

Future Electronic Fuzing for Enhanced Effects



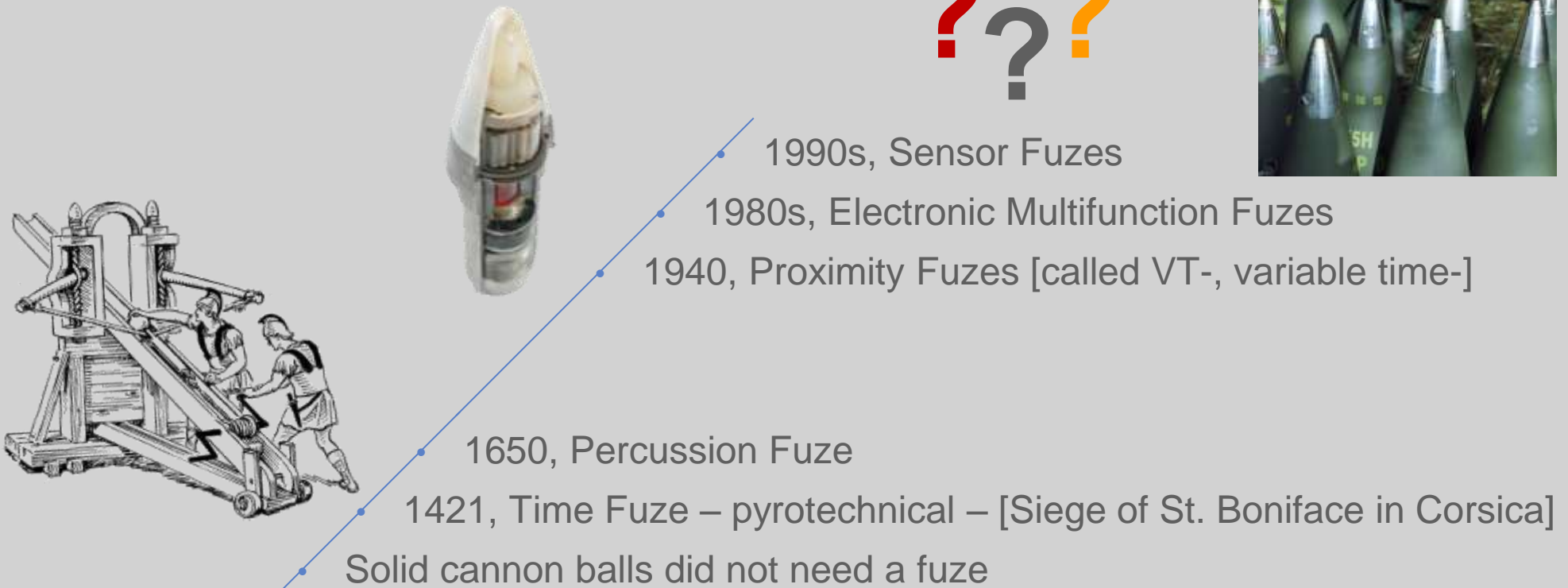
57th Annual Fuze Conference
July 30th, 2014
Harald Wich
Diehl & Eagle Picher GmbH

Overview

- ◆ Definitions and History
- ◆ Fuze Functions and Categories
- ◆ Modern Electronic Solutions and Subsystems
- ◆ Power Supply
- ◆ Other Hurdles
- ◆ Summary and Conclusion

A little bit of (Fuze) History

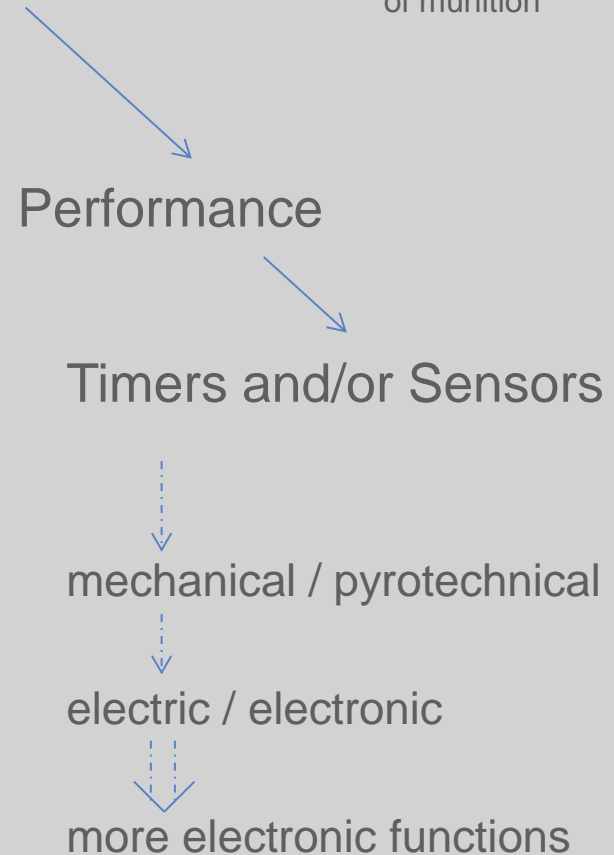
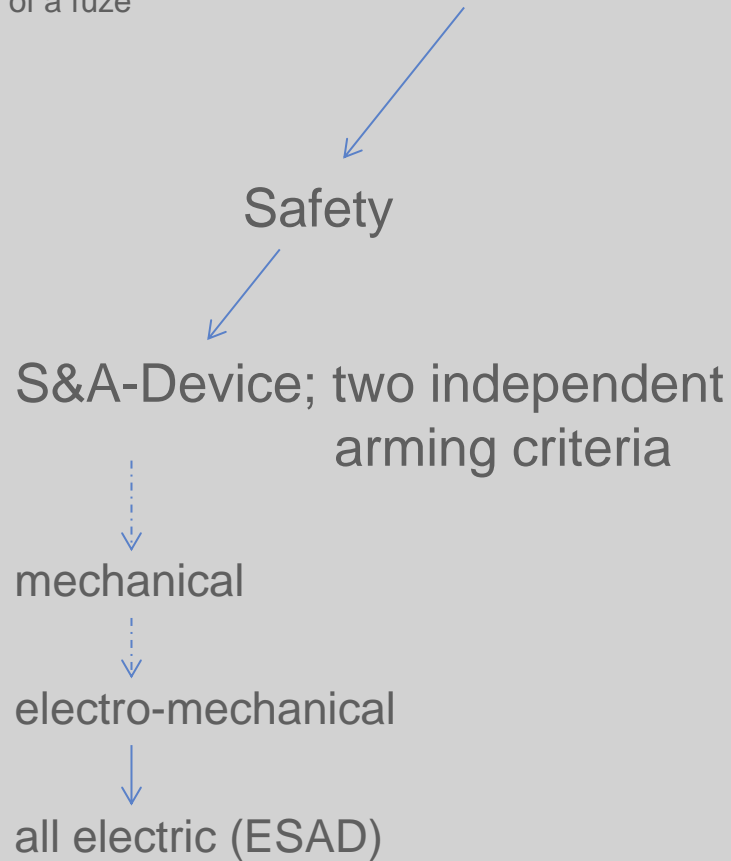
Definition: “A Fuze is a Device that initiates an Explosive Function.” ^[1]



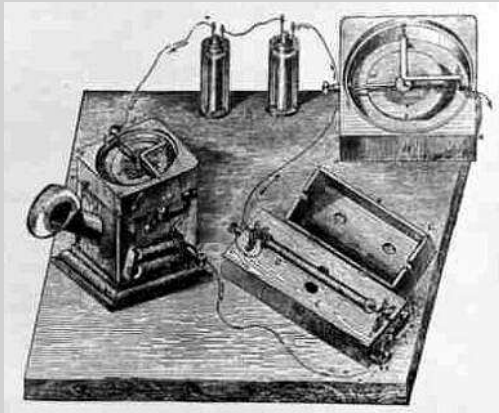
^[1] Wikipedia: „Artillery Fuze“

Definition

Purpose of a fuze = enable and improve effect of munition



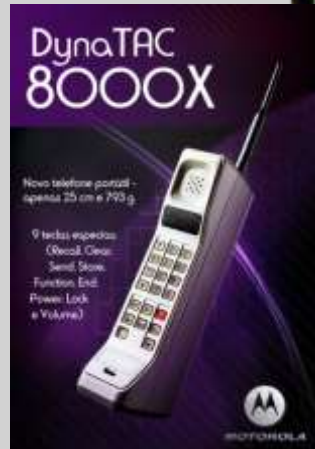
Let's look aside



1861



1985



1983



2013



1989



2013

Fuze Functions



Point Detonating (PD)



Point Detonating + Delay (PD + D)

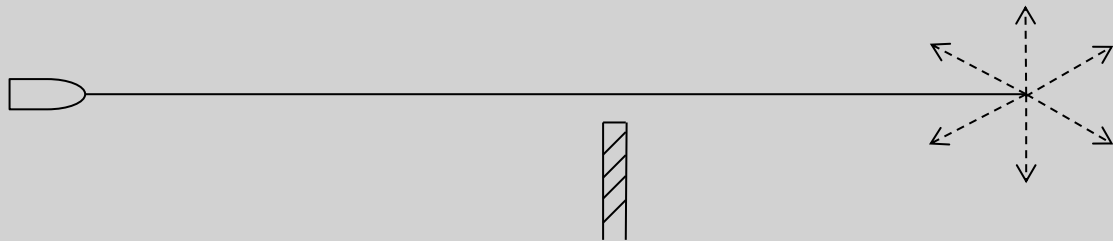


Layer-/ Event-Counting



Airburst (T)

Fuze Functions



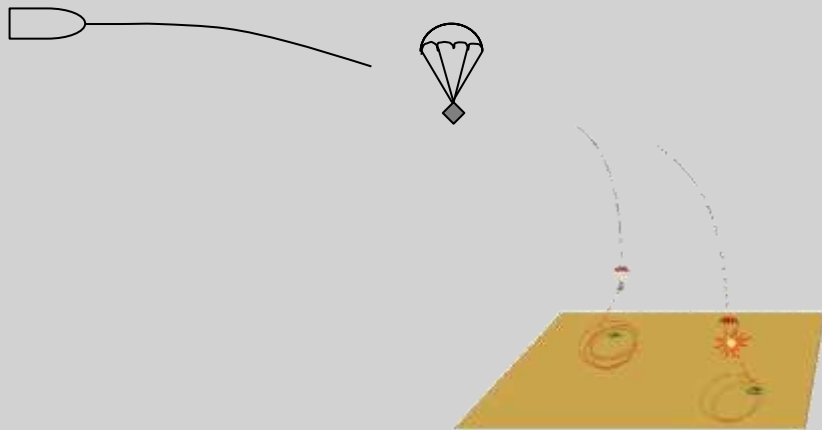
Self Destruct (SD)



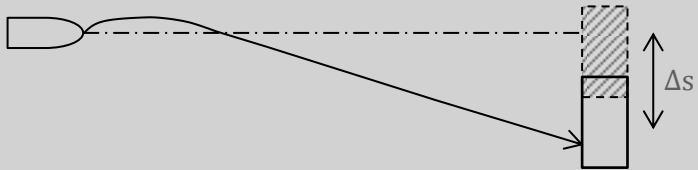
Proximity (PX)



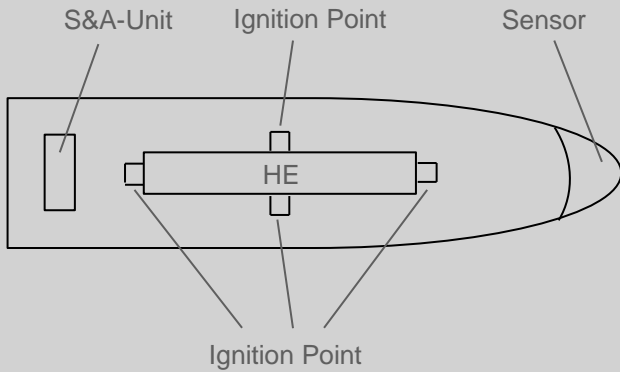
Target Detection



Fuze Functions



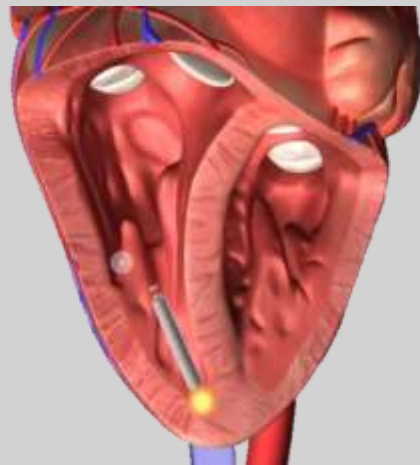
Course Correction



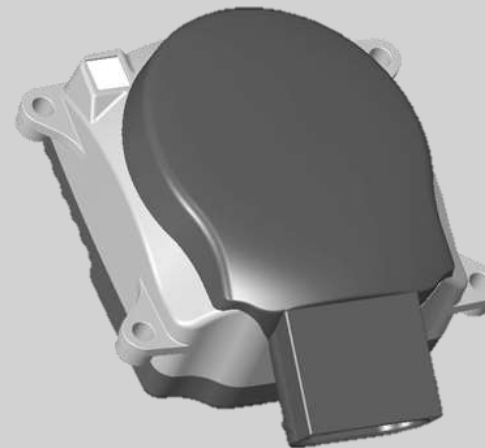
“Dial a Yield”
Selectable Warhead Function

Modern Electronic Solutions

- ◆ Miniaturized Systems

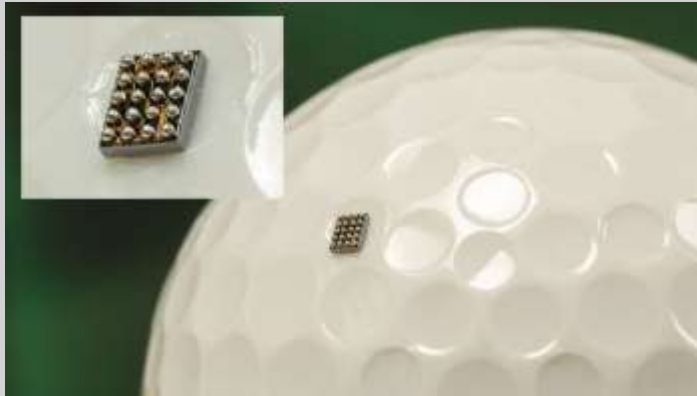


Cardiac Pacemaker



77 GHz Automotive Radar

Modern Electronics Subsystems



Microcontroller



9-axis Motion Sensor

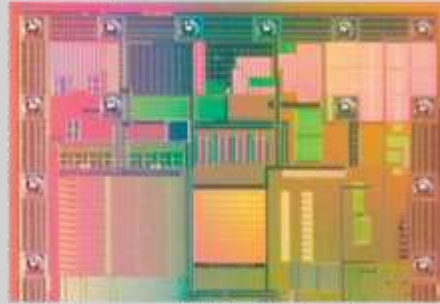


GPS-Receiver

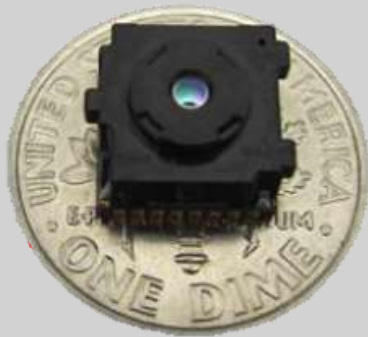
Modern Electronics Susystems



3D infrared time of flight sensor



Single chip W-band radar



80x60 LWIR camera



Actuator



Power Supply

- ◆ All new electronic Subsystems are
 - Low voltage 1.7 - 8.5 V*
 - Low current 5 - 110 mA*
 - ⇒ Low power 10 - 300 mW*

- ◆ Typical combinations for medium caliber

$$P_{\text{Peak}} = 50 - 500 \text{ mW}$$

flight times of 10 - 20 sec sum up to

$$E = 0.5 - 10 \text{ J}$$

- ◆ Sophisticated Power management is required to lower Energy

** for the examples shown*

Power Supply

- ◆ Set-Back-Generators are far too small for these applications
- ◆ Miniaturized Fuze Batteries can do *

DEP-14103



50 mW; 3 J

DEP-14104



75 mW; 10 J

DEP-14202



500 mW; 100 J

- ◆ TEPS plus a moderate size capacitor can do *

DEP-15001



100 mW; 100 mJ

DEP-15030



200 mW; 200 mJ

DEP-15060

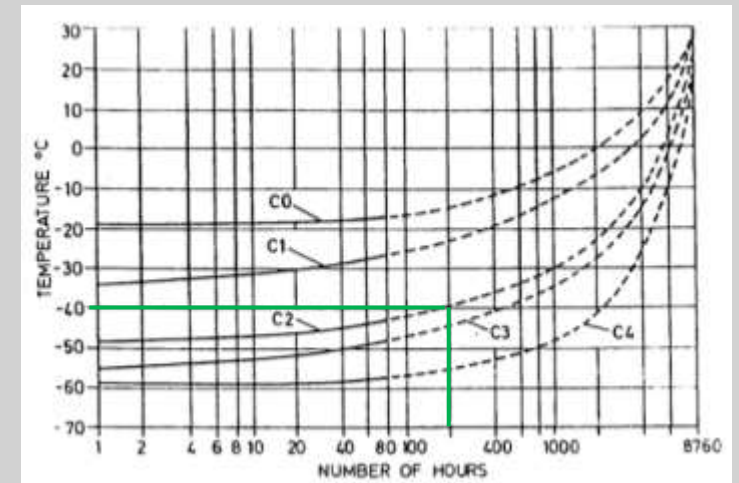


1000 mW; 2000 mJ

* See #16520

Other Hurdles

- ◆ All examples shown are commercial temperature range, $-40^{\circ}\text{C} \div 80^{\circ}\text{C}$
- ◆ Fuzes are usually $-46^{\circ}\text{C} \div 63^{\circ}\text{C}$ (C2, AECTP 200)
- ◆ How critical is the gap of -6°C
 - geographically (colder areas) x • time-wise
 - Northern Norway (Scandinavia)
 - Prairie provinces of Canada
 - Tibet
 - Much of the (former) USSR
- ◆ We see various ways to solve this issue !



200 hours of a year

Summary

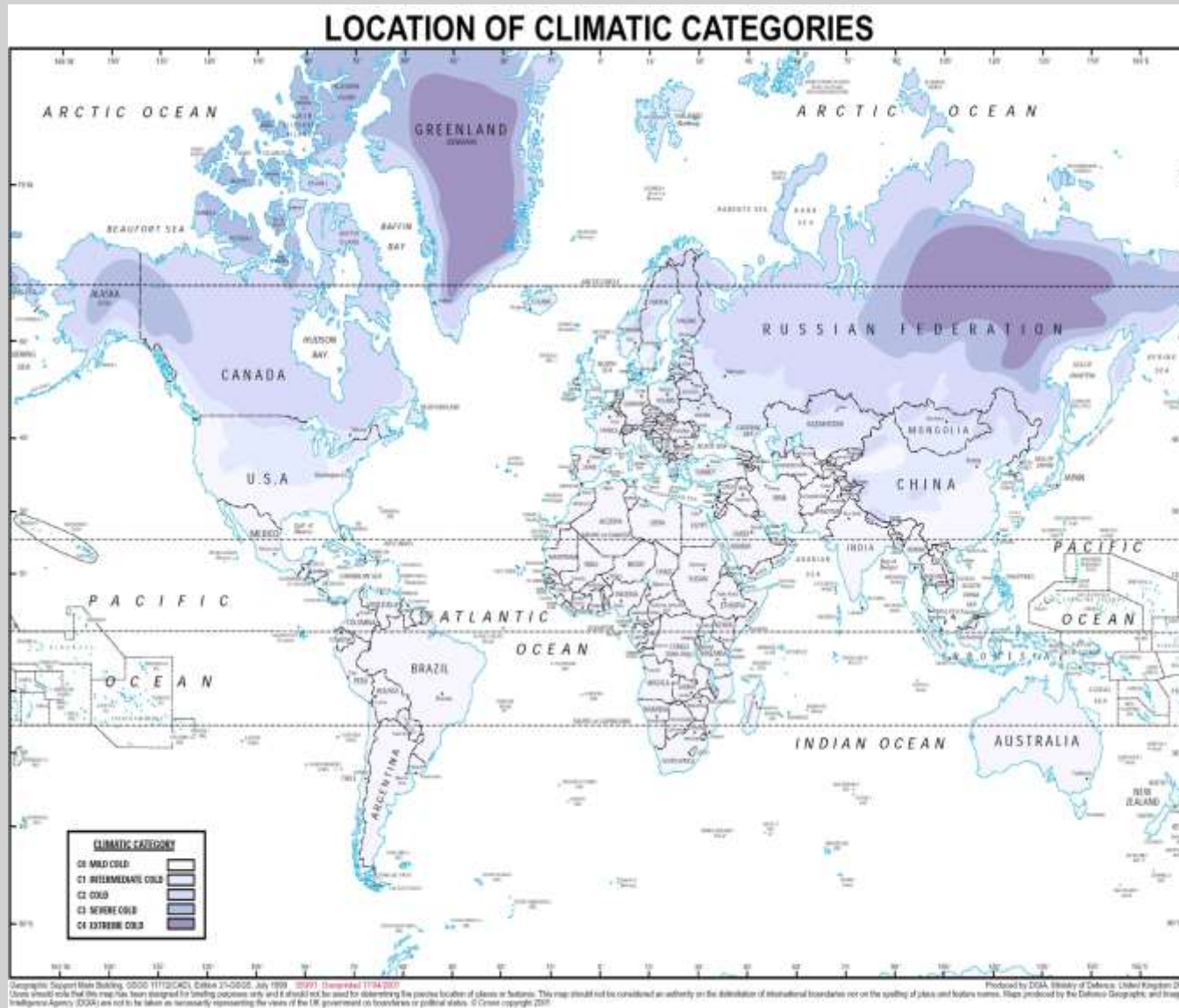
- ◆ Electronic Fuzing can significantly enhance Effectivity of Future Munition
- ◆ Everyday Commercial Electronic Systems demonstrate the functions which can be achieved today
→ almost no limits
- ◆ Electronic Commercial Subsystems are suitable for very advanced fuze functions
- ◆ Power Supplies with the right power and energy with very long shelf life are available
- ◆ The AECTP200, -6°C issue seems to be no show-stopper

Let's do it !

Thank you for your attention!

Questions?

Backup



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