – the position that we were cleared to.

It seems that for me reading, hearing, and pronouncing French words and/or names are very different from how the appear in our English. I end up asking for verification after every clearance. Many French controllers seem to know that we don't understand their English well; so, they'll say the word, and then spell it out phonetically. I had one, just coming out of Tel Aviv yesterday. He cleared me to [VESAN]. I said, "Where?" He said, "VESAN, Victor Echo Sierra Alpha November." OK, it's VESAN; I see that on the map.

But for me, again, I have trouble with pronunciation in Southeast Asia – Korea, Vietnam, and sometimes Japan – accents are troublesome. For me, the Asian-English is not very clear, so when words are clipped, or run together, it becomes a problem. My perception is that when I talk with an Asian controller, all the words will be put together; and it's very difficult for me to determine just what was said. It's a very common thing throughout Asia.

Japan tends to have some very excellent English-speaking controllers. When I find one that isn't, it falls right into the category of very difficult to understand. Many male Japanese controllers add an "Oh" to a phrase. Our call sign might be [Airline name] eight four six and it becomes [Airline name] eight Oh four six; and unless my ears are tuned in to that, I'm going to miss the call. Also, when Japanese controllers say the number "seven" I just don't hear it very clearly. I'm not quite sure what I heard.

Radio

The signal quality, the quality of the English being spoken, whether it's an accent or just dialect – and then, I would also chalk up part of it to hearing

issues. As I'm getting older,[9] I'm beginning to have a difficult time understanding some Asian controllers who have very high, nasally voices. I do know that I have partial hearing loss in certain frequencies. Sometimes it's difficult to determine what word was said.

I have more of a problem with the quality of the radios flying the Caribbean and South America, than I do understanding the words. We just can't understand anything they're saying, not because of the way they talk but because it doesn't get to the airplane very well. I don't know if it's more static or just poor quality. It [sounds] like it's coming through a wire between two cans – some of it is really, really bad.

Frequently I Experience Problems Resulting From How Words Are Pronounced Explanation

Fifteen respondents reported that they frequently experienced problems related to how words are pronounced. Seventy-three percent provided additional information that was arranged by common topics.

Accent

I find it very difficult hearing what controllers are saying to me in a Spanish and occasionally French accent. I have to stop what I'm doing, look at the chart, and make sure that the fix they name is the one I want to go to. I have to remember that English may be their second language and I have to understand their accents when they speak English.

You ask is it more than just the language, is it the phraseology and being unfamiliar with the phraseology? It's also being unfamiliar with the middle accents. The first part of the word might be emphasized and the last part of the word faded out; they pronounce it differently than we do.

Culture

I think the French are very proud of their language, and rightfully so. When we are cleared to a position or a waypoint, the names are pronounced in French as if delivered to a French pilot. If it is an off-airways waypoint, we might not know where we're cleared to. So, we need to look at our chart and have a good idea where the controller is sending us, so we can interpret what we hear correctly. Otherwise, we might have to ask for a repeat and he will spell it phonetically.

And I want to explain that when we experience problems, it's not that this has necessarily caused me to make a wrong turn or do something incorrectly; the problem that I feel it has caused is the communication and the deciphering of what it is exactly that they want us to do, which takes a little bit of time and puts us behind the aircraft. On most

---

[9] Presbycusis is a loss of hearing ability due to aging. Higher frequencies are more susceptible to hearing loss than lower frequencies. It occurs more frequently among older men.

of these flights, there is some kind of verbal interaction that breaks down.

Pronunciation

I have trouble understanding what is said – especially when European controllers pronounce fixes and waypoints. I just don't hear the subtle differences and it causes the names of fixes to sound similar to me. I have to ask for verification, like one out of every three or four transmissions, to make sure I understand exactly what they want me to do.

I also have trouble with accents and pronunciation in South America. I think my problem understanding Brazilians is the influence of the Portuguese language. In Brazil and Chile, the letter "E" is added to words and it takes some getting used to. In Peru and Ecuador, it's difficult for me to understand everything spoken in English with a Spanish accent particularly when the letter "V" is pronounced like our letter "B." "Victor" is "Bictor."

In the Caribbean, the Jamaican influence is apparent and I experience a language barrier when communicating with controllers there; and then, Havana's pretty straightforward. Haiti can be a little problematic for me at times – Port au Prince, and the French influence into the Haitian culture so that's a double whammy.

Some other areas I've noticed are Southeast Asia – Korea, Vietnam, China, and occasionally Japan. Japan tends to have some excellent English-speaking controllers.

Often I Experience Problems Resulting From How Words Are Pronounced Explanation

Three respondents reported that they often experience problems that were related to how words are pronounced. Comments from the written and interview portions of the questionnaire are included below.

Pronunciation

Since native English speakers emphasize the first syllable and Hispanic speakers emphasize the second syllable in their words, it causes me to have to shift gears. For English-speaking and -hearing people, there are many fixes that sound and look very similar to us but to them, are different. I can't figure out exactly what they're saying. I feel lucky if I understand what is said, but I cringe when I hear my call sign. I'm like, "I hope I can understand this time" – I might let down the guys in the cockpit because it seems like I always have trouble getting it the first time.

When I'm in Europe, around Sicily and some Southern parts of Italy, it gets pretty colorful. I've found the pronunciation can be varied and emotional.

26. What problems affect you most related to differences in the word(s) used to describe a clearance, instruction, advisory, or request? Please list some examples.

The pilot responses included differences in phrases, as well as words. Forty-three of them provided examples and comments that were organized according to reoccurring themes: Communications, Procedural Ambiguities, Training and Differences Between U.S. and ICAO/International Flights, and Word Meaning in Different Parts of the World.

Communications

We identified seven different issues that are reported repeatedly throughout all discussions. They are presented in Table 3 and discussed separately.

Table 3. Communications Issues Identified by U.S. ATP Pilots.

Communication Issues
Call Signs
Line Up and Wait
Non-Routine Requests
Pronunciation
Radio
Speech Rate
The Number of Instructions
Transfer of Communications and Conditional Clearances

Call Signs

A lot of times, in places like China, India, or Japan, if the numbers are the same or similar, controllers use phonetics and not the name of our company. For example, "Continental ninety-nine" was "Charlie Oscar Alpha" and before, when I was going over Turkey, they would use "Continental Airlines Charlie Oscar Alpha" versus "Continental." I'm tuned to hearing "Continental" not "Charlie Oscar Alpha."

Another thing is the use of *heavy*. The way controllers are expected to say call signs is definitely a problem. Every country has its own way of doing it – the FAA, only on the first transmission (except if the controller doesn't want to respond that we're a heavy jet). With the Canadians, it is every transmission.

Line Up and Wait

Line up and wait is an ICAO procedure,[10] while the U.S. procedure is *position and hold*.[11] What I'm referring to is differences in words, not differences in what they want us to do. In Santo Domingo, we are cleared to "line up and wait" or "line up and wait after arrival Airbus." If we ask, "Do you mean after the aircraft that just passed?" they say "No, no, after the one [that is] six miles out." *Line up and wait* is a big problem. We pretty much ironed that out. I just wish every country said it the same way.

Non-Routine Request

I've found that the pronunciation of off-route

---

[10] Line up and wait is a grouping of ICAO phraseologies (3.4.11).
[11] U.S. phraseology (ATP 7110, par. 3-9-4).

waypoints, instructions, and explanation of unexpected events is difficult to understand from the cockpit to the controller and from the controller to the cockpit. In other words, if I call up Rome and ask for a different routing into Fiumicino,[12] because of weather or volcanic activity – it's very difficult for him to understand what I'm saying. Conversely, when he comes back and gives me a routing that I'm not anticipating I must spend time deciphering and analyzing what he said while looking for it as we're traveling at 250 miles an hour. So, both of us have trouble if it's outside the spectrum of what we're anticipating to hear.

Pronunciation

The pronunciations of words that are different from what I have been hearing are difficult for me to understand. Sometimes I won't catch the numbers in a frequency change, the name of a fix, or off-route waypoints because they might be pronounced differently. I've found that the arrival fixes, "MELON" and "AIRES," spoken by some Asian controllers in English can be very difficult for me to decipher.

There are nearly 100 different SIDs[13]/Transitions and STARs[14]/Transitions at Charles De Gaulle Airport (CDG) often distinguishable by only one letter or number. Even though I've been there many times, sometimes I have to re-verify what ATC tells me because I have a difficult time hearing the difference. I think it's more familiarity and frequency of flying into an area that overcomes the problems on understanding the pronunciation and accent. I can lose my experience level by not flying there often enough.

Speech Rate

My experience has been that when controllers get tongue-tied and frustrated, they start speaking very fast and we know we're in trouble. When that happens, I ask them to just slow down a little bit for me. Like a band, if the singer can't sing, the band just plays really loud, and no one knows the difference.

The Number of Instructions

I expect, and can handle easily, three instructions. And what kind of chaps me is, many times over in one Asian country, I get a heading, turn, descent, and frequency change. We're always heading west and the controller says, "Two five zero two six zero two seven zero." Heading 250 and slow to 260; or was it turn to 260 and slow to 250? So to me, it's the amount of information given; it's not a problem with differences in words.

Transfer of Communications and Conditional Clearances

I have the most problems with frequency changes. A controller may give me a frequency to change over to and has enough of an accent or speaks too rapidly so I can't catch all of it. You know, 33 or 23, and now we have the additional 23.5 frequencies; and so I think, "What was that that he wanted exactly?" I mean, "Say again the frequency." Just yesterday, the same thing happened on a flight.

When I get a conditional clearance like, "Cleared for the ILS[15] at the marker contact tower" why can't I contact the tower now? Why tell me to do something five minutes from now in a very high workload environment? I'm liable to forget it 99% of the time because there's no buzzer to remind us to do that five minutes from now. I would be shocked if landing without a clearance was not preceded by some conditional clearance, because when you tell me to do something, I do it now. I don't wait five to ten minutes.

Procedural Ambiguities

Presented in Table 4 is a list of the pilots' issues related to the procedural ambiguities they experienced. These problems are all related to the differences in the words that describe a clearance, instruction, advisory, or request speech act[16] and when they are used.

Table 4. List of Procedural Ambiguities.

Procedural Ambiguities due to Word Usage
Altitude Assignment
High Speed
Pre-Departure Clearance (PDC)
Restricted or Unrestricted Climb
Runway Separation
Transition Level

Altitude Assignments

Altitude assignments vary with the country and controller. Words such as *climb and maintain* and *maintain* are used in a different context by foreign controllers. It is common for them to say *level two five*, and in the U.S., the controllers always say *flight level* [e.g., flight level two five zero].

High Speed

High speed means going more than 250 knots below 10,000 feet, and that's generally over the water; so, we are technically in approach airspace. Sometimes on departure I hear, "cleared high speed." Does that mean I can go up to the aircraft limit speed at low altitude? Or, am I restricted to the

---

maneuvering speed 283 knots as opposed to 360 knots? These are some of the questions in my mind.

Pre-Departure Clearance (PDC)

The real questions are, who do I call, and how far can I expect them to clear me? Do I call clearance delivery? Do I call tower? Do I call approach? Do I put in a request and have them call me back?

The biggest thing I've seen in Europe is it's regimented. They've got an apron, a ramp, a company frequency and they want us, at particular times, to step through those particular frequencies in a particular sequence for specific purposes. If we don't do it that way, it messes up the whole wheel turning. We take two gears off the machine and it's going to strip itself if we don't start at the beginning and work through the process.

Some parts of South America are very good about providing the clearance or ground control on the pre-clearance frequencies. But some aren't. In one country in South America, we get the clearance request going, then we get *pushback engine start* clearance; and when we're on the taxi out, once they see us pointed toward the runway, they know that we're, no kidding, going to go flying. It's almost like, "Oh, he's really serious." Now they start reading it to us.

In some cases, we hear folks on another frequency reporting overhead, and doing an arc back in and things like that; it's nice to be able to sit there and think, "Okay, I've got one guy landing, one guy reporting in, and one guy up here." I don't get that luxury if I have to copy a clearance, and get to the end of the runway, complete a takeoff checklist, and then start down a runway. Once they get us on a runway, they want us out of there.

And other places, getting the clearance on taxi out is difficult for me because it makes me that much more distracted when they're trying to get us to a particular end of a runway, or to take a particular route. In some cases, they'll clear us to our taxi to position, and holding position, for runway "humpty-cratts." As we're taxiing out I look up, and the runway is completely clear; I start to copy the clearance and look back up, and here comes this airplane back out, just as Ground is saying, "Hold position for pushing back seven six seven," or something like that. And they're allowing somebody else to come out in front of us.

Restricted or Unrestricted Climb

Restricted or unrestricted climb is one of those differences I find in other countries. In Santo Domingo, we are cleared to filed altitude then given initial level off, "cleared to climb flight level one two zero," as opposed to *expect altitude*. They still require pilots to make the restrictions on whatever SID[17] that they're on. "Cleared high-speed climb," [brings about the

same concerns] when Tel Aviv clears you. I have the same questions with the restrictions on the arrival. Canada uses something else.

Runway Separation

Runway separation is scary at some places. We could be at 500 feet and hear "you're cleared to land." You see them[18] just pulling off but not clear. Do they mean, "You're cleared to land now?" A lot of times in one city in Asia, we'll see that. I don't find it very comfortable. I want to ask, but we're afraid that he's going to yell at us when I ask, "Have you forgotten about us?" But I've seen it below 500 feet as well. All the time I'm sitting there thinking, "Get ready for a go-around because that aircraft will not clear before I touch down." Other than the U.S., when we switch over to tower we're told to *continue*.

In the U.S., we can be number five and they'll clear us to land. But we won't be cleared to land until the runway is positively cleared and vacant for us alone. It's something that's peculiar to the U.S. I'm surprised I don't know what a U.S. controller has to have to clear us to land, even though we're number four or five in line. Of course, he can always cancel our landing clearance. In other parts of the world – we'll get "continue" until the runway's all ours. That's one difference, and I prefer the U.S.

In Santo Domingo, we are cleared "line up and wait" or "line up and wait after arrival Airbus." A *line up and wait after arrival aircraft* clearance to me is a bogus clearance. Why not wait until the arriving – whatever it is – has landed, then clear me to *line up and wait*. In a broad sense, conditional clearances have always bothered me.

Sometimes the verbiage they use like "you're not cleared for takeoff," "you're not cleared for landing," can be misinterpreted very easily. I realize that they're translating from their language to English, but they're thinking in their language; and if we step up to the bar a little bit here, I think it's going to make it a lot safer. In the U.S., we never hear *not cleared for takeoff* or *not cleared for landing*. But it's commonplace in Central and South America, and Mexico.

Transition Level

Transition level is assigned by ATC. When they clear us below what we think their transition level will be, I always ask them, "What is the transition level?" There needs to be an easier way to handle the transition levels.

In the U.S., everything below 18,000 is reported in *thousand feet*, and in Europe everything above 5,000 or 6,000 or whatever is reported in *flight level*, for example, "flight level five zero." In a romance language, *transition level* is said as *level of transition*. So when I ask them, "What's the transition level?" they don't get it even though the words are

---

[17] Standard Instrument Departure.

[18] Aircraft on the runway.

the same. But when I ask in Portuguese or Spanish, then they get it completely.

It is very frustrating switching from 298, to 1013, to a local altimeter. In one South American city, 6,000 feet is the transition altitude. So the transition level is above that at some point. If I ask what the transition level is in English, they say, "Yeah, you're cleared 500 feet." Although it doesn't vary by more than a few hundred feet, the point is we want to be sure that we don't leave the standard Pressure Altitude of 1013 hPa[19]/29.92 InHg[20] before it's time.

When you're saying the transition level at 6,000 feet, they just told us to maintain 6,000, and, "Wait a minute, you just told me the transition level's at six zero." Am I flying with pressure set at 1013 hPa, or what do you want me to set? We have a high barometer out there like 3020 InHg, so that's a pretty big discrepancy in altitude (about 256 feet) – especially at the lower altitude, where everybody's flying within 1,000 feet of each other, or whatever.

Beijing Approach will issue a clearance to descend to an altitude, for example, 4,000 meters, and then they'll add the words *on standard*. And it took me the longest time to figure out what *on standard* meant. And what he was doing, because the transition level may vary, he was adding that to say, "I don't want you to change to local altimeter here." But that's something peculiar to Beijing; I don't even think it's written anywhere, but they use it. In Santos, they've started throwing that on a regular basis.

Training and Differences Between U.S. and ICAO/International Flights

There were two over-reaching issues the pilots discussed in response to interviewer questions regarding attaining a desired comfort level for international flights. One issue pertained to training and the other to differences between the U.S. and ICAO/Foreign terminology and phraseology.

Training

I don't recall specifically training in ICAO terminology. We were thrust into the environment and learned it as we went along. We learned from "the school of hard knocks." Give international pilots a half-day class in what ICAO terminology means. For example, *maintain radar heading* means *fly heading to one eight zero*, or to fly our assigned or present heading.

For new crews going into a foreign country, training is a must. There are several things we get before going south – speed control and things like the 15,000-foot restriction. On the charts in Mexico, it talks about 200 knots when we're 10,000 feet AGL[21] or below. So flying into Mexico City, we're used to 250 knots at 17,000 feet; whereas, usually here in the U.S., we're used to it at 10,000 feet. These are

little things that we have to try to read through the charts multiple times.

When we're within 30 miles, below 10,000 feet above the airport, we're supposed to be at 250 knots. When we're at 17,000 feet and slowing down, I'm finding out that I have to wait awhile to make sure that my speed is slow enough, if I need to put the slats out that I'm still high enough that I may have a mach number that's almost up to the point where I can't get them out. So there are other things you have to watch out for.

Modules

You were asking about the modules.[22] I think the modules are a great tool that absolutely needs to be provided. The modules are good for a review, but they don't replace a first time with the check airman, or if you haven't been down there in awhile. I think that's where our airline is trying to go to reduced manpower – not to send check airmen. The modules do not replace a check airman.

We used to have little booklets on the particular airports, like the type of modules that they've built for some of these airports – San Jose, Guadalajara, Mexico City. They used to give us these little informational books so check airmen could train new pilots. It was great stuff. But these modules are replacing that, and that's good. The modules are very good. There are some airports that I do not want to go into the first time by myself.

Check Rides

Our airlines still requires a check airman on certain airports. But they've relieved some of the necessity for a check airman on a first flight into certain other airports. That's probably not necessarily evil; we may not need it for every airport. For ones that are really tough – they still require one. I don't see them taking that away. If they did, I'd raise a red flag.

Check airmen are needed because of the geography, procedures, and communications. St. Thomas is in the middle of a bunch of mountains, and its approach is very steep. It has a short runway, and there's a mountain at the end. Guatemala has a short, slick runway with cliffs on each end.

As far as I know, Mexico City is the only place left in Mexico that requires a check airman on the first flight. There are pilots that will not bid Mexico City. It's like going out to New York or La Guardia; it demands your full attention. There is very little room for error, there are many ways to mess up, and it's just that you have to be careful. The airport elevation is over 7,300 feet. When intercepting the ILS we may get or are warned that we may get side-stepped to the other runway; there are high-speed turns; we're almost at the tire limit speed for takeoff and landing.

---

[19] Hectopascal - a unit of the metric system, which is the same as millibar. (Used Internationally)
[20] Inches of mercury (U.S. standard).
[21] Above ground level.

[22] The modules are "computer based training" that teach pilots local differences and procedures about a particular city before ever leaving the U.S.

Differences Between the U.S. and ICAO/International Terminology/Phraseology

Different theaters use different words for the same thing, or at least their pronunciation is different. The difference is between our terms and the rest of the world.

The United States does not subscribe to ICAO terminologies, internally here. For instance, I hear foreign pilots having problems coming to New York, all the time. They're used to ICAO, and they don't get that here; they get Common English.

Sometimes verbiage controllers' use like, *you're not cleared for takeoff* or *you're not cleared for landing* is strange. That type of thing can be misinterpreted very easily. I realize that they're translating from their language to English; but they're thinking in their language, and if we step up the bar a little bit here, I think it's going to make it a lot safer. Then I think we're definitely on the right track.

In the U.S., you never hear *not cleared for take-off* or *not cleared for landing*, which could easily be confused with *cleared for takeoff*, or *cleared to land*. In the States, if ATC wants us to get on a runway and get ready to go, *its position and hold*; whereas in Australia and Europe, it's *line up and wait*. We have to adapt a little bit, but we can usually understand; and I think they have to adapt to some of our way of saying things. A *cleared direct [FIX]* may mean *cleared direct via flight plan route* in foreign countries.

I think the bulk of this came from training in the U.S., and our ICAO compliance has never been very good in the first place. And we're looking at it from the perspective of where we came from, and thinking they're nonstandard, but the fact of the matter is we were nonstandard all along – both pilots and controllers.

Also, this deal about *holding position*, well it's always been that way. If we had used ICAO terminology in the first place, we wouldn't have had years of experience knowing what we expect. *Cleared into position and hold* means what we know it to mean; but using the same words in a different order makes it mean [something] entirely different in ICAO standards. So that's why I say, it's to their credit that they have actually been a lot more standard in areas than we have been. And that's what we're citing, as though they're messing us up, but it's really us that's messed up in our comprehension. Oh yeah. There's that "Americanism," if you want to call it that. We have an U.S. ATC system, which we all grew up in, and the minute we went international, we adapted, and so forth.

The word *clearance* is used quite often. We get *clearance to push; taxi clearance*, maybe an apron, a ramp, a company, a ground free; and an *ATC clearance* with many different interpretations.

It seems to me that few controllers seem to understand what is expected with distress calls. I had an emergency condition in one Asian country where we had to shut an engine down on the triple;[23] and their handling of that emergency condition – they didn't quite understand that everything was under control. And every time we went to a new controller, he wanted to do everything for us; and we're trying to calm him down and he's getting more excited.

Another example is *minimum fuel* versus *emergency fuel*. Our FARs[24] provide a very clear definition of emergency fuel. My experience in the Asian countries is that they have no concept of *emergency fuel*, *minimum fuel* and *expedited handling* because we are getting short of fuel. We avoid trying to get too descriptive, because they're not going to be able to follow what we're saying.

Word Meaning in Different Parts of the World

Presented in Table 5 are some examples pilots gave of words and phrases they thought had different meanings from country-to-country and from controller-to-controller. The first three are general statements. We attempted to arrange the remaining 11 according to phase of flight. Some of these words and phrases were discussed during the small focus group meetings.

27. **There are problems related to the same word(s) used to describe different actions. Just to get you thinking, consider the difference between "hold point" used in the air versus "hold point" used on the ground or "taxi into position and hold" versus "line up and wait." Can you think of any other examples? Please list a few.**

Of the 48 pilots, 62% cited examples of problems related to the same word(s) used to describe different actions, and different word(s) used to describe the same action. As shown in Table 6, their examples reside within four different themes: Communication Problems, Same Words Used to Describe Different Actions and Different Words Used to Describe Same Actions, The Development of an ATC System, and Words/Phrases That May Cause Problems.

Communication Problems
Accent

The accents in Asia and the U.K. can be difficult to get. The accents in Scotland and Ireland, coupled with the worst radios in the aviation world, lead to misunderstandings.

Omission of Descriptive Word(s) to Identify Action

How many times have I been instructed to do something, and the controller does not say what he is referring to, like "maintain two five zero." Is that a speed, altitude, or heading? Last week, going down to the Caribbean, we were told to "maintain two five zero;" and we were at 33,000 feet, and we didn't know if that was knots or flight level.

---

[23] The Boeing 777 aircraft is referred to as the "triple."
[24] Federal Aviation Regulations.

Table 5. ATP Examples of Word and Phrase Disparities.

General Statements
Altitude assignment on a SID/STAR that requires you to make the restrictions stated on the SID/STAR.[a]
Maintain radar heading is used in some countries.
Phonetic spelling of fixes, words, and call signs before pronouncing the word is sometimes confusing.

Word and Phrase Disparities Presented by Phase of Flight
Line up and wait in foreign countries and *position hold* in the U.S.
You're not cleared for takeoff; *you're not cleared for landing*. In the U.S., you will never hear these phrases because they are easily confused with *cleared for takeoff* or *cleared to land*.
Cleared high speed while below altitude requiring 250k.[b]

Word and Phrase Disparities Presented by Phase of Flight (continued)
Direct route clearances mean direct to fix via flight plan route in foreign countries and *direct to fix* in the U.S.
Cleared via versus *cleared by* (procedure) is not a real problem. But when you're cleared via a procedure versus cleared by the procedure itself, what is the difference?[c]
Flight versus *flight level*, when assigned an altitude.
Cleared to climb level one two zero versus *flight level*.
We say, *transition level*; they say, *level of transition*.
Pilot's discretion descent has a different meaning in foreign countries.
Speed, heading, altitude, etc., without the word describing which is referred to, i.e., *maintain 250*.
Overshoot[d] is a term they used in Canada, England, and some other European countries. It means that you turn, that you stay on the localizer or something; it really means that they're getting ready to send you around.

[a] If you have a published crossing altitude, you are required to make that altitude as shown on the SID/STAR.
[b] This could occur during departure or arrival, but outside of the United States, such as in Canada. The U.S. has a mandatory limit of 250 KIAS below 10,000 ft.
[c] Usually the pilot would be cleared to the destination airport via a point depicted on, for example a STAR, and then the routing and altitudes depicted on that procedure.
[d] The respondents did not clarify their understanding of the meaning of the word.

Table 6. Themes and Examples of Problems Related to the Same Word Describing Different Actions.

Communication Problems	
Accent	
Omission of Descriptive Word(s) to Identify Action	
Pronunciation	
Same Words Used to Describe Different Actions and Different Words Used to Describe Same Actions	
Altitude Assignment	Cleared to Push
Altitude Restriction	Direct Route Clearance
Bearing Versus Radial	Overshoot
Cleared Approach	Pilot's Discretion
The Development of an ATC System	
Each Country/Controller Differs	
Pilot Training	
Words/Phrases That May Cause Problems	
ATC Waits for Pilot Request	Line Up and Wait After Aircraft of the Moment
Cleared to Offset vs. Deviate	Line Up and Wait Versus Position Hold
Follow Versus Follow Behind	Parking Bay
Holding Instructions	Unclear Taxi Instructions
Landing Instructions	Visual Approach Versus ILS Approach
Line Up and Take Off	

[a] Anchor words attach meaning to the numbers present in speech acts. For example, "degrees" is associated with heading, "knots" with speed, and "descend"/"climb" with altitude.
[b] The pilot is responsible for spacing.

We were pretty sure it wasn't a heading because it wasn't anywhere near to an appropriate heading. I think the controller is not speaking in his native tongue; and it just didn't come out complete when he utilized English. So, of course, we just asked to repeat; but that's what frequently happens – we end up asking for repeat clearances a lot.

Pronunciation

Flying over South America, we check in, and the controller might utter a few things, and it sounds like "maintain three nine zero," except he leaves out *maintain*. "I didn't know you were at three nine zero, I didn't tell you to maintain." So, it's the experience of knowing when I check on, this guy's probably going to say this, that, and the other thing.

[Kan trá ver se (Kán trav er se)] If it's a word that kind of rhymes with an English word, that's where the problem is. If I missed a word or two, I'll say to the guy next to me, "Did you catch that?" Even though he doesn't speak [the local language of the controller], he's been there enough that he goes, "Oh yeah, what he said was, we're going to transition over to Upper Bravo 3-19." The controller sounded like he said, "pour me a martini" or, I don't know what. It's the rhyming type things that aggravate me at times.

I hear something that may rhyme with a fix down route; and he's saying something that has no relevance to that at all, because his accent's so severe. It's not a wording thing; it goes back to the written thing. It doesn't seem like many of these places diverge from the actual written procedure; it's, did we get the right procedure in the first place? If I'm flying with a guy that's doing this all the time, he could help by saying that they're going to give us the, AVASU 3, with a deep, deep accent. If I'm listening for that, "Oh yeah, okay," now it's written down, everything's just fine.

And we're cleared for takeoff – No, we're not. We have to dig through the 42 pages of charts and gouges, [25] and, it's either the rhyming or the sounds are alike. If we're geared to listen for what we think were going to get, suddenly that guy's speaking pretty clear to us. If I go in there just completely blind, fat, dumb, and happy, he may be speaking English but his accent may be so severe to me that things that are pretty commonplace, just aren't coming through. And I'm thinking, "Now what did that sound like?" I encountered some real problems that could have become operational problems. We have to ask him again. I talk about it with my flight crew and say, "Better check on that." Okay, real common in the cockpit, "Did you get that?" We'll hear a transmission before saying "Roger," or ask to confirm it. Then say, "[Airline name] one two three is cleared to xyz flight level abc."

If they phonetically spell a three-letter fix, I get it real quick. If there's a particular departure, or arrival, that is a native language word, like "BUCOS" becomes "BULOS" – real simple – and if I hear about the "BUCOS Two Alpha," then I look in my charts and there's only a "BULOS One Charlie," and here's a "BUCOS Two Alpha," that can help differentiate [between what he said and what was heard].

When we get what I perceive to be rapid fire Brits who have such staccato to their voices at times, it's "What did he say?" Was it "South Hampton" or "South Park?" And the Scots, I get transfixed by their language. If I listen to what they say, and have an idea of what they're expected to say, it's very easy. But numbers and letters, and alphanumeric designation [that appear] at the end of a native language fix name, make it much easier to understand what they're trying to say.

Same Words Used to Describe Different Actions and Different Words Used to Describe Same Actions

During the discussions, pilots spent differing amounts of time talking about their flight experiences related to Altitude Assignment, Altitude Restriction, Bearing vs. Radial, Cleared Approach, Cleared to Push, Direct Route Clearance, Overshoot, and Pilot's Discretion.

Altitude Assignment

A phrase that comes to mind is *descend to*, rather than *descend and maintain*. Just the difference in phraseology can really catch us off guard, if we're not used to it.

Altitude Restriction

Altitude restrictions are different while on a procedure of being cleared both lateral and vertical, or just the lateral – so that's the biggest one while airborne. Clearances out of MEX[26] will give a high altitude, i.e., 350, as our original clearance. The actual hold down is much lower – we are expected to know this. I'm on a SID and the controller will say, "Climb and maintain flight level three five zero;" he doesn't mention any restrictions, but I am expected to meet them. I don't think there's a big problem in Europe or Japan. I think it is just as they expect – the three dimensions – not just the two dimensions.

Bearing Versus Radial

Sometime ago, I ran into a controller who uses *bearing* when *radial* is meant. That happened a long time ago, when the radio range and ADF[27] were used for navigation. We're talking about VOR[28] where we fly radials. The bearing and VOR don't go together. Bearing and ADF are together. I haven't heard it recently, but it was another example of a word that has two different meanings – what they said versus what they meant.

---

[25] A "gouge" is a collection of personal notes of a pilot that provides information about previous flights that serve as memory joggers.

[26] 3-Letter Identifier for Mexico City Airport.
[27] Automatic Direction Finder.
[28] VOR stands for very high frequency omnidirectional radio range.

Cleared Approach

France is the only country where I have run into this – *cleared to intercept loc*. It means, *cleared for approach*. It is kind of like no clearance; just proceed on.

Cleared to Push

In many places *clearance to push* means you're cleared to push and start engines. In other places, *clearance to push* is separate from *clearance to start*.

Direct Route Clearance

An example of a phrase or a word having two different meanings that I have run into is *cleared direct*. In Europe and Central and South America, it can mean direct to fix via flight plan route. In the U.S., it means direct track from present position to fix, and direct from one point to another.

Figure 2 depicts a flight plan route (Points A, B, C, D, and E) and a direct route (Point A, Point E). The solid line represents what an international controller may expect with a similar *cleared direct* clearance. This can lead to U.S. pilot uncertainty. The dotted line indicates the route that both the U.S. pilot and U.S. controller expect to be flown, when cleared "Point A direct Point E," eliminating the route over Points B, C, and D.

Overshoot

The term, *overshoot* is used in the U.K., Canada, and other places. They may direct us to *overshoot* versus *go around*. It means the same thing; it's a classic. I think that when you hear it the first time, it's going to be confusing.

You've heard the one about the L1011[29] pilot? It's an old war story. Supposedly, the L1011 was going into Gatwick and was told to overshoot because there was a guy on *position and hold*, or *line up and wait* there. He said, "Yeah it's no problem; I'll overshoot that guy and land just past him." I don't know if it's true or not. Most countries use *go around* or *cleared missed approach* in this situation.

Pilot's Discretion

I hear *plot's discretion*, and it means we can do things at our discretion. Or I hear, *descend when ready*. They mean the same, but are termed differently.

The Development of an ATC System

There were two underlying issues that surfaced. One issue involves the differences between how countries provide their air traffic control services and the other talks to training.

---
[29] Lockheed aircraft.
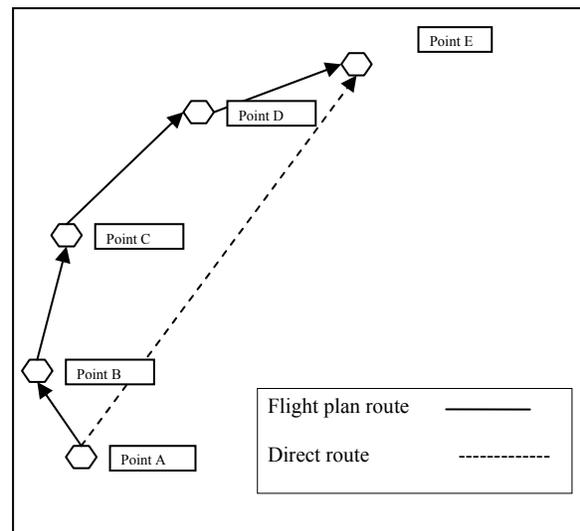
Figure 2. Incongruent Expectations Involving a Cleared Direct Clearance.

Each Country/Controller Differs

Where the controller learned English ATC telephony is a big thing. In Panama, it's as though we never left the United States. But in Colombia, it's a whole new world, same in Bogota, everywhere else in South America. It's just different.

When I fly to London, I know what I'm [probably] going to hear from the tower. I know anywhere else that I fly internationally I'm going to be told to "continue" by the tower before I can land. I've got to remember to get the landing clearance.

The *hold point* concept for taxiing is used more widely in Europe than in the U.S. I hear it in some places in Asia – like Hong Kong, where the controllers are British-trained.

The *speed limit point* is used in some places in Europe. It's another restriction not really used in the U.S. In the U.S., they will spell it out on a chart, "250 knots and 10,000 feet at this point." In the U.K. chart, they'll just have this little, shaded box, and we have got to go somewhere else in the chart to find out what that means. If we fly past that point at a high speed, we've violated our clearance. It's a bit of a problem, simply because they use it in other countries, and they don't use that concept here. I think it's probably more generic to the U.K. There are just some things on their charts that are less clear to us than they could be. I actually think, in this issue, they ought to be doing it the way we do it in the United States; just put it on the chart next to the box – how fast you want me to be going, and what altitude you want. If it's important, put it all in there. I've been up all night.

We need to talk about *hold points on the ground, hold points in the air, taxi into position and hold*. I wish everybody would use the same standard ICAO terminology. It would make things easier. Hold points in the air don't usually create a problem – unless

the instructions are nonstandard, like hold different from how you get to the fix: Northeast and it's not published on the charts. Sometimes, we don't know if we're supposed to hold or not; we're just cleared to a fix and nothing else.

We have all had this happen in France, "cleared to intercept loc" with no approach clearance. In France *cleared to intercept the loc*, is *cleared for approach*.

Pilot Training

Most of the examples in question 27, and the ones we have talked about, are illustrated in our Part 2, which is part of the FARs we carry in the airplane. If you study it and go to an international ground school, you should pick up on most of this. There's always something that is not quite in the same context, order, the radio is scratchy, their English language skills seem to be butchered, or their accent is so strong. But as far as the different phraseology, most of it is spelled out, if we look for it ahead of time.

At our airline, I know in the training that I've received, some of the more common terms like *overshoot* and *line up and wait*, are briefed extensively. When you first go there, it's not the first time you've heard these kinds of expressions.

Domestic guys are sent to Mexico City without international ground school. They may not be diligent enough to look in Part 2 and some of the other places to find the nuances of international flying, which are illustrated in international ground school. I am a domestic captain, but domestic as far as that's concerned includes Canada and at least most of Mexico. It doesn't include going across the Gulf to Cancun or something like that; but I'm still hitting Monterrey, Mexico City, Puerto Vallarta, Acapulco, and all of those places down there that's considered domestic flying. There are a lot of nuances that I really have to look at, and be familiar with, and experience raises my comfort level.

Words/Phrases That May Cause Problems

In this part of the interviews, the pilots discuss the words/phases that may lead to incorrect actions.

ATC Waits for Pilot Request

In one country in South America, on the descent, we check in and the controller may say, "You tell me when you want to start down, okay?" Basically, that's what they'll say. Go to other places and they won't say anything; they'll fly you overhead three five oh. In the States, controllers would never say, "Let me know when you want to start down." They say, "Descend pilot's discretion" or "Cross humpty at flight level so and so." Sometimes the South American way feels better.

Cleared to Offset Versus Deviate

When I ask for a deviation for weather, or something, the controller might say, "Cleared to offset."

It was really a clearance to deviate around the weather. It is a term that I'm aware of; but I'd like to hear what I'm used to in my comfort zone. If you're not experienced in the area you're flying, it could really mess you up.

Follow Versus Follow Behind

In one city in Europe, when I was given the clearance *cleared to follow behind* I challenged it. I said, "I understand that I am cleared to follow." That would have answered them in the affirmative; but it still did not convey the meaning of what he meant, and what I mistook the meaning to do – a most dangerous situation, I think.

Tower thinks you understand; you think you understand; you proceed according to that understanding; and you're wrong. I don't know how you would rectify that particular situation. If you have a question, and you think you might be wrong, be very careful. If you think you're right, you proceed on to the next problem, and file that one away. You don't even think about it anymore.

Holding Instructions

It is probable that the U.S. is more standard in issuing holding clearances than other places. We all know that going into the London area, if we're going to have to delay at a fix, it won't sound like it does here. In the London area, we'll be told to "take up the hold at Willow." It's not "enter this" or "enter that." Another controller may say, "Enter the hold." Well, that makes a little more sense; but the first time I heard "take up the hold," I had to stop and think for a second; and then I was distracted.

Nuances are as varied as individuals are. *Cleared the racetrack* is confusing. It's published on the charts – and I don't have a specific for it – but I don't think you'll see *racetrack* listed as an ICAO word, but you'll hear it in Britain occasionally. The intent is holding, in a racetrack [pattern] at this so and so waypoint.

There are places in Central and South America that are not using standard ICAO terminology in holding. In some cities, there's a fix on part of the approach, close to the initial approach, or at the initial approach point, and the controller will say, "Report that point outbound." It's along your route of flight, down into the approach and landing. What they really mean is, "Report that fix outbound and enter holding." If no one ever told me that, I could look at that and say, "I'll report it outbound as I continue on the approach." What it really means is you're going into holding. That's my clue to query and say, "Okay understand we're going to hold at this point." And they say, "Yes, OK," and so that's it.

Holding on the ground is different. I will hear *hold point* different ways – in a Runway 35 hold position, hold line, position hold, hold short, line up and wait – they all are understandable, if heard

at the right time. Last week, I was told to "take the runway." Now what the heck does that mean? *Hold short* is not one I particularly like. Which is better –*taxi into position and hold* or *line up and wait*? It would make things easier if everybody would use the same standard ICAO terminology.

Landing Instructions

In the U.S., we can be 15 miles out, behind several airplanes, check onto the tower frequency and told we're cleared to land. Not in other countries – when I contact the tower, I'm going to be told to *continue* before I can land. I've got to remember to get the landing clearance. They'll give it to you, but not until all the other airplanes in front of you have landed and are clear.

Line Up and Take Off

At least two times each I have gotten the clearance, "line up and takeoff Runway 9," or "Runway 2." That's totally bizarre. I know what *line up and wait* is, and I know what *takeoff* is; but I don't know what *line up and takeoff* is. I've always gotten clarification, "What do you want us to do exactly?" That is very nasty, and I wrote a report on that. I've only heard it in two places – in Cancun, Mexico and in Sao Paulo, Brazil.

Line Up and Wait After Aircraft of the Moment

My first time to England, I got the clearance, "I want you to line up and wait after the aircraft of the moment." What he told me to do was to take my position after the guy does a go-around. It's English, but not English I'm used to. I sat there and went, "Wow, if this happens in English, then I can just imagine what will happen in other countries."

Line Up and Wait Versus Position and Hold

Line up and wait versus *position and hold* can be confusing. They mean the same thing, but one is used in Europe, Central and South America, and the other in the U.S.

Visual Versus ILS Approach

Many times in the domestic, we're used to hearing, "Cleared for the visual approach." In some European countries, we're waiting for that clearance and will have to ask them specifically. Then they'll come back with, "Yes, you are cleared for the ILS runway" or whatever. There's ambiguity in a critical environment like that. We want to know that we are cleared for the approach.

Parking Bay

Parking bay is a term I only heard in China. When we're cleared to push back and start, they'll say, "Cleared to Parking Bay 15" – it's a spot. Unless you heard that before, you don't know what it means. They say, *parking bay*, or *papa bravo* sometimes. That's even worse. *Papa bravo* means nothing to me. In the States, they would say, "Spot 11."

Unclear Taxi Instructions

When taxi instructions are not in the expected sequence, as in "'Cleared to Runway 22" instead of "taxi to Runway 22 via Echo," I always ask, "What taxiway am I to go to?" I like taxi instructions that are given in the expected sequence. Of course, we're listening to instructions in their native language. Until we ask in English and we're expecting a certain taxi clearance, and then we get a different sequence. We have to ask, "What is the taxi limit?" "Can I go any route to Runway 22, or take the shortest route, or taxiway Echo?" In Canada, you can get, "Taxi to runway XX." The Canadian terminology of your clearance to taxi to a runway for departure does not have the same meaning as it does in the United States.

28. **Have you experienced problems related to how words are pronounced (e.g., accents or dialects)? Please explain.**

The respondents' compiled comments from the written and interview portions of the questionnaire are listed alphabetically in Table 7, followed by their abridged responses. In addition to the seven identified problems related to pronunciation, they also presented radio, technology, and unfamiliar words as associated problems.

Problems Related to How Words Are Pronounced
Accent

The biggest problem I have is rapid-fire talking with heavy accents transmitted over weak radios. When they're speaking English, more of my brain cells go into concentrating, pulling away from whatever else I might be doing in a multitask environment, like flying. For me, accents may be difficult in Scotland, France, most of South and Central America, New

Table 7. Problems Pilots Experienced Related to how Words are Pronounced.

Problems Related to How Words Are Pronounced	Associated Problems
Accent	Radio
Dialect	Technology
Pronunciation – Enunciation	Unfamiliar Words
Pronunciation of Fixes	
Pronouncing Phonetically	
Speech Rate	
Voice Pitch	

Zealand, China, and Japan. Sometimes, in Australia and Great Britain, it really depends. On the other hand, controllers I've dealt with in the Hong Kong or Singapore, seem easier to understand.

I understand a lot of the Asian language is so verbal; and they place a lot of their emphasis on the sound of the word and that can totally change the meaning. The Dutch are very good, usually. But, every once in a while, their words sound too guttural and the accent too heavy for me to understand what was said. When I call them up and ask for a repeat, they do it very well.

In South America, it's very common that the transmissions are of poor quality; and that just compounds my problem with accents. Many times, we have to make clarification calls to get corrected instructions.

We have our own accents in the U.S.; when in the Southern part, I wonder if we're speaking the same language. Someone pointed out that female French controllers are the most difficult to understand, due to their heavy accents. Even in India, some of it is very difficult for me.

Dialect

When controllers speak, it's a different dialect, like the Scottish, every word is hard for me to understand. In Japan, South America, and France it depends on the controller and the dialect usage.

Pronunciation of Fixes

Every country has its own way of pronouncing words that may not sound like we say them. They're pronouncing the names of intersections, VORs, and procedures as they would in their native language, not how we would in English. If we're cleared to a fix and I'm familiar with its pronunciation; it's no problem. But, when it's different, I get the charts out and try to find a name that matches.

The Russian pronunciation of some fixes can be pronounced about seven or eight different ways. We're looking at the fix TEVVA – Is that TEVA, TBAY, or TIVVA? In Japan, we go to NIPPI NUPTA NANGO; we know all of them in our mind, but occasionally I'm surprised. The fixes are different enough that we're not going to confuse NIPPI with NUPTA; but if we hear NIPPI and that's all we have, and it comes up on the screen NIPPI – we know we're good.

I find it very hard to understand Latin American and Caribbean controllers, unless we fly the routes frequently and can name the fix or NAVAIDs[30] that are Spanish, or in the local language. An example is Charlie, Delta, Oscar at Santo Domingo, which is pronounced "CACHO;" but looking at the spelling, you would never get that. Maybe skip the name and just use the phonetics, "Cleared CACHO, Charlie, Delta, Oscar" spoken very slowly would be great.

I think controllers probably get a lot more train-

ing than we do. It comes down to controller and pilot training. We know the rule to pronounce the five-letter fixes – It's supposed to be a hard syllable and then the soft one. And yet, there is a way we're supposed to hear, hard and soft syllables, and it's confusing.

For NAVAIDs, phonetics is enough, but for FIR[31] boundaries, if they would speak slowly, clearly, and give the fix name and then phonetics afterwards. I can't write that fast, and I can't process the information up here. If we ask for phonetics and then they give it to us, it causes extra wordage, extra congestion on the frequency. The solution might be to send the data digitally. Read it on your screen and – oh, yes, it's accepted.

Pronunciation – Enunciation

I have to include Russian with Spanish and Chinese as languages that I've had the most significant amount of problems. I also have trouble when Portuguese-speaking controllers add an "E" to words, and when Chileans and some Spanish-speaking countries use the Spanish rather than English pronunciation of words. When we're looking at our route of flight and have two similar sounding fixes, I spell it back to make sure we're going to the right one. It happens when we're about to be transferred, especially from one major ARTCC[32] to another.

It may be my hearing of what they're trying to say, because I think they're doing their best to give me a good English clearance; but sometimes when I'm hearing their accent, I find myself having to ask for it to be repeated – sometimes two or three times. I hope it doesn't make the guys frustrated, but I want to make sure I go where he's expecting me to go. But there are times, no matter what country, that the accent, or the dialect, is so pronounced that we can't understand the controller. I can have that same problem in New York, the Northeast Corridor, or Chicago.

Another problem is translation. There are many English words that do not exist in other languages. Sometimes, things may be lost in the translation. I don't have an example, but I've seen it many times; that's why we standard [phraseology].

Well the "R words" are really tough for some non-Spanish speakers; it seems like Spanish speakers roll their R's. I'm sure that it's difficult for some Asian controllers to learn English. I've spoken to some whose English is perfect; but for the most part, a lot of them still have the problems with words with "R" and "L." And some Asian controllers pronounce English words quite differently.

The Japanese pronunciation of numbers such as "two" and "three" sound very similar to me. Because of their high-pitched voices, I miss a lot of numbers. In any clearance, there's going to be a lot of altitudes and frequencies with these numbers in

---

[30] Navigational Aid.

[31] Flight Information Region.
[32] Air Route Traffic Control Center.

them. We might be cleared to flight level 320, but to me it sounds like 330; and sometimes it takes a couple of transmissions to get across. Also, they insert the "Oh" sound in their speech, making 846 into "eight-oh-four-six."

The French controllers' pronunciation, when they slow down, emphasize "L," "J," and "K" for some reason. You got me to thinking that it is absolutely true, they talk too fast, and like he[33] said, you ask them to repeat, and they talk at least as fast again.

Which words are the most difficult to understand? Definitely the numbers in frequency changes "two," "three," "one," "six," and "seven." When we go to Europe, there are three digits past the decimal point in radio frequencies – and we're used to just using two digits in the States.[34] When they say "one two three decimal six one five," I think there's too many numbers and then I remember that six one five is right.

I think the hardest people for me to understand are the female Taiwanese controllers; and I think they speak Mandarin, or Cantonese. But they have sibilant – they make "S's" and they almost lisp their English pronunciation, and it's very difficult to hear over the radio. And I'm always saying to them, "Say again, say again."

I find that the British-trained controllers tend to have very good enunciation, especially when they speak slower, and their English tends to be pretty easy to understand; but when we hear a Scottish or Welsh accent, sometimes it can sound like a completely different language. In some ways, I can understand what the British controllers are saying better than many of the North American controllers – other than the terminology being slightly different. For the most part, I've had very good luck with Indian or Pakistani controllers.

I find it challenging interpreting intersection names when there is an accent. Local accents make it almost impossible for me to determine the correct name. The words in standard ATC are easier to understand. When they ask me to do something in nonstandard ATC, I have a hard time trying to decode it.

Pronouncing Phonetically

There is a vast difference in controllers' mastery of English. My biggest problem is when a controller tries to use the phonetic alphabet for fixes that I don't know. I have a hard time with how they pronounce some words that aren't used much or are pronounced differently in their language. That has led to controller-pilot frustration because of having to ask for the name of the fix three times and still not quite getting one of the letters in it. If they're trying to get us off our route, and spell a phonetic point that we have to find on the map and put into an FMS, we don't want to put in the wrong point because it'll send us some place that we're not supposed to be.

Using the phonetic alphabet saves me. I use it a lot. When I can't understand what he's saying, I tell him to just spell it, and then I usually get it.

Speech Rate

The speed of conversation can hinder understanding. I have trouble when I fly the Northeast Corridor. It seems that they talk so fast and expect everyone to know all the nuances to their operations. When a controller speaks too fast with an accent, I ask for a repeat, congesting the frequency.

In some instances, the controller is extremely busy. If the weather's bad, they tend to talk much faster; and sometimes confirming the clearance can be difficult because of other transmissions. So, it's not just that they talk fast, the conversation is very fast. Clearances are read very quickly, and they don't wait for an answer.

Voice Pitch

I don't want this to be interpreted as a sexist remark, but women's voices in general, don't transfer easily over the radio. Poor equipment and background noise add to the shrillness, which masks what they're saying. The pitch on some female controllers, when they start with my call sign, at that point where I'm concentrating on the shrillness of it, I'm missing the words. It divides my attention and makes it harder for me to understand.

Radio

Almost anywhere in South America, the distances are so vast that the radios don't seem to have coverage. I've found that accents are worse if the radios are weak. Sometimes it's really disconcerting. The natural reaction is to turn up the volume; then another airplane transmits, "WOOO OH" and blows us out of the cockpit because they transmit OK. It's very annoying and compounds everything.

In many places of the world, it sounds as though the equipment is World War II vintage. It sounds like a tin can at the end of a string. In one Western European city, talking with approach control is terrible. I think they are working from 60-year-old transmitters because there is a shrill in the background that masks what they're saying.

There is hollowness in the sounds of many of the controllers in one country in Eastern Europe. It sounds like their equipment is poor – maybe they were never taught how to speak into a microphone. When I hear the echo background, they're using a carbon [microphone]. Oftentimes, it sounds as if the controller is not using a headset, even though they are available, especially in some countries in South America.

A cockpit procedure I like is to require pilots to wear the full headset below 18,000 feet. Communication

---

[33] The pilot who commented earlier in the discussions.
[34] In the U.S., standard phraseology is two digits to the right of the decimal; other areas use three digits to the right of the decimal.

and understanding is clarified, whether between crewmembers, on the cockpit voice recorder, or somebody on the ground.

Technology

The technology that is coming and how we operate in some of the areas of operation, obviously the CPDLC[35] and ADS[36] environment is entirely different when flying in Latin America, where you're speaking, making position reports, and talking to controllers on a limited basis. I'm hoping that is where the technology is leading us in the future.

Unfamiliar Words

Some of the words used are kind of a miscommunication, for lack of a better term. One word they use is *pre-direct*. In the U.S., we get cleared from Point A to Point B as a direct routing. Over there, we can be direct to here, now they want us to go down to a route fix, and they'll say, "Pre-direct to xyz."' Exactly what is *pre-direct*? What we want to know is, "Are we cleared direct?"

28a. Which words are more difficult for you to understand?

The words provided by the respondents' written portion of question 28a are presented in Table 8. Their compiled comments involved issues related to fixes, numbers, and procedures.

Fixes, Procedures, and Numbers

Fixes and procedures that have very similar spellings or pronunciations are problems for me. English spoken with a heavy local accent sometimes gets a puzzled look from pilots. Look at ACINA and EXANI. Another one – and they're about six centimeters apart – SIGMA is the boundary between America and Mexico, and SEGMA is out towards Panama. They're both given as part of direct clearances. Am I going to SIGMA or SEGMA? On readback, I must spell it to be clear. I can't even recall how they pronounce "X" down there. Keep in mind that it really depends on what word is being pronounced, and by which controller – a Swedish controller trying to say "R" or a Mexican saying "J."

There are so many fix names – they're all limited to five characters – and if we were in an airspace system that had such long distances between NAVAIDs here in the U.S., we might have more of that issue. We understand the context in which those five letters were stuck together and that it's supposed to be pronounceable (e.g., LUVLY, PANZE). But down there, maybe the five letters they put together don't make sense to us but may say something to them (e.g., DONIS, MANEM).

Coming out of Scotland, crossing PIKIL I learned to say, "Pike Hill;"[37] they call it "Pickle." Whether

colloquial or local pronunciation, not the phonetic, it's not by the letters – like "Pike Hill" versus "Pickle." It's what they call it; once you get used to it, it's fine.

Numbers, especially in frequencies, flight levels, and call signs, are a big problem for me in Japanese airspace; they'll say a frequency, and I'll read back what I thought was the frequency; I'm off by a couple of numbers. Then there are the numbers "one," "two," and "six." It seems to me that a "six" in Spanish doesn't roll off the tongue, or maybe I'm not hearing it very well. It seems like Spanish numbers are spoken too fast.

The proper names of the facilities within a country, waypoints, and intersections are the ones that are the most difficult for me. What is its relationship to the 2,000-character Chinese language? They came up with a sound, and somebody at Jeppesen had to come up with the way it is spelled in an English language. What does TIAJQM sound like together? I don't know. When one camera manufacturer was coming up with a name, they selected "Kodak" because it's pronounced the same in every language.

Ground controllers and clearance delivery, oddly enough, seem to have the worst English language skills. Tower controllers are better, and approach is even better; then, as we get farther away from the airport, it starts to get worse. The approach controllers are the "hot" English speakers.

28b. Do you perceive a difference in clarity of information provided when a native English speaker uses "Indian English" versus "Hong Kong English" versus "British English" versus "North American English?"

Some written responses included a specifically stated "yes" or "no," while others were implied. The responses were incorporated and appear in Table 9 according to (1) Perceived Difference; (2) Variety of English Language; and (3) Response Type (Positive, Negative, Comments). One respondent did not provide any information, since he was not familiar with the other English dialects.

Cannot Answer

With the whole native/non-native English speaker, I am not sure how to approach that. If a non-native Korean pilot comes on the radio talking with a Hong Kong approach controller, I couldn't tell you that he was Korean. I could probably tell you he was Oriental, but I wouldn't be able to tell you from where. Other non-native speakers – a French person, sure, I think I could tell that a French person was trying to speak English to a Hong Kong controller. But in the Oriental [languages], I wouldn't be able to tell you if the person was Korean, Japanese, or Chinese.

It all boils down to the individual controller's proficiency in English. It's all about training – how far are they going to let him go before they put him on the mic?

---

[35] Controller Pilot Datalink Communication.
[36] Automatic Dependent Surveillance.
[37] That is what PIKIL sounds like to the pilot.

Table 8. List of Words and Issues That Impede Pilot Understanding.

Accents, Speech Rate
Not pinpointing actual words but a heavy local accent may be challenging at times
Short words can easily become abbreviated and sound completely different especially when spoken fast
Nearly any word in "Pidgin English" of the Eastern Caribbean
French
Not words but languages/Controller – French
French women controllers sending us to off route waypoints
Local fix pronounced in French versus my "American"
Spanish
Spanish-based fixes, NAVAIDs, and some words, unless one knows Spanish
Spanish numbers
Clearances/Procedures
Clearances that you are not expecting
Clearances to fixes
Procedures (STARS/SIDS)
Speed changes/restrictions/altitude restrictions; i.e., crossings, waypoint names
Direct (in Japan)
Fix Names, Waypoints, Intersections, NAVAIDs, STARs/SIDs
Fix names
The proper names of navigational facilities or intersection names on charts
Many waypoints and intersections are difficult to understand if you haven't had a chance to see them first
Unfamiliar NAVAIDs
When VORs are referenced using full names versus 3-letter identifiers
Letters
"R," "L," "J" and "W" words
Numbers
Numbers in frequencies, flight levels, call signs
The numbers two, three, five, six, eight seem to be difficult
Most foreign countries do not use niner for nine
Unexpected words, clearances, etc
Clearances that you are not expecting
Unexpected words, clearances, charted points
Unusual or unfamiliar words
Words (i.e., names) that are native to the particular country

Table 9. U.S. Pilots' Perceptions in Information Clarity as Spoken by Native English-Speaking Controllers.

There is a Difference Among Native Speakers of English
Indian English
Positive
– Indian is probably the clearest.
Negative
– Indian English would be the most difficult. The others do not present a problem.
– Indian controllers are impossible to understand.
– Indian English is the hardest to understand.
Hong Kong English
Positive
– Hong Kong English is the easiest.
British English
Positive
– I find English spoken by English natives (U.S., U.K.) very easy to understand.
– British and North American English are the easiest to comprehend.
– British-trained controllers are very easy because the words are clearly separated.
Negative
– British English is the hardest to understand.
North American English
Positive
– British and North American English are the easiest to comprehend.
Negative
– Indian, Hong Kong, or British English when spoken at a normal rate seem to be more precise and understandable than some North American English.
– Some domestic, New England controllers are tough.
– When I fly the NE corridor, they talk fast and expect us to know all their nuances to their operations.
Non-specific
– (1) North American (2) British (3) Hong Kong.
– I've never heard Hong Kong English but remember there were differences in the other three.
Cited No Specific Variations of the English Language
Negative
– Accents other than U.S. and U.K can be very difficult.
– Heavy accents can slow down the conversation.
– To unfamiliar pilots there is sometimes a puzzled look of "What did they just say?"
Cited Other Than Specified Option
Negative
– Certainly, heavy accent and English (e.g., Scottish version of English) can be hard to understand.
– Japanese is hard to understand.
– Scottish controllers are impossible to understand.
There is no Difference Among Native Speakers of English
Positive
– Results are generally quite good.
– Not to the "tuned ear."
Conditional (Non-specific)
– Somewhat; To a degree; A minor one; Very little; Very little if any; Not specifically; Not a problem.
– Not normally, however, some native English speakers have a wider vocabulary. I was recently told, "Go around Airbus ensconced on Pad B."

Don't Perceive a Difference

I haven't had significant experience to say that it's been a problem. When I'm hearing people who have grown up with English, British, Australian, and the U.S., even with their accents, I'm more able to pick up what they're trying to say than Spanish and French; but it has gotten better. Sometimes their pronunciation and my hearing can cause difficulties.

Perceive a Difference

There's quite a bit of difference between Indian English or Hong Kong English, British English, and North American English. There are different terminologies, accents, and speeds [speech rates]. It's funny because the British have so much of an influence, both in Hong Kong and India. But because of the native speakers there, the way they pronounce English is quite noticeable. The differences are subtle, and native words do creep in, but I can tell they were brought up with British English.

If it's an English speaker in any of those countries, I pretty much can "tune my ear" to anything that the British taught – whether it's Indian, Hong Kong, or what have you. It's when we get the non-native English speakers who put accents on words that we don't expect; but it just doesn't flow to the ear from what I've heard, because the syntax may not be correct to my ear or where they emphasized.

U.S. English Versus British English

There is a difference in clarity in British English; I can't put my finger on exactly what it is, other than they speak pure English and we speak American. They may have a more exacting form of English. We have a lot of slang. I'm used to Northeast English, which is basically very fast, as opposed to a little slower, but clipped English in the British Isles. And each group has a slight accent. The British English speakers are more standard, and usually very easy to understand.

Indian English Versus Hong Kong English

You know you're on the same page with a native English speaker, and there's rarely a need to have them "say again;" and invariably you will, if they're non-native. When speaking English, an Indian speaker is a little singsong, while the Hong Kong, with the Chinese inflections over it, is very precise.

North America

My trouble is in the North American regional dialects, similar to the New York area. Or occasionally I'll get somebody in Georgia, and that's a little harder for me to interpret. Yeah, let's talk about Northeast English versus Southeast English.

The controllers in the Northeast think nothing of seeing how fast they can possibly talk to us, and give so much information at the same time that we can't possibly write it all down and understand. In the South, they wait until we say, "Go ahead, I'm writing some more information down here."

A Follow-on Question

Interviewer: If there was one universal English language that could be broadcast synthetically or otherwise, which one would you want it to be?

I think Australia is better at proper phraseology, or Hong Kong. They are also very good with proper phraseology. There are an awful lot of Australian controllers working in Hong Kong and they are really on top of that over there.

28c. Do you perceive a difference in clarity of information provided when a non-native English-speaker uses "Indian English" versus "Hong Kong English" versus "British English" versus "North American English?"

For this question, pilots were to consider that controllers might not have English as their primary language. The controllers may have learned English in school or privately. The pilots may hear non-native English-speaking controllers provide ATC services in the English taught by native speakers from English-speaking countries. Because some of the pilots' remarks directly related to Question 28b, they were moved into that section of the report.

The responses were incorporated and appear in Table 10 according to (1) Perceived Difference (Yes or No); (2) Variety of English Language; and (3) Response Type (Positive, Negative, Comments). There were two respondents who did not provide any information. They reported that they were not familiar with the other varieties of English spoken by non-native English speakers. The respondents' compiled comments from the written and interview portions of the questionnaire follow.

Perceived Differences
The Differences Vary From Subtle to Pronounced

The difference is subtle, most of the time; at others, it is pronounced. There is always a problem listening to a non-native speaker use different English dialects; maybe it's my familiarity with the language. Going into Great Britain versus Delhi, India, or Hong Kong, China, it's just the nuances of what they say, what they do, and different words.

The Influence of American Television on English Spoken in Non-English Airspace

It's funny when a non-English speaking person tries to use the American slang heard on TV. (American programs are shown around the world). They may not understand the context in which it was said but will repeat it, and we wonder how they come up with that.

Table 10. U.S. Pilots' Perceptions in Information Clarity as Spoken by Non-Native English-Speaking Controllers Using Different Varieties of the English Language.

There is a Difference Among Non-native English Speakers
Indian English
Non-specific
– I've never heard Hong Kong English but remember there were differences in the other three.
Hong Kong English
Positive
– I prefer Hong Kong English, then North American, British and Indian.
British English
Negative
– British English harder to understand vs. North American English.
– The Brits are the worst.
North American English
(See comments under Hong Kong English and British English.)
Not Definitive (Cited No Specific Option)
Positive
– Most definitely; Very much so; Yes; Yes, but not as much difference.
Negative
– More difficult to understand, repeats necessary.
Conditional (non-specific)
– Sometimes.
– Maybe a slight accent, but these "English" speakers are very standard and usually easy to understand.
– The non-native accent, inflection and emphasis can outweigh the normal precision and make understanding difficult.
– Rule for normal conversation, or lack of rule-slang, can impact radio traffic.
There is a Difference Among Non-native English Speakers
Cited Other Than Specified Option
Negative
– Almost same as Q28b. A non-native with yet another accent can distract from understanding clearly. [Certainly, heavy accent and English (i.e., Scottish version of English) can be hard to understand.]
– Chinese's and Russian Controllers do not speak confidently and seem to slur words together.
– Japanese voices pitched high and grate.
There is no Difference Among Non-native English Speakers
Indian English
– Unknown term, "Indian English."
Hong Kong English
– No issue Hong Kong.
Not Definitive (Cited No Specific Option)
– Again, quite satisfactory; Not really; No; None.
Conditional (non-specific)
– Not normally, except due to slight vocabulary differences.

Table 11. Extent Pilots Found Nonstandard Terminology Confusing.

Extent Nonstandard Terminology is Confusing	Number of Pilots	Issues Discussed
To a great extent	2	Line up and Wait Partial Call Sign Use of Roger
To a considerable extent	9	Initial Contact Japanese Accent and Pronunciation Line Up and Wait and Stand By Nonstandard Altitude Restriction Pilot Expectation TCAS U.S. Lack of ICAO Standardization
To a moderate extent	6	(Amended) Full Route Clearance Different Taxi and Approach Clearances Terms With Multiple or Different Meanings
To a limited extent	30	Did Not Fully Understand Question Different Terminology for Emergency, Weather, Delays, etc Each Airport/Country has Different Procedures for Issuing Pre-Departure Clearances (PDC) Must Get Around Pronunciation Terminology Is Not Standard to Any Country
Not at all	1	It is Not an Issue

English Spoken by Controllers in Mexico and France

I have heard some British accents once or twice in Mexico that surprised me. For me, the French are the absolute worst to understand because of the way they draw out words and run syllables together. If we say, "Say that again," in a slower cadence and lower tone, they'll come back to us that way. But, if there are more than about four or five guys trying to get direct from one place to another, they're using rapid-fire French; and then switch over to English, but it "Ain't no kind of American English I know."

English Spoken by Controllers in China

I've noticed that Chinese controllers have a problem enunciating certain numbers correctly. A large percentage of clearances have numbers – frequencies, altitudes, headings, airspace, and things like that. Add to that a nasal tone when they speak, their volume tends to be rather forced, and it's almost like a staccato sort of a pitch. When they're issuing a frequency, it can be very difficult for me to understand.

Limited Experience

I have flown a bit in New Zealand and Australia, but I've only been to Hong Kong once. Think about Northern Canada, where you have the French-speaking controllers using English. It's not so much of a problem for me if they use standard terms.

India, for instance – If you're going off the page, and you want to start talking to someone, it's going to go over a lot of non-native English speakers' heads. If you're sticking to a normal clearance and

ICAO stuff, I think they tend to stick to it a little bit better because it's what they know.

29. To what extent have you found nonstandard terminology confusing?

The data in Table 11 show only one pilot found nonstandard terminology to be a non-issue, while at least 62.5% reported to it to be confusing to a limited extent. The remaining pilots indicated nonstandard terminology was confusing, at least to a moderate (12.5%), considerable (19%), or great extent (4%). Their compiled comments are presented below according to the extent they found it confusing.

To a Great Extent I Found Nonstandard Terminology Confusing Explanation

Both of the pilots who selected this response on the written questionnaire provided comments during the oral interviews.

Line Up and Wait

During my first flight into Latin America, the use of nonstandard phraseology was extremely confusing. The first time I heard a *line up and wait* clearance or *you're cleared to three two zero and after departure maintain 2,000 feet*, was hugely confusing to me. Now that I've operated in these areas for a number of years, it's not so much of a problem anymore, but it could be a big problem for someone on their first flight there.

24

Partial Call Sign

Leaving off a call sign or just reading back a number causes me to stop and think, "Who is he talking about?" If I knew, I might be able to track where this guy was. During the most intense part of the flight [the approach phase], is where I try to figure out where we are in the sequence. If I've been on the radio hearing all the call signs answering clearances, I can build a mental map of where everyone is. If a pilot comes on and uses only a number [or partial call sign], I lose my situational awareness. This use of numbers only in call signs is true even in the U.S.

Use of Roger

The acknowledgment of a clearance by "Roger" isn't used much. I hear controllers say, "I need a readback on that." I'm glad to see that is happening because it helps my situational awareness if the nonstandard types of things are avoided.

To a Considerable Extent I Found Nonstandard Terminology Confusing Explanation

Eight of the nine respondents who selected this response provided comments.

Initial Contact

With pilot fatigue being involved, initial contact with an ATC facility with different dialects, hearing words we're not expecting is confusing when nonstandard. The most obvious one occurs coasting in off the North Atlantic Track, when we switch to Scottish [control] at 20 West. Before our first contact, there is a bunch of airplanes checking in; we can't get a word in edgewise so we're a little antsy. When we call in, he says, "[Airline name] stand by, [Airline name] stand by." Then it's, "[Airline name] Scottish control da-da-da" – he's giving instructions immediately but we're not ready.

Japanese Accent and Pronunciation

When we fly to Japan, there are some words that are not easy to understand, because some of the letters are difficult for Japanese controllers to pronounce. However, they're absolutely stringent on their phraseology and the order that they deliver a clearance. It's always the same, probably down to the pause between instructions. I have never flown there when there's been a big weather system or an emergency. I can't say how that would work out once things degrade, but the common phraseology is good.

Line Up and Wait and Stand By

Hearing the controller say, "line up and takeoff on twenty-seven" really caught my attention. It is totally nonstandard. I've never heard anything like that. When we request a direct route, or ask when to begin a descent, French controllers say, "I call you back." We use standby. The use of nonstandard terminology, different accents, and other conditions

we've talked about, make it very confusing and dangerous.

Nonstandard Altitude Restriction

The nonstandard use of, *climb with/without restrict*, and *climb and maintain on a SID*. There are also some descents and taxi clearances that include nonstandard terminology, or are given in an order that we don't expect, that have caused confusion. In some places, published restrictions are to be intact or waived, airspeeds, and when to slow.

It is more challenging and difficult when there's weather, when there's a hold up on the airport, or we have to hold some place because they've got reduced routing into the airport. When we're cleared off our expected routing, verification is imperative because it's difficult when the phraseology and verbiage gets nonstandard, gets away from what we're expecting, and their pronunciation sometimes makes it more difficult for us to understand. It increases our workload when we have to make multiple transmissions.

Pilot Expectation

I expect a certain clearance at a certain time to a certain place. I expect certain instructions at various times in my flight and different instructions can be confusing until we can get everything decoded and this goes right into the front of the program. When we get something that's not on our route, we can have FMS programming issues.[38] We may have to break out the maps and look for it. If we can't find it, we have to ask, "Say that again" or, "can you spell that?" After a few times the controller gets a little frustrated with the spelling and he'll say, "Cleared your destination."

My biggest nightmare on the ground is a nonstandard transmission from a controller asking me to pull in behind a different kind of airplane and a different taxiway – trying to figure out what airline he's talking about, did he mean line up behind him, or what was he saying? And I usually ask for a retransmission.

Let's face it, if controllers move things out of the order that we expect to hear them, it makes understanding more difficult. We expect to hear these things; and as long as they come in the right order with the right phraseology, it's all clear. The biggest offenders are down in South America.

TCAS[39]

TCAS is a great tool; the other great tool is GPWS[40] – enhanced GPWS with the terrain mapping – what a godsend that is. My situational awareness goes way up with TCAS – knowing other traffic, seeing the weather, mountains and all displayed on our map; it provides a lot of necessary information.

---

[38] Making FMS inputs.
[39] Terminal Collision and Avoidance System.
[40] Ground Proximity Warning System.

Before we started bringing some of that stuff into the F100,[41] I had a check airman go with me to Lyon at night. The check airman told me that when we come in on this runway expect to go out and make a big teardrop approach. I'll need to slow down; otherwise, we may be really wide of our approach.

The next day, I see that we flew right over the top of a 10,800-foot mountain. To have a display showing this10,800 foot piece of terrain, allows me to know why I'm at 12 [thousand feet]; up to this point, a lot of that stuff has been additional information – that is really critical. Situational awareness is a lot better.

U.S. Lack of ICAO Standardization

With the examples that have been covered, the way we differ in the States from ICAO terminology and phraseology is one of the biggest problems we have. The lack of standardization is the issue. We are nonstandard compared to the world.

To a Moderate Extent I Found Nonstandard Terminology Confusing Explanation

Five of six respondents provided comments. Their comments have been condensed and combined to remove redundancies.

(Amended) Full Route Clearance

In an international setting, I expect to hear standard terminology. Otherwise, I must question the intent of any clearance/communication. Let's start with *full route clearance*, because it's what we typically get" but they don't tell us it is a reroute. Knowing that we're going to get a reroute would really help; otherwise, it adds confusion.

Receiving our initial clearance in pre-flight preparation is probably one of the weakest links in the process when flying internationally. The procedures used domestically are probably the clearest and most succinct, where the communication is not a barrier. When they change our clearance in pre-flight preparation they say, "Contact XXX on this frequency." Then we can compare our printed version with the new clearance. If it doesn't match, we can see the changes and ask for a new flight plan with those changes. If we're getting a verbal clearance domestically, they will say, "Be prepared to copy a full route clearance," or "We have an amendment to your clearance."

We don't get this benefit internationally. I have to say, "Hey can you clarify that? That wasn't ICAO standard phraseology." "What do you want me to do?" If it's just "[Airline name] triple seven heavy descend and maintain flight level two nine zero," that's standard ICAO communication.

Is there ICAO standard terminology that would give us that same route clearance? They give me, as part of our paperwork, a printed sheet that says,

"Hey, 15 minutes prior to departure, do this, 10 minutes prior do that" They'll even have the verbiage expected for that call, and what we should say specifically to the controller at that point. It's a cheat sheet. When we have alternate altitudes, alternate speeds, or something, we might expect to call for clearance prior to push back, but expect our clearance on the taxi out.

Different Taxi and Approach Clearances

All countries are different. In Shanghai, he says, "Expect your clearance on taxi out." The other day, I got it before I pushed. Another place that they use nonstandard terminology is Beijing. What does this mean, "cleared for approach maintain your altitude?" It's not "maintain your altitude until established," or "maintain your altitude until you're on the glide slope." It's just *maintain your altitude*. They wanted me to fly the approach but stay at [my present] altitude. When I got this clearance, I stated my altitude and prepared for a *slam-dunk*.[42] I liken that situation to the level of maturity of the aviation environment over there. Every time we go to Beijing, it gets better because they're training more people and getting more sophisticated with less nonstandard terminology. But for now, "cleared for approach, maintain XXX altitude" is typical in Beijing.

Terms With Multiple or Different Meanings

Look at our 10-7 page, which is the ground operations page, and the 10-9 pages – put these two together. There are many differences in ground operations and how things are called. The terms we hear are *gate hold*, *ramp tower*, *apron* (apron means different things in different places), *terminal ramp*, *hold line*, *hold point*, *critical areas*, but it's not standard across the ICAO system. So, at some places, for push, you'll call Ramp Control; other places we'll call Terminal Ramp; other places we'll call Ramp Tower; and hopefully it's depicted on our 10-7 pages on how to do that.

Nonstandard terminology in the South American arena can be difficult. It confuses me only from the standpoint that I want to be absolutely and completely sure what the clearance is and what they are saying. So, it increases my workload and the controller's because if I'm not absolutely sure, I have to ask for clarification.

In normal flight, it's not a problem. If there is a problem with the aircraft or there's weather, our focus is not necessarily going to follow the communications. If we are dealing with an aircraft with a non-normal situation, it can greatly elevate our workload because we're trying to convey something in nonstandard terminology. Nonstandard phraseology will require me to clarify.

---

[41] Fokker 100 airliner.

[42] A slam dunk is a rapid descent when an aircraft is on a short final.

To a Limited Extent I Found Nonstandard Terminology Confusing Explanation

Of the 30 respondents who reported to a "limited extent," 13% provided no comments, and another 13% indicated they did not understand the question. Once the question was clarified, two pilots reported "infrequently," one to a "limited extent," and one reported "not at all."

Did Not Fully Understand Question

They usually give us standard information. It would be very confusing whenever it's nonstandard – depending on the phase of flight. We expect them to be clear and concise telling us what they want us to do. I think this is what he wants me to do; I go back and recheck it, because this is the point where they usually ask me to do this. They did that last week; they'll probably do it next week. So I need to go back and clarify it. I would probably press him to state it again in proper ICAO standards.

From what I've seen, the foreign pilots have more trouble with our nonstandard terminology than I think we do with theirs. To the inexperienced international pilot terms such as *line up and wait* or *cleared direct,* with those local accents, would make that nonstandard terminology confusing.

Different Terminology for Emergency, Weather, Delays, etc.

Everything we've talked about, and what really accentuates it is, when there's a nonstandard operation, in other words – an aircraft emergency, weather, delays, other traffic, and an influx of additional traffic. Now, ATC gives us something different – a hold off of an airway or slow down, do this or do that, and turns and vectors. That's where experience level comes in again. The problem is the confusion that comes when there is a nonstandard operation.[43]

We've all heard "your transmissions are stuck on" versus "blocked," or "position and hold," for "line up and wait." "We're going five hundred, make it quick." It really makes me chuckle when I hear the controller say something like, "I'll get to you in a little bit," instead of "stand by," or "wait one," or something a little more succinct.

In Brazil, we have a procedure to warn pilots – descend on anything in an arrival, or descend via an arrival. In the morning, it's very difficult to catch the nuance; we have to be very specific because one controller will give a clearance to go to particular altitudes, while another will feed us the altitudes, and we do the lateral math ourselves. We can really hose ourselves if we don't ask very specifically, "Now is this *on* or *via*?"

If you have a plan when you call them, most often they'll concur and accept the plan. I find that is the easiest way to straighten out what I'm expected to do sometimes.

Each Airport/Country Has Different Procedures for Issuing Pre-Departure Clearances (PDC)

The excitement begins when we get our clearance. In the U.S., our clearance comes up printed – I can't think of anywhere that happens internationally. So, when outside the U.S., everybody has to really pay attention, so we stop what we're doing and listen to the clearance. Pre-departure clearances may be given in sequences that we're not used to getting. I've noticed that a lot in South and Central American countries. It seems random to me but I know what to expect as far as nonstandard terminology. I try to become aware of some of the waypoints, so I know what they're telling me. Then I go over all the departures. There could have one departure for every runway. There are probably 20 in Germany.

Whoever is in the right seat says, "Okay, guys, I'm getting ready for the clearance," and everyone listens. I have my written clearance out to see if it's going to follow. They might say, "You're cleared as filed to San Francisco," or "Your destination," or "You're cleared," or they might give us a bunch of fixes that are on our route to the destination. If it doesn't match what I've got written down, I'm scrambling around saying, "Did they say this departure?" "Did they say that departure?"

Expect Clearance on Taxi Out

In the United States, we really never taxi without a clearance. But internationally, every airport has different procedures as far as when we get our clearance, when we push back, and when we can start the engines. We call for clearance prior to push back, but we expect it on the taxi out. Some of the procedures are so convoluted that our operations people made us a printed sheet as part of our international paperwork. It helps us go through the procedure. It may say, "15 minutes prior to departure do this, 10 minutes prior make the 10-minute call, at 5 minutes prior…." For example, in Shanghai it says, "Expect your clearance on taxi out." The other day, I got it before I pushed.

Must Get Around Pronunciation

Every nonstandard term/phrase is generally not a factor in understanding instructions once pronunciation is understood. Pronunciation aside – for the most part, controllers do a pretty good job using standard terminology. There are a thousand fixes on a Caribbean map. There's no way we can remember how a particular fix or waypoint is pronounced. When we're actually there, it's a dynamic situation, especially if we don't figure out the name of where we're going to go. A perfect example – I was flying into Savannah last week and there's an outer marker named MAVIS. I pronounced it "mā-vəs," and the guy I was flying with pronounced it "mā'vĭs."

Terminology Is Not Standard to Any Country

What is nonstandard terminology? For example,

---

[43] The pilots reported emergency, weather, delays, etc. as being nonstandard.

Table 12. Extent Pilots Experienced Language-Related Difficulties When Programming FMS to Comply With ATC.

Extent Language-related Difficulties Experienced	Number of Pilots	Issues Discussed
To a great extent	0	
To a considerable extent	1	Dialect and Accent – Cuba and Lima
To a moderate extent	3	Inputting 1- or 2-Letter Codes
To a limited extent	26	British vs. South American Clearances Cultural Differences Inputting Altitude NAVAID Designators Not Recognized Phonetics Aid In Input and Punctuation Problems With Similar-Sounding Names Routings Differ From PDC and Company FMS Translations Confused Programming Verifying Verbal Fix/Waypoint With FMS
Not at all	18	ATC Words Communication Difficulties Limit Use Datalink and FMS May Not Match Did Not Understand Question Familiarity Aids In Input Similar Names Confuse Input

we know we're going to get *line up and wait* and we know what it means; it's not standard to the U.S., but for them, it is. The first time we go in and hear nonstandard terminology, it's confusing. After that, it seems to be a lot less so. The reason being, once we've been to a particular airport, we expect the nonstandard and it becomes the standard at that airport. We learn quickly what we have to do to survive.

Anytime I talk in plain English with a foreign controller, it becomes very interesting. They seem to recognize something off the beaten track is going to confuse us. For example, the flight attendants set the watch to the wrong time and just completed serving breakfast as I was preparing the aircraft for landing. There was no way they could collect trays and prepare the airplane in time for landing. I had to call the controller and ask for a delay. I wasn't sure if I was going to be able to convey that to him. I said, "We are not ready to land, and we need to delay. Could I make a 360 or do a holding pattern?" Fortunately, he figured it out.

Not at All Have I Found Nonstandard Terminology Confusing Explanation

Only one respondent reported no difficulty.

It Is Not an Issue

I don't get that much nonstandard terminology, and if it's a little different from what we expect, it's not really confusing. We just clarify it if we need to.

30. **To what extent do you experience language-related difficulties when programming the FMS to comply with ATC?**

As shown in Table 12, 54% of the pilots reported that they experienced language-related difficulties "to a limited extent" when programming the FMS to comply with ATC. An additional 37% "had not experienced any difficulties." (The pilots who reported "no difficulties" embellished upon their written responses and their oral remarks appear under issues discussed.) Language presented itself as a difficulty "to a moderate extent" to 6% of the pilots and "a considerable extent" to one pilot. During the interviews, 34 pilots discussed their issues, 14 had nothing to add, and two did not understand the question.

To a Considerable Extent I Experience Language-Related Difficulties When Programming the FMS to Comply With ATC

Dialect and Accent – Cuba and Lima

For me, Cuba, Lima, and North Lima are good; South Lima is worse. Their dialect and accent can confuse me. I have more problems with spelling there. Even when I try to spell phonetically, I have trouble understanding exactly where they're going with it.

To a Moderate Extent I Experience Language-related Difficulties When Programming the FMS to Comply With ATC

Inputting One- or Two-Letter Codes

It's been my experience that some countries are better than others. Obviously, language has nothing to do with the box, but it's the information that we're getting to input into the box. To program the FMS properly, I have to understand exactly what my route is. So, the problem is in pronunciation of the fix/waypoint, etc. If I enter a NDB[44] with a one- or two-letter code for a particular NAVAID, [45] I have to be sure that we heard exactly the point that they want us to go to, and that I input the correct point into our navigational system; otherwise, we'll go to the wrong place.

To a Limited Extent I Experience Language-related Difficulties When Programming the FMS to Comply With ATC

Of the 26 pilots, 23% made no comments. The comments of the other 16 pilots are presented alphabetically, according to identified issues.

British Versus South American Clearances

When we receive clearances, it's getting the spelling right or else get the full route including the fixes. The Brits are really good. When we enter British airspace and start getting clearances, we pull up the route page as we come off the tracks. We look at it and know he's going to give us "cleared to London airport." If it's not there, we catch it, and know what to expect.

South America is a different story. We get a change within a route, or something out of the blue when we're not ready and least expecting it. It's usually not with a strong English-speaking person, or else the radios are bad. We'll say, "Say again; say again." We have the technology to eliminate this issue by the use of Datalink.

Cultural Differences

It's a cultural difference again. There's almost a point of pride among South American controllers to get the clearance to us on the first pass. In Latin America, it seems like half the time they spell out the name of the fix before we ask to *go direct* [FIX]. In some places in Europe, it seems that controllers are pretty uppity about it. "Why should I spell? I'm using the King's English." I've seen it where we may get a penalty if I ask, "Please read back," after getting a clearance to leave Paris. He'll say, "I call you back." Then four or five other guys get their clearance – we just went to the back of the line.

Inputting Altitude

I have an example of a British ATC clearance to climb, "Cleared to level two seven zero." That's a new clearance that has to be input. And this is separate from the restriction; it's not really a cruise level change, so the way you program it into the FMC varies. It's not just changing the cruise level; it's actually putting in the whole thing. If the guy said, "Cleared to two seven zero," – with restrictions – and I just entered the cruise level change, I may not make the restriction. British ATC clearance, "Cleared to flight level two seven zero, level by GIBSO" is a crossing restriction, not merely a cruise level change so FMS programming varies.

NAVAID Designators Not Recognized

Assuming there's a 3-letter designator – well, it's in our FMC as a 3-letter designator, and it gives a name for it that doesn't even relate to the 3-letter designator – that's a big one so we must look at all our charts. If it's a 5-letter word, then it gets a little strange. Our airline reduced the number of tailored charts that made navigation very easy in regions like South America. We had one chart with all of South America on it. But it's gone, so now it's all standard Jeppesen-issued. The lack of tailored charts has made it a little more difficult.

Phonetics[46] Aids Input and Pronunciation

Spelling of a fix or waypoint phonetically by non-English [speaking controllers] is sometimes impossible if it's not on the flight plan or known. If I have difficulty locating it, I ask for it to be spelled phonetically. It may take more time to clear up, and it's frustrating for the controller and pilot when it happens. Once I understand where they want me to go, I don't have much trouble. Most of the time, the FMS is a godsend because it has the arcing approach to Mexico City; it makes that approach a lot easier and safer.

Problems With Similar-Sounding Names

A heavy accent makes it very difficult to figure out which fix they want when two of them sound very similar in English. I have the same problem with similar-titled STARs and SIDs. It gets confusing at times. In Narita, we get the ARIES North and the ARIES South departure.

In some of the Southeast Asia airspaces, they may pronounce the word perfectly – properly – in their language, using English. It's similar to "garage" [guh-rahzh, -rahj, in American English] versus "garage," [gar – ij, -ahzh, in British English]. It's the same word, but our pronunciations differ.

Routings Differ From PDC and Company FMS

I experience the most impact when it's not a

---

[44] Non-Directional Radio Beacon.
[45] Navigational Aid.

[46] The international radiotelephony spelling alphabet created by ICAO. It is referred to as ICAO phonetics in *FAA Order JO 7110.65.*

familiar routing, or it differs from the flight plan/ original PDC. Changes to what I have to program in the FMS are a problem. If we're *cleared as filed*, it's easy; we have less pronunciation to decipher. If we get a full-route clearance verbally by a non-native English speaker, it can be a true handful. It's an invitation to a violation somewhere.

When we get initial clearance at our coast-in point, we check not only the flight plan we check the programming in the FMS, ascertaining that we have exactly what we're supposed to be getting. It's analogous of placing your order with McDonalds, once we get the order we check the bag to make sure we got what we ordered.

The FMS routing is from our company, written in plain English. We program it in, and invariably, it's the one we get when we coast in. We can look at the list of intersections and clearance points and understand what he's going to say by just reading it off our screen. Once we come back into the radar environment, on both ends – on the Canadian side and on the European side, they're named intersections; after we go over one of the points, we're in normal VHF communications, radar contact, and normal operations.

Translations Confused Programming

The FMC is a great asset and help. It's very smart. It takes simple instructions and only goes one place after another. Programming isn't a universal language. Some transitions, like in China, have little logical order. In the FMS, I might select a departure, and then I'll have four or five transitions. The departures, or transitions might all have the same name, but with a different prefix or a suffix letter attached to them. I have to select each one and determine where it goes; it's not very clear. I'm not quite sure who programs that; I'm not sure if it's language-related, or country-specific issue.

Verifying Verbal Fix/Waypoint Names With FMS

A verbal clearance is much more challenging when I have to verify a waypoint name. When I'm programming my FMS, I'm looking for a word match, "Oh that's what I heard, because that's the only one that sounds like what was said." If I'm not sure, I use the FMS printed word to verify it verbally over the radio.

Europe has many fixes in a small area. There are five NAVAIDs along a 40-mile segment of our jet way. I'm looking at our chart and half the time, I can't find some of them because they're just so crammed. There are boxes off to the side with an arrow pointing over an intersection that is 2 inches away, and I'm looking for the name off to the right.

Not at All Do I Experience Language-related Difficulties When Programming the FMS to Comply With ATC

Twelve of the 18 pilots who selected this response commented. Two did not understand the question.

Communication Difficulties Limit Use

I won't touch the FMS unless I know what I'm going to put in there. I check with my crew, "Am I hearing right? We're going direct to BUCLOS as opposed to BUCLAS?" Going into Japan, I'm told, "Cleared to MERIN." We know it's supposed to be MELON, but they cannot pronounce MELON. [Because some names are pronounced differently than what pilots expect], we almost had an airplane run out of gas in South America a couple of months ago.

So, the difficulty is in the communication, not the programming. If there are language barriers, the FMC is very difficult to program. We have to understand what the controller said if I'm to input it correctly; otherwise, it never comes up on the FMC.

The person that puts the fix on a screen so it doesn't have to be spelled phonetically should have a winner's placard. We could spell a fix phonetically, but they're going Alfa, Delta, Charlie – it comes up with three – oh, we're going to ANCHO, then BOWLEGS, then, whatever – it could take out situational awareness and cause slight confusion.

Datalink and FMS May Not Match ATC Words

We can get a complete route of flight 99% of the time by Datalink. We ask for it, and they send us the whole flight, short of the arrival or departure. The FMC[47] "speaks" English. It's easier than listening to unfamiliar words.

May Not Understand Question

Having the FMS off or on doesn't make any difference. We have that capability, but I don't know if you're talking about the stored routes. The clearance is a verification of what you can expect. I still have to navigate from what I understood, in the interpretation of the clearance. Now all I have to do is push one button – I've got a whole list of legs up there. When the controller says, "[Airline call sign] direct to TUBIE." "What did he say?" "I don't know?" "Oh, did he say ATUBIE?" "Oh yeah, we got it there."

If the controller uses unfamiliar fixes and talks fast, I would not use the FMS. When the language barrier is deciphered, the route written down, I've identified it on the map, and we know where we're going is safe then, I'll reprogram the FMS. Some pilots put fixes in the FMS on the fly, but that's not procedurally correct. When procedures aren't followed, pilots get in trouble.

Similar Names Confuse Input

I make sure common departures that sound alike are completely resolved, before I put anything in

---

[47] Flight Management Computer.

the box. At de Gaulle,[48] they have two departures that are spelled almost identically. They both begin with an "A," and there are only two letter differences; it's easy to confuse them. The two departures are spelled really similar and sound very similar, but they're totally different – clearances, departures, departure procedures. The taxiway markings are horrible on the north complex. It's hard to know what taxi directions they want you to go to if they don't speak clearly.

DISCUSSION

International Flight Experiences Among Participants

In the three months preceding the interviews, the 48 U.S. pilots listed 74 geographical areas they had flown through, with Canada, England and Mexico frequented by at least 33% of the pilots. They landed in 47 different countries or regions during that time period. Within the 30 days preceding the interviews, 83% flew an average of five international flights, including multiple flights to Costa Rica, Guatemala, and Venezuela. Clearly, as a group, the pilots had diverse flight experiences.

English Language Acquisition and Usage

All of the U.S. pilots listed English as their first language and learned it informally at home prior to entering elementary school. Also, they reported English as the language spoken most frequently at home. Approximately 60% neither spoke nor understood any languages other than English. For the remaining pilots, many indicated they spoke/understood some French, Spanish, or both. In addition to Spanish, one pilot spoke/understood German, and one spoke/understood Spanish, French, and Portuguese. When asked about their listening and speaking skills, nearly 80% reported no dominance of one skill over the other.

Word Meaning and Pronunciation (how words are spoken)

Factors Influencing Decoding ATC Communication

The U.S. pilots' responses on the written component of the interview indicated problems related to word meanings occurred occasionally; but they did not perceive word meanings as an obstacle during their flights. In fact, 58% reported they rarely experienced problems related to word meanings, 33% reported occasional problems, and 8% indicated they frequently experienced problems.

Regardless of how frequently they experienced problems with word meanings, for them, accent, speech rate, and pronunciation adversely affected their ability to understand word meanings to a greater extent than radio technique and the quality of ATC radio equipment. All of these components have an effect on a pilot's ability to decode the voice stream to get to the next stages of information processing — comprehension, selection, and execution of an action sequence.

When a controller's accent is notably strong, the captains frequently ask all pilots in the cockpit to listen intently to what is being said to understand what ATC wants them to do. Add to the accent the perception of a rapid speaking rate, and the pilots will, more likely than not, miss part of the clearance, instruction, advisory or other information. Furthermore, controllers who speak before depressing the microphone key clip the beginning of their messages. Poor delivery technique may result in a failure to receive the entire message on the flight deck, which can change the entire meaning of a phrase. Finally, poor radio equipment weakens and distorts voice characteristics, rendering some aspects unintelligible.

To aid decoding, pilots may refer to their charts, gouges (i.e., personal notes), and other reference materials as they talk among themselves to reach consensus as to what the controller said. Under these situations, they may request a "say again" or confirmation of the transmission. Otherwise, they read back what they thought was said, expecting the controller to correct a faulty readback. To successfully decode the message, the pilot collaborates with other crewmembers to reach consensus. The question that emerged was, "What does ATC want us to do?"

Successfully decoding an ATC message does not ensure they understood what to do. Unfortunately, not all words and phrases universally convey the same meaning for pilots and controllers. The most common examples provided by the discussants involved runway surface operations. They noted that in some parts of the world, ATC does not use the phrase "position and hold" as is done in the U.S. Instead, the controller may say, "Line up and wait." Also, the message "Line up and wait after the arriving aircraft" creates confusion. The arriving aircraft may not necessarily be the aircraft preparing to land but is nine miles or more from the threshold. By talking to other pilots or relying on their previous experiences, pilots learn to ask the controller which aircraft will trigger their movement onto the runway surface. Although there may be an implied lack of knowing when to take the runway, it may be that the pilot does not want to taxi onto the runway when he cannot know for certain which aircraft he is to separate himself from, or if he will be on the runway for an extended period of time.

If the controller said, "Line up and wait after the landing airplane," but prematurely released the microphone key, or the pilot diverted attention to prepare to taxi onto the runway, the pilot may hear only, "Line up and wait." This may result in the pilot selecting an action sequence resulting in taxiing-out in front of an aircraft preparing to land.

Another example is related to differences in perceptions that may be cultural rather than language-based. In the U.S., if a pilot says "MAYDAY" to convey an emergency, the controller assists the pilot to bring the aircraft to a safe landing if possible. This might involve clearing other

---

[48] Charles de Gaulle International Airport resides outside of Paris, France.

aircraft away from the area and notifying supervisory and emergency personnel (e.g., fire, rescue). In some parts of the world, MAYDAY may not have the same meaning for controllers as it does for pilots, and their controllers may not react like U.S. controllers or provide expected services.

Being Able to Discriminate Between Similar-Sounding NAVAIDs Is a Problem

It would seem from the written component of the interviews that pronunciation was a more frequent problem among the U.S. pilots than word meanings, primarily because of the controllers' accents. In fact, only 20% reported they "rarely" experienced problems with how words were pronounced, 40% "occasionally" experienced problems, 31% "frequently" experienced problems, and 6% "often" experienced problems. Sixty-five percent of the pilots discussed the problems with controller pronunciation.

One encompassing problem was with similar-sounding names of fixes, waypoints, and intersections. Non-native English-speaking controllers pronounce these words using the accents, dialects, emphasis on syllables, etc., consistent with their native language. Pilots unable to successfully discriminate a similar-sounding word from another often asked other crewmembers for assistance. The additional effort pilots have to put forth parsing the controller's voice stream correctly to decipher ATC instructions and advisories takes time. That may put them behind the aircraft.

The question that emerged was, "What did ATC say?" The problem partially arises from differences in accents, pronunciation, and dialect, as well as the quality of the broadcasting equipment on the ground. When ATC clears pilots to a fix, waypoint, or intersection, the controllers pronounce these words in their native language as if to a local pilot. It makes it difficult for many U.S. pilots to really decipher what ATC is saying – especially if they are on their first or second flight into that area. It is not uncommon for pilots to delay other duties to look at the chart to determine the fix ATC gave them.

There are differences in how syllables are pronounced by speakers of different languages, e.g., U.S. English, Mex•i•co *Pronunciation:* (mek'si-kō"); Mexican, Mé•xi•co *Pronunciation:* (me'hē-kô"). In particular is the time lag between pronouncing the first consonant and the voicing of the vowel in a consonant-vowel cluster (category group). That is, /p/ followed by /a/ to create /pa/ varies for English and Spanish. Also, the location of syllabic stress affects how words are pronounced. The differences hinder language decoding by the listener. Individuals learn to associate words and word meanings to sounds in their native language; until pilots learn to associate particular words with specific sounds of foreign languages, there will be difficulty.

Lack of Standardization in Phraseologies and Inconsistencies in Language Proficiency

Air traffic operations are highly standardized – aircraft arrive at a particular time and location at a set altitude, heading, and speed. Controllers develop expectancies based on these traffic patterns and follow localized written procedures and standard phraseology for communications. Likewise, pilots develop similar expectations. Phraseologies were constructed to standardize the utterances spoken by controllers and pilots to build a shared understanding. Unfortunately, there are variations to that standard that can affect safety. When coupled with differences in language proficiency, the affect on aviation safety may erode.

Some of the variances from prescribed phraseology involve how an air carrier's name, flight number, and weight designator (e.g., use of heavy) are spoken by controllers. Other examples include the words "you're not" as part of an utterance from ATC (e.g., "you're not cleared for takeoff;" "you're not cleared to land"). A practice of issuing instructions at different points created angst in the cockpit. It may be that one controller may say, "Cleared to land" to a pilot who is number 15 in line, while another controller may wait until that same pilot is number one before saying, "You're cleared to land." Also, one controller may use *line up and wait*, while another *position and hold*. Pilot use of *emergency fuel* versus *minimum fuel* versus *expedited handling* because of low fuel does not always convey the level of the emergency. The procedure of authorizing the pilot to establish separation, as in *line up and wait after the arriving aircraft,* was extremely troubling, as the pilot could not determine which of the arriving aircraft to follow.

Lengthy clearances, especially those containing latitude and longitude, can be a problem for pilots as can the order in which instructions are given. Based on a comprehensive analysis of enroute operational communications, Prinzo, Hendrix, and Hendrix (2009) recommend that controllers include three of fewer instructions/clearances in a transmission, and this corresponds to what pilots said during their interviews. Memory becomes taxed once this upper limit is reached. Controllers who exclude anchor words (e.g., heading, speed, flight level, etc.) create problems for pilots. As noted by one pilot, "Many times, they'll give you a heading, a turn, a descent to, and a freq change. We're always heading west and the controller says, 'two five zero two six zero two seven zero.' Heading 250 and slow to 260; or was it turn at 260 and slow to 250?"

When unexpected events occur that have the potential to create a problem, controllers and pilots cannot always rely on these phraseologies to explain their situations, provide actions, or offer solutions. During these times, pronunciation of the off-route waypoints, instructions, numbers, and nonstandard phraseology often become difficult to understand. When uncertainty exists, pilots ask for clarification, confirmation, and verification – especially when controllers' accented English and pronunciation impedes understanding. As pilots gain familiarity with these languages, the controllers' utterances become easier to decode, understand, and execute because pilots are developing mental representations that correspond to these words. However, these associations decay if not practiced and heard frequently.

The pilots provided examples related to some of the procedural ambiguities they experienced. With altitude clearances, U.S. controllers use the words *flight level*, followed by three discrete numbers; outside the U.S., controllers use *level* followed by two discrete numbers. Thus, pilots assigned an altitude of 25,000 feet will hear this spoken by the U.S. controllers as, "flight level two fife zero;"[49] and the controller outside the U.S. will say, "level two fife."

Same Words Used for Different Actions Create Confusion

During the discussions, pilots spent differing amounts of time talking about their flight experiences related to altitudes and altitude restriction, bearing vs. radial, clearances, and pilot's discretion. For example, *cleared to intercept loc* is an approach clearance, while *overshoot* and *go around* are missed approach clearances. Of the 48 pilots, 62% cited examples of problems related to the same word(s) used to describe different actions, where the words themselves have caused confusion.

Pilots need to be particularly sensitive to the disparities in the intentions expressed by some words and phrases spoken by controllers outside of the U.S. One often-cited example was the *direct route clearance*. Although the same words are delivered to the pilots, in the U.S., the controller wants the pilot to fly direct to the fix just given; whereas, the non-U.S. controller may want the pilot to fly direct to the fix according to the flight plan route.

The U.S. pilots reported that when outside U.S. controlled airspace, the same clearance "cleared direct Point E" (see Figure 2) issued by a non-U.S. controller frequently has an additional phrase "cleared direct flight plan route," causing confusion. In particular, the question pilots ask themselves is, "What is the route I'm expected to fly when given the clearance 'cleared direct Point E flight plan route?'" And what is expected when the additional phrase *flight plan route* is omitted in a foreign country? Do they fly the clearance as they would if in the U.S., or do they cross all of the fixes from Point A to Point E? This is especially true when the controller uses "cleared direct point E" twice, followed by "cleared direct Point E flight plan route." The direct clearance becomes a point of confusion because the *direct* part of the clearance may be used by some foreign controllers as a non-ATC (common language) phrase. In one reported incident, the pilot was cleared "direct to DME *mileage* VOR *radial*" and then questioned by the controller when he flew direct and not via an arc. While the *Aeronautical Information Manual* (FAA, 2008b) and the ICAO (2007) explain the direct route as direct point to point, some non-U.S. controllers may be adding the extra phrase, causing confusion. The reported method for handling this clearance was to keep asking for clarification.

At some airports, *clearance to push* instructs the pilot that the aircraft can be towed away from the gate, and the pilot may start the aircraft's engines; while at other airports, *clearance to push* instructs the pilot that the aircraft can be

moved away from the gate. The pilot must wait to start engines until issued the *clearance to start*. These examples make it clear that pilots must be fully aware and vigilant in understanding the full intent behind the words used by ATC.

Some countries use phraseology that is not used in the U.S. One example is *speed limit point* and another is *cleared to offset*. The former refers to a speed restriction listed on charts, while the latter is a course deviation. Often, airline training programs offer courses to their international pilots that will include some briefings on phraseology and procedures that differ from those used in the U.S. Training, coupled with simulator experiences, a check airman, and an experienced crew, should assist the inexperienced pilot when making a first flight into an unfamiliar airspace and possibly mitigate the effects of fatigue associated with a long flight across several different time zones.

Developing One Standard for Pronunciation and Delivery Technique Are Key Factors

Attempting to make sense out of what they heard diverted the pilots' attention away from the primary task of flying their aircraft. Accented English, spoken quickly, required greater pilot concentration on what was being said and made understanding notably difficult. In particular, the pilots indicated that the names of intersections, navigational aids, and procedures were pronounced by controllers in their native languages, and these pronunciations were quite varied. The pronunciation and spelling of some NAVAIDs can be quite similar and lead to problems for the pilots. Also, the influence of the controllers' primary languages was evident as they pronounced the numbers "one," "two," "three," and "six," and words with "J," "L," "R," and "W" sounds. The importance of the pronunciation of numbers cannot be overstated because they appear in clearances, instructions, advisories, call signs, and procedures.

It became particularly difficult when controllers broadcast over weak radios with poor signal quality and when air-ground communications reached saturation levels. Transmissions might sound hollow and distorted; if the controllers spoke at a higher pitch, their voice might be masked by signal noise at higher frequencies. Also, controllers speaking at a fast pace left little time for pilots to ask for clarification.

When asked if they perceived a difference in clarity of information provided by native English-speaking controllers, some pilots reported that training was the key element. If all controllers received proper training that included broadcasting techniques and instruction in English language skills, then clarity would not be an issue. Among pilots who perceived a difference between U.S., British, Indian, Hong Kong, and Australian controllers, they noted subtle differences in dialects, terminologies, accents, and speech rates as distinguishing characteristics. When asked if one universal standard could be broadcast, precision and proper phraseology were key factors.

---

[49] The number five is pronounced fife in ICAO phonetics.

The same question was put to them about non-native, English-speaking controllers. Among the pilots who perceived differences, the differences ranged from subtle to obvious. The differences reside in the accents, cadence, tone, speech rate, and knowledge of plain English. As long as standard ICAO phraseology was adhered to and flight conditions were routine, communicating was straightforward.

Expectancies Facilitate Pilot Action but May Create Problems

Ninety-eight percent of the pilots reported nonstandard terminology as confusing to a limited or greater extent; approximately 75% discussed their experiences, offered examples, or both. There were two common threads to their responses: The first dealt with the timing of clearances (taxi, approach, full route) and the second with the negative affect nonstandard terminology had on understanding.

As pilots fly into a particular airspace, they develop memories of their flight experiences. These memories have a structure and contain a series of episodes with explicit begin and end sequences. As noted in the first report (Prinzo & Campbell, 2008), pilots spend time reviewing their flight plan, charts, gouges, as well as talking with their flight crew about previous missions. All of this information is used to develop their schemata (Bartlett, 1932), which are general knowledge units used during comprehension.

One particular type of schema is the script (Schank & Abelson, 1977). Scripts are causally-linked memory representations of action sequences. Speech acts activate them, and the quality of a script is based on expertise. That is, skilled pilots who often fly to a particular airport have clear and distinct expectations about the appropriate order in which they perform action sequences – they develop scripted action sequences. In comparison, less skilled pilots and pilots who are relatively unfamiliar with that same airport have weaker scripts and may perform the same actions unsystematically. When nonstandard phraseology is used, activating the appropriate script, its associated action sequence, or both may not occur or is delayed until the pilot understands what the controller is attempting to say. This happens when pilots request either a "say again," "confirm," or "verify" of all or some of the ATC transmission.

The extent to which a particular speech act matches the script for a given action sequence, the less time it will take the pilot to understand it. As noted by the pilots, all countries are different as to when they issue clearances. Some clearances are given before pushback while the aircraft is at the gate and sometimes when taxiing to the runway. There also are temporal differences when pilots are to make position reports, what to include in these reports, and whether the controller wants a position report. Consequently, pilots must have access to different scripts for each country's airspace they enter so as to comply with its rules and procedures.

There are disparities between the procedures used in the U.S. and other countries in the delivery of full and amended route clearances. In the U.S., ATC will provide the pilot with a warning to expect a verbal clearance or an amendment to a clearance previously issued. In other countries, pilots do not receive advance notice of a forthcoming change, it just arrives and they have to figure it out on their own. The differences between what is stored in pilots' memories as scripts and actual events can create confusion, erode understanding, and add stress.

Receiving clearances that appear nonsensical add to uncertainty as do receiving instructions out of an expected order. For example, "cleared for approach, maintain your altitude" may violate the pilot's expectations that when coming in on an approach, there is the expectation of descending and slowing the aircraft. The pilot may apply an approach script, infer a rapid descent at some point of the approach corridor, and build an expectation to receive that instruction from ATC before a go around is necessary.

The important point is pilots develop scripts as part of their pre-flight preparation. These scripts form their expectations during the various phases of flight. They lay out these scripts from beginning to end with slots (frames) ready to receive particular terms so they can initiate the appropriate procedures. They expect to receive instructions, clearances, and other ATC speech acts in a particular sequence, beginning with their call sign. Sometimes the foreign controller's English-language proficiency impedes the delivery of these messages, making comprehension difficult for the pilot. Other factors that can either facilitate or interfere with understanding include the order of ATC speech acts in a message, the timing of ATC messages, and whether or not the contents of ATC messages are in agreement with the pilot's expectations.

Language-Related Difficulties Slow Reprogramming the FMS

Approximately 63% of the pilots reported no problems programming the FMS once they were able to understand what the controller said and wanted them to do. Consequently the difficulty resided in the communication, not the programming. There were several factors that impeded the pilots from communicating effectively with controllers – faulty ground-radio equipment, signal strength that interfered with the intelligibility of the voice stream, and language barriers. High pitch shrills, white noise (static), and weak signals can mask, distort, and otherwise make the voice stream partially, or completely, unintelligible. When this happens, pilots rely on previous experience to infer what might have been said, may turn up their radios, confer with other crewmembers, or ask the controller to repeat, confirm, or verify all or part of the message.

Hearing a language other than one's native language takes time because some sounds are difficult to detect and may be perceived as a non-word sound sequence. For example, the sound of \p\ in the words "spin" and "pin" are heard as being the same when in fact they are differently produced; "pin" is aspirated (a puff of air is felt on the back of the hand) whereas "spin" is not (Cummings, 2004). This may

be one reason that non-native English-speaking controllers mispronounce some names and numbers – if they cannot detect the subtle differences, they may not be able to create them during phonation.

Failure to detect differences in basic sounds creates problems for pilots because they, like controllers, may not hear the subtleties or put them together meaningfully to create words. As a result, pilots frequently ask controllers to either say the word again or spell it phonetically. Still, the controllers' dialect and accent make deciphering difficult. Once the voice stream is decoded successfully into meaningful sounds, word recognition proceeds rapidly. In fact, native speakers can recognize a word spoken in their language within 200 or fewer ms and reject a non-word sound sequence in 500 ms (Aitchison, 2003).

During this phase, pilots may be reading along or writing down what they heard (or thought they heard) as it is delivered by the controller. If the controller was reciting the filed flight plan route, the pilots did not perceive language as a barrier because they just followed along using the previously received clearance or FMS routing. However, the names of STARs, SIDs, and other changes to the flight plan route (e.g., a reroute) may exacerbate programming the FMS. The pilots noted the following language barriers to programming the FMS: (1) Although some fixes sound similar when spoken in English, they have different spellings, (homophones; e.g., their and there); (2) The name of a fix may be the same in print but is pronounced differently (heterophones; e.g., tear – cry and tear – rip); (3) Strong accents make it difficult to determine which of several fixes ATC wants them to go to; and (4) Unfamiliar fixes spoken quickly. It behooves pilots to ensure they input exactly what ATC transmits over the radio, or, the route of flight may deviate from the intended route, and the aircraft will go to the wrong place. Pilots should never second-guess the pronunciation of route information. When in doubt, they should ask ATC to spell fixes phonetically using the ICAO phonetic alphabet before putting them into the FMS.

Generally, pilots followed a practice for reprogramming the FMS: (1) Understand and verify what ATC said; (2) Write it down; (3) Identify it on the map; (4) Confirm it with other crewmembers; and (5) Enter the reroute into the FMS. One pilot had the practice of mentally flying the aircraft to establish a reroute and then entering the data into the FMS. In summary, once a verbal understanding is acknowledged, there is no problem with the FMS.

Recommendations
1. Adopt and adhere to the phraseologies contained in Doc4444 by all of the ICAO member states and the aviation community. Lack of standardization in phraseologies, procedure execution, and inconsistencies in language proficiency can led to misunderstandings and unsafe acts.
2. Resolve the disparities that currently exist in the intentions (meaning) expressed by some words and phrases (e.g., cleared direct clearance, prepare to overshoot).
3. Develop additional phraseologies for inclusion into Doc4444 if the existing phraseologies cannot explain adequately an event involving the safety of an aircraft, provide actions, or offer solutions.
4. Develop one standard order for the presentation and delivery of ATC phraseology by ATC, and require that ATC personnel adhere to it. For example, "cleared for approach, maintain your altitude" may violate pilot expectations to descend and lead to confusion.
5. Transmit no more than two speech acts in an ATC message (excluding speaker and receiver identifiers). Analysis of ATC voice tapes have repeatedly demonstrated that messages containing more than two speech acts (e.g., clearances, instructions, request, or their combination) lead to radio frequency congestion and the production of readback errors.
6. Develop and implement one universally accepted and agreed upon standard accent, dialect, speech rate, cadence, and pronunciation for aviation telephony. Inherent differences between speakers' and listeners' languages impede decoding ATC communication.
7. Develop aviation training courses that address plain language proficiency, cultural differences, and appropriate phraseology to declare an emergency, indicate the degree of emergency, assisted handling requests, and assistance during unexpected or unusual situations or events.
8. Adopt standardized language-proficiency testing standards, instruments and testing procedures by all of the ICAO member states. This would help assure better global communication standards.
9. Require at least a Level 4 Language Proficiency in Common English as defined by ICAO in *Doc9835* for ATC personnel and flight crews involved in flight operations. To retain their certification, ATC personnel and flight crews will/must demonstrate more than a limited understanding of the concepts of "emergency fuel," "minimum fuel," "expedited handling" because of low fuel and other safety-related phraseologies.
10. Although the interviews and discussions focused on pilot and controller communications, some of the examples provided by the pilots also involved safety personnel (e.g., firefighters, emergency rescue technicians). Pilots and controllers must demonstrate the ability to extract and relay the words necessary to indicate the extent of the emergency, i.e., "declare an emergency" (Doc4444) in minimum fuel, emergency fuel, or requests for expedited handling.
11. Adopt minimum ICAO hardware/software standards that assure appropriate voice/data communication quality and coverage to enhance the safety of ATS operations now and into the future. ICAO member states should be encouraged to cooperate in upgrading their hardware, software, and communications equipment for the benefit of global aviation.

REFERENCES

Aitchison, J. (2003). *Words in the mind: An introduction to the mental lexicon.* Oxford, Eng.: Blackwell Publishing.

Associated Press. (Feb. 19, 2007). "LI pilots supported by data." Long Island, NY: Newsday. www.newsday.com/news/local/longisland/ny-liair0219,0,7974836.story?co. Accessed 13 December 2007.

Babbitt, B. and Nystrom, C. (1989). *Questionnaire construction manual.* U.S. Army Research Institute for the Behavioral and Social Sciences. Research Product 89-20. stinet.dtic.mil/cgi-bin/GetTRDoc?AD=ADA212365&Location=U2&doc=GetTRDoc.pdf. Accessed 26 March 2008.

Bartlett, F.C. (1932). *Remembering.* Cambridge, Eng.: Cambridge University Press.

Burki-Cohen, J. (1995). *An analysis of tower (ground) controller-pilot voice communications.* DOT/FAA/AR-96/19. Washington, DC: Federal Aviation Administration.

Cardosi, K. (1993). *An analysis of en route controller-pilot voice communications.* DOT-VNTSC-FAA-93-2. Cambridge, MA: Volpe National Transportation Systems Center.

Cardosi, K. (1994). *An analysis of tower (local) controller-pilot voice communications.* DOT/FAA/RD-94/15. Washington, DC: Federal Aviation Administration.

Cardosi, K., Brett, B., and Han, S. (1996). *An analysis of TRACON (Terminal Radar Approach Control) controller-pilot voice communications.* DOT/FAA/AR-96/66. Washington, DC: Federal Aviation Administration.

Centro de Investigação e Prevenção de Acidentes Aeronáuticos. (2008). *Final report of the aircraft accident involving PR-GTD and N600XL.* ntsb.gov/Aviation/Brazil- ntsb.gov/Aviation/Brazil-CENIPA.htm Accessed 1 Apr 2009.

Cummings, D.W. (2004). *American English spelling – An informal description. MD: JHUP.*

Federal Aviation Administration. (2008a). The *FAA aerospace forecast fiscal years 2009-2025.* www.faa.gov/data_research/aviation/aerospace_forecasts/2009-2025/media/FAA%20Aerospace%20Forecasts%20FY%202009-2025.pdf. Accessed 2 April 2009.

Federal Aviation Administration. (2008b). *Aeronautical information manual.* www.faa.gov/air_traffic/publications/ATPubs/AIM/aim.pdf. Accessed 7 Jan 2010.

International Civil Aviation Organization. (2004). *Manual on the implementation of ICAO language proficiency requirements.* Doc 9835/AN453. Montreal, Quebec, Canada.

International Civil Aviation Organization. (2007). *Air traffic management – Procedures for air navigation services (ATM-PANS), Doc 4444. 15th Edition.* Montreal, Quebec, Canada.

NBER (2008). *Determination of the December 2007 peak in economic activity.* www.nber.org/cycles/dec2008.html. Accessed 2 April 2009.

Prinzo, O.V. (1996). *An analysis of approach control/pilot voice communications.* Report no. DOT/FAA/AM-96/26. Washington, DC: Federal Aviation Administration.

Prinzo, O.V. and Campbell, A. (2008). A. *United States airline transport pilot international flight language experiences report 1: Background information, general/pre-flight preparation and general/air traffic control (ATC) procedures.* Report no. DOT/FAA/AM-08/18. Washington, DC: Federal Aviation Administration.

Prinzo, O.V., Hendrix, A.M., and Hendrix, R. (2006). *The outcome of ATC message complexity on pilot readback performance.* Report no. DOT/FAA/AM-06/25. Washington, DC: Federal Aviation Administration.

Prinzo, O.V., Hendrix, A.M., and Hendrix, R. (2008). *Pilot English language proficiency and the prevalence of communication problems at five U.S. air route traffic control centers.* Report no. DOT/FAA/AM-08/21. Washington, DC: Federal Aviation Administration.

Prinzo, O.V., Hendrix, A.M., and Hendrix, R. (2009). *The outcome of ATC message length and complexity on en route pilot readback performance.* Report no. DOT/FAA/AM-09/2. Washington, DC: Federal Aviation Administration.

Reuters. (Feb. 15, 2007). *Pilot rejected for poor English.* www.reuters.com/article/oddlyEnoughNews/idUSDEL26653520070215. Accessed 26 March 2008.

Schank, R, C. and Abelson, R.P. (1977). *Scripts, plans, goals, and understanding: An inquiry into human knowledge structures.* Hillsdale, NJ: Erlbaum.

Tiewtrakul, T. (Sep 2007). *Analysis of approach controller-pilot communications.* Unpublished Masters Thesis. Cranfield University Human Factors Department, School of Engineering, (p 105).