The Problematics of Gender for Aviation Emergency Communication during an Inflight Emergency: A Case Study

Angela Cora Garcia iD
Bentley University, USA

Abstract: Due to the rarity of female pilots, aviation communication is typically conducted in a single-gender environment. The role of gender in interactions during inflight emergencies has not yet been adequately explored. This single case analysis uses a qualitative approach based on conversation analytic transcripts to investigate how gender may be relevant either explicitly or implicitly in radio transmissions between flight crew and Air Traffic Control (ATC) personnel, as well as internal ATC phone interactions as participants work to handle an inflight emergency. This incident involved a female pilot and a male copilot, thus providing a naturally occurring rare event to explore the potential relevance of gender. The analysis shows that explicit references to gender are limited to occasional asymmetrical use of gendered address terms and gendered pronouns. Participants also used interactional formulations that—while not explicitly gendered—have been associated in previous research with gender differences in interaction, for example, the use of indirect forms of requests or complaints, actions that imply inferences about the emotional state of participants, or possible confusion over the identity of the pilot given the transitions between male and female sounding voices speaking on behalf of the plane. The findings are discussed in terms of implications for how gender differences can impact aviation communication during emergency incidents.

Angela Cora Garcia is a professor in the Department of Natural and Applied Sciences at Bentley University in Waltham, Massachusetts. Her main areas of research are conversation analytic studies of mediation sessions, emergency phone calls to the police, air traffic communications, and political speeches and interviews. She is the author of a textbook on conversation analysis, *An Introduction to Inter-action: Understanding Talk in the Workplace and Everyday Life* (2nd ed.) (Bloomsbury Academic Press, 2023), and a conversation analytic study of mediation, *How Mediation Works: Resolving Conflict through Talk* (Cambridge University Press, 2019).

email address: agarcia@bentley.edu

Previous research has shown that inflight communication problems can be a factor in accidents, and effective communication can facilitate the successful resolution of incidents in flight (e.g., Cushing 1994; 1995; Jones 2003; Federal Aviation Administration 2006; Howard 2008). Due to the rarity of female commercial pilots, who constitute only about 5% of pilots (Gorlin and Bridges 2021), aviation communication is typically conducted in a single-gender environment, and there are correspondingly very few women pilots in the Federal Aviation Administration (FAA) database of accidents and incidents. The role of gender in inflight interactions has not yet been adequately explored.

The theoretical perspective relied on for this analysis is the ethnomethodological conversation analytic approach. The ethnomethodological perspective directs our attention to the procedures people use to accomplish social action and social organization (Garfinkel 1967). This single case analysis uses a qualitative approach based on conversation analytic transcripts and sequential analysis to investigate how gender may be relevant either explicitly or implicitly in radio transmissions between flight crew and Air Traffic Control (ATC) personnel as they work to handle an inflight emergency. In addition, internal ATC telephone interactions regarding the flight are analyzed. Southwest Airlines Flight 1380 experienced an emergency in which the plane safely landed after experiencing loss of one engine, injury to the aircraft, and fatal injuries to one passenger (Stack and Stevens 2018; Shults 2019). This incident was unusual because the captain of the flight was a female pilot; the co-pilot was male. This incident thus provides a naturally occurring rare event to explore the potential relevance of gender.

Literature Review

Gender/ing, Language, and Communication

Earlier studies of gender in social interaction show how gender is socially constructed and study numerous ways an interactional style is often tied to gender (e.g., see Speer and Stokoe 2011). People do gender via their actions and choices about how to present themselves (West and Zimmerman 1987). Schegloff (1997) further argues that instead of assuming that gender is relevant for every interaction, analysts must show how it is procedurally relevant in a given exchange (see also Weatherall 2002). Previous conversation analytic studies have shown how participants can display an orientation to the relevance of gender through the use of gender-related terms or concepts or by topicalizing it (Hopper and LeBaron 1998; West and Fenstermaker 2002). There are also ways that gender can be implicitly relevant but not highlighted or focused on (e.g., Ochs 1992; Hopper and LeBaron 1998). These interactional asymmetries may be related to gender or other social roles or status differences that are relevant in the context. For example, in Tuccio and Garcia's (2020:54) analysis of how flight instructors interact with student pilots during inflight instruction, they note the connection between interactional choices and power differences between participants:

> Directives (especially imperatives—Vine, 2009) can be a way of exerting dominance or control over another (Goodwin, 2002). Directives are often mitigated (Goodwin & Cekaite, 2013). In Goodwin's (2002) analysis of directives in children's interactions, she found that unmitigated directives assert power differentials between participants. Vine (2009) found that how directives were formulated varied with the

context in which they occurred and were related to social role and social status in the organizational setting she investigated, as well as to the purpose of the exchange.

Another conversation analytic study explored gender and interruptions in doctor/patient interaction and found that males made more intrusive interruptions than females and that male doctors interrupted female patients intrusively more than they interrupted male patients intrusively (Mohajer and Endut 2020).

Recent studies from a variety of methodological perspectives continue to find a wide range of differences in communication styles between genders. In a study of speech emotion recognition by artificial intelligence, Costantini and colleagues (2022) found that it was more challenging for the systems to categorize speech produced by different genders than it was to categorize people speaking different languages. "[T]he differences between male and female in expressing emotions are assessed as crucially relevant, possibly even more than cultural and phonetic differences between languages belonging to a similar cultural background" (Costantini et al. 2022:11). Andy, Sherman, and Guntuku's (2022) study of how males and females constructed Twitter posts about loneliness showed that the females' posts tended to focus on emotions, while the males' posts tended to focus on trust and relationship problems. Hollander (2001) argues that perceptions of vulnerability are tied to our conceptions of being female. Gleason (2020) conducted an automated analysis of Supreme Court arguments and found that the success of the speaker was related to linguistic choices consistent with gendered norms. He found that male attorneys were rewarded for using less emotional language, and female attorneys were rewarded for using more emotional language. Gleason's (2020) work suggests that women working in male-dominated fields may be at a disadvantage if they break expectations about how women are supposed to communicate.

Gender and language become relevant for work, employment, and professions in several ways. Goldhammer, Malina, and Keuroghlian (2018) discuss the challenges nonbinary people have in obtaining medical care. They argue that medical personnel should not use conventional titles such as Mister, Miss, or Ms when greeting patients and should ask patients what pronouns they prefer. These recommendations are not only relevant to people who define themselves as nonbinary but reflect more general cultural shifts about how people think about and express their gender identities (see also Klein 2011). Hedegaard (2019) studied medical personnel interacting with patients and found that when patients did not follow stereotypically gendered norms, the staff interacted differently with them (more informally, less "professionally"). Hildenbrand, Perrault, and Rnoh (2022) found that female patients were more likely to feel they were treated dismissively by healthcare providers than male patients. Mavisakalyan's (2015) meta-analysis of previous research on gender differentiation in languages around the world (such as gendered nouns or pronouns) showed a relationship with women's labor force participation. Newberry-Koroluk (2018) argues that while the profession of social work is dominated by women in terms of the percentage of workers, it is not a workplace where women or women's culture predominate. The relatively few males in the profession tend to be in positions of authority. This suggests that mere numbers alone are not sufficient to shape the culture of a profession.

Alvinius, Deverell, and Hede (2020) investigated how gender impacts communication in crisis management teams. They argue that "studies have also found that crisis communication is characterized by masculinization and militarization of civilian work processes where social change and new security threats challenge the civil crisis management system with demands for introducing military structures—work processes that assign high value to masculine norms" (Alvinius et al. 2020:274). Alvinius and colleagues (2020) note that while most crisis managers (e.g., police) are male, most crisis communicators are female. The "military" approach of the (typically male) crisis managers to solving the crisis was sometimes in conflict with the approach of the (typically female) crisis communicators to handling communication about the emergency. Those crisis communicators who were male and shared backgrounds with the crisis managers often had an easier time integrating into the work of the team. In general, male norms tended to dominate the culture of the crisis teams.

If these patterns hold in other professional contexts, such as aircraft/ATC interactions, there is a potential for problems when women are the minority in a profession. Pilots tend to be mostly male, supervised by males, and often influenced by military culture, so this field may also have a male culture (Ferla and Graham 2019; Yanıkoğlu, Kılıç, and Küçükönal 2020; Gorlin and Bridges 2021).

Inflight Crew and ATC Communication

Previous research on air traffic communication has shown how official communication procedures can be functional for flight safety (Cardosi, Falzarano, and Han 1998). Routine plane/ATC communication protocols emphasize the use of scripted speech and interactional routines that incorporate "call and response" models to assure that procedures and checklists have been followed (Nevile 2001; 2004a; 2004b; 2006; Jones 2003; Howard 2008; Falzon 2009; Arminen, Auvinen, and Palukka 2010). These techniques are functional for radio communications that are audible to all planes within reach of the signal and avoid confusion as to who is being addressed, as well as an unnecessary distraction for others (Nevile 2001; Sanne 2003).

Nevile (2001) shows how inflight crew and ATC staff establish clarity as to who is performing which functions in the plane (e.g., captain vs. first officer, "pilot-flying" vs. "pilot-not-flying"). He notes that "[p]ersonal pronouns indicate which role participants are playing in a context where more than one role may be available" (Nevile 2001:59). Pronouns can work to display a connection of a turn to prior talk. For example, Nevile (2001) shows how pilots can convey whether they are acting as the individual performing a specific role or acting as part of a crew through singular or plural pronouns.

Garcia (2016) used conversation analysis to analyze interaction during an inflight emergency. She found that while scripted interactions worked well for routine situations, once the emergency began call signs were often omitted, and sentential grammar was more often used instead of truncated, "positional" grammar, and a dyadic conversational exchange could occur between the ATC and the plane. Once the emergency was announced, other planes in the sector who could hear the communications about the emergency would know that these utterances were between the ATC and the flight having the emergency rather than to them (Garcia 2016). In almost all of the emergency incidents posted on the FAA website, all of the participants were males.

Given previous research in a variety of contexts on gender differences in communication, the question as to whether or how gender may impact aviation communication should be addressed, in particular, whether gender becomes more relevant, visible, or consequential in the portions of the interactions that use hybrid/conversational mode as opposed to scripted routine talk.

Previous Research on Gender and Aviation Communication

Much of the previous research on gender in aviation communication was published during the 1990s and early 2000s and focused on issues such as how gender impacts the treatment of flight attendants (Hochschild 1983; see also Murphy 1998), the effect of the gender of automatic voice warnings on cockpit crews' perceptions and responses to those warnings (Arrabito 2009), or how changing expectations about the authority of the pilot can challenge the masculine identity that is tied to that organizational role (e.g., Ashcraft 2005). A recent paper by Zirulnika and Orbe (2019) studied how Black female pilots manage their identity and role in a job that may put them in a challenging position regarding norms and expectations created for an almost exclusively White male profession. Studies that explored aspects of communication compared factors such as the length and composition of instructions given by male and female pilots, but did not analyze talk in an interactional context in real-world situations (e.g., Fischer and Orasanu 1999; Vermeulen 2009).

There is a need for research on gender in aviation communication that examines naturally occurring interactions between the flight crew and ATC personnel as they do the work of flying the plane and assisting from the ground. As a work setting that typically involves all-male personnel, aviation needs research that explores how women in traditionally male-dominated fields do their work and interact with the largely male personnel in the profession. The current paper works to fill that gap by analyzing ATC/plane interactions during an inflight emergency in which the plane had a female pilot and a male copilot. This analysis also includes telephone conversations between ATC personnel about the ongoing incident as they shared information and coordinated interactions with the plane.

In the next section of this paper, I will describe my data and methods and then present the analysis of transcripts of the audio recordings of the incident from the ATC personnel and the crew of Southwest Airlines Flight 1380. The paper concludes with a discussion of how gender can be implicitly or explicitly relevant in interaction in this workplace setting.

Data and Methods

Conversation analysis is a qualitative approach to studying talk in its interactional context (Liddicoat 2007; Schegloff 2007; ten Have 2007; Hutchby and Wooffitt 2008; Heritage and Clayman 2010; Garcia 2023). Conversation analysis provides direct access to the techniques and procedures participants use to shape their actions and interpret the actions of others (Schegloff and Sacks 1973; Sacks 1984; Heritage 1987). Participants display their interpretation of each others' actions in their responses to them, which enables analysts to make inferences about how participants enact their roles and do the work of the setting (Schegloff and Sacks 1973; Heritage and Atkinson 1984).

Conversation analysis has a long history of research on how work is done through talk. Early studies of workplace interactions and talk in institutional settings explored how the procedures used to organize talk can be selectively implemented to accomplish the goals of that setting (e.g., Atkinson and Drew 1979; Boden and Zimmerman 1991; Drew and Heritage 1992). Current conversation analytic research on talk in a wide range of workplaces includes Asmuß (2008), Barnes (2007), Kevoe-Feldman (2018), and Vöge (2010) in business settings; Garcia (2019) and Gibson and Fox (2021) in legal settings; and Peräkylä (2019), Stivers and Timmermans (2020), and Wang (2020) in medical settings. The conversation analytic approach to the study of interaction is well-suited to the study of talk in workplace settings, including aviation (e.g., Frankel 2000; Neville 2001; 2004a; 2004b; 2006; Arminen et al. 2010; Arminen, Koskela, and Palukka 2014; Tuccio and Nevile 2017; Tuccio and Garcia 2020).

Stokoe and Smithson (2001) argue for the necessity of using a conversation analytic approach to sequential analysis and the analysis of utterances in context for the understanding of gender (see also Garcia 1998). Previous conversation analytic research by Whitehead (2009; 2018; 2020) and others on how race is made relevant in a wide range of interactions can also inform the consideration of how gender may be relevant in this analysis of air traffic communications. This body of research uses conversation analytic findings and concepts such as membership categorization analysis, formulations and reformulations, and repair of errors or misunderstandings to investigate how race is made implicitly or explicitly relevant in a given interaction (e.g., Sacks 1992; West and Fenstermaker 2002; Whitehead 2009; 2018; 2020; Whitehead and Lern-

er 2009; Stokoe 2015; Shrikant 2019; Garcia 2022a). Whitehead's (2020) study showed that implicit references to race were often quite subtle and had to be inferred from how the speaker constructed their talk and referred to social roles, regions, occupations, and other aspects of the cultural position they occupied.

The purpose of a single-case analysis is to understand a particular event (Schegloff 1987; Whalen, Zimmerman, and Whalen 1988). This approach enables us to compare the single case with published findings about routine air traffic communication and routine interactions in other settings to gain insights and new understandings of potential causes of communication failure or success during air traffic emergencies. This line of research should lead to practical implications for understanding how gender may become relevant or how gender differences in interactional style might impact air traffic communication during emergency situations.

The data used in this paper are the radio transmissions with the pilot and copilot of Southwest Airlines Flight 1380 and several ATC personnel that assisted the plane in its approach and safe emergency landing in Philadelphia. Stack and Stevens (2018) report that Flight 1380 had taken off from New York's LaGuardia airport for Dallas, Texas when an engine fire occurred. Damage to the engine caused a hole in the plane, resulting in fatal injuries to a passenger and leading the flight crew to request an emergency landing. The pilot ("captain") on this flight was female, and the copilot was male. Most of the ATC/Flight 1380 interactions were conducted by the female pilot. The gender of the pilot is indicated in each excerpt to clarify which pilot was speaking. Telephone

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communications between ATC personnel were also analyzed; the participants in these exchanges were all male.

The Federal Aviation Administration posts audio data and transcripts on their website that are available to the public: (https://www.faa.gov/data_research/accident_incident/2018-04-17).

While the official FAA transcripts accurately record the words spoken by the parties involved, they lack the detail required for a conversation analytic study. I extensively revised the transcripts of the audio data using a conversation analytic approach (see Jefferson 2004). The transcribing conventions are in the Appendix. I then conducted a sequential analysis of each transcript. I examined the radio interactions between the female pilot of Flight 1380 and the various ATC staffers she communicated with during the flight and compared them with interactions between the male copilot and ATC staffers. While the emergency was in progress, these ATC staffers also engaged in telephone conversations with each other as they worked to coordinate the hand-over of the plane from one sector to the next and to coordinate the landing of Flight 1380 with that of other planes approaching Philadelphia airport. I made note of all actions that were explicitly or implicitly relevant to gender in these exchanges. The ATC staffers in these internal phone calls were all male, and I examined whether and how they used gendered pronouns to refer to Flight 1380.

The analysis below will show that explicit references to gender are rare, except for the occasional asymmetrical use of the gendered address terms "sir" and "ma'am" in the ATC/plane radio transmissions, and the use of gendered pronouns in

the ATC/ATC phone conversations that do not accurately represent the gender of the inflight crew. There are several ways in which gender may be implicitly relevant in these interactions. Participants may use interactional formulations that—while not explicitly gendered themselves—have been associated in previous research with gender differences and/or power differences in interactions, such as the use of indirect forms of requests, demands or complaints, inferences about the emotional state of participants, and a possible instance where ground personnel did not recognize the speaker as the pilot because of her female sounding voice. The results of this analysis will be discussed in terms of potential implications for how gender can impact ATC/plane communication.

Analysis

In the analysis that follows, I use examples from the data to illustrate each of the ways in which gender may be relevant. I first analyze the asymmetrical use of gendered address terms ("sir" and "ma'am") and then analyze the use of gendered pronouns to refer to Flight 1380. This will be followed by the analysis of excerpts that display an implicit orientation to gender during the interactions.

Gendered Address Terms

As shown in Garcia (2016), once an emergency begins, the plane's call sign may be omitted in radio transmissions without causing confusion as to which plane is being addressed because other planes in the sector can hear the dyadic exchange about the incident as directed to the plane involved in the incident. In the radio transmissions studied for this project, there were a few instances of "sir" or "ma'am" being used as address terms.

The use of these gendered address terms displays an orientation to the presumed gender of the person being addressed. In the radio transmissions, the female pilot addressed the male ATC as "sir" several times, and on one occasion, a male ATC addressed the female pilot as "ma'am." All of these gendered address terms were used asymmetrically.

For example, as Excerpt 1 begins, the female pilot for Southwest Airlines Flight 1380 ("SWA1380") answers the question asked by the ATC staffer "10R" without using the plane's call sign (lines 20-21). She first answers 10R's question and then uses a gendered address term before adding more information about the emergency: "yes sir we're single engine descending have uh fire in number (0.1) one." (lines 20-21).

Excerpt 1

14	1504:54	SWA1380	southwest thirteen eighty has an engine fire descending.
15			((female voice))
16			(0.3)
17	1504:59	10R	southwest thirteen eighty:: uh are you? you're descending?
18			right now?
19			(0.2)
20	1505:03	SWA1380	yes sir we're single engine descending have uh fire in
21			number (0.1) one. ((female voice))
22			(0.1)
23	1505:07	10R	alright southwest thirteen ei:ghty u::h okay! where would you
24			like to go to which airport
25			(0.2)
26	1505:12	SWA1380	give us (thee) vector for your clo:sest ((female voice))
27			(0.5)
28	1505:16	10R	u:hm okay! how about u:h middletown airport just fly heading
29			two five zero.
30			(0.4)
31	1505:21	SWA1380	okay heading two five zero: we're looking a:t u:h philly
32			(it's uh) ((female voice))
33			(0.2)
34	1505:28	10R	southwest thirteen eighty roger a:nd uh just stand=by-

The gendered address term "sir" is the first explicit reference to gender in the exchange. The pilot's use of "sir" in this excerpt is not reciprocated—it is thus an asymmetrical use of a gendered address term. This type of use of "sir" may be a sign of politeness or respect or may even indicate deference to authority or a higher-ranking person being addressed.

As the plane moves closer to the target airport, Flight 1380 is transferred from 10R to ATC staffer "25R." Excerpt 2 shows 25R using the gendered address term "ma'am" in an exchange with the female pilot (SWA1380, line 24). This is also an asymmetric use of an address term.

Excerpt 2

1	1508:13	SWA1380	center southwe:st?, thirteen eighdy declaring an emergency
2			going through seventeen thou!sand need your loca:l altimeter.
3			(0.2)
4	1508:19	25R	<u>uh</u> southwest thirteen eighty u:h new york thee u:h (0.1) eh
5			baltimore altimeter is uh two niner eight zero and you said
6			you're going to one one thousand?
7			(0.2)
8	1508:26	SWA1380	going down to <u>one!</u> one thousand, two [nine eight] zero?
9		?	[( )]
10			(0.8)
11	1508:31	25R	southwest thirteen eighty <u>thank</u> you
12			(0.2)
13	1508:34	SWA1380	<u>a:ll!</u> right and southwest thirteen eighty ah hundred and forty
14			nine souls on board.
15			(0.2)
16	1508:38	25R	i'm sorry <u>how</u> many souls on board and hours of fuel?
17			(0.2)
18	1508:41	SWA1380	<u>four niner</u>
19			(0.5)
20	1508:43	25R	forty nine?
21			(0.3)
22	1508:45	SWA1380	one <u>hundred forty nine</u>. ((annoyance in voice))
23			( )
24	1508:46	25R	okay thank you ma'am and how many s- how many hours of
25			(fuel/fool) you have?
26			(4.0)
27	1508:52	SWA1380	three- (0.1) plus

25R's "okay thank you ma'am" (line 24) occurs after a slightly problematic exchange with the female pilot about the number of people ("souls") on the flight and how much fuel is left (lines 13-22). The pilot had to repeat the information about the number of souls three times before 25R understood her. There is some annoyance evident in her tone of voice the third time she provides this information (line 22). Perhaps 25R's use of "ma'am" in his response in line 24 is a courtesy to efficiently and quickly amend his inability to hear her.

The Use of Gendered Pronouns in Internal ATC Telephone Calls

ATC staffers used gendered pronouns to refer to Flight 1380 in their internal phone calls about the incident as they worked to assist the flight. Immediately after the interaction shown in Excerpt 1 above, in which 10R talked via radio to the female pilot of Flight 1380, 10R makes a phone call to 25R (Excerpt 3). Both 10R and 25R refer to Flight 1380 as "he" or "him," even though 10R has just completed the radio exchange with the female pilot in Excerpt 1 and is, therefore, aware that at least one of the inflight crew is female.

Excerpt 3

```
1                        [Begin Phone call]
2                                    ((beep))
3              ?                     you're right on.
4                                    (0.2)
5    1505:40       10R               seven one pa:pa (0.8) is u::h an emergency?, (0.4) descending?,
6                                    (0.2) single engine (0.3) gonna turn direct philly. (0.5) .hh do you
7                                    want to work him? hhh=
8    1505:48       25R                              =u::h yeah! if he's going direct
9                                    ( . )
10             10R                   okay.
11             [End Phone call]
```

In Excerpt 3, 10R first announces the emergency (lines 5-6) and then asks, "do you want to work him? hhh" (lines 6-7). In his response, 25R also uses the male pronoun to refer to Flight 1380 ("=u::h yeah! if he's going direct"). With one exception (discussed below), the ATC personnel in these data use the male pronoun when referring to Flight 1380 in internal phone calls. Because of the use of the male pronoun 25R does not know that when he subse-

quently speaks to Flight 1380 via radio, he may be speaking to a female rather than a male pilot.

After the call from 10R to 25R to ask if he will take charge of the plane's flight, 25R calls Philadelphia Departures ("Dep14") to convey information about the emergency and plan for Flight 1380's landing (Excerpt 4, lines 15, 19-21). In this call, both 25R and Dep14 refer to Flight 1380 with male pronouns (lines 20, 24, and 26).

Excerpt 4

```
12                                    (17)
13             [Begin Phone call]
14   (3.59audio)    ((beep))
15             25R               he:y departure fourteen?
16                                    (3.5)
17             Dep14             yes sir!
18                                    (0.2)
19             25R               I got aye uh (0.1) single engine southwest thirteen eighty going
20                               direct in to philly he's an emer!gency. (0.4) you want to just
21                               stop (your) departures after thuh u p s?
22                                    (0.4)
23             Dep14             stop all departures going u:h me[(dina   )]
24             25R                                           [(    ) oh] I don't know he's
25                               going right in over modina so: uh I don't know what eh-
26                               altitude you want him at?
27                                    (2.5)
28             Dep14             a:::hm, (2.0) like eight? would be goo:d [somewhere] around
29             25R                                                      [(        )]
30             Dep14             there yeah
```

Given the rarity of female pilots in commercial aviation, it would not be surprising that participants in these internal calls typically referred to the plane as "he" in their discussions about how to handle the ongoing emergency. It is also possibly a choice primed by 10R's use of the male pronoun. The use of the male pronoun means that when/if a female voice does appear in the subsequent interactions, it could be potentially disorienting. However, if 10R, who had spoken directly with the female pilot, had referred to the flight as "she" in the call with 25R when the norm was to use "he," this could have led to unnecessarily lengthening the call by introducing a non-essential topic of talk. Unnecessarily topicalizing the gender of the inflight crew would be an unnecessary distraction. While there is no evidence that this potential problem occurred in this incident while the plane was in the air, as we will see in the discussion of Excerpt 8 below, once the plane was on the ground, it is possible that the expectation that the pilot would be male (have a male voice) may have caused a momentary delay in responding to radio communication from the female pilot.

Gender and the Inflight Crew

Nevile (2001) explained how the flight crew communicates the allocation of the roles of the radio operator, navigator, or "flying pilot" during a flight. The higher-ranking person (captain) may be the one flying the plane (flying pilot), or they may do other work while the lower-ranking person flies the plane. These roles may also be switched during a flight. The ATC personnel on the ground are, therefore, accustomed to different people making radio transmissions on behalf of a flight.

While most of the radio transmissions between ATC and Flight 1380 are between the female pilot and the male ATC personnel, there are a few radio transmissions made by the male copilot. There is no evidence in the data that these unannounced transitions from the female pilot to the male copilot caused confusion during the inflight emergency.

Excerpt 5 shows radio transmissions between Philadelphia ATC "North Departures" (ND) and

Excerpt 5

20	1511:37	ND	southwest thirteen eighty? fly heading zero niner zero please
21			(0.2)
22	1511:40	SWA1380	heading zero nine zero southwest thirteen eighty ((male voice))
23			(8.0)
24	1511:53	ND	southwest thirteen eighty can i get thuh fuel in POU:nds and thee exact
25			nature of thee emergency please!
26			(0.2)
27	1511:59	SWA1380	engine a::h engine severe damag:e. h (0.2) engine failure a:nd exact
28			pounds of fuel?, (0.5) six seventee::n twenty one (0.2) thousand
			((female voice))
29			(0.8)
30	1512		
31	1512:13	ND	thank you.

Flight 1380. While in Excerpts 1 and 2 above, the female pilot spoke on behalf of the plane, when ND next addresses Flight 1380, he receives a response from the male copilot instead of the female pilot he had been speaking with about 15 seconds prior (Excerpt 5, line 22).

The male copilot responds to ND's transmission in line 22, using routine scripted talk to confirm receipt of the instructions ND has given him in line 20. When ND next addresses Flight 1380 in line 24 ("can i get thuh fuel in POU:nds and thee exact

nature of the emergency please!" [lines 24-25]), the female pilot responds (lines 27-28).

After a brief phone call between ND and ATC staffer "North Arrivals" (NA), in which ND refers to Flight 1380 with the male pronoun (not shown), Excerpt 6 shows ND again addressing flight 1380 (lines 45-46). The male copilot responds (lines 48-49). ND then asks, "you gonna go ri:ght in or do you need an extended final" (lines 51-52). The female pilot responds to this question ("extended final." [line 54]). There is no indication in this exchange that the switch in speakers was problematic.

Excerpt 6

```
45    1513:19  ND         southwest (            ) thirteen eighty fly heading zero niner zero
46                        descend and maintain four thousand
47                        (0.8)
48    1513:26  SWA1380    four thousand (.) heading zero nine zero southwest. (0.2) >thirteen
49                        eighty< ((male voice))
50                        (5.0)
51    1513:44  ND         and southwest thirteen eighty you gonna go ri:ght in or do you need an
52                        extended final
53                        (0.5)
54    1513:48  SWA1380    extended final. ((female voice))
55                        (0.3)
56    1513:50  ND         thank you
```

The internal ATC phone call from ND to NA in Excerpt 7 occurred right after Excerpt 6. Excerpt 7 shows

the first instance in which any of the ATC personnel use the female pronoun to refer to Flight 1380.

Excerpt 7

```
      [Begin phone call]
57    1513:51  NA    yo
58    1513:52  ND    she said she needs an extended final thirteen eighty
59    1513:54  NA    okay
60    1513:54  ND    southwest thirteen eighty here she comes.
```

In this phone call, ND refers to Flight 1380 as "she" instead of the male pronoun "he" he used in his previous phone call with NA ("she said she needs an extended final thirteen eighty" [line 58]). NA re-

sponds with "okay" (line 59). The switch in gender is not remarked on or topicalized, even though in their previous phone call just about 30 seconds prior, ND had referred to the plane as "he."

In sum, the issue with gendered pronouns is not that they are used but whether there is any consistency as to whether they refer to the plane or the crew and whether consistently sticking to one gender to refer to a flight would have less potential to cause confusion than using a gendered pronoun that did not match the apparent gender of the crew (based on their voices). It is possible that foreshadowing an unexpected gender of a crew member (e.g., a rare female pilot) through the use of gendered pronouns could be functional by preventing possible confusion. Of course, voices are not always accurate indicators of gender, and pilots could potentially have a wide range of gender identities beyond the binary male or female categories. Perhaps a convention of referring to flights as "they" instead of "he" might be a better option to avoid priming per-

sonnel for a male voice, even though the likelihood of it being a female pilot is very small due to the rarity of women in this occupation.

Emotion, Vulnerability, and Care Work—Implicit Gendering?

Excerpt 8 shows radio transmissions between NA and Flight 1380 during the landing approach to the Philadelphia airport. This excerpt began shortly after Excerpt 7 ended. While there are no explicit references to gender in Excerpt 8, there may be some ways gender is implicitly relevant. For example, at times, NA ("North Approach") is overly solicitous, almost treating the pilot as if she were upset or emotionally distraught (which she has given no evidence of being).

Excerpt 8

```
1    1514:10  SWA1380  (0.1) one two? (0.2) I need u:h single channel no more channel switching.
                        ((female voice))
2                       (0.5)
3    1514:14  NA        southwest thirteen eighty you're on approach frequency one two eight
4                       point four. you're where you should! be, maintain four thous!and, ãnd
5                       ah do you need any further assistance from me what- type of final do
6                       you want i heard short- (0.1) or long
7                       (0.1)
8    1514:23  SWA1380   (yeah) we're gonna need uh long final.
9                       (0.2)
10   1514:25  NA        okay. i'm gonna let you drive until you: tell me you wanna turn base
11                      okay? so u:h that'll be at least uh twenty five mile final lo:nger than that
12                      i'll have to do some coordination?, but that will be fine we'll get that
13   1514:25            done for you. you let me know when you want to come in.
14                      (0.2)
15   1514:37  SWA1380   >okay.< twe:nty is good (0.2) a:nd a:h (0.1) we may need shorter here in
16                      uh moment tell me thuh runway we are setting up for
17   1514:43  NA        you're gonna set up for two-
18                      (0.4)
19   1514:47  SWA1380   say again.
20                      (2.0)
21   1514:49  NA        southwest thirteen eighty you'll be landing two seven le:ft
22                      two seven left today .hh and ah you just let me know when you need to
23                      turn base ah i ah right now i only have one person in front of you which
24                      is uh southwest
25   1514:49  NA        and i'm sure he'll pull off if you need to go right in.
26                      (4.0)
```

As Excerpt 8 begins, the female pilot requests a single radio channel (line 1). She formulates this request directly and without mitigation as an "I need" statement. NA responds with the scripted call sign for her plane, followed by information about the radio channel ("frequency" [lines 3-4]). He then asks a question that he repairs in progress: "ãnd ah do you need any further assistance from me what- type of final do you want i heard short- (0.1) or long" (lines 4-6). The question about further assistance seems unnecessary. Presumably, if the pilot wanted anything, she would ask. To his credit, NA repaired this turn and replaced it with a specific question about the final approach. The female pilot responds with "(yeah) we're gonna need uh long final." (line 8). Her response is conversational rather than scripted and is direct and concise. NA's response in lines 10-13 is also in a conversational form, but it is very lengthy for radio transmission and seems to include some unnecessary material. Since it is a radio transmission, the pilot cannot respond until he is done with the transmission because only one person can broadcast at a time. Nevertheless, NA includes a request for confirmation within his turn ("okay?" [line 11]), displaying an orientation to her right to confirm or reject his suggestions or plans. In a face-to-face or telephone conversation, the pilot could respond to a confirmation request, but in a radio exchange, she cannot respond until he has stopped transmitting. The use of "okay?" here may be an affiliation move to show support or concern and to emphasize that he will do whatever he can to facilitate her approach to the airport. The rest of NA's turn seems designed to provide reassurance and to reaffirm that the pilot can request what she wants. This seems odd given that she has shown no sign of needing reassurance, and routine procedures would surely prioritize the needs of a plane experiencing a serious emergency, as is the case with Flight 1380.

NA's turn in lines 10-13 is not only conversational rather than scripted or hybrid mode—it is an extended and elaborated turn. It is wordy, time-consuming, and potentially distracting, given the situation. NA's tone is solicitous and somewhat anxious. It sounds like he is trying to reassure the pilot or provide emotional support via his reassurances. The question arises as to whether he would be taking this tone if the pilot were a male. There is nothing obvious in the pilot's tone of voice or turn formulations that betrays emotional upset that would warrant these types of emotional support moves (Whalen and Zimmerman 1998; Garcia 2022b).

The exchange proceeds in a conversational style. The female pilot acknowledges NA's turn with a quick ">okay.<" (line 15), which sounds like an agreement with his suggestion ("that'll be at least uh twenty five mile final" [line 11]), but she follows this with "twe:nty is good" (line 15), which seems to be an indirect way of disagreeing with his suggestion of twenty five miles. The pilot then hesitates and suggests it may be less than twenty: "(0.2) a:nd a:h (0.1) we may need shorter here in uh moment" (lines 15-16). Taken together, these parts of the pilot's turn may be an indirect way of rejecting his suggestion of 25 miles. However, she does not leave space for NA's reply and—within the same transmission—flows through to a question about the runway (line 16). NA's reply was apparently cut off because the pilot is able to transmit in line 19 as she initiates an other-repair ("say again."). In his reply, which begins in line 21, NA starts with the plane's call sign, but then uses sentential form ("you'll be landing") instead of a scripted response. The remainder of this turn reverts to conversational style: "and ah you just let me know when you need to turn base ah i ah right now i only have one person in front of you which is uh southwest and i'm sure he'll pull off if you need to

go right in." (lines 22-25). The work done in this extension of his turn could be described as reassurance work rather than informing. This part of his turn contains information she does not need to know (e.g., the name of the airline of the plane in front of her and that there's only one plane ahead of her in line for landing). All she needs to know is that since she has an emergency, they will do what is needed to get her on the ground. The question this raises in terms of the implicit relevance of gender is why this reassurance was perceived to be necessary. The pilot was speaking in a calm and coherent way and did not display being upset in words or tone of voice.

Transitions from the Female to the Male Voice

Once the plane is on the ground, the most critical part of the emergency is over. However, the plane's crew is still dealing with injured passengers, and the ground crew is still ruling out the potential for fire. Thus, the emergency is not actually over yet. Excerpt 9 is from radio transmissions between the plane and ground personnel. "Local Control West" (LCW) is an ATC staffer, and "Foxtrot 21" (F21) is out on the runway working with crews that are assisting with the plane. In Excerpt 9, Flight 1380 is first represented by the female pilot and then by the male pilot. The personnel, thus, hear first a female voice and then a male voice speaking on behalf of the flight. In this section, I discuss how the apparently unexpected female voice may be confusing F21 and how the subsequent switch from the female pilot's voice to the male copilot's voice may also be causing confusion.

As Excerpt 9 begins, F21 (working with safety crews on the ground) asks to talk to the pilot (line 5). LCW responds that "he's coming over to my frequency now" (lines 7-8), thus letting F21 know that he can

talk to the pilot on the same radio frequency they are currently conversing on. Note that he used the male pronoun "he" in this transmission. The pilot then announces her presence in the conversation "(alright) this is captain ( ) at seven two:" (line 10). There is then a 2-second pause (line 11). LCW displays an orientation to this pause as indicating a problem with turn transition (the absence of a response from F21) and repairs F21's absent response with "foxtrot twenty one that's thuh captain there go ahead." (line 12). While there is no information in the exchange that explains F21's delay in responding, the absence of a response could be due to confusion as to whether the female voice was the captain, especially since LCW had just used the male pronoun to refer to her. Once the LCW initiates repair of the absent response, the female pilot then speaks again: "yes sir (thuh lead/I believe) captain's side is where we had thuh damage. (0.1) and that's thee engine that went out." (lines 13-14). F21 then hesitates briefly and responds (lines 16-18), first addressing the threat of fire issue, then asking about injuries "u:h is there any injuries? inside thee aircraft itself" (lines 16-17). The last part of F21's transmission also addresses the fire issue: "and (what-) also we have no signs of any smo:ke .h or fi:re from thee outside right now" (lines 17-18). The pilot's response in lines 20-21 is also in conversational mode.

About a minute later, F21 makes another request to talk to the pilot ("can we talk to thuh pilot again=" [line 27]). After a 4-second pause, the male copilot of Flight 1380 speaks: "go ahead for southwest u:h thirteen eighty" (line 30). After another 4-second pause, the male copilot speaks again, apparently working to repair the absent response from F21: "southwest thirteen eighty is up: o:n (0.2) thirty five one" (line 32). Another pause follows (line 33), and LCW again intervenes to repair F21's absent response ("foxtrot

twenty one that's thuh pilot there go ahead." [line 34]). As with LCW's earlier intervention, it is possible that confusion about who is speaking arose from the shift from the female to the male pilot, although the delay could be due to an unrelated issue. The way LCW phrases his intervention ("that's thuh pilot there go ahead") is consistent with the interpretation that he believes that F21 does not realize that a male is now speaking on behalf of Flight 1380 rather than the female pilot he was talking to earlier.

Excerpt 9

1	1522:15	F21	( ) foxtrot twenty one
2			(0.2)
3	1522:17	LCW	foxtrot twenty one tower
4			(0.5)
5	1522:17	F21	U::hm (0.1) i need to: talk to thuh pilot?
6			(0.4)
7	1522:24	LCW	foxtrot twenty one go to tower <u>one</u> one ah correction <u>he's</u> coming over
8			to <u>my</u> frequency now
9			(0.1)
10	1522:28	SWA1380	(alright) this is captain ( ) at seven two: ((female voice))
11			(2.0)
12	1522:33	LCW	foxtrot twenty one that's thuh captain there go ahead.
13	1522:35	SWA1380	yes sir (thuh lead/I believe) captain's side is where we had thuh
14			damage. (0.1) and that's thee engine that went out. ((female voice))
15			(0.6)
16	1522:42	F21	U:h yeah we're (we're going down) to check for heat source. u:h is there
17			any <u>in</u>juries? inside thee aircraft itself and (what-) <u>also</u> we have no
18			signs of any <u>smo</u>:ke .h or fi:re from thee outside right now
19			(0.2)
20	1522:55	SWA1380	okay we <u>do</u> have injured inside so as <u>soon</u> as: ah we can get those taken
21			care of that'd be great. ((female voice))
22			(16)
((12 lines omitted))			
23	1524:30	F21	philly tower, foxtrot twenty one.
24			(0.1)
25	1524:31	LCW	foxtrot twenty one tower?
26			(0.7)
27	1524:34	F21	can we talk to thuh pilot again=
28		?	=[( )]
29			(4.0)
30	1524:40	SWA1380	go ahead for southwest u:h thirteen eighty ((male voice))
31			(4.0)
32	1524:45	SWA1380	southwest thirteen eighty is up: o:n (0.2) thirty five one ((male voice))
33			(2.5)
34	1524:51	LCW	foxtrot twenty one that's thuh pilot there go ahead.
35			(1.5)
36	1524:55	F21	(ah/alright?) how many injuries do you have on thee aircraft?
37			(0.2)
38	1524:58	SWA1380	we tried to u:h we're trying to figure (it) out right now (stand by)

Indirect/Mitigated Talk

A second issue to consider in Excerpt 9 is how the interactional style of participants changes once the plane is on the ground. In this section, I will compare how the female pilot's communications on the ground differ from her communications in flight. For example, once on the ground, the female pilot produces some indirectly formulated or mitigated requests that have the characteristic of implicit complaints. Maynard (2013:201) notes that complaints can be formulated simply by displaying "notice of a negative event" (see also Schegloff 1988). For example, consider lines 20-21 in Excerpt 9 ("okay we do have injured inside so as soon as: ah we can get those taken care of that'd be great." However, note that her interactional style differs here compared to how she communicated earlier. Instead of directly stating what is needed

or what she wants (e.g., "a single channel" as in Excerpt 8), here, she produces a mitigated and indirect request for medical attention for the injured. This turn is followed by 16 seconds of silence rather than a direct response from F21.

In Excerpt 10, which also occurred after the plane had landed, the female pilot makes a request to get the emergency services ("EMS") on board to attend to the injured passengers (lines 1-2). The first part of her turn (after the self-identification) is a direct statement of need ("we need e m s on board" [line 1]). This is followed by a question that can be heard as an indirect complaint ("is ther:e uh way to get them UP here?" [lines 1-2]). The implication is that they have waited a long time to get the EMS on board to help the injured passengers.

Excerpt 10

```
1    SWA1380      and this is: uh thirteen eighty we need e m s on board is ther:e uh way to
2                 get them UP here? ((female voice))
3    1528         (5.0)
4    1528:11  LCW foxtrot twenty one did you copy that?
5                 (12)
6    1528:24  F21 foxtrot twenty one.
7                 (0.2)
8    1528:25  LCW yeah they wanna know if they can get e m s on board thee aircraft (there)
9                 (0.2)
10   1528:39  F21 we are in thuh process of bringing e m s on
11                (0.1)
12   1529     LCW (yeah) thank you.
```

Another instance of indirect/mitigated talk on the behalf of the female pilot occurred earlier, when the plane was still in the air (Excerpt 11).

Note that 10R's question in lines 1-2, other than beginning the transmission with the plane's call sign, is completely conversational in structure. The pilot's response is in hybrid mode. She starts with "oka:y," repeats her plane's call sign, and says, "we're single engine, that's it." (line 4). She repeats the information 10R had given in his turn—that they are single engine—but follows it with "that's

it."—thus declining an opportunity to "tell a story," give details, or elaborate. Earlier, she had said there was a hole in the plane, but in this context, she presents the single engine as the only relevant issue. As the transcript notes, she sounds annoyed by this question. 10R's response follows her lead by keeping it short and simple ("okay. single engine." [line 7]), repeating the information she has given to display his understanding of it. He then uses conversational structure to transition to the next part of his turn ("just" [line 7]) and follows it

with a scripted format instruction ("maintain one one eleven thousand"). 10R immediately follows this with a question ("do you need anything standing by on thuh ground?" [lines 7-8]). The pilot's answer is both mitigated and indirect: "yes, if you would," (polite formulation). The rest of her turn implies that she needs the trucks on the ground rather than makes a direct request for trucks (she tells him which side of the plane they should be on: "tell all thuh trucks that it's on theh engine number o:ne captain's side." [lines 10-11]).

Excerpt 11

1	1507:36	10R	southwest thirteen eighty (eh-) just so i can understa:nd (0.2) you
2			said that you are still single engine, a:nd uh what else?
3			(2.5)
4	1507:45	SWA1380	oka:y, southwest thirteen (eighty) eighty we're single engine, that's it.
5			((sounds a little annoyed))
6			(0.3)
7	1507:51	10R	okay. single engine. just maintain one one eleven thousand do you
8			need anything standing by on thuh ground?
9			(0.5)
10	1507:55	SWA1380	yes, if you would, tell all thuh trucks that it's on theh engine number
11			o:ne captain's side.
12	1508		(.)
13	1508:01	10R	okay. thank you. southwest thirteen eighty contact new york center one
14			tree five point four five
15			(0.2)
16	1508:06	SWA1380	three five four five. good day! ((sing song intonation))

As previous research has shown, there are advantages to switching to an ordinary conversational mode rather than using routine scripted talk when an emergency is in progress (e.g., Garcia 2016). However, the use of a conversational mode makes any gender differences in interactional style or expectations about such things as how requests or complaints should be formulated or whether or how emotions should be displayed potentially problematic if there is a possi-

bility of complicating the interaction about the emergency situation.

Discussion and Conclusions

In sum, I found several ways that gender may be explicitly or implicitly relevant for the exchanges between the participants in this workplace interaction during the incident affecting Flight 1380. First,

I showed that while gendered address terms (sir, ma'am) are rarely used, when they are used, they are used asymmetrically. Of course, as shown in Garcia (1998), the significance of asymmetrical actions must be examined in terms of their use in the specific interactional context they are used within (see also Stokoe and Smithson 2001). In this case, the gendered formal address terms "sir" and "ma'am" are used in a way that may reflect differences in power and status. As Stevanovic (2018) notes, how speakers formulate their utterances may convey their power or status in the situation. As a pilot who is also a captain, the female pilot is of higher status than the ATC staffer in terms of her institutional role. The question arises whether the fact that she addresses him with "sir" (and does not receive a reciprocal "ma'am") may be an implicit reflection of the intersection of gender with social role or status. All except one of the instances of gendered address terms in the radio transmissions were by the female pilot. The question arises as to whether the asymmetric use of these terms is a display of orientation to lower status or extra politeness.

Gendered pronouns were used in internal ATC phone calls to refer to Flight 1380. Male pronouns (he, him) were almost always used, even when the ATC staffer had just communicated with the female pilot. There was one instance where an ATC staffer used female pronouns to refer to the flight. While the use of these gendered pronouns did not cause any problems or hesitation in the calls made during the inflight emergency, it is possible their use could lead to confusion. It might be preferable to retain scripted talk (the plane's call sign) or implement a change to the use of the plural pronoun "they." Scripted talk is designed to increase safety, including by providing clarity over which flight is being referred to (Cushing 1994; Jones 2003; Nevile 2004a;

Howard 2008; Falzon 2009; Garcia 2016). This is one reason why flight call signs are used as identifiers in radio transmissions between ATC and planes rather than names of individual crew members. In these dyadic telephone calls between ATC staffers, the flight identification issue may seem less of an issue, but note that these phone calls are interspersed with direct radio transmission exchanges between ATC officers and the flight experiencing the emergency. Thus, how references to the flight are handled in the telephone calls could possibly impact those radio communications.

There were several ways in which gender may be implicitly relevant in these data. The female pilot used mostly direct and unmitigated formulations inflight during the emergency, with a couple of exceptions. Once the plane was on the ground and passenger injuries and the potential for the fire were assessed and managed, the female pilot used more indirect and mitigated formulations. Potentially gender-related differences in style of communication seemed to be more pronounced once the plane was on the ground.

Another potential communication style difference that may have been related to gender was that one ATC staffer communicated in a way that suggested the female pilot may have been feeling vulnerable, emotional, or needing support even though her transmissions during the flight had not displayed a need for reassurance. Stevanovic and Peräkylä (2014) describe the complex intersections between power, status, and emotion as they are constructed and reflected in how participants formulate their utterances and sequences of actions. For example, in Excerpt 8 between the ATC "North Arrival" (NA) staffer and the female pilot, there was incongruence between how the participants either did or did not

display an orientation to the emotional context of the emergency with which they were currently dealing.

While the interactions that occurred during the emergency with Flight 1380 appear to be conducted professionally and competently, the analysis has shown some potential ways that gender could have played a role in how the interactions unfolded. The switch from scripted to hybrid/conversational formats when emergencies happen can be functional for handling emergencies (as shown in Garcia 2016) but may also open the door for problems when aviation interactions involve female pilots because conventions, stereotypes, or patterns of interactions typical of male/female interactions (e.g., assumptions about emotionality, status/position on the hierarchy, formulations to convey politeness) may emerge. How gender is made explicitly or implicitly relevant could conceivably lead to problems or less than optimal communication in other instances and could become even more complex as nonbinary gender categories are included (Klein 2011). This analysis may lead us to imagine what ATC/plane communication could/should be like if its gendered nature is noticed and redesigned to create the most effective form of communication rather than relying on norms created by and shaped by a traditional concept of male/male communication, military conventions, and organizational concerns for standardization. Given previous research in a variety of contexts on gender differences in communication, the question as to whether or how gender may impact aviation communication should be explored further, in particular, whether gender becomes more relevant, visible, or consequential in the portions of the interactions that use hybrid/conversational mode as opposed to scripted routine talk. Some specific research questions that could fruitfully be addressed include direct comparisons of pilot/ATC interactions with different configurations of participants in terms of gender (e.g., male or female pilots interacting with male or female ATC staffers). Since female commercial pilots are relatively rare, using routine flight/ATC interactions instead of the rarer accident/incident flights as a data source would provide access to more interactions involving female pilots. This would facilitate the exploration of a wider range of participants and enable further explorations of the type and extent of gender relevancies in aviation talk. For example, how gender may become relevant in routine scripted ATC/flight exchanges could be compared with those non-routine incidents where hybrid or conversational formats of interacting are used (Garcia 2016).

Acknowledgments

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Appendix: Simplified version of Gail Jefferson's (2004) transcription conventions

Symbol	Definition
.hh hh	Inhalations and exhalations, respectively
ta::lk	Colons indicate a syllable is drawn out
that-	Dash indicates a word was cut off abruptly
lot	Underlining indicates stress or emphasis
YOU	Capital letters indicate increased volume
(1.4)	Numbers in parentheses indicate the length of pauses (in seconds)
(talk)	Words in parentheses are tentative transcriptions
( )	Empty parentheses indicate non-transcribable talk
.,?!	Punctuation generally indicates intonation, not grammatical structure
ãnd ah	~ indicates quaver in voice
<more slowly>	Carets indicate the enclosed talk was spoken more slowly
>more quickly<	or more quickly than the surrounding talk
A: [a copy of it]	
B: [I have]	Brackets indicate simultaneous speech
A: yeah=	
B: =in order	Equal signs indicate one word is placed immediately after another without pause or overlap
A: are yuh gonna?	Words spelled as pronounced

Citation