

Replacement of HALONS

DCMAT
PILOTE FONCTIONNEL DE LA MAINTENANCE

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What's a halon?

Chemically speaking, a halon is a **carbonic chain** where one or several **hydrogen** atoms have been **replaced by a halogen** atom (fluorine, chlorine, bromine, iodine).

Legally speaking, are excluded from the halon family:

- **CFC** (chlorofluorocarbons),
- **HCFC** (hydrochlorofluorocarbons),
- **HFC** (hydrofluorocarbons).

Thus, halons concerned by the present revision are:

- **1211** (difluorochlorobromoethane),
- **1301** (trifluorobromomethane),
- **2402** (tetrafluorodibromoethane).



Why use halons?

Discovered in the 1930s, halons are:

- chemically inert (practically),
- non toxic,
- easy to put under pressure,
- non-flammable.



Their extinguishing power is efficient at low rate and, unlike nitrogen or carbon dioxide, they do not choke the fire by preventing oxygen to reach combustion point. Instead, halons inhibit fire by seizing intermediate free radicals.

Thus, **halons** perfectly meet requirements for an extinguishing agent. Furthermore, there is no risk of asphyxiation for living beings.

Nevertheless, halons do present some risks at short and long terms:

- release of strong acids, especially during slow combustion,
- production of chlorine, ozone destruction catalyst.

Why replace halons?

Already regulated by the European directive 2037/2000, halons have been **decommissioned within 99%** of their previous applications.

Only a **critical use is authorised** by the appendix VII:

- military critical use = **59%** (28% for the army)
- civilian critical use = **41%** (police, airport emergency rescue...)

This directive and its appendix will be reviewed this year. The critical use percentage will be reduced.

If France intends to anticipate this reduction, the MoD, especially the army, will have the major responsibility of retrofitting their equipments.



Critical uses in the French Army

In military ground (tactical) vehicles only...

- *fixed* extinguishers for *engine* compartments
- *fixed* extinguishers for *crew* compartments
- *portable* extinguishers for *crew* compartments

Some extinguishers can be used for **both** compartments.

Concerned fleets

- Main battle tank (MBT) (chars)
- Armoured personal carrier (APC) (VAB)
- Light armoured vehicle (LAV) (VBL)
- Armoured combat earthmover (ACE) (EBG)
- Armoured recovery vehicle (ARV) (DCL)
- Bridgelayers (EFA)
- Multiple rocket launcher (MRL) (LRM)



Fleets already without halon extinguishers (present or future)

- Infantry fighting vehicle (IFV) (VBCI)
- tracked or wheeled canons (AUF1)

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Involved in the study



DGA - *MoD procurement agency*



DCMAT - *central direction for the maintenance of army equipments*



STAT - *army technical and experimental section*



Maintenance units - *regiments, battalions & bases*

+ industrial designers & providers

Criteria for alternative systems

1. minimal ozone-depleting potential
2. minimal inhalation toxicity (LD_{50} , LOAEL, NOAEL)
3. suitable extinguishment efficiency (heptane cup burner test)
4. minimal global warming potential
5. suitable boiling temperature
6. suitable storage pressure
7. short atmospheric life time

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Replacement relevance

For each equipment, analysis of several criteria:

- ❖ existing alternative system
- ❖ technological feasibility
- ❖ technological consequences
- ❖ operational consequences
- ❖ decommissioning date
- ❖ financial resources



Replacement relevance

For the Leclerc MBT...

- ❖ existing alternative system **none in 2005**
- ❖ technological feasibility **to be studied**
- ❖ technological consequences **unique use**
- ❖ operational consequences **long immobilisation**
- ❖ decommissioning date **long after 2015**
- ❖ financial resources **must be scheduled**

⇒ *result of the study (2006): FM200*
⇒ *replacement between 2008 & 2012*



Replacement relevance

For the AMX30 MBT...

- ❖ existing alternative system
- ❖ technological feasibility
- ❖ technological consequences
- ❖ operational consequences
- ❖ decommissioning date
- ❖ financial resources

YES - CO₂

immediate

NO

short immobilisation

decision pending

no special need

⇒ no replacement currently scheduled



Replacement relevance

For the current **APC...**

- ❖ existing alternative system
- ❖ technological feasibility
- ❖ technological consequences
- ❖ operational consequences
- ❖ decommissioning date
- ❖ financial resources



YES - FM200
parallel study in process
to be determined
long immobilisation
not before 2030
must be scheduled

⇒ *replacement by the existing system (FM200) until the new one (fog maker) is feasible*

Alternative solutions

- mixed technologies
- gas FM200 or FE36
- gas NOVEC 1230
- water mist (fog maker)
- fire suffocation (CO_2 , N_2)

minimised risks

unconsciousness (at use rate)

trial results still pending

pulmonary oedema (drowning)

asphyxiation



Questions?



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