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SYSTEM SAFETY AND THE TECHNICAL AUTHOR

TCUK16 WORKSHOP

TUESDAY 13TH SEPTEMBER 2016

DELIVERED BY GRAEME DOWDELL FISTC

System safety / H & S relationship

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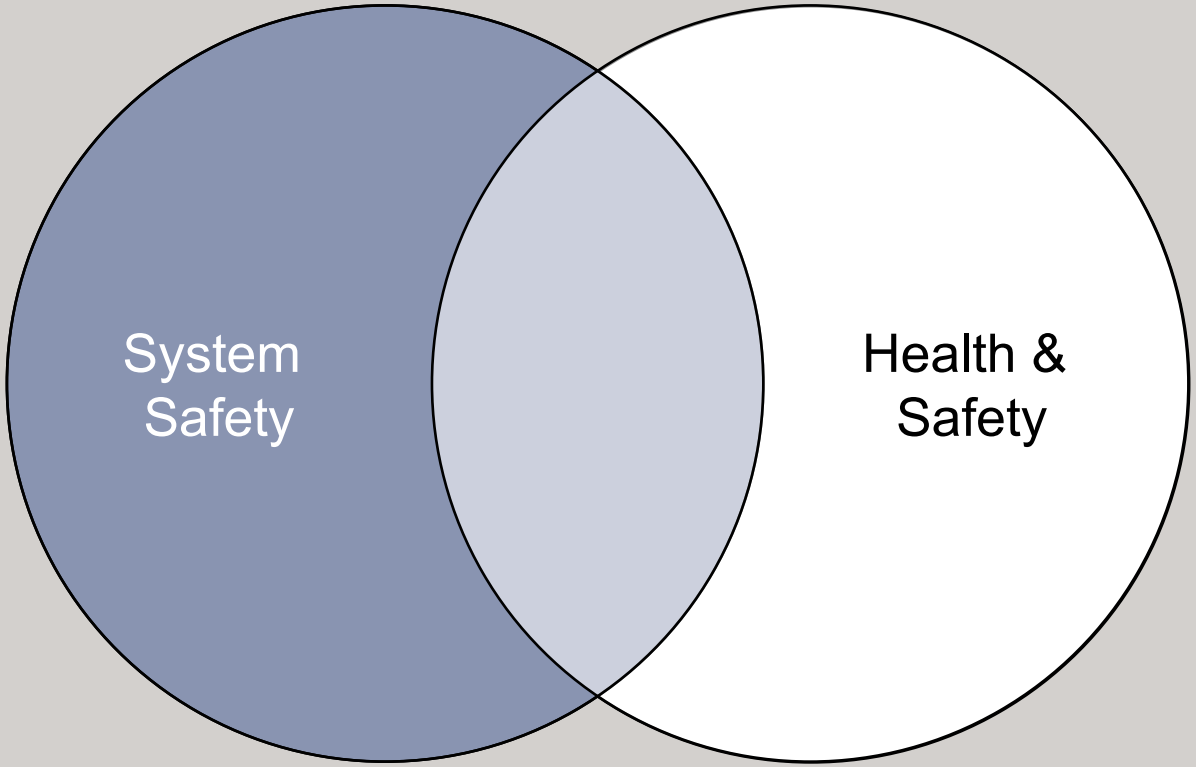

System safety workflow

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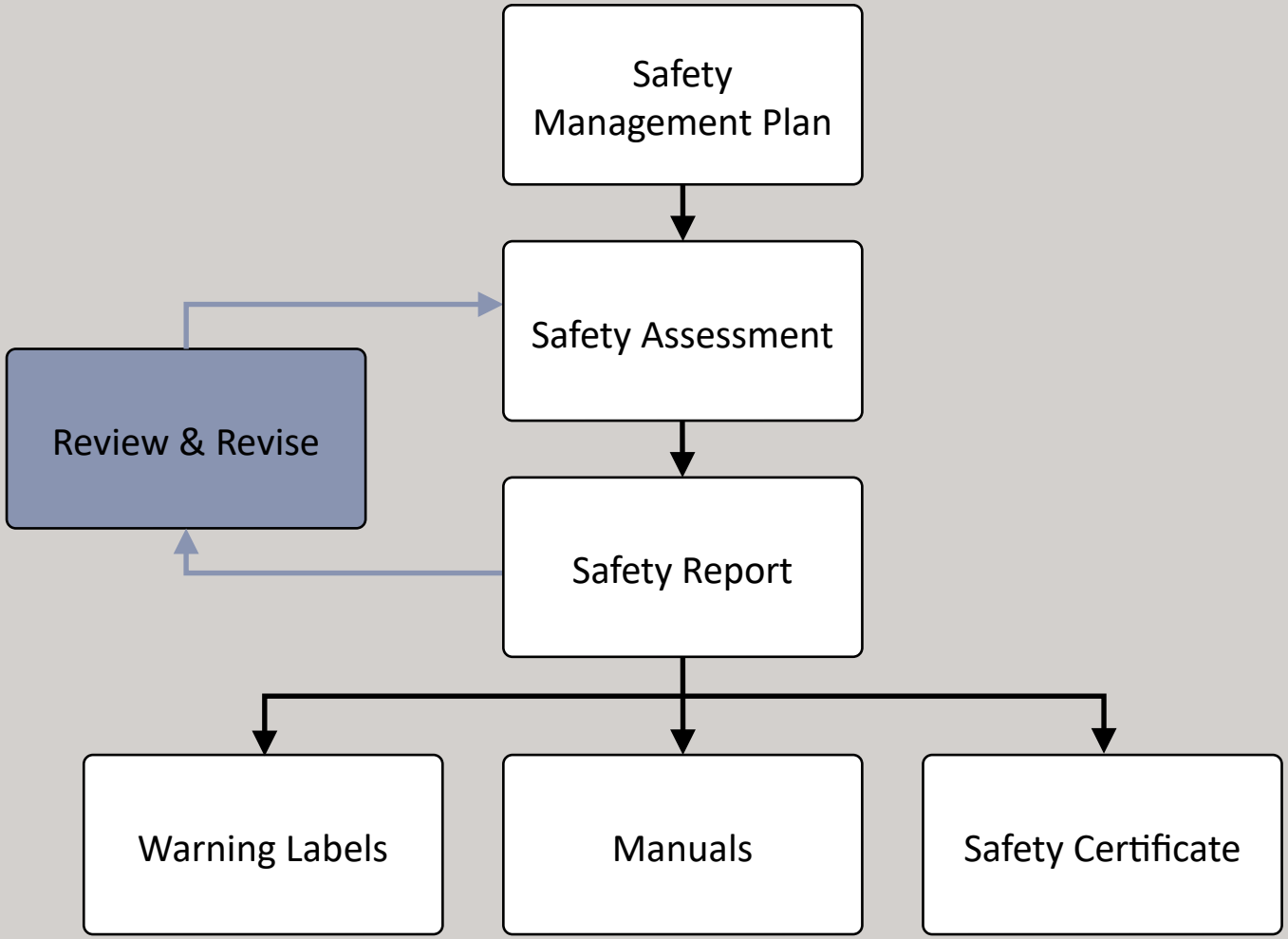

A Technical Author can contribute to:

- Safety Management Plan
- Safety Assessment
- Safety Report
- Review and revision of Safety Report.
- Manuals (of course - that's what we do !)
- Warning labels
- Possibly produce a good looking safety certificate
  (but DO NOT sign it !)

Examples of Safety Reports

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- Safety Case (Def Stan 00-56)
- Safety Assessment Report (MIL STAN 882)
- “Technical File” to support CE Marking.
- Safety Integrity Level (SIL) report.

Each has its own requirements but all aim to demonstrate that safety risks have been reduced to as low practicable.

What do we mean by “Safe”

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Activity	Average Risk of Death
Maternal death in pregnancy (direct or indirect causes)	1 in 8,200 maternities
Surgical anaesthesia	1 in 185,000 operations
Scuba diving	1 in 200,000 dives
Fairground rides	1 in 834,000,000 rides
Rock climbing	1 in 320,000 climbs
Canoeing	1 in 750,000 outings
Hang-gliding	1 in 116,000 flights
Rail travel accidents	1 in 43,000,000 passenger journeys
Aircraft accidents	1 in 125,000,000 passenger journeys

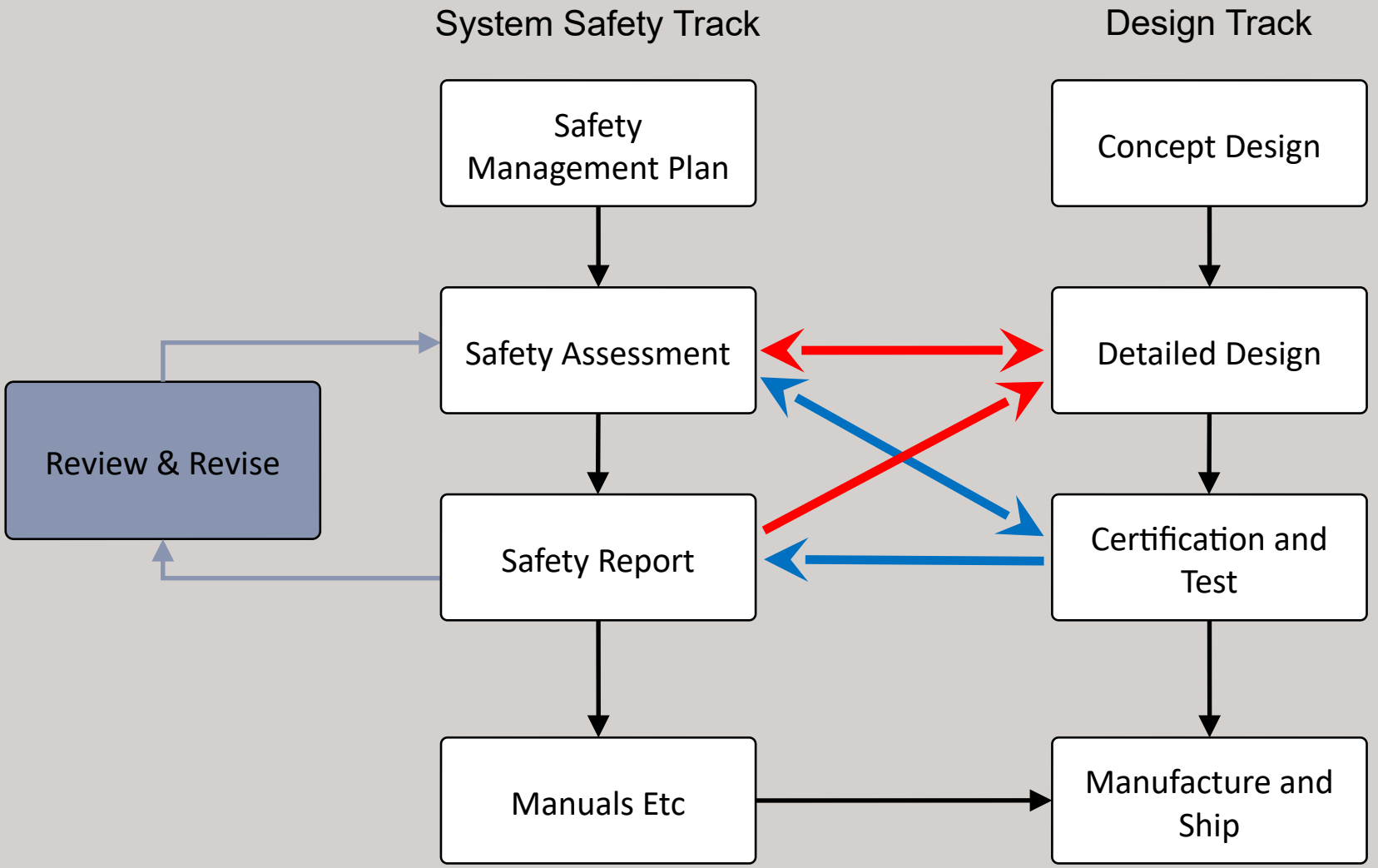
“Safety” is not an absolute.

Almost all human activities involve a degree of Risk of injury, or death, or damage/financial loss.

When we say something is “Safe”, what we really mean is:

The Risk of death, injury, or damage is acceptably low, and can therefore be tolerated.

Relationship between system safety and design/manufacture



How do I “fit in”

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- As Technical Authors we are already part of the process. We write the manuals.

- If the Safety Report makes recommendations for procedures, instructions, Warnings, Cautions, etc., to go in the manuals, we have a duty to make sure it happens.

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- It is a legal requirement in the UK (and many other countries) that if a Warning label is attached to a piece of equipment, there MUST be a safety warning about that hazard included in the appropriate manual.

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- It is a legal requirement in the UK (and many other countries) that if a Warning label is attached to a piece of equipment, there MUST be a safety warning about that hazard included in the appropriate manual.
- We can bring our documentation, organisation and management skills to other parts of the process.

Who writes the Safety Report?

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Possible contenders for writing the safety report:

- Senior Management.
- Design/development/engineering/technical department.
- Health and Safety.
- Technical Author.
- Call in a Consultant.

Who will do it best?

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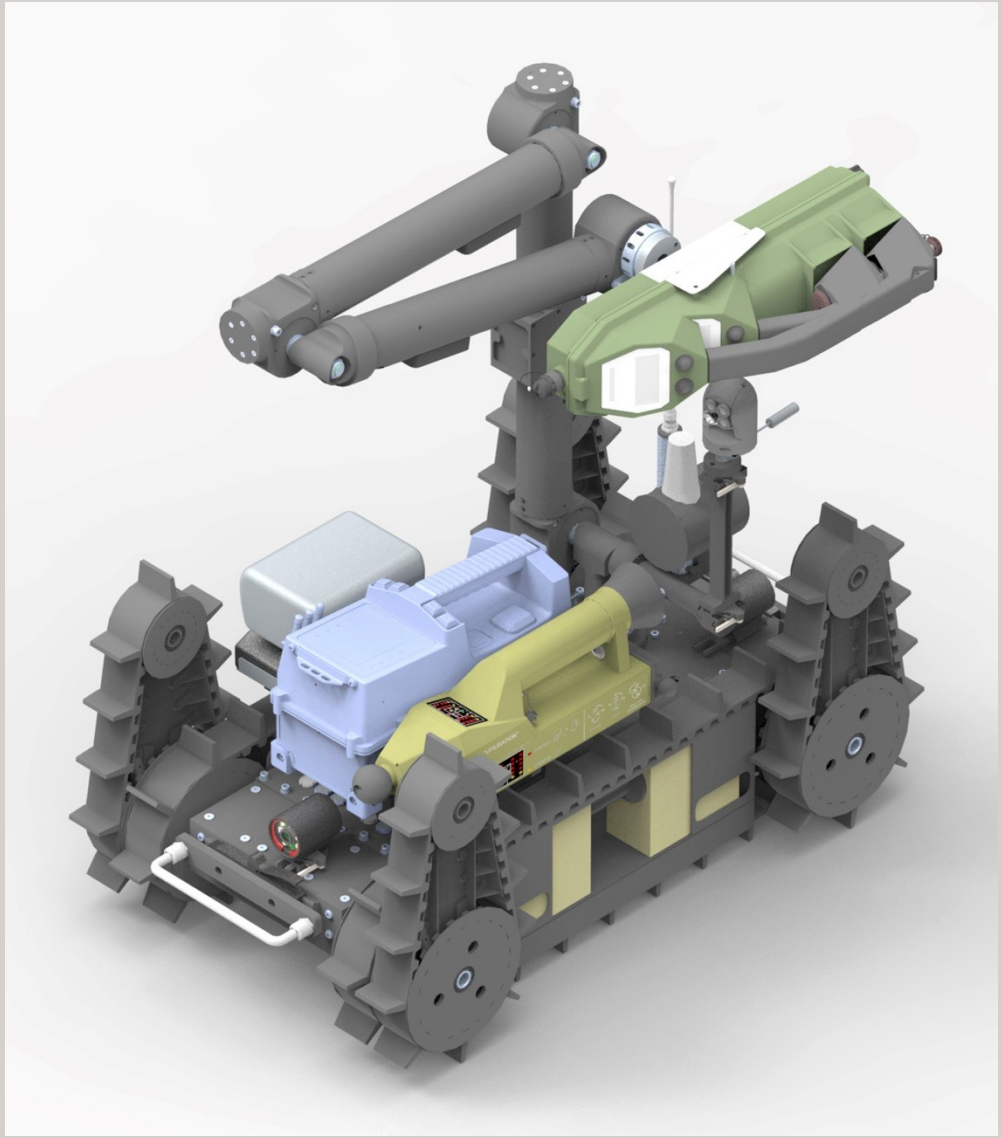
Who is best placed to write the safety report:

- Senior Management.
- Design/development/engineering/technical department.
- Health and Safety.
- Technical Author.
- Call in a Consultant.

In my opinion the best solution is that all the above have something to contribute.

UGV



Operator Control Unit

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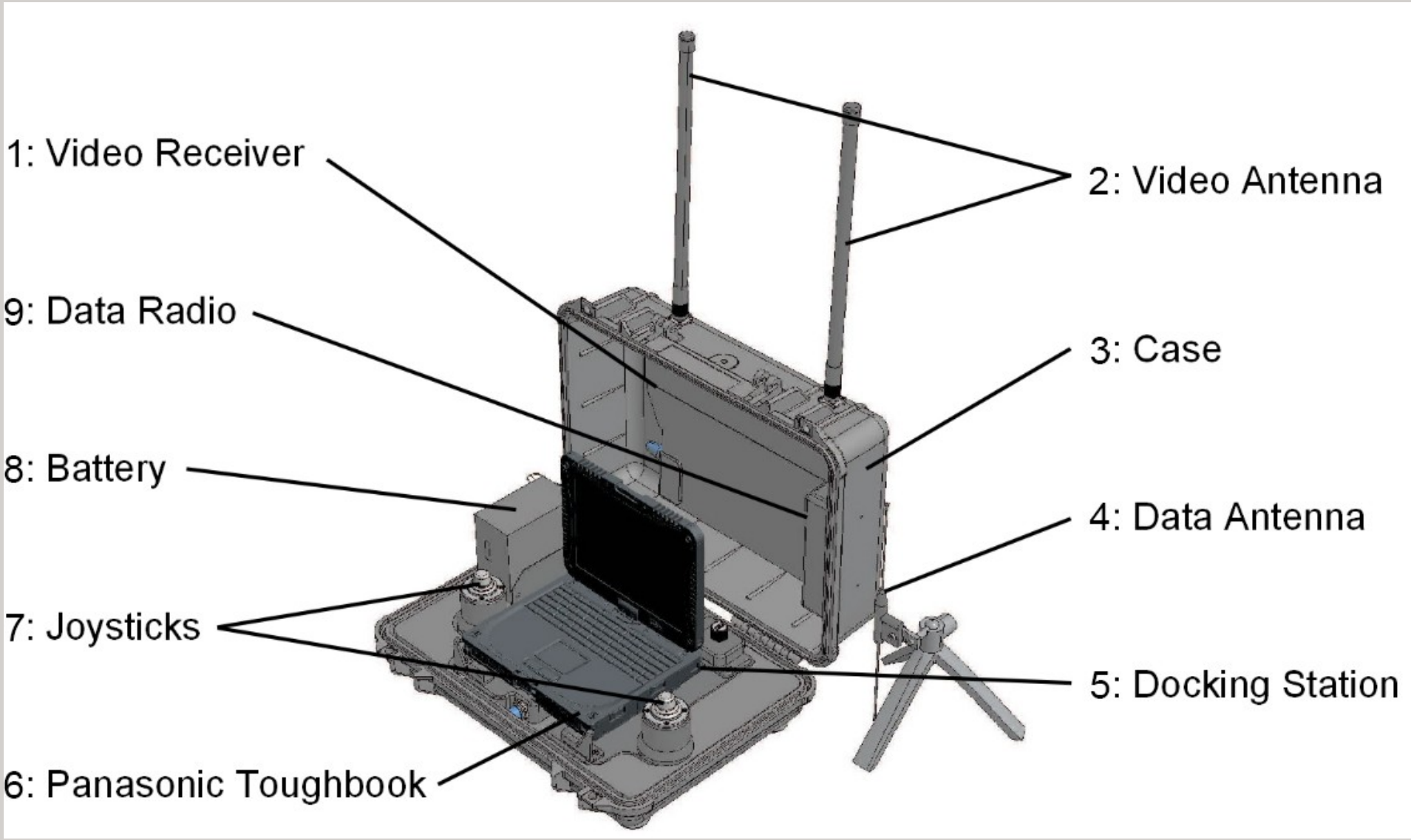

Sc0pe of safety analysis

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It is vital that at the start of the system safety process, the scope of the safety analysis and documentation is defined.

In particular the boundaries of the equipment or product to be analysed must be identified and documented.

You cannot be expected to perform a safety analysis on items that you do not have technical knowledge of.

Try to identify items on, or associated with, the UGV that should NOT be included in the safety analysis.

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Excluded items should be identified in the Safety Management Plan and Safety Report.

Good practice to direct the reader to where they can find safety information for excluded items.

Hazard Accident Combination

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Safety Analysts often refer to Hazard Accident Combination (HAC).

- A Hazard is something that can cause an accident.
- Some Hazards require an Event to occur to trigger an Accident or Incident.
- An Accident is an unintended event or sequence of events that results in harm.
- An Incident is an unintended event or sequence of events that could have resulted in harm, but did not.

A HAC is the sequence whereby a Hazard becomes an Accident. Note that:

- A Hazard may cause more than one type of Accident.
- An Accident may be caused by multiple Hazards.

Hazard identification

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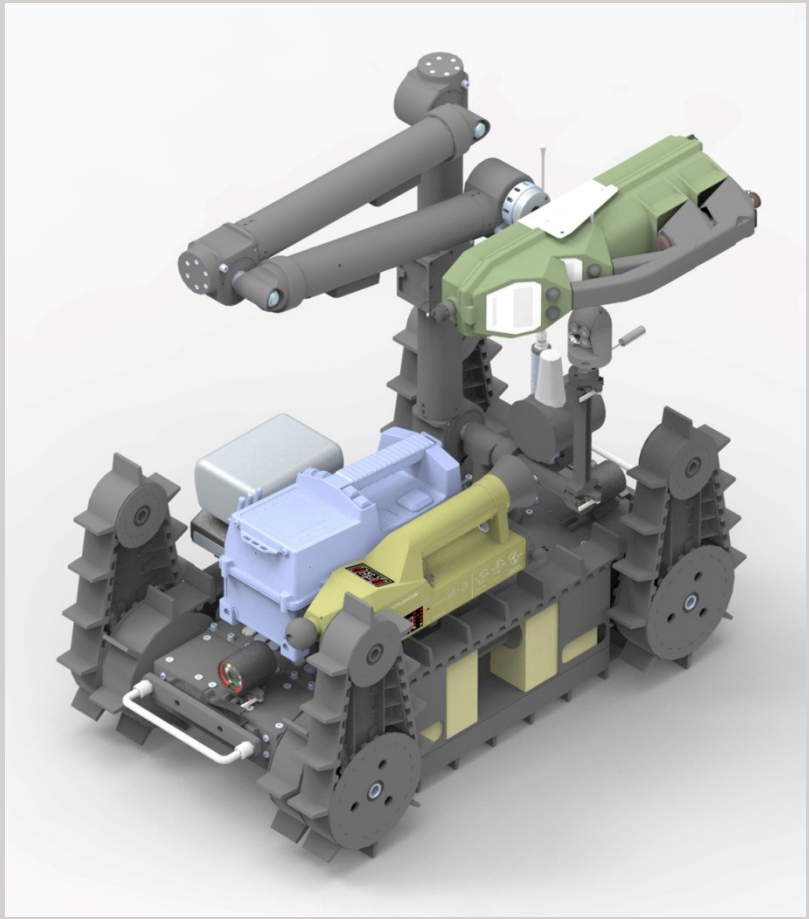
When identifying Hazards consider:

- Possible harm to the operators.
- Possible harm to other people.
- P0ssible damage to the equipment.
- Other potential damage to property.
- Potential damage to the environment.

Hazard Identification



Try to identify some Hazards on the UGV and the Accidents they can cause.

System Context Diagram

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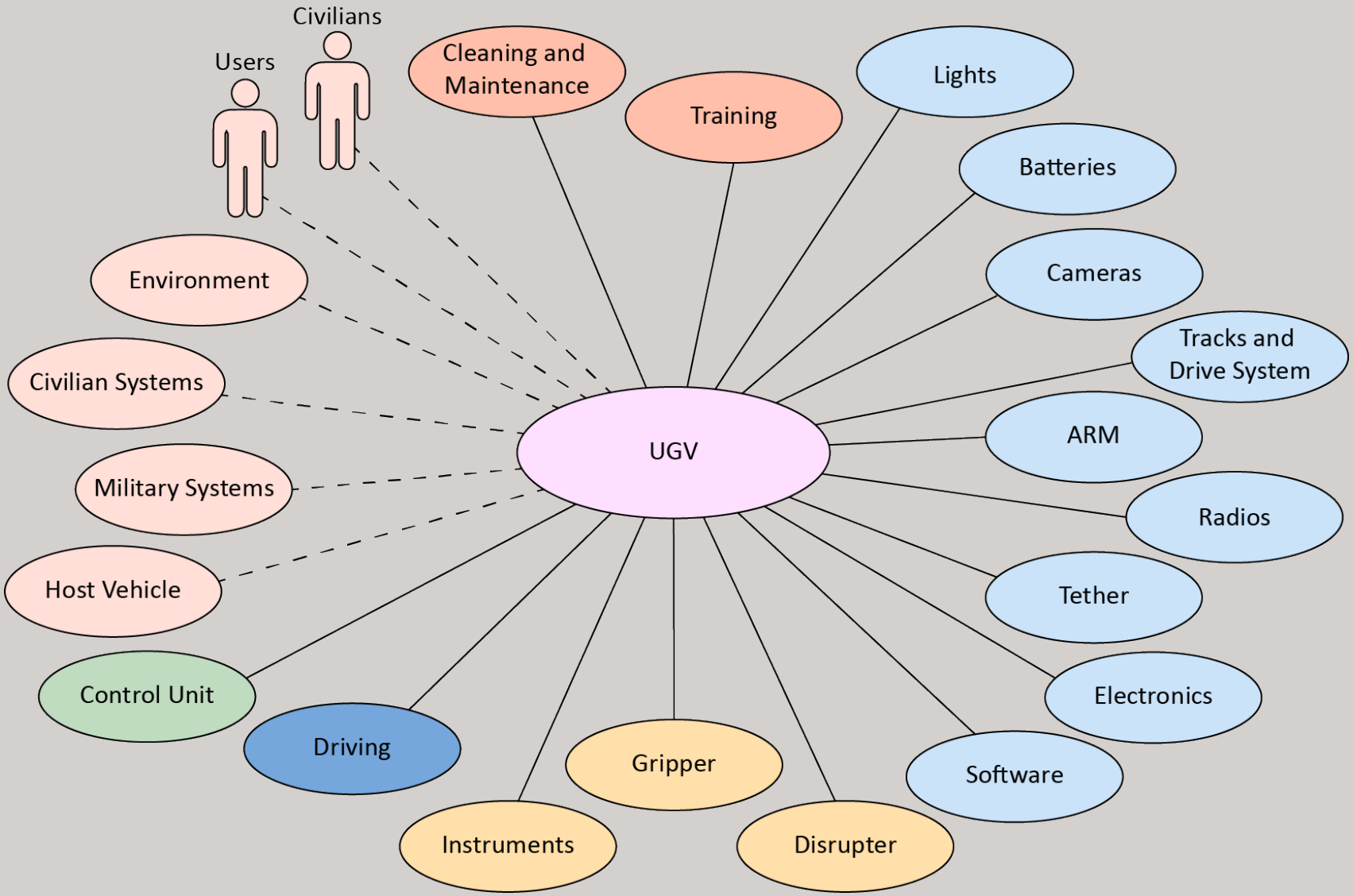

Safety Risk

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Safety Risk is:

THE SEVERITY OF THE ACCIDENT

X

THE PROBABILITY OF THE ACCIDENT HAPPENING

Severity – Personal Injury

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Consequence	Severity Category	Description
Catastrophic	1	Death
Critical	2	Loss of limb or injuries which require qualified treatment and/or an injury that will leave a permanent mark.
Marginal	3	Less serious personal injury i.e. injuries which can be treated by staff at hospital, welfare centre or the like. The injury does not leave a permanent mark.
Negligible	4	Injuries which can be treated by personnel locally trained in nursing. The injury does not cause any inability to work after treatment.

Severity – Financial Loss

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Consequence	Severity Category	Description
Catastrophic	1	Monetary loss equal to or exceeding €10M.
Critical	2	Monetary loss equal to or exceeding €1M but less than €10M.
Marginal	3	Monetary loss equal to or exceeding €100,000 but less than €1M.
Negligible	4	Monetary loss less than €100,000.

Severity – Environmental Damage

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Consequence	Severity Category	Description
Catastrophic	1	Large-scale irreversible damage involving large scale pollution and/or destruction of habitat and extinction of local population of species.
Critical	2	Large-scale reversible damage involving medium scale pollution and threat to natural habitat and/or wildlife. Short-term loss of habitat and reduction in local population of species.
Marginal	3	Moderate environmental incident involving localised pollution or small-scale reversible damage with a marginal threat to habitat or local population of species.
Negligible	4	Minor reversible environmental damage not violating law or regulation. Minor or limited threat to habitat or local population of species.

Frequency Classifications (Probability)

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Frequency Classification	Occurrence during life of an individual equipment
Frequent	The event is estimated to be able to occur frequently during the remaining lifetime of the equipment (on average more often than 1 time per year).
Probable	The event is estimated to be able to occur frequently during the remaining lifetime of the equipment (on average with an interval of 1 to 5 years).
Occasional	The event is estimated to be able to occur infrequently during the remaining lifetime of the equipment (on average with an interval of 5 to 75 years).
Remote	It is possible that the event will occur (on average with an interval of 75 to 1000 years).
Improbable	It can be assumed that the event will not occur (on average more rarely than1 time per 1000 years).

Risk Matrix

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Consequence	Frequent	Probable	Occasional	Remote	Improbable
1. Catastrophic	Intolerable risk	Intolerable risk	Intolerable risk	Limited tolerable risk	Tolerable
2. Critical	Intolerable risk	Intolerable risk	Limited tolerable risk	Tolerable	Tolerable
3. Marginal	Intolerable risk	Limited tolerable risk	Tolerable	Tolerable	Tolerable
4. Negligible	Limited tolerable risk	Tolerable	Tolerable	Tolerable	Tolerable

Controls

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A Control is a measure put in place to reduce a Safety Risk.

A Control can:

- Remove the hazard.
- Prevent the Accident happening.
- Reduce the probability of the Accident happening.
- Reduce the consequence of the Accident happening.

Application of Controls

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When applying Controls:

1. First try to eliminate the Hazard.
2. Apply physical guards, interlocks, etc., to prevent the Hazard causing an Accident.
3. Reduce the frequency and severity of the Hazard and/or Accident.
4. Use procedures, training, warning labels.

Revisit your Hazard and see how the Controls have reduced the Safety Risk.

What do we bring to the party?

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- Our writing skills.
- Our ability to organise information.
- We can act as a “User representative”.
- Our ability to get information out of people.
- Our understanding of the product.

How does it affect us?

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The results of the System Safety study are critical in determining the Warnings, Cautions, and procedures in the manuals.

Any Questions

THE END

Thank you