EG 2401(a) Engineering Professionalism

Lecture 2

Sem I, AY 2021-22

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TOPIC 2 – Understanding Ethical Problems (Ethical Theories)

- ***Objective 1**: upon the completion of this lecture class, we will be able to discuss several [pertinent] ethical theories.*

- ***Objective 2**: ... and also see how these theories can be applied to engineering problems.*

Reference Reading: *Fleddermann* 4th Ed Chapter 3

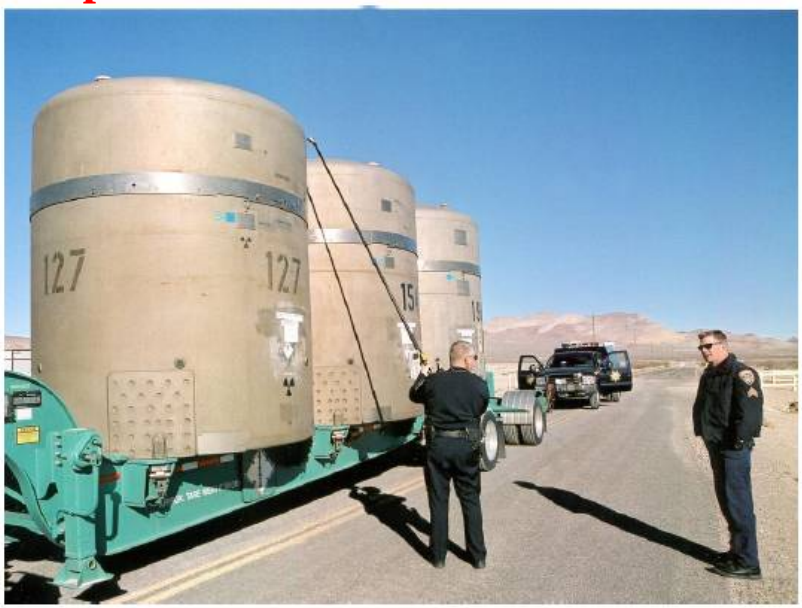
Example: Waste Isolation Pilot Plant (WIPP), Carlsbad, NM U.S.A. *[read also Fleddermann Chapter 3]*

WIPP is designed to be a permanent repository for nuclear waste generated in the United States. It consists of a system of tunnels bored into underground salt formations. These salt beds are considered by geologists to be extremely stable, especially to incursion of water which could lead to seepage of the nuclear wastes into ground-water. However, there are many who oppose this facility, principally on the grounds that transportation of the wastes across highways has the potential for accidents that might cause health problems for people living near these routes.

Example I: Waste Isolation Pilot Plant (WIPP), Carlsbad, NM U.S.A. *[read also Fleddermann Chapter 3]*

Waste Isolation Pilot Plant	
WIPP	
 WIPP, a geological repository for radioactive waste	
Country	United States
State	New Mexico
County	Eddy County
Nearest city	Carlsbad

© Wikipedia



Shipment of casks arriving at the WIPP

Read also the more detailed article, available as a free download from Wikipedia©, which is also in "Assigned Readings" IVLE Folder...

Example: The Goodrich A7-D Brake Case *[read also Fleddermann pp 114-116]*

… In June of 1967, Goodrich was awarded the contract to supply the brakes for the A7-D by LTV, the prime contractor for the airplane. The qualifying of this new design was on a very tight schedule imposed by the Air Force. The new brake had to be ready for flight testing by June of 1968, leaving only one year to test and qualify the design. To qualify the design for the flight test, Goodrich had to demonstrate that it performed well in a series of tests specified by the Air Force.

… In the course of writing the report on the A7-D brake tests, Vandivier became aware that some of the test results had been rigged to meet the Air Force's specifications. Vandivier raised his concerns about the report he was writing, feeling that he couldn't write a report based on falsified data. His attempts to write an accurate report were not allowed by management, and Goodrich submitted a report using the jury-rigged data. Based on this report, the brake was qualified for flight testing.

Read also the more detailed related articles, available as a free download from Wikipedia©, which is also in "Assigned Readings" IVLE Folder...

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Example II: The Goodrich A7-D Brake Case *[read also Fleddermann pp 114-116]*

A-7 Corsair II	
	
U.S. Navy A-7E from Attack Squadron 46 (VA-46)	
Role	Attack aircraft
Manufacturer	Ling-Temco-Vought
First flight	26 September 1965
Introduction	February 1967

Close-up of a disc brake on a car

A railroad bogie and disc brakes

© Wikipedia

TOPIC 2 – Understanding Ethical Problems (Ethical Theories)

- **THL2.1 – Ethical Theories**
- **THL2.2 –Utilitarianism (*Ethical Theory 1*); also Cost-Benefit Analysis**
- **THL2.3 –Duty Ethics (*Ethical Theory 2*) & Rights Ethics (*Ethical Theory 3*)**
- **THL2.4 – Virtue Ethics (*Ethical Theory 4*)**
- **THL2.5 – Which Theory to Use?**
- **THL2.6 - Summary (II)**
- **THL2.7 – additional PRACTICE (!!); the Goodrich A7-D brake case.**

Reference Reading: *Fleddermann* 4th Ed Chapter 3

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TOPIC 2 – Understanding Ethical Problems (Ethical Theories)

➢ THL2.1 – Ethical Theories

- **THL2.2 –Utilitarianism (*Ethical Theory 1*); also Cost-Benefit Analysis**
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Reference Reading: *Fleddermann* 4th Ed Chapter 3

THL2.1 – Ethical Theories

- ***We will first look at several theories of ethics in order to have a meaningful framework for decision making.***

- ***This multiplicity(!!) of applicable theories is needed, as it is rather invariably the situation that the development of any suitably meaningful problem solving methodology must reflect the complexity of ethical problems, and the diversity of approaches that have been developed over the centuries.***

THL2.1 – Ethical Theories

- ***A <u>moral/ethical theory</u> defines terms in uniform ways and links ideas and problems together in consistent ways. Four ethical theories will be considered ---***

a. ***Utilitarianism (with its additional variants)***

b. ***Duty Ethics***

c. ***Rights Ethics***

d. ***Virtue Ethics***

- ***<u>Footnote</u>: There should be *no* need to attempt rote memorization of these terms & their definitions for my part of this module. In my part/approach, the list of all such definitions will be furnished as items in the Data Sheet/Appendix of the examination paper!!!!***

THL2.1 – Ethical Theories

The few next statements may seem self-evident, but do properly require deeper thought, which will be borne out in the later analyses…

- ***The 4 theories will allow us to analyze a problem from different angles.***

- ***Frequently the result will be the same even though the theories are rather different.***

- ***Yet quite often, the different theories will give different answers! (The WIPP example will be such a case.)***

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TOPIC 2 – Understanding Ethical Problems (Ethical Theories)

- THL2.1 – Ethical Theories
- **THL2.2 –Utilitarianism (*Ethical Theory 1*)**
- THL2.3 –Duty Ethics (*Ethical Theory 2*) & Rights Ethics (*Ethical Theory 3*)
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- THL2.7 – additional **PRACTICE (!!)**; the Goodrich A7-D brake case.

Reference Reading: *Fleddermann* 4th Ed Chapter 3

THL2.2 – Utilitarianism (Ethical Theory 1)

- ***Utilitarianism**: this perspective holds that those actions are good that serve to maximize human well-being.*

- ***Utilitarianism**: The emphasis in utilitarianism is not on maximizing the well-being of the individual, but rather on maximizing the well-being of society (or essentially a specific sample/ population given consideration on the issue at hand) as a whole.*

THL2.2 – Utilitarianism (Procedure for Usage)

- ***Utilitarianism*: suggested procedure in using this --**

a. ***Identify the actions and/or choices.***

b. ***Identify the parties involved.***

c. ***Identify the utility of the action or choice.***

d. ***Identify the attendant issues/problems.***

e. ***Consider the utility versus the issues/problems.***

f. ***Go through for each party involved.***

Example: Waste Isolation Pilot Plant (WIPP), Carlsbad, NM U.S.A. *[read also Fleddermann Chapter 3]*

WIPP is designed to be a permanent repository for nuclear waste generated in the United States. It consists of a system of tunnels bored into underground salt formations. These salt beds are considered by geologists to be extremely stable, especially to incursion of water which could lead to seepage of the nuclear wastes into ground-water. However, there are many who oppose this facility, principally on the grounds that transportation of the wastes across highways has the potential for accidents that might cause health problems for people living near these routes.

THL2.2 – Utilitarianism
[Sample Analysis of WIPP...]

- ***Utilitarianism - WIPP (action and/or choice): develop nuclear technology, and properly dispose of nuclear waste.***

- ***Utilitarianism - WIPP (identify the parties involved): Here, an important party/major player would be the U.S. nuclear agency. Another party involved would be communities along the planned waste transportation route.***

THL2.2 – Utilitarianism
[Sample Analysis of WIPP...]

- ***<u>Utilitarianism - WIPP (what is the utility?)</u>: this development of nuclear capability will facilitate the implementation of many technologies such as medicinal uses of radioisotopes and nuclear generation of electricity.***

- ***<u>Utilitarianism - WIPP (what is the attendant issue/problem?)</u>: there is a nuclear waste disposal matter to be resolved.***

THL2.2 – Utilitarianism
[Sample Analysis of WIPP...]

- ***Utilitarianism - WIPP (what is the utility?): if this waste disposal problem is solved, it will benefit society by providing improved healthcare and more plentiful electricity.***

- ***Utilitarianism - WIPP (what is the attendant issue/problem?): there is a potential for adverse health effects for individuals living near the transportation routes to WIPP.***

THL2.2 – Utilitarianism
[Sample Analysis of WIPP…]

- ***<u>Utilitarianism - WIPP (utility versus issues)</u>: here, the utilitarianism theory would likely analyze it as --- "The slight potential for adverse health effects for individuals living near the transportation routes is far outweighed by the overall benefits to society. So, WIPP should be allowed to open".***

THL2.2 – Utilitarianism
[Sample Analysis of WIPP...]

Remark: It will be often useful to tabulate each specific "ethics analysis". In our module, we will use the following tabular template ---

Action/ Choice	Party #1: U.S. nuclear agency	Party #2: Communities along route
Ethics category --- Utilitarianism		
Develop nuclear technology	Utilitarian ethics is satisfied, as its development will facilitate implementation of technologies such as radio-isotopes for medicine, and nuclear generation of electricity.	Utilitarian ethics is satisfied, when communities give their support for this development.
Develop WIPP to dispose of nuclear waste	Utilitarian ethics is satisfied, as development of WIPP is necessary for development of nuclear technology to carry on.	Utilitarian ethics is satisfied on societal benefit, but does not address the dangers from waste transportation.

THL2.2 – Utilitarianism
[Sample Analysis of WIPP...]

- ***Utilitarianism (further notes)**: as the example demonstrates, the utilitarian approach can seem to ignore the needs of individuals.*

- ***Utilitarianism (further notes)**: an important objection is that its implementation depends greatly on knowing what will lead to the most good. Often-times, maximizing the benefits to society involves some guesswork, and the risk that the best guess might be wrong.*

THL2.1 – Ethical Theories [a REMINDER here!!]

Remark: At this point, many will (rightfully so) be worried/concerned; thus useful here to be reminded of our earlier note that…

- ***We will first look at <u>several</u> theories of ethics in order to have a meaningful framework for decision making.***

- ***This <u>multiplicity</u> of applicable theories is needed, as it is rather invariably the situation that the development of any suitably meaningful problem solving methodology must reflect the complexity of ethical problems, and the diversity of approaches that have been developed over the centuries.***

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THL2.2 – Utilitarianism (Act-)

- ***Act Utilitarianism**: This focuses on individual actions rather than on rules. In this "flavor" of utilitarianism, the perspective is taken that individual actions should be judged based on whether the most good was produced in a given situation, and rules should be broken if doing so will lead to the most good. [John Stuart Mill (1806-1873).]*
- ***Act Utilitarianism**: Although described as a "flavor", this is largely similar to the mainstream "Utilitarianism" approach (focusing on "actions"); and leads to the same results mostly. For our module, we will note, and acknowledge, this similarity.*

THL2.2 – Utilitarianism [RECALL]

For our module, we will note, and acknowledge, this essential similarity between Act-Utilitarianism and mainstream Utilitarianism…

- ***Utilitarianism: this perspective holds that those actions are good that serve to maximize human well-being.***

- ***Utilitarianism: The emphasis in utilitarianism is not on maximizing the well-being of the individual, but rather on maximizing the well-being of society as a whole.***

THL2.2 – Act-Utilitarianism (Procedure for Usage)

Thus, although perhaps be-labouring the point...

- ***Act-Utilitarianism*: suggested procedure in using this --**

a. Identify the actions and/or choices.

b. Identify the parties involved.

c. Identify the utility of the action or choice.

d. Identify the attendant issues/problems.

e. Consider the utility versus the issues/problems.

f. Go through for each party involved.

THL2.2 – Act-Utilitarianism
[Sample Analysis of WIPP...]

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Again be-labouring the point for Act-Utilitarianism...

Action/ Choice	Party #1: U.S. nuclear agency	Party #2: Communities along route
Ethics category --- Act-Utilitarianism		
Develop nuclear technology	Act-Utilitarian ethics is satisfied, as its development will facilitate implementation of technologies such as radio-isotopes for medicine, and nuclear generation of electricity.	Act-Utilitarian ethics is satisfied, when communities give their support for this development.
Develop WIPP to dispose of nuclear waste	Act-Utilitarian ethics is satisfied, as development of WIPP is necessary for development of nuclear technology to carry on.	Act-Utilitarian ethics is satisfied on societal benefit, but does not address the dangers from waste transportation.

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THL2.2 – Utilitarianism (Rule-)

- ***Rule-Utilitarianism**: This holds that moral rules AND/OR existing civil rules/regulations are most important, while still noting utility as of major importance. E.g. rules such as "do not harm others"; "do not steal". Or relevant civil rules/regulations (note that we include these civil rules too!!) that may be present. Rule utilitarians hold that although adhering to these rules might not always maximize good in a particular situation, overall, adhering to moral and/or civil rules will ultimately lead to the most good.*

THL2.2 – Utilitarianism (Rule-)

- ***<u>Rule-Utilitarianism</u>: This "flavor/variant" of the Utilitarianism ethics theory typically is helpful to moderate possible excesses from the purist Utilitarianism (Act- and mainstream) approach. But issues can also arise from, say, instances where rules existing are "protectionist" etc...***

THL2.2 – Act-Utilitarianism (Procedure for Usage)

- ***Rule-Utilitarianism*: suggested procedure in using this --**

a. ***Identify the actions and/or choices.***

b. ***Identify the parties involved.***

c. ***Identify the utility of the action or choice.***

d. ***Identify the attendant issues/problems, and consider existing rules.***

e. ***Consider the utility versus the issues/problems, and consider existing rules.***

f. ***Go through for each party involved.***

THL2.2 – Utilitarianism (Rule-)

- ***<u>Rule-Utilitarianism (to ponder)</u>: How might the earlier WIPP Utilitarianism approach analyses have been moderated here if, for the townships/communities along the transportation route, there were civil regulations governing passage of hazardous materials through the townships/communities?***

THL2.2 – Act-Utilitarianism (Procedure for Usage)

Action/ Choice	Party #1: U.S. nuclear agency	Party #2: Communities along route
Ethics category --- Rule-Utilitarianism		
Develop nuclear technology	Rule-Utilitarian ethics is satisfied, as its development will facilitate implementation of technologies such as radio-isotopes for medicine, and nuclear generation of electricity. No existing rules are violated.	Rule-Utilitarian ethics is satisfied, when communities give their support for this development. No existing rules are violated.
Develop WIPP to dispose of nuclear waste	Rule-Utilitarian ethics is satisfied, as development of WIPP is necessary for development of nuclear technology to carry on; but only if existing rules on transportation of hazardous materials through communities are observed. This may require extensive modifications to the transport vehicles and/or building of completely new roads.	Rule-Utilitarian ethics is satisfied on societal benefit, and also addresses the dangers from waste transportation.

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THL2.2 – Utilitarianism; and Cost-Benefit Analysis

- ***Cost-Benefit Analysis**: In many ways, this is really not an ethics methodology at all, although we should be aware of it. Thus while cost-benefit analysis shares many similarities with Utilitarianism, it is *not* an ethical analysis tool!!*

- ***The goal of an ethical analysis is to determine what the ethical path is. The goal of a cost-benefit analysis is, quite differently, to determine the feasibility of a project based on costs.***

THL2.2 – Utilitarianism; and Cost-Benefit Analysis

- ***Cost-Benefit Analysis**: In cost-benefit analysis, the costs of a project are assessed, as are the benefits. Supposedly, only those projects with the highest ratio of benefits to costs will be implemented.*

- ***Cost-Benefit Analysis**: As with Utilitarianism, there are pitfalls. For example in the building of a dam --- benefits are easy to calculate, but how to calculate "costs" to the environment and the communities displaced? Those who reap the benefits will also be participants in bearing the costs? All the costs on one group, while another group reaps the benefits?*

THL2.2 – Utilitarianism; and Cost-Benefit Analysis

- ***Cost-Benefit Analysis**: When looking at an ethical problem, the first step should be to determine what the right course of action is; and then factor in the financial costs in choosing between ethical alternatives.*

- ***Re-look at the WIPP case, and applying Rule-Utilitarianism + Cost-Benefit Analysis to illustrate…***

Further Reading: *Fleddermann* 4th Ed Section 3.3.3

Possible action	Description	Ethics, and then Cost-Benefit Analysis
I	For nuclear waste transport to WIPP, use whatever available transport without considering adequate safety considerations.	Satisfies purist Act-U ethics; but likely violates Rule-U ethics (at least, and others later). Thus although Cost/Benefit is lowest here, it cannot and should not be considered.
II	Examine available transports, and modify/fortify accordingly to meet all safety requirements.	Ethical. First lowest Cost/Benefit suitable for consideration.
III	Examine available transports, and modify/fortify accordingly to meet all safety requirements. Also provide safety/security escorts.	Second lowest Cost/Benefit suitable for consideration. But difference likely to be minor compared with above, and will satisfy additional ethics classes (of later). More appropriate to consider in short-term.
IV	Examine available transports, and modify/fortify accordingly to meet all safety requirements. Also begin to develop and build roads/highways that do not pass through communities/townships.	Highest Cost/Benefit candidate. Likely satisfies the most number of ethics classes. Appropriate to consider as medium- or longer- term choice.

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Reference Reading: *Fleddermann* 4th Ed Chapter 3

THL2.3 – Duty Ethics & Rights Ethics

- ***Duty Ethics**: In this perspective [a major proponent was Immanuel Kant (1724-1804); a philosopher], ethical actions are those that could be written down on a list of (moral) duties: be honest, don't cause suffering to other people, be fair to others, etc.*

- ***Duty Ethics** : Once one's duties are recognized, the ethically correct moral actions are obvious. In this formulation, ethical acts are the result of proper performance of one's duties.*

THL2.3 – Duty Ethics (Procedure for Usage)

- ***Duty Ethics*: suggested procedure in using this --**

a. ***Identify the actions and/or choices.***

b. ***Identify the parties involved.***

c. ***Identify the duty ethics satisfied (or ignored/violated) by the action or choice.***

d. ***Go through for each party involved.***

Example: Waste Isolation Pilot Plant (WIPP), Carlsbad, NM U.S.A. *[read also Fleddermann Chapter 3]*

WIPP is designed to be a permanent repository for nuclear waste generated in the United States. It consists of a system of tunnels bored into underground salt formations. These salt beds are considered by geologists to be extremely stable, especially to incursion of water which could lead to seepage of the nuclear wastes into ground-water. However, there are many who oppose this facility, principally on the grounds that transportation of the wastes across highways has the potential for accidents that might cause health problems for people living near these routes.

THL2.3 – Duty Ethics (Procedure for Usage)

Action/ Choice	Party #1: U.S. nuclear agency	Party #2: Communities along route
Ethics category --- Duty Ethics		
Develop nuclear technology	Duty ethics is satisfied, as it would be a duty of the U.S. nuclear agency to develop nuclear technology.	From the perspective as an involved community, there is that implicit duty to give support on this.
Develop WIPP to dispose of nuclear waste	Duty ethics is satisfied, as it would be a duty of the U.S. nuclear agency to develop suitable avenues for nuclear waste disposal.	It can be argued that it is not their duty (to encourage WIPP to be developed with transport that passes through their community).
Propose sufficiently modified & fortified transports and/or building of alternate roads.	In tandem with the direct duties above, this aspect as a further duty helps sustain the efforts.	Duty ethics is satisfied if they make such alternative proposals, especially if they had opposed the un-modified WIPP.

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THL2.3 – Duty Ethics & Rights Ethics

- ***Rights Ethics*: largely formulated by John Locke (1632-1704), whose statement that humans have the right to life, liberty, and property was essentially encapsulated by America's founding fathers in their so-named "Declaration of Independence" in 1776.**

- ***Rights Ethics* : this holds that people have fundamental rights that other people have a duty to respect.**

THL2.3 – Rights Ethics (Procedure for Usage)

- ***Rights Ethics*: suggested procedure in using this --**

a. ***Identify the actions and/or choices.***

b. ***Identify the parties involved.***

c. ***Identify the rights ethics satisfied (or ignored/violated) by the action or choice.***

d. ***Go through for each party involved.***

THL2.3 – Rights Ethics (Procedure for Usage)

Action/ Choice	Party #1: U.S. nuclear agency	Party #2: Communities along route
Ethics category --- Rights Ethics		
Develop nuclear technology	Marginally, a case can be made that Rights ethics is satisfied here, for as employees, they have legitimate rights to carry out their paid work in sustenance of their life, liberty and property!!	On this matter, as involved persons, they have that right to state their position on whether this is a conscionable development to support, or not.
Develop WIPP to dispose of nuclear waste	Ditto as above!!	Rights ethics would be violated if no safety considerations were given for nuclear waste transportation.
Propose sufficiently modified & fortified transports and/or building of alternate roads.	Rights ethics is satisfied, for here, in addition to their own rights to continued work and employment, they also looked to health and safety rights of the communities on the route.	Rights ethics would be satisfied if this part was properly carried out.

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Reference Reading: *Fleddermann* 4th Ed Chapter 3

THL2.5 – Virtue Ethics

- ***Virtue Ethics*: here, actions are considered right if they support good character traits (virtues) and wrong if they support bad character traits (vices).**

- ***Virtue Ethics* : Traits such as responsibility, honesty, competence, loyalty… are "virtues". The converse… dishonesty, disloyalty, irresponsibility, incompetence… are "vices".**

- ***Virtue Ethics*: possible usage in engineering career situations via posing questions such as:**

a. *Is this action honest?*

b. *Will this action demonstrate loyalty to my community and/or my employer?*

c. *Have I acted in a responsible fashion?*

THL2.4 – Virtue Ethics

- ***Virtue Ethics*: To use virtue ethics in an analysis of an ethical problem, you should first identify the virtues or vices that are applicable to the situation. Then determine the course of action each of these suggests.**

THL2.4 – Virtue Ethics (Procedure for Usage)

- ***Virtue Ethics*: suggested procedure in using this --**

a. ***Identify the actions and/or choices.***

b. ***Identify the parties involved.***

c. ***Identify the virtue ethics satisfied (or ignored/violated) by the action or choice.***

d. ***Go through for each party involved.***

THL2.4 – Virtue Ethics (Procedure for Usage)

Action/ Choice	Party #1: U.S. nuclear agency	Party #2: Communities along route
Ethics category --- Virtue Ethics		
Develop nuclear technology	Virtue ethics is satisfied here in their responsibility to their employer in carrying out their work.	Certainly one possible responsible possibility would be to maintain awareness of such a development.
Develop WIPP to dispose of nuclear waste	This part is more complicated. Virtue ethics is satisfied here in their responsibility to their employer in carrying out their work. It is also satisfied on honesty if they kept all informed of potential dangers. It is violated if they should mis-inform.	Virtue ethics is satisfied if they conducted responsible discussions with relevant parties.
Propose sufficiently modified & fortified transports and/or building of alternate roads.	Virtue ethics is satisfied if they responsibly took this extra step for safety.	Virtue ethics is satisfied if they also took part for a responsible role.

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Reference Reading: *Fleddermann* 4th Ed Chapter 3

THL2.5 – Which Theory to Use?

- ***Again, the 4 theories will allow us to analyze a problem from different angles.***

- ***Frequently the result will be the same even though the theories are rather different.***

- ***Yet quite often, the different theories will give different answers! (The WIPP example was such a case, on some matters.) What then??...***

THL2.5 – Which Theory to Use?

- ***When it is possible, generally rights and duty ethics should take precedence over utilitarian considerations. Thus, actions that can lead to deaths of individuals should generally be viewed negatively, regardless of what appears to be possible benefits to society. With thorough analysis using all the theories, hopefully a balanced judgement can be formed.***

- ***In Lecture 3, we will study some tools for "Ethical Decision Making"...***

Further Reading: *Fleddermann* 4th Ed Section 3.3.7

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THL2.2 – Utilitarianism (Ethical Theory 1)

- ***Utilitarianism**: this perspective holds that those actions are good that serve to maximize human well-being.*

- ***Utilitarianism**: The emphasis in utilitarianism is not on maximizing the well-being of the individual, but rather on maximizing the well-being of society (or essentially a specific sample/ population given consideration on the issue at hand) as a whole.*

THL2.6 – Summary II (Ethical Theories)

- ***Act Utilitarianism**: This focuses on individual actions rather than on rules. In this "flavor" of utilitarianism, the perspective is taken that individual actions should be judged based on whether the most good was produced in a given situation, and rules should be broken if doing so will lead to the most good. [John Stuart Mill (1806-1873).]*
- ***Act Utilitarianism**: Although described as a "flavor", this is largely similar to the mainstream "Utilitarianism" approach (focusing on "actions"); and leads to the same results mostly. For our module, we will note, and acknowledge, this similarity.*

THL2.6 – Summary II (Ethical Theories)

- ***Rule-Utilitarianism**: This holds that moral rules AND/OR existing civil rules/regulations are most important, while still noting utility as of major importance. E.g. rules such as "do not harm others"; "do not steal". Or relevant civil rules/regulations (note that we include these civil rules too!!) that may be present. Rule utilitarians hold that although adhering to these rules might not always maximize good in a particular situation, overall, adhering to moral and/or civil rules will ultimately lead to the most good.*

THL2.6 – Summary II (Ethical Theories)

- ***Duty Ethics**: In this perspective [a major proponent was Immanuel Kant (1724-1804); a philosopher], ethical actions are those that could be written down on a list of (moral) duties: be honest, don't cause suffering to other people, be fair to others, etc.*

- ***Duty Ethics** : Once one's duties are recognized, the ethically correct moral actions are obvious. In this formulation, ethical acts are the result of proper performance of one's duties.*

THL2.6 – Summary II (Ethical Theories)

- ***Rights Ethics*: largely formulated by John Locke (1632-1704), whose statement that humans have the right to life, liberty, and property was essentially encapsulated by America's founding fathers in their so-named "Declaration of Independence" in 1776.**

- ***Rights Ethics* : this holds that people have fundamental rights that other people have a duty to respect.**

THL2.6 – Summary II (Ethical Theories)

- ***Virtue Ethics*: here, actions are considered right if they support good character traits (virtues) and wrong if they support bad character traits (vices).**

- ***Virtue Ethics* : Traits such as responsibility, honesty, competence, loyalty… are "virtues". The converse… dishonesty, disloyalty, irresponsibility, incompetence… are "vices".**

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TOPIC 2 – Understanding Ethical Problems (Ethical Theories)

- **THL2.1 – Ethical Theories**
- **THL2.2 –Utilitarianism (*Ethical Theory 1*); also Cost-Benefit Analysis**
- **THL2.3 –Duty Ethics (*Ethical Theory 2*) & Rights Ethics (*Ethical Theory 3*)**
- **THL2.4 – Virtue Ethics (*Ethical Theory 4*)**
- **THL2.5 – Which Theory to Use?**
- **THL2.6 - Summary (II)**
- **THL2.7 – additional PRACTICE (!!)**

Reference Reading: *Fleddermann* 4th Ed Chapter 3

Example: The Goodrich A7-D Brake Case *[read also Fleddermann pp 114-116]*

… In June of 1967, Goodrich was awarded the contract to supply the brakes for the A7-D by LTV, the prime contractor for the airplane. The qualifying of this new design was on a very tight schedule imposed by the Air Force. The new brake had to be ready for flight testing by June of 1968, leaving only one year to test and qualify the design. To qualify the design for the flight test, Goodrich had to demonstrate that it performed well in a series of tests specified by the Air Force.

… In the course of writing the report on the A7-D brake tests, Vandivier became aware that some of the test results had been rigged to meet the Air Force's specifications. Vandivier raised his concerns about the report he was writing, feeling that he couldn't write a report based on falsified data. His attempts to write an accurate report were not allowed by management, and Goodrich submitted a report using the jury-rigged data. Based on this report, the brake was qualified for flight testing.

Read also the more detailed related articles, available as a free download from Wikipedia©, which is also in "Assigned Readings" IVLE Folder...

Example II: The Goodrich A7-D Brake Case *[read also Fleddermann pp 114-116]*

A-7 Corsair II	
	
U.S. Navy A-7E from Attack Squadron 46 (VA-46)	
Role	Attack aircraft
Manufacturer	Ling-Temco-Vought
First flight	26 September 1965
Introduction	February 1967

Close-up of a disc brake on a car

A railroad bogie and disc brakes

© Wikipedia

Example: The Goodrich A7-D Brake Case *[read also Fleddermann pp 114-116; full text here]*

This case is one that is very often used as an example in engineering ethics texts, especially to study whistle-blowing. In studying this case, it is important to keep in mind that much of the information presented here is derived from the writing of the whistle-blower. An individual who is deeply embroiled in a controversial situation such as this one will have different insights and viewpoints on the situation than will management or other workers. Little is publicly known about what Goodrich management thought about this case.

In the 1960s, the B.F.Goodrich Corporation was a major defense contractor. One of their main defense-related industries was the production of brakes and wheels for military aircraft. This industry was located in Troy, Ohio. Goodrich had developed a new and innovative design: a four-rotor brake that would be considerably lighter than the more traditional five-rotor design. Any reduction in weight is very attractive in aircraft design, since it allows for an increase in payload weight with no decrease in performance.

Example: The Goodrich A7-D Brake Case *[read also Fleddermann pp 114-116; full text here]*

In June of 1967, Goodrich was awarded the contract to supply the brakes for the A7-D by LTV, the prime contractor for the airplane. The qualifying of this new design was on a very tight schedule imposed by the Air Force. The new brake had to be ready for flight testing by June of 1968, leaving only one year to test and qualify the design. To qualify the design for the flight test, Goodrich had to demonstrate that it performed well in a series of tests specified by the Air Force.

After the design had been completed, John Warren, the design engineer, handed the project over to Searle Lawson, who was just out of engineering school, to perform the testing of the brakes. Warren moved on to other projects within the corporation. Lawson's first task was to test various potential brake-lining materials to see which ones would work best in this new design. This test would be followed by the testing of the chosen linings on full-scale prototypes of the brakes. Unfortunately, after six months of testing, Lawson was unable to find any materials that worked adequately. He became convinced that the design itself was flawed and would never perform according to the Air Force's specifications.

Example: The Goodrich A7-D Brake Case *[read also Fleddermann pp 114-116; full text here]*

Lawson spoke with Warren about these problems. Warren still felt that the brake design was adequate and made several suggestions to Lawson regarding new lining materials that might improve performance. However, none of these suggestions worked and the brakes still failed to pass the initial tests. Lawson then spoke about these problems with Robert Sink, the A7-D project manager at Goodrich. Sink asked Lawson to keep on trying some more linings and expressed confidence that the design would work correctly.

In March of 1968, Goodrich began testing the brake prototypes. After 13 tests, the brake had yet to pass the Air Force's specification for temperature. The only way to get the brakes to pass the test was to set up cooling fans directed at the rotors. Obviously, brakes that required extra cooling would not meet the Air Force's specification. Nevertheless, Sink assured LTV that the brake development was going well.

Example: The Goodrich A7-D Brake Case *[read also Fleddermann pp 114-116; full text here]*

Kermit Vandivier was a technical writer for Goodrich who was responsible for writing test reports and was assigned to write the report for the new A7-D brakes. This report would be an integral part of the Air Force's decision-making process. Vandivier was not an engineer, but he did have experience in writing up the results of this type of test. In the course of writing the report on the A7-D brake tests, Vandivier became aware that some of the test results had been rigged to meet the Air Force's specifications. Vandivier raised his concerns about the report he was writing, feeling that he couldn't write a report based on falsified data. His attempts to write an accurate report were not allowed by management, and Goodrich submitted a report using the jury-rigged data. Based on this report, the brake was qualified for flight testing.

Vandivier was concerned about the safety of the brake and wondered what his legal responsibility might be. He contacted his attorney, who suggested that he and Lawson might be guilty of conspiracy to commit fraud and advised Vandivier to meet with the U.S. Attorney in Dayton. Upon advice of the U.S. Attorney, both Lawson and Vandivier contacted the FBI.

Example: The Goodrich A7-D Brake Case *[read also Fleddermann pp 114-116; full text here]*

In July, the Air Force asked Goodrich to supply the raw test data for review. This request led to efforts at Goodrich to control the damage that would ensue when the real nature of the tests became known. Not being satisfied with the report presented to it, the Air Force refused to accept the brake. Knowing that the four-rotor brake was not going to work, Goodrich began an effort to design a five-rotor replacement. Vandivier continued meeting with the FBI and supplied FBI agents with Goodrich documents related to the A7-D brake tests.

Apparently, Lawson had impressed LTV because after the flight testing was over, LTV offered him a job. Lawson accepted and left Goodrich on October 11, 1968. With the only other person who really knew about the test procedures gone, Vandivier also decided to resign from Goodrich. In his letter of resignation, he included a series of accusations of wrongdoing against Goodrich regarding the brake tests. Vandivier went to work for the *Troy Daily News*, the local newspaper.

Example: The Goodrich A7-D Brake Case *[read also Fleddermann pp 114-116; full text here]*

At the *Daily News*, Vandivier told his editor about the situation at Goodrich. From there, the story made its way to Washington, where it came to the attention of Senator William Proxmire, among others. In May of 1969, Proxmire requested the General Accounting Office (GAO) review the issue of the qualification testing of the A7-D brakes. The GAO investigation led to an August 1969 Senate hearing chaired by Proxmire. By then, the new five-rotor brake had been tested and qualified for use on the A7-D. At the hearing, Vandivier's concerns and the GAO findings were publicly aired. The GAO report confirmed Vandivier's statements about testing discrepancies, though the report also showed that there was no additional cost to the government in obtaining a working brake and that the brake problems didn't cause any substantial delays in the overall A7-D program.

No official action was taken against Goodrich as a result of this incident, and there does not seem to have been any negative impact on the careers of those at Goodrich involved in the A7-D project. Lawson went on to a successful career at LTV. Vandivier later wrote a chapter of a book and an article in Harper's magazine detailing his version of the story.

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Action/ Choice	Party #1: Goodrich management	Party #2: Lawson and Vandivier	Party #3: USAF and Public
Ethics category ---			
Goodrich management modifying test conditions and results			
Lawson & Vandivier contacting the FBI			

Action/ Choice	Party #1: Goodrich management	Party #2: Lawson and Vandivier	Party #3: USAF, LTV and Public
Ethics category --- Act-Utilitarian			
Goodrich management modifying test conditions and results	Goodrich management can argue that it is satisfied because the act preserves the business of the company. But because this approach relies on knowing the "overall utility", it is contentious. Discuss more…	Lawson & Vandivier, being employees, can have the case put to them also that Act-Utility is satisfied.	Here, "utility" would be getting the A7-D flying successfully. Thus utility is violated, as indeed Act-Utility as consequence.
Ethics category --- Rule-Utilitarian			
Goodrich management modifying test conditions and results	If the company does not have rules not permitting this, again they can argue that it is satisfied as it is their "practice". It is not satisfied if there are explicit company rules not permitting this.	Lawson & Vandivier, being employees, likely have to follow the company's analysis here.	At this level, rules of government and corporations comes into play. Clearly Rule-Utility is violated.

Action/ Choice	Party #1: Goodrich management	Party #2: Lawson and Vandivier	Party #3: USAF, LTV and Public
Ethics category --- Duty Ethics			
Goodrich management modifying test conditions and results	Goodrich violated the engineering duty of developing a brake meeting the specifications.	Goodrich violated the duty of being a responsible & honest employer to them	Goodrich violated the duty of being a responsible & honest company. Also violated the duty of supplying a safe & proper brake for the A7-D.
Ethics category --- Rights Ethics			
Goodrich management modifying test conditions and results	Goodrich could argue that they have the right to send these interim reports to keep the project going, since they were going to develop a successful alternative 5-drum brake anyway. But this is a weak argument for ethics…	Goodrich violated the rights of them to have an honest employer.	Goodrich violated the rights of USAF, LTV and public to receive truthful reports. Also violated the rights of receiving a safe & proper A7-D.

Action/ Choice	Party #1: Goodrich management	Party #2: Lawson and Vandivier	Party #3: USAF, LTV and Public
Ethics category --- Virtue Ethics			
Goodrich management modifying test conditions and results	Goodrich violated the virtue ethics of responsibility & honesty. They could argue that they satisfied the virtue ethics of loyalty to ensuring the company's business continue. (This is always likely, & needs to be watched against.)	Goodrich violated the virtue ethics of being a responsible & honest employer to them	Goodrich violated the virtue ethics of being a responsible & honest company.

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Action/ Choice	Party #1: Goodrich management	Party #2: Lawson and Vandivier	Party #3: USAF, LTV and Public
Ethics category --- Act-Utilitarian			
Lawson & Vandivier contacting the FBI	Goodrich management can argue that it is not satisfied because this act de-rails the business of the company.	Lawson & Vandivier can argue that Act-Utility is satisfied, because this act of revealing would lead to development of a safe and proper A7-D brake.	Here, "utility" would be getting the A7-D flying successfully. Thus utility is satisfied, as indeed Act-Utility as consequence.
Ethics category --- Rule-Utilitarian			
Lawson & Vandivier contacting the FBI	If the company have rules not permitting this, then it is not satisfied as far as they are concerned.	Lawson & Vandivier violated the rule as far as the company is concerned. They satisfied the rule at the US level since they followed the legal advice given by the US Attorney.	At this level, rules of government and corporations comes into play. Clearly Rule-Utility is satisfied.

Action/ Choice	Party #1: Goodrich management	Party #2: Lawson and Vandivier	Party #3: USAF, LTV and Public
Ethics category --- Duty Ethics			
Lawson & Vandivier contacting the FBI	Goodrich violated the duty of not noting the untruthful report informed previously.	They satisfied the duty of being responsible & honest engineering employees. Moreover, they had first brought this to the company's attention without success.	Lawson & Vandivier satisfied the duty of being responsible & honest citizens. Also satisfied the duty of helping to ensure a safe A7-D program.
Ethics category --- Rights Ethics			
Lawson & Vandivier contacting the FBI	Goodrich could argue that their rights are violated, because this is an internal problem, which they will solve finally. But again, this is a weak argument for ethics, though it will likely always be made…	They satisfied their rights to tell the truth. Again moreover, they had first brought this to the company's attention without success.	They satisfied the rights of USAF, LTV and public to receive truthful reports. Also satisfied the rights of all here of receiving a safe & proper A7-D.

Action/ Choice	Party #1: Goodrich management	Party #2: Lawson and Vandivier	Party #3: USAF, LTV and Public
Ethics category --- Virtue Ethics			
Lawson & Vandivier contacting the FBI	Goodrich violated the virtue ethics of responsibility & honesty to not note the untruthful report highlighted by Lawson & Vandivier. They could argue that they satisfied the virtue ethics of loyalty to ensuring the company's business continue, because they were developing an alternative 5-drum brake anyway.	They satisfied the virtue ethics of being responsible & honest engineering employees. They also satisfied the virtue ethics of being loyal to the country. They, though, can be considered to have violated the virtue ethics of being loyal to the company. (Thus, again note the earlier notes that ethics analysis must take all facets…)	Lawson & Vandivier satisfied the virtue ethics of being responsible & honest & loyal to the country. They also satisfied the virtue ethics of being responsible & honest to ensure a safe A7-D program.

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