DOCUMENT RESUME

ED 088 296 FL 005 596

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TITLE Efficient Conversation: The Talk between Pilots and Air Traffic Controllers.
PUB DATE Jan 74
NOTE 35p.

EDRS PRICE MF-$0.75 HC-$1.85
DESCRIPTORS *Aircraft Pilots; Airports; Aviation Technology; *Aviation Vocabulary; *Communication (Thought Transfer); Language Patterns; Radar; *Radio; *Sociolinguistics; Traffic Control; Traffic Safety

ABSTRACT

Two-way radio communications between air traffic controllers using radar on the ground to give airplane pilots instructions are of interest within the developing framework of the sociology of language. The main purpose of air traffic control language is efficient communication to promote flight safety. This study describes the standardized format of one part of routine two-way radio communications--the approach to the airport to land. (Author)

EFFICIENT CONVERSATION:

The Talk Between Pilots and Air Traffic Controllers

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January 1974

ABSTRACT

Two-way radio communications between air traffic controllers using radar on the ground to give airplane pilots instructions are of interest within the developing framework of the sociology of language. The main purpose of air traffic control language is efficient communication to promote flight safety. This study describes the standardized format of one part of routine two-way radio communications--the approach to the airport to land.

Examination of tape recordings reveals both differences from and similarities to naturally occurring conversations. The differences are: the language is specifically designed to be "efficient" in conveying the most information possible within a very short time; there is never any face-to-face communication between pilots and controllers since the radio is the only communications medium; and only one person may speak at a time, due to the design of two-way radio equipment.

Similarities between air traffic control language and natural conversations are: the pilots and controllers form a speech community; they share the rules of interpretation for more than one language variety ("formal" and "informal"); the privileges of switching from one language variety to another are not equally distributed; the participants are members of the speech community who have mastered a natural language; the conversations are "situated" and "indexical," with language use only being appropriate at a certain time and place and the actions

occuring only being sensible by hearing the talk; and in spite of many constraints, an informal speech community is formed.

Some questions about the role of these language varieties in the high degree of stress experienced by air traffic controllers are raised.

INTRODUCTION*

Human language use has long been an area of interest to scholars and lay persons alike. Among others, linguists, anthropologists, and grammarians have concentrated on analysis, categorization, and interpretation of the speech symbols which occur among all human groups everywhere. Of more recent concern has been the development and expansion of the sociology of language, the study of the social factors involved in the uses of language and language varieties. Interest in this field is on the social factors which account for appropriate lexical selection, choice of structure, and "non-verbal" communication channels.

One emphasis of the sociology of language has been the study of "natural conversations," those which are routinely conducted by members of a speech community unselfconsciously in everyday life. Several recent findings are relevant. First, for the occurrence of natural conversation to be explained, a speech community must exist. A speech community has been defined as "a community sharing rules for the conduct and interpretation of speech, and the rules for the interpretation of at least one linguistic variety" (Hymes, 1972:54). Within this concept, more than just "understanding the language" is specified. Speakers must know more than just vocabulary and syntax; and understanding of the appropriateness of selection and "style" is also necessary.

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*This is a greatly revised version of an unpublished paper entitled "A Sociolinguistic Study of Air Traffic Control Conversation," December, 1972.

To be a member of a speech community, one must exhibit mastery of a "natural language" (as opposed to a pidgin language, for instance), and be engaged in the production and display of commonsense knowledge of everyday activities (Garfinkel and Sacks, 1970:342). Without these prerequisites, normal conversation would be impossible. "Trust in powers to converse holds for such a society and for everyone taken to be a member. Every ordinary conversation proceeds then from that trust, from what seems to be a state of trust in the power to talk" (Rose, 1967:viii).

Sacks (1972:339) has suggested that the framework being developed for the sociology of language view the rules or norms governing speakers from the perspective of those speakers themselves, instead of as an external constraint. "Viewers use norms to provide some of the orderliness, and proper orderliness, of the activities they observe."

Another of the foci developing is investigation of the many rules operative in speech. Studies such as those of Ervin-Tripp (1972:213-50) and Schegloff (1972:346-80) demonstrate that these rules are analyzable by referring to the social situation in which the speech event is taking place.

And, finally, perhaps the most potentially fruitful perspective of this field of study is the insistence on examining conversation as an ongoing accomplishment, rather than a "given." Garfinkel (1967:vii) emphasizes that this interest in the "situated" and "indexical" nature of talk seeks to discover the ways members make sense out of what is happening. "...the objective reality of social facts <u>as</u> ongoing accomplishment of the concerted activities of daily life, with the ordinary, artful ways of that accomplishment being by members known, used, and taken for granted, is, for members doing sociology, a fundamental phenomenon" (emphasis in original). The talk is "situated," meaning that it is only appropriate in its specific context at the time, place, and social occasion of its use. It is "indexical" in that it describes or makes sensible the situation in which it is occuring. (See Garfinkel, 1967:1-34).

It is in light of these concerns that this study of a special case of language use is undertaken--two-way radio communication between pilots in the air and air traffic controllers using radar on the ground. The nature of this talk specifically designed to be an efficient means of communicating information exhibits several interesting differences from and similarities to ordinary natural conversations which are worthy of attention.

I am grateful to Floyd Fahey, Chief of the Airport Traffic Control Tower at Denver Colorado's Stapleton International Airport, who provided about 90 minutes of tape recordings of routine two-way radio communications made during September and October of 1972.

THE SETTING AND FORM OF AIR TRAFFIC COMMUNICATION

The setting of the conversations recorded is as follows: pilots of both small aircraft and large commercial jetliners are either approaching Stapleton Airport to land, or else are flying through the area to one of the smaller airfields in the Denver area. The air traffic controllers are located in a dark room at Stapleton Airport's Control Tower building. There are 10 radar screens, all connected to a computer. Each controller is responsible for directing a portion of the aerial traffic within a 25-mile radius of the airport. Two controllers direct arriving aircraft on "instrument" flight plans. These consist mainly of commercial airliners and business aircraft. In 1971, two more controllers were added to handle the arrivals of those planes not on instrument flight plans. This traffic consists mostly of small, private planes. While in the past, these pilots flying "visually" have been totally responsible for their own safety, they are now required to be in contact with the controllers. The service they receive is essentially the same as for the "instrument" flight traffic--instructions on the direction and altitude to fly, and notice of any other airplanes within close proximity of their flight path.

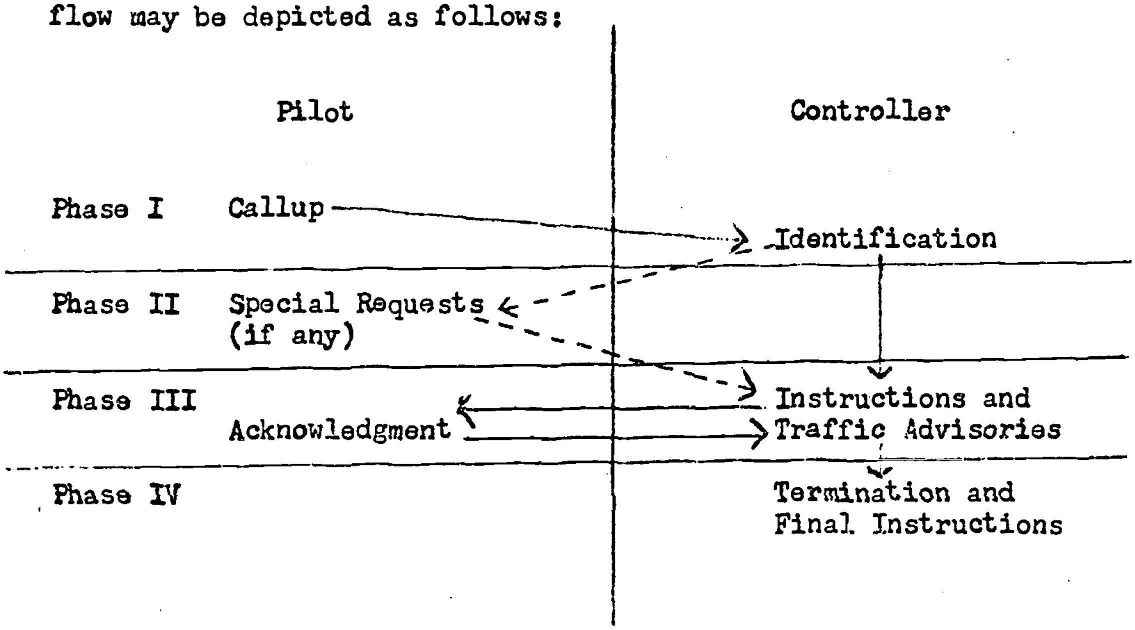
The materials presented here are verbatim transcripts of these conversations with the arrival controllers. The letter "C" indicates the air traffic controller is speaking via two-way radio. The numbers, such as 92S or 701 indicate that the pilot of the aircraft with that registration number is speaking. Following most excerpts of conversation are restatements and non-technical interpretations of what was said.

The use of two-way radios has been in wide use in commercial airliners since the 1930's, and in small private planes since the 1950's. With the increased crowding of the skies--there are over 100,000 aircraft registered in the United States, flown by about three-fourths of a million licensed pilots--attention has been given to the use of radios as a means of promoting safe flight.

The subject of "proper" use of the aircraft radio is evident in many aviation publications. The basic Federal Aviation Administration (FAA) manual for pilots, the Airman's Information Manual, has a section devoted to proper methods of contacting ground stations, identifying one's aircraft, transacting the business, as well as the standard phonetic alphabet. This section is reporduced in Appendix I. Likewise, the FAA's Private Pilot's Handbook of Aeronautical Knowledge includes the same information, adding the admonition:

> As already indicated, FAA recommends, and good operating practice demands, that pilots use their two-way radios for air-ground communications....When he is ready to transmit, the pilot should hold the microphone close to his mouth. After giving thought to what he is going to say, he should speak in a normal tone of voice. Although the message may be phrased in his own words, certain radiotelephone phraseologies are commonly used to reduce the length of transmissions and provide uniformity....Remember, however, that it is not necessary for you to be thoroughly familiar with the standard phraseologies and procedures for air-ground communications. A brief call to any FAA station, stating your message in your own words, will receive immediate attention (1965:146).

The form of all the conversations is the same: the "callup" or initial contact and identification by the controller; special requests by the pilot (if any); flight instructions and traffic advisories by the controller to the pilot and acknowledgment by the pilot; and the "termination" or final instructions by the controller. The conversation flow may be depicted as follows:



Phase I--The Callup and Identification

Pilots always initiate the callup, because with two-way radios, it is not possible to know who is listening to the radio frequency. The radio frequencies used by pilots are adjustable in the plane. Aircraft flying on instrument flight plans, such as commercial jetliners, have already been talking with other radar controllers, but as they approach Denver's Stapleton Airport, they are given instructions to contact the Denver radar facilities on the appropriate frequency. Meanwhile, for these planes, the computer attached to the radar screen has placed the airplane's flight number on the screen. With the use of an automatic radio in the airplane called a transponder, the computer is able to "find" and identify the specific plane on the radar screen and track its movement. This machinery does much of the work formerly required of the controller himself. All the pilot must do is call the controller on his two-way radio to inform the controller that he has established radio contact. Typically, in the callup, the pilot calls the controller and identifies his airplane number and his altitude, or height above sea level. If the computer has found the plane, the controller will repeat the plane number, and say "radar contact." For example:

1. 06V: Denver Approach, Turbo Commander 6-5-zero-6-Victor, 1-7 thousand.
2. C: Turbo Commander 6-5-zero-6-Victor, Denver Approach Control. Radar contact. Confirm Information Mike.

Interpretation:

1. A pilot, flying an Aero Commander aircraft number 6506V, is informing Denver Approach Control (the name used for designating the controllers handling instrument flight traffic arriving in the 25-mile control radius from Stapleton Airport) that he is listening to that radio frequency, and flying at an altitude of 17,000 feet.

2. The controller repeats the plane number and identifies himself as Denver Approach Control. He confirms that the computer has found the airplane on the radar screen ("radar contact"). "Confirm Information Mike" is a request to the pilot to find out if the pilot has listened to a recorded weather and airport conditions report, which is broadcast on a different radio frequency. This continuous recorded message is similar to the "time and temperature" recordings on many telephone exchanges, and it eliminates the need for the controller to give each pilot the same information. This obviously allows the radio frequency to be used for the actual air traffic control.

For small planes flying visually, the process is not so simple. Most small planes do not yet have transponders, and so the controller must scan the moving dots on the entire radar screen to look for the aircraft. Often, after the pilot has identified himself and stated his direction and altitude of flight, the controller will ask him to make a turn, so he may observe which dot moves in that direction on the radar screen.

1. 32T: --Bonanza 5-3-2-Tango, 1-26-9.

2. C: Bonanza 5-3-2-Tango, Denver Radar. Do you have a transponder?

3. 32T: Uh, negative, sir. We are showing 26 D-M-E out on the 1-9-5 degree radial of Denver, and we're on our way to Jeffco, uh, northbound--at 7 thousand 500.

4. C: --Tango, roger. What's your heading right now?

5. 32T: Heading right now is 3-?-zero.

6. C: You just about over Ar.pahoe County Airport?

7. 32T: --we should be west of that, sir.

8. C: OK, I observe one target heading directly over Arapahoe County Airport, and, uh, you say on the Denver 1-95 radial?

9. 32T: That's affirmed.

10. C: Turn right, heading 3-6-zero for 30 seconds. This turn for identification. Denver altimeter 3-zero-2-1.

11. C: --radar contact. 26 miles south, a little southeast of Jefferson County Airport. Resume normal navigation. Report if you change altitude.

12. 32T: 3-2-Tango.

Interpretation:

1. The pilot of Beechcraft Bonanza number 532T initiates a callup to Denver Radar, the name of the radar controller handling airplanes not on instrument flight plans. "1-26-9" indicates to the controller that the pilot's radio receiver is tuned to a frequency of 126.9 MHz.

2. The controller repeats the aircraft number and identifies himself. He then asks the pilot of the plane is equipped with a transponder, the automatic radio which allows the computer to track the plane.

3. The pilot replies that he does not have a transponder ("negative, sir"). He then tries to pinpoint his location so the controller may spot the plane on radar. "26 D-M-E out on the 1-9-5 degree radial of Denver" is a position report stating the plane is 26 nautical miles from the Denver navigational radio beacon. He informs the controller that he is heading toward Jefferson County Airport ("Jeffco"), near Stapleton Airport, and that he is flying north at an altitude of 7,500 feet.

4. The controller repeats the plan number and acknowledges that he understands the information ("roger"). He asks for the plane's direction of flight.

5. The pilot answers that he is flying approximately northwest, on a compass heading of 320 degrees.

6. The controller asks the pilot if he is near the Arapahoe County Airport, south of Stapleton.

7. The pilot says he is west of that airport.

8. The controller says he sees a plane on radar ("one target") directly over the airport, and asks for confirmation of the plane's direction from the Denver radio beacon.

9. The pilot confirms the direction.

10. The controller instructs the pilot to turn to the right to a northerly direction for 30 seconds. "This turn for identification" tells the pilot that the controller merely wants to observe his radar screen to see which dot moves in that direction. "Denver altimeter 3-zero-2-1" is to tell the pilot what the barometric pressure is at the airport, so the pilot may adjust his altimeter, the cockpit instrument which measures height above sea level.

11. After a pause, the controller informs the pilot that he is now located on radar, in a position 26 miles southeast of Jefferson County Airport. "Resume normal navigation" tells

the pilot he may turn tack to his original northwest heading to fly to the airport. Also, if the pilot climbs or descends, he must report the change to the controller.

12. The pilot, by repeating his aircraft number, acknowledges that he has understood all the information and instructions.

Phase II--Special Requests (If Any)

After the callup and identification, there are occasionally special requests by the pilots. Most often, the pilot merely asks without any preliminaries, as in the following case:

1. 14F: --Baron 1-1-4-Fox.
2. C: Baron 1-1-4-Foxtrot, Denver Radar.

3. C: --Baron 1-1-4-Foxtrot, Denver Radar.
4. 14F: Yes sir, we are about, uh, a mile southeast of Cherry Creek Dam and we're just, uh, coming up on 8 thousand. Landing Stapleton. We'd like to get a transponder check, sir.
5. C: November 1-4-Foxtrot, roger. Uh, stand by just a moment. We're having a little difficulty as it would be, uh, with our transponder at Stapleton now. We'll have it fixed in just a second. We'll make a check for you...

Interpretation:

1. The pilot initiates the callup, identifying himself as Beechcraft Baron number 114F.

2. The controller responds with the plane number and identifies himself.

3. The controller repeats his transmission, because the plane did not answer.

4. The pilot identifies his position ("a mile southeast of Cherry Creek Dam") and his altitude as 8,000 feet. He says he intends to land at Stapleton Airport and would like to test his transponder.

5. The controller says that it will be possible after a short delay, due to equipment failure.

Sometimes, however, the pilot will ask permission to make a special request, as in the following transmission:

1. 705: Roger, set 3-zero-1-8. I've got a request.
2. C: And November Juliett-7-zero-5, go ahead.
3. 705: Uh, roger, we'd like to fly over, uh, around this altitude'd be fine over in the vicinity of Lowry, and look at it, look down at it and get myself set up for this flyover.
4. C: November Juliett-7-zero-5, roger. Maintain 1-1 thousand...

Interpretation:

1. Navy jet NJ705, after speaking to the controller on other matters, acknowledges the barometric setting for his altimeter as 30.18 inches of mercury ("Roger, set 3-zero-1-8"). He then informs the controller of his wish to make a special request.

2. The controller tells the pilot to proceed.

3. The pilot asks for permission to deviate from his flight path while remaining at his present attitude, in order to fly over Lowry Air Force Base for a visual inspection. This is in preparation for a "flyover"--a formation flight of planes during a military ceremony.

4. The controller agrees to allow the request, and tells the pilot to remain at the present altitude of 11,000 feet.

Phase III--Instructions, Advisories, and Acknowledgments

The majority of two-way radio communications of this type is devoted to flight instructions and traffic advisories. The instructions consist of commands to the pilot to tune his transponder, climb or descend, speed up or slow down, turn right or left, and the like. After each of the controller's transmissions, the pilot is compelled to acknowledge that he has understood the command, and will comply with it. The most common ways of doing this are to say "roger," "wilco," or to repeat the instructions or the aircraft number. The following conversation contains a typical array of instructions by the controller to the pilot:

1. 34F: Denver Approach, King Air 3-4-Fox, out of 13-point-4 with Juliett.
2. C: King Air 3-4-Fox, stand by....
3. --3-4-Fox, radar contact. Say altitude.

4. 34F: Uh, we're out of, uh, 1-2-point-8, sir, and we have Juliett.
5. C: King Air 3-4-Fox, descend and maintain 1-1 thousand. Turn left, heading 1-7-zero, vector runway 2-6-right.
6. 34F: Left 1-7-zero. Vectors 2-6-right. Down to 1-1 thousand.
7. C: Sir....

8. 34F: 3-4-Foxtrot, 1-1 thousand.
9. C: OK. King Air 3-4-Foxtrot, roger. Turn left, heading 1-4-zero.
10. 34F: Uh, left, 1-4-zero.

11. C: 3-4-Fox, turn right to heading 1-5-zero.
12. 34F: Right, 1-5-zero....

13. C: King Air 3-4-Fox, maintain 8 thousand, turn left, heading 1-2-zero.
14. 34F: Left, 1-2-zero. Down to 8 thousand. We're out of 11.
15. C: Roger.

16. C: --Fox, turn right to heading 1-7-zero. Report altitude.
17. 34F: OK, sir. We're out of 10. Right to 1-7-zero.

Interpretation:

1. The pilot of Beechcraft King Air number 34F calls Denver Approach Control, indicating he has just descended from an altitude of 13,400 feet ("out of 13-point-4"). He is descending on the instructions of another radar controller. "With Juliett" means the pilot has listened to Information Juliett, the previously described recorded weather and flight information which is broadcast on another radio frequency.

2. The controller responds, and asks the pilot to wait momentarily.

3. After a pause, the controller indicates that he has located the plane on the radar screen ("radar contact"). This was done automatically with the transponder and the computer attached to the radar. He then asks the pilot to tell his altitude.

4. The pilot says he is descending from 12,800 feet, and repeats that he has Information Juliett.

5. The controller tells the pilot to continue descending and level off at 11,000 feet. At the same time, the pilot is told to turn to the left to a compass heading of 170 degrees--very close to south. He is also told that he is being guided to a landing on runway 26-Right at Stapleton Airport.

6. The pilot repeats the new compass heading, the runway being used, and his new assigned altitude.

7. The controller merely signifies the correctness of the pilot's understanding of the instructions.

8. The pilot, after identifying himself, informs the controller that he has descended and is now flying level at 11,000 feet.

9. The controller, after confirming that he understood what the pilot said ("roger"), tells him to turn to the left to a new compass heading of 140 degrees.

10. The pilot repeats the instructions, to confirm them.

11. The controller tells the pilot to turn to the right, to a new compass heading of 150 degrees.

12. The pilot repeats the instructions, to confirm them.

13. The controller tells the pilot to descend and level off at 8,000 feet, and at the same time turn to the left, to a new heading of 120 degrees.

14. The pilot repeats the instructions, and tells the controller he is beginning to descend to 8,000 feet from the present altitude of 11,000 feet.

15. The controller acknowledges that he has understood ("roger").

16. The controller tells the pilot to turn right, to a heading of 170 degrees, and asks to know the plane's altitude.

17. The pilot reports he is descending from 10,000 feet, and repeats the instructions to turn right to 170 degrees.

During the previous exchange, the instructions, information, and confirmations are conducted with an ease and rapid pace which leaves the uninformed listener wondering how sense can be made from the talk. But, for the pilots and controllers, this is nothing more than routine "shop-talk," a skill developed over thousands of hours of experience.

Another major part of air traffic conversation consists of traffic warnings to pilots when other planes are in proximity. These traffic advisories take the form of the controller telling the pilots where the other plane is, relative to the pilot's direction of flight. The pilot is imagined to be sitting in the middle of a horizontal clock face, and always facing 12 o'clock. Three o'clock is directly to his right, 9 o'clock to his left, and so on. Then, the distance of the other plane is given to the pilot, along with the direction of flight, and his relative speed (usually either "fast" for jets and "slow" for small planes). Again, these advisories call for an acknowledgment by the pilot, usually whether or not the pilot sees the other aircraft.

1. C: Niner-2-Sierra, traffic at 1 o'clock, 3 miles, eastbound, is at 7 thousand, climbing.
2. 92S: Roger, I have him. 9-2-Sierra....
3. C: 9-2-Sierra, do you see the Cessna at 1 o'clock and 3 miles, eastbound, 7 thousand?
4. 92S: Uh, negative. 9-2-Sierra....

Interpretation:

1. The controller tells the pilot of aircraft number 92S to look in front and slightly to the right ("1 o'clock"), at a distance of 3 miles, for a plane going in an easterly direction at 7,000 feet and climbing.

2. The pilot tells the controller he has spotted the other plane.

3. The controller asks if the pilot sees a Cessna brand plane in front and slightly to the right, at a distance of 3 miles, going east at 7,000 feet.

4. The pilot replies that he does not.

The ability to deal with these traffic advisories seems to represent one of the more difficult tasks for pilots, particularly novices. Often, the pilot will not comprehend all the information, and will usually ask that it be repeated:

1. C: ...9-5-Tango, traffic at 10 o'clock, 2 miles, southbound, below you, 61 hundred--6 thousand 100 feet.
2. 95T: 9-5-Tango, be advised, uh, you'll have to say it again, over.
3. C: OK, just, uh, at your 11 o'clock, less than a mile now. (No response from 95T.)

Interpretation:

1. The controller informs the pilot that another plane is to the pilot's left ("10 o'clock"), at a distance of 2 miles, going south, below the altitude of 95T, at 6,100 feet.

2. The pilot did not understand the broadcast, and asks for it to be repeated.

3. The controller says the plane is now in front of 95T and slightly to the left ("11 o'clock"), at a distance of less than 1 mile.

Phase IV--The Termination

The termination marks the end of communications between the controller and pilot. In the examples presented here, the pilots who are preparing to land are given "final approach" instructions to the airport. The pilot is told what type of landing approach to make--by instruments or visually--and when to change radio frequencies. Before landing, the pilot is guided by the control tower controllers, the men in the glass-enclosed buildings who visually guide planes within a distance of 5 miles from the airport. Once again, an acknowledgment from the pilot is required.

1. C: TWA 431, cleared visual approach, runway 2-6-right, and call Denver Tower over Skyranch, 1-1-8-point-3. Traffic is a Cessna at 7 thousand 500 feet, 2 o'clock, 5 miles. He'll be passing in front of you, over Fitzsimons Hospital, southbound.
2. 431: OK, thank you.

Interpretation:

1. The controller tells TWA Flight 431 that the pilot is allowed to approach the airport visually, without instrument guidance, to land on runway number 26-Right. He must change his radio frequency to talk to "Denver Tower" when he reaches Skyranch Airport, 5 miles from Stapleton. The radio frequency for Denver Tower is 118.3 MHz. In addition, there is a Cessna aircraft flying at 7,500 feet, to the pilot's right ("2 o'clock") at a distance of 5 miles. The other plane will be passing Fitzsimons Hospital, a prominant landmark, as he flies south.

Thus, the standard format of this type of two-way radio communication between pilots and controllers is: the callup and identification; special requests (if any); instructions, advisories, and acknowledgments; and termination of communications between the two.

SOME DIFFERENCES BETWEEN "NATURAL" AND AIR TRAFFIC CONTROL CONVERSATIONS

Perhaps the primary difference between natural conversations and air traffic language is the fact that, by design and intent, air traffic language is designed to be efficient--that is, to express the most information possible accurately within the shortest possible time.

The need for efficient communications can be illustrated easily. Suppose two jets are traveling directly toward each other, each at 180 miles per hour (a speed routinely used near airports, and actually slow by jet standards). If a radar controller sees the situation on his radar screen when they are one mile apart, he must analyze the problem, broadcast the information, and the pilot must take evasive action--all within 10 seconds to avoid a collision.

It is an expressed goal of the air traffic control facilities to promote safe flight by efficient use of the radio. During flight training, pilots are instructed to restrict their conversations strictly to "the work" at hand. Yet, as this paper demonstrates later, this professed goal is not attained, either by pilots or controllers, indicating the presence of other understandings on the part of both as to the nature of two-way radio communications.

Consider how much information must be expressed to a pilot by the controller. Four distinct dimensions of flight are involved--speed, direction, altitude, and climb or descent. Pilots are given instructions regarding all four of these realms. And, commands such as "turn left, heading 1-7-zero degrees, descent to 8 thousand feet, slow to 1-8-zero knots" contain what must be considered an irreducible amount of verbal symbols, at least within the present technology. It must be noted that research is being conducted into the possibilities of completely automated flight, controlled by computers on the ground, with pilots and controllers acting only as monitors of the electronic equipment.

A principal way that the desire for efficiency can be seen is by considering the standardization of "style." It appears to be thought that if the "style" of the communication remains fixed, the listener can concentrate on the "content" of the message. Presumably the repetitious format and order of presentation of information allows this part of the communication to become a "background feature," taken for granted and not noticed by the conversants unless trouble occurs. The traffic advisories, for instance, routinely occur in the following order: direction from the pilot (expressed with reference to the imaginary horizontal clock face), distance from the pilot, the other plane's direction of flight, a description of the other plane, and the relative speed ("fast" or "slow") or altitude, and climb or descent pattern.

C: OK, at 12 o'clock, 4 miles, westbound, a Continental jet descending.

C: Niner-1-Whiskey, roger. 7 thousand would be better. Traffic at 10 o'clock, 4 miles, eastbound, a D.C.-10, high, climbing.

C: --Tango, traffic 1 o'clock, 2 miles, southeastbound, altitude unknown.

C: Uh, roger, understand. Watch for military traffic at 12 o'clock, 1 mile, southeastbound, moderate speed, and 12 o'clock, 2 miles, turning, uh, westbound, fast moving.

Since there is so much information presented rapidly, at a time when the pilot may be busy with other tasks besides actually flying the airplane, the routine presentation of information in the same order, as in the above excerpts from several conversations, allows the pilot to have the expectation that information will be presented in the same order. So he may concentrate on the information itself, the "content," while disattending to the "style," as illustrated here by the same order of presentation. Expressed another way, "creativity of expression" by either the pilot or the controller could have negative consequences in this situation.

A second difference between natural conversations and radio communication is that there is never any face-to-face communication between pilots and controllers. Hence, the kinesic and parakinesic dimensions of communication--the subtleties of gesture and body movement--are missing. In fact, a great deal of the paralinguistic dimensions, such as tone of voice, are also absent, because two-way radios do not convey different vocal features well, and everyone sounds very much alike.

A third difference is the fact that the design of two-way radios makes it mandatory that only one person speak at a time. When either the pilot or controller is transmitting, he is unable to hear any messages directed to him. In this respect, a radio is different from a telephone, where both parties may speak and listen at the same time. As soon as someone presses his microphone button, he is unable to receive any transmissions.

Under this constraint, one must resort to constantly identifying himself by aircraft number, either at the beginning or end of each transmission, unless it is absolutely unmistakable who is speaking. Thus, there is a great deal of redundancy. This is somewhat analagous to asking speakers in a natural conversation to say their name before they started to speak. Natural conversations would be difficult, at least in the beginning. The necessity of identifying oneself may serve to add an air of restraint, in contrast to "careful and carefree" ordinary conversation.

SOME SIMILARITIES BETWEEN "NATURAL" AND AIR TRAFFIC CONTROL CONVERSATIONS

Despite the aforementioned differences, there are many important similarities between two-way radio communications and ordinary conversation. These will be discussed in terms of the issues of the sociology of language previously mentioned.

First, I believe the controller-pilot speech group is a speech community. These speakers share rules of conduct and interpretation of speech which follows its own mutually-understood set of norms or rules. Not only do these speakers understand and share the fules of format and appropriate use of the two-way radio, but I argue that they speak more than one language variety. Not only can both parties understand and demonstrate "efficient," strictly work-oriented language, but they also are capable of using a language variety which allows for the introduction of much non-essential talk.

The following conversation illustrates the large amount of non-efficient and non-essential talk which can be observed within a routine conversation. All the underlined portions of this conversation are non-efficient and non-essential for the reason listed immediately to the left of the line:

	1.	782:	--Jetstar 7-7-8-2 is leaving--1-4 thousand with November, requiring the long runway.
Unnecessary	2.	C:	Jetstar 7-3-2, roger, <u>and what do you mean by the long runway?</u> The, uh, runway

Unnecessary			2-6-Right has now been lengthened to 7 thousand 9 hundred and 24 feet. You have that information?
Unnecessary	3.	C:	--haven't had a chance to have a look at it yet, cause, uh, the city hasn't put the information. We just opened the runway up, about, oh, a week ago.
Unnecessary	4.	782:	OK, we haven't been here since then.
Unnecessary	5.	C:	OK, this will be vectors, visual approach, runway 2-6-right. The D.C.-10's are using it, so I think you'll get by all right....
	6.	C:	Jetstar 7-7-8-2, are you proceeding direct to Denver V-O-R?
Unnecessary	7.	782:	Yes, sir.
Unnecessary	8.	C:	OK, thank you. Just wanted to confirm you weren't on a heading.
	9.	782:	And I do want to confirm that its going to be a--visual, or vectors for a traffic pattern.
Unnecessary Redundant Unnecessary	10.	C:	Yes, sir. Vectors visual approach, runway 2-6-Right. They've got good weather: 14 thousand scattered, and the visibility is 40. And there'll be no traffic in tight for you to follow.
Unnecessary	11.	C:	--to the final about 5 miles, 7-8-2, and, uh, we'll point out the airport and see how it works out.
Unnecessary Redundant	12.	782:	Ok, uh, thank you very much, uh, we're not in a D.C.-10 this morning. We're in a Lockheed Jetstar and--
Unnecessary	13.	C:	Roger, I have that information.

In this very interesting conversation, it is apparent how much non-work talk is present. After the callup and identification (lines 1 and 2), the controller switches from a strict, forman, efficient format to a discussion of the fact that he has not seen the new runway which has recently been repaired and opened (line 3). Then he offers, "The D.C.-10's are using it, so I think you'll get by all right" (line 5). He was joking with the pilot, who was flying a small, private business jet. Both men know that the small jet needs much less runway to take off and land than a D.C.-10 jumbo jet. Then later, the controller tells the pilot the weather conditions (line 10), which is redundant information because in the callup, the pilot informed the controller that he had received the recorded weather broadcast called Information November (line 1). In fact, line 10, spoken by the controller, is the air traffic equivalent of "idle conversation to pass the time of day."

This conversation also reveals another feature of two-way radio conversation which shows its similarity to ordinary conversation--there are privileges of speaking which are unequally distributed. A primary rule, of course, is that the pilot initiates the callup, and the controller has both the right and duty to command the pilot to take certain actions, described above. Beyond this, however, is the fact that the right to initiate the switch from formal to informal language variety rests with the controller only. In the preceding example the controller initiates the switch from work to non-work talk by discussing the new runway (line 3). This occurred after he gave the pilot all the information necessary concerning runway length (line 2). Later in the conversation, the pilot attempts to joke about the fact that he is not flying a D.C.-10, but rather a small business jet (line 12). But he is promptly silenced by the controller's unwillingness to switch again into a non-work conversation (line 13). This example demonstrates that it is the controller who occupies the dominant position with regard to the right to switch from one language variety into another. The controller initiates a joking sequence of conversation, but moments later refuses to allow the pilot to do the same thing.

Similarly, I argue that these participants are "members" of this speech community, because they have mastered this natural language (see Garfinkel and Sacks, 1970:342). I think this is a natural language in the same sense any other English language variety is a natural language; that is, while generally conforming to rules of grammer, syntax, and other rules of English, it nonetheless comprises a subset which is perfectly intelligible to the members. (For discussions of the Black English Vernacular as another example of an English language variety, see Labov, 1972; Dillard, 1972.) Also, for the controllers and pilots, it is not self-conscious, unless there is trouble, as with a faulty radio transmitter or receiver. In fact, humor can be conveyed in this language variety, although it is admittedly technical, but perfectly understandable (and humorous) to members of this speech community:

1. C: --24, are you navigating inbound on the localizer?
2. 024: No, we're shooting a, uh, little practice, uh, A-D-F approach. We've got the runway and the airport in sight.
3. C: Got it. Show a little bit left of course.
4. 024: Don't tell them.

In this case, while approaching the airport to land, on a clear day, the pilot of a commercial jetliner was making a practice A-D-F approach, a form of instrument-guided approach used in bad weather when the pilot cannot see the ground (line 2). But, he was doing a very poor job--poor enough, in fact, that controller noticed on the radar screen that the plane was off course (line 3). The pilot's joking reply, "Don't tell them" (line 4), refers to the Federal Government's flight examiners, who make pilots pass rigid flight tests every six months before they are allowed to fly commercial airliners.

Many parts of two-way radio language used in air traffic control are understandable to speakers of ordinary English. Expressions such as "turn right," "turn left," "slow to 160 knots," "descent to 8,000 feet," and the like can be easily understood, and with practice and familiarity with the technical equipment and procedures, a natural language develops.

Sacks (1972:339) discussion of the use of norms by speakers is a further indication of the natural language character of these conversations. "...viewers use norms to explain both the occurrence of some activity given the occurrence of another and also its sequential position with regard to the other, e.g., that it follows the other, or precedes. This is a first importance. Second, viewers use norms to provide the relevant membership categories in terms of which they formulate identifications of the doers of those activities for which the norms are appropriate." To members, the conversation's sequencing of events is clear, even at times when the controller does not use the normal pattern of repeating the aircraft number for identification:

1. C: Roger, 9-5-Tango. Altitude now, sir?
2. 95T: Uh, 68 hundred, over.
3. C: OK, as soon as you leave 69 hundred, resume your own navigation, and you're just along the southern edge of the Arsenal area now. Its just off your left wing, prohibited area, sir.
4. 95T: Uh, roger, I have it in sight, and, uh, as soon as I reach 7 thousand, uh, continue on my own, over.
5. C: OK.
6. 95T: 9-5-Tango, thank you.

In this example, there was no confusion about who the controller was speaking to, even though he only used the identification, 9-5-Tango, at the beginning (line 1). The aircraft did not specifically identify himself after the callup until the end of the conversation (line 6).

Another key similarity to ordinary conversation are the properties of being "situated" and "indexical." Two-way radio communication is a very good example of both properties. That the talk is situated is obvious. Commands such as "turn left" or "slow down" are appropriate to specific aircraft at specific moments. Pilots rarely question commands, even though it is possible to do so because the pilot has the final responsibility for safety, and he may deviate from instructions when he feels it is necessary. Many passangers do doubt wonder why their plane is being turned, apparently more often than necessary. This fact may be explained by noting the "indexical" nature of the talk. The talk makes the reality that it is talking about sensible. The pilot's actions of turning the plane, slowing down, and the rest make sense when the commands are heard from the controller. In fact, the actions of the controller as well as the pilot are unintelligible, that is, done "for no apparent reason," unless one hears and understands the talking. The talk adds a dimension which makes the actions sensible.

Sometimes more information than the minimum necessary is given to the pilot, as in this case when the controller explains to the pilot why he must slow down to follow another plane (line 7):

1. C: 7-4-Quebec's radar contact.
2. 74Q: Thank you.
3. C: Confirm at 8 thousand, 7-4-Quebec, and do you have Information Mike?
4. 74Q: Say again?
5. C: Confirm Information Mike and level at 8 thousand.
6. 74Q: Affirmative. Uh, I have Information Mike and 8 thousand.
7. C: All right, sir. Western 7-0-1, reduce to 1-8-zero knots. You're following a Frontier jet that's just over Buckley now, northbound.
8. 701: Roger, we have him in sight and we're reducing.

And finally, the most important consideration is that "society" is produced by this kind of talk between pilots and controllers, in spite of the many limitations and constraints placed on the talk. The norms of one language variety--the "informal" non-efficient non-essential non-work one--dictate that politeness and verbal courtesy be extended. Examples are abundant of both pilots and controllers saying "good morning," "good day," "yes sir," "thank you" and others, when all that is minimally necessary is a brief, efficient acknowledgment such as "roger" or the airplane number. Also, controllers often give either redundant or unnecessary information. My interpretation of this is that, contrary to the view that this inefficient talk represents a deviation from the supposedly rigid rules, they are attempts to create a more "human" society--even among men who never see or meet each other. Examples of the informal language variety cited are examples of an ongoing accomplishment of artful and ordinary ways of speaking which become taken for granted by these members as they create a social world via two-way radio (see Garfinkel, 1967:vii).

Instances of the informal and inefficient use of the radio occur constantly, even during the busiest and most rushed times, and one must conclude that the norms of the informal variety are important by both parties within the conversations. Contrary to the expectation that the occurrences of non-efficient talk would disappear during the busy times, this did not prove to be the case. The non-efficient dimensions of communication are accomplished during the course of the ongoing conversations, even though official rules and one set of norms (the "formal" one) militate against this. And they persist, even during the most busy and frantic moments, allowing the conclusion that pilots and controllers strive to create a society in the midst of many constraints.

SOME IMPLICATIONS AND QUESTIONS

Speculation about the dimension of the non-efficient talk present in most conversations could take many forms, but one is of particular interest: why has this informal language variety developed within the supposedly rigid framework of two-way radio communications?

One explanation could be an historical one. Perhaps in the early days of radio communications, the system and its rules were more flexible. During the 1930's, for instance, radio contact was often lost with aircraft, and equipment failures were common. Also, radar was not in use at that time. Many of today's pilots and controllers could have been trained and socialized into the language community by early users of the radio, and thus become accustomed to the more informal modes of speech used at that time. Possibly interviews with pilots or controllers, or research into the history of radio communication would be revealing.

A second explanation could be a "natural" one. That is, since both pilots and controllers occupy occupational roles that are not totally segregated or exclusive, they may bring their norms of speaking appropriate to other contexts into the air traffic control setting, in an unconscious manner.

It would be revealing to run an experiment where a group of people who had no familiarity with aviation were trained from the beginning to believe that _any_ non-efficient non-work talk was deviant and potentially dangerous. Experiments done in situations where new arrivals in a work scene have no notion of the work to be done can accomplish talks thought to be impossible by those already doing the work (Rosenthal and Jacobson, 1968:5-6). Would this new group be able to do the work of air traffic control more accurately and faster than controllers now, without increasing stress? An experiment of this type could have far reaching effects for the entire group of pilots and controllers. Studies of air traffic language done (Frick and Sumby, 1952; Sumby, 1960) to date ignore this issue.

A well-planned study of this type could be valuable for another reason, not yet discussed. It is well known that there is a large amount of stress associated with the air traffic controller's occupation. The abnormally high number of physiological stress symptoms exhibited by controllers led several physicians in 1972 to organize the American Academy of Air Traffic Control Medicine. One doctor (Wehrmacher, 1972:1102) reported that of the 111 controllers he examined, 86 showed signs or symptoms of peptic ulcers.

A potentially important question is: what role does the very nature of the conversational environment play in contributing to this stress? Would there be less pressure on controllers if there were more latitude allowed in the speech format? Would this also occur if the distinction between non-work and efficient talk were removed? Would stress decrease if more automatic equipment were added, so that controllers would not need to rely on the quickness and accuracy of their memory and judgment?

Unfortunately, the present study has not shed light on these questions. But the findings that men seem to create a society characterized by an informal speech community may suggest that a modification of the norms of formality and rigidity be modified so that the more informal language variety is seen as completely legitimate is desirable. Talking is a very large part of the controller's work, and intimately associated with his task. Following the sociology of language's recent considerations as outlined earlier, the nature of language use is intimately connected with and mutually influential to the social situation of its occurrence. It would be fruitful to delve into the nature of the speech community created by pilots and controllers, with the expressed purpose of seeking to discover ways that changes could be instituted to reduce the stress on controllers without sacrificing flight safety.

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RADIOTELEPHONE PHRASEOLOGY AND TECHNIQUE

CONTACT PROCEDURE

1. Initiate radio communications with a ground facility by using the following format:

a. Identification of the unit being called.

b. Identification of the aircraft.

c. The type of message to follow, when this will be of assistance.

d. The word 'OVER.'

Example:

NEW YORK RADIO, MOONEY THREE ONE ONE ONE ECHO, OVER.

2. Reply to callup from a ground facility by using the following format:

a. Identification of the unit initiating the callup.

b. Identification of the aircraft.

c. The word 'OVER.'

Example:

PITTSBURGH TOWER, CESSNA TWO SIX FOUR FIVE ZULU OVER.

NOTE.—The word 'OVER' may be omitted if the message obviously requires a reply.

3. Use the same format as for initial callup and reply after communication has been established except, after stating your identification, state the message to be sent or acknowledgment of the message received. The acknowledgment is made with the word 'ROGER' or 'WILCO' and pilots are expected to comply with ATC clearances/instructions when they acknowledge by using either 'ROGER' or 'WILCO.'

Example:

APACHE ONE TWO THREE XRAY, ROGER.

4. After contact has been definitely established, it may be continued without further call-up or identification.

5. Pilots operating under provisions of FAR Part 135, ATCO, certificate are urged to prefix their aircraft identification with the phonetic word "Tango" on the initial contact with ATC facilities unless they have been assigned FAA authorized call signs.

Example:

TANGO AZTEC 2464 ALFA.

NOTE.—The prefix "Tango" may be dropped on subsequent contacts on the same frequency.

MICROPHONE TECHNIQUE

1. Proper microphone technique is important in radiotelephone communications. Transmissions should be concise and in a normal conversational tone.

NOTE.—Identification of Aircraft—Pilots are requested to exercise care that the identification of their aircraft is clearly transmitted in each contact with an ATC facility. Also pilots should be certain that their aircraft are clearly identified in ATC transmissions before taking action on an ATC clearance.

2. When originating a radiotelephone call-up to any air-ground facility, indicate the channel on which reply is expected, if other than normal.

Example:

The New York FSS transmits on several VOR frequencies in the area. These VOR's are shown on charts, each having a different name, identification, and frequency. If you are tuned to the Riverhead VOR and wish to call the New York FSS, call "RIVERHEAD RADIO." This tells the New York FSS which frequency you are listening to. If you call "NEW YORK RADIO", you have to tell them what frequency you are listening to—"REPLY ON RIVERHEAD VOR."

3. Keep your contacts as brief as possible. Pilots should not read back altimeter setting, taxi instructions, wind and runway information to towers except for verification or clarification of instructions. Other pilots are waiting to use the channel.

4. Contact the nearest Flight Service Station. Don't continually attempt to see how far your transmitter will reach. If in doubt about the frequency to contact an FSS, transmit on 122.1 MHz and advise them the frequency you are listening on.

5. Avoid calling stations at 15 minutes past the hour, because of interference with scheduled weather broadcasts.

6. When making a position report, pilots should in all cases state the name of the reporting point over which, or in relation to which, they are reporting. The phrase "OVER YOUR STATION" should not be used.

AIRCRAFT CALL SIGNS

Garbled aircraft identifications in radiotelephone transmissions should never be taken for granted but should always be checked.

1. During the initial contact with a ground station, the complete aircraft call sign is used.

a. Civil itinerant aircraft pilots should use the type name (or make) of their aircraft, followed by the complete certification number.

Example:

BONANZA ONE TWO THREE FOUR TANGO.

b. Air Taxi or other commercial operators not having FAA authorized call signs should prefix normal identification with the phonetic word "Tango."

2. Air carriers and commuter air carriers having FAA authorized call signs identify themselves by stating the call sign, followed by the trip number spoken as a group.

Example:

UNITED TWENTY-FIVE OR COMMUTER SIX-ELEVEN.

3. Military aircraft pilots may use whichever of the following is applicable:

a. The service name or designated prefix followed by the last 5 digits of the serial number.

Example:

AIR FORCE FOUR FOUR NINER THREE TWO or MAC FOUR FOUR NINER THREE TWO.

b. The service name or designation followed by the word "RESCUE" and the 5 digits of the serial number.

c. Assigned voice call signs consisting of a selected authorized code word followed by a two-digit flight number.

Example:

ANDY TWO ZERO.

d. Assigned double-letter, two-digit flight numbers.

Example:

ALFA KILO ONE FIVE.

4. Civilian airborne ambulance flights (aircraft carrying ambulatory or litter patients, organ donors, or

From: Airman's Information Manual Part I. February, 1972.

organs for transplant) will be expedited and necessary notification will be made when the pilot requests. When filing flight plans for such flights, add the word "Lifeguard" in the remarks section. In radio communications use the call sign "Lifeguard" followed by the type, digits, and letters of the registration number. Pilots should use discretion in the use of this term. It should be used for those missions of an urgent nature.

Example:

LIFEGUARD CESSNA TWO SIX FOUR SIX.

5. Abbreviated call-signs may be used ONLY when initiated by the ground station and will consist of the aircraft type followed by the last three characters of the tail number.

Example:

"TRI PACER SIX TWO YANKEE."

GROUND STATION CALL SIGNS

Ground station call signs shall comprise the name of the location or airport, followed by the appropriate indication of the type of station:

OAKLAND TOWER (airport traffic control tower);
MIAMI GROUND (ground control position in tower);
DALLAS CLEARANCE DELIVERY (IFR clearance delivery position);
KENNEDY APPROACH (tower radar or nonradar approach control position);
ST. LOUIS DEPARTURE (tower radar departure control position);
WASHINGTON RADIO (FAA Flight Service Station);
NEW YORK CENTER (FAA Air Route Traffic Control center).

PROCEDURE WORDS AND PHRASES

The following words and phrases should be used where practicable in radiophone communications:

Word or Phrase	Meaning
ACKNOWLEDGE	"Let me know that you have received and understood this message."
AFFIRMATIVE	"Yes."
CORRECTION	"An error has been made in this transmission. The correct version is . . ."
GO AHEAD	"Proceed with your message."
HOW DO YOU HEAR ME?	Self-explanatory.
I SAY AGAIN	Self-explanatory.
NEGATIVE	"No" or "Permission not granted" or "That is not correct."
OUT	"This conversation is ended and no response is expected."
OVER	"My transmission is ended and I expect a response from you."
READ BACK	"Repeat all of this message back to me."
ROGER	"I have received all of your last transmission." (To acknowledge receipt, shall not be used for other purposes.)
SAY AGAIN	Self-explanatory.
SPEAK SLOWER	Self-explanatory.
STAND BY	"If used by itself means 'I must pause for a few seconds.' If the pause is longer than a few seconds, or if 'STAND BY' is used to prevent another station from transmitting, it must be followed by the ending 'OUT'."
THAT IS CORRECT	Self-explanatory.
VERIFY	Confirm.
WILCO	I have received your message, understand it, and will comply.
WORDS TWICE	(a) As a request: "Communication is difficult. Please say every phrase twice." (b) As information: "Since communication is difficult, every phrase in this message will be spoken twice."

TIME

1. The Federal Aviation Administration utilizes Greenwich Mean Time (GMT or "Z") for all operational purposes.

To Convert From:	To Greenwich Mean Time:
Eastern Standard Time	Add 5 hours
Eastern Daylight Time	Add 4 hours
Central Standard Time	Add 6 hours
Central Daylight Time	Add 5 hours
Mountain Standard Time	Add 7 hours
Mountain Daylight Time	Add 6 hours
Pacific Standard Time	Add 8 hours
Pacific Daylight Time	Add 7 hours

2. The 24-hour clock system is used in radiotelephone transmissions. The hour is indicated by the first two figures and the minutes by the last two figures.

Examples:

0000 ---------- ZERO ZERO ZERO ZERO
0920 ---------- ZERO NINER TWO ZERO

3. Time may be stated in minutes only (two figures) in radio telephone communications when no misunderstanding is likely to occur.

4. Current time in use at a station is stated in the nearest quarter minute in order that pilots may use this information for time checks. Fractions of a quarter minute less than eight seconds are stated as the preceding quarter minute; fractions of a quarter minute of eight seconds or more are stated as the succeeding quarter minute.

Examples:

Time

0929:05 ----TIME, ZERO NINER TWO NINER
0929:10 ----TIME, ZERO NINER TWO NINER AND ONE-QUARTER
0929:28 ----TIME, ZERO NINER TWO NINER AND ONE-HALF

FIGURES

1. Figures indicating hundred and thousands in round number; as for ceiling heights, and upper wind levels

up to 9900 shall be spoken in accordance with the following examples:

500	FIVE HUNDRED
1300	ONE THOUSAND THREE HUNDRED
4500	FOUR THOUSAND FIVE HUNDRED
9900	NINER THOUSAND NINER HUNDRED

2. Numbers above 9900 shall be spoken by separating the digits preceding the word "thousand." Examples:

10000	ONE ZERO THOUSAND
13000	ONE THREE THOUSAND
18500	ONE EIGHT THOUSAND FIVE HUNDRED
27000	TWO SEVEN THOUSAND

3. Transmit airway or jet route numbers as follows:

Examples:

V12	VICTOR TWELVE
J533	J FIVE THIRTY THREE

4. All other numbers shall be transmitted by pronouncing each digit.

Examples:

10	ONE ZERO
75	SEVEN FIVE
583	FIVE EIGHT THREE
1850	ONE EIGHT FIVE ZERO
18143	ONE EIGHT ONE FOUR THREE
26075	TWO SIX ZERO SEVEN FIVE

The digit "9" shall be spoken "NINER".

5. When a radio frequency contains a decimal point, the decimal point is spoken as "POINT."

Examples:

122.1	ONE TWO TWO POINT ONE
126.7	ONE TWO SIX POINT SEVEN

(ICAO Procedures require the decimal point be spoken as "DECIMAL" and FAA will honor such usage by military aircraft and all other aircraft required to use ICAO Procedures.)

FLIGHT ALTITUDES

1. Up to but not including 18,000' MSL—by stating the separate digits of the thousands, plus the hundreds, if appropriate.

Examples:

12,000	ONE TWO THOUSAND
12,500	ONE TWO THOUSAND FIVE HUNDRED

2. At and above 18,000' MSL (FL 180) by stating the words "flight level" followed by the separate digits of the flight level.

Examples:

190	FLIGHT LEVEL ONE NINER ZERO
275	FLIGHT LEVEL TWO SEVEN FIVE

DEGREES

The three digits of the magnetic course, bearing, heading or wind direction. The word "degrees" should be added for wind directions. All of the above should always be magnetic. The word "true" must be added when it applies.

Examples:

(magnetic course) 005	ZERO ZERO FIVE
(true course) 050	ZERO FIVE ZERO TRUE
(magnetic bearing) 360	THREE SIX ZERO
(magnetic heading) 100	ONE ZERO ZERO
(wind direction) 215	TWO ONE FIVE DEGREES

SPEEDS

The separate digits of the speed followed by the word 'knots'. The controller may omit the word "knots" when using speed adjustment procedures, "Reduce/Increase Speed To One Five Zero.

Examples:

250	TWO FIVE ZERO KNOTS
185	ONE EIGHT FIVE KNOTS
95	NINER FIVE KNOTS

PHONETIC ALPHABET

1. Phonetic letter equivalents are communications safety tools to be used when receiving conditions are such that the information cannot be readily received without their use. Under adverse communication conditions, e.g., frequency congestion, phonetic equivalents are employed for single letters, or to spell out groups of letters or difficult words. Pilots are encouraged to use the phonetic alphabet when identifying their aircraft, especially in initial contacts with air traffic control facilities.

2. The International Civil Aviation Organization (ICAO) phonetic alphabet is normally used by FAA personnel. However, different phonetic equivalents may be used by pilots, or, upon the pilot's request may be used by FAA during communications with such pilots.

A	· —	Alfa	(AL-FAH)
B	— · · ·	Bravo	(BRAH-VOH)
C	— · — ·	Charlie	(CHAR-LEE) (or SHAR LEE)
D	— · ·	Delta	(DELL-TAH)
E	·	Echo	(ECK-OH)
F	· · — ·	Foxtrot	(FOKS-TROT)
G	— — ·	Golf	(GOLF)
H	· · · ·	Hotel	(HOH-TEL)
I	· ·	India	(IN-DEE-AH)
J	· — — —	Juliett	(JEW-LEE-ETT)
K	— · —	Kilo	(KEY-LOH)
L	· — · ·	Lima	(LEE-MAH)
M	— —	Mike	(MIKE)
N	— ·	November	(NO-VEM-BER)
O	— — —	Oscar	(OSS-CAH)
P	· — — ·	Papa	(PAH-PAH)
Q	— — · —	Quebec	(KEH-BECK)
R	· — ·	Romeo	(ROW-ME-OH)
S	· · ·	Sierra	(SEE-AIR-RAH)
T	—	Tango	(TANG-GO)
U	· · —	Uniform	(YOU-NEE-FORM) (or OO-NEE-FORM)
V	· · · —	Victor	(VIK-TAH)
W	· — —	Whiskey	(WISS-KEY)
X	— · · —	Xray	(ECKS-RAY)
Y	— · — —	Yankee	(YANG-KEY)
Z	— — · ·	Zulu	(ZOO-LOO)

1	· — — — —	Wun
2	· · — — —	Too
3	· · · — —	Tree
4	· · · · —	Fow-er
5	· · · · ·	Fife
6	— · · · ·	Six
7	— — · · ·	Sev-en
8	— — — · ·	Ait
9	— — — — ·	Nin-er
0	— — — — —	Zero