

## An interactive conversation with a chatbot: Does ChatGPT know standard phraseology in aviation English?

Rabia Dinçer<sup>1</sup>

Nazmi Dinçer<sup>2</sup>

Oğuz Guksu<sup>3</sup>

<sup>1</sup>Turkish Air Force Academy, Turkey / Contact: [rgungor@hho.msu.edu.tr](mailto:rgungor@hho.msu.edu.tr) 

<sup>2</sup>Turkish Air Force Academy, Turkey / Contact: [ndincer@hho.msu.edu.tr](mailto:ndincer@hho.msu.edu.tr) 

<sup>3</sup>Turkish Air Force Academy, Turkey / Contact: [oguksu@hho.msu.edu.tr](mailto:oguksu@hho.msu.edu.tr) 

### Abstract

This research investigates the profound effects of ChatGPT, an artificial intelligence (AI) language model, on the domain of aviation English. Within an industry that places significant emphasis on safety and accuracy, this study utilizes a qualitative case study methodology to evaluate the performance of ChatGPT. There has been an interactive conversation with ChatGPT acting as an air-traffic controller. The observations based on the instant responses of the chatbot following the prompts demonstrated that ChatGPT shows exceptional competence in conforming to conventional aviation phraseology throughout different flight stages, ranging from ground clearances to landing, by using role-play situations. Beyond linguistic accuracy, ChatGPT facilitates dynamic and contextually relevant dialogues, enhancing aviation education and training experiences.

### Keywords

Aviation English,  
Standard  
Phraseology,  
Chatbot,  
ChatGPT

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### Introduction

The aviation industry, known for its meticulousness, intricacy, and steadfast dedication to safety, largely depends on efficient communication as a cornerstone element. Within the dynamic airspace, where pilots and air traffic controllers operate, the use of clear and precise language holds significant implications for the preservation of human life. People find themselves in an era commonly referred to as the age of artificial intelligence, whereby the distinctions between human and machine capabilities are becoming increasingly indistinct. Within this context, the domain of aviation

communication emerges as a prominent arena in which this revolution is taking place (Dincer, 2023).

Aviation English, a domain-specific language, functions as a common medium of communication for pilots, air traffic controllers, and professionals in the aviation industry on a global scale (Ragan, 1996). The language that has been carefully constructed is not only a compilation of words and phrases, but rather a well-organized framework designed to minimize uncertainty and facilitate efficient, lucid, and unequivocal interaction, especially in situations characterized by heightened pressure. At the core of this system lies the concept of "standard phraseology," which encompasses a collection of predetermined words and terms that undergo training for pilots and air traffic controllers (Campbell, 2004). This standardized code serves as a universal means of communication within the aviation domain. Aviation communication is rightly recognized as one of the key components, standardized phraseology in aviation is especially known for its several characteristics that make up an important element in a framework language governing life and work there (Bieswanger 2016). Because this system remains determined in its mission to promote clarity and accuracy, it guarantees that communication within the aviation domain is always clear, and details are never omitted anywhere around the world expecting maximum efficiency. Besides being used in everyday speech, standard phraseology is often essential to emergency communications. It provides an orderly orientation for aviation personnel to be able to quickly and securely deal with emergency situations (Estival, 2016). Secondly, as Dincer and Gokhan note (2023), the use of this type of language is really important in aviation training and certification procedures. It truly reflects industry thinking with its emphasis on standardization for safety reasons.

With technological progress disrupting numerous fields, AI is the game-changer that promises overwhelming gains in efficiency and precision (Luckin & Cukurova 2019). AI is affecting business across healthcare, finance and even manufacturing (Sharma et al., 2021). Yet the aviation sector, known for its attention to safety and innovation, has been very hesitant about adopting AI. This caution has given rise to a central question: Can AI, represented here by ChatGPT (an artificial intelligence language model developed by OpenAI), actually understand the subtle distinctions of

Aviation English and use standard phraseology in real-world safety-critical aviation settings?

When AI is introduced into the field of aviation communication, it brings up many considerations. Such a humanized AI can help streamline processes and decision-making (Huang, 2022), but the aviation industry is in its own league. Safety is paramount, with standards and procedures of the greatest rigor (Alderson 2009). As a result, its entry into this field requires an in-depth analysis of whether it can fit the industry's safety architecture.

So now the limelight has fallen on ChatGPT, an advanced language model using AI that can generate text as though written by a human from massive amounts of data. Therein, we are forced to ask ourselves: Can it skillfully maneuver through the rigid world of Aviation English with its often bizarre phraseology, its conceptualized customs, and even more nuanced change in meaning from utterance to utterance? Can ChatGPT understand the special language, abbreviations, and background of aviation dialogues? Accordingly, can it combine these two aspects to communicate smoothly with air traffic control and other human pilots in a robotic voice while meeting the precision and clarity required by standard phraseology? These questions are at the core of this inquiry. On the question of how effective this innovation could be, very little was found in any literature.

In this climate of questioning and reflection, the aviation industry is at a crossroads. Combining AI with communication means innovation will always be paired with the need to ensure safety. Therefore, the findings from this study have important implications for aviation but also broader conversations about how AI should find its place in safety-critical environments. Embarking on this exploration of how ChatGPT operates in the language world of aviation, is done with profound respect for aerospace's devotion to safety as well as genuine questions about what role AI can play working alongside humans.

This study sets out on an exploratory mission to discover the limits and potentials of ChatGPT in aviation conversation. Consequently, we hope our research into the aviation dialogues that will occur across various stages and phases of flight--from clearance to taxi, approach to landing--can explore whether this AI-based system can

naturally fit in with existing methods used by human operators. Therefore, it is aimed to seek answers to the following research question:

1. To what extent does ChatGPT maintain a seamless dialogue with the users based on the prompts provided?
2. To what extent does ChatGPT use standard phraseology during the role-play as pilots and air traffic controllers?

### **Standard Phraseology**

In the field of aviation, communication is of the utmost importance due to its impact on safety, productivity, and understanding. English has become the lingua franca of aviation since the 1950s (Crystal, 2003). In this respect, the International Civil Aviation Organization (ICAO) that is a specialized agency of the United Nations and makes regulations about aviation has put forward in Annex 10 Volume 2 (2001) that the function of English is explicitly confirmed as the common language of aeronautical aviation. It further expresses:

Air-ground radiotelephony communications shall be conducted in the language normally used by the station on the ground or in the English language (5.2.1.2.1).

The English language shall be available, on request from any aircraft station, at all stations on the ground serving designated airports and routes used by international air services (5.2.1.2.2).

Standard phraseology is a component of Aviation English, which was developed specifically to meet the requirements of the aviation industry (Seidlhoffer, 2005). Even though it is specialized, this framework is essential for ensuring interactions that are clear and unambiguous. In the field of aviation, standard phraseology refers to a structured and formal collection of idioms and phrases that are universally acknowledged and used to enhance communication among members of the aviation industry. ICAO (2010) notes that “The purpose of phraseologies is to formulate short, simple and unambiguous language for the transmission of routine messages” (para. 3). This specialized language has the primary characteristics of codification. However, haphazard development is not the way standard phraseology come about. It is subject to a long process of editing by international aviation organizations, including the

International Civil Aviation Organization (ICAO). Thus these standardized expressions are used throughout the world regardless of nationality or culture (ICAO, 2016). This is in contrast to informal language, which abounds with idiomatic terms and has just as many ways of understanding them. Standard phraseology must be intendedly constructed into a directive without ambiguity or exceptions. There are also some terms in aviation--like takeoff or landing as technical concepts--which have well-defined meanings and can hardly be replaced by colloquial equivalents (Renouf 1992). Standard phraseology uses such phrases and terms as are specially adapted to aviation. They have this advantage, especially for those working in the aviation industry, with all its special problems and situations. For example, several terms are used to denote different stages of flight or meteorological situations (Estival et al., 2016). In the current case, redundancy is a defensive measure rather than an extraneous one. Repeating or reinforcing certain important directives in conventional terms helps enhance perception and recognition. This is one of the altitude assignments by air traffic controllers to pilots: They repeat the number so that its accuracy can be checked (Ferrer et al., 2017). Because of its dynamic nature, standard phraseology in the aviation industry also has to keep changing. These expressions are regularly reviewed, amended and updated by the various regulatory agencies to ensure their continued currency, clarity and implementability in addressing a changeable environment (Mackenzie 2010). The systematic approach of standard terminology gives its users an adaptable communication tool for meeting precisely what is required as part of the country.

Safety, efficiency and consistency are the elements of standard phraseology's significance in aviation communication. In such circumstances, in which even the simplest misunderstanding could turn into calamity, use of standardized terms helps ensure clarity. By reducing or alleviating misconceptions, it is aimed to decrease the likelihood of accidents. Additionally, the aviation industry is characterized by a multitude of time-sensitive scenarios. The use of standard phraseology ensures expeditious and efficient communications, hence facilitating the acceleration of processes and decision-making (Bieswanger, 2016). In terms of consistency, it can be said that individuals with many language origins come together due to the worldwide scope of the aviation industry. According to Drayton and Coxhead (2023), using a

unified linguistic strategy ensures consistent communication, irrespective of the participants' native language.

Lopez et al. (2013) emphasize that there are basically two types of language that pilots utilize during the flight. While plain English refers to general English that is used in daily work, standard phraseology refers to the routine conversations taking place between air traffic controllers and pilots. In this respect, Bieswanger (2016) states that “while standardized phraseology is concerned with the fairly restricted aspects of routine air traffic control issues, plain Aviation English covers a broader range of topics in non-routine situations, such as emergencies as well as other unusual or unexpected contexts.” (p.74). Standard phraseology is characterized by a greater degree of structure and specificity, in contrast to the natural flexibility seen in plain English. The presence of rigidity in a system or process is essential for promoting clarity and minimizing ambiguity. Moreover, standard phraseology in aviation contexts involves the use of specialized terminology that may be unfamiliar to those without expertise in the field, who are more accustomed to everyday language (Lopez, 2011). Although there may be variations in the details of plain English across different countries, the use of standard phraseology ensures worldwide understanding regardless of geographical location (Campbell, 2014).

All in all, the very nature of aviation demands the existence of an effective communications system. Making sure that these are clear, safe and efficient is of vital importance to standard phraseology. The distinction between specialist language and plain English is precisely intended to point up the individuality of the latter, thus injecting a new sense into it. It also helps us understand that for safety reasons aviation must be kept at its most safe and effective levels possible.

### **Chatgpt in Education**

ChatGPT, developed by OpenAI and released in November 2022 is a major step forward in natural language processing (NLP). Because it can create text imitating human speech, it is a very useful tool. Based on the GPT-3 pretrained language model, ChatGPT also introduces methods to resolve questions about its conduct (Haleem et al., 2022).

To uphold the quality of its responses and mitigate the risk of generating erroneous outputs, ChatGPT implements three primary strategies: fine-tuning under human supervision, reward modeling and reinforcement learning. It starts by applying supervised learning to a set of labeled demonstrations in order to fine-tune its performance. First comes the use of a labeled dataset containing demonstrations for improving performance through supervised learning. Later, the system creates a dataset in which human graders rate these outputs of the model. This is done as an attempt to further improve performance via reinforcement learning based on direct feedback from humans experiencing it side-by-side with them. The outcome of this process is the model we call InstructGPT (Ouyang et al., 2022).

Bozkurt (2023) points out that a standout feature of ChatGPT is the ability to generate original, contextually appropriate material in real-time interactions with users. Unlike some databases of alternative artificial intelligence language models, ChatGPT is rather adept at maintaining a neat and interesting conversation style. This enhances its authenticity and entices us to try it in real-life situations. The unique characteristic of ChatGPT makes it stand out among language models.

As Dignum (2021) simply puts it, ChatGPT has much potential as a handy reference work--especially to those taking part in the act of learning. It gives learners the opportunity to look into and solve complex problems. In the view of Rudolph et al. (2023), ChatGPT is seen as a very effective base for those who prefer experimental and practical forms of learning enrichment activities. One notable feature of ChatGPT is its ability to understand and answer inquiries phrased naturally. In this way, it becomes possible for learners to conduct conversational exchanges by using ChatGPT in a manner similar to asking teachers questions. In Rahman and Watanobe (2023), according to the user-friendly, intuitive nature of ChatGPT. It is thus useful for learners at many educational levels from elementary school all through higher education up until professional development.

The educational usefulness of ChatGPT is by no means limited. Fitria (2023) states that this tool can help enhance reading skills and improve writing ability thanks to its valuable suggestions including those related to grammar and syntax. Additionally, the aforementioned model can offer practice activities and quizzing with all kinds of

courses including mathematics, physics, languages as well as literature (Bozkurt et al., 2023). Beyond that, ChatGPT is able to produce detailed explanations for a wide range of topics and well-structured answers toward various questions not only developing problem-solving abilities but also encouraging analytical and innovative thinking (Kasneji et al., 2023). It has also been proposed that ChatGPT could be something of a dream come true in terms of individualized learning assistance, such as for group discussions or debates (Limo et al., 2023). Additionally, it provides assistance to people with disabilities by supplying services such as speech-to-text and text-to-speech capabilities.

That is to say, ChatGPT can be a very capable instructor across many professions (Lo 2023). The use of this tool helps improve the level of mastery in terms of language proficiency, programming skills, and report writing ability; others can even be used for specific applications such as medical reports or legal papers. Another feature is that learners are given the opportunity to discuss explanations, questions, and other things with ChatGPT using detailed talks. This sort of interactive activities could be engaged in across all manner of times and places.

### **Methodology**

A qualitative research methodology is used in the present study to examine comprehensively how well ChatGPT performs when it comes to aviation communication. Human quality harmonizes with humanity: The qualitative methodology is particularly beneficial for fully grasping the complexities of language, interpersonal relations and context--factors that play crucial roles in evaluating whether a natural-language processing algorithm can truly master its task. The qualitative research framework is employed through the use of a case study technique in this study. As a technique for carefully studying the relations and behavior of participants, case study is extremely well suited to providing an in-depth description that preserves authenticity; as appropriate this can be applied even to separate incidents or events. The chosen sample chatbot for this research is ChatGPT as an air traffic controller (ATC) within the context of aviation role-play situations. This particular scenario provides an



opportunity to conduct a targeted examination of the system's efficacy in the specialized domain of aviation communication.

### **Procedure**

During the joint investigation, a systematic protocol was used to evaluate the efficacy of ChatGPT in the context of aviation communication, namely via the utilization of role-play situations. At the outset, participants were assigned specific roles, whereby one individual assigned the position of the pilot (researcher), while the other individual undertook the tasks associated with the ATC. The allocation of responsibilities had a significant role in replicating the genuine communication dynamics seen in flight circumstances.

To ensure the appropriateness of the framework for each role-play session, much consideration was devoted to defining the specific aviation context. The identified phases of the flight included clearance and taxi, take-off, climb, cruising, descent, approach, and landing, with the delineation of the departure and destination airports. The rigorous adherence to standard phraseology played a pivotal role in the role-play sessions. The researcher conscientiously adhered to the precise terminology and conventions used in aviation communication, ensuring that our interactions faithfully mirrored genuine aviation scenarios.

Prior to conducting the experimental conversation, the researcher had done a couple of trials to decide the appropriate prompts to initiate, maintain and close the conversation. Finally, it took about four hours to maintain a real life-like conversation with the chatbot by using different prompts based on standard phraseology of aviation and a wide range of contexts such as departure from Istanbul to Chicago or vice versa in different weather conditions.

The researcher that interacted with the chatbot is known as an English language expert (ELE) who provides aeronautical communication training for more than 5 years as well as a certified English Language Proficiency Rater that assesses the oral competency of ab-initio pilots. Additionally, a commercial airline pilot accompanied throughout the research to ensure that the flight procedures, phraseology and prompts are well suited to address the research questions. Therefore, two individuals were in front of the computer and observing the conversation as subject matter experts.

In these role-play interactions, the activities between a pilot and an air traffic controller developed in much the same way as would those of two people chatting with each other. In communication, the pilot carried out submission of requests and transmission of relevant information while air traffic control (ATC) responded promptly by issuing instructions or clearances in conformity with established standards for standard phraseology. Through this process of role-play games, ChatGPT also demonstrated an ability to adjust its language style according to the situation. It involved how to assess changing weather conditions, real-time traffic reports and unexpected situations that might crop up along a plane's course.

All role-play sessions were recorded in detail, from the generation of textual transcripts to timestamps. The keeping of records proved to be a key factor in the subsequent examination and assessment of ChatGPT's effectiveness for aviation communication. To evaluate the capabilities of ChatGPT in a comprehensive manner, and to actively participate inside situations simulated for normal functioning including all terms of flying. They also considered all angles of the situations which flight operations might encounter, from getting a first clearance and receiving taxi instructions during ground control to complicated communications for approach & landing procedures. The transcripts were carefully analyzed after every role-play session. The objectives of this study were to evaluate whether ChatGPT can comprehend not only the specific aviation language, but also provide satisfactory answers. Not just that, it should answer in a way consistent with accepted standards for correctness and clarity required by standard phraseology (SP). Our work took the approach of performing several rounds of role-play scenarios. The data so obtained were thus rich and varied in nature. The dataset was then used for a thorough assessment of ChatGPT's performance.

### **Findings and Discussion**

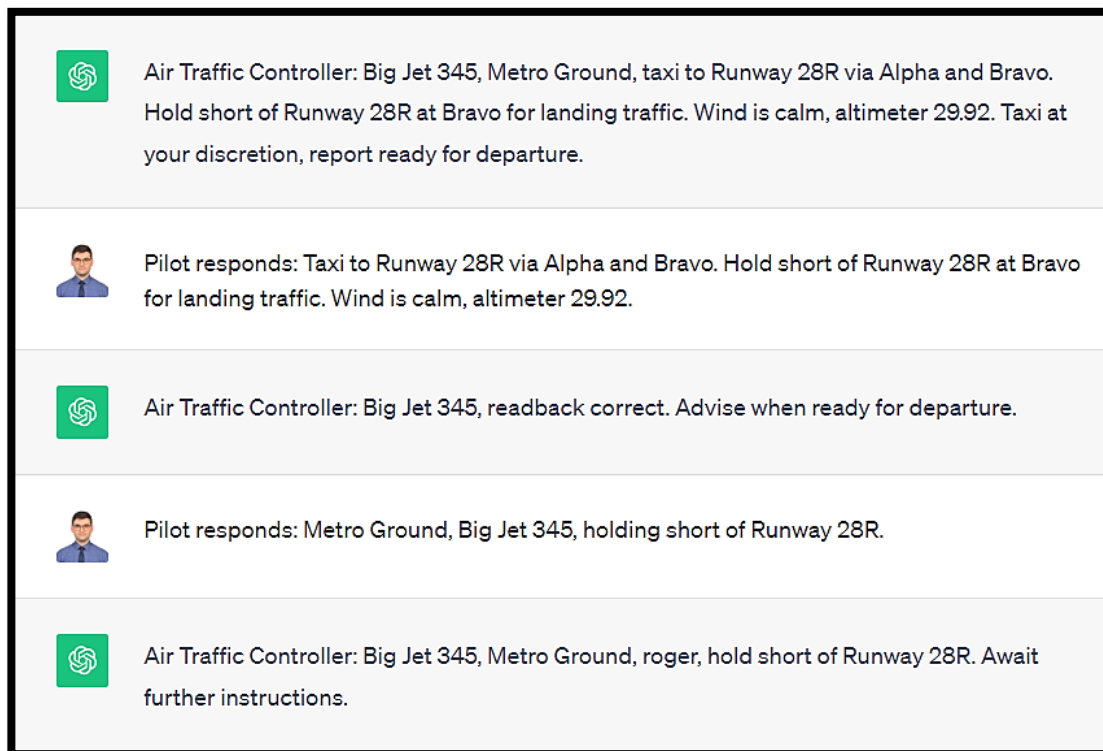
The aviation industry, with its paramount focus on safety and precision, relies heavily on effective communication. For decades, the aviation industry has been placing emphasis on fluent and accurate communication with regulations, standardization and advanced training techniques including Computer-Based Training (CBT). As aviation has seen exponential growth in terms of the number of personnel, passengers and

vehicles, so does the technology, as well. The AI movement around the world has been transforming every field. It improves effectiveness and raises the standards. This paper, therefore, explores the transformative impact of one of the most famous chatbots, ChatGPT.

The interactive role-play exercises conducted using ChatGPT have yielded significant findings about the language model's ability to sustain coherent conversations with human participants that adopt the roles of pilots and ATCs (see Figure 1, Figure 2, and Figure 3). The results of this study suggest that the model has the capacity to improve aviation communication in several aspects.

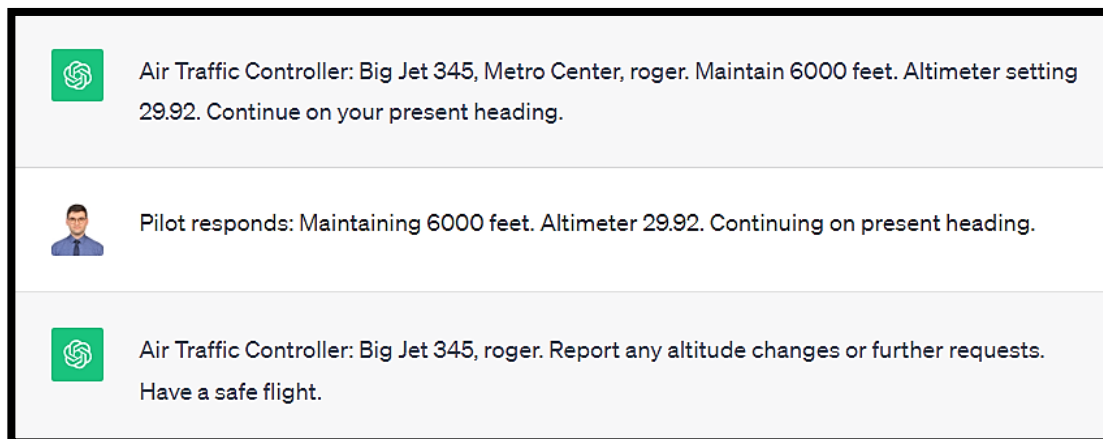
**Figure 1**

*Departure Information with ChatGPT*



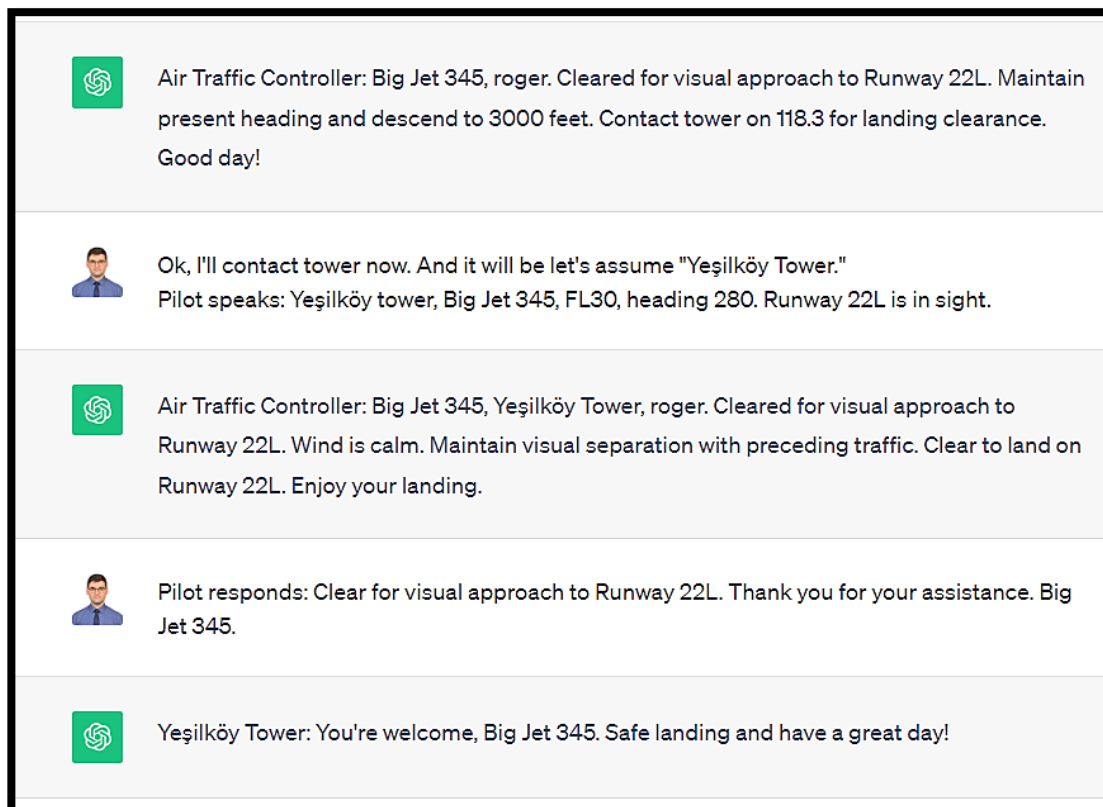
**Figure 2**

*Initial Climb with ChatGPT*



**Figure 3**

*Landing with ChatGPT*



An particular finding to note, first of all, is that ChatGPT is capable in its use of standard phraseology. The aviation communication system successfully replicates the fundamental characteristics of precision and clarity. This ability to maintain a constant form of conversation was particularly impressive, and it also shows just how well ChatGPT can reproduce typical conversations with aircraft. In other words, its suitability for use in aviation applications was once again confirmed by the model's

superior ability to keep response accuracy and precision high across many different utterance types. This skill is of particular importance, as in operational situations where the accuracy with which language can be used may affect both safety and efficiency. Aviation communication is all about precision. Studies by Huang et al. (2022) and Haristiani (2019) have emphasized ChatGPT's proficiency in replicating specific language structures and terminology, a skill of paramount importance in aviation communication, where precision can directly impact safety and operational effectiveness. In fact, Huang (2017) argues that dialogue-based computer-assisted learning is an effective means of improving education. Kohnke (2022) sees chatbots like this as a way for learners to continue self-studying.

What's more, the role-play sessions proved that ChatGPT could adapt to different stages of a flight. The model was adaptable, as evidenced by its various phases of operation. Clearances for taxi and detailed communications around on operator's approach going into landing were all examples of stage operations performed successfully in this manner. The adaptability shown by ChatGPT is also in keeping with the evolving characteristics of aviation communication. This starkly demonstrates how much of a resource ChatGPT can be as an aid in aviation training and education at all phases of flight. This is in line with the highlights of Dignum (2021) specifying ChatGPT as a dynamic and flexible learning tool. Its adaptive nature has already been praised by Bozkurt (2023) who says that the system's ability to be adapted makes ChatGPT a personalized tutor. This finding is consistent with those reported by Elbanna and Amrstrong (2023), both of whom discovered that ChatGPT promotes productivity, encouraging adaptive learning.

A major discovery was the stimulation of productive interactive discussion generated by ChatGPT. The algorithms-generated replies thus allowed for interactive and relevant dialogue. For both those engaged in aviation education and for practicing-aviation professionals, this character of involvement is crucial because it allows them to achieve real experiences that can provide the best possible preparation for actual. This appears to fit with the results of Opara et al. (2023) who indicate that ChatGPT offers quick answers that mimic conversations in real-time. Moreover, this discovery further demonstrates the point that Cao (2023) has put forward about intelligent interaction.

That is to say: while there are other technological tools used in education that interact with students through activities programmed after the integration of data sets such as transcripts and school records, ChatGPT converses directly with a student according to their prompts, and answers.

These findings pave the way for further exploration and development. Given that it has capabilities for interactive use and a track record as an aviation communication tool, ChatGPT holds possibilities in the area of flight training. In particular, those students who are interested in actually trying to put their verbal skills into practice but don't have many opportunities can get some experience using standard phraseology interactively via real-time conversation with air traffic control or other related. Subsequent efforts might concentrate on enhancing the model's capability to manage specialist aviation terminology and tackling particular difficulties.

### **Conclusion**

Over the years, stability in emphasis on safety; accuracy and speed of transmission have brought about rapid development of aviation. This development has been accelerated through the establishment of rules and standardization activities, as well as training reforms. Today, the aviation industry is once again expanding dramatically in terms of manpower, passengers and technical progress. At the same time, profound changes have come about in other areas through the global AI movement. This study seeks to assess just how much impact an artificial intelligence (AI) breakthrough like ChatGPT can have on the field of aviation communication.

It's clear from the observation that ChatGPT has potential to change communication in aviation. These results have serious consequences for the field. They also shed some light on the future of AI, likely to help in upgrading safety, training and operational standards.

ChatGPT's strength resides in its rigid conformity to established language usage. These replies conform to the expectations of aviation communication in terms of accuracy and clarity. This serves a vital function in the aviation industry. The only thing more important than precision of movement are words themselves-the safety on board

and operational success all depend upon them. In addition, the roleplay sessions have enabled us to observe the different nature of ChatGPT at different stages of flight. From the first ground clearances and taxi instructions to the complexities of approach and landing, the model showed its adaptability at many levels. The adaptability seen in the ChatGPT is conducive to changeable characteristics of aviation training. As a result, it makes ChatGPT an extremely helpful resource for aviation training and education from all aspects of flight operations.

The investigation on ChatGPT's incorporation into aviation communication all in all brings out its ability for deep change. This particular system has demonstrated its ability to keep up with the aviation industry in role-playing situations. It conforms well to the accepted safety and accuracy criteria of that profession. The current effects of tech on the aviation industry have produced AI constructs such as ChatGPT, giving glimpses into a future with greater communication, safety, and training in this important profession. The first step toward the realization of this revolutionary vision has been taken, and now that ChatGPT takes center stage in aviation communications, its role is pivotal.

Despite its excellent abilities, this research also showed that with the language model struggling to accommodate itself to case requirements, there were some limitations. When confronted with more complex aviation vocabulary or context, some problems would sometimes arise. ChatGPT often comes across as being capable of adapting to typical usage, but sometimes it needed more explanation or provided commentary that was relevant in the context, if not entirely reflective of what one would expect on aviation radio. For example; if the system is not prompted about shifting from one stage of flight into another, it is somewhat hesitant to do so by itself. In other words, prompts are very important in stimulating the chatbot to respond.

### **Ethics Committee Permission Information**

Ethical approval is not applicable, because this article does not contain any studies with human or animal subjects.



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