

A CASE STUDY OF SIGHTSEEING TOUR BOAT ACCIDENT OFF THE SHIRETOKO PENINSULA AND PEDAGOGIC IMPORTANCE OF CASE STUDIES IN ENGINEERING ETHICS EDUCATION

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Abstract

We explore a case study on an accident and show how it can be a pedagogical source of engineering ethics education for technical college students. We deal with a sight-seeing tour boat accident off the Shiretoko Peninsula which occurred on April 23, 2022. A tourist boat *Kazu I* sank with twenty-six people on board in bad weather. The Japan Transport Safety Board (JTSB) issued a progress report of this accident on December 15, 2022. This report identifies six factors of the accident but does not discuss any ethical problems from the point of view of engineering ethics. Among the factors, we examine the hull structure, a judgment by the captain, and the non-compliant attitude of an operating company as potential subjects in engineering ethics classes. According to the report, for instance, the boat was running with its hatch not fixed and closed without good reason, and the seawater flowing into it from the hatch is supposed to be one of the principal causes of the sinking. Can engineers predict the possibility of a shipwreck and advise the company to repair the hatch? Why did not the captain exercise good judgment on the departure from the port? These questions can be the topics of discussion in engineering ethics classes. After looking into the causes of the accident spelled out in the report JTSB issued, we argue the pedagogical importance of new case studies in engineering ethics education. While classical cases we can see in textbooks of engineering ethics are easy to treat, new ones are difficult to argue because of a lack of previous research. There is, however, room for free discussion in a recent case, and it can attract students more because they may know it well in the latest news report. These advantages enable students to think about the case as a person concerned.

Keywords: *engineering ethics education, sightseeing tour boat accident, bounded rationality, cost-benefit analysis, the importance of case study*

Introduction

This study aims to analyze a recent incident case that had a social impact in Japan and to consider the perspectives of dealing with such case studies in courses of engineering ethics education. Engineering ethics education in KOSEN is developing, and its methods and contents should be refined further (Kobayashi, 2007; Souma, 2018; Shimura, 2022). In general, we derive various analytic points of view from past research on social accidents. It goes without saying that there is little research on the latest incidents. Case studies enable us to recognize ethical problems in engineering, cultivate and exercise our moral imagination, and prevent terrible accidents (Harris et al., 2000). Accumulating good case studies is thus an essential issue for engineering ethics education. We should search and deal with the latest cases to contribute to engineering ethics education for technical college students.

We deal with a sight-seeing tour boat accident off the Shiretoko Peninsula caused on April 23, 2022. Media reported this incident widely and repeatedly, and people got angry about the negligence of the operating company. We discuss this accident as follows. We outline the accident based on a progress report issued by Japan Transport Safety Board (JTSB) in December 2022. We rely on it only to summarize the accident because it just presumes the causes of the accident and suggests how we should improve the management of leisure boats but does not identify the problems for engineers. The Japan Society of Mechanical Engineers reported that this accident is a case of engineering ethics (The Japan Society of Mechanical Engineers, 2023). However, these two documents do not clarify how this case concerns engineering ethics. We try to make clear the ethical problems and discuss them with the help of philosophical studies on engineering ethics.

1. Outline of the accident

1-1. Outbreak

A tourist boat *Kazu I* sank with twenty-six people on board in bad weather on April 23, 2022. The boat company Shiretoko Pleasure Cruise operated it. The Shiretoko Peninsula, designated a natural World Heritage Site in 2005, is a popular destination for observing drift ice and rare animals. Twenty bodies were recovered from the sea of the Shiretoko area, with six missing. No survivors were found. According to the bereaved, all found passengers died of suffocation.

The ship, crewed by a 54-year-old captain and a 27-year-old deckhand, started cruising at 10:00 from Utoro port to Shiretoko Cape. It was a 3 hours cruising tour off the coast of Shiretoko Peninsula. The sea looked calm at Utoro port in the morning, but it would be stormy off Shireroko in the afternoon. The Japan Meteorological Agency issued a gale advisory at 3:09 on the day for Shari Town and a high-surf advisory at 9:42. An employee of another boat company advised the captain not to set out for sailing before the departure of *KAZU I*.

The cruising seemed to be plain sailing in the morning. An employee working for another company in the same industry, who heard from the captain of *KAZU III* that it had gotten windy in the sea, called the captain of *KAZU I* at 11:47, 12:05, and 12:47 but had no response. He used a radiotelephone of his company to talk with the captain, who responded at 13:07 that the ship was at the point of Kashuni-no-Taki Falls and would return to the port behind the presumed time. He continued intercepting the radio, in which the captain signaled that the boat was flooding with water and sinking. He reported it to the Japan Coast Guard (JCG) at 13:13. JCG received an emergency call from one of the passengers at 13:18. At 13:26 or later, the ship went missing with 26 people on board.

1-2. Search for survivors

At 16:15, JCG dispatched five patrol boats and two aircraft to search for survivors, but they could not find the missing people and the pleasure boat during the day. At 5:01 or later the next day, several passengers were found and rescued near Cape Shiretoko, whose death was confirmed. Japan Maritime Self-Defence Force searched the ship by using underwater cameras and found it at a depth of 120 meters of the sea near Kashuni-no-Taki Falls on April 29. It looked into the boat with a remotely operated vehicle on May 8 or later. On May 19, 20, 21, and 23, a diver searched for the missing person in the cabin. The boat was salvaged and towed toward Utoro port but dropped into the sea on May 24. It was salvaged again on May 26 and unloaded at Abashiri port on June 1st.

2. Analysis of the accident

2-1. Six factors of the accident

The progress report JTSA issued in December 2022 identified six factors of the accident as below.

- 1) Hull structure
- 2) Judgment on the departure
- 3) Compliance with the codes of safety and management
- 4) Effectiveness of inspection
- 5) Lifesaving equipment and telecommunication device
- 6) Framework of search and rescue

Among them, engineering ethics can concern the hull structure, the judgment on departure, and compliance. We examine these three causes one by one.

2-2. The problem of a hatch and water tightness

As for the structure, JTSA points out the wrong position of a hatch and unsatisfactory water tightness. The captain could not supposedly see the hatch from the pilothouse because the location of the hatch was at a blind angle. It was fatal in this incident because one of the principal causes was the water intruding from the hatch into the compartment and then into the engine room, which caused the shutdown of fuel injection and prevented the ship from advancing into the sea. JTSA presumes that the boat would have avoided a loss of control if it had kept the water tightness of its bow compartment.

2-3. Captain's decision making

The captain set out for sailing even though he was advised not to sail in supposedly terrible weather. We cannot reveal why the captain decided to set out because it is impossible to hear from him. We can only say that this accident would not have occurred if the captain had held back the decision for departure.

2-4. Violations against safety management codes

Did the operating company meet the compliance requirements? There is no recording of consultation between the captain and the company leader, even though the company's safety management codes require a discussion between them when it is difficult for the captain to cancel the cruise due to the weather. In addition, they also demand that the president works in the office while the boats are cruising, but the president was not there when *KAZU I* was on a cruise on April 23. Thus, we observe certain violations against the codes, which became a dead letter in their daily operations. Furthermore, there does not seem to have been a climate of observing them in the company.

Hokkaido District Transport Bureau performed unannounced inspections several times before the accident, especially on April 21, 2022, two days before the accident. The ballast positions in *KAZU I* were different from those that the ship examination certificate designates. In addition, the hatch had not been closed when the ship was running. Inspectors could not find the problems of the ballast's wrong positions and the broken hatch.

3. Discussion from viewpoints of engineering ethics

3-1. Trade-off condition

The report issued by JTSB clarifies six factors behind the accident and suggests how we should avoid the same kind of accident. It does not discuss any ethical problems from the point of view of engineering ethics. What sort of engineering problem can we find in this accident?

Engineers are expected to find not the perfect but the best solution under the trade-off conditions (Saito, 1998). Under bounded rationality, engineers cannot elucidate all causality of this world. Despite this, they must design and produce artificial products with maximal care for the public and their client (Saito, 2001). *KAZU I* is a ship originally designed for sailing in a calm sea, which probably lowered the priority of the hatch because it is inconceivable that seawater gets into the boat from the hatch and high waves destroy the hatch. When the owner changed, the sailing area also changed. In a stormy sea such as the Okhotsk Sea, it should have been necessary to bring the hatch into sight from the wheelhouse and vital to keep the water tightness of the bow compartment. It is doubtful, however, as far as we can suppose, with our bounded rationality, that the hatch positioned at a dead angle from the pilothouse and unsatisfactory water tightness would be a crucial defect for the ship in a stormy sea. This question may enable students to recognize the nature of bounded rationality and consider how they should act in similar situation.

3-2. Cost-benefit analysis

No one can testify why the captain set out for sailing that morning. We can point out at best three reasons he decided on his departure. The weather was not so terrible when he judged the cruise would be safe. He might think the company could not earn fare receipts if it cancels the cruise. The captain might consider the wishes of passengers boarding the pleasure boat at any cost. He must have estimated various conditions at the same time. Could engineers insist on the safety of passengers and show their reasons to a responsible person for operation when they find a conflict between the company's profit and the passengers' security? Generally, cost-benefit analysis is helpful for seeking the reason for a conduct amid the conditions. It is true that, as the Ford Pinto case indicates (Saito, 2001), a company has a positive reason for raising the priority of pursuing its profit to some extent, even though it damages the safety of users. In the boat case, the captain probably prioritized the wishes of passengers, but if he had weighted heavily on the lives of passengers in the analysis, his decision-making might have changed. Thus, this case will be an occasion to know and discuss the cost-benefit analysis much biased on the safety.

3-3. Compliance

Compliance, an attitude to obey the codes of ethics of the organization, is essential for every member of society. But they often make amoral actions as if they forgot the importance of compliance. Japanese industries imported

the code of ethics from the U.S. several times after Meiji Period (Natsume, 2021). Engineers improved them each time they established a new organization for engineers. They needed them to make sure of their judgment and behavior in ordinary operations. The effectiveness of the codes is, however, doubtful because it seems to be a mere slogan, and would not play a sufficient role of guideline in an actual situation (Iwasaki, 2000). The report issued by JTSB suggests that the employees of the boat company had not followed their company codes of safety management and that it was one of the causes of the accident. We still have to question students on how we enhance the consciousness of compliance in daily operations.

4. Teaching scheme

4-1. Purpose

This missing boat case can be a moral lesson about the scent of danger, the biased cost-benefit analysis, and a judgment in favor of safety and security. In a class where we treat the case, we aim to cultivate students' ability to catch the scent, utilize the analysis, and make good decisions.

4-2. Lesson

4-2-1. Introduction

We start with the introduction of the case. TV documentaries, articles on the internet, and the JTBS reports are available. It will be more efficient for students to overview them ahead of the class.

4-2-2. Analysis

Students conceive the background and causes of the accident based on the materials mentioned above. Students think about them individually and talk about them in a group. So that students discuss something in a class, they must find out the questions to discuss. The teacher can help them find the questions as we identify three crucial ones: how we suppose, with our bounded rationality, that the hatch positioned at a dead angle from the pilothouse and unsatisfactory water tightness would be a crucial defect for the ship in a stormy sea?; could engineers insist on the safety of passengers and show their reasons to a responsible person for operation when they find a conflict between the company's profit and the passengers' security?; how we enhance the consciousness of compliance in daily operations?

4-2-3. Discussion

After identifying the questions students should treat, they discuss them to make clear what they should do in the same situation. Students give a presentation about their discussion and debate with the audience. At the end of the class, students write down what they learned on the communication paper.

5. Pedagogic importance of the latest cases

We generally think of engineering ethics education as lessons for students who will become engineers or researchers to make good decisions when they need to make ethical judgments and behavior (The Institute of Electrical Engineers of Japan, 2014). It is necessary not only to enrich their knowledge but to let them think as a person concerned. A case study is an adequate pedagogical method for this objective.

What kind of example is appropriate for the case study in engineering ethics education? We can access a lot of good cases many engineers and researchers have accumulated. Engineers are interested in specific, concrete, or practical problems (Harris et al., 2000). Focusing on a case with these qualities seems to be a better approach to attracting students' attention. We always need to select attractive and proper ones based on the interest of the students we take charge of.

We also think about the advantages of treating the latest cases. In classical textbooks, such as *Ethics for Science-Engineers: Concepts and Cases* (Harris et al., 2000) published in the U.S., there are ample case studies helpful for our understanding and consideration of engineering ethics. However, we also recognize that an ethical analysis in a case study leaves room for some uncertainty (Harris et al. 2000). It is risky to believe the answer described and proposed by the analyzer. We are, nevertheless, apt to accept a solution in the textbook without question. At this point, classical studies are accessible but not enough to stimulate students to analyze the case and find a solution for themselves. The latest ones are, on the contrary, immune to the fixed viewpoint and solution powered by the researcher's authority. Moreover, in new cases, students are likely to acquire information timely, get interested in the current topics, and think critically about them because they have to think by themselves.

Conclusions

We treated a boat accident in this paper. JTSB says it needs more time to finish the final report, in which we would find a detailed and thorough analysis. We just mentioned three questions on the viewpoints of engineering ethics. The questions are open to students' free and creative discussion because there are no decisive arguments about them.

We hypothesize that treating the latest cases in engineering ethics class is advantageous enough to give students materials to think and argue with ease. It is an intuitive opinion and has no evidence that confirms the hypothesis. Having materials of the latest case studies on social accidents, using these materials in lectures of engineering ethics classes, and testing this hypothesis will be the next problem for this study.

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