M85 study revisited

Reaffirming the case against cluster munitions

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When the process to prohibit cluster munitions started, all submunitions without self-destruct features (SD) were generally considered unacceptable

Were SD submunitions the solution, or part of the problem?

- ✓ Claims that bomblets with self-destruct mechanisms (SD) reduced cluster munitions' failure rates and that this provided a sufficient level of protection for civilians.

- ✓ Proposals to not prohibit cluster munitions with bomblets that had SD and/or that satisfied a maximum failure rate requirement, of e.g. 1%.

The M85

✓The «benchmark» SD submunition.

✓Test results showed between 1%-2.3% failure rate.

✓Documented to have been used in combat:

Iraq 2003, Lebanon 2006.

✓Part of the solution, or part of the problem?

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M85
An analysis of reliability

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Key lessons

- Difference between submunition failure rates obtained during testing and combat use.
- Submunitions are, *per se*, compromise technology that, under operational conditions, will always generate unacceptably high levels of duds.
- Self-destruct features can lower failure rates, but their potential to do so is limited.
- Complex self-destruct mechanisms create more unpredictable submunitions that further complicate and endanger post-conflict clearance.

Lithuania's notification of withdrawal:

"significant advancements in the technology and precision of cluster munitions have reduced the risk of unexploded ordnance and civilian casualties, and the Republic of Lithuania is committed to adopting these advanced munitions, which include enhanced safety mechanisms and self-destruct features, thereby minimizing humanitarian concerns associated with their use, and by withdrawing from the Convention on Cluster Munitions, Lithuania can continue to invest in and deploy these improved technologies responsibly"

But no such enhanced munitions exist, and no such munitions are on the horizon.

Since the negotiations in 2008…

Some development and manufacture of new submunition types with new types of self-destruct mechanisms have been document (Russian).

- No new cluster munition is on the market or in development that meaningfully alters the key conclusions of the M85 report.

NPA rejects 1% claim

- Norwegian People's Aid rejects claims that a submunition can be manufactured that can achieve a 1% failure rate in combat conditions.
- If 1% were possible, it would still cause unacceptable levels of unexploded ordnance.
- Had all cluster munitions used over South Lebanon in 2006 had only a 1% failure rate, a legacy of roughly 40,000 duds would still have resulted.

«But all munitions have a failure rate…»

Comparing the dud potential of cluster munitions and those of unitary munitions.

Munition type	No. used	Likely no. of duds at 10% failure rate
Unitary ATACMS	500	50
Cluster ATACMS	500 x 950 M74 bomblets	47,500

High numbers

+

Small and sensitive

Military utility is overstated

- Overtaken by newer technologies.
- Alternatives are available.
- Reintroducing them into European arsenals is not military necessary, while the negative impact is undeniable.
- Eroding the principles of international humanitarian law that underpin the CCM is a self-defeating logic.

Examples of individual M85 duds found in Lebanon


Controlled testing


Use in combat

Testing

- ✓ Good ammunition
- ✓ Careful deployment
- ✓ Favourable weather
- ✓ Hard, level ground
- ✓ No vegetation

The limitations of testing

✓ Common testing regimes produce very optimistic indications of performance because of favourable conditions and narrow parameters.

✓ Test results are therefore misleading as predictors of the actual risk to civilians.

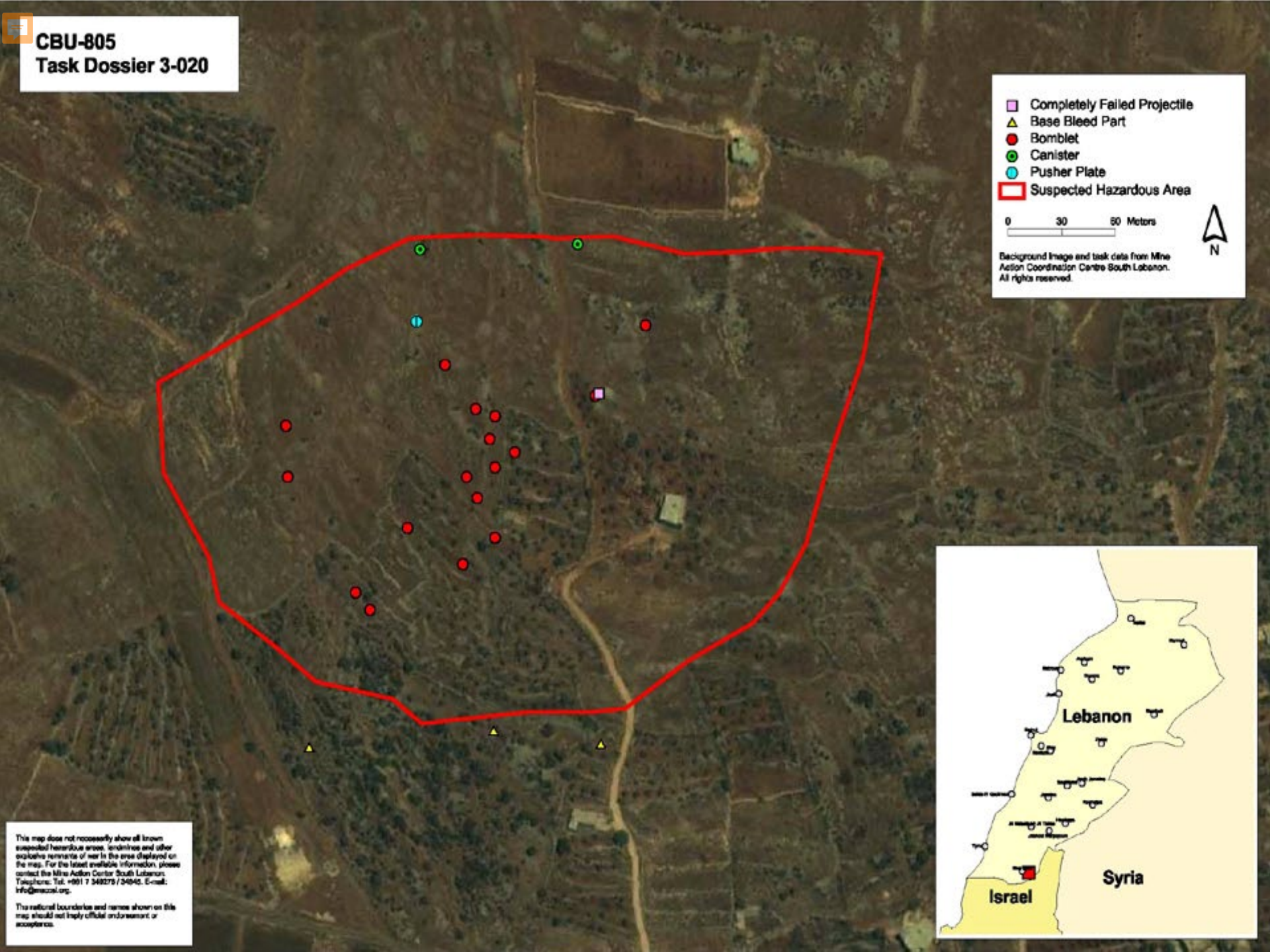
✓ Greater discrepancy between testing and operational performance for submunitions than for other ammunition, because they are small and more vulnerable to changes in the environment.

Tests of submunitions with self-destruct mechanisms are particularly unrealistic:

- ✓ When testing against hard ground, most of the bomblets detonate on impact with the ground, and the SD is never tested – and thus potential problems do not appear.
- ✓ If the same bomblets were to fall in soft ground, many more would not detonate on impact – and then potential problems with the SD will appear – and the number of duds will be higher.
- ✓ In the Norwegian 2006 tests a total of only 26 detonations (out of more than 9,300) were caused by SD.

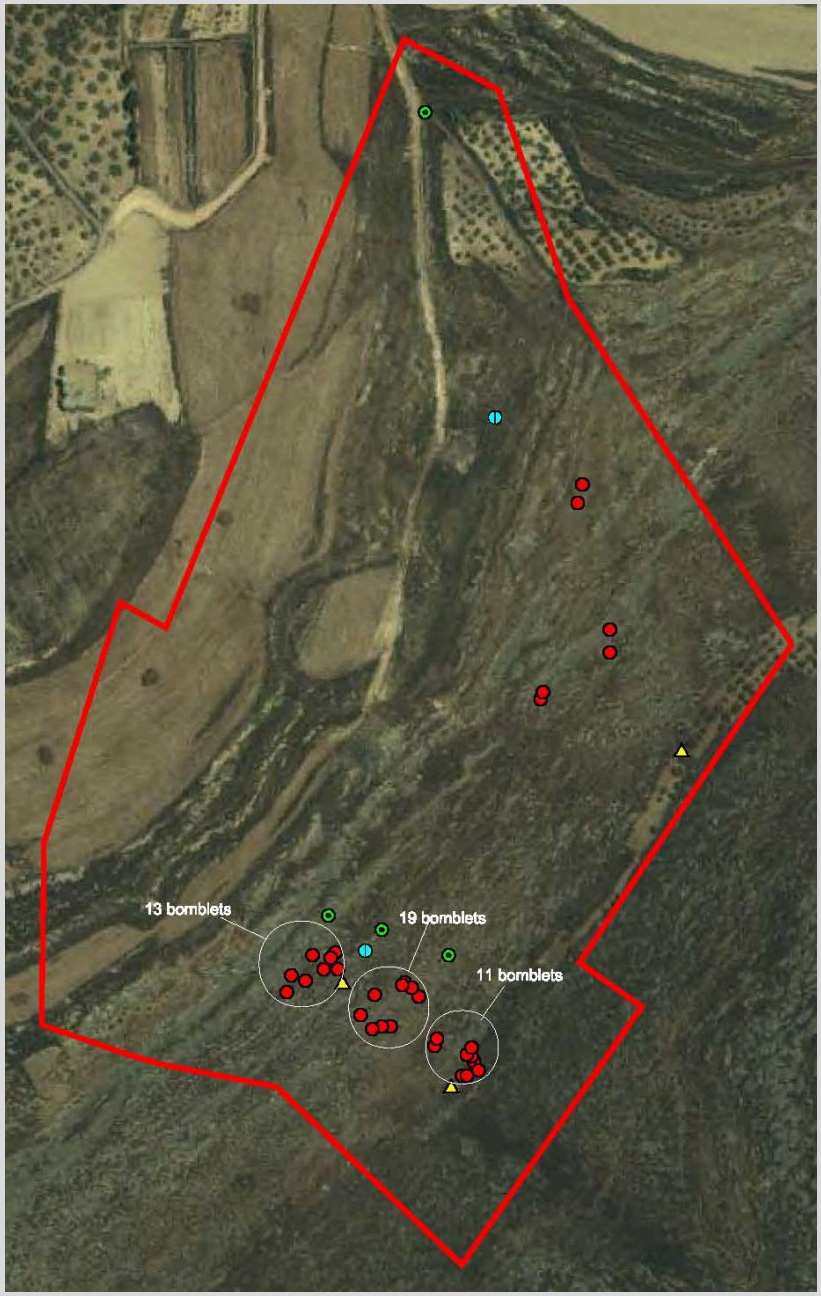
Research conclusion:

- A consistent dud rate for M85, as used in Lebanon, around 10%.


CBU-805
Task Dossier 3-020
Completely Failed Projectile
Base Bleed Part
Bomblet
Canister
Pusher Plate
Suspected Hazardous Area
0
30
60 Meters
N
Background image and task data from Mine Action Coordination Centre South Lebanon.
All rights reserved.
This map does not necessarily show all known suspected hazardous areas, landmines and other explosive remnants of war in the area displayed on the map. For the latest available information, please contact the Mine Action Center South Lebanon.
Telephone: Tel. +961 7 348273 / 34845. E-mail: info@mracsl.org.
The national boundaries and names shown on this map should not imply official endorsement or acceptance.
Lebanon
Syria
Israel

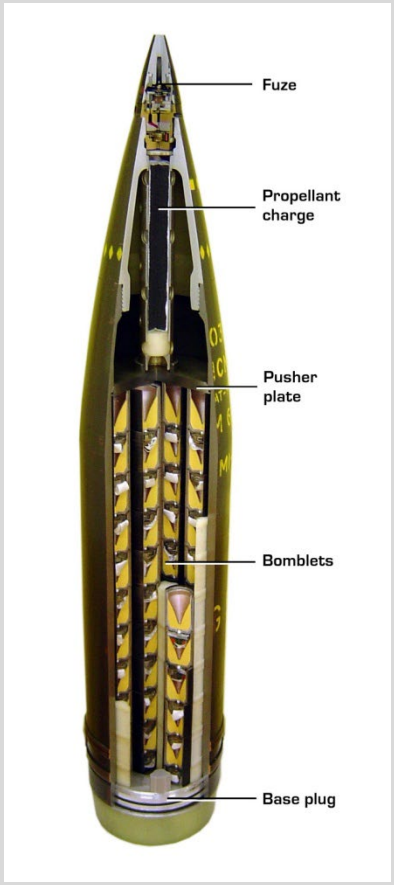
Keep in mind…

- ✓ Favourable conditions for submunition reliability in Southern Lebanon at the time.
- ✓ Performance would be even worse in other environments.



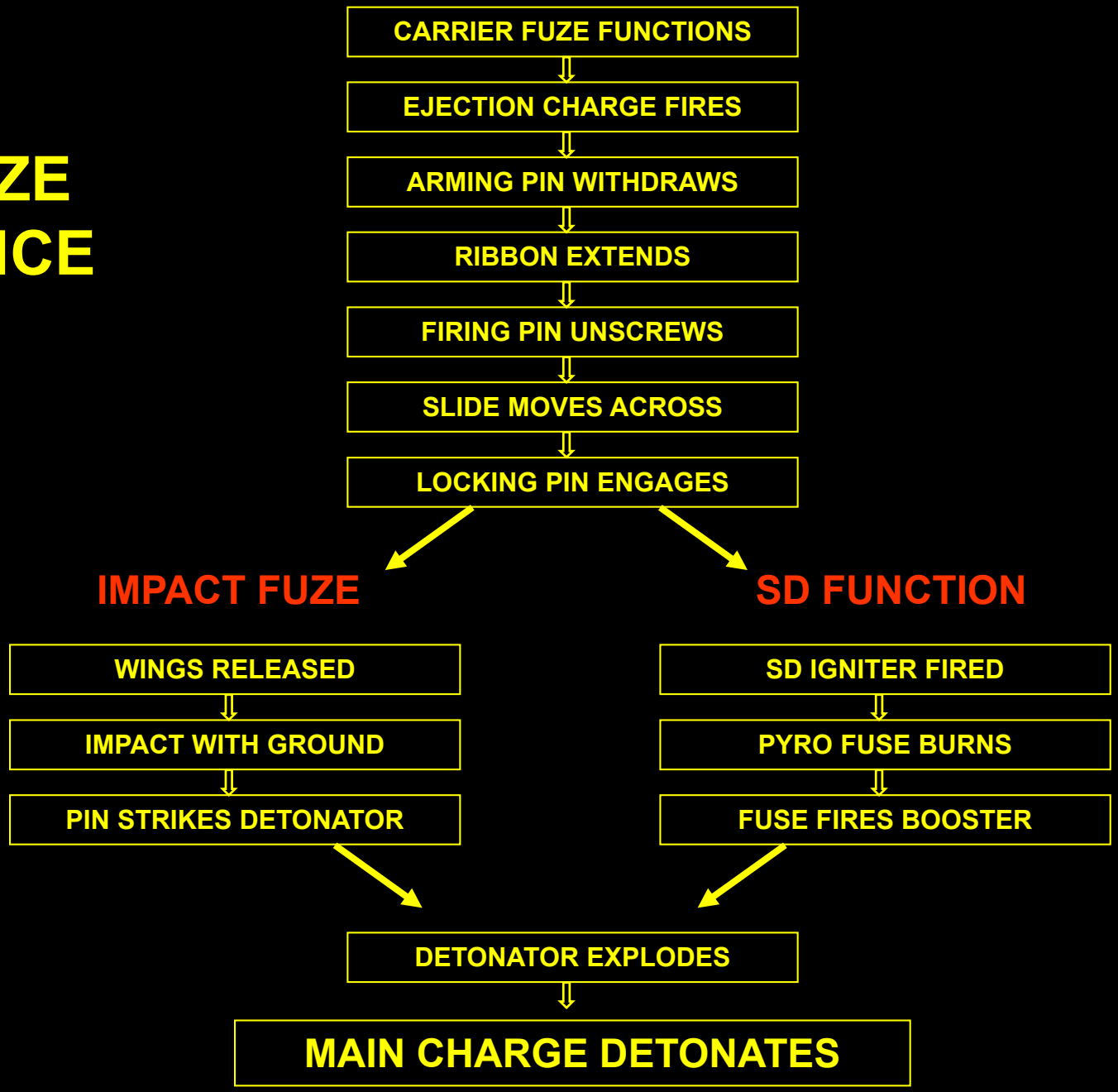
Compromise technology

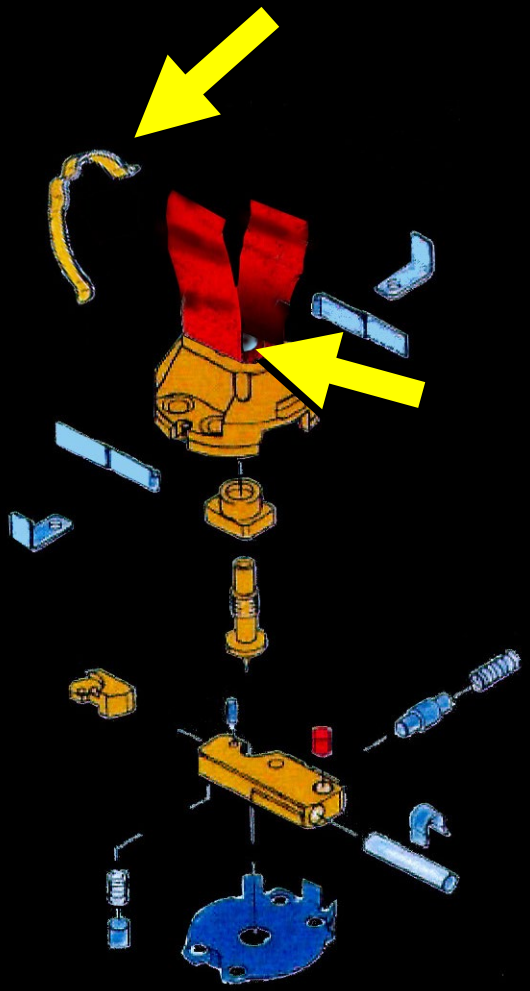
- Submunitions are, per se, compromise technology: their small size drives unavoidable design trade offs between effectiveness and reliability.
- Cluster munitions will always produce unacceptably high numbers of duds in operational conditions.



The SD is a pyrotechnic fuse which should be ignited as the bomblet arms in flight, and which burns for 15 seconds. Should the primary impact mechanism fail when the bomblet hits the target/ground, then the SD fuse should set off the detonator, normally 5-7 seconds after impact.

M85 FUZE SEQUENCE





CARRIER FUZE FUNCTIONS

⇩

EJECTION CHARGE FIRES

⇩

ARMING PIN WITHDRAWS

⇩

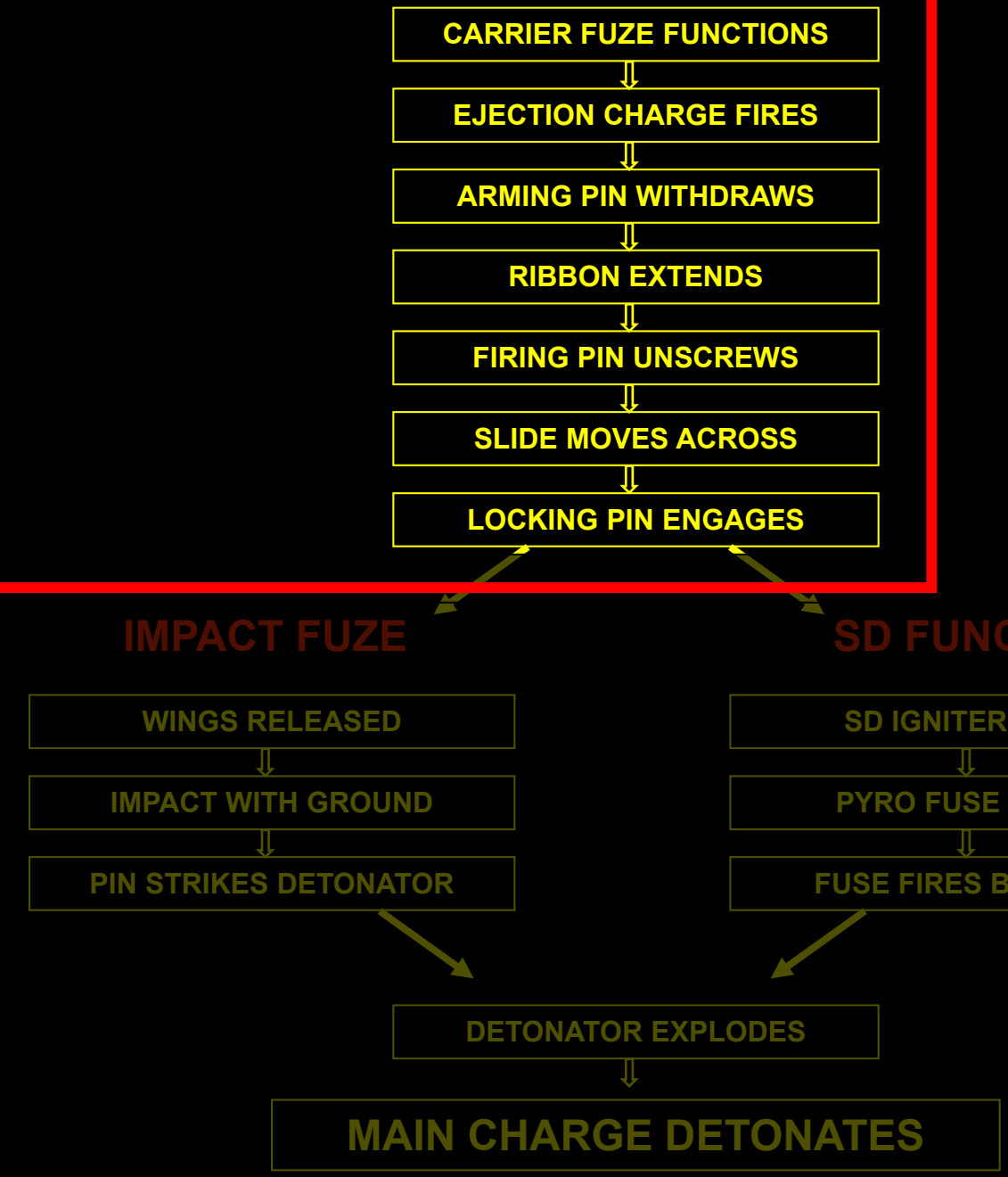
RIBBON EXTENDS

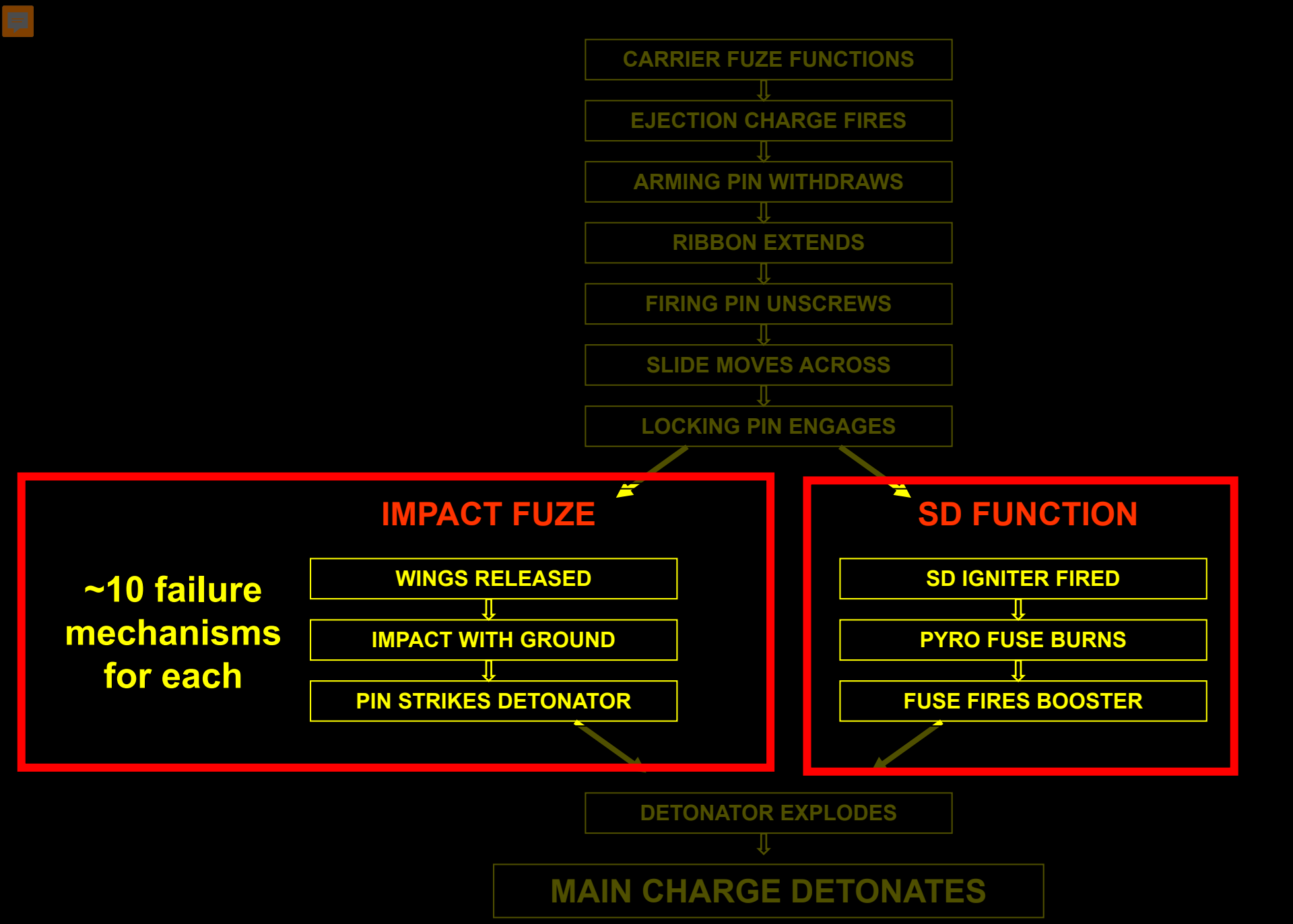
⇩

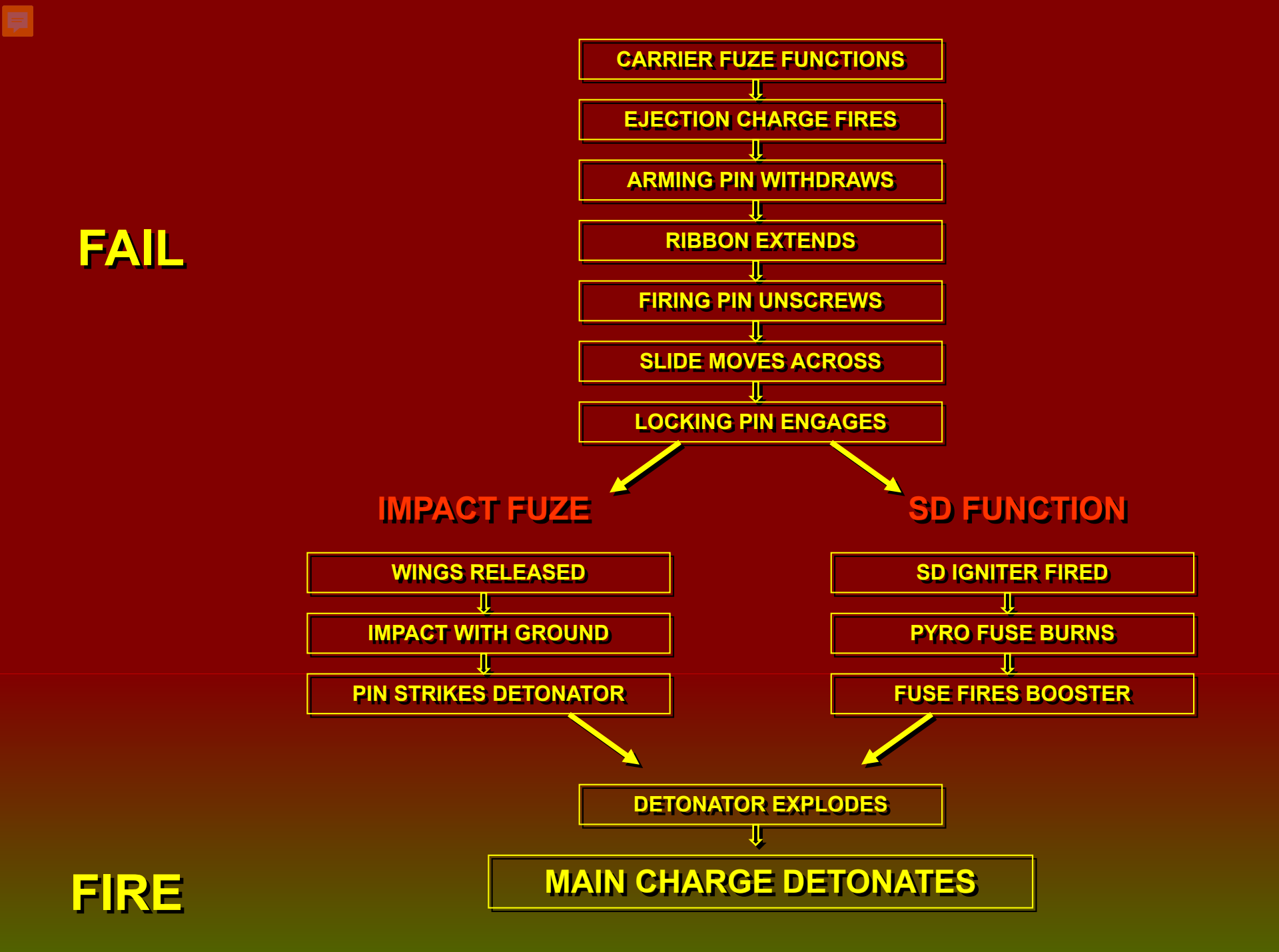
May fail because:

- Clip fails to release
- Ribbon becomes tangled
- Ribbon rips off (rivet fails)
- Two or more knot together

3 – 5 failure mechanisms for each




CARRIER FUZE FUNCTIONS
EJECTION CHARGE FIRES
ARMING PIN WITHDRAWS
RIBBON EXTENDS
FIRING PIN UNSCREWS
SLIDE MOVES ACROSS
LOCKING PIN ENGAGES
IMPACT FUZE
~10 failure mechanisms for each
WINGS RELEASED
IMPACT WITH GROUND
PIN STRIKES DETONATOR
SD FUNCTION
SD IGNITER FIRED
PYRO FUSE BURNS
FUSE FIRES BOOSTER
DETONATOR EXPLODES
MAIN CHARGE DETONATES


FAIL
CARRIER FUZE FUNCTIONS
EJECTION CHARGE FIRES
ARMING PIN WITHDRAWS
RIBBON EXTENDS
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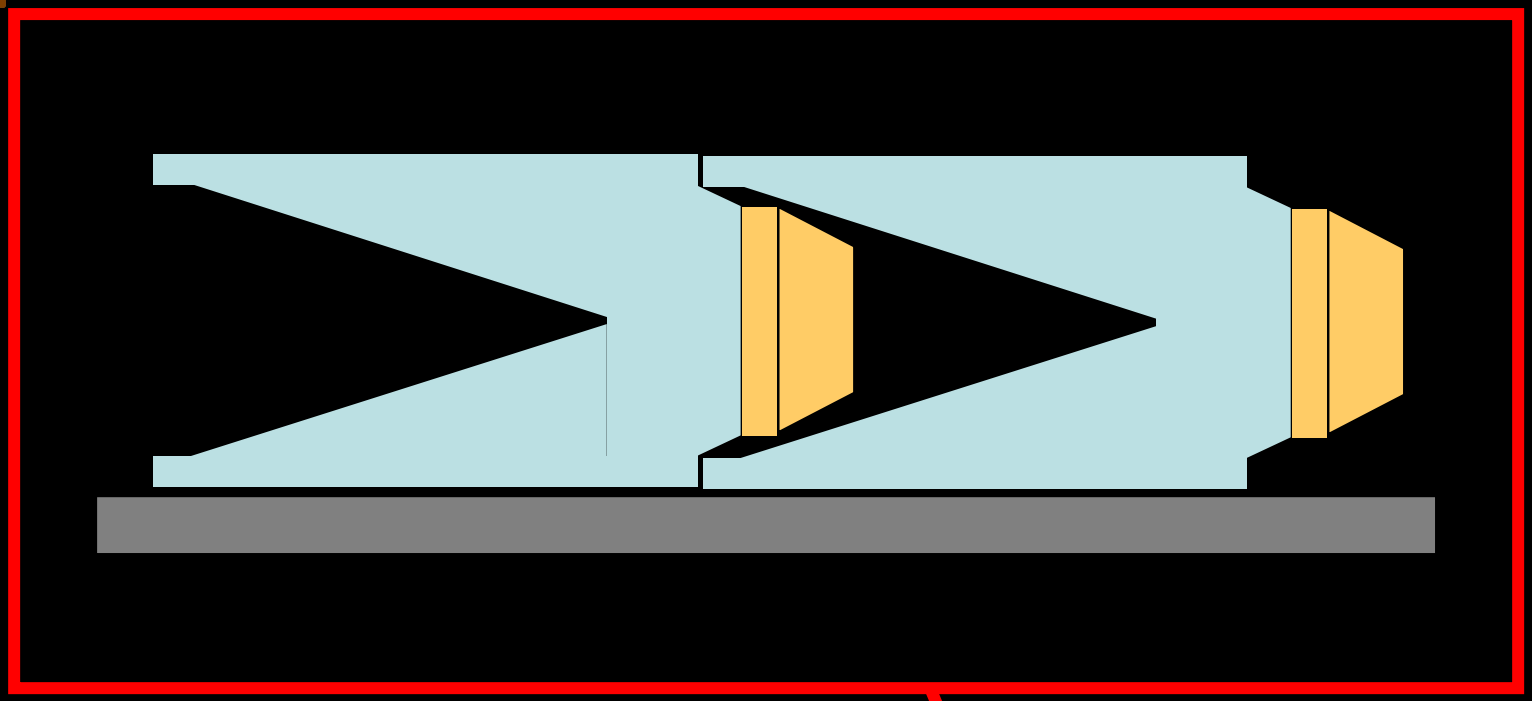
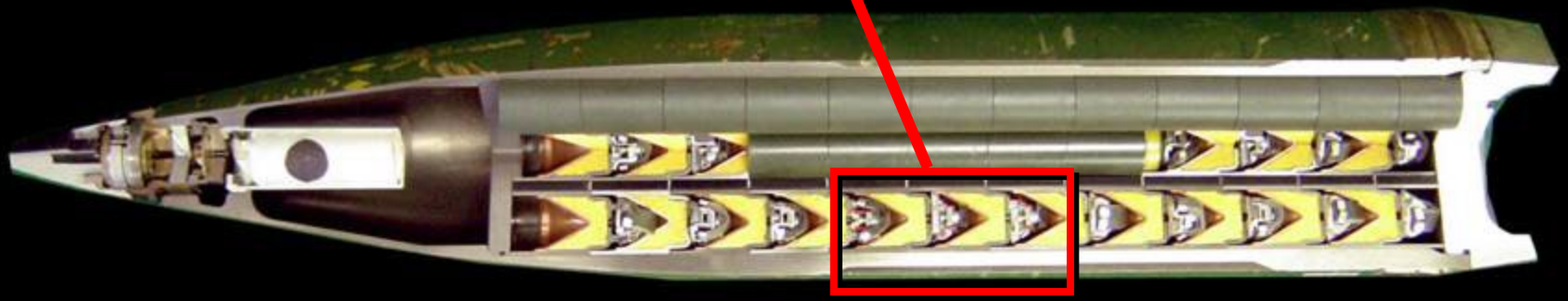
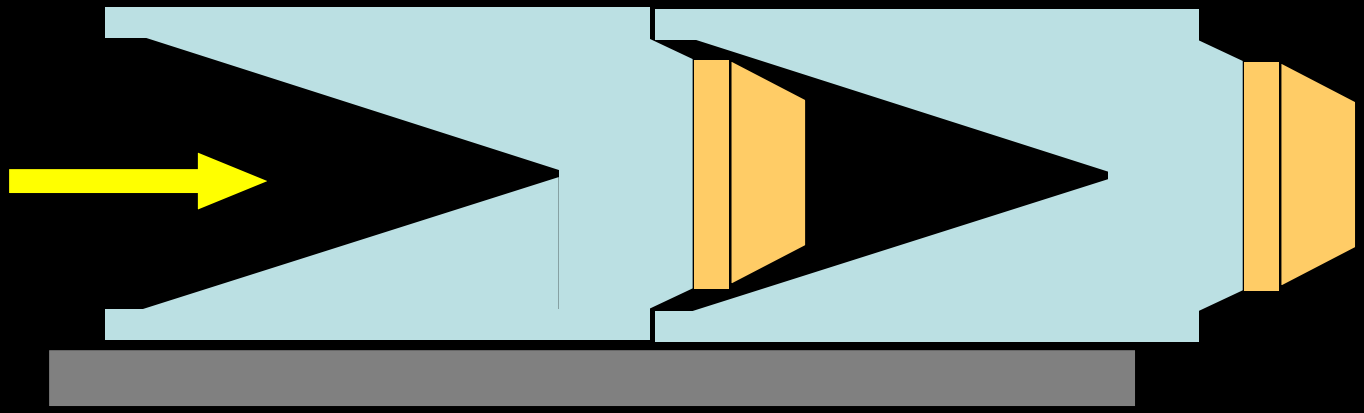
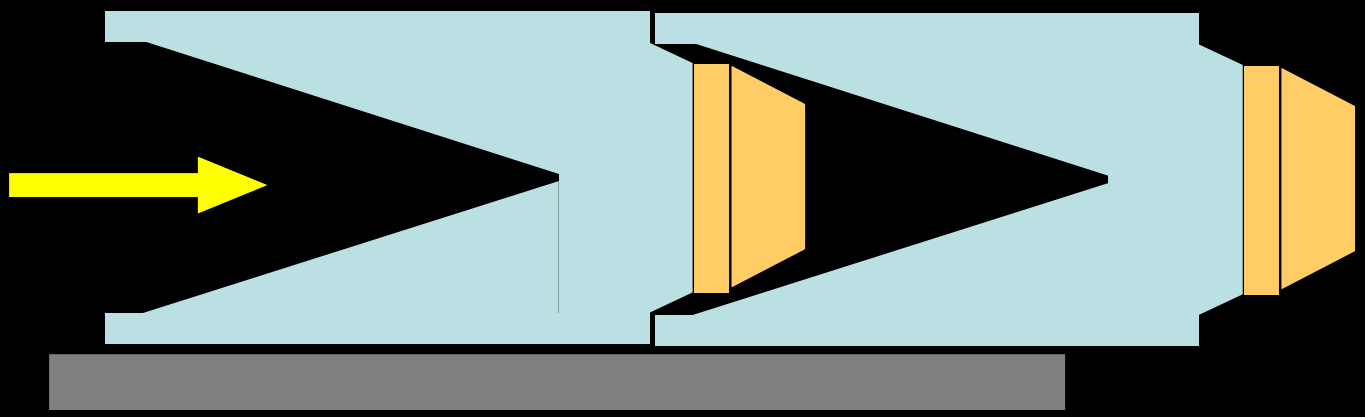
PIN STRIKES DETONATOR
SD IGNITER FIRED
PYRO FUSE BURNS
FUSE FIRES BOOSTER
DETONATOR EXPLODES
MAIN CHARGE DETONATES
FIRE

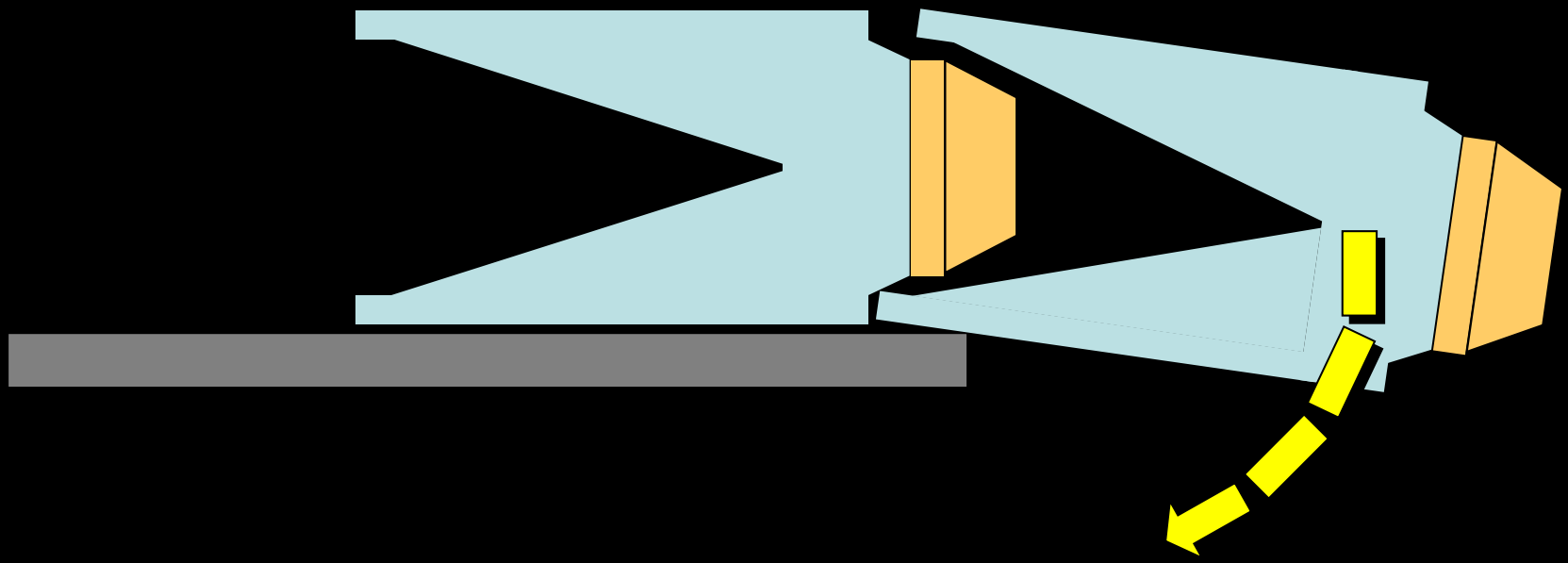

Missing ribbon
Bent retaining tab
Fragment damage
PRE-IMPACT DAMAGE

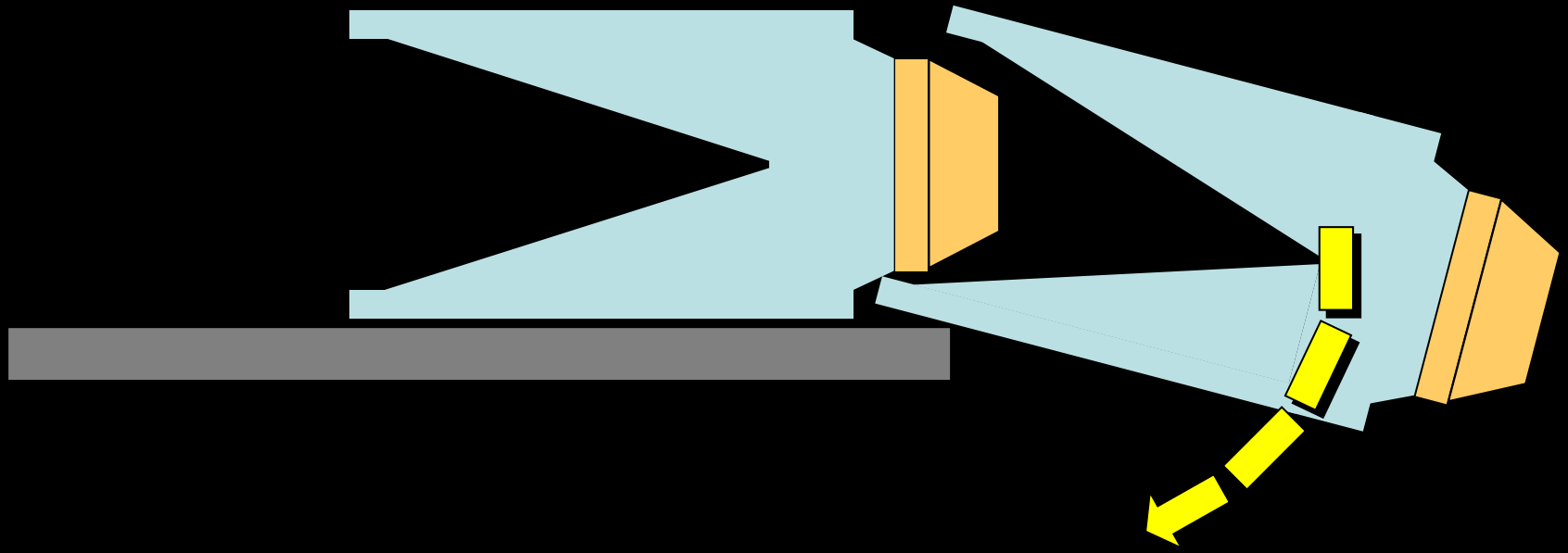


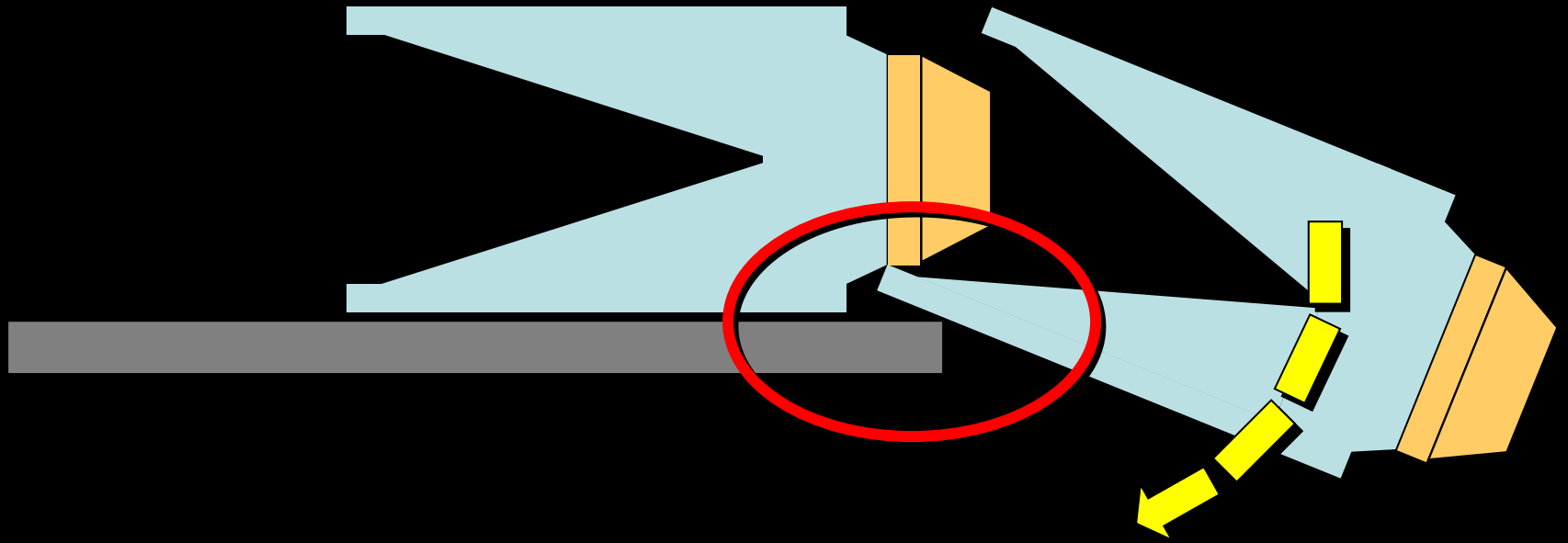


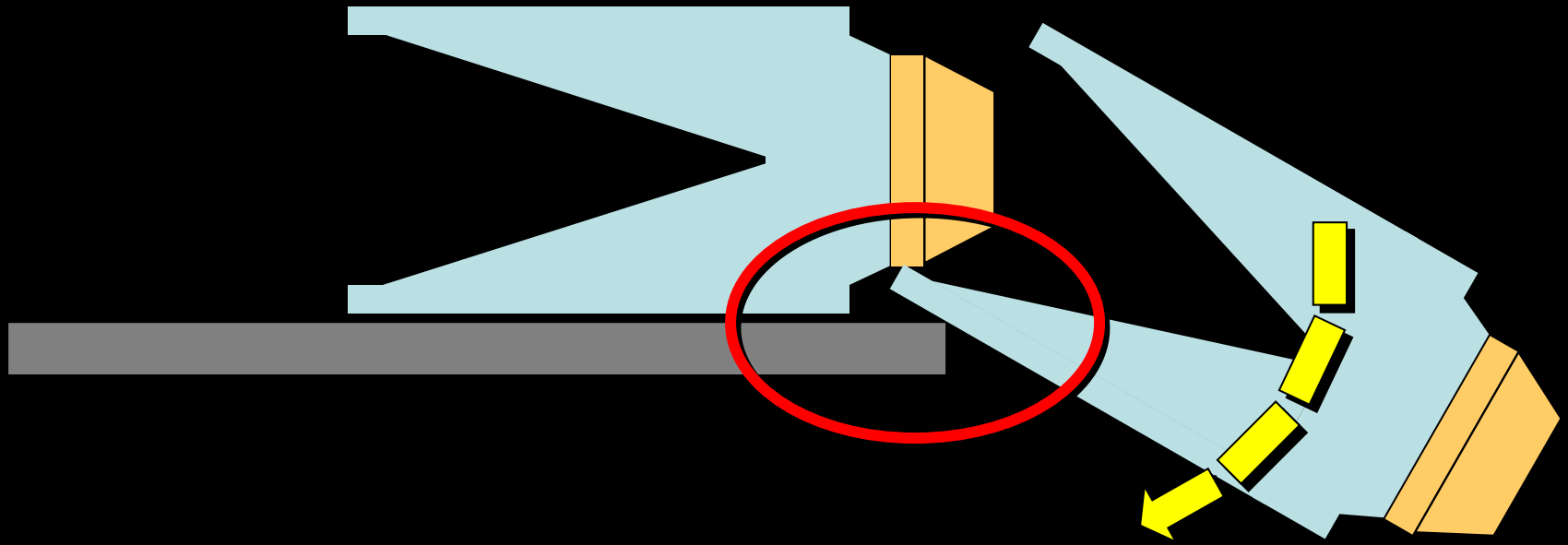




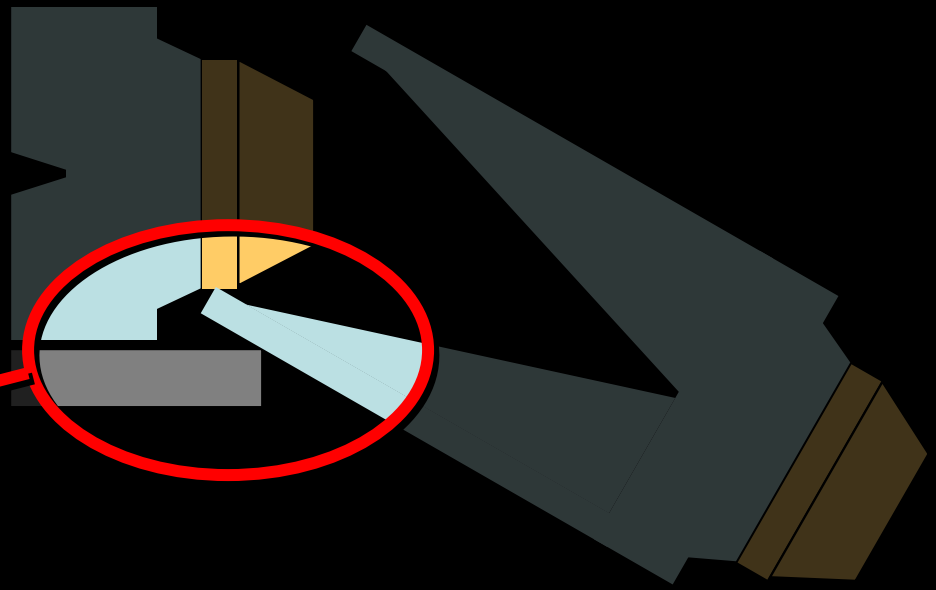









BOMBLET
HLA-SPR



Failure analysis

- ✓ Systematic failures relating to design and function
- ✓ Human factors
  - Rough handling
  - Procedural errors
  - Miscalculation of range/elevation
  - The higher the charge, the higher the failure rate
- ✓ Environmental factors
  - Poor ammunition storage or maintenance
  - Ageing
  - Extremes of temperature
  - Cushioning of impact by soft ground or vegetation
  - Ribbons cathcing on structures or vegetation

Main takeaways

- Be skeptical!
- Better cluster munition technology is not available or on the horizon.
- Humanitarian harm is undeniable.
- Not militarily necessary to reintroduce cluster munitions. Alternatives are available.
- Base decisions on field realities and the CCM.
- Eroding the principles of international humanitarian law that underpin the CCM is a self-defeating logic.