

A Multimodal Discourse Analysis of Aircraft Cabin Safety Briefing Card:

A Visual Grammar Approach

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ABSTRACT

Cabin safety briefing cards are critical multimodal tools that combine informative texts and pictograms to convey essential aircraft safety features, equipment usage, and emergency procedures, significantly contributing to effective cabin safety management. This study employs Kress & Van Leeuwen's (2006) visual grammar framework to conduct a multimodal discourse analysis of the safety briefing card, exploring the interplay between visual images, textual elements, and social symbols. The analysis reveals how these elements collectively construct a coherent cabin safety discourse, emphasizing the complementary roles of visual and textual modalities. Findings highlight that the integration of narrative and conceptual visual processes with imperative and declarative textual structures enhances passenger comprehension, while the strategic use of color, salience, and framing optimizes information delivery. This research advances multimodal discourse analysis and offers practical insights for improving safety briefing card design to enhance cabin safety.

Keywords: cabin safety briefing card, visual grammar, multimodal discourse analysis, aircraft safety, pictogram.

1. INTRODUCTION

Effective communication of aircraft cabin safety information is of utmost importance in ensuring passengers' safety. The passengers' level of knowledge regarding safety plays a critical role in determining their ability to respond appropriately in emergency situations (Chittaro, 2017). Therefore, the effective dissemination of cabin safety information is widely emphasized by the International Civil Aviation Organization (ICAO, 2018) and civil aviation authorities worldwide. Common forms of communication include cabin safety instruction cards, cabin safety announcements, in-flight safety demonstrations by cabin crew, and cabin safety videos. Among these, paper-based safety briefing cards (SBC) are extensively used due to their cost-effectiveness and reusability and are incorporated into aviation standards. For example, the Federal Aviation Administration (FAA)

in the United States mandates that all commercial aircraft must be equipped with safety briefing cards to provide passengers with essential safety information and behavioral guidelines. Safety briefing cards often use

pictorials to convey safety information to passengers. A series of related pictorials is known as a pictogram. The underlying assumption is that pictorials and pictograms, unlike text, will be universally understood. To investigate the safety cards further, the National Transportation Safety Board (NTSB) (2001) collected a sample of 22 safety briefing cards from various operators. They found that the cards in use varied widely in terms of multimodal context. The relationship between different modalities and the organizational structure of the multimodal resources employed to convey safety information significantly impacts the effectiveness of communicating crucial safety information.

2. LITERATURE REVIEW

Research shows that passengers who know emergency procedures and follow cabin crew instructions are more likely to survive during distress or emergency situations. The NTSB (1985) conducted an investigation into 21 accidents that occurred between 1962 and 1984. The findings revealed that the passengers' risk of injury or death in these accidents

could have been significantly reduced if they had taken certain actions: (1) actively listened to the flight attendant's oral safety briefings and demonstrations, (2) familiarized themselves with the safety card to understand the location and operation of safety equipment, and (3) been more motivated and prepared to respond effectively during emergency situations.

Due to the strong correlation between paying attention to safety information and passenger survival, regulatory authorities have implemented requirements for operators to provide comprehensive briefings on emergency procedures to all passengers. In the United Kingdom, the Air Navigation Order mandates operators to deliver briefings that cover the location and proper usage of emergency exits, safety belts, oxygen equipment, life jackets, floor path lighting systems, and any other equipment intended for passenger use during emergencies. Similarly, in the United States, the Federal Aviation Regulations stipulate that passengers must receive briefings covering topics such as smoking regulations, emergency exits, seat belts, and flotation devices.

Currently, research on safety briefing cards primarily focuses on comprehensibility studies. For instance, Fang et al. (2017) conducted empirical research on the presentation format of safety briefing card illustrations, demonstrating that a mixed presentation format is most effective in conveying safety information to passengers. Cheng et al. (2016) and Shen et al. (2016) conducted questionnaire surveys to analyze passengers' comprehension levels and provided suggestions, proposing the use of a combination of text and images on safety briefing cards, along with textual explanations in critical sections. However, they did not elaborate on the underlying reasons for employing the combined text and image format. Additionally, Chittaro (2017) compared different media for safety briefings, finding that interactive video controls improved passenger engagement but did not analyze the multimodal interplay within static safety cards. Similarly, Fennell and Muir (1992) explored passenger attitudes toward safety briefings, noting that comprehension varies with design clarity, yet their study lacked a detailed examination of how visual and textual elements interact to construct meaning. More recent studies, such as Molesworth et al. (2018), examined how mode of delivery affects recall of key information presented in the preflight safety briefing.

Despite these contributions, a significant research gap remains in understanding the multimodal discourse of safety briefing cards through a systematic theoretical framework. Previous studies, while addressing comprehension, media comparison, or delivery

modes, have not explored how visual and textual modalities collaboratively construct safety discourse in static safety briefing cards. This study addresses this gap by employing Kress & Van Leeuwen's (2006) visual grammar framework to conduct a multimodal discourse analysis of cabin safety briefing cards. By examining the interplay between different modes, we aim to uncover the underlying motivations for integrating textual and visual elements. In light of the research gaps, this study seeks to address the following questions: (1) How do visual and textual modalities interact to construct cabin safety discourse in safety briefing cards? (2) What roles do representational, interactive, and compositional meanings play in enhancing the effectiveness of these cards?

Theoretically, this study contributes to the methodology of comprehensibility research in the context of safety briefing cards while also expanding the analytical scope of visual grammar analysis. Additionally, it deepens and broadens the research landscape of multimodal discourse analysis theory. From a practical standpoint, the findings of this research have the potential to enhance the effectiveness of safety information dissemination through the use of safety briefing cards, ultimately contributing to the improvement of cabin safety management.

3. ANALYTICAL FRAMEWORK

The discourse analyzed in this study is the safety briefing card of the Singapore Airlines A350-900 aircraft. It is a double-sided, color-printed 32-page booklet that provides detailed instructions on precautions during takeoff, landing, and flight phases, emergency exit locations and evacuation routes, the use of life rafts and slides, oxygen masks, life jackets, seat belts, and other safety information. The discourse context of the safety briefing card revolves around the introduction and explanation of cabin safety information, safety equipment, and safety procedures. The participants involved are the airline, represented by cabin crew members and the passengers. The mode of communication is a specially designed paper-based visual and textual manual.

Kress & Van Leeuwen (2006) proposed three types of meanings in visual grammar based on Halliday's (2014) three metafunctions of language: representational meaning, interactive meaning, and compositional meaning. Representational meaning refers to the representation and extension of conceptual metafunction in multimodal discourse, encompassing conceptual structures and narrative structures.

Interactive meaning reflects the interpersonal metafunction in images, including contact, social distance, attitude, and modality. Compositional meaning refers to the spatial arrangement of various elements in multimodal discourse, which is manifested through information value, salience, and framing.

3.1 Interpretation of ideational and representational meanings of SBC

3.1.1 Ideational meaning of text

Below is a transitivity analysis of the textual elements in the SBC.

Table 1: The transitivity analysis of the text in SBC

Clause	Process type	Participant	Process	Goal	Environment
(1)	Material process		remove	spare lithium batteries and valuables	from these bags
(2)			keep	seatbelt fastened	when seated
(3)			remain	in your seats	with seatbelts fastened
(4)	Relational process	Selected seats	have	inflatable seat that will inflate on impact	
(5)		Infant life vests	are	available	
(6)	Mental process		recognize, locate	the emergency exit door.	

As shown in Table 1 the material process clauses primarily serve to explain the specific operational methods of safety equipment, such as life jackets, oxygen masks, and seat belts. The relational process clauses mainly provide information about the status and location of safety equipment, such as the position and storage status of oxygen masks, life jackets, and emergency slides.

The mental process clauses address the passengers' cognitive actions, such as recognizing and locating the emergency exit door. These clauses highlight the items that passengers need to confirm before takeoff, during the flight, and in case of emergencies. For example, passengers need to ensure that their seatbelts are fastened, seatbacks are upright, and luggage is stowed properly before the flight takes off.

3.1.2 Representational meaning of the images

The representational function of images can be categorized into narrative and conceptual meanings. Narrative images depict ongoing activities, events, spatial arrangements, and moments of change, including actions, reactions, speech, and mental processes.

Action processes represent the actions and behaviors depicted in the image, consisting of an agent, vector,

and goal. For example, the last five images in Figure 2 belong to the action process. The passengers are the actors, the oxygen masks are the goals, and the vectors consist of a series of actions. For instance, in Figure 2.2, the vector involves pulling downwards, and in Figure 2.3, it involves pulling a cord to activate the oxygen. In Figure 2.4, the vector represents covering the mouth and nose, and in Figure 2.5, it involves assisting a child with wearing the mask. Reaction processes are also represented by vectors, which consist of one or more participants' gaze directions. They include a reactor, a reaction process, and a phenomenon. In Figure 2.1, the passengers are the reactors; the phenomenon is the dropping of the oxygen mask, and the reaction process is conveyed through the passengers' eye contact. For example, in Figure 4.1, the cabin crew is the reactor, and the phenomenon being reflected is the situation outside the cabin. The reaction process is represented by dashed vectors, indicating that they are observing the outside situation. Speech and mental processes are represented by vectors formed by discourse and thoughts. However, since the safety briefing card does not involve passengers' speech or thoughts, there are no mental or speech processes depicted.

Conceptual images provide visual definitions, analyses, and classifications of people, objects, places, etc. They can be categorized into classification processes and analysis processes.



Figure 1: Instruction of seatbelt



Figure 2: Instruction of face mask

Classification processes involve grouping similar participants based on shared characteristics or hierarchical relationships under a higher-level participant. In the context of safety briefing cards, the symbols and signs can be classified into prohibitory, indicative, and directional categories.

Prohibitory symbols are typically represented by red circular signs and indicate actions or behaviors that are prohibited. Examples include "No Smoking" signs and "No Use of Portable Electronic Devices" signs. Indicative symbols represent different flight phases, such as takeoff, cruising, descent, landing, and taxiing. They are typically depicted with a black border and a green background. Directional symbols, usually depicted in green, provide guidance and information. Examples include emergency exit signs and evacuation route indicators.

The symbols and signs in safety briefing cards (see Figure 3) form a hierarchical relationship, where the overarching concept is the safety briefing card's symbols, and the specific symbols represent subordinate concepts. This relationship follows a hypernym-hyponym syntax.

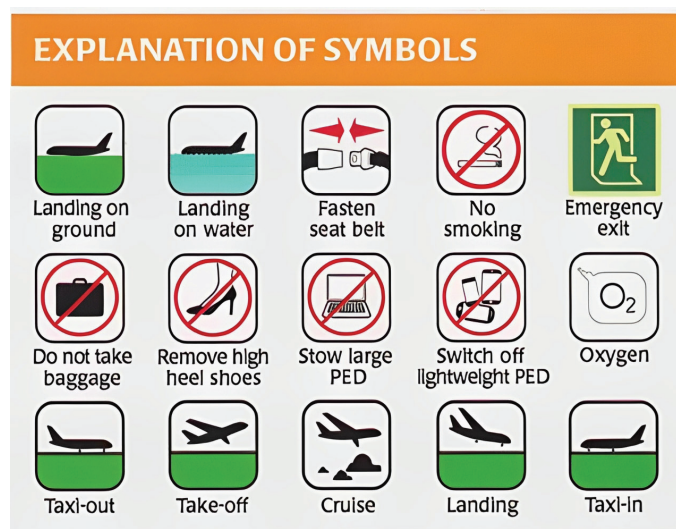


Figure 3: Explanation of symbols

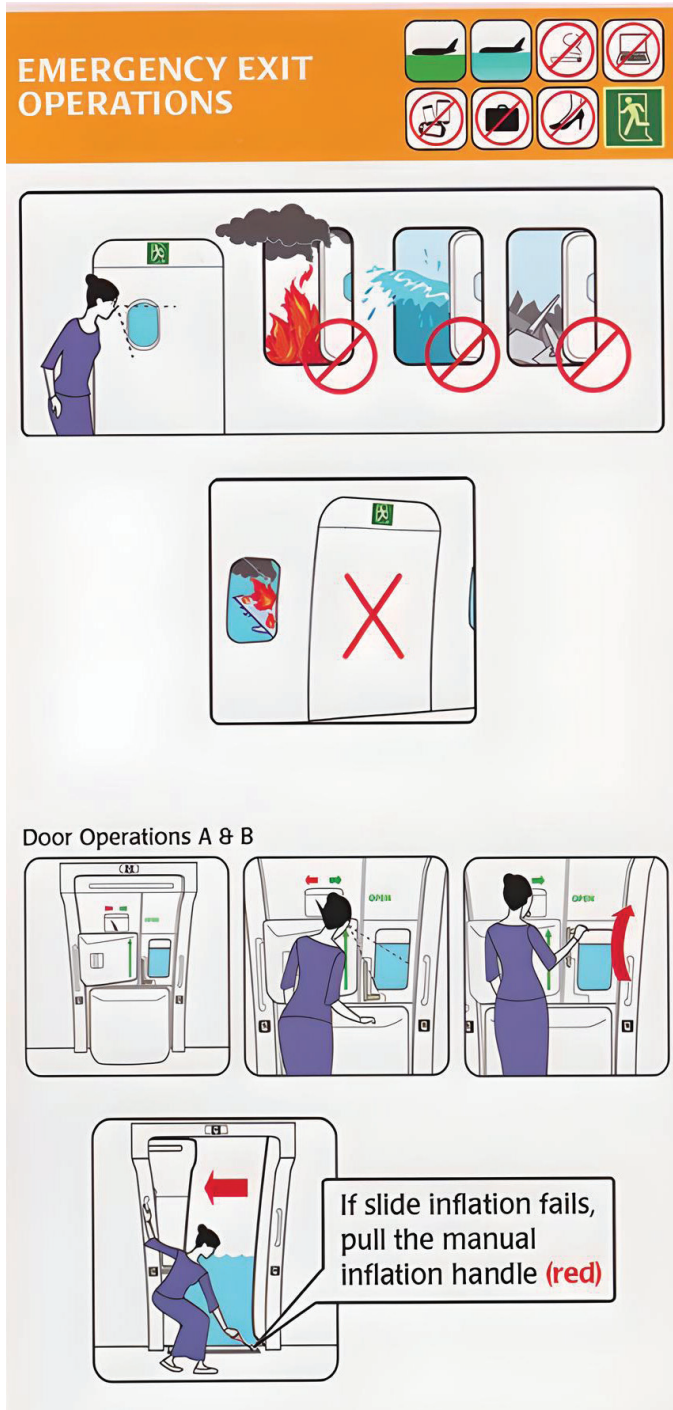


Figure 4: Instruction on emergency exit

The analysis process is fundamentally concerned with the relationship between a whole entity and its constituent parts, where the entirety can be deconstructed into its individual attributes. This process encompasses two key elements: the whole entity acts as the carrier or container, while the parts assume the role of attributes. For instance, "how to wear an oxygen mask" represents a holistic concept that can be broken down into several sequential steps involved in the process of donning an oxygen mask. Similarly, the act of donning a life jacket constitutes a

holistic concept comprising various procedural steps, thus establishing a relationship between the whole entity and its constituent parts, as illustrated in Figure 5.

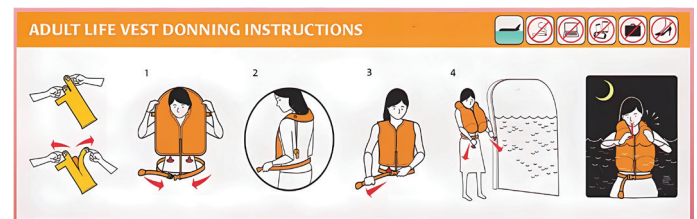


Figure 5: Instruction of life vest

It is important to note that safety briefing cards often incorporate a combination of processes to illustrate the appropriate actions to be taken in different scenarios. These cards encompass both narrative processes and conceptual processes, collectively elucidating the response strategies in emergency situations. Figures 4.1 and 4.2 exemplify the integration of action processes within the narrative context and classification processes within the conceptual framework. The classification processes showcase the various types of emergency situations, while the action processes underscore the restriction imposed on cabin crew members from opening the cabin door under such circumstances.

In line with Royce's (2007) theory of intersemiotic complementarity, the relationship between images and text mirrors is found within language itself. The interplay between different semiotic resources and their complementary nature serves to compensate for the limitations of a solitary modality interpretation, resulting in a more potent expression than that achieved through a singular modality alone. For instance, Figure 6 can be readily interpreted as "Do not push open the door while smoking," but it is through the supplemental explanation provided by the textual modality that the image's intended meaning is accurately conveyed. Therefore, the complementary relationship between images and text assumes paramount significance in the construction of a multimodal discourse within cabin safety briefing cards, playing a pivotal role in their composition.



Figure 6: Forbidden symbol

3.2 Interpretation of the interpersonal and interactive meaning of SBC

3.2.1 Interpersonal meaning of text

The interpersonal metafunction is realized through the mood system and the modality system, with declarative mood and imperative mood being the two primary moods. Declarative sentences primarily describe the status of safety equipment, luggage storage, etc., while imperative sentences provide specific operational instructions for safety equipment.

3.2.2 Interactive meaning of the images

The interactive significance of images primarily involves two participants: the represented entities (people, objects, scenes within the images) and the interactive participants (image creators and image viewers). Specifically, interactive significance refers to the relationship between the image creator, the entities represented in the image, and the viewer of the image while also reflecting the viewer's attitude towards the represented entities. Interactive significance consists of four elements: social distance, visual contact, perspective, and modality.

Social distance is usually represented through the use of shot types. Shot types refer to the different ranges of visual coverage of the subject resulting from varying distances between the camera and the subject being filmed. Shot types are generally categorized into five types: close-up, medium shot, medium close-up, long shot, and extreme long shot. Safety briefing cards predominantly utilize medium shots (e.g., oxygen mask

usage), long shots (e.g., luggage storage positions, demonstration of crash positions), and extreme long shots (e.g., life raft, emergency slide usage) to present more information about people and the environment. These shot types can reflect the spatial relationship between individuals and objects while also visually demonstrating the operational steps of emergency equipment. Close-up and medium close-up shots should be avoided in safety briefing card images as they typically focus on specific features and details of individuals or objects, thus being unable to depict the complete actions of individuals or their spatial relationship with safety equipment. The use of medium shots for oxygen mask usage (see Figure 2) suggests designers should prioritize shots that clearly depict spatial relationships to enhance comprehension of equipment operation.

Visual contact refers to an imagined contact relationship established between participants in the image through eye gaze directed towards the viewer. When the participants' gaze is not directed toward the reader, it falls under the category of "offering" images. Since safety briefing cards only provide information to the reader without seeking any information in return, there is no eye contact situation with the reader.

The shooting perspective of an image often determines the expression of attitude. A level perspective signifies an equal relationship between the reader and the participants in the image. A frontal angle can evoke a sense of immersive experience for the reader. The flight attendants and other depicted passengers on the safety briefing card are portrayed in an equal relationship with the reader, utilizing a frontal horizontal perspective to create a sense of realism and objectivity for the reader.

Kress & van Leeuwen (2006) differentiate three levels of visual modality based on aspects such as color saturation, color contrast, contextualization, representation, depth, lighting, and brightness. Realistic images with high color saturation are less effective in capturing the reader's attention (Fang, 2017). Therefore, images with comparatively lower color saturation are commonly used. In terms of color contrast, different colors convey different meanings. Red represents danger; green represents safety; black indicates flight phases; red circles represent prohibition; green arrows represent escape routes, emergency exit locations, etc. The salience of red arrows (see Figure 5) indicates that high-contrast visual cues could be used to highlight critical actions, such as pulling the oxygen mask cord.

3.3 Interpretation of textual and composition meaning of SBC

3.3.1 Textual meaning of the text

The textual metafunction is realized through the thematic system and information structure. Since the descriptive text on the cabin safety briefing cards mostly consists of imperative sentences, it exhibits the characteristics of verbs as themes with a high degree of overlap between new information and the theme.

Table 2: The information structure of the text in SBC

Thematic System	Theme	Theme
	Pull	the manual inflation handle
	Keep	seatbelts fastened when seated
Information Structure	new	known

3.3.2 Compositional meaning of the images

The composition meaning of images is realized through three resources: informational value, salience, and framing.

As an extension of information structure in the grammar of images, Kress and van Leeuwen (2006) propose that the arrangement from left to right forms a structure of known information and new information. The information on the left or at the top of the image represents known information, often characterized by generality and salience, while the information on the right or at the bottom represents new information, typically depicting concrete or specific details. For example, in Figure 2, the image on the left is known information, while the image on the right is new information. Specifically, in Figure 2.2, 2.1 serves as known information. More specifically, the oxygen mask in 2.1 is new information, but in 2.2, it becomes known information. Similarly, in the illustration of the cabin door switch in Figure 4, 4.1 presents the observation of the situation outside the cabin, and 4.2 becomes known information, with the new information being "cannot be opened." The information on the left in Figure 2 and at the top in Figure 4 represents known information with salience and generality, while the information on the right and at the bottom is more specific.

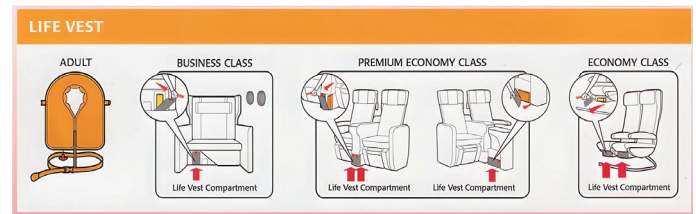


Figure 7: Instruction of life vest

Salience refers to the degree to which the elements constituting an image attract the viewer's attention and can be manifested through the foreground, background, relative size, color contrast, line thickness, color intensity, etc. (Kress & van Leeuwen, 2006).

As shown in Figure 1, the red arrows and in Figure 4, the red and blue highlighting of the emergency nature create a distinct contrast with the background color, making the colors eye-catching and capturing the reader's attention. Prohibition signs, indicated by red circles and diagonal lines, draw the reader's attention. As shown in Figure 2.3, a circular magnified image is inserted to emphasize that pulling the red cord is the only way to trigger the oxygen supply. In Figure 4, relatively large-sized images are used to illustrate the prohibition of opening the cabin door in the event of a fire. As shown in Figure 5, each image is accompanied by magnified circular details and red directional arrows to alert the reader's attention.

Framing refers to whether spatial dividing lines are present in the image, using lines to represent the spatial separation or connection between different components within the image. The analyzed safety briefing cards in this paper employ orange bar-shaped separators and white backgrounds between different topics. The same white background represents the same topic, and the different images within the white background are interconnected, forming a coherent whole. Each subheading achieves the coherence and cohesion of meaning from both information and color aspects, highlighting the overall discourse theme, clear viewpoints, and concise expression.

4. CONCLUSION

This study conducted a comprehensive multimodal discourse analysis of aircraft cabin safety briefing cards, employing Kress and Van Leeuwen's (2006) visual grammar framework alongside Halliday's (2014) metafunction theory. The analysis elucidated

the pivotal roles of textual and visual modalities in constructing a coherent and effective safety discourse. It demonstrated that the interplay between these modalities—through representational, interactive, and compositional meanings—enables safety briefing cards to convey critical information with clarity and precision. The findings underscore the necessity of intersemiotic complementarity, where visual elements, such as pictograms and symbols, alongside textual instructions, are used to ensure accurate communication of safety procedures. The absence of either modality risks misinterpretation, potentially compromising passenger comprehension and safety.

Moreover, the study revealed that non-linguistic modalities, particularly visual elements, have become increasingly prominent in modern safety briefing cards, driving their evolution as primary conveyors of meaning, with textual elements providing essential supplementary clarification. This shift reflects the universal accessibility of visual cues, which transcend linguistic barriers, while texts anchor specific instructions. However, the analysis affirms that neither modality alone can achieve the

precision and efficiency required for effective safety communication, highlighting the irreplaceable role of multimodal design in cabin safety briefing cards.

Theoretically, this research enriches multimodal discourse analysis by applying visual grammar to a novel context, offering a robust framework for analyzing safety communication. Practically, the findings provide actionable insights for aviation authorities and airlines to optimize the design of safety briefing cards, enhancing passenger engagement and comprehension.

While this study provides a theoretical analysis, its focus on a single airline's safety briefing card may limit the generalizability of findings. Future research could validate these insights through empirical testing of passenger comprehension across diverse airline designs. Future studies could apply this framework to digital or interactive safety briefings, explore cross-cultural variations in passenger interpretation of visual cues, or conduct empirical tests to measure the impact of multimodal designs on comprehension and behavior.

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