Professional Ethics

Kris Bubendorfer & Paul Dagger

ENGR 401 ***Professional*** Practice

Notices

- Wed 9am Workshop in Co246, Co242 and 243

- Individual assignment 1 is now underway
  - 4 pages Includes references. Everything.

Professional Ethics

- New technology can have risks often pose ethical issues, as well as potentially negative financial, and reputational outcomes.
- As professional engineers it is likely you will have to deal with most, or all, such outcomes during your careers.
- We'll actually come back to talk about these other risk outcomes, but for now, we're going to put on our professional engineering hats and look at examples of engineering ethics.

What are Professional Ethics

- Professional ethics typically refer to a set of principles and standards that guide the behavior of individuals within a *specific* profession.

- When an ethical standard is breached, you need to take action, such as:
  - seeking guidance from your professional organisation,
  - taking corrective measures to address the ethical breach, or
  - reporting unethical behavior.
  - Failure to act *appropriately* can result in disciplinary action.

- Ethical standards help maintain trust and credibility within the profession and ensure the well-being of clients, colleagues, and the public.

Common Principles in Engineering Ethics

- **Integrity and Honesty:** Engineers are expected to be honest and transparent in their professional activities. This includes accurately representing their qualifications, findings, and recommendations.
- **Professional Competence:** Engineers should only undertake tasks for which they are qualified by education and experience. Continuous professional development is encouraged to stay current with evolving technologies and best practices.*
- **Safety:** Ensuring the safety and well-being of the public is a paramount concern for engineers. They should prioritise the safety of their designs, products, and projects, and take steps to minimise risks.
- **Environmental Responsibility:** Engineers have a responsibility to consider the environmental impact of their projects and to promote sustainable practices in design and construction.
- **Social Responsibility:** Engineers should consider the broader societal implications of their work - they should strive to contribute positively to the well-being of society.
- **Conflict of Interest:** Engineers should avoid or disclose situations that could compromise their professional judgment or create conflicts of interest.
- **Whistleblowing:** Engineers are encouraged to report any unethical or illegal engineering activities.

Protected Disclosures (Protection of Whistleblowers) Act 2022*

- A protected disclosure is when the discloser believes on reasonable grounds that there is, or has been, **serious wrongdoing** in or by their organisation**, they disclose in accordance with the Act and they do not disclose in bad faith.
- A discloser is a person who has an employment type relationship with the organisation they are disclosing about. This includes current and former employees, homeworkers, secondees, contractors, volunteers and board members.
- A discloser is **entitled to protection** for a protected disclosure made in accordance with the Act, even if they are **mistaken** and there is **no** serious wrongdoing.
- The protections a discloser is entitled to are confidentiality, not retaliated against or treated less favourably, and **immunity** from civil, criminal and disciplinary proceedings. These protections extend to people who volunteer supporting information for the disclosure.

https://www.publicservice.govt.nz/publications/protected-disclosures-act-2022

Protected Disclosures (Protection of Whistleblowers) Act 2022

- A discloser may make a protected disclosure to their organisation ***or to an appropriate authority*** at any time.
- An appropriate authority is a **trusted** external party who can be approached if a discloser is not confident about making the disclosure within their own organisation, such as:
  - The membership body of a particular **profession**, trade, or calling with the **power** to discipline its members, or
  - The head of any public sector organisation; any officer of Parliament (the Ombudsman, Controller and Auditor-General, Parliamentary Commissioner for the Environment),
  - A discloser may also make the disclosure to another person, as long as they do so on a confidential basis and for the purposes of seeking advice about how to make a protected disclosure in accordance with the Act.
- An appropriate authority does not include a Minister or Member of Parliament and disclosures to the **media** are **not** protected under the Act*

https://www.publicservice.govt.nz/publications/protected-disclosures-act-2022

What is a Serious Wrongdoing?

Serious wrongdoing is an act, omission, or course of conduct		
Type of serious wrongdoing	**Does it apply to the public sector?**	**Does it apply to the private sector?**
An offence	Yes	Yes
A serious risk to public health, or public safety, or the health or safety of any individual, or to the environment	Yes	Yes
A serious risk to the maintenance of the law including the prevention, investigation and detection of offences or the right to a fair trial	Yes	Yes
An unlawful, corrupt or irregular use of public funds or public resources	Yes	Yes, but does not include the use of private sector funds or resources
Oppressive, unlawfully discriminatory, or grossly negligent or that is gross mismanagement by a public sector employee or a person performing a function or duty or exercising a power on behalf of a public sector organisation or the Government	Yes	Yes, but does not include the use of private sector powers

What is **not** a serious wrongdoing?

- Things like dissatisfaction with the leadership of an organisation or,
- more minor misconduct matters may not amount to serious wrongdoing and thus may not be covered by the Act, however,
- you do not ‘need’ to meet this threshold as a whistleblower to have protection.

Protected Disclosures - some possible limitations.

- **Limited scope:** the definition of "serious wrongdoing" may be too narrow and excludes certain types of misconduct or unethical behavior.
- **Lack of oversight:** there is no independent authority tasked with overseeing and enforcing whistleblower protections.
- **Enforcement challenges:** whistleblowers may face have trouble in proving retaliation, as the burden of proof lies with the whistleblower.
- **Cultural barriers:** despite legal protection, there may still be a culture of silence or fear of repercussions that discourages whistleblowing.

What is your threshold for action?

Engineering NZ Code of Ethics - OBLIGATIONS IN THE PUBLIC INTEREST

1. Take **reasonable** steps to safeguard the health and safety of people.

2. You must, in the course of your engineering activities,

   - have regard to **reasonably** foreseeable effects on the environment from those activities; and

   - have regard to the need for **sustainable** management of the environment.

3. If you have **reasonable** grounds to believe that an engineering matter has, or could have, **adverse consequences** you **must** bring the matter to the notice of the relevant regulatory body **unless**,

   - having **made** inquiries, you are satisfied on **reasonable** grounds that the matter is being dealt with through an appropriate process or in an appropriate manner.

Engineering NZ Code of Ethics - OBLIGATIONS RELATING TO PERSONAL CONDUCT

4. Act competently

   a. You **must**:

      i. ensure that your relevant knowledge and skills are kept up to date; and

      ii. only undertake engineering activities that are **within** your competence; and

      iii. undertake engineering activities in a careful and **competent** manner.

   b. You must **not**:

      i. **misrepresent**, or permit **others** to misrepresent, your competence; or

      ii. **knowingly** permit other engineers for whose engineering activities you are **responsible** to:

      undertake engineering activities that are outside their competence; undertake engineering activities in a manner that is not careful and competent; misrepresent, or permit others to misrepresent, their competence.

Engineering NZ Code of Ethics - OBLIGATIONS RELATING TO PERSONAL CONDUCT

5. Behave appropriately - in performing, or in connection with, your engineering activities you

a. **must**

I. act with honesty, objectivity, and integrity; and

II. treat people with respect and courtesy; and

III. disclose and appropriately manage conflicts of interest; and

b. must **not**

i. offer or promise to give to any person anything intended to improperly influence a decision relating to your engineering activities; or

ii. accept from any person anything intended to improperly influence your engineering activities; or

iii. otherwise engage in, or support, corrupt practices.

6. Inform others of **consequences** of not following advice

If you become aware that your professional advice may **not** be followed, and consider that a failure to observe that advice may have **adverse** consequences**,** you **must** inform the recipient of the advice of those adverse consequences.

Engineering NZ Code of Ethics - OBLIGATIONS RELATING TO PERSONAL CONDUCT

7. **Maintain** confidentiality

a. If you obtain confidential information from clients or employers in the course of your engineering activities you

i. must **not** use the information for any purpose other than the purpose for which the information was obtained; and

ii. must **not** disclose the information unless the disclosure is permitted by this rule.

b. You **may** disclose confidential information if, and to the extent that

i. you are required to disclose the information in order to comply with rule 3 or rule 8 **and** you have first raised the matter **with** the person to whom confidentiality is owed; or

ii. you are otherwise required by law to disclose the information; or

iii. the information is publicly available; or

iv. the disclosure is **authorised** by the person to whom confidentiality is owed.

c. Information disclosed under subclause (b)(i) or (ii) may only be disclosed to the person or organisation to whom or to which you are **required** to disclose it.

Engineering NZ Code of Ethics - OBLIGATIONS RELATING TO PERSONAL CONDUCT

8. Report breach of Code If you have reasonable grounds to believe that another **Member** has committed a significant breach of the Code of Ethical Conduct you must report the matter to Engineering New Zealand.

Famous Engineering Ethics Case Studies - Ford Pinto

- The Ford Pinto (1971) is largely remembered as one of the most dangerous cars ever made, while some people may argue this point, it remains a salutary lesson in engineering ethics and **transformed** car safety standards.

- The Ford Pinto was designed to compete with the new small cars being imported from Japan, at a $2000 price point.

- The car was rushed (design work started in 1968), and the general layout and body design work was done before the engineering work - the engineering was done to fit the design, rather than the design to work with the engineering.

- Approximately 117 lawsuits were brought against Ford in connection with rear-end accidents in the Pinto.

Famous Engineering Ethics Case Studies - Ford Pinto

- The primary issue was that the petrol tank was placed behind the rear axle under the boot floor to give enough luggage space.

- This positioning wasn't an issue in itself - as, while this was a uncommon approach for USA production, it was seen in Ford production in many other countries (including NZ, Australia, UK, Germany, and so on).

- However the Pinto was made:
  - without adequate boot floor reinforcing,
  - a weak easily crumpled rear bumper, and
  - too little clearance from the rear differential. Compounded by the use of a bolted differential housing, rather than a smooth differential housing.

Was this outside their competence?

Famous Engineering Ethics Case Studies - Ford Pinto

What happened in an rear end accident?

- In a significant collision, the petrol tank would be pushed forward and could be torn by the exposed bolt heads on the differential assembly.
- Lack of strong reinforced bulkhead and boot floor meant that the petrol could enter the passenger compartment in an accident.

So, poor engineering and bad accidents - sure, but

- why was this unethical, and
- why all of the (successful) lawsuits?

Famous Engineering Ethics Case Studies - Ford Pinto

Why was this unethical?

- Ford crash tested 2 production vehicles and several prototypes **before** the Pinto went on sale.
- The crash testing revealed the Pinto performed poorly and would fail new safety rules being introduced in 1973.

"caused the fuel neck to be torn from the gas tank and the tank to be punctured by a bolt head on the differential housing."

"caused the fuel tank to be driven forward and to be punctured, causing fuel leakage."

"spilled fuel entered the driver's compartment through gaps resulting from the separation of the seams joining the rear wheel wells to the floor pan," separations due in part to "the lack of reinforcement in the rear structure."

Famous Engineering Ethics Case Studies - Ford Pinto

Why was this unethical?

- The Pinto met all federal standards at the time, and therefore did not contravene any law.
- Ford management knew all of the issues resulting from a rear collision **before** any were sold.
- Ford tested modified Pinto prototypes, which "proved safe at speeds at which the Pinto failed," including modifications to line the fuel tank with a rubber bladder, to locate the fuel tank above rather than behind the rear axle, and to add reinforcement.
- The cost of the modifications was $15.30 per vehicle.
- The ruling in the Grimshaw v. Ford Motor Company found,
  - while "the standard of care for engineers in the industry" after a failed safety test was to "redesign and retest," and,
  - although the fixes were inexpensive,
  - "Ford produced and sold the Pinto to the public **without** doing anything to **remedy** the defects.

Famous Engineering Ethics Case Studies - Ford Pinto

Management knowledge

- In April 1971, a report prepared by Ford engineers entitled "Fuel System Integrity Program Financial Review" was distributed to management and discussed.
  - It referred to the crash tests of Ford vehicles and estimated the financial impact of design changes to comply with the proposed federal fuel system integrity standards.
  - The report recommended **deferring** fixes in order to accrue cost savings.

https://www.washingtonpost.com/archive/politics/1980/02/08/ford-decided-to-save-665-per-car-rather-than-redesign-pinto-trial-told/

Famous Engineering Ethics Case Studies - Ford Pinto

The trial verdict of Grimshaw v. Ford Motor Company was appealed, and in May, 1981, a California appellate court affirmed the jury's verdict and the trial judge's $3.5 million punitive damage award. They pulled no punches:

- "Ford decided to defer correction of the Pinto's shortcomings by engaging in a cost-benefit analysis balancing human lives and limbs against corporate profits. Ford's institutional mentality was shown to be one of callous indifference to public safety. There was substantial evidence that Ford's conduct constituted 'conscious disregard' of the probability of injury to members of the consuming public. …"
- "The conduct of Ford's management was reprehensible in the extreme. It exhibited a conscious and callous disregard of public safety in order to maximize corporate profits."

in 1977, before the trial a 60-Minutes television episode was broadcast in which correspondent Mike Wallace accused Ford of reasoning that "we'll buy 2,000 deaths, 10,000 injuries because we want to make some money"

Famous Engineering Ethics Case Studies - Ford Pinto

If we were to apply the current ENZ code of ethics, we'd fail on:

1, 3, parts of 4, maybe 6 and 8.

Of course, that was over 50 years ago, and many things have changed, and many decisions made then are fortunately unthinkable now.

Famous Engineering Ethics Case Studies - Boeing Max

- The Boeing 737 MAX crisis is considered one of the most significant ethical failures in the aviation industry.
- It highlights the consequences of prioritising profits over safety, inadequate oversight, and a breakdown in corporate culture and ethics.
- The Boeing 737 MAX was a new generation of the popular 737 aircraft, designed to compete with the Airbus A320neo.
- However, several design decisions and ethical lapses led to two catastrophic crashes in 2018 and 2019, resulting in the loss of 346 lives and the grounding of the entire MAX fleet worldwide.

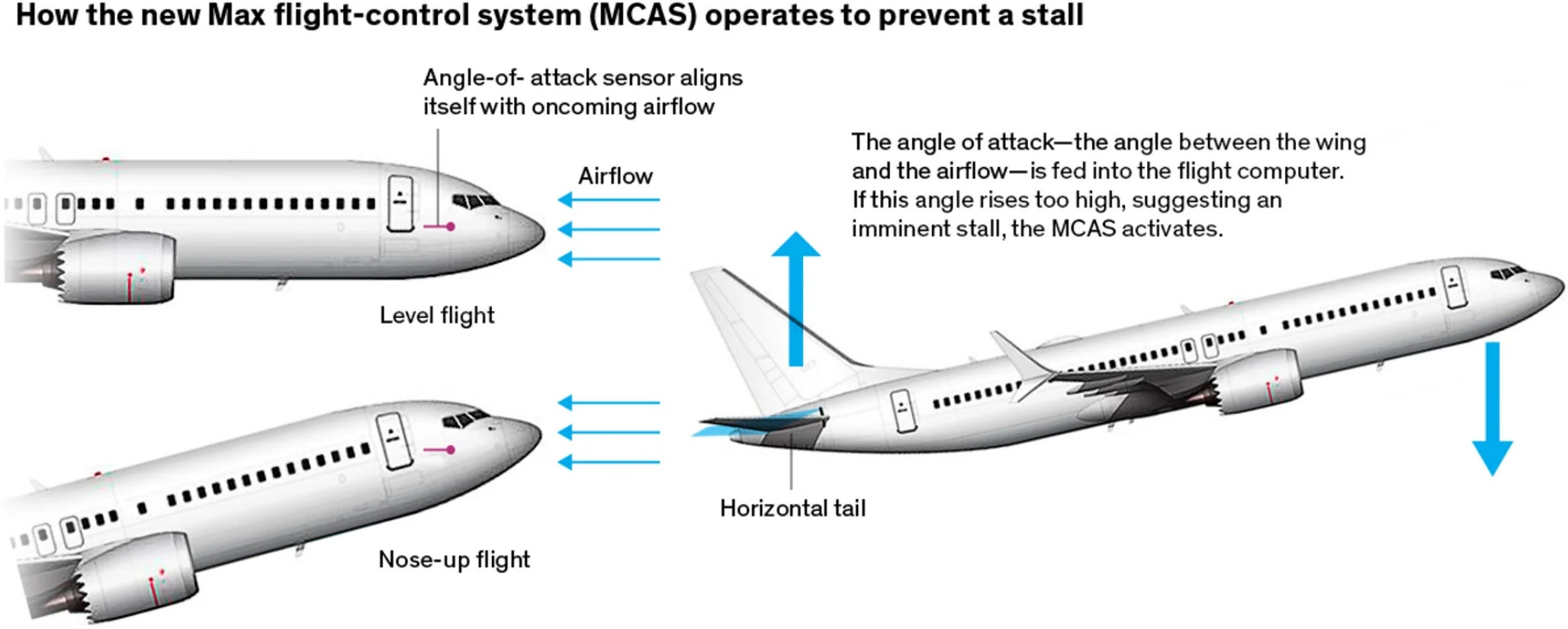
Famous Engineering Ethics Case Studies - Boeing Max

- The two crashes were caused by issues related to a new flight control system called the Manoeuvring Characteristics Augmentation System (MCAS).
- This was introduced as larger more efficient fan jet engines were fitted to the aeroplane and these had to be mounted further forward.
- Boeing wanted the FAA to certify the airplane as another version of the long-established 737 as this would limit the need for additional training of pilots, a major cost saving for airline customers.
- However, the positioning of the new engines could cause aerodynamic lift in certain conditions, and the MCAS system was introduced to counteract the additional lift by nosing the plane down.
- The idea being the MAX would handle similar to earlier 737 versions, and therefore would not need additional pilot training or extensive certification.

Famous Engineering Ethics Case Studies - Boeing Max

- Boeing convinced the FAA that MCAS could not fail hazardously or catastrophically, and that existing procedures were effective in dealing with malfunctions.
- Because of this the MAX was exempted from certain newer safety requirements, saving Boeing billions of dollars in development costs. However,
  - In both crashes, one of the two* angle-of-attack sensors provided erroneous data, causing MCAS to **repeatedly** and **aggressively** push the nose of the aircraft down.
  - The pilots struggled to regain control as MCAS continued to **override** their inputs based on the faulty sensor data.
  - Not letting the pilot regain control by pulling back on the column was an **explicit design decision**. Because if the pilots could pull up the nose when MCAS said it should go down, why have MCAS at all?
  - Pilots were **not adequately** informed or **trained** on the **existence** and **functionality** of MCAS during the transition to the 737 MAX.

Famous Engineering Ethics Case Studies - Boeing Max



Famous Engineering Ethics Case Studies - Boeing Max

- The plane's new system **didn't** have **redundancy** where it needed it. If the sensor **failed**, the MCAS could be adversely affected,
  - but the FAA didn't catch this. Why?
  - Much of the certification process is **delegated** by the FAA **to manufacturers** themselves. The design and certification process for MCAS was flawed, with inadequate safety assessments and risk analysis.
  - There was a **lack of transparency** from Boeing in disclosing the existence and potential risks of MCAS to pilots, regulators, and airlines.
  - Boeing **made assumptions** about how pilots would respond to MCAS emergencies that proved to be **inaccurate**.
- Why? **Failure of ethical and company culture.**

Famous Engineering Ethics Case Studies - Boeing Max

Prioritising profits over safety:

- Boeing was under intense pressure to bring the 737 MAX to market quickly to compete with Airbus and meet airlines' demands for fuel efficiency.
- Decisions were made to cut costs and rush the certification process, potentially compromising safety.

Regulatory capture and cozy relationships:

- There were concerns about the Federal Aviation Administration's (FAA) oversight and its close relationship with Boeing, which may have compromised the regulator's ability to provide effective scrutiny.
- The FAA's reliance on Boeing's self-certifications and delegated authority raised questions about conflicts of interest.

Famous Engineering Ethics Case Studies - Boeing Max

Unethical corporate culture and lack of accountability:

- Internal messages and emails revealed a culture of concealment, pressure, and disregard for safety concerns raised by employees, e.g.,

  *Boeing engineer, Curtis Ewbank, filed an internal ethics complaint alleging that company managers rejected a backup system for determining speed, which might have alerted pilots to problems linked to [the] two crashes of 737 MAX. A similar backup system is installed on the larger Boeing 787, but it was rejected for the 737 MAX because it could increase costs and training requirements for pilots.**

- There was a lack of accountability and leadership, with executives prioritising financial goals over ethical conduct.

Famous Engineering Ethics Case Studies - Boeing Max

The Boeing 737 MAX crisis had severe consequences, including the grounding of the aircraft, numerous lawsuits, criminal investigations, and a significant erosion of public trust.

- In January 2021, Boeing paid over $2.5 billion in settlement after being charged with **fraud** in connection to the crashes.
- Most **estimates** suggest that the overall financial impact of the 737 MAX crisis on Boeing exceeded $20B - with some estimates of $60B or more when factoring in lost sales and reputational damage.
- Some reading:
  - https://spectrum.ieee.org/how-the-boeing-737-max-disaster-looks-to-a-software-developer
  - https://www.forbes.com/advisor/credit-cards/travel-rewards/737-max-what-is-safety-anyway/