Name: Date: Class:

# Case Studies from Student Interviews With Engineering Professionals – Student Guide

## Aerospace Engineering

Aerospace engineers frequently face dilemmas centered on safety compliance, pressure from management, and professional integrity.

- **Refusing Unsafe Approval:** Ms. B was overseeing two companies; one was not testing enough or being very safe for a program dealing with visiting crews. Knowing she could not sign off on an unsafe launch, and feeling she wasn't being taken seriously, **she quit that program to work on one that better aligned with her ethics.**

- **Resisting Management Pressure:** Another team constantly had to stand its ground against the Program Management Office (PMO), which wanted to make projects "as short and cheap as possible." The PMO repeatedly asked the team to cut corners and just sign off on a structure that might not be trustworthy to save time. The team always insisted on more time to investigate thoroughly and ensure safety.

- **Team Contribution:** Mr. J faced a dilemma when a person on his project team didn't show up or contribute to the work. The choice was whether to tell the supervisor or include the person in the final project regardless. Mr. J and his group decided to split the work equally among the members who did contribute and report the non-contributor to the supervisor.

- **Balancing Business and Ethics**: Mr. A noted that Aerospace is a highly regulated field, creating constant challenges to balance business interests with ethics and compliance with FAA regulations. He makes decisions by stepping back to see the broader picture and never rushing, to ensure decisions are balanced and do not compromise safety.

## Biomedical Engineering

Biomedical engineers' dilemmas were sharply focused on patient well-being, research integrity, and navigating procedural necessities in healthcare.

- **Patient Safety and Testing:** An engineer and his team cut corners to meet tight deadlines and failed to test their prosthetic product before user testing. The first test patient subsequently had a seizure due to the electrical signals, leading the engineer to emphasize the need to always test thoroughly and "dummy-proof" designs in a medical setting.
- **Patient vs. Profit:** Mr. M described the dilemma of doctors or providers prioritizing selling expensive treatments over what is truly best for the patient. He always chooses to put the patient first, even if it risks hurting his professional relationship with a doctor.

- **Procedural Shortcuts:** Two separate engineers faced product recalls during the holidays. Both chose to go outside the necessary procedures (skipping some internal communication) to quickly and effectively resolve the recall. One engineer received a "slap on the wrist" for working outside the established procedure, demonstrating the conflict between immediate patient safety and established protocols.

- **Accountability for Products:** Ms. P addressed the dilemma of fault for prosthetic damage—patient or engineer? She judges based on the situation: If the damage is regular due to activity, the patient pays; if it is very rare or a first incident, she takes responsibility and repairs the prosthetic free of cost.

- **Research Integrity and Patient Misconduct:** Dr. T discovered falsified data while trying to replicate published research. Separately, Ms. G and Dr. T both dealt with patient disrespect and inappropriate comments. Solutions included prioritizing professional ethics, allowing a resident to not return to the room, and maintaining the option of dismissing a patient from the practice.

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**Civil Engineering**

Civil engineers frequently faced dilemmas where public safety and integrity clashed with financial pressure or client deadlines.

- **Safety Over Cost:** One engineer working on an 18-story building discovered the fire escape routes wouldn't work properly in an actual fire. Despite the client asking him to skip the fix, the engineer insisted on correcting the issue, adding two months to the project. Similarly, Mr. I and his team reduced the road speed limit from 45 mph to 40 mph to ensure a sharp curve met safe speed requirements.

- **Reporting Mistakes:** Mr. F reported a major, costly design mistake that failed to account for the existing water plant's flow into a new elevation. Rather than hiding the error and risking the water station failing to purify water, he was honest, leading the company to pay for the correction. Separately, an engineer who found an undersized underground water pipe that could cause minor flooding immediately told the client, even though fixing it would cost more money.

- **Resisting Corruption & Fraud:** An engineer was told to create two separate blueprints for a train track project—one for use, and a second, twice-as-expensive one to defraud a partner company. Another engineer successfully resisted pressure from developers to fast track a project, prioritizing the city's need for the best final product. The line between being polite and accepting bribery (e.g., expensive dinners expected to yield something in return) was a personal dilemma for one engineer, who chooses to say "no" most of the time.

- **Public Health:** Engineers working on water and wastewater systems consistently dealt with developers who tried to cut corners and costs, which poses a significant concern to public health.

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**Industrial Engineering**

Industrial engineers' dilemmas focused on food safety and corporate honesty.

- **Food Safety:** JT encountered a truck carrying disinfectant for chicken nuggets that had a rusty valve. Because the rust would contaminate the product, he refused the delivery, saying he "Sent that Suicide Jockey back home and didn't accept that truckload," prioritizing food safety.

- **Fraudulent Sales:** An engineer discovered a previous sales rep had fraudulently ordered more than $100,000 worth of product and asked the warehouse to store it, solely to "get over the line" and make the top 15% of the sales organization. The engineer notified his chain of command, and HR eventually received the issue.

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**Electrical Engineering**

The challenges for electrical engineers centered on safety compliance, ethical use of technology, and legal requirements.

- **Refusing Safety Compromise:** One engineer faced clients who tried to skip required safety tests or have him "fudge" the numbers to violate safety standards and finish faster. He mandated that all safety checks be completed, even though it meant the product was not finished on the client's original timeline. He always abided by IEEE laws.

- **Ethical Technology Use:** Mr. R is strongly opposed to the idea of using robots as weapons, believing they should assist and help us, not fight our wars. He works with NGOs and carefully selects research in his lab to ensure their work is used in an ethically positive way.

- **Following Legal Procedure:** An engineer stressed the necessity of obtaining the proper license to transmit new hardware frequencies due to high demand. He noted that when demand is high, it is easy to justify an unethical action, so it is essential to have the ethics decided and follow procedure first.

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**Mechanical Engineering**

Mechanical engineers' dilemmas often involved product quality, workplace safety, and balancing cost with standards.

- **Workplace Safety and Accountability:** An engineer had a supervisor who endangered the lives of two others by refusing to admit to mistakes. Despite the supervisor's threats, the engineer reported the supervisor and had him removed. A different engineer also reported an unsafe supervisor offshore who expected silence, reinforcing the lesson that safety and ethics are above authority.

- **Product Quality and Approval:** An engineer faced management pressure to approve products that didn't meet standards to hit deadlines. He chose the ethical route by refusing to sign off until standards were met. Separately, an engineer working on missile technology established an "Escape" clause that allows them to terminate the project entirely if ethical concerns arise.

- **Safety Over Cost Savings:** An engineer setting up an HVAC system for two labs realized they could combine the two separate systems to save about $150,000. He chose to keep the systems separate, prioritizing safety and proper lab standards over cost savings.

- **Resisting Efficiency for Safety:** Ms. E on a team voted against a new recommendation to evaluate water pressure protection that promised efficiency gains because it threatened other safety factors such as water pressure, concluding the possible efficiency wasn't worth the safety risk.

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**Miscellaneous Engineering Disciplines (Project, Process, Systems, Product)**
These engineers dealt with organizational integrity, research accuracy, and moral contribution.

- **Organizational Integrity:** A project manager had to take over a project restructured due to bribery by the previous head engineer, who was taking golf outings from the contracted company. His new boss specifically told him to "SPECIFICALLY read over the ethics pamphlet again" as he took over.

- **Moral Contribution:** Systems engineer Ms. K struggles with working for a defense company on the F-35 fighter jet program, meaning her work indirectly contributes to warfare and violence. She is currently exploring opportunities outside the defense industry to better align her work with her personal values.

- **Research Accuracy:** Process engineer Ms. E had to deal with a published article on composition that was solely based on assumptions. Her job was to find and curate factual data while incorporating her professional knowledge of safety factors in power plants.

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**Software Engineering**
Software engineers focused on data privacy, intellectual property, and system security.

- **Data Privacy and Consent:** An engineer faced a client request to log extra user data for "analytics" without clear user consent, which would have violated privacy regulations. The engineer raised the issue with legal and compliance teams, explained the privacy implications, and offered a compliant, opt-in alternative, prioritizing end-user protection.

- **Security Over Deadline**: An engineer dealt with a critical system security flaw discovered close to launch, which risked exposing sensitive customer data. The business team wanted to launch to meet deadlines, but the engineer communicated the risks to leadership and recommended delaying the launch to fix the issue, prioritizing customer trust and data security.

- **Intellectual Property and Credit:** One engineer stressed the importance of giving appropriate credit when reusing code built by others. He made it a point to send a thank you note and ensure the original developer's name was included in the documentation, adding his own name only to the enhancements he created.

- **Open-Source Misuse:** The misuse of open-source software for personal benefit without proper credit or license was identified as an ethical issue. The solution is to properly get the needed licenses and compensate when necessary.

- **Ethical AI Development:** Mr. G questioned whether his job developing ultra-advanced AI that might take control of tasks was ethical. He decided to continue, but with the intent to ensure AI advances in a way that humans want it to, helping with tasks, not controlling them.