Schweizerische Eidgenossenschaft
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Federal Office of Civil Aviation FOCA
RPAS Working Group

RPAS in Switzerland Rules and Integration

Montreal, 24. March 2015
Workshop 6, National Regulation

Our starting point

Ordinance on Special Category Aircraft

- Applies to hang gliders, kites, paragliders, tethered balloons, parachutes and unmanned aircraft.
- Not in the register
- Airworthiness is not checked
- No noise certificates
- No authorization required for commercial flights
- **No distinction between RPAS and Model Aircrafts**

Therefore:

- **No legal basis to issue a TC**
- No requirements for operators and pilots

Ordinance on Special Category Aircraft

- ✓ **No distinction between RPAS and Model Aircrafts**
- ✓ **No authorization required for commercial flights**

No operational limitations as long:

- Below 30kg (historically)
- Within direct visual contact (VLOS) (1998)
- Not within a distance of less than 100 meters around crowds (outdoors) (2014)
- > 5km Distance to civil & military airports/aerodromes
- < 150m AGL within a CTR

Authorisation foreseen and possible if not in the above framework

Insurance required

Within this framework no additional risk mitigation is required

Two main Groups unmanned aircrafts OPS

- Below 30kg
- Within direct visual contact
- Not within 100m around a crowd
- > 5km away from airports
- <150m AGL within CTR

Anything else

No additional risk mitigation required

Additional risk mitigation required

No authorisation required

Authorisation required

Certification as a new Request

• Below 30kg • Within direct visual contact • Not within 100m around a crowd • > 5km away from airports • <150m AGL within CTR	Anything else	Certification
No additional risk mitigation required	Additional risk mitigation required	No additional risk mitigation required
No authorisation required	**Authorisation required**	**Operator Certificate**

Resulting Concept in Switzerland

No additional risk mitigation

- (Below 30kg)
- Within direct visual contact (VLOS)
- Not within a distance of less than 100 meters around crowds (outdoors)
- > 5km Distance to civil & military airports/aerodromes
- < 150m AGL within a CTR
- Commercial ops allowed

No Authorisation

Additional risk mitigation

Anyth

No additional risk mitigation

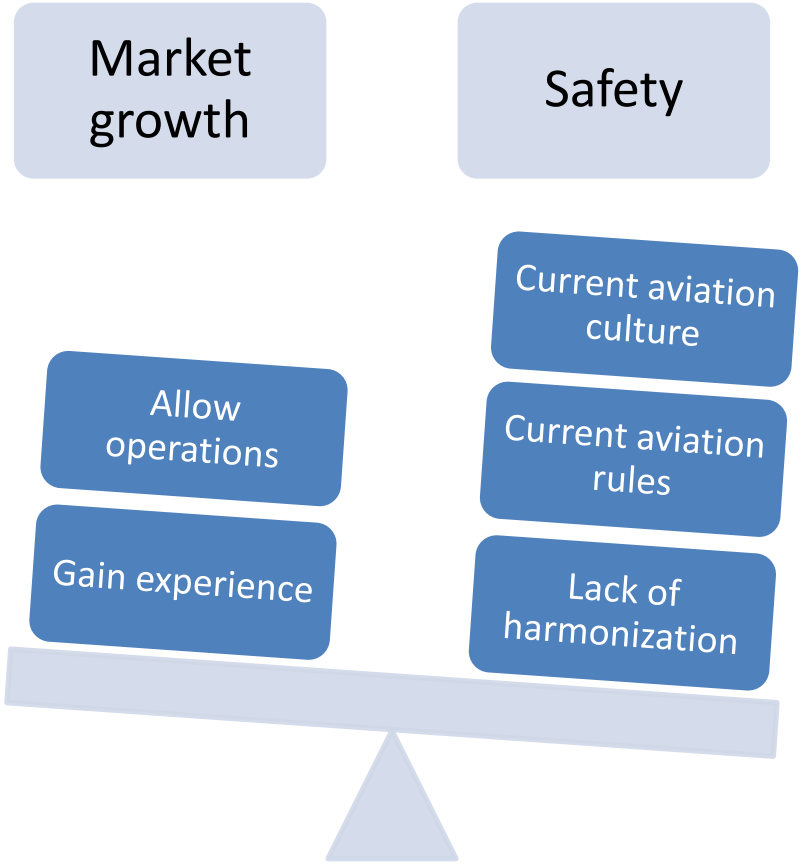
Certification)

- Operation inside the approved RPAS design envelope.
- Operation is part of the approved Operation Certificate scope.
- Operation is part of the approved crew qualification

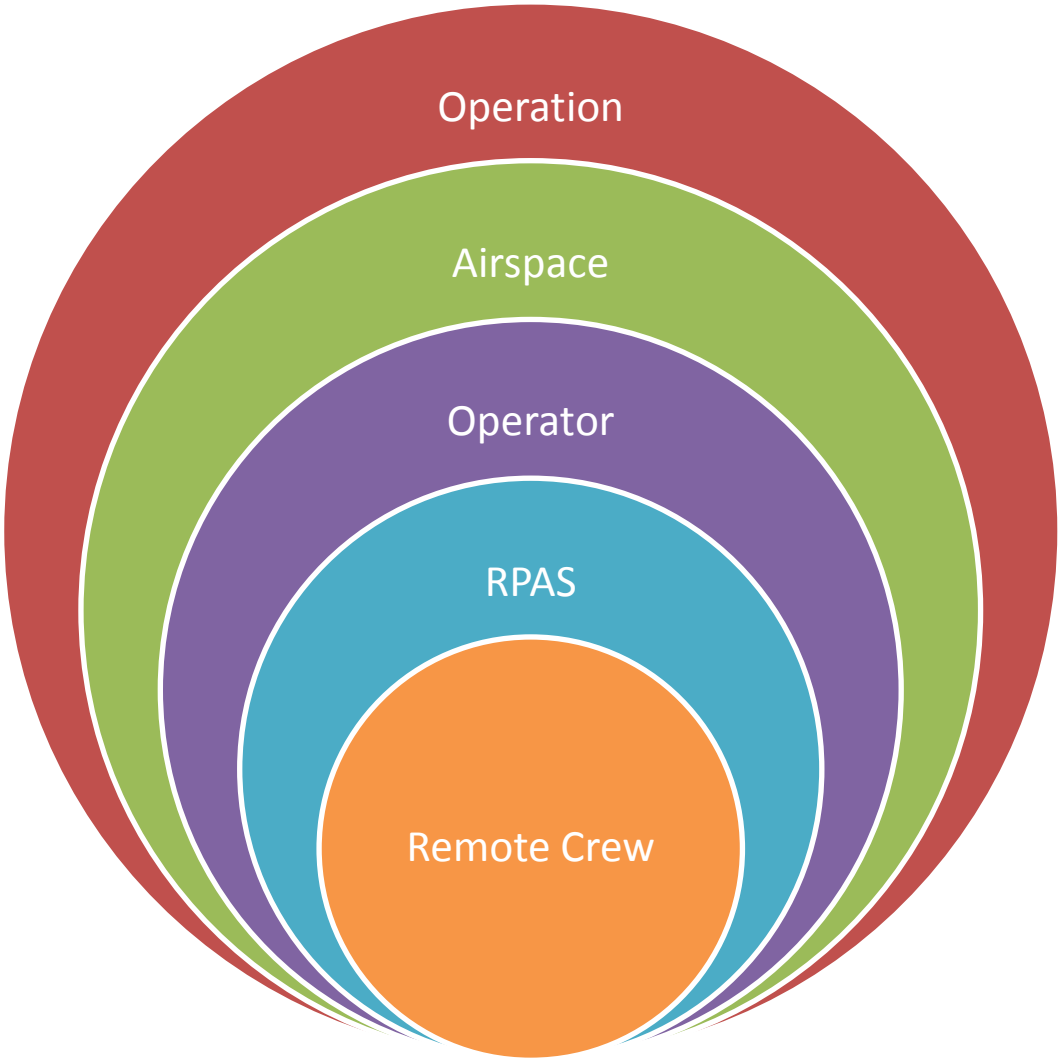
Specifics of category «?»

- Wide variety of operations, very difficult to categorize
- Wide range of expertise among applicants
  - Small start-ups (no money, no time, great people)
  - Photographers with NO aviation experience
  - Meteorologists with NO aviation experience
  - Military
- Wide range of RPAS
  - COTS (e.g. Phantom S-800)
  - Amateur built
  - Custom built for specific operation
- Huge economic potential if allowed to grow

A balancing act…



Back to basics - Safety of RPAS

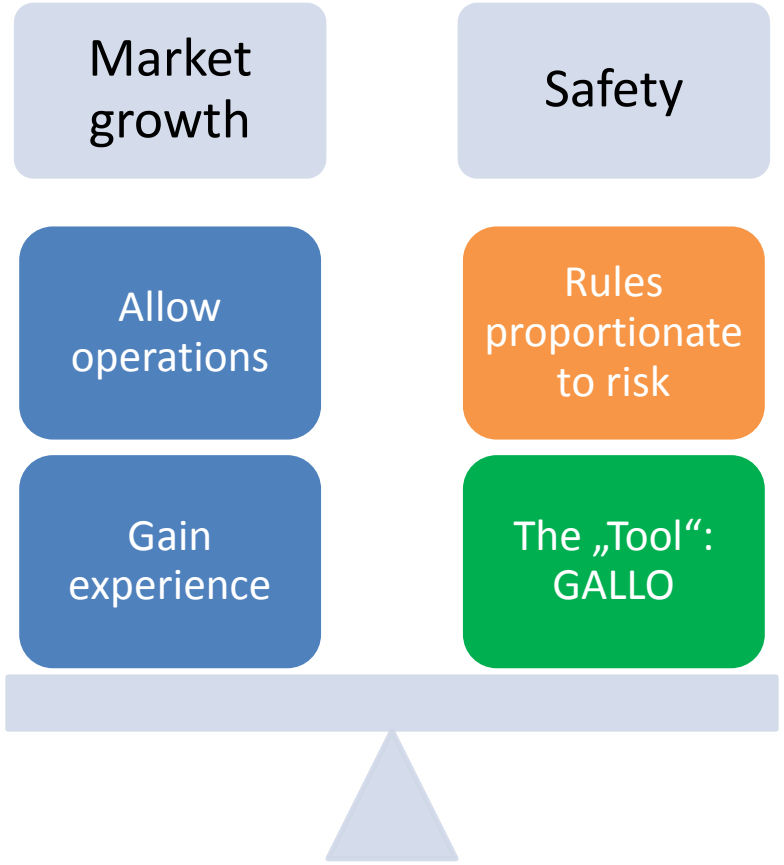


Where does the risk come from….

- A RPAS is normally not a danger by itself. It is the operation in which the RPAS takes part, which can create a risk.
- The same RPAS over Montreal is not the same risk as over the Northpole.
- Thus, the most effective RPAS regulation will use a **risk-based approach** to categorize the operation instead of the RPAS.

- It is the Authority's task to apply **"Safety Barriers"** to mitigate the risk coming from the operation.

A balancing act…



A change in strategy – out of comfort zone!

A change in culture, from atomistic…

.. to holistic!

Total Hazard and Risk Assessment

- A tool to determine, if the risks are acceptable and what safety barriers/mitigations need to be established.
- These safety barriers can affect the RPAS and the operational environment.
- **Therefore, detailed information are required about**:
  - Operator
  - Operation
  - RPAS incl. Datalink & QMS (configuration control, change management, CAW, etc.)
  - Proposed Limitations

- The advantage of a Total Hazard and Risk Assessment as above is, that it can be used as well, to determine the applicable certification basis for a product (CS-LURS/LUAS.1).

Safety Barriers…

Safety Barriers in manned aviation

- Certification (Design & Production, Ops, FCL, Aerodromes etc.)
- Defined envelope of approved operation

Safety Barriers out of the rules

- Defined envelope, where no active Authority involvement is required
- In Switzerland: VLOS only, 100m away from people crowds, (max. 30kg)

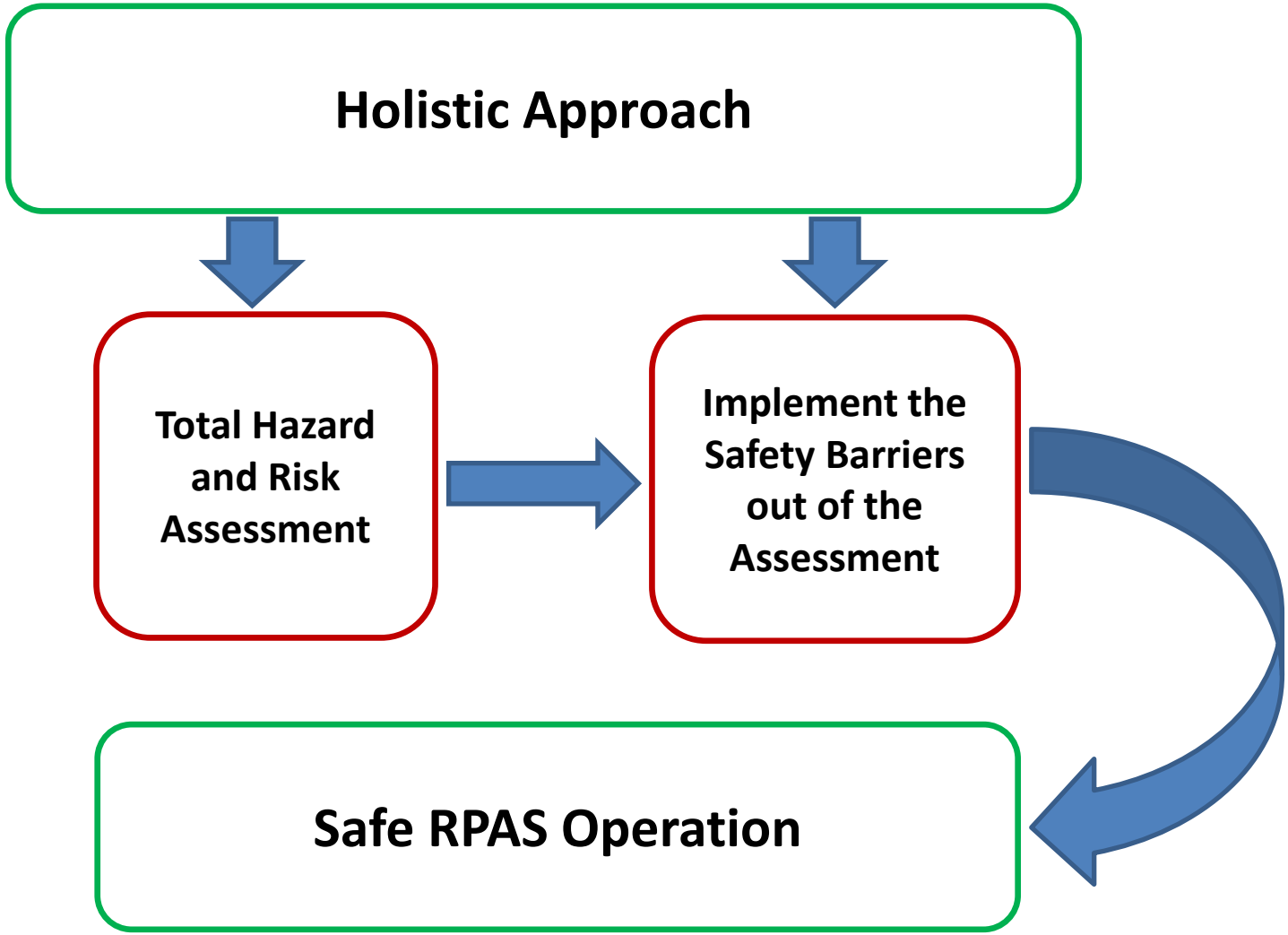
➢ «Open envelope»

Additional Safety Barriers due to:

- The intended operation being outside of the approved envelope
- The intended operation being outside the “Open envelope”

✓ Airspace, Ground, Operation, additional technical requirements

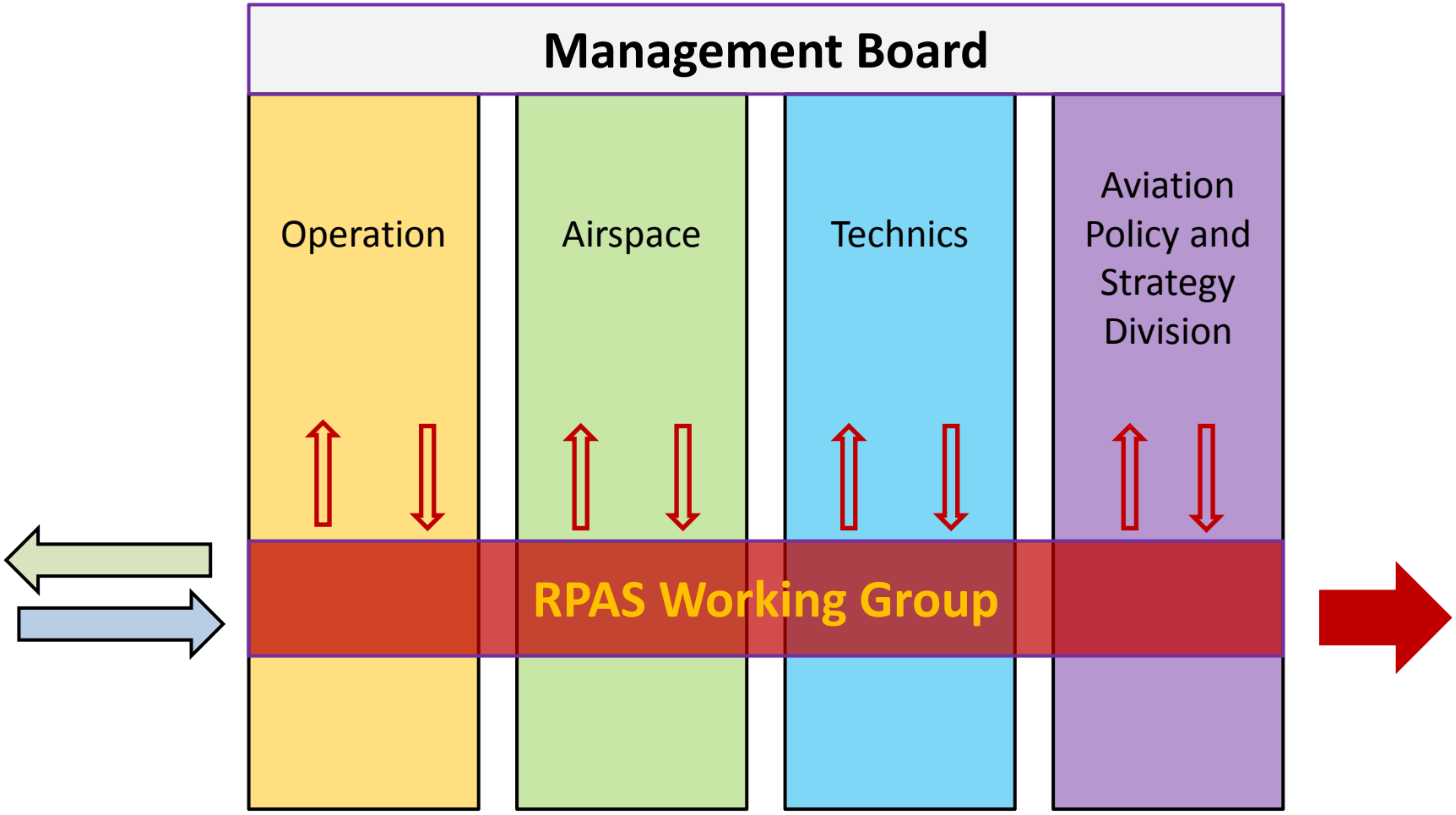
Resulting 3 Safety Modules



Type of approvals

- VLOS ops above 30kg up to 150kg (**simplified process**)
- VLOS ops directly over crowds (OVER)
- VLOS ops in close proximity of crowds (<100m, SIDE)
- VLOS tethered (**simplified process**)
- BLOS (0-150kg)
- VLOS & BLOS >150kg for Annex II (Basic Regulation)

Swiss FOCA & RPAS Working Group



Back to basics - Safety of RPAS

Safety Issues

- Serious or fatal injuries to people on the ground
- Damage to critical infrastructure on ground
- Serious or fatal injuries to people in the air (i.e. Mid-air Collision)

Generated by the RPAS by:

- Loss of control → ground impact
- Loss of control → fly away (will eventually result in ground impact)

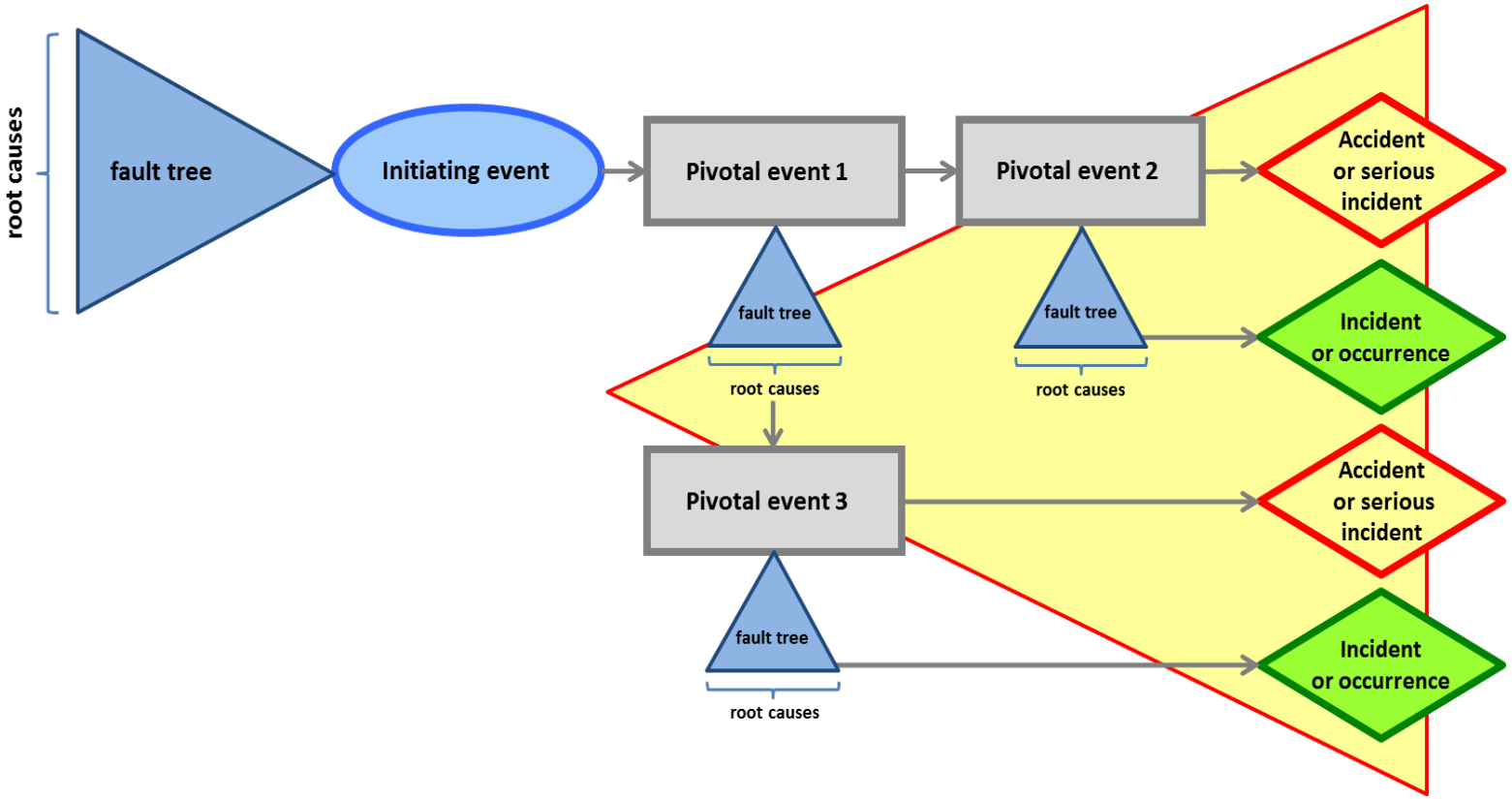
We call it «GALLO»

Guidance for an Authorisation for Low Level Operation of RPAS

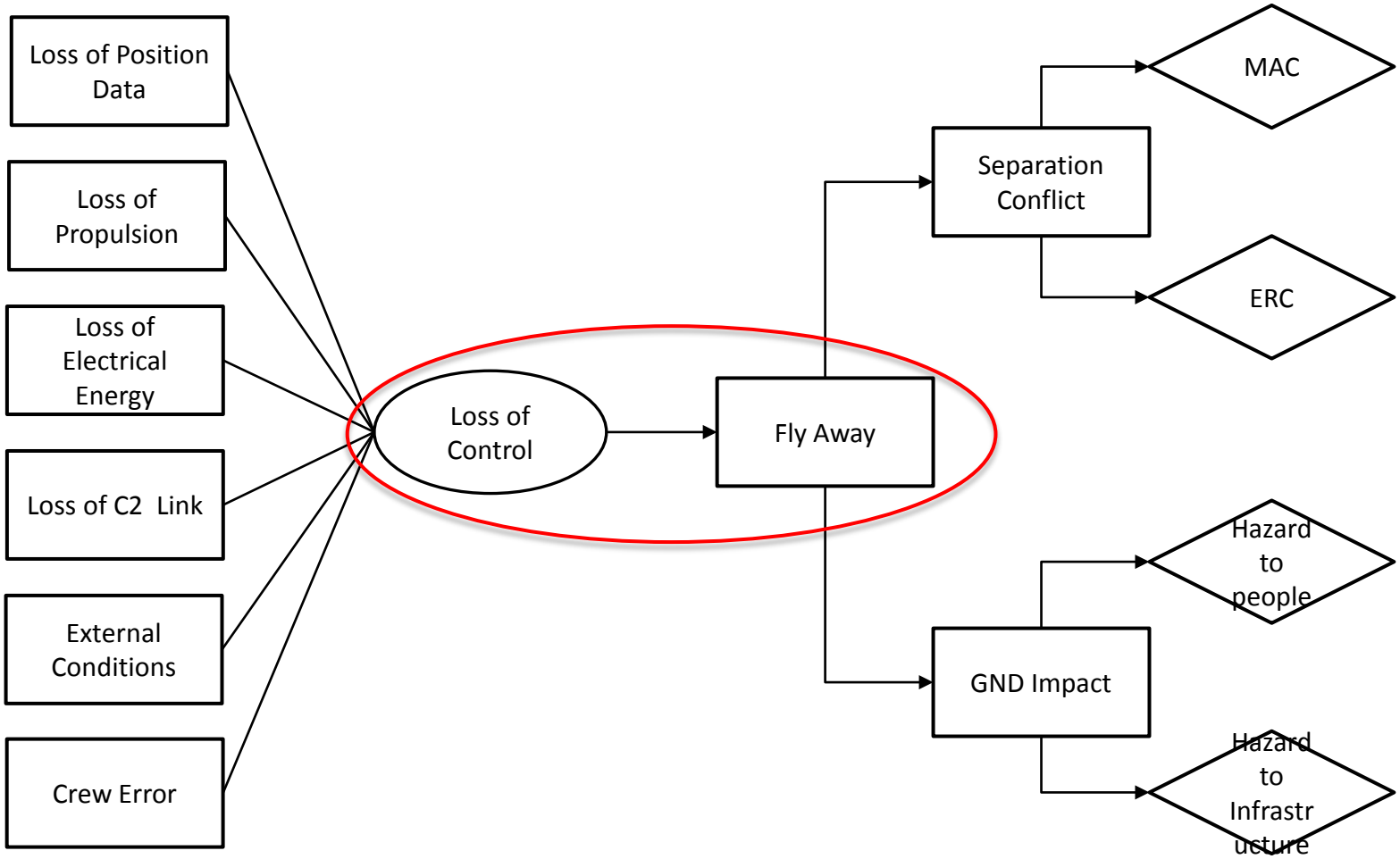
- A Total Hazard and Risk Assessment as required e.g. in CS-LURS
- Technical shortcomings can be mitigated by operational limitations[…]
- Allows operations where normal airworthiness certification is impractical

1. What happens if [...]?
2. Why this can happen?

Event Sequence Diagram



What happens if […]?



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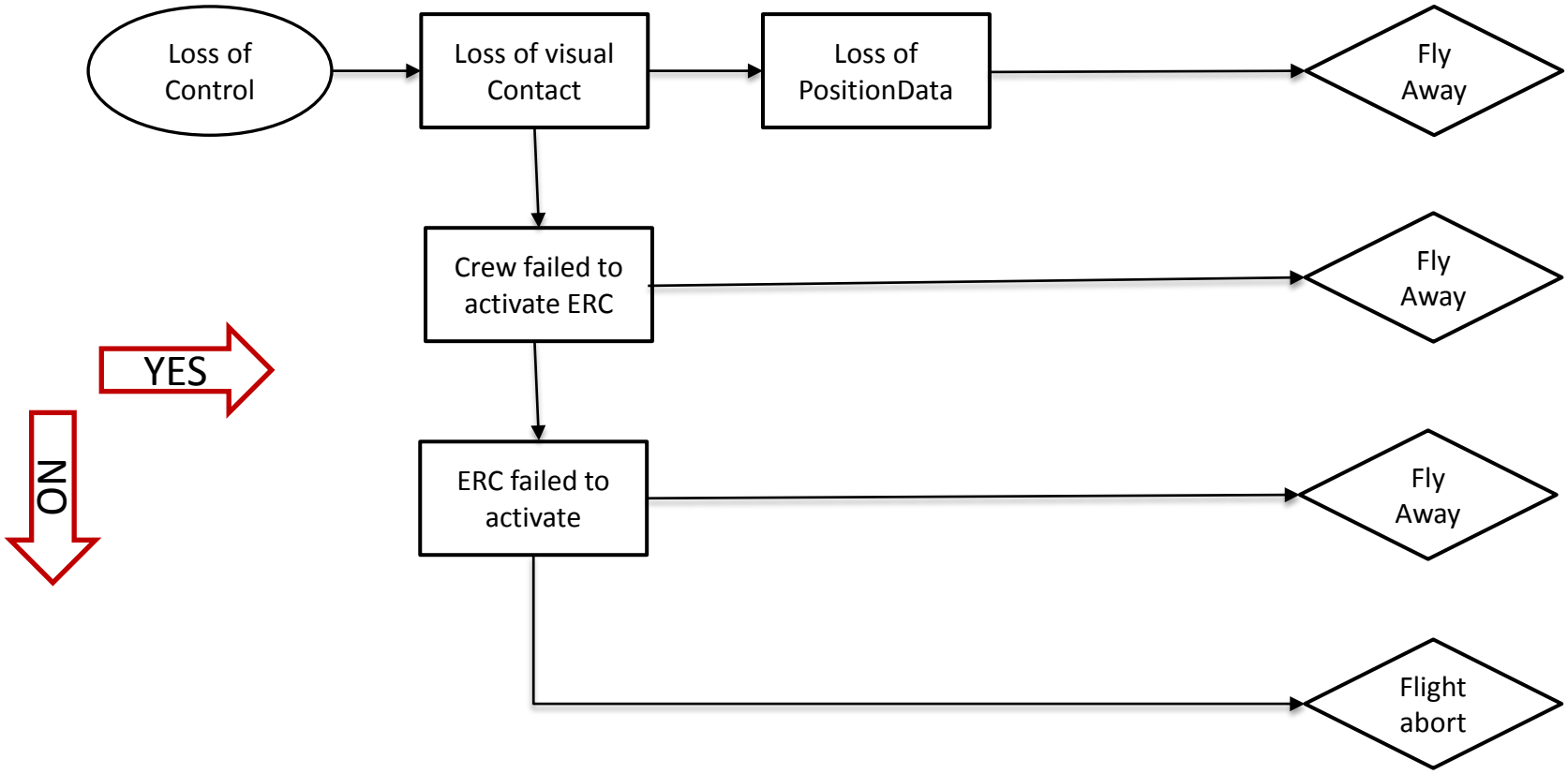

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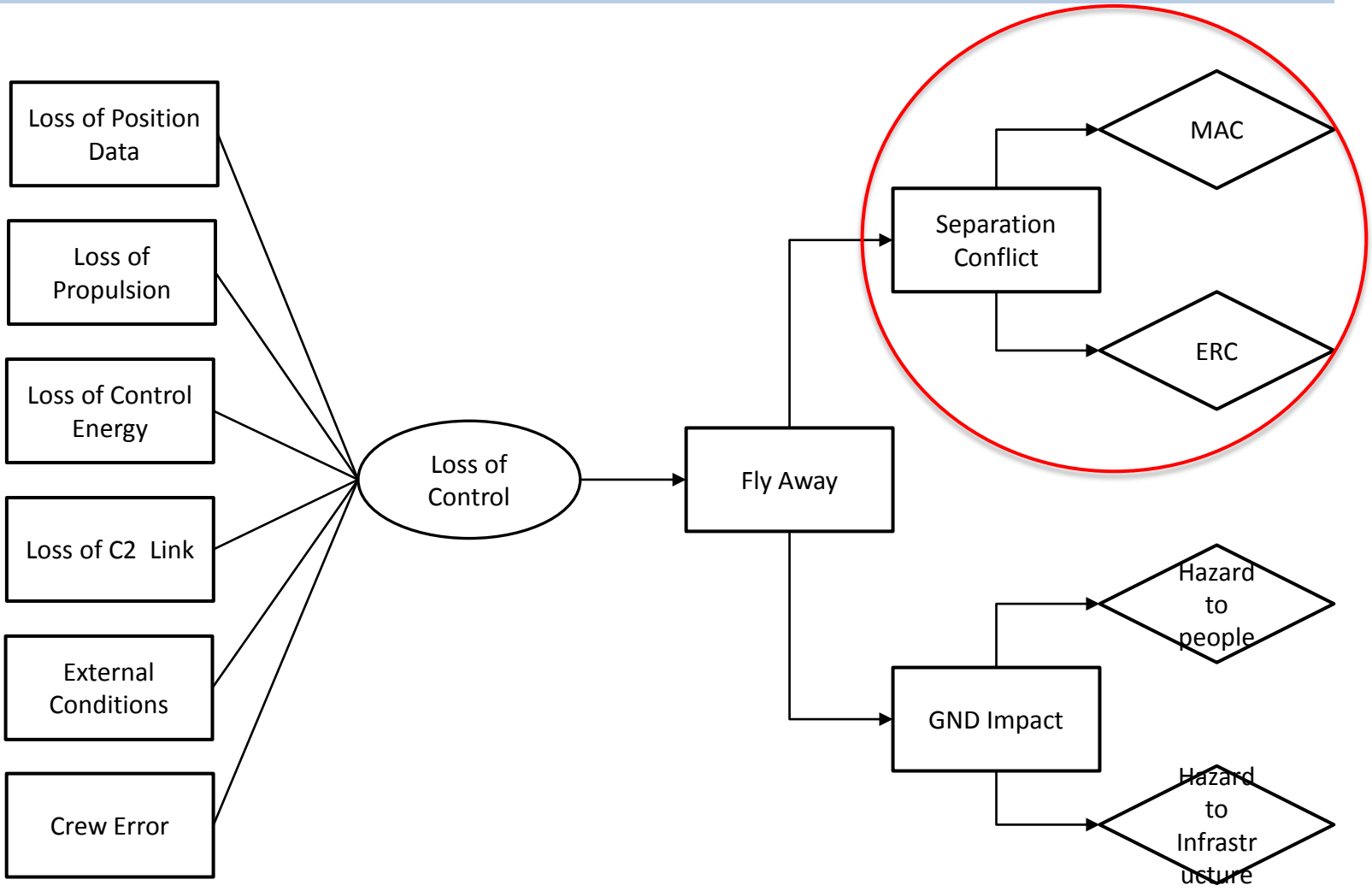

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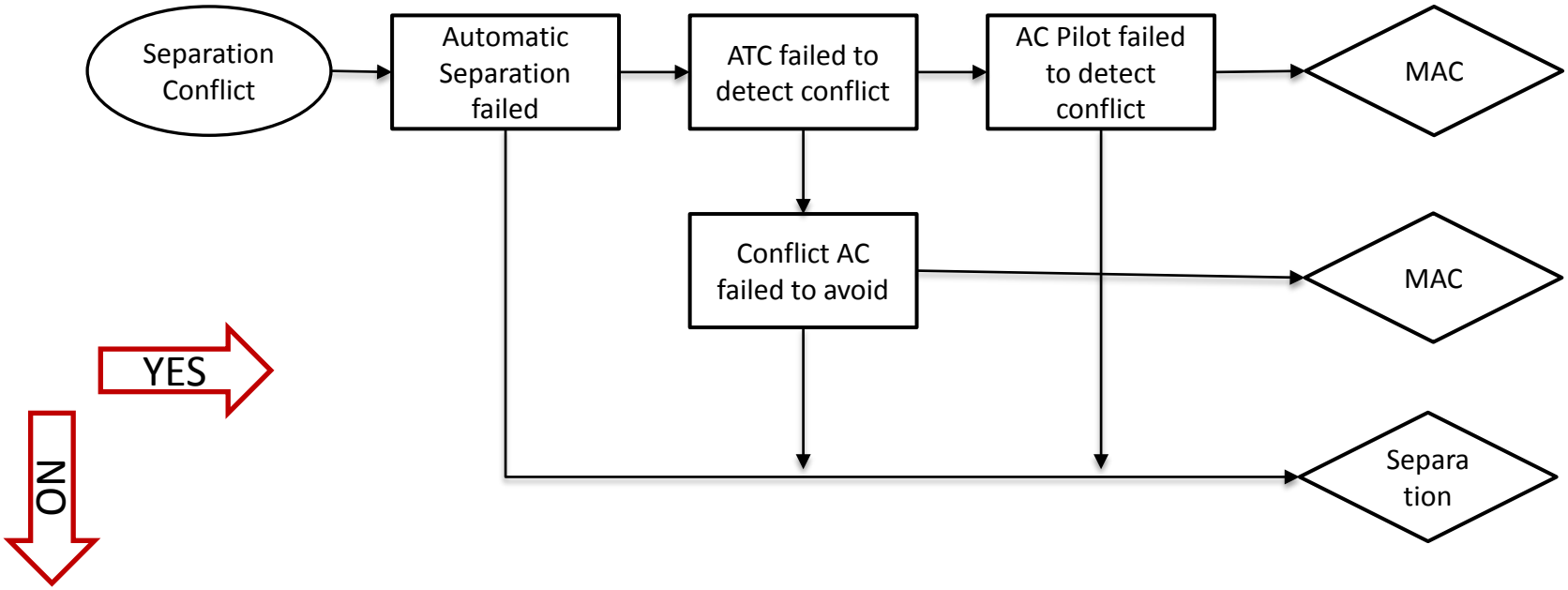
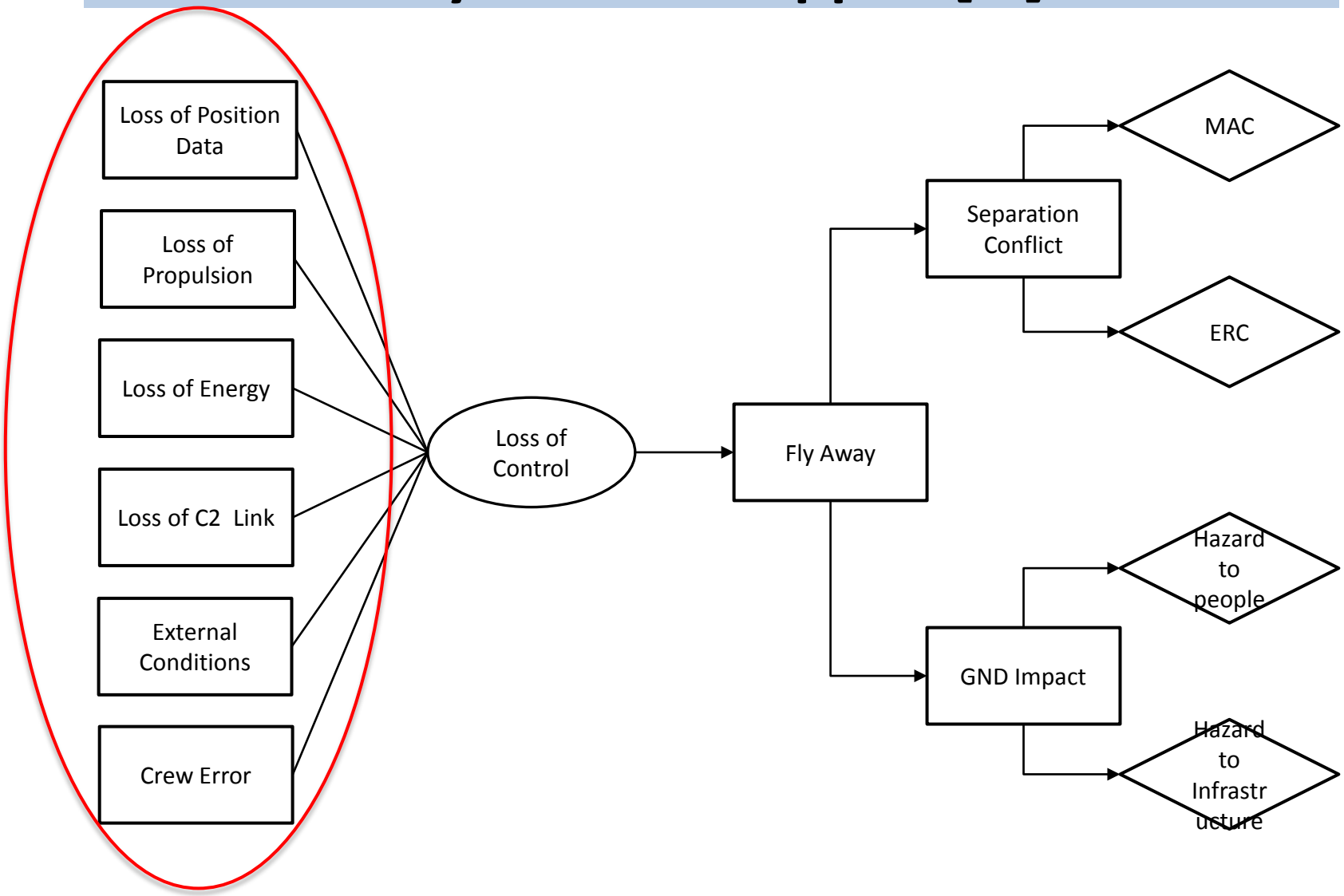
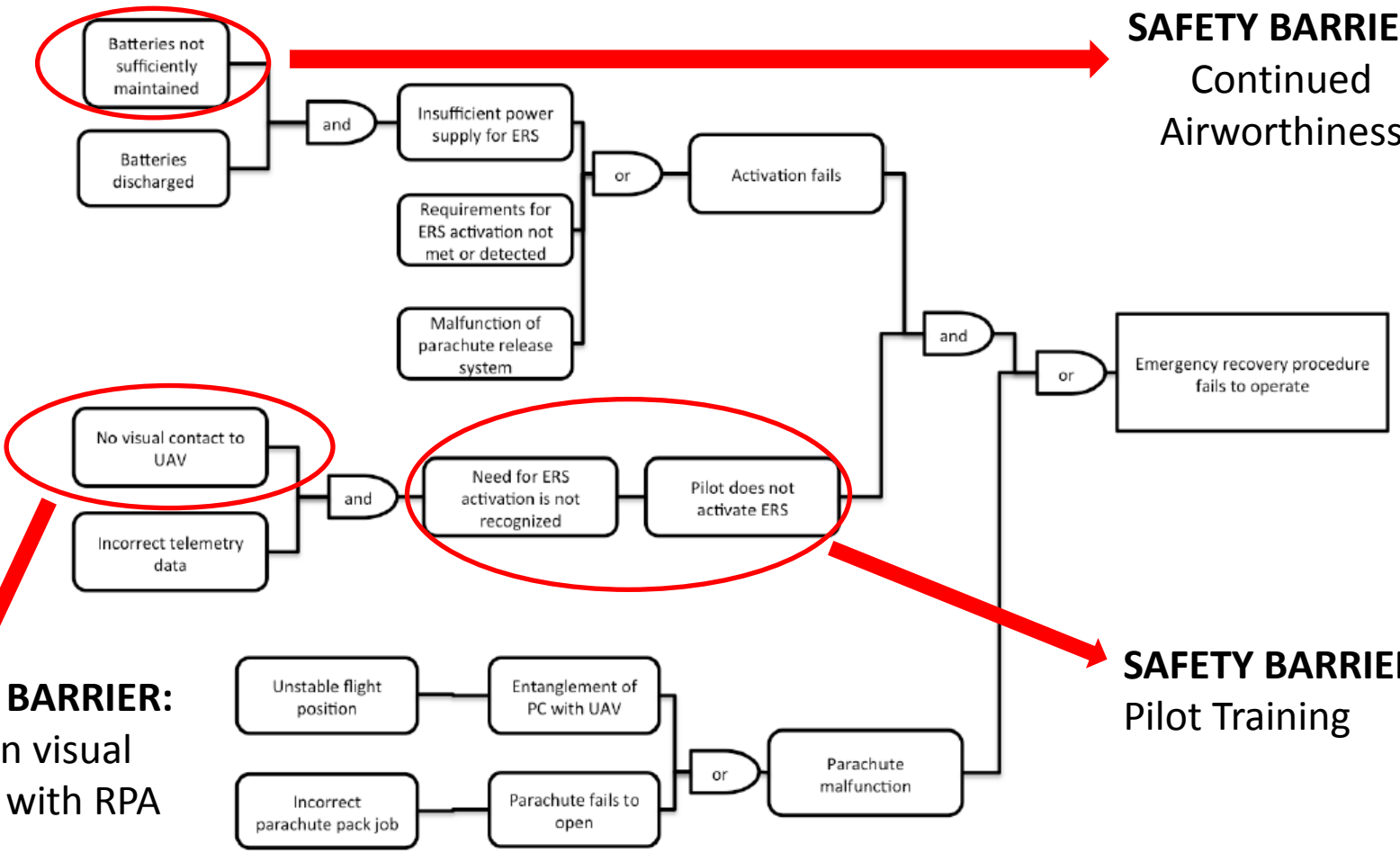


Why this can happen […]?



Bow Tie – why this can happen […]?



SAFETY BARRIER:
Continued Airworthiness

SAFETY BARRIER:
Maintain visual contact with RPA

SAFETY BARRIER:
Pilot Training

Risk model and accident scenarios

- GALLO model based on results of ASCOS WP3.2 results
- 6 accident scenarios represented as ESD types (Event Sequence Diagram)
- Events are further detailed in Fault Trees

ESD type 1 – System failure
ESD type 2 – Datalink deterioration
ESD type 3 – Operations outside approved envelope/limitations
EDS type 4 – Fire
ESD type 5 – Loss of safe separation
ESD type 6 – Remote crew error

Conclusions

Guidance for an Authorization for Low Level Operation of RPAS

Provides a framework for the applicant to:

1. Collect information about his intended operation
2. Perform a structured technical review of the RPAS with focus on safety features related to the operation
3. Analyse the accident scenarios and identify the relevant safety barriers
4. Provide all this information to the authority in a standardized format

Conclusions

Guidance for an Authorization for Low Level Operation of RPAS

Provides a framework for the certifying authority to:

1. Build a comprehensive picture of the operation under approval
2. Understand the risks involved in the operation
3. Understand what safety barriers are in place to ensure safety of the operation
4. **Invest the limited available resources on the verification of those barriers**

Questions…

…and Answers…