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U.S. Airline Transport Pilot International Flight Language Experiences, Report 3: Language Experiences in Non-Native English-Speaking Airspace/Airports

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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 complete the task of strengthening 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 requirements (ELP) 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 group of 48 U.S. pilots of their difficulties in international operations who met with 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 31-38 and their comments from discussions of those questions with interviewers are presented as a compiled narrative. The pilots' responses had nine major thrusts: (1) Traveling into non-native English-speaking countries can be a positive learning experience leading to professional growth and development; (2) English-language proficiency varies from country to country and individual to individual; however, problems occur everywhere; (3) Hearing multiple languages on the radio restricts situational awareness and diminishes pilots' expectations as information derived from the party line decreases; (4) Radio protocol is lost in a multilingual environment; (5) Whenever communication problems occur, flight deck operations slow down as the flight crew diverts attention away from other tasks, so more of their attention is directed to listening to what the controller said; (6) Communicating with non-native English-speaking controllers requires more effort and concentration to ensure the intent of the controller's transmission is understood; (7) When off-normal events arise, controllers have difficulty communicating in Common English, and pilots have difficulty understanding them; (8) Voice characteristics contribute to intelligibility and the ease with which pilots and controllers understand each other; and (9) Advanced avionics such as TCAS/CDTI, FMS, and CPDLC/DataCom offer possible solutions to the language barrier.

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CONTENTS

EXECUTIVE SUMMARY

This is the third report from series one that presents 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.

Several major U.S. airline companies were asked to solicit volunteers from among their international pilots to serve as paid subject matter experts in a structured interview constructed to assess the language difficulties they encounter during international flights. There were 12 pilots from each of four airlines –American, Continental, Delta, and United – 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 no more than four pilots. There were morning and afternoon sessions that took place over several days at each company's preferred 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 is included in the first report (Prinzo & Campbell, 2008).

The first report summarized the U.S. pilots' oral and written responses to the questions contained in Sections 1-3, and the second report continued with Section 4. This report continues with Section 5 and summarizes the pilots' responses to questions 31-38. It provides a wealth of ideas related to the international flight experiences of the pilots who participated in small focus group discussions. The pilots' answers to the questions and discussions during the interviews were their perception of the situations they encountered. Many stories were anecdotal and some were relayed in third person. The analyses of those 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.

The pilots listed 21 different non-native English languages that they heard during their international flights, with Spanish and French listed 22.60% and 19.86%, respectively. When asked about their overall non-native English-speaking language experiences, 52% reported it as negative, while only 25% indicated they rarely experienced communication problems.

When flying in a non-native English-speaking country, 41 of 48 of the pilots indicated that 75% or more of their interactions with controllers involved the use of ICAO standard phraseology during routine communications. Only 25% of the pilots reported controllers frequently switch from ICAO standard phraseology to Common English when trying to explain or verify a previously issued clearance. Although these controllers' Common English might be unconventional, they made their point. They said many controllers avoid saying anything considered nonstandard. They believe this to be because of the controller's limited English skills. In fact, 65% of the pilots said that a considerable amount or more of their attention was required to understand the English spoken by non-native speakers.

The pilots' responses had nine major thrusts:

1. Traveling into non-native English-speaking countries can be a positive learning experience leading to professional growth and development,
2. English language proficiency varies from country to country, and individual to individual; however, problems occur everywhere,
3. Hearing multiple languages on the radio restricts situational awareness and diminishes pilots' expectations as information derived from the party line decreases,
4. Radio protocol is lost in a multilingual environment,
5. Whenever communication problems occur, flight deck operations slow down as the flight crew diverts attention away from other tasks so more of their attention is directed to listening to what the controller said,
6. Communicating with non-native English-speaking controllers requires more effort and concentration to ensure the intent of the controller's transmission is understood,
7. When off-normal events arise, controllers have difficulty communicating in Common English, and pilots have difficulty understanding them,
8. Voice characteristics such as accent, pitch, pronunciation, and speech rate each contribute to intelligibility and the ease with which pilots and controllers understand each other, and
9. Advanced avionics such as TCAS/CDTI, FMS, and CPDLC/DataCom offer possible solutions to the language barrier.

United States Airline Transport Pilot International Flight Language Experiences

Language is the source of misunderstandings.

— Antoine de Saunt-Exupéry in The Little Prince

In a report released by the National Bureau of Economic Research (NBER, 2008), America's 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 Atlantic.

Once the volume of U.S. and foreign flagship carriers increases, so 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 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 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 death 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 (Associated Press, 2007). 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; however, they disagree in their interpretations of these facts and offer different conclusions. Whereas CENIPA

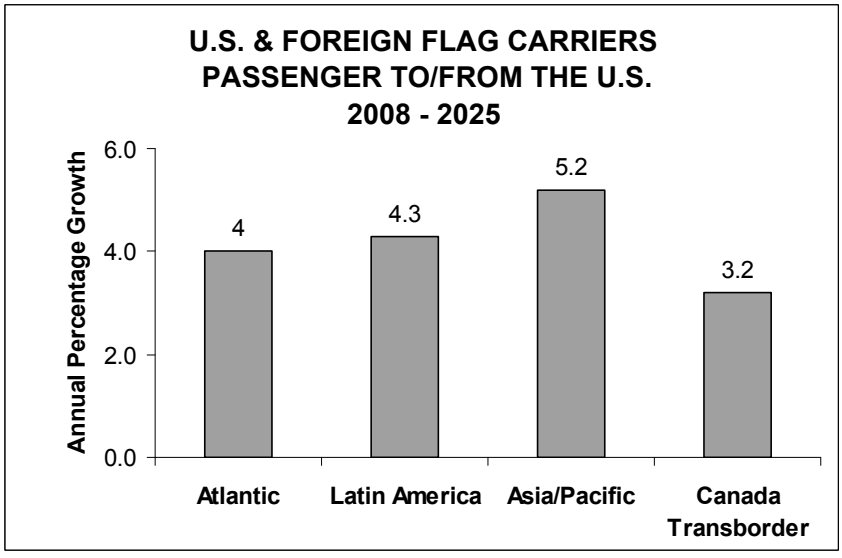

Figure 1. Projected Average Annual Growth in Passengers

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-speaking (e.g., Korean, Japanese) pilots performed by 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-speaking pilots, followed by native English-speaking pilots, and the least problems occurred among the Thai/local pilots. Tiewtrakul concluded that the Thai controller's 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, 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 communications performed by Prinzo, Hendrix, and Hendrix (2008) revealed that when an aircraft was operated by foreign carrier/airline with a language other than English as their primary or official language, not only was more time spent on the radio communicating with ATC, but more transmissions were exchanged, and more communication problems were present within their transactions. In these situations, the pilot's English proficiency – especially accents – often resulted in the controller not being able to completely understand the pilot. Rarely did the U.S. controllers express difficulty understanding an 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 in 2004 the Manual on the Implementation of ICAO Language Proficiency Requirements. 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) and in foreign countries and its perceived impact on safety by airline transport pilots.

[1] As an example, in 1990, Avianca Flight 52 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] Manual on the Implementation of ICAO Language Proficiency Requirements, Appendix A.

[4] Ibid.

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 would contribute to the understanding of some of the language issues, communication problems, and procedural differences airline transport pilots encounter when flying internationally. 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 12 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 three sections of the structured interview: 1) Background Information related to the recency of international flight experiences among the pilot-participants, 2) General/Preflight Preparation, and 3) Air Traffic Control (ATC) Procedures. It covered the U.S. pilots' responses and discussions of questions 1-23. The second report (Prinzo, Campbell, Hendrix, & Hendrix, 2010) is 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 involving word meanings and pronunciation. It covered the pilots' responses and discussions to questions 24-30 in Section 4.

This is the third report in the series. It involves pilots' responses and discussions of questions 31-38 found in Section 5 and centers upon their language experiences in non-native English-speaking airspace and airports. When possible, the content was tabulated and presented in tables. Their verbal discussions are combined, condensed, edited, and presented from the perspective of a hypothetical, albeit typical ATP-rated pilot, in the form of a narrative. Pilots were to imagine flying into a country where a language other than English was the primary language. Although the controller would speak English to them, the controllers might speak to other local pilots in the primary language of their country. As a result, the U.S. pilots might hear several different languages on any given frequency.

METHOD

Participants

A total of 48 U.S. pilots (12 pilots each from American, Continental, Delta, and United Airlines) participated in this study. All were selected by their respective companies and received remuneration from Acheson Consulting for their participation as paid subject matter experts. U.S. pilots flew an average of 15 yrs internationally (S.D. = 10 yrs, range = 1-36 yrs) and had an average of five international flights (S.D. = 6 flights, range = 0-35 flights) in the 30 days preceding the interviews.

Structured Interview Questionnaire

Pilots provided information pertaining to any problematic English language-based communication, procedure, or observation they experienced or heard over their aircraft's communications system during international flights. The questions were developed by the first author, with expertise provided by several retired airline transport pilots, a member of the Proficiency Requirements in Common English Study Group (PRICESG), and several human factors research psychologists. The *Questionnaire Construction Manual* (Babbitt &Nystrom, 1989) was used to construct some of the questions and response alternatives.

A copy of the questionnaire was administered during a mock interview with three FAA employees who had international piloting experience. During that meeting, participants commented on the understandability of individual items and critiqued the breadth, structure, and scope of the questionnaire as a whole. Their comments were incorporated into the final revision of the questionnaire.

The structured interview questionnaire was divided into 10 sections, with a total of 64 questions (q): (1) Background Information (q1-17); (2) General/Pre-Flight Preparation (q18); (3) ATC Procedures (q19-23); (4) Word Meaning and Pronunciation (q24-30); (5) Language Experiences in Non-Native English-Speaking Airspace/Airports (q31-38); (6) Non-Native English-Speaking Controllers Communicating With Native English-Speaking Pilots (q39-45); (7) Language Experiences in Native English-Speaking Airspace/Airports (q46-53); (8) Native English-Speaking Controllers Communicating With Non-Native English-Speaking Pilots (q54-59); (9) Communication Problems (q60-62); and (10) Technological Intervention (q63-64).

Procedure

Within two weeks of the scheduled interview, each pilot received a copy of the interview protocol and questionnaire. They were asked to respond to a set of language-based questions regarding their international flight experiences and consent to being audio recorded. If they agreed to participate in the structured interviews, they were to complete the 17-page questionnaire and

Table 1. Non-Native English Languages Typically Heard During International Flights.

Non-Native English Language	Percentage Cited
Cited Between 29 - 33 Times	
Spanish	22.60 %
French	19.86 %
Cited Between 9 – 13 Times	
German, Portuguese	8.90 %
Japanese	7.53 %
Chinese	6.85 %
Italian, Russian	6.16 %
Cited Between 1 – 4 Times	
Dutch	2.74 %
Arabic	2.05 %
Korean	1.37 %
Danish, Hebrew, Hindi, Hispanic, Mandarin Chinese, Papiamento,[a] Swiss, Taiwanese, Turkish, Vietnamese	0.68 %
Total	100.00 %*

[a]Papiamento is the local language (a mixture of four unrelated languages) of Curacao, the largest and most populous island of the Netherlands Antilles.
*Allowing for rounding error

return their responses to their airline's designated point of contact. Their responses were copied and made available to the interviewers for review prior to the interviews. The pilots had access to their completed questionnaires to aid the interview process. The interviews were conducted at the pilots' airline office in the U.S.

There were no more than four pilots in each focus group, and each meeting with U.S. pilots lasted approximately 3.5 hrs. Upon completion of the interviews, the pilots' written responses and oral remarks were transcribed and incorporated into a database, along with the responses and remarks of the other pilot participants for analysis.

RESULTS

Some of the pilot discussions of a particular question appeared to address similar topics with an underlying issue or concern. Consequently, those topics were grouped together and its core issue, or concern, extracted and labeled. Topics within an issue or concern are presented alphabetically, as is the issue or concern. The pilots' responses were edited to remove redundancies and improve readability.

Forty-eight ATP pilots responded to the questions and reported English as their primary language, having learned it informally at home. Approximately 60% reported they neither spoke nor understood languages other than English. Many of the remaining U.S. pilots indicated they spoke/understood some French, Spanish, or both. In addition to Spanish, one pilot spoke/understood German, and another spoke/understood Spanish, French, and Portuguese. The pilots made 77 flights to 32 different countries – 14 countries were flown to once each while six flights were made to Chile. All continents except Antarctica are represented.

Section 5: Language Experiences in Non-Native English-Speaking Airspace/Airports

31. List the different non-native English languages you typically hear over your communications system during international flights.

When asked to list the different non-native English languages heard over their communications system, one respondent stated, "I hear all local languages while flying through every country I passed," but gave no specific language; while another reported "None." The other 46 respondents made 146 entries. The languages were grouped according to how often they were listed and then converted into percentages.

As seen in Table 1, pilots listed 21 different languages; Spanish and French were cited 22.60% and 19.86% respectively. Chinese, German, Italian, Japanese, Portuguese, and Russian were listed between 6.16% and 8.90%. The remaining languages varied from 0.68%.to 2.74%.

32. ***How would you rate your overall non-native English-speaking language experiences during these flights?***

As seen in Table 2, slightly more than 52% of the pilots reported negative experiences, while only 17% reported either very positive or positive experiences during overseas flights. The remaining 31% reported their non-native English-speaking experiences as neutral.

Very Positive Explanation

Of the two respondents, one offered comments.

Not All Air Traffic Control Messages Are in English

Someone asked me why I didn't speak French when in France because I spent so much time there. I said, "One, because where we travel I would have to learn to speak Spanish, Portuguese, French, German, Swiss, Japan and Russian. And two, the ICAO standard is

Table 2. Pilot Ratings of Non-Native English-Speaking Language Experiences.

Overall Non-Native English Language Experience	Number of Pilots	Issues Discussed
Very Positive	2	Not All Air Traffic Control Messages Are in English
Positive	6	Kudos for English Speakers High-Pitched Voices Are Difficult to Understand
Neutral	15	ATC Separation Versus $TCAS_a$ Culture It Depends on How We Interpret the Question Reduces Situational Awareness Speech Rate
Negative	25	Cultures Differ Increases Workload Multi-Linguistic Environments Reduce Situational Awareness Radio Protocol Is Lost in a Multi-Linguistic Environment

[a]Traffic Alert and Collision Avoidance System

English. It could have been French, Spanish, or German; but it's English."

Positive Explanation

Six respondents rated their overall non-native English-speaking language experiences during these flights as positive. Approximately 67% of them provided comments that were edited, compiled, grouped, and are presented alphabetically.

Kudos for English Speakers

I'm so impressed that everyone can speak our language so much better than I can speak theirs. For many, it's a second job. They're working in the middle of the night when we're going there. English is a second language for them, so we need to understand what they're going through. It can be inconvenient for them when we ask for a clearance two or three times, but overall they do a pretty good job. I have to add, English is supposed to be the international air traffic language; and we have a ways to go in other parts of the world in making that happen.

Because they speak in another language [to local pilots], we don't really know what these other airplanes are doing. Other than the loss of situational awareness, which is really a big deal when we get into the approach phase, it's not so bad. I took several years of Spanish, so I can pick up mostly what they're saying because they're using ATC Spanish. So overall, it becomes a learning experience and my understanding improves.

High-Pitched Voices Are Difficult to Understand

We encounter difficulties in Taiwan until we get on approach and tower. I have a difficult time understanding the clearances issued by controllers in Bangkok and clearance delivery can be very challenging for me. I also have difficulty understanding several Japanese enroute controllers who have very high, nasally voices. I almost anticipate what they're going to say, and read back what I thought they would say; and they either say my read back was correct or not correct.

Neutral Explanation

Fifteen respondents rated their overall non-native English-speaking language experiences during these flights as neutral. Approximately 40% of them provided comments (written and interview) that were edited, compiled, grouped, and are presented alphabetically.

ATC Separation Versus TCAS

A lot of folks come to me with stories – "I was in holding and there was an aircraft below me and ATC was trying to clear me down into that aircraft. I told him 'I got this guy on TCAS.' Some controllers might not know what TCAS is, especially if you say it that way." The pilot could not get the point across that he was not going to descend. There was an airplane below him. ATC kept giving him a clearance to descend down to 4,000 feet. Some controllers are not going to say they don't understand what you're saying; and my point is – and it's not a huge point – there's stuff on either side.

Culture

It certainly seems like we're unearthing the "Ugly American," and that our perspective tends to be on problems communicating or flying within their airspace. I expect there will be some difficulties and understanding what's going on when I go there. Over a period of time, it seems less of a problem. I still find some difficulty understanding what they're saying but some is good, some is poor; and the poor is really poor.

It Depends on How We Interpret the Question

I look at it as a learning experience in a dynamic environment – taken one case at a time – it's negative. Taken over time, it becomes a learning experience; and learning experiences are positive.

Reduced Situational Awareness

I'm only negative when controllers and pilots talk to each other in their native language. If it's a lower altitude on arrival or departure frequencies and it's at a very busy time, they're taking away from me part of the situational awareness where I know where that airplane is. If he was talking to the one 10 miles out when he cleared the plane to land, I would like to know if the guy that he's talking to is on arrival and is 10 miles out. However, if they're talking in Spanish or Portuguese, I'm denied that piece of information.

Speech Rate

It's an interesting thing – we go there with the attitude of some speak English better than others do. We're going to do our best to get from Point A to Point B safely and check all the boxes. When we call for clearances, we talk slowly and hope they return the courtesy by speaking slowly so we can understand them and write it all down.

Negative Explanation

Twenty-five respondents rated their overall non-native English-speaking language experiences during these flights as negative. Approximately 40% provided comments that were edited, compiled, grouped, and are presented alphabetically.

Cultures Differ

It's a given we'll have some issues with the language barrier. I don't like it when controllers speak in their native language because it is to our detriment, since it can impact situational awareness – especially when there is an airplane we need to be concerned about in our airspace. If there is a problem or something we need to be aware of, at times they don't answer. So that's where datalink may help – when we're trying to get other information that they just don't know how else to convey.

Controllers in some countries refuse to use anything except English. I have heard some controllers specifically chide pilots for not using English.

Increases Workload

More effort is required to assure understanding combined with busy radio frequencies means that other tasks get delayed. It increases the number of times clearances will have to be repeated. It adds to the controller's workload and the pilot's also.

Multi-Linguistic Environments Reduce Situational Awareness

We hear controllers and pilots use their native language for conversation – as we do domestically. It perplexes me when I hear things that I do not understand. First of all, it eats up airtime that somebody else may need. Second, it distracts me away from my situational awareness. I was in China this weekend, and most of the other airplanes were getting their clearances in Chinese; in Germany, I only hear clearances in English. If ATC is talking to Air France, it's in French. I'd really like to know what their clearances were, but I don't speak the local language. I have no idea where they are or what they're doing. They may be talking about a thunderstorm up ahead, and we're heading there.

Radio Protocol Is Lost in a Multi-Linguistic Environment

The other problem is that it breaks radio decorum – the unwritten rules of when to chime in. If ATC talks to Air France in French, I'm waiting for the pilot to respond. I don't know whether this guy should respond back or not. I thought that after counting off a few seconds enough time passed so I'm going to ask to do something, but I just stepped on top of Air France, because now he's trying to respond.

33. How is your workload affected by your experience with non-native English-speaking language differences during a flight?

In response to this question, one respondent offered no comments while another reported no affect on his workload. Among the remaining pilots, 48% said it increased their workload, 37% said it was workload-related, and 15% said it required added attention. Their responses were organized according to how their workload was affected, and the issues gleaned from their responses are presented in Table 3.

Increases Workload

Added Repeats and Requests

I find myself repeating requests or passing on information. I might give up on a request because it creates too much confusion and the workload increases when I make repeated radio calls to clarify ATC instructions. So, I sit there and I'm keyed into what's coming out, trying to decode what I received, especially when another crewmember says, "What did he say?" If I have to control it for him – I have to go back and talk to the controllers again, transmissions double.

Communication Intensified

My workload typically increases when I enter a foreign country because, in addition to keeping track of what my airplane's doing, I spend extra time making sure I understand what ATC is telling me to do. I am more alert, vigilant, and cognizant of what I think was said, determine if it jives with what I expected to hear but at the same time I don't want to read into it. If I don't understand, I ask again to get it clarified.

The extra attention requires increased concentration on communication and being distracted from normal cockpit duties. I would like to know what the controllers are saying to the other aircraft – especially in an approach environment. If ATC clears the guy ahead

Table 3. How Pilot Workload Is Affected During Flights by Non-Native English-Speaking Languages.

How Workload Is Affected	Issues Discussed
Increases Workload (n=22)	Added Repeats and Requests Communication Intensified More Time on Radio Non-Native English Speaker Ability To Maintain Situational Awareness
Requires Added Attention (n=7)	It is Easy to Miss Your Call Sign Multiple Languages On Frequency Pronunciation of Fixes and Nonstandard Terms Speech Rate and Dialect
Workload Related (n=17)	Emergency Must be Prepared Unfamiliar Airports Use of Electronic Equipment

of us to a certain flight level or altitude, I expect the same thing if we're following. If I don't understand the local language, my situational awareness is degraded because I don't understand what's going on around me – that is a negative.

I listen more intently for English messages when they are mixed in with other languages. Hearing different dialects, tone, accents, pronunciation, and speech rate make it fatiguing. With time, my ear becomes trained to listen through the accents. If I understand the phraseology, I know when a point may come to an end; otherwise, I have to listen more intently to discern when the next English communication will show up.

More Time on Radio

On any trip into a non-native English area, you spend extra time on the radios to make sure you are not miscommunicating. The workload can be tremendous if you don't understand what is being said. It can increase radio chatter, tie up the frequencies, and slow communication down a whole lot.

Non-Native English Speaker Ability

The ability of the non-native English speaker is the big factor in understanding what ATC wants us to do. If we get a controller who doesn't speak English very well, workload goes up when some crewmembers have difficulty communicating and understanding ATC. Miscommunication is the thing that I worry about most, and we're always on guard for it. Many times flying from Brussels to London, we go into a holding pattern and as communications increase because of the intensity of the operation, CRM[5] goes down because the pilot-flying has to answer the radio at the same time.

To Maintain Situational Awareness

Workload increases because we lose situational awareness when pilots and controllers speak in their native tongue. Half the focus of the non-English portions is to glean possible traffic conflict information. We've got to be more aware of the situation outside – there are airplanes on the TCAS. The crew is looking out the window, keeping an ear open for somebody else that ATC is speaking to in English that could give us a better picture of what's going on out there. It's a bit distracting not to have a sense of what other planes are doing. We spend more time trying to figure out who, what, where, why, and where they are at, and how they're affecting our flight.

Requires Added Attention

It Is Easy to Miss Your Call Sign

A lot of times I'll miss a radio call because I didn't hear my call sign because I wasn't able to follow the communications directed in the local language to other air traffic around me. Other pilots may get clearances either in a native language or in an accent that I'm unable to understand. I might miss a call because I don't realize that's what they're doing.

I'll be honest with you – if we went to an entirely digital or database system, even in domestic control, we wouldn't be able to use that either because we would never see the clearances going to other aircraft. If someone was given a descent, or a slow down electronically, we would never see it; and we use that domestically here. I use that information for planning – well that guy just got slowed down; maybe I should ask for slower so I don't have to hold on arrival and burn extra gas. It's more difficult to keep a high awareness of the traffic in two-language radio transmissions.

Multiple Languages On Frequency

I listen to all radio transmissions. It is distracting because I have to listen harder whether he's talking to me in English or another airplane in a foreign language. If I'm concentrating on that, maybe I'm not concentrating on what normally gets my attention.

This is pretty much a mundane point; however, it does increase our workload. For example, I am on approach and there's an aircraft right in front of me. If ATC switches him to the tower and gives the frequency in English, I know what he'll give me. But if it's in French, it just increased my workload – I have

[5] Cockpit Resource Management

to work faster, for I can't preemptively set it in and be ready when I'm switched over to tower.

When controllers talk in their language, it's invariably when there's a lot going on. They revert to their language because the pilots don't understand what to do when it's said in English. I get the impression they want to get the pilots off their backs.

I tend to listen to ATIS[6] twice as long. The first part is in the native language and the second is English. It is not unusual to turn the radio off for the first part and by the time you turn it back on, it's in the native language again.

Pronunciation of Fixes and Nonstandard Terms

When we ask for something that's not standard, our workload increases in a million places. I fly a glass cockpit triple seven.[7] When ATC gives me something that's not on the display, I pull out the charts. I must verify the waypoints so I can put them in the FMS[8] – where is that fix? Where are they sending me? Spell the fix and I'm out of your way.

There are things that we do to mitigate the increased workload. We went so far as to make a four-page list of Spanish words – what the fixes are; the way they're spelled; the way they sound – the way controllers pronounce them and the way we hear them.

Speech Rate and Dialect

I have to pay more attention because of the speed of the message that is passed to me. Also, the tone and dialect – it is more fatiguing.

Workload Related

Emergency

Workload definitely increases, although it's not unsafe by any means. Then again, how would I tell the controller I had a cabin fire, engine fire, terrorist attack, or something like that in English? If something is dangerous or urgent and language is a barrier – it could be a problem. On a normal routine basis, it increases your workload. Just trying to be prepared has an effect on your performance.

Unfamiliar Airports

When we go into certain cities, we fly a normal pattern. They may have 15 corridors when we usually have two, three, or five – just because of the way we come in from the north, or east, or west – it's usually on a track. For some reason they want to bring us in on a different waypoint – well, where is it? We dig out the chart to find out the difference.

If Lufthansa was flying to Dallas from Frankfurt all the time, they would be coming in over the northeast corner post. If ATC said to go to a different arrival fix such as Bowie, the pilots would not know where it was unless they looked at the chart. If they're not familiar with the area, will they know how the Bowie VOR[9] is spelled?

Must be Prepared

If I'm in an area where I have little experience or I am not prepared properly, my workload definitely goes up. If I have experience and the controllers come back with what we are expecting – our workload comes back to what we would consider normal, which would be like a 737[10] taking off from Denver and going to Chicago.

Use of Electronic Equipment

In any dense airspace, we use TCAS a lot; it's our only real backup to not being able to be clear with what's on the radio with the language barrier. The Chinese and the cargo carriers aren't required to have TCAS; so there are a lot of airplanes that do not show up on it. In the Pacific, we know there is 10 minutes between airplanes. We use TCAS to determine when to ask for climbs, because we know that ATC won't give it without the 10 minutes. So we might slow to get some spacing, and then ask for it.

I can add to the PDCs[11] and ATIS – if we could get Datalink messages over the ACARS[12] it would be a lot simpler. Almost anywhere, domestically, you request your PDC or the ATIS, and print it off. Anywhere overseas that I've been, you've got to listen to it.

34. How often do you experience communication problems in non-native English-speaking airspace/ airports?

As shown in Table 4, 25% of the pilots reported in non-native English-speaking airspace/airports they "rarely" experienced communication problems and 52% reported "occasionally." The 11 remaining pilots indicated "at least 25% or more of their interactions with non-native English-speaking controllers resulted in communications problems." Approximately 40% provided examples of the types of problems they experienced.

During the interviews, a pilot was asked whether there should be a policy that all countries' air traffic communication be spoken in English, even to their own pilots. The pilot provided the following insight.

> Yes, I'd vote for it. This may be a trait for pilots in general to overcome – barriers that we're sitting here complaining about. Then again, that is the point of the process we're going through today, isn't it? To expose as many experiences as we have. I focus in more on the word "problem." How often has it actually caused a situation I wasn't able to resolve? It doesn't mean the job was easier because of it. If you ask how often this has caused your job to become more difficult,

[6] Automated Terminal Information Service

[7] Boeing 777 aircraft

[8] Flight Management System

[9] Bowie VOR – UKW

[10] Boeing 737 aircraft

[11] Pre-Departure Clearance

[12] Aircraft Communications Addressing and Reporting System is used for Datalink transmissions.

Table 4. Frequency of Communication Problems in Non-Native English-Speaking Airspace/Airports.

Frequency of Communication Problems	Number of Pilots	Issues Discussed
Rarely (Less than 10% of my interactions with controllers)	12	Communication or Equipment
Occasionally (Between 10-24% of my interactions with controllers)	25	Communication Problems Depend Upon Country Become Familiar and Go Total English
Frequently (Between 25-74% of my interactions with controllers)	8	Regional Culture Is a Factor
Often (between 75-90% of my interactions with controllers)	2	Accent and Pronunciation Are Problems
Without fail (more than 90% of my interactions with controllers)	1	Trouble Everywhere

I would certainly increase the frequency; places with more international arrivals tend to be better at English communication.

Rarely Explanation

Of the 12 pilots who reported "less than 10% of their interactions with controllers involved problems," 33% provided comments. Presented below is a compilation of their experiences.

Communication or Equipment

Equipment malfunctions are very rare; and trying to understand what they're saying sometimes comes up. Even 5% is likely to throw a negative impact on the outcome of the flight. If you take all my interactions with ATC, I have one or two problems in every flight. Quantified over all my flights, rarely are communication problems difficult to resolve.

Occasionally Explanation

Of the 25 pilots who reported "between 10-24% of their interactions with controllers involved problems," 40% provided comments. Presented below is a compilation of their experiences.

Communication Problems Depend Upon Country

When I experience communication problems, it's the same reason – it breaks up the radio cadence – that's the single, largest problem of all. It takes time, takes my concentration away from a lot of other tasks as I wonder when it will be my turn to speak.

I go into San Juan every now and then, but it is not hard. We go to Mexico and Cancun and their English is okay. For the most part, English is very good in Costa Rica, Guatemala, and Panama. In Europe, everybody is raised speaking two or three different languages. What helps me out is learning to count in Spanish. When a controller gives numbers, I can translate them from Spanish into English.

Become Familiar and Go Total English

We understand that we're an international airline now and 10 years ago, we didn't understand that, even though we flew to all these areas. The Asian controllers are learning ICAO procedures, and as things become more predictable and better, problems should occur less. Just as Bangkok Ground is hard for us to understand, they have just as much difficulty understanding us – it's occasionally hazardous. Sometimes it's difficult for us to understand Scottish radios and accents. With three people in the cockpit and 30 minutes before we get to an airport, we'll figure out what was said.

Frequently Explanation

Of the eight pilots who reported their interactions with controllers frequently involved problems, 38% provided comments. Presented below is a compilation of their experiences.

Regional Culture is a Factor

It depends on which region we go into. Pronunciation and accents can slow us down but we deal with it. If one or two of us have to ask, "What did he say?" that's a good indicator. I always have problems in Saint Lucia or Curacao Control, but then I find Martinique not too bad when we talk to the tower controller.

Often Explanation

Of the two respondents who reported 75-90% of their interactions with controllers involved problems, one offered the following comments.

Accent and Pronunciation Are Problems

The big problem is, if I don't hear my call sign – especially the [first part of our company's name] I have to have the entire transmission said again. Generally, if I miss it because of the accent, then the way numbers are said will confuse me and I will miss them also. Anything nonstandard invariably requires them to say it again. There are so many different words that can be put in any transmission – "knot," "decimal," or make a negative versus a positive clearance.

Without Fail Explanation

One respondent reported more than 90% of his interactions with controllers involved problems.

Table 5. Pilot and Controller English Language Proficiency in Non-Native English Countries.

Issues Discussed
Accent
Busier International Airports Have Better English Language Proficiency
Culture
Differences Reside Between Individuals Not Countries
Limited English Language Skills
Male vs. Female Voice
Pre-Departure Clearance
Pronunciation
Ratings by Area

Trouble Everywhere

Somewhere, there's not a single flight that I don't encounter some kind of problem. It may not be significant compared with others – but without fail, it happens.

35. Of the non-native English-speaking airports that you fly into, do you find the English language skills of other pilots and controllers comparable from one country to that of another? Please explain.

Among the 48 respondents, 31% indicated the English language skills of pilots and controllers are comparable from one country to that of another. Among the remaining pilots, 61% noted differences in English language skills among pilots and controllers in different countries/airports; two offered no comments and two were undecided.

Comparable Explanation

The pilots' responses were organized into two general themes. The first involved speaking in their native or local language. The second related to an assessment of the English language proficiency of the pilots and controllers during a transaction.

Communication Practices

If I make position reports in Spanish, some South American controllers respond in Spanish. That's when I have to fess up and say, "Okay, you just tested my Spanish vocabulary right there. You got all I got." If a Spanish-speaking pilot speaks to a Spanish-speaking controller, and the controller responds in English because he just finished talking to us, they will keep their conversation in English.

In Mexico, France, China, and Madrid, pilots and controllers speak to each other in their native languages.[13] If I speak French to a French controller, it will stay that way for the duration of that conversation. Sometimes, when I hear [Aero Mexico pilots] in the U.S. – their English is quite good.

English Language Proficiency

Most of the pilots and controllers speak English to get their points made. I've never felt in jeopardy because they didn't speak English well enough. They think that we're going to understand them and may take it for granted but it's just not that easy.

Some countries have better English-speaking pilots than others; a lot are comparable between the pilots and the controllers. Some are excellent; however, we can have a problem with non-native English speakers in this country. So overall, they are somewhat equal; but it is very difficult for me to understand Piarco[14] Control.

Not Comparable Explanation

According to the flight experiences of the other pilots, their written and oral comments indicated the English skills of the pilots and controllers in the areas they fly into were not comparable. Their responses were organized into nine general themes, listed alphabetically in Table 5.

Accent

For me, some controllers have thicker accents. We can have some non-native English-speaking controllers who are proficient in their job, with a thick accent and they get the information across to me very well. Another controller with the same thick accent who's not as proficient – it's going to deteriorate. I've had the most trouble and most workload trying to understand what ATC wanted us to do at Charles de Gaulle and Beijing. I find these to be the thickest and difficult accents to understand.

Busier Airports Have Better English Language Proficiency

Airfields with a higher frequency of international arrivals tend to have better English communication skills. If a field is primarily an international airport, the communication process evolved to a fairly effective level. The further away you get, at smaller or less developed airports, you notice less skill, especially among the small aircraft pilots.

[13] "In Annex 10, it is stipulated that radiotelephony communications shall be conducted either in the language of the station on the ground or in English, and that English shall be made available when pilots are unable to use the language of the station on the ground" (ICAO DOC9835, 2004).

[14] Piarco is located in Trinidad, West Indies.

Culture

It varies from one country to another and culture is part of it – those with close ties to the U.S. or U.K. seem to have a better understanding of English. There is the perception [among some pilots] that some controllers in some countries make little attempt at communicating in English.

It's been my experience that it is in the poor, less developed countries, where the language barrier is really there. It seems to me that many pilots are more comfortable communicating in their native language, and do so when afforded the opportunity. That concerns me, because I'm not following along in the conversation, and I need to.

When controllers become very proficient in English – controllers in San Jose, Costa Rica are very good examples – they go to the private sector because they can double their salary. Then, somebody new comes on who will start at the bottom and work up.

I find countries like Germany, the Netherlands, and Israel versus countries that don't teach English from the very beginning have an exceptional ability to communicate in English. There are countries, however – like Russia and China – where English is taught on a limited basis, if at all. So, it appears that a controller's ability to communicate is limited to the job at hand.

Differences Reside Between Individuals Not Countries

I think the differences between the airports that I operate into are based more on the individual controller, not so much the country. I couldn't pinpoint one country having a specific problem – obviously, mastery of the English language is the big difference.

It's the same with pilots – they vary a lot. Those from some countries have more problems. Pilots and controllers with English as a second language have a broader basis for the English language compared with the pilots and controllers where it is not as important. Controllers less familiar with English probably have limited exposure to it.

Limited English Language Skills

Controllers whose understanding of the English language is restricted to ATC terminology kind of freeze up when asked a question outside the box [ATC parlance]. Their communication is limited to basic ATC and to what they're planning to give you. It's the same with the pilots as the controllers.

One time at the Los Angeles Airport, a [foreign air carrier] in front of us had a locked brake. We could not get the point across to the pilot that he had a problem. He was very much ATC English. We called ATC and said, "The seven four in front of us has a locked brake; tell him, just don't give him his clearance." And that's what happened.

Male vs. Female Voice

It's easier for me to understand a deeper male voice than a female voice. I don't know if it's because the tones that are received through my headset are more readily ascertained because it's a lower frequency or what.

Pre-Departure Clearance (PDC)

Everyone does the PDC different. PDC is a wonderful tool for speed and accuracy. When we're trying to taxi an airplane and burning gas, trying to avoid other people, making sure we're going to the right runway, taxiway, and trying to write down the clearances – by golly, something may go wrong. Throw in some weather, night, flight attendants calling us with a passenger problem, or toilet problem or whatever – it's a recipe for a problem. We always try to get our clearance before we leave the gate, in some cases we get it when we taxi out. I'm finding that in a lot of places, if I ask for it before I taxi, sometimes they'll give it to me, and sometimes they won't.

Pronunciation

I've found that Italian controllers tend to roll their "r's" and Canadian controllers are easy to understand. Even though my mother is French, and I was raised speaking it, I find French controllers to have the strongest accents and sometimes will have trouble understanding them.

Ratings by Area

There is a huge difference depending where in the world you're flying. English skills vary greatly by area, controller, and pilot. I find some pronunciation, inflection, dialects, and accents can be difficult for me to understand. I may have trouble with the phraseologies; and if I ask for a repeat, we can figure it out.

In the daytime, at the busier airports in some countries, the controllers will be more experienced and the quality of communication is much better. If we come in at night, we may get more junior controllers, and the quality can be significantly degraded.

Another problem for us is controllers who switch back and forth from their native language – talking to their own guys – to English. It's strange because we have to listen a little bit more carefully to hear our call sign.

Regardless of the areas the pilots flew through, to, and from, there were six generalities extracted from their comments and discussions. First, when busy, controllers don't always have the time to say it right. Second, controllers can become frustrated with pilots who do not immediately grasp what is said in accented-English. Third, some controllers speak too fast for pilots to understand. Fourth, controllers who are more experienced make communicating easier. Fifth, as pilots are exposed to an area more frequently, communicating becomes easier. Sixth, accented-English requires increased attention.

Table 6. Areas Where Pilots Say the Intelligibility of Some Non-Native English-Speaking Controllers Causes Them to Work Harder to Understand Them.

Areas Where Intelligibility Affects How Hard Pilots Work to Understand
Bogota and Paris
Egyptian controllers are difficult compared to German
Germany is easy compared with France
Havana is better than Miami
Haiti and Dominican Republic are difficult
Martinique is inconsistent – very good to poor
Mexico is not bad; Mexico City is better than Costa Rica
Montreal is not usually an issue; Montreal is more difficult than Charles de Gaulle or London Heathrow
Moscow is more difficult than Mexico, Paris, or Stockholm
Mumbai is more difficult than Stockholm
Panama is better than Curitiba (Brazil); Panama is slightly better than Ecuador
Piarco Control (Eastern Caribbean) and St. Lucia are always hard; St. Lucia is always terrible
Scottish controllers and sometimes Irish controllers are difficult
"Stans," Uzbekistan, Pakistan, etc.; all the "Stans" on to India; Eastern Siberia
Tokyo is better than Korea
Venezuela

Table 7. Issues Affecting How Hard Pilots Work at Understanding Non-Native English-Speaking Controllers.

Issues
Accent
Areas Where Workload Increases
English Proficiency Varies From Country/Controller to Country/Controller
High Pitched Voice
Poor Radio Equipment
Pronunciation
Repeats
Speech Rate
Varying Cultures

35a. Do you find that the intelligibility of some non-native English-speaking controllers causes you to work harder to understand them? (Think Montreal versus Katmandu or Johannesburg versus Dakar.) Use any other examples that you may care to.

In response to this question, 21% of the pilots answered with only the word "yes," while another 54% offered comments indicating that, in their experience, there was a need to work harder to understand non-native English-speaking controllers. Some of the pilots named areas that were given in a context of "these increase the workload." The areas are listed in Table 6.

Presented in Table 7 is an alphabetized list of the issues that increased their workload related to the intelligibility of non-native English-speaking controllers. One pilot reported no increase in workload. That pilot stated,

> I didn't find a big difference in non-native English-speaking controllers, and they didn't actually cause me to work any harder to understand them. The controllers in Latin America, South America, and Europe are very good.

Accent

There is a different accent going from country to country or state to state; and that's an issue when flying. We can go through five different accents and different countries. It is hard so we have to listen closely.

Areas Where Workload Increases

It is amazing how many of our pilots have trouble understanding the Scottish controllers, me included. I have to ask them a couple times where it is they want us to go because understanding what I perceive as heavy brogue over a bad radio makes it tough. Rome is very difficult for me too. In some ways, it is because I have a problem with the controller's pronunciation and enunciation. Lima, Peru is difficult, and sometimes Venezuela's clearances are extremely difficult to ascertain. In the Caribbean, Cuba's almost like talking to Miami Center. They're just outstanding – very polite and courteous, professional. Jamaica can have problems sometimes, but typically, they're very good, and their radios are very good.

English Proficiency Varies From Country/Controller to Country/Controller

There is a wide skill level of English spoken from country to country, and even from individual to individual. One day we get controllers who are excellent, and the next day we'll get some who are

not quite as good. Some areas are excellent, while others are difficult. We have to work harder with non-native English-speakers.

Mexico is pretty good unless we just happen to get a controller who's not as proficient. Peru is perceived to be the most difficult due to poor radio quality and limited English language proficiency. Pilot stress level is very high passing through the "Stans" on the way to India – Uzbekistan, Turkmenistan, etc. – because of limited English skills.

Some Russian controlled airspace – East Siberia and Mongolia – is still an issue. In Eastern Russia, English isn't a problem, as many controllers are furloughed Aeroflot pilots; however, most are being recalled to work. We have been turned back from the border of Russia several times in the past year because they didn't have an English-speaking controller on duty.

High Pitched Voice

I have great difficulty understanding female Japanese controllers' voices. There is a very definite difference in its pitch. I don't have the same difficulty with male Japanese controllers' voices; it's as if we're in Chicago. I can hear and understand very well.

Poor Radio Equipment

When flying the "Poles," we go from Magadan[15] Control to various air traffic control agencies in Siberia, and the area below Siberia. My experience has been that Russian controllers have very poor equipment. And I find controllers in Mongolia are very, very difficult to understand; and the quality of their equipment is very, very poor.

I find Central America really good because there is basically one facility for all of Central America. The radios are very good – Panama is real good.

When I fly to South America, my experience has been that both Venezuela and Colombia are fair; Ecuador is poor; it seems the farther south we go, the more difficult it gets. To me, Peru is the most difficult, for two reasons – bad equipment coupled with a limited understanding of the English language.[16] Amazonia also has very poor equipment. There are a lot of mountains to deal with and hundreds of miles between the transmitters. It seems to me that it would be easier if they could bounce the signal off a satellite than do point-to-point transmissions.

Pronunciation

It's not just a question of the quality of the equipment; I have trouble with the way waypoints and fixes are spoken – they never sound like they do in English. I may have looked at the fixes on the chart in advance; and after I've heard them three times, I figure out what fix it is.

Repeats

The controller workload increases with all the repeats and airplanes they talk to. But, it varies by controller, and the enroute controllers are most difficult because they're generally in more remote locations. If we don't understand or have a misunderstanding, I have to say, "Repeat," "Say again," or "What do you mean by this?" This increases the workload for pilots and controllers. It is best not to use the built-in speakers in the cockpit. Wear a headset, put in an earpiece, and try to hear it clearly the first time rather than having to ask for clarification.

Speech Rate

It's been my experience that there are quite a few controllers who speak too rapidly and with heavy accents, causing other non-native aircraft to request repeated transmissions. I've found this to be particularly true when they are using poor radio equipment. A request for repeat will only cause some controllers to speed up. That in turn causes congestion on the frequency. Controllers who seem to speak at a normal speed do not have much of a problem with us asking for repeats.

Varying Cultures

The more unintelligible I find someone is, whether non-native or native English – the harder I work. In some Asian countries, approach controllers don't seem to be confident in their English-speaking ability. It may be that they are relatively new to English and commercial air traffic control. My two Beijing trips and Magadan were challenging. I found South America enroute very difficult; however, Sao Paulo and Buenos Aries approach, tower, and then departure controllers were quite easy to work with. They stayed on the page and used standard terminology. Sometimes it is very difficult for me to understand Scottish and Irish controllers, which is strange since they are part of the U.K.

35b. What makes some non-native English-speaking controllers' speech more difficult than others to understand? (e.g., speech rate, pronunciation)

The responses of the pilots were organized into four broad themes: (1) Voice Properties (Accent, Dialect, Pitch, Proficiency, and Pronunciation), (2) Delivery Technique (Cadence, Speech Rate), (3) Radio Equipment (Broadcast Sound Quality, Spotty Radio Coverage), and (4) Unpublished Radio Frequencies. The respondents reported these factors influenced the understandability of non-native English-speaking controllers. One interviewer also asked a group of controllers several follow-on questions, and their responses appear at the end of question 35b.

The ability to understand a speaker is also affected by hearing loss. Some of the symptoms of age-related hearing loss include: (1) Difficulty understanding spoken words, speech sounds mumbled or slurred, (2) High-pitched sounds are hard to distinguish, (3) Conversations are

[15] Magadan is located in Northeastern Siberia.

[16] The pilot may be referring to English skills beyond those used in ATC radiotelephony.

difficult to understand, particularly when there's background noise, and (4) Men's voices are easier to hear than women's voices, primarily because men's voices are lower-pitched. Thus, the pilots' responses are likely to reflect both personal as well as environmental factors in combination with the four broad themes mentioned above.

Voice Properties

Accent

It is hard to break this out and say, "This country is necessarily better than this other one." It depends on the controller. I'll be doing great; and then get a handoff to somebody else in the same airspace, and it's like – "Can I go back to the other one, please?" We know the accent, dialect, pronunciation, rate, as well as the ability to enunciate vary from controller to controller. Enunciation is a problem – it doesn't matter what country we're in – if controllers enunciate differently than we expect, transmissions sound garbled.

Dialect

If the big picture here is – we're all going to speak English together – it's hard to expect anyone to lose their accent. Even in the U.S., we've got different accents; there are people we're all going to find hard to understand. They're speaking the same language, theoretically; if you slow it down – I think that's the key.

It depends on the region – each region's different; each country's going to be a little different. They have the basics, and that's as far as it goes. When there's a breakdown, communication comes to a stop. Then we're on our own and we're going to do what we have to do, what we think is right.

Pitch

What makes a controller's speech difficult for me to understand? (1) Pitch of voice; (2) Pronunciation and slurring of the words – I would tie those two together, pronunciation/slurring words; (3) Nonstandard verbiage; and (4) Quality of equipment.

Along with [pitch] is the lack of variation or modulation. There is no up and down – everything sounds the same to me. If I miss one word, the rest of the words seem like one gigantic word to me. I can't figure out where the words break apart. It seems to me that we'll ask for repeats from female controllers much more frequently than from a deeper, monotone male voice. Actually, it may have nothing to do with it being women; it's the way the radios carry their voices.[17]

Proficiency

In Curacao, we have a [note] on our flight plan that says Curacao is in training. All controllers are in training down there; so anytime we go through Curacao, we're talking to a trainee. We can always hear the [instructor] in the background, either correcting or suggesting things to him; so again, sometimes as a training issue, sometimes a lack of effort. The further south we go, I find a tendency among controllers to be less proficient in English.

Pronunciation

Pronunciation that includes the syllable emphasis and enunciation affect understanding. It seems to me that some controllers just become lazy in their pronunciation that I find difficult to understand. If I say, "Say again," the quality of their English improves when they realize that I didn't understand what they said. The other thing I experience is the tonal quality of some of the controllers. If you heard them, you would know what I'm talking about, – they start to use slang, instead of saying, "Roger,"[18] it is "Raja." Also, if they're using something I'm expecting in ICAO terminology, I can probably understand; however, if they use something other than that – or a local procedure that is not really written out – it becomes difficult for me.

Sometimes, it's difficult for me to understand Japanese pronunciations because I'm not used to it. It's the inflection, enunciation, and pronunciation of words and letters. The Japanese controllers have a practice of putting an "O" in all the call signs "[company name] O eight eight nine," versus "[company name] eight eight nine."

Delivery Technique

Cadence

I have a problem with the speed and cadence. They may place the wrong emphasis on the wrong syllable. If he doesn't say "[call sign] we've got your clearance when you're ready to copy" – we're not prepared for it; and it may be a complex clearance.

Speech Rate

When you add pronunciation, cadence, and accent, speaking too fast is the biggest problem we have. Some controllers seem to speak fast to mask their fluency while others speak rapidly because they think they're pretty good at English. But, they're not as good as they think because we miss what they say or don't comprehend it.

We also have more difficulty understanding when they are in a hurry because there's a lot of traffic out there. When the controller is rapid-fire machine-gunning these clearances out, sometimes, if we have a question, it's very difficult to get a word in there. We're no longer listening because we're still trying to process what was said, remembering what was heard, and deciphering or interpreting the language.

And I feel that controllers dealing with a high volume of international flights, need to understand that

[17] It may be the higher pitch, when coupled with aircraft and communication equipment noise, renders female voices less intelligible than lower-pitched voices.

[18] A standard air traffic term used to indicate, "I received your message and understand it."

slowing down the rate, and even just separating the call sign from the body of the communication being given, could make the difference. It seems to be a lot better when non-native English-speaking controllers are slow and deliberate, then I can understand them the first time; it is easier. So that's the single greatest thing – a controller speaks too fast to everybody and this leads to too many repeats.

Radio Equipment

Broadcast Sound Quality

Which is better, the equipment, or speech production? I think we could probably understand the verbiage if the equipment was good enough to hear [what was spoken]. If it's clear, no static, and not distorted and scratchy, we can work around it as long as we can hear and understand it. I experience reverberation every once in a while. It's different from a barrel sound – it's a tunnel effect, I hear an echo. I think it is a problem in the relay between station to station before it spits it out to us.

And the other one – we call it a "tin can effect." That's when it sounds like I'm talking into a tin can with a string line attached. I find that it happens when I'm flying into Lima, passing through Ecuador, and in a descent, we switch to a VHF frequency – however, it sounds like the person is speaking at the bottom of a 55-gallon drum. There are echoes, there are delays in the transmission, where we're letting them know we're there.

Spotty Radio Coverage

Kingston sometimes uses the south frequency for the north, and north frequency for the south. Panama recently added a new sector – now there is North and South Panama. We used to get five minutes of dead time or so, especially if the weather was bad. Now when the weather is good, we can talk to them within a minute or two. We can contact them using VHF, make a relay, a phone patch, wait five minutes, or go to HF;[19] but, by the time we tune it and make a call, the VHF will probably be coming back in.

There are two parts to Lima – Lima North and Lima South. There is a stretch where we're out of contact. They have a common HF frequency – 8 8 5 5; and we're told that if we can't reach them to call on 8 8 5 5. I tried to do that, and I'm here to tell you none of us have gotten hold of any controlling agency on HF. HF coverage is nonexistent there.

There is one way we get around communication problems – we listen to American, Continental, United, and Delta; and relay information for each other. We have 300 miles of airplanes and we can talk to each other; and we do relay clearances and requests all the time down there.

Unpublished Radio Frequencies

There are frequencies that are never available – either the agencies did not put the right information on Jeppesen charts, or Jeppesen did not put it in the communication boxes on their charts. I have examples in my best practice guide of 20 frequencies – and there's not a single one of them on a typical chart.

Follow-on Questions

One of the interviewers asked the pilots several follow-on questions to their discussion about proficiency. The first question addressed concerns with communications that deviate from the expected pattern of information exchange between pilots and controllers. The second dealt with the pronunciation of numbers by controllers.

Outcome of Unscripted ATC/Flight Deck Communications

In response to the question, "If ATC gave you a clearance and you said, Unable, and you came up with an alternative, would they understand?" the following dialogue occurred:

I have experienced silence on the air. They may be talking to a supervisor, or trying to find out, "Now what do we do? This crew is not accepting what I just gave them; I don't know what to give them now." So we're on our own.

Interviewer - Do you get to stay at that altitude until they come back?

Yes, unless it was a dangerous situation.

Interviewer - Then you let the controller know that you're going to descend or climb?

We'll just tell them. We don't even ask in some places. "We are deviating for weather, we are doing this." We're telling them; and they're going to have to make it work for us; otherwise, we would have gone through a thunderstorm.

Pronunciation of Numbers

In response to the interviewer saying, "With all of your different language experiences in other countries, imagine hearing controllers speaking the numbers one through ten," the following reply was offered by the pilots:

For me, the Europeans do the numbers the best, and China and Taiwan the most difficult. The others are in between. And again, with South America, I haven't really had any trouble with numbers. The Japanese tend to insert "O's" when saying numbers.

36. When flying in a non-native English-speaking country, how often do controllers use ICAO standard phraseologies for routine communications to speak to you?

[19] High Frequency

Table 8. Frequency of ICAO Standard Phraseology Usage by Controllers in Non-Native English-Speaking Countries.

Frequency of ICAO Phraseology Usage	Number of Pilots
Without fail (more than 90% of my interactions with controllers)	13
Often (between 75-90% of my interactions with controllers)	28
Frequently (between 25-74% of my interactions with controllers)	6
Occasionally (between 10-24% of my interactions with controllers)	1
Rarely (less than 10% of my interactions with controllers)	0

As shown in Table 8, 85% of the respondents reported at least 75% or more of their interactions with controllers included the use of ICAO standard phraseology during routine communications when flying in a non-native English-speaking country. Furthermore, an additional 12% reported they frequently heard controllers use ICAO standard phraseology when communicating with them. However, one pilot reported when flying in a non-native English-speaking country, controllers occasionally used it for routine communications when speaking to them. None of the pilots said they occasionally heard controllers use ICAO standard phraseology during their communications with ATC.

Only 25% of the pilots who selected "Without fail," "Often," and "Occasionally" made comments. Their comments from the written and interview portions of the questionnaire were organized according to thematic content and response selection.

Without Fail Explanation

Among the pilots who selected this option, 31% provided comments.

Non-Native Speakers Know Only Standard Phrases

> Generally, we hear ICAO phraseology. When it strays, it's difficult to understand – however, it doesn't happen very often.

Often Explanation

Of the 28 pilots who selected this option, only 21% commented.

United States Nonstandard and Unusual Events Everywhere

> The non-native English-speaking [countries] use more ICAO standards, certainly more than we do in the U.S. – that is in regards to terminology.[20] It's the phraseology they are trained with, and that's what they tend to give us. It doesn't seem like there's a whole lot of nonstandard ICAO words. Sometimes the words they give us, and how fast they say them, may cause me to [ask for a] repeat. They seem to go out of their way to use standard phraseology. Most controllers are toward the high end; I would say more than 90% are very professional and very good at what they do.
>
> My concern is when we come into the nonstandard arena, when there's something wrong with the aircraft and we have to convey a lot of information at a given time and we need very quick – not resolutions – good information right now – is it readily available and how would it be conveyed, standard phraseology or nonstandard?

Frequently Explanation

Of the six respondents, two commented.

South America Is Nonstandard and Lacks a Pattern of Communication

> When we go to South America, there can be a lot of nonstandard communication. I have experienced the terminology to be quite a bit different – not "line up and wait," but "you're not cleared to land." The "continue"– we hear that a lot. When I call approach ATC will say, "Continue;" and if I ask about the weather, I don't think they understand what I'm talking about because of their limited [non-ICAO] English. They know a couple of phrases and that's about it. If we ask them any other questions, or query something, we get into the nonstandard because they don't have a set way of doing things – very limiting.
>
> They try to be more ICAO-standard than what we think. We're used to what we do here, except we're not necessarily ICAO standard. If you ask a group of Brazilian pilots what they think of coming to the U.S. and how standard we are, you might find they think we are very nonstandard.

37. When flying in a non-native English-speaking country, how often do controllers use Common English for routine communications to speak to you?

Common or plain English occurs when either the pilot or controller switches from standard phraseology and speaks in a conversational manner. Table 9 shows that only 25% of the respondents reported controllers frequently (or greater) use Common English for routine communications when flying in a non-native English-speaking country. Notably, 44% indicated they occasionally hear Common English during their interactions, and an additional 31% said their interactions with controllers rarely involved Common English.

Without Fail Explanation

Of the two respondents who reported more than 90% of their interactions with controllers involved some use of Common English, one offered an explanation.

[20] Terminology and phraseology used interchangeably

Table 9. Frequency of Common English Usage by Controllers in Non-Native English-Speaking Countries.

Frequency of Common Language Usage	Number of Pilots
Without fail (more than 90% of my interactions with controllers)	2
Often (between 75-90% of my interactions with controllers)	8
Frequently (between 25-74% of my interactions with controllers)	2
Occasionally (between 10-24% of my interactions with controllers)	21
Rarely (less than 10% of my interactions with controllers)	15

When things go badly, controllers use Common English to fix it. They'll say, "[Company name] we wanted you to go here, now go there."[21] I consider Common English to be what the controllers use when they are trying to explain what the clearance was. They're trying to resolve it and will use Common English to fix it.

Often Explanation

Six of the eight respondents who selected between 75-90% of my interactions with controllers provided comments during the interview. None included a specific example during their discussions.

Controllers do talk to us after they give us the clearance; they'll come back and talk to us in a clarification sense and use Common English. Most controllers are pretty professional with what they convey in the clearances – climb to and maintain a particular altitude, or descend to maintain a certain altitude.

It's been my experience that in Mexico, controllers do a good job. They use their best English. Most controllers get what they want with routine communications; if not, they attempt to use nonstandard terms. But then again, it depends on their fluency; if they're not confident of their English, they tend to avoid Common English completely. As their confidence level builds, they try to use it occasionally and to varying degrees of success. The exception is, when they communicate in their native language to a crew of their region.

Frequently Explanation

Of the two respondents, one offered the following comment.

Typically, controllers use ICAO standard phraseology. Occasionally they'll say something in Common English. ICAO is what I expect and what I get. ICAO standard phrases are easier for me to understand and Common English can be used to verify.

Occasionally Explanation

Twenty-one respondents circled "Occasionally (between 10-24% of my interactions with controllers)." The discussions by 48% of the pilots were organized into two overlapping themes: The degree with which Common English occurs depends on (1) how comfortable they are with their command of the English language and (2) how structured the ATC environment is to support its use by controllers.

May Practice English to Gain Proficiency

My experience has been that it depends on the part of the world I am in as to what I will hear. Generally, some controllers are good, and some are fair in Common English. If they are comfortable with Common English, they may say a few words. Sometimes when there's time, they'll want to talk to us using Common English for practice. However, ICAO phraseology is mostly used and Common English may be used to explain ICAO phraseology. It may not be what we're expecting, or what we're used to hearing, but we get a drift of what they want us to do – that probably comes from experience.

When the other controllers try to speak English, we often can't understand them; they shy away from trying to speak it; they don't want to be embarrassed. So they stick to the ICAO phraseology.

Structure of Phrases Varies with Country

For me anyways, it seems like the more structured the environment the more ICAO terminology is used. When I'm in the NATs,[22] it's 100%; in the U.K, it's about 100% – they'll throw in some of the common language like, "Yeah," "Roger," or something like that; and in Mexico and South America, it's mostly ICAO phraseology.

Experienced pilots know about weather and what to expect because there's a lot of repetition in our flights. I would hate to throw new pilots into that briar patch, so to speak; because there could be misunderstandings. This is true for our ground control and push back crews – they have been told what we're supposed to say, and if we say it a little different – like "I am setting the brake" instead of "parking brake set"– we sometimes get a pause; they're not used to that; they're used to the routines.

Common English might be used when coordinating a ground delay or taxi back to the gate, maybe the routing is nonstandard, or ATC is trying to figure out why we need to delay. Some experienced controllers revert to Common English to help us understand an instruction like *taxi to holding point*. If we ask for a repeat, they may use Common English so we can understand it by saying, "Do not enter runway." Of

[21] This is Common English used in lieu of "[Call sign] cleared to CDG via Aries arrival." Throughout the interviews, pilots used Common English in lieu of giving specific clearances.

[22] North Atlantic Tracks

course, when we ask for clarification or progressive instructions, they may break it down into one or two words at a time for both themselves and the pilot. In the cockpit, standard phraseology works the best for all of us. They understand what we're saying; we understand what they're saying.

Rarely Explanation

Fifteen respondents reported that non-native English-speaking controllers used Common English during their interactions. Of these pilots, 73% commented on their interactions. Once again, there were two overlapping themes: The degree with which Common English occurs depends on (1) how comfortable they are with their command of the English language and (2) how structured the ATC environment is to support its use by controllers.

Non-Native English Speakers May Not Be Uncomfortable Speaking English

I've rarely experienced any familiar conversational English. It just doesn't happen because I think they are trained to be proficient in ICAO standards and that's their safety net. They keep trying to go back to the standard phraseology; and when they can't they finally say, "Hey [Company name] what are you doing?" or "We want you to turn here now – go there." It seems to be their last resort.

When we've spoken with particular non-native English-speaking controllers long enough and they feel very comfortable with us, they may practice their Common English but it just doesn't come out right. Their English is not good enough yet. If less proficient controllers start using nonstandard [phraseology] and a heavy accent is added, with poor pronunciation – we will have a problem understanding them. If we're trying to set up a 10-minute hold, get the cabin ready for descent; then confusion can drastically escalate.

Varies with Country

When dealing with non-native pilots, the non-native English-speaking controllers seem to attempt standard phraseology. The order of the words might be different; for example, in the U.S., ATC might ask, "[Call sign] give me your Kagis[23] estimate?" The Japanese controller won't say it that way. He'll say, "Estimate at Kagis." The first time [you hear it] or if you didn't anticipate the request, you might say it's not how we would hear it domestically.

It's been my experience that non-native English-speaking controllers are not that comfortable with English; they lack knowledge of the language to issue it any other way. The exceptions are that the controllers in Germany, the Netherlands, and some Scandinavian countries are very familiar with English as a second language. They can use slang and Common English to get their point across. Mexican controllers routinely use Common English; Europeans rarely do. In Central and South America, it could lead to confusing directions, instructions.

[23] Kagis is a fix in Japan and is used here for illustrative purposes only.

38. When flying in a non-native English-speaking country, how would you describe the controller's ability to communicate with you in Common English?

This is a multifaceted question that explores how well pilots understand non-native English-speaking controllers when they use ICAO phraseology and when they deviate away from it. These controllers may believe they are proficient in their knowledge and use of the English language to the point where they may speak to pilots in Common English, jargon, or slang. Pilots may experience problems that are language-based with potentially adverse consequences. By asking very specific questions, we probe into their experiences during these flight situations. Each question (and corresponding probes) appears with its specific results and discussion as stand-alone items.

As shown in Table 10, 17 of the pilots describe the controllers' ability to communicate in Common English as good, while another 20 reported it as fair. Only 7 described it as poor. No one described communication as terrible. One respondent did not make a selection although his written comments and discussion during the interview included "excellent," "good," and "poor." Also, two respondents circled multiple selections; while their comments on the written portion and during the interview included "good," "fair," and "poor" for one respondent, and "good" and "poor" for the other. Only one respondent circled "Their communication skills are excellent." Unfortunately, it was voided because he evaluated the Common English of British controllers.

Good Communication Skills Explanation

Approximately 71% of the pilots who said the Common English communication skills were good offered explanations. The controllers' ability to communicate with them in Common English depended on the language production skills (accent, pronunciation, and speech rate) of the controllers, coupled with the pilot's attention and prior experience flying in that particular country.

Attention and Experience Are Needed for Understanding

I find the most troubling parts involve frequency changes, altitudes, and clearances. A lot of times, we hear attitudes in their tone of voice and patience level, especially if we ask them to repeat something. It's so busy, in many parts of the world, it's hard to get back in and say, "Say again," let alone [ask a second or] third time.

The first time we go into someplace where we can't understand the words, we work harder. The more we're there, the better we understand their English. Once we've been there and know what to expect, a clearance out of the blue can be understood. If ATC says "[Company name] so and so you're cleared to X," I'll say "[Company name] so and so cleared to X," and make sure they agree we're cleared to X.

Table 10. Controller Common English Skills in Non-Native English-Speaking Countries.

Common English Skills	Number of Pilots	Issues
Their communication skills are good	17	Attention and Experience Are Needed for Understanding Depends on the Country Language Production (Accent, Pronunciation, Speech Rate)
Their communication skills are only fair	20	Common English Is Limited or Not Attempted by Pilots Level of Ability Depends on Interactions With English-Speaking Pilots
Their communication skills are poor	7	English Proficiency English Ability Is Theater-Specific
Their communication skills are terrible	0	
Invalid – Rated British Controllers	1	
No selection circled	1	
Multiple selections circled	2	

Depends on the Country

Controllers who use normal English phraseology are good. And the ones who don't know English will not talk to us. Either way, the Common English that is used is good enough that we can figure out what they are trying to get at.

It's been my experience that European controllers, especially the German controllers converse well. We're relatively new flying over to Delhi; we have a little difficulty in Pakistan, Afghanistan, and Kazakhstan because they are as new for us as we are new to them. So far, I've experienced very little Common English in the Middle East; however, usually we understand. I flew to the South Pacific going through Tonga, and some of those areas were difficult for me. And all through Micronesia[24] – there are some difficulties there – and some in Russia; and much more in China. The communication skills among Japanese controllers are good because we communicate with standard phraseology and it works. If we had to explain a complex problem in a South American country, I don't think the message would get through. As a general rule, the farther south you go, the more difficult it gets.

Language Production (Accent, Pronunciation, Speech Rate)

For me, the root of the problem is accents, not air traffic control English. Most of the controllers I've run into are fairly good, and it's their pronunciation or inflection that may be a little bit different. The more experience we have in that country the better we can understand their pronunciation. When they talk too fast, it's hard for us to understand.

Only Fair Communication Skills Explanation

Approximately 70% of the pilots who said the Common English communication skills were only fair provided commentary. The controllers' ability to communicate with them in Common English depended on the language production skills (accent, pronunciation, and speech rate) of the controllers, coupled with the pilot's attention and prior experience flying in that particular country.

Common English Is Limited or Not Attempted by Pilots

It is hard for me to ascertain how good non-native controllers' English skills are because I make no attempt to use Common English with them. As a second language, it's fair, but that's only the few words that might be used about a flight. If the flight is normal, there is no need to make a transmission outside of ICAO standard phraseology.

It's a lot harder to communicate when we want to do something out of the ordinary because of weather or something else. In the U.S., I can ask a controller, "Do you have any smooth rides?" or "Are the rides any better above us or below us?" If we are in another country, I say I want to go up or go down. I don't try to push their limits.

It's Open to Interpretation

When we fly in a non-native English-speaking country, we hear so many words that seem to have a different meaning. When a controller starts speaking English outside of what we're expecting, my interpretation and his interpretation may be different. It's the same as a non-native pilot trying to speak to a controller in the local language. If it is terrible, he'll want the pilot to come back to the ICAO standard.

Lack of Proficiency Forces Structured ICAO Phrases

I find that when we step outside the bounds of ATC English, it becomes more difficult for them to express what they want to say and more difficult for us to understand what they're trying to say in Common English. Basically, if ground crews want to hear, "Parking brake set," even the phrase, "parking brake is set" is outside of the norm. Common English is usually involved in these kinds of nonstandard situations; asking a controller for a "ride report" or something else is out of the ordinary.

[24] Micronesia is located in the western Pacific Ocean about 2,500 southwest of Hawaii.

Table 11. Amount of Attention Required Understanding Non-Native English-Speaking Controllers.

Amount of Attention Required	Number of Pilots	Issues
A great amount	11	Depends Upon Pilot Experience English Ability Is Theater-Specific Requires Deliberate Listening Requires Extra Crew Resource Management
A considerable amount	20	Nonroutine Situations Are Problematic Requires Deliberate Listening Requires Extra Crew Resource Management There Is A Learning Curve Understand Can Be Lost in Translation
A moderate amount	13	ICAO Phraseology Makes Understanding Easier Pilot Fatigue Exacerbates Attention There Is a Learning Curve
A limited amount	4	English Ability Is Theater-Specific
It is effortless	0	

If the controller's communication skills are only fair, his ability to understand and respond is limited. A worst-case scenario is a situation where the pilot wants to tell the controller they have hot brakes, or a gear fire. These types of transmissions don't go through very well. Two or three repeats may not be enough; a taxi to the gate may be all the controller understands. I don't want to taxi to the gate, I want to know if he sees a fire.

Level of Ability Depends on Interactions With English-Speaking Pilots

It's been my experience that the level of ability is dependent completely on the volume of English-speaking traffic through that sector. If everything is going as planned, Chinese and Japanese controllers do a pretty good job; however, if there is a malfunction or emergency, all bets are off.

If I was asked the question – Where would I prefer to deal with an emergency, the Atlantic or Pacific area? – I'd be much more comfortable having a problem in Europe than in China, Japan or in the Asian Pacific. Canada and Europe are the best. Germany is excellent. So the answer to the question depends on where you are.

Poor Communication Skills Explanation

All of the pilots who provided comments described the controllers' Common English as poor.

English Proficiency Poor[25]

Some countries and individual controllers are terrible at Common English, and we have no flexibility [outside of ICAO standard]. Any nonstandard requests are often difficult to communicate. Although their ATC English is good, some do poorly if they try Common English.

English Ability Is Theater-Specific

As a pilot, you could probably get away with telling someone working Havana Center that you had white caps in your coffee cup and what the ride is like; I don't think you ought to try that in China. In Central America, you have a problem when you get off standard phraseology. Panama is good. In between them you just have Kingston and [the controllers are] Jamaican, so it's not bad.

From that point south, it is really difficult. I've found that if I ask about sports events like the World Cup it goes nowhere. Any nonstandard request or remark is very difficult to communicate. If we're not using standard phraseology or it's not the expected communication at that point of the flight, it's difficult to catch it in the first communication. In Europe, they understand Common English more than in South American.

38a. In general, how much attention is required for you to understand what a non-native English-speaking controller is saying in English?

The pilots' responses and compiled comments from the written and interview portions of the questionnaire are included below. As shown in Table 11, 65% of the pilots reported either a considerable (42%) or a great (23%) amount of their attention was required to understand the English spoken by non-native speakers. No one thought understanding these controllers was effortless.

A Great Amount Explanation

Eleven respondents circled "A great amount." One respondent made no comments. Among this group of pilots, 91% made comments that were organized into four issues: Pilot Experience, Area of Operation, Deliberate Listening, and Crew Resource Management.

Depends Upon Pilot Experience

How much attention is required is probably determined by what experience the pilots have in that

[25] Throughout the interviews, pilots had difficulty separating Common English and standard phraseology in English.

theater. It's almost like [flying as] a single pilot sometimes when you have someone who is new in a new area – you cannot assume that pilot understands – so the workload is definitely higher.

At [company name], a pilot's first flight over there is as a listener. They don't do the speaking on the radio. They are flying the plane, manipulating the controls and listening.

English Ability Is Theater-Specific

The amount of attention to communication has an affect on situational awareness. Frequently we say to each other, "What did he say?" "Did you get that?" We are always on our toes. Before I even squeeze the trigger to communicate, I try to figure out what they are going to say back to me. It takes a great deal of time and attention in a non-English-speaking country. In Mexico, communication is very attention-intensive – we have to make sure everybody understands, especially if there is a problem.

Requires Deliberate Listening
Benefit of Wearing a Headset

I am considering getting a noise-cancelling headset so both my ears can listen in a quiet environment because of the distortion coming out of the speakers. I know that one ear is better than the other is at some frequencies.[26]

Deliberate listening is required when flying in a non-native English environment! It focuses a lot of my attention because I want to be absolutely sure about what is being conveyed. I listen much more intently than I would in the U.S., only because I tend to discern the meaning here much more easily.

Workload Increases in Non-normal Situations

I listen intently and I think that – based on workload – if there are two or three of us, then we all listen intently. I can see where the workload would exponentially increase if you were in a non-normal situation. If one person was flying the aircraft as well as speaking, in a situation like that, and the other pilot was engaged in handling the non-normal situation then it could lead to an extremely increased workload.

Requires Extra Crew Resource Management

We really have to be attentive going anywhere in South America. When we're coming off our rest breaks, a lot of captains want even the pilot coming off rest up there 30 or 45 minutes prior [to landing]. They have to be wide-awake and fully functional so they can see what's going on. Coming into the U.S., most guys say 30 minutes is fine because it's so easy to understand and it's routine.

I go into Brazil two or three times a month, so it's no big deal; I know what to anticipate; otherwise, that extra 15 minutes really helps. If the weather is bad, and all of a sudden, we're holding with everything else, now it takes everybody in the cockpit to help.

[26] Just as the right hand is dominant for many people, there also is ear dominance for hearing.

A Considerable Amount Explanation

Of the 20 respondents, 70% offered comments and participated in discussions.

Nonroutine Situations Are Problematic

I've found that anything outside the routine, although infrequent, requires a considerable amount of time. I often ask ATC to repeat what they're saying. We recently had an airplane in China that wanted the emergency equipment and it never came. The controller didn't understand what they wanted, and neither did the emergency guys.

Requires Deliberate Listening

In the non-native English-speaking countries, we really have to listen, stop doing whatever else we're doing, and listen to what they're telling us so we can understand the clearance. A lot of times, I'll pick up a pen or pencil in anticipation of what they're going to say so I have a written backup. This is unlike the U.S., where they're speaking to us as if in a conversation – and we just instantly go "Roger."

Requires Extra Crew Resource Management

From experience, we anticipate when it should come, what it should be; and when a clearance is given, everyone listens and someone will call out what he heard. Sometimes we take a poll among the pilots to see if they can decipher what was said; this requires a considerable amount of attention from everyone.

There Is a Learning Curve

I've been flying these areas a lot lately, so it's gotten easier. If I'm flying with new guys, I really want to make sure they understand they don't need to be doing anything else. They need to be paying attention to communication.

When asked whether their company made any effort to pair a new captain with a first officer who had been there a lot, several pilots offered the following comments:

I've flown an SAQ[27] to Mexico City with two guys who have less than 100 hours both in the control seats. They're trying to listen to what the controller is saying, but they're not hearing the Spanish. They're also trying to concentrate on flying the airplane, which isn't natural to them yet. It gets tough for these guys. However, they are legal to do it.

When I fly with inexperienced crewmembers, I always tell them to listen slowly when trying to understand a controller – although they say four or five words, it sounds more like ten. So we all listen slowly

[27] Type of aircraft

to the whole thing, rather than what we would do in the States. In the States, controllers say the words and we understand them quickly.

Understanding Can Be Lost in Translation

I'm prepared for ATC to speak to other aircraft in their native language and then English to us more so in different parts of the world. I just steel up and plan ahead. We hear so many words that seem to mean something differently there. For example, "their," "they're," "there;" "to," "too," "two" – numbers sound different.

If I try to speak in Spanish, what if it's terrible? I might be saying something and not know his interpretation. [When that happens] he'll try and talk to me in Spanish and I just say, "I don't understand." So, I stop and ask in ICAO phraseology, "What do you want me to do?" Then, he'll come back with the ICAO standard.

With all that said, their communication skills are good; but it still requires a considerable amount of attention and being on the lookout at all times. As far as how much attention is required to understand what a non-native English-speaking controller is saying in English depends on where you are and on their accents.

A Moderate Amount Explanation

Approximately 69% of the 13 pilots provided written and oral comments.

ICAO Phraseology Makes Understanding Easier

I would prefer to hear standard ICAO phraseology. But, on the rare occasions when there are no phrases to cover something – a clearance or deviation for weather, or to clear up his understanding of what I want, it becomes more difficult for ATC to express what they want to say and more difficult for us to understand what they're trying to say. If they move away from ICAO phraseology, they're a little bit less comfortable with the words they use, so I've got to listen up for nuances that will help me understand what they are saying.

Pilot Fatigue Exacerbates Attention

We certainly touched on something that causes us to realize another major factor or two that make it difficult. When you near the critical phase of flight – arrival and approach, having flown all night, last pilot on break just woke up, body rhythms are out of whack, and going to the flight deck – you need to understand what's going on, be prepared to think quickly, process the weather, and have some attention for what ATC wants you to do. You have to ask the co-pilot, "Did you hear what he said?"

There Is a Learning Curve

Initially, a moderate amount of my time is spent trying to understand what the controller wants. But as I become more familiar with the wording and accents, it becomes easier and less attention is required. It also depends on the individual controller; some are easier to understand than some U.S. controllers are. A lot of what we're talking about is small, in the overall picture, but big in a specific instance.

A Limited Amount Explanation

Of the four respondents who reported a limited amount of their attention is required to understand the English spoken by non-native English-speaking controllers, all made comments.

English Ability Is Theater-Specific

It varies widely – it takes a lot of attention in some areas, while other areas are easy. I've found that if I listen the normal way, understanding is almost always there. As I've been exposed to an area more and more, it's gotten easier. Anytime we're dealing with a more experienced controller, it's easier. Accented English requires increased attention.

I think all controllers want to take the time to say it right – they don't have the time. Even our controllers have gotten nasty with foreign carriers flying in here when it's "say again, say again," and then, "say again." It's understandable what they're going through, and they're frustrated with a pilot coming into our country and not immediately grasping the language of some controllers with a rapid-fire accent saying, "Do this, do that, do this." You'll hear it on both ends of the spectrum when you talk to the foreign pilots.

38b. What are the most troubling language-based problems you experienced with non-native English-speaking controllers?

Approximately 94% of the pilots commented on this question during the interview. Their responses were grouped together by related content and then arranged thematically. We identified five language-based problems involving issues ranging from accent to a failure to communicate. They are presented alphabetically in Table 12, followed by the respondents' abridged comments.

English Ability Is Theater-Specific

I think that poor radios, English as the second language, and then different phraseologies in the poorer countries will be with us for a long time. We will not easily understand the controllers' pronunciation of words until their equipment improves.

Also, some countries don't have the airway structure [that is] anything like what we have. They have very few airways – so there are a lot of airplanes on those airways – and there is hardly ever a break in the action. It just seems like it's always peak traffic. They're giving out instructions very quickly. If we have a problem and need to get something repeated, it's hard to cut in to tell them. Meanwhile, we're not able to conform to whatever it is that they want us to do. Meanwhile we're still on our way.

Table 12. Language-Based Problems Arranged Thematically.

Language-Based Problem	Issue
English Ability Is Theater-Specific	Asia South America The "Stans"
Misunderstandings	Call Sign Clarity of Message Multiple Languages on Frequency Diminishes Situational Awareness Nonstandard Phraseology Similar-Sounding Words Translation
Pilot Controller Interactions	Failure to Communicate Results in Frustration Readback/Hearback Loop Provides No Assurance Repeating Transmissions Without Variation Uncertainty Regarding Mutual Understanding
Speech Characteristics	Accent Decoding What Was Said Pronunciation Speech Rate
Unexpected and Complex Clearances	

Misunderstandings

Call Sign

To detect our call sign sometimes in Latin America or South America requires us to listen closely to catch it. When we call in the first time, controllers respond back with the phonetics "Delta Alfa Lima" instead of "Delta" or Uniform Alfa Lima for "United." It takes us by surprise and we may miss the call. We hear some different dialects, and the way our call sign is pronounced in some places is sometimes hard to understand. They may not have seen or are used to our ninety-nine one or ninety-nine Alfa call signs. These call signs aren't that common yet.

Clarity of Message

The most troubling language-based problem I experienced with non-native English-speaking controllers is usually the clarity of what they mean and what I hear. Clarity is what is meant by the transmission – for example – "cleared direct" as opposed to "cleared present position direct" or "cleared to," it's the clarity of what fix it is.

There is a conflict in meaning of certain ATC phraseology, such as "line up," "line up and wait," and "cleared to follow behind." I don't even think that was ever in our books; we can see that some of the things they say have certain meaning to them, but they might have a different meaning to us.

Multiple Languages on Frequency Diminishes Situational Awareness

When controllers speak to other aircraft in their native language, I don't have a clue as to what they're saying. It reduces my situational awareness as to what's going on in the pattern, or if there are weather situations. I'm wondering, is that something important I might need or want to know about? The problem is more than annoyance at the chatter; it's less situational awareness and misunderstanding a clearance, due to the fact that sometimes I don't understand controller/pilot communication in their native language; and quite often, when they point out or clear us to somewhere, it is confusing.

Nonstandard Phraseology

We need to deviate from the standard when there is an emergency or if someone misunderstands a transmission. The language problems come up when controllers have to use nonstandard ICAO phraseology – when there is a need to deviate from standard, making sure it is understood.

Similar-Sounding Words

Even though I already know that a clearance is coming, sometimes it's very difficult to know and understand what was said. We may have to listen to it two or three times before somebody hears it for what it was. But we still read it back and get the affirmation that was in fact what ATC said.

Clearances and reroutes to fixes and NAVAIDs that are non-English based and understanding altitude or number-based clearances can cause problems. Waypoint names often are not common words. I have difficulty distinguishing one from another – especially if they look alike or sound alike. When that happens, I may have to request it be spelled phonetically.

What I find even more troubling is the "two three zero," and "three two zero" clearances given by some non-native English-speaking controllers, because the "two" and the "three" become almost blurred, sound alike. I have to clarify it – "was it two one two three zero; or was it "three one two three zero?"

Translation

In translating the native language to English, or English to their language, there may not be a word to fit [the meaning or intent]. We had a flight not long ago in South America where the pilots wanted to burn some fuel to get down to the max landing

weight. They tried to explain that to the controller enroute, but the controller could not understand the English words to translate them into his language.

Pilot Controller Interactions

Failure to Communicate Results in Frustration

If a point is not conveyed or understood, we either ask for a repeat or have them say it again. Often, I find there is frustration as controllers will speak louder or talk faster.

Readback/Hearback Loop Provides No Assurance

The most troubling thing I see is pilots using the controller's hearback to correct their readbacks. My suggestion is that if pilots don't understand what they heard, they should just say, "Say again." Say again is the proper way.

The hearback/readback problem is significant. We had a problem where a pilot was expecting a clearance onto a runway. He was given a hold short clearance and said, "Roger position and hold." He was expecting *line up and wait*; but didn't get that, but that's what he read back. Relying on ATC to correct you is not a good idea. It causes me great uneasiness because I say to myself, "Did I really read back what he told me to do?"

Repeating Transmissions Without Variation

One problem I have experienced is controllers who repeat the same garbled English multiple times instead of varying it. For example, I'm given a radio frequency and say, "Say again;" and they say it exactly the same way again. "Say again," they'll say it exactly the same way the third time instead of getting another person to say it, vary the pace, pitch, or doing something different.

Uncertainty Regarding Mutual Understanding

The most troubling parts for me would be frequency changes, altitudes, and clearances. It's so busy in many parts of that world, it's hard to get back in, and say, "Say again." Once I get a clearance, I try to understand and make sure I have it; it's a question of "Is he hearing what I'm saying, and vice versa?"

Speech Characteristics

Accent

It's my experience that language-based problems are geographical – a native language either lends itself to speaking English in a heavy accent or not. A strong accent is not only bad in Common English; it is bad in ATC English. I will have difficulty understanding heavily accent English or very thick-tongued English.

Decoding What Was Said

The most troubling language-based problem with non-native English speaking-controllers is that we just can't understand each other. It's been my experience that if there is a query coming from our airplane, we don't get a response because of a language barrier. Just making ourselves understood is problematic in a non-normal or unexpected situation. Understanding what they are telling us – flight levels, headings, and clearances – affects the safety of flight.

VORs, NAVAIDS, and Waypoints

One big area that keeps coming to my mind is that a lot of NAVAIDs look alike and sound very similar; and I have to re-verify them. Everyone talks about this problem.

Pronunciation

It seems to me that the pronunciation and sentence structure – like Spanish – are backwards from English in the way [native speakers] fix their words. The inability of a controller to pronounce ICAO standard phrases is a problem in any non-native English country. If the phraseology is nonstandard, then pronunciation is a bigger problem.

The way fixes are pronounced in a controller's native language makes it seem as if I never heard them. In other words, we don't pronounce the word that we see in front of us the way they pronounce it; and in Japanese, it's the "l's" versus "r's."

The differences in pronunciation are basically the most troubling problem. It is more difficult when we don't realize that they didn't understand us, or they don't realize that we didn't understand them. If I know that we didn't understand, I can try to clarify that issue and eventually get it clarified and visa versa. If it's so subtle that everyone misses it, we're on different pages, it's allowed to stay that way, and that's when the most trouble occurs.

Speech Rate

One of the big language-based problems is that it is hard for us to understand when ATC talks too fast. Sometimes it can be that they're trying so perfectly to do the vowels that we're listening faster than they're talking; we're just not on the same page.

Unexpected and Complex Clearances

The complexity of clearances can be problematic that are unexpected such as reroutes, change of fix or waypoint, altitude restrictions, speed changes, etc. For example, I received a clearance that had a specific problem while we were on the ground. It was the initial clearance and it was very difficult because we could not understand what ATC wanted us to do. We never were certain that we had it right; but at the same time, we were trying to prepare the airplane, get the engines started, and things like that. That was the most troubling language-based experience with a non-English controller.

Table 13. Frequency of Jargon or Slang Usage by Controllers Not Interpreted Easily by U.S. Pilots.

Frequency of Jargon or Slang Not Easily Interpreted	Number of Pilots	Issues
Rarely (less than 10% of my time monitoring pilot/control communication)	41	Never Heard Any Jargon or Slang Heard a Little Jargon and Slang and Understood It Only U.S. Controllers Use Jargon and Slang European Controllers Use Jargon and Slang
Occasionally (between 10-24% of my time monitoring pilot/control communication)	6	
Frequently (between 25-74% of my time monitoring pilot/control communication)	1	
Often (between 75-90% of my time monitoring pilot/control communication)	0	
Without fail (more than 90% of my time monitoring pilot/control communication)	0	

38c. How often have you heard non-native English-speaking controllers use jargon or slang that was difficult to interpret?

As shown in Table 13, 85% of the pilots reported they rarely experienced difficulty interpreting the jargon or slang they heard spoken by non-native English-speaking controllers. Approximately 13% of the respondents occasionally heard it while one pilot said it occurred frequently, although they provided no examples. Their compiled comments from the written and interview portions of the questionnaire are included below.

Rarely Explanation

Forty-one respondents reported they rarely heard slang or jargon while monitoring their radios. Of these pilots, 49% offered comments that were combined by theme and abridged.

Never Heard Any Jargon or Slang

My perception is they typically don't use a whole lot of English outside of ATC, so they aren't going to be too willing to use slang. I wouldn't understand it if they were saying it in their native language.

Heard a Little Jargon and Slang and Understood It

Any jargon or slang that I have heard I knew and understood. Sometimes I hear phrases such as "speed up." I'm not used to hearing "speed up." I know "accelerate to," or "increase airspeed," or "maintain 250 knots." I find that non-native English-speaking controllers tend to avoid using anything that's outside of the norm as much as possible. They don't want us to be confused, and they don't want to be confused by us; so most of the time, we stick to a script and we don't use jargon or slang; they understand that's not permitted.

Only U.S. Controllers Use Jargon and Slang

I only hear jargon or slang in the U.S. It should be troubling because this is what a non-native English-speaking pilot hears flying into the U.S.; they don't speak English as a primary language and they aren't going to be too willing to use it.

European Controllers Use Jargon and Slang

Most of the jargon and slang that I hear is in Europe, and they know what they're saying. Sometimes we hear, "Follow the lights" when we turn off the taxiway. And we're going, "What, which lights?" What they're talking about are the taxi lights – the lights lead us to where they want us to go and are turned off when they want us to stop. It actually works very well, by the way.

Occasionally Explanation

Of the six pilots who reported they occasionally heard controllers use slang or jargon, 33% offered comments that were edited.

I've heard, "fly to," and sometimes numbers are given without specification on whether they are "airspeeds," "altitudes," or "headings." Going back to earlier experience, as I'm crossing an FIR[28] boundary in the Middle East and expecting to get my clearance across, the controllers say "continue;" and that is equivalent to "cleared as filed to your exit point." I need to understand that is what they are telling me by saying, "continue."

Frequently Explanation

One respondent reported he frequently heard slang or jargon while monitoring pilot/controller communications. He gave no examples of jargon or slang.

38ci. Please write some examples of the jargon that was difficult to interpret.

Presented in Table 14 are the five examples of jargon generated by the pilots. Although others were mentioned during the course of the interviews, only those given in response to this question are represented.

[28] Flight Information Region

Table 14. Examples of Jargon.

Jargon
"I call you back" vs. "stand by"
"Fly to"
"Continue" on initial contact at FIR or UIR[a] in the Mideast rather than "cleared as filed" to exit point
"Redirect" vs. "cleared direct"
"Breakout" vs. "go-around"

[a]Upper Flight Information Region - ICAO

Table 15. Examples of Slang.

Slang
"No sea wet" [no sweat]
Native language "yes" or "no" vs. "affirmative" or "negative"

38cii. Please write some examples of the slang that was difficult to interpret.

Presented in Table 15 are two examples of slang provided by the pilots. In both cases pilots experienced difficulty understanding what the controller had said to them.

DISCUSSION

During one part of the interview, a pilot answered a question that expressed the sentiment of many pilots. The question was, "When controllers are speaking in their native language to their own pilots, is that much of an issue for you?" to which the pilot replied, "I feel out of the loop because I don't know if the foreign carrier coming in might be conflicting traffic for me. You kind of know what the controller's asking them and what they're acknowledging. So, everybody's sort of on the same sheet of music. I really have no idea what the controller might be asking the pilot. It makes me a little uneasy; for the most part, I guess they're keeping things sorted out, I hope."

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 their aircraft 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 noted they had learned to speak it informally at home prior to entering elementary school. Also, they reported English as the language spoken most frequently at home. Approximately 60% reported they 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 also spoke/understood German, and one spoke/understood Spanish, French, and Portuguese. When asked about their listening and speaking skills, nearly 80% of the pilots reported no dominance of one skill over the other.

Language Experiences in Non-Native English-Speaking Airspace/Airports

There were 21 different non-native English languages heard by pilots during their international flights, with Spanish and French listed 22.60% and 19.86%, respectively. Chinese, German, Italian, Japanese, Portuguese, and Russian were listed between 6.16% and 8.90%, while the remaining 14 languages varied in presentation from 0.68% to 2.74%.

When asked how they would rate their overall non-native English-speaking language experiences, only 17% of them rated it as either very positive or positive, 31% rated it as neutral, and 52% reported it as negative. Among the pilots with a favorable rating, notably their admiration for controllers being able to speak English was apparent (especially when many of the pilots only spoke English). Likewise, pilots viewed flying outside the U.S. as a learning experience offering them the opportunity to develop their piloting skills and become more culturally aware.

The pilots who expressed a more neutral viewpoint also noted the opportunity for personal and professional development; they also took the stance that both pilots and controllers have difficulty understanding one another. The example of a pilot who had difficulty getting the controller to understand that he could not descend because there was an aircraft beneath him displayed on TCAS highlighted the problem. Trying to explain TCAS to the controller may have resulted from the controller lacking an understanding of aircraft electronic systems such as TCAS, the English language, or both.

Among the pilots who reported negative experiences, there were several factors supporting their rating. These factors involved the frustration of hearing different languages on their radios that restricted situational awareness, and more effort making repeated calls to ATC coupled with diverting more of their attention to listening to what the controller said to assure understanding.

Only 25% of the pilots reported they rarely experienced problems related to communication problems in non-native English-speaking airspace/airports, while another 52% reported occasional problems. Finally, 23%

of the pilots indicated 25% or more of their interactions with non-native English-speaking controllers resulted in communications problems.

Overall Non-Native English-Speaking Language Experiences

Professional Growth and Development

Only 17% of the pilots viewed traveling into countries with controllers whose English language skills varied as a positive learning experience. Initially, it was difficult, but as they completed more flights, learning occurred, and what once was viewed as unintelligible and difficult became manageable. With each flight, pilots developed expectancies derived from understanding exactly what it was that they experienced. Because controllers speak in English and the local language, pilots learned some of what was said in that language because it was repeated so frequently. As they became more seasoned, they valued their accomplishments.

The remaining 83% discussed the factors that led them to report their experiences as neutral (31%) or negative (58%). In particular, accented English and pronunciation are problems for them, as are the influences of different cultures on controller proficiency. When combined with multiple languages on frequency, situational awareness was adversely affected, as was identifying turn-taking as an integral part of the communication protocol. Each is summarized below.

Accent and Pronunciation Are Problems

Pilots reported that countries with close ties to the U.S. or U.K. seem to have controllers who have a better understanding of English. English, unlike most other world languages, has a different stress and rhythm pattern. Whereas other languages give equal time to pronounce syllables (regardless of whether or not they are stressed), in the English language, equal amounts of time only occur between stressed syllables; unstressed syllables are spoken very rapidly. Consequently, there is a negative transfer that occurs when listening to languages other than English. The farther removed the language is from English, the more difficult it is to process and understand. In particular, accent and pronunciation create problems for U.S. pilots, especially waypoints, fixes, company name as part of the call sign, and numbers.

Cultures Differ

Some of the pilots' perceptions were that controllers and pilots from poorer countries generally display less comprehension of English, are difficult to understand, and may prefer to communicate in their native language when the opportunity arises. If U.S. pilots ask a question about the communications, if there is a problem or concern, at times, these controllers fail to answer them. The lack of an acknowledgment may be due to the controllers' insufficient English language skills, their preference of speaking in their native language, or they are simply ignoring the pilot.

Another factor the pilots discussed was whether or not the culture supported developing English language skills of their citizens. In Europe, children learn English as a second language as part of their normal schooling. In other countries, English is taught on a limited basis, if at all. Likewise, the proficiency of the learner is based on individual differences. Some are better than others are, although sharing the same educational opportunities. The better ones seek jobs in the private sector because they can double their salaries over that of the wages of an air traffic controller.

Communications in a Multilingual Environment Reduces Situational Awareness

When non-native English-speaking controllers talk to local pilots in their native language, pilots who do not know that language cannot comprehend the conveyed information and experience limitations to their situational awareness. U.S. pilots would rather not make inferences or assumptions regarding actions by other aircraft in their proximity and prefer knowing how that information could affect them. Their ability to anticipate diminishes as expectations derived from party-line communications decrease.

Radio Protocol Is Lost in a Multilingual Environment

Listening to a combination of English and the local language deters from the radio cadence of turn taking. In the English language when a speaker finishes talking, there is a rising-falling intonation and silence signaling the listener the end of the utterance. If a question is asked, there would be a rising intonation at the end of the utterance. Unfortunately, pilots unfamiliar with the language cannot follow along and, not knowing when the utterance will end, are at a loss regarding when they can make a call or if the controller was calling them. Often they miss hearing their call signs.

Effects of Non-Native English-Speaking Language Differences on Pilot Workload

Increases Workload

One factor cited by pilots that increased their workload was the apparent difference in controller English language proficiency. Generally, there is the slowing of decoding skills – mapping of sounds and silence to detect meaning from nonsense to detect their call sign, standard phraseology, and numbers into meaningful utterances. When controllers do not speak English very well, transmissions have to be repeated many times for comprehension to occur. Pilots cannot rely on transmissions to other pilots to facilitate decoding since they do not understand what was transmitted to local pilots in their native language. Prinzo, Hendrix, and Hendrix (2008) report U.S. controllers and non-native English-speaking pilots exchange more transmissions than when both the controller and pilot are native speakers of English.

A second factor was exertion of more effort to ensure understanding the intent of the controller's transmissions from the phraseology used. As noted in Prinzo, Campbell, and Hendrix (2010), ATC phraseology such as "cleared direct" is not limited to one meaning. Any misunderstanding will increase the workload for both the pilot and controller. To resolve ambiguity often requires the exchange of multiple transmissions, as opposed to a single one. In such situations, everyone's workload goes up with all the repeated radio calls for clarification. Because of the higher workload, it is harder to understand the non-native speaker's English.

A third factor was actively listening to communications between non-native English speakers arising from hearing multiple languages on the radio. When controllers and pilots speak in a language other than English, there is a reduction in U.S. pilot situational awareness caused by not fully understanding ATC communications presented over an open party line. ATC party-line communications provide a valuable piece of information not presently found on a traffic and collision avoidance system (TCAS) – that of intent. By listening to controllers issuing instructions, clearances, traffic, and weather advisories to other pilots, combined with TCAS, pilots develop a more comprehensive analysis of the airspace around them. When communications degrade, they experience a partial loss of this situational awareness that can be unsettling. They try to piece together the "who," "what," "where," "why," and "when" to determine how their flight may be affected from partial information.

Fourth, these communications when combined with busy radio frequencies, delay completion of other normal station-keeping functions, especially during a critical phase of the flight when some crewmembers experience difficultly communicating and understanding the controller.

Requires Added Attention and Concentration

Decoding a message from a non-native English-speaking controller requires increased concentration and attention because the controller's dialect, accent, pronunciation, inflection, and speech rate affect linguistic-processing of the voice stream. As noted in Prinzo, et al. (2010), until pilots learn to associate particular words with specific sounds of a foreign language, they will experience difficulty with that language.

Communication in a multilingual environment also demands more attention and increased concentration to discern what was said from what was expected. As noted in Prinzo and Campbell (2008) in preparation for a flight, pilots review their flight plan, maps, charts, and other materials in addition to talking with other pilots who recently flew the same flight and their flight crew. All of this information, along with their prior knowledge and preflight preparation, becomes integrated and form a series of episodes with an explicit beginning and end action sequences (e.g., scripts, Schank & Abelson, 1977). The quality of these mental representations is based on expertise – pilots with many flight hours for a particular route have well-developed and clear expectations about the order in which ATC will deliver instructions and clearances, as well as the contents of these speech acts. They anticipate the type of a clearance they are going to receive to facilitate understanding and then listen for the confirmation of their expectation. They may have the message repeated to ensure understanding. If there is incongruence, the pilot puts forth a request to have the message repeated to clarify any uncertainty.

Unfortunately, regional differences in English language proficiency may direct attention to decoding processes when flying in non-English-speaking countries. Pilots expect problems and discussed the differences in language skills among controllers according to phase of flight – whether they were in the en route or arrival environment. The amount of radio communication was factored in – when radios are busy with consecutive calls to and from ATC, more attention is diverted to interpreting and understanding what was said. Because of the added attentional demands placed on them when engaged in ATC communications, many pilots try to complete much of their station-keeping tasks at the cruise altitude (e.g., all briefing items, FMS entries, coordination with flight attendants) so they can allocate more of their attention towards listening to ATC. When they begin their descent, both pilots focus on what is being said so they understand what is taking place around them with other aircraft.

Workload Related

TCAS Cannot Remedy the Loss of Situational Awareness Due to Multiple Languages on Frequency

Pilots have come to depend upon their TCAS to aid situational awareness when in non-native English-speaking airspace because of the language barrier. Although systems like TCAS were not developed for navigational purposes, some pilots use its information to request changes in altitudes and speeds based on separation minima. The problem is that neither a complete nor an accurate picture of all aircraft is presented on the visual display within the selected range.[29] Still, it provides some useful information and is a backup tool when they are unable to understand ongoing communications on the radio due to the language barrier or radio coverage.

Advanced Avionics Offer Possible Solutions to the Language Barrier

The NextGen system will provide digital communications to flight crews in multiple formats (e.g., text, graphics). Presently in use are several early deployments of digital data transfer systems such as the Controller-Pilot Data Link Communications (CPDLC) system[30] and the Automatic Dependent Surveillance systems (e.g.,

[29] The requirement for an aircraft to have a TCAS or similar aircraft collision avoidance systems instilled is determined by the country of registration.

[30] CPDLC is defined in the pilot controller glossary as "A two-way digital very high frequency (VHF) air/ground communications system that conveys textual air traffic control messages between controllers and pilots."

ADS-Broadcast,[31] ADS-Contract[32]). CPDLC is currently used by the FAA's Advanced Technologies and Oceanic Procedures (ATOP) Ocean21 system to send electronic messages between oceanic controllers and pilots prior to their entry into the U.S.

Clearly, one benefit of CPDLC is improved information transfer. It provides pilots an alternative to voice communications for receiving information controllers have difficulty conveying in understandable English. A second benefit is a reduction in pilot and controller workload: neither will have to repeat a transmission, since the message is available for viewing on a visual display. A third benefit is the redistribution of attention to operational and procedural tasks. Trying to decode accented English diverts attention from other tasks as pilots (and controllers) attempt to understand each other.

Although CPDLC was originally developed for routine communications, pilots expressed concern with the language proficiency skills of controllers and whether they would be able to communicate effectively during emergency conditions. As noted by several pilots, "How would I tell the controller I had a problem – a cabin fire, engine fire, or terrorist attack, or something like that in English?" Developers and policymakers may want to revisit the applicability of CPDLC for emergency and off-normal operations.

While CPDLC will not remedy the loss of party-line information U.S. pilots experience when communications occur in languages other than English, the ADS-B system provides much of the missed information. It provides pilots with traffic graphically displayed in real time of aircraft similarly equipped. Call signs, trajectories, position, altitude, current heading, etc., are several pieces of information pilots have available for display to augment and update their situational awareness. These NextGen applications will enhance present-day operations in oceanic airspace as more aircraft are equipped with these avionics.

When in non-English-speaking countries, information from the automated terminal information service is heard in the local language and then in English. It is presented as a continuous transmission, and pilots often listen to it many times to extract information. It is a very time-consuming task that diverts the pilot's attention and increases workload, especially if the pilot flying also has to listen to it. ATIS information could be uplinked to onboard avionics and pilots choose the mode of presentation.

Frequency of Communication Problems

Only 25% of the pilots reported they rarely experienced communication problems during their interactions with controllers, while 75% said more of their interactions involved communication problems. Some pilots used individual flights as the basis for their response, whereas others examined all of their flights over time. The degree with which these communication problems arose appeared to be related to where pilots flew – some parts of the world were more problematic, as were the types of problems they experienced; however, problems occurred everywhere. In some cases, the problems stemmed from faulty equipment. In others, it was country-specific, and the regional culture's influence on the controller's ability to communicate in English. Pilots reported the controller's accent or pronunciation of waypoints, fixes, numbers, or words as sources. Whatever the case, whenever a communication problem occurred, flight deck operations slowed down as the flight crew diverted attention from other tasks to understand what the controller said.

Variability in English Language Skills of Pilots and Controllers

When asked whether English language skills are comparable from one non-native English-speaking country/airport to that of another, 61% of the pilots reported some countries have better English-speaking pilots than others, as was the case with their controllers. The pilots' English is consistently better than that of the controllers. Notable differences resided in accents.

Several pilots commented that a key factor that determined proficiency in English was learning it early in life. From their flight experiences, they reported there is a wide skill level of English speaking from country to country, and even from individual to individual. Furthermore, the pilots suggested countries placing a strong emphasis on its children learning English as a second language, beginning in elementary school, generally spoke English better than a person learning it as an adult.

Their perceptions are partially supported by research into second-language learning. There is much controversy regarding "critical periods" for language-learning, depending upon which aspect of language is investigated (e.g., phonology, vocabulary, grammar). For example, research performed by Flege, Mackay and Piske (2002) showed that dominant Italian bilinguals had detectable foreign accents when speaking English, but early bilinguals (English dominant) had no accents in either language. Sebastián-Gallés, Echeverría, and Bosch (2005) report learning a second language once the phonology of the first language is stored in memory can reduce sensitivity to distinguish new sounds present in the second language. Many factors influence whether a person becomes proficient in a second language (motivation, maturity, learning style, etc.)

Other key factors included the level of proficiency tended to compensate for stronger accents, and the busier international airports tended to attract controllers who are more fluent in English. Communicating with English-speaking pilots reinforces their basic skills and encourages them to speak more frequently which, in turn, increases their proficiency.

[31] ADS-B provides pilots real time traffic on radar-like displays to enhance their situational awareness.

[32] ADS-C allows establishment of position-reporting contracts between ground systems and an aircraft's avionics.

Factors Contributing to the Intelligibility of Non-Native English-Speaking Controllers

About 75% of the pilots indicated they had to work harder to understand non-native English-speaking controllers. Regardless of whether native or non-native in the English language, the more unintelligible the speaker, the more difficult it was for the pilots to understand what was spoken. Voice characteristics such as accent, pitch, pronunciation, and speech rate each contribute to intelligibility and the ease with which pilots understand controllers.

On international flights, it is not uncommon for pilots to hear five or more different accents as they travel from one country (or state) to that of another. Controllers with higher-pitched voices are not only difficult to listen to but also hard to understand. Add to that their varied pronunciations of waypoints, fixes, and numbers coupled with a rapid speech rate, and it is no wonder that pilots will ask for repeats in the form of a say again, confirmation, or verification of some or all of the transmission.

Factors Contributing to the Understandability of Non-Native English-Speaking Controllers

The responses of the pilots were organized into three broad themes: Voice Properties, Delivery Technique, and Radio Equipment.

Voice Properties

There are individual differences in the voice properties of all speakers. We use these unique qualities to distinguish between speakers as male or female, child or adult, native, or foreign, etc. When listening to people, we can also determine their geographical area of primary residence by country and region.

With bilingual and multilingual speakers, oftentimes the dominance of their first language carries over into the other languages that they speak. Because some languages have shared properties, they are easier to learn and understand than languages sharing few to no commonalities. For example, English, French, German, and Spanish belong to the same Indo-European language family, making them easier to learn as a second language among the speakers of these languages. In contrast, speakers of languages such as Arabic (Afro-Asiatic language family), Japanese (Altaic/Isolate language family), and Chinese (Sino-Tibetan language family) are considered difficult to learn by native English (Indo-European language family) speakers and visa versa.

Notably mentioned factors affecting the understandability of non-native English-speaking controllers were their differences in accent, dialect, enunciation, pitch, and pronunciation. The proficiency of controllers was influenced by the opportunities they had to communicate with others in English. In particular, if controllers worked at busy international airports that contracted with English-speaking airlines, they had a greater possibility of hearing English and practicing their speaking skills. The more frequent these communications occurred, the greater the opportunity to practice English.

Another factor affecting understanding was whether controllers learned English as part of their early educational experiences. Controllers who learned English during early childhood had less influence of their first language on their English production. Although accented, it was not as apparent as the speech of a controller who learned English as an adult.

Delivery Technique

U.S. controllers deliver messages in a particular cadence, which U.S. pilots are acclimated to. Likewise, native English-speaking pilots have a cadence that is understood by English-speaking controllers, though it may vary pilot-to-pilot, company-to-company, and country-to-country. Different messages have different melodies. When outside the U.S., pilots do not hear this expected "melody;" rather, they hear controllers who may place the emphasis on an unanticipated syllable, pause when unexpected, lack the voice contour for particular commands, and so forth.

Cadence is separate from speech rate. Pilots reported that the controller's speech rate was the biggest problem they experienced in communication. As traffic load increased, so did the rate of speech and the number of repeated transmissions. Some pilots perceived that controllers may speak faster, either to mask a lack of proficiency or to show off their proficiency. In fact, the ICAO Language Proficiency Rating Scale contained in *Doc 9835* (ICAO, 2004) evaluates the fluency dimension of proficiency using tempo as one element of consideration – a faster tempo received a higher mark for fluency. Therefore, while learning English, controllers might be told to speak faster to obtain a higher score on this dimension. They may continue to speak quickly once in the control room, although they may be less proficient on other dimensions.

An interesting study conducted by Zhao (1997) argued that the perception of speech rate is highly subjective and influenced by context, language proficiency, memory capacity, listening habit, and processing strategy of the listener. In his study, the listener had controlled the rate at which auditory materials were presented by expanding, compressing, or not changing pause and syllable durations within a sentence. The findings revealed the development of individually determined, internalized ideal speech rates that listeners adjusted to a slower rate to improve their comprehension. As they became more proficient (or adapted to the speaker's delivery style), subsequent speech rates increased without a decrement in understanding.

Thus, it might be best for controllers in the international airspace to speak slower to improve pilot comprehension. Also, they could pause after the call sign and after each instruction or clearance in the transmission. This might reduce the number of pilot requests for repetition.

Radio Equipment

The pilots also discussed the sound quality of the broadcast contributed to the intelligibility problems during their international flights. If pilots cannot hear the controller's voice clearly because of static, distortion, reverberation, hollowness, echo, or their combination, it will be difficult to extract the auditory component from acoustic noise. If they cannot disambiguate one sound from another, identifying meaningful words is unlikely.

Another problem was spotty radio coverage. In some cases, weather was a contributing factor, in others the radios may not have been monitored, whereas in others it was nonexistent. In these situations, party-line communication becomes valuable among pilots who share information with each other.

ICAO Standard Phraseology Usage by Non-Native English-Speaking Controllers

When flying in a non-native English-speaking country, 85% of the pilots indicated that 75% or more of their interactions with controllers involved the use of ICAO standard phraseology during routine communications. Generally, non-native speakers know only the standard phrases and perform as professionals by not deviating away from these phrases. There was an exception, and that was in South America, where their pilots indicated more nonstandard communication. It may be part of the local culture's influence. Several examples were provided that included, "You're not cleared to land" and "continue" when calling approach.

Common English Usage by Controllers in Non-Native English-Speaking Countries

Typically, interactions with non-native English-speaking controllers involve ICAO standard phraseology, although it can vary from country-to-country and individual controllers. Common English is usually used only by experienced controllers who are more familiar with English. Only 25% of the respondents reported controllers frequently (or greater) switch from standard phraseology to conversational or plain English. This generally occurs when controllers try to explain or verify a previously issued clearance. Whether or not controllers use Common English often depends on their previous successes (increases confidence) or failures (increases embarrassment). The more confident they become, the more likely they are to continue using it. The 75% who indicated they heard controllers communicate with them in Common English only occasionally or rarely added the controllers' usage of Common English might be unconventional, but they make their point.

Non-Native English-Speaking Controllers' Ability to Communicate in Common English

Approximately 77% of the pilots described the controllers' ability to communicate with them in Common English as either good (35%) or fair (42%), and another 15% indicated it as poor. The remaining pilots did not select one of the response options; rather, they said some countries' controllers were good, others fair, and some poor. As a group, none were terrible (although some individual controllers were so designated).

When pilots fly in the U.S., they often informally ask controllers, "How's the ride?" to learn whether there is any nearby turbulence at their altitude. This generally does not occur in other countries because many controllers would not know what the pilot was saying; they do not have any phraseology that includes the words "ride report." If the controllers' communication skills are only fair, their ability to understand and respond is limited to ICAO phraseology. Even among the better controllers, when off-normal events arise, it is not easy for pilots to understand what they are attempting to convey in Common English. One pilot said he'd rather have a problem in Canada or Europe (Germany) than in China, Japan, or in the Asian Pacific region.

Amount of Attention Required for Understanding

No one thought understanding non-native English-speaking controllers was effortless. In fact, 65% of the pilots reported either a considerable (42%) or a great (23%) amount of their attention was required to understand the English spoken by non-native speakers. Just as controllers' English language proficiency increases as they speak it more frequently and gain confidence, there also is a learning curve for pilots and their listening skills. Just as the quality of the radio broadcast and equipment influence intelligibility, where they were, the degree of accented English, normal as compared with off-normal situations, availability of other pilots in the cockpit, as well as fatigue – all of these factors exert an influence on how well pilots understand non-native English-speaking controllers.

Initially, pilots invest much attention separating the acoustic information from the auditory signal. How well they can make the separation depends upon the signal-to-noise ratio that affects intelligibility. The greater the noise, the less intelligible the speech signal embedded within that noise (i.e., articulation index, see French & Steinberg, 1947; and Beranek, 1947). Several pilots mentioned possibly purchasing noise-cancelling headsets to improve intelligibility.

Pilots with limited international experience initially experienced greater difficulty and expended much attention understanding non-native English-speaking controllers, compared to pilots with more international experience. However, as they gained familiarity, intelligibility appeared to improve, as did their decoding and comprehension skills, making understanding easier and requiring less attention.

As noted previously, most controllers use ICAO standard phraseology when speaking English and are effective

communicators. However, it still requires a considerable amount of attention and vigilance from pilots, especially when controllers revert to their native language.

The Most Troubling Language-Based Problems

The pilots were very open about discussing the language problems they experienced. For them, the controllers' ability to communicate with them seemed specific to a geographical area where some controllers were more adept at English, and learning that language was supported by the government. Generally, pilots discussed the problems that arise from poor radios, the controllers' ability to speak English as a second language, and their outcome on crew performance and flight safety.

Misunderstandings

Another group of problems resulted in misunderstandings. One problem involved the way controllers pronounced the call sign. Typically, it begins with the company name such as, American, Continental, Delta, United, and so on. However, some controllers used the phonetic alphabet for pronouncing the company's three-letter identifier (e.g., alfa, alfa, lima for American Airlines).

Another problem involved translating. In some instances, words do not exist in which to explain a concept or action, and either the pilot or controller may resort to nonstandard phraseology. An example was given of a pilot who needed to dump fuel to get down to the maximum landing weight, but the controller could not translate the Common English words spoken by the pilot into his language. There was a failure to establish the common ground of understanding between them. Misunderstandings also occurred when numbers sound similar to one another. Likewise, the names of waypoints and fixes in reroutes. Finally, the issue of controllers speaking to other aircraft in a language other than English interfered with their understanding of the situation near them.

Pilot Controller Interactions

As part of resolving misunderstandings, pilots and controllers exchange additional transmissions in the form of requests for confirmation, verifications, and either full or partial repeats. If the pilot incorrectly reads back the contents of the previous controller transmission, there is the expectancy that the controller will hear the mistake and correct it. However, this assumption is faulty in that there is no assurance that the mistake will be acknowledged and corrected, especially when the English language skills of the controller may lack proficiency.

The failure to communicate can be very frustrating for both participants – repeating the information using the same phraseology only saying it louder or faster is not adequate; neither is dismissing either the readback or request for clarification. When uncertainty exists between what the controller says to do and the pilot's subsequent action, the information may need to be restated differently. This would require more than a basic level of English language proficiency.

Speech Characteristics

Language-based problems are geographical, in that the native language either is heavily accented (compared to "broadcast English" on U.S. television programs), and the speech rate can make it difficult to be understood. The pilots indicated that the two most troubling language-based problems with non-native English-speaking controllers were difficulty in understanding and non-response due to a language barrier. One common problem discussed among pilots was the accent placed on words and names of navigation aids by controllers in their native language do not necessarily correspond to how these same words and fixes are pronounced in the U.S. Since many waypoint names may look alike and can sound very similar, pilots ask controllers to re-verify them. The differences in pronunciation become exacerbated when pilots do not realize they really did not fully understand the transmission, process the information differently than what the controller expected, and it goes undetected. If either one realizes they are operating on different premises, it can be resolved.

Unexpected and Complex Clearances

Receiving unexpected and complex clearances can be problematic (such as reroutes or altitude restrictions). This is especially true when pilots are multitasking while either taxiing to a runway or immediately after takeoff.

Slang or Jargon Usage by Controllers

For the most part, if controllers were using jargon or slang, it would be in their primary language and many of the pilots would not understand it. In fact, 85% of the pilots said controllers avoid saying anything considered nonstandard because of their limited English skills.

Mitigation Strategies and Techniques

1. Develop a visual aid to facilitate communications with non-native English-speaking controllers that lists the names of fixes with their phonetic spelling and identifier. One airline developed a four-page visual aid for Spanish.
2. Talk slowly and deliberately to ATC to make understanding easier. Decoding one language into that of another is not an automatic process and takes time for less proficient speakers.
3. Learn to count in the languages of the countries you frequent.
4. Try to complete station-keeping tasks at cruise altitude (e.g., all briefing items, FMS entries, flight attendant issues) so more attention is directed to listening to ATC when on descent.
5. Keep communications to very basic ICAO phrases. Any nonstandard requests are often difficult for non-native English-speaking controllers to understand.
6. Wear a headset and put in an earpiece instead of listening to external speakers.

Technological Solutions to Global Issues

1. Globally inconsistent English language proficiency among pilots and controllers may be reduced by developing ATC training software packages that display the speaker's speech samples against an accepted universal standard to improve English skills. Secure, online language proficiency testing certified to meet ICAO requirements could ensure that all states meet the same training standards provided by flight schools, ATC academies, and training centers. Testing would include assessing English-language proficiency in reading and writing, as well as listening and speaking skills within a cross section of normal and off-normal circumstances.
2. Multi-linguistic environments restrict effective information transfer that reduces situational awareness, diminishes pilots' expectations derived from the party line, and impedes the established radio protocol. The use of Automatic Dependent Surveillance applications that provide call signs, current and projected altitudes, speeds, headings, and route information for aircraft in proximity to "ownship." Also, a user-selectable ATIS uplink could be made available in English and the local languages.
3. Unfamiliar, heavily accented English slows decoding and understanding processes. Intelligibility degrades when coupled with poor radio equipment and weak broadcast strength. It is possible to develop a standardized voice, tailored for the user, for automated up- and down-link messages. Aviation personnel could be provided with user-selectable modes for information display (voice, text, graphics). Likewise, the industry could exploit vocoder technology to allow the user to recall information, and change the pitch, speech rate, and volume or display presentation.
4. Inability to make oneself understood may pose a threat to aviation safety as attention is diverted away from operational tasks and directed to listening to what is being said. During these times, more effort and concentration are needed to ensure the intent of the transmission is understood. This is especially true when confronted with an off-normal event such as a mechanical problem, passenger health issue, adverse weather, and so on.

To mitigate these events, urgent and time critical message elements should be crafted as part of the DataCom message set. Users should have an area-based reference display for the phonetic pronunciation of native language numbers/waypoints/NAVAIDS for routes and reroutes, as well as access to a universal thesaurus for DataCom message sets.

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