

Microwave Fuze

INNOVATIVE DIGITAL PROXIMITY FUZE
FOR 76/62 mm GUN
(Microwave, Programmable)



 OtoBreda Division

 **Alenia**
DIFESA

Companies



SIMMEL DIFESA

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ITALIAN NAVY

awarded the development contract

ALENIA DIFESA

OTOBREDA DIV.

(former OTO Melara)

- computer modeling
- μ W sensor
- signal processor
- firing tests

SIMMEL DIFESA SpA

(heritage from Borletti and BPD)

- fuze integration
- impact sensor
- post-impact delay
- battery
- S&A
- pyrotechnic chain

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FUZE MAJOR FEATURES

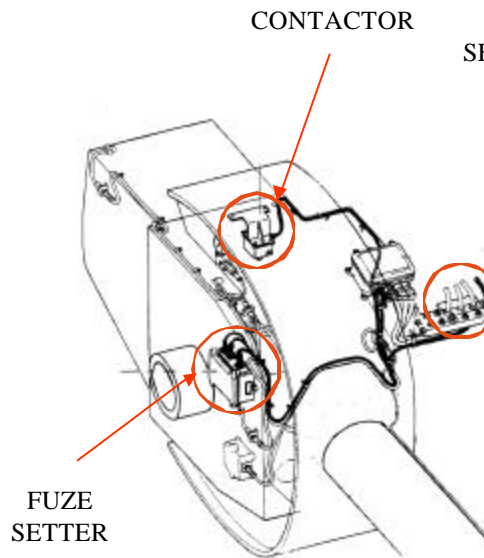
- PROGRAMMABILITY OF OPERATING MODES
from the FCS through a setter
- 5 OPERATING MODES
 - PROXIMITY vs SEA SKIMMER (default mode)
 - PROXIMITY vs FIXED WING AIRCRAFT
 - PROXIMITY vs ROTARY WING AIRCRAFT
 - PROXIMITY vs SURFACE TARGETS
 - DELAYED IMPACT vs REINFORCED TARGETS
- 2 BACK-UP MODES (not available if delayed impact is selected)
 - UNDELAYED IMPACT
 - SELF DESTRUCTION

FUZE MAJOR FEATURES continued

- SAFETY SYSTEM
 - COMPLIANT WITH STANAG 4187
 - SAFE SEPARATION DISTANCE (MECHANICAL ARMING) > 100 m
- OPERATING TEMPERATURE RANGE $-31^{\circ}\text{C} \div +63^{\circ}\text{C}$
- STORAGE TEMPERATURE RANGE $-40^{\circ}\text{C} \div +71^{\circ}\text{C}$

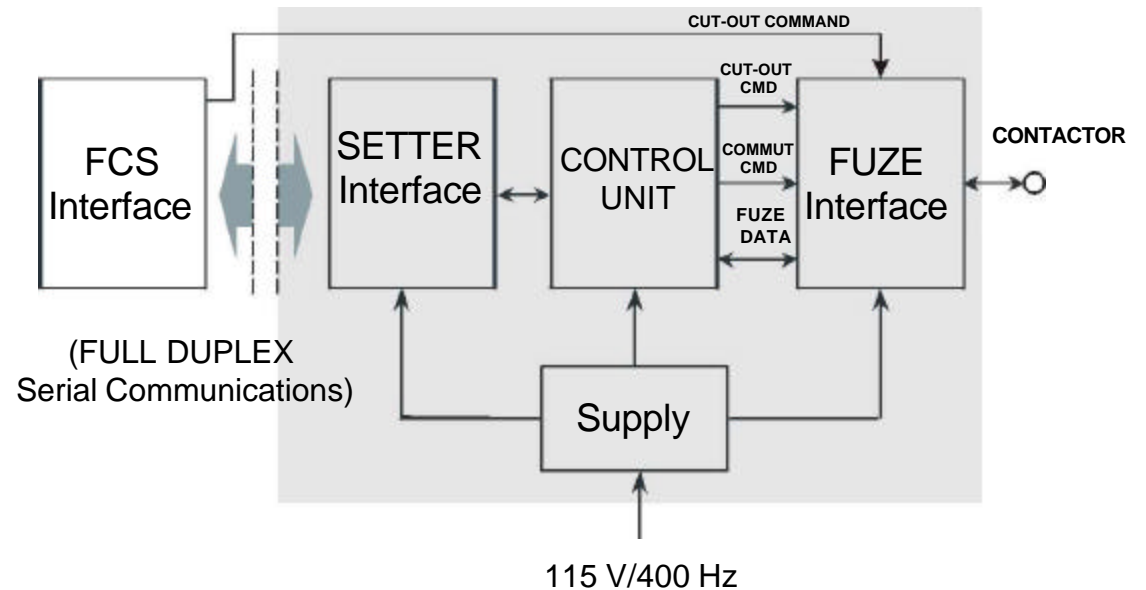
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ELECTRONIC SETTING SYSTEM FOR 76 mm PROXIMITY FUZE



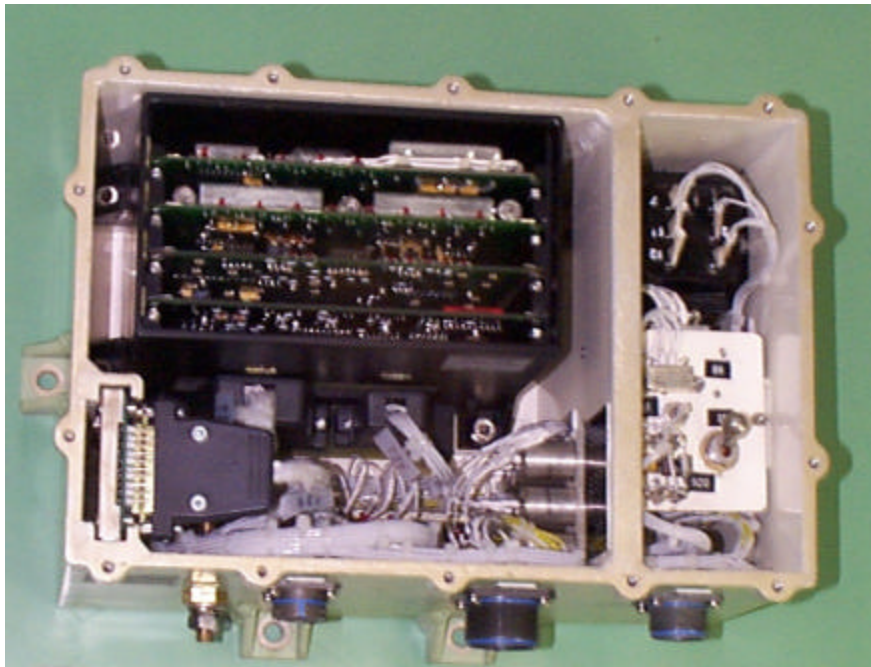
INSTALLATION ON GUN ELEVATING MASS

FUNCTIONAL BLOCK DIAGRAM



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ELECTRONIC SETTER FOR 76 mm PROXIMITY FUZE



- **DEVELOPMENT COMPLETED**
- **4 SYSTEMS ORDERED BY ITALIAN NAVY FOR NEW FPB's**
- **18 SYSTEMS WILL BE INSTALLED ON EXISTING SHIPS**

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ELECTRONIC SETTER FOR 76 mm PROXIMITY FUZE

FUNCTIONS

- **SELECT THE OPERATING MODE (PROXIMITY/DELAYED IMPACT).**
- **ENABLE FUZE RECEIVER JUST BEFORE TARGET INTERCEPT.**
- **OPTIMIZE PROXIMITY PERFORMANCE AGAINST DIFFERENT KINDS OF TARGETS BY SELECTING DEDICATED SOFTWARE.**
- **RETAIN THE COMPATIBILITY WITH IN-SERVICE FUZES**

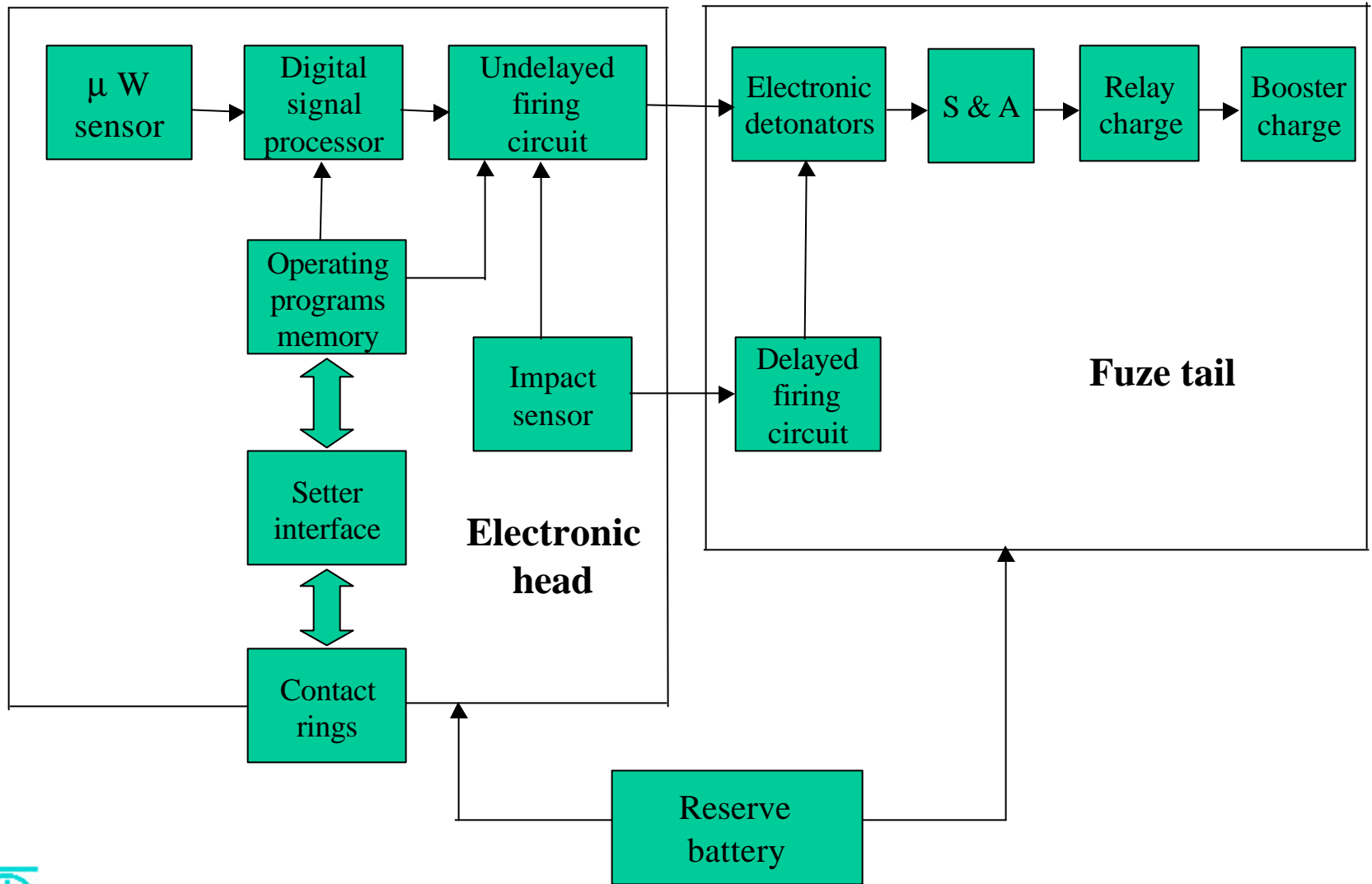
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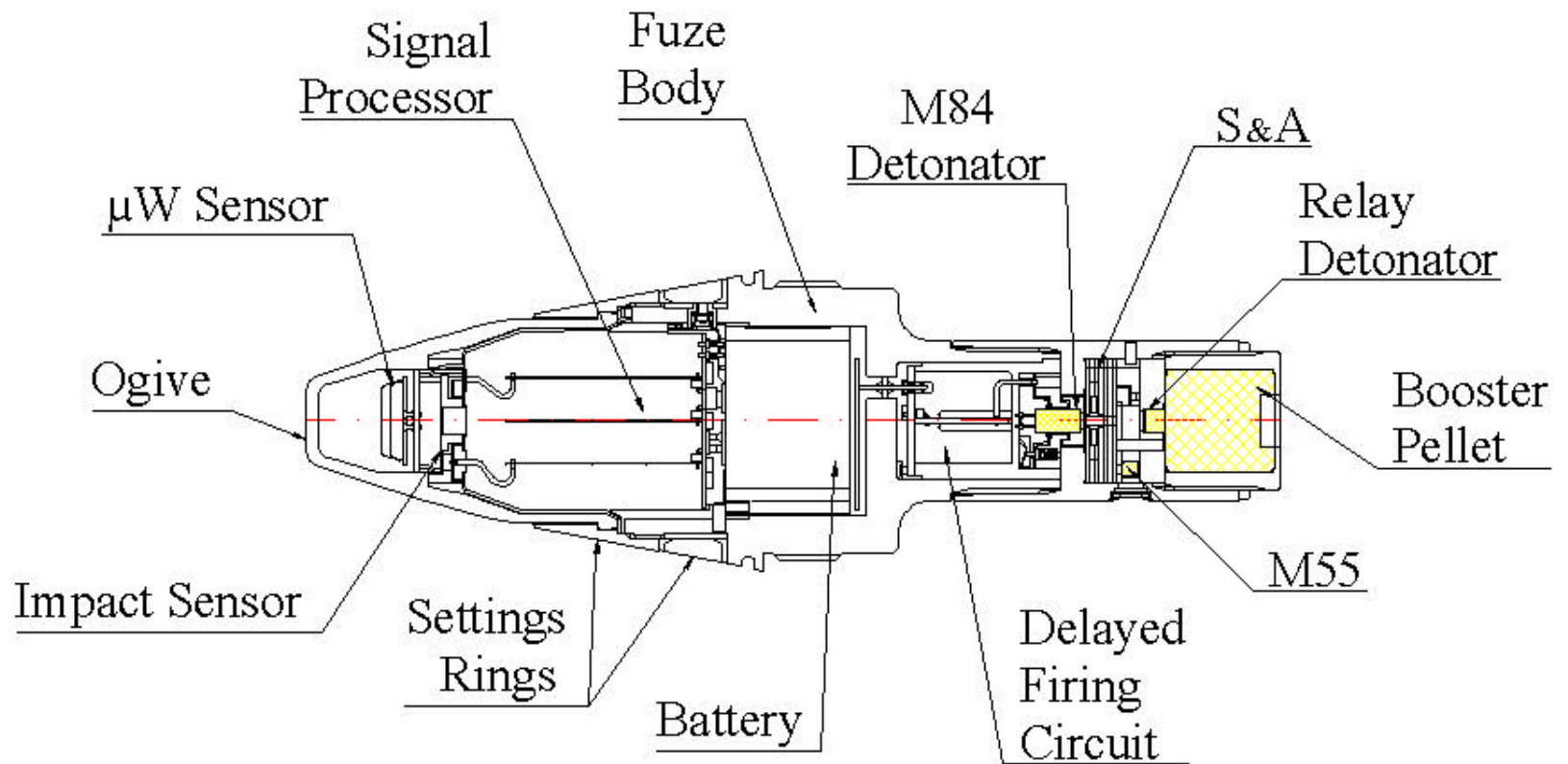
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Fuze layout



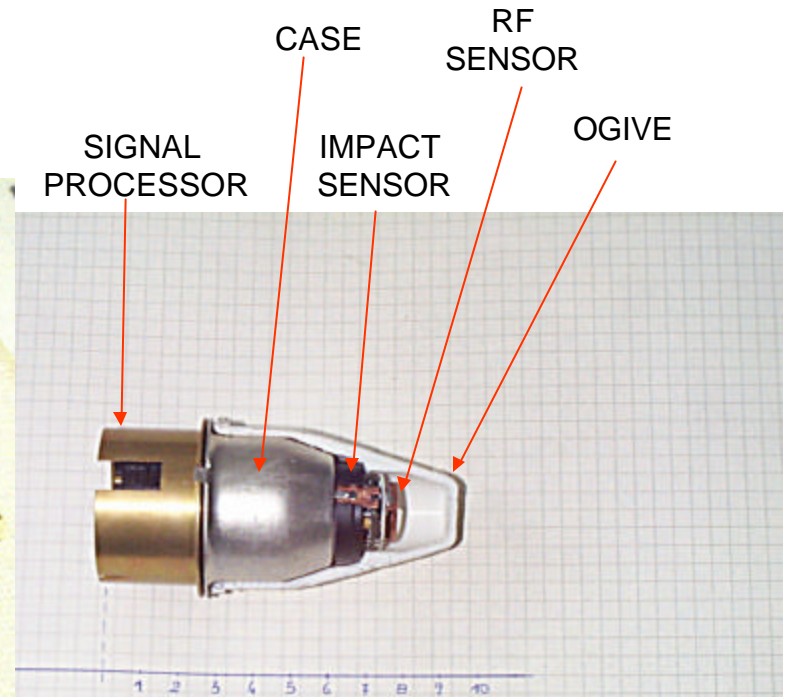
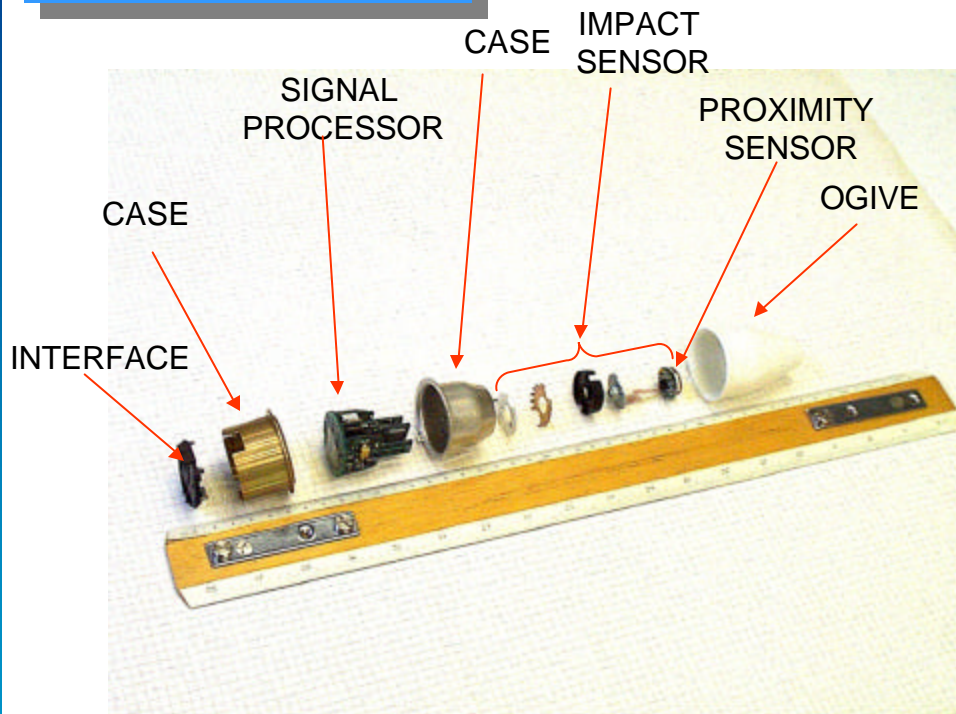
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FUZE TECHNICAL DESCRIPTION

ELECTRONIC HEAD BREAKDOWN



ELECTRONIC HEAD ASSEMBLY

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TELEMETRY PROJECTILE FOR IN FLIGHT TEST

USED DURING FUZE DEVELOPMENT



FUZE UNDER TEST

TELEMETRY
EQUIPMENT

- 2 A.C. CHANNELS FOR SENSORS SIGNALS (WIDEBAND)
- 2 D. C. CHANNELS FOR POWER SUPPLY CHECK
- 1 TRIGGER CHANNEL FOR DETONATION CHECK

TELEMETRY
ANTENNA

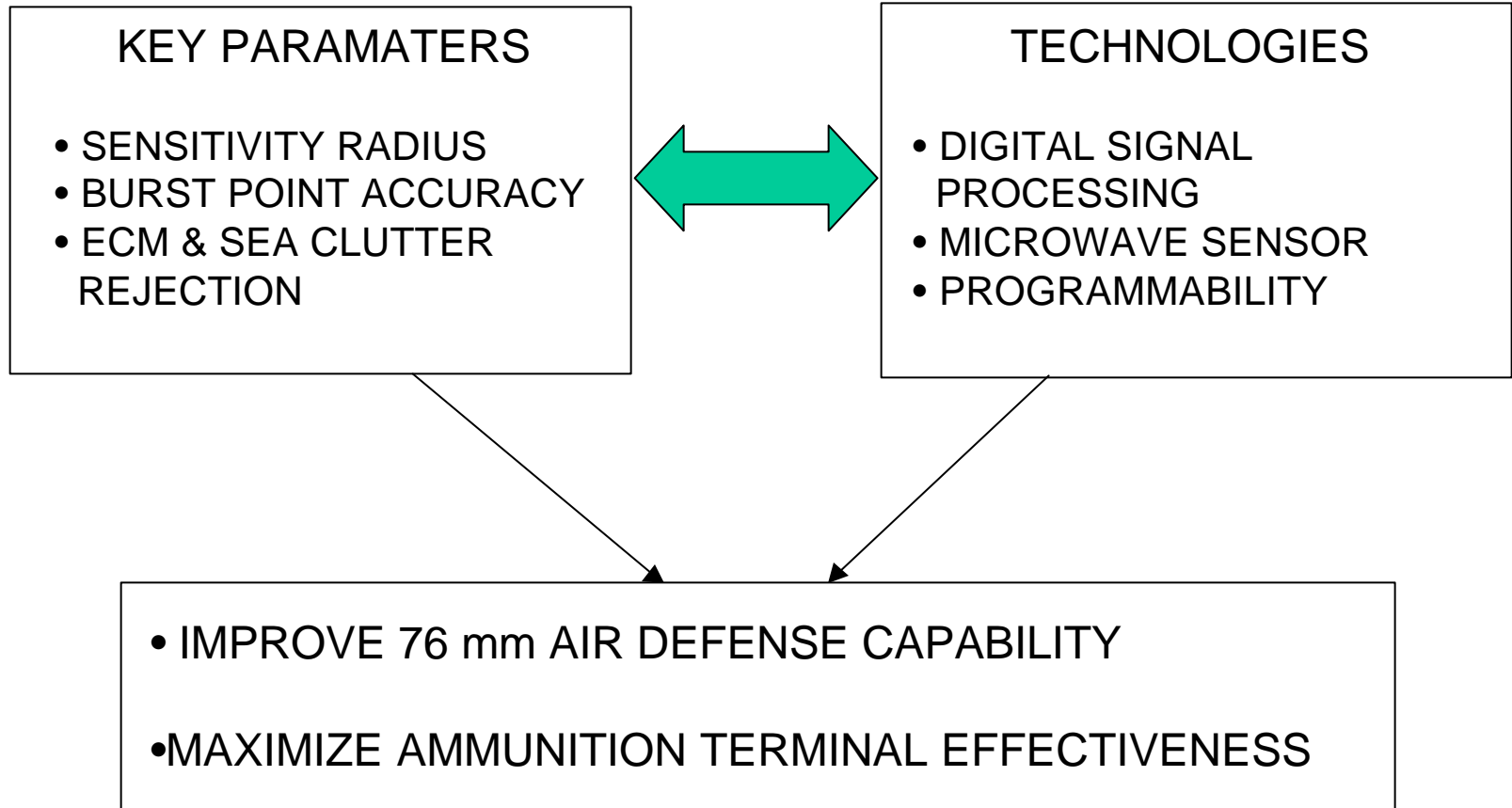
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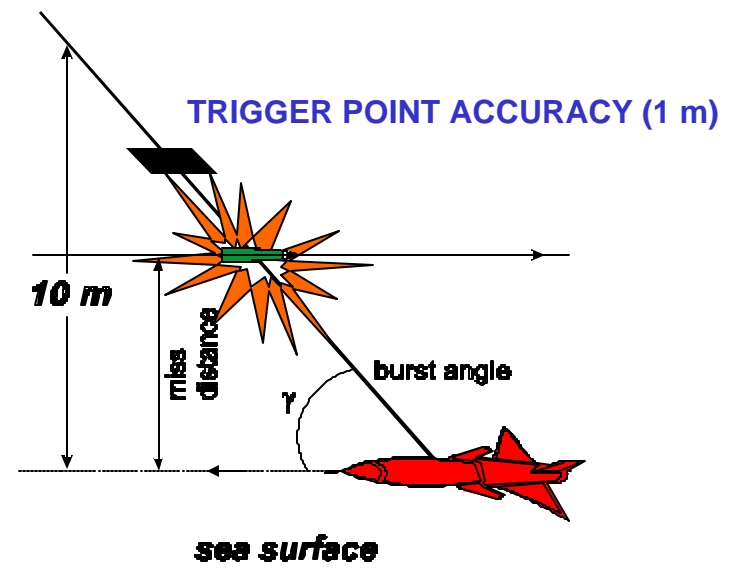
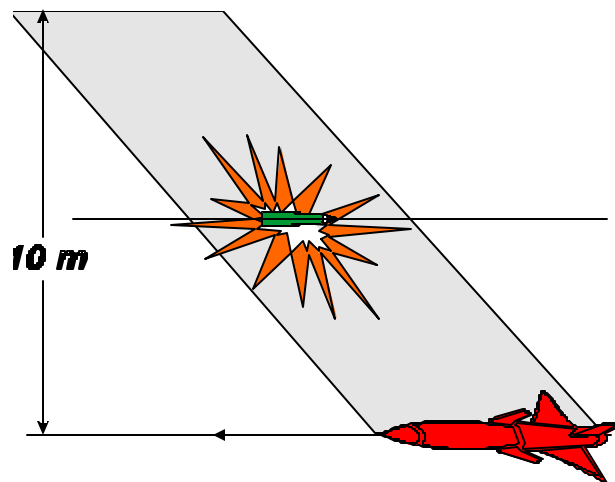
WHY A NEW FUZE



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CHARACTERISTICS OF THE NEW MICROWAVE FUZE

USEFUL BURST ZONE FOR AMMUNITION TERMINAL EFFECTIVENESS



- BURST POINT OPTIMIZATION ACCOUNTING FOR MISS DISTANCE AND RELATIVE INTERCEPTION SPEED
- INSENSITIVE TO SEA CLUTTER
- ECM PROTECTION

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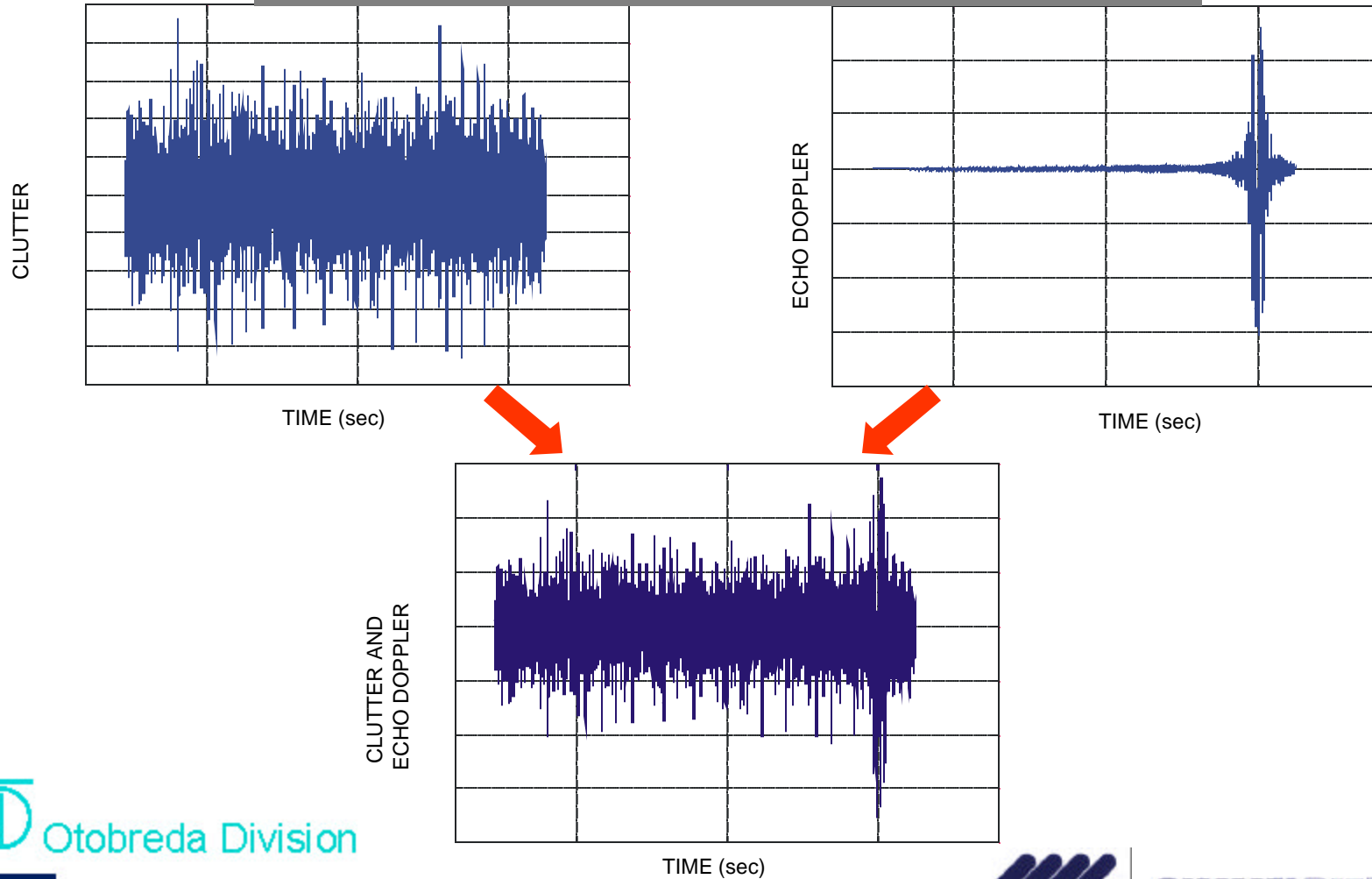


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HIGH SENSITIVITY RADIUS

ACHIEVED BY

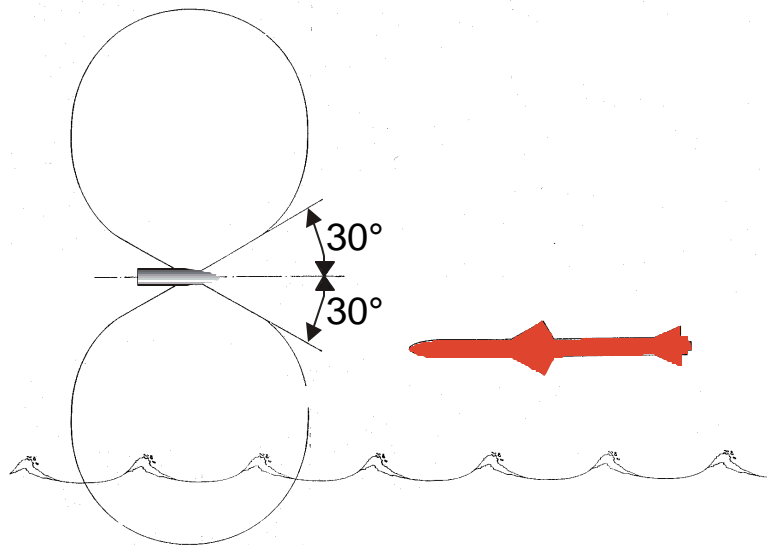
- LOW NOISE SENSOR
- HIGH COMPUTATION CAPABILITY DIGITAL SIGNAL PROCESSOR
- FFT AND PATTERN MATCHING ALGORITHMS



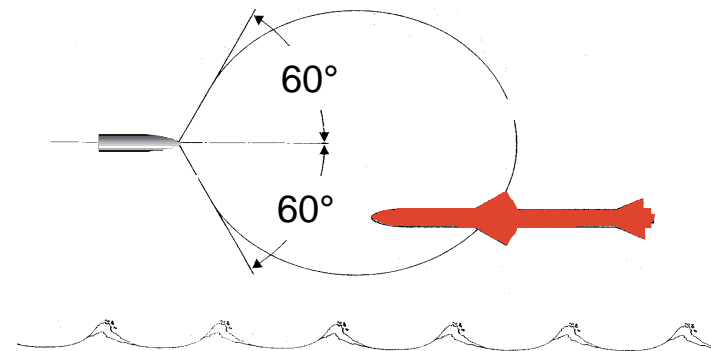
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REJECTION OF SEA CLUTTER NOISE AND IMPROVEMENT TO TARGET DETECTION RANGE

BODY ANTENNA FUZE



NEW MICROWAVE FUZE



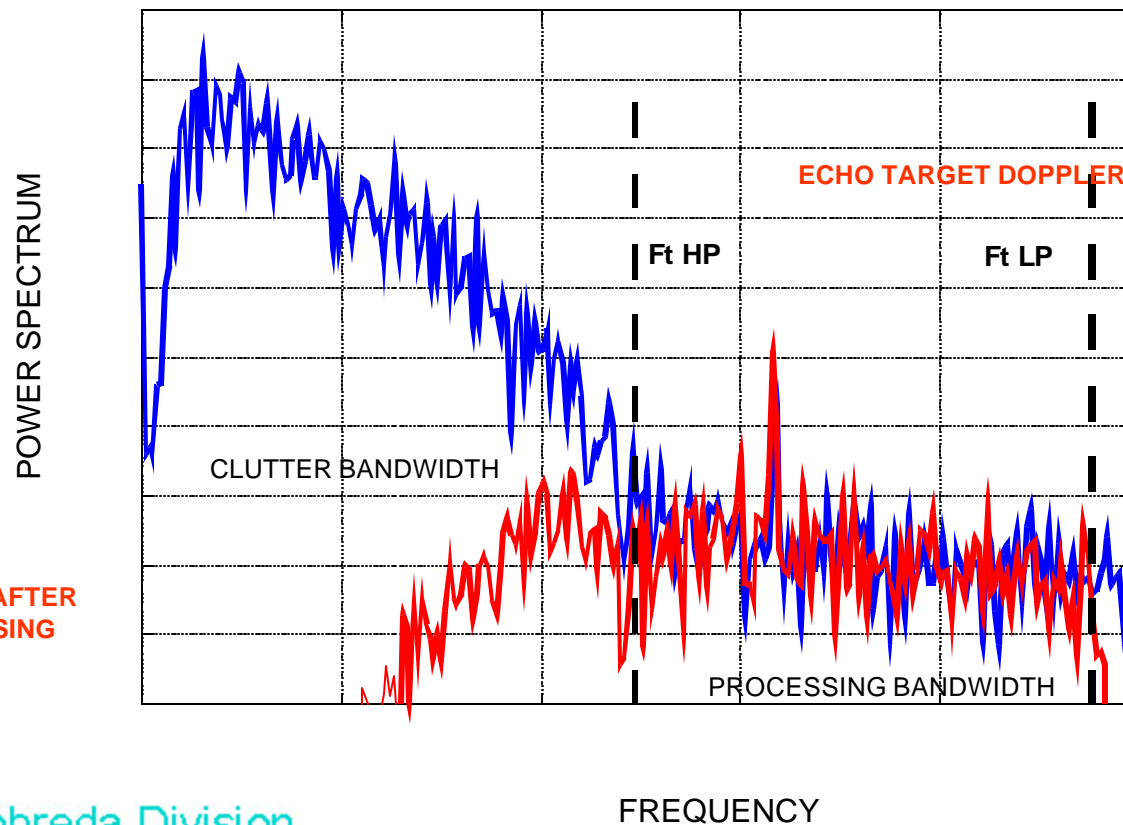
- INCREASE TARGET DETECTION RANGE
- REDUCE CLUTTER NOISE

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REJECTION OF SEA CLUTTER NOISE

ACHIEVED BY

- OPERATING NARROW BANDWIDTH ANALYSIS TO SEPARATE TARGET SIGNAL FROM CLUTTER NOISE
- INCREASING FUZE RF FREQUENCY TO INCREASE THE TARGET/CLUTTER SEPARATION



SPECTRUM OF SIGNAL
(CLUTTER AND
ECHO DOPPLER)
RECORDED
ABOUT 90 m
BEFORE
TARGET INTERCEPT

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LOW SENSITIVITY TO EM ENVIROMENT

ACHIEVED BY

- AN ELECTRONIC SETTER MOUNTED ON THE GUN WHICH ENABLES THE FUZE PROXIMITY MODE ONLY IN VICINITY OF TARGET
- USING NARROW BANDWITH SENSOR, ROBUST DIGITAL SIGNAL PROCESSING, ADVANCED SW LOGICS

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PERFORMANCES IN PRIMARY ROLE

Primary Role	: ANTIMISSILE
Radial Sensitivity	: > 10 m
Action Probability	: > 95%
Level on sea	: down to 2 m

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IMPROVEMENTS TO THE “76/62 GUN BASED” SYSTEM

COMPARISON BETWEEN NEW MICROWAVE FUZE AND BODY ANTENNA FUZES (SEA SKIMMING MISSILE)

	MICROWAVE	BODY ANTENNA
RADIAL SENSITIVITY	> 10 m	3 m
TRIGGERING ACCURACY	1 m	2 m
DETONATION POINT OPTIMIZATION	ACCURATE (1)	COARSE
SEA CLUTTER REJECTION	VERY HIGH	MEDIUM
ECM PROTECTION	VERY HIGH	LIMITED

(1) Function of relative speed and miss distance

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FIRING TEST AGAINST LOW ALTITUDE TARGET



TEST LOCATION:
BALIPEDIO
"COTTRAU"

LA SPEZIA
15 JUNE 2000

*8 ROUNDS
FIRED WITH
MISS
DISTANCES
BETWEEN
3 AND 6 m*

MOVIE SHOWING 8 FIRINGS

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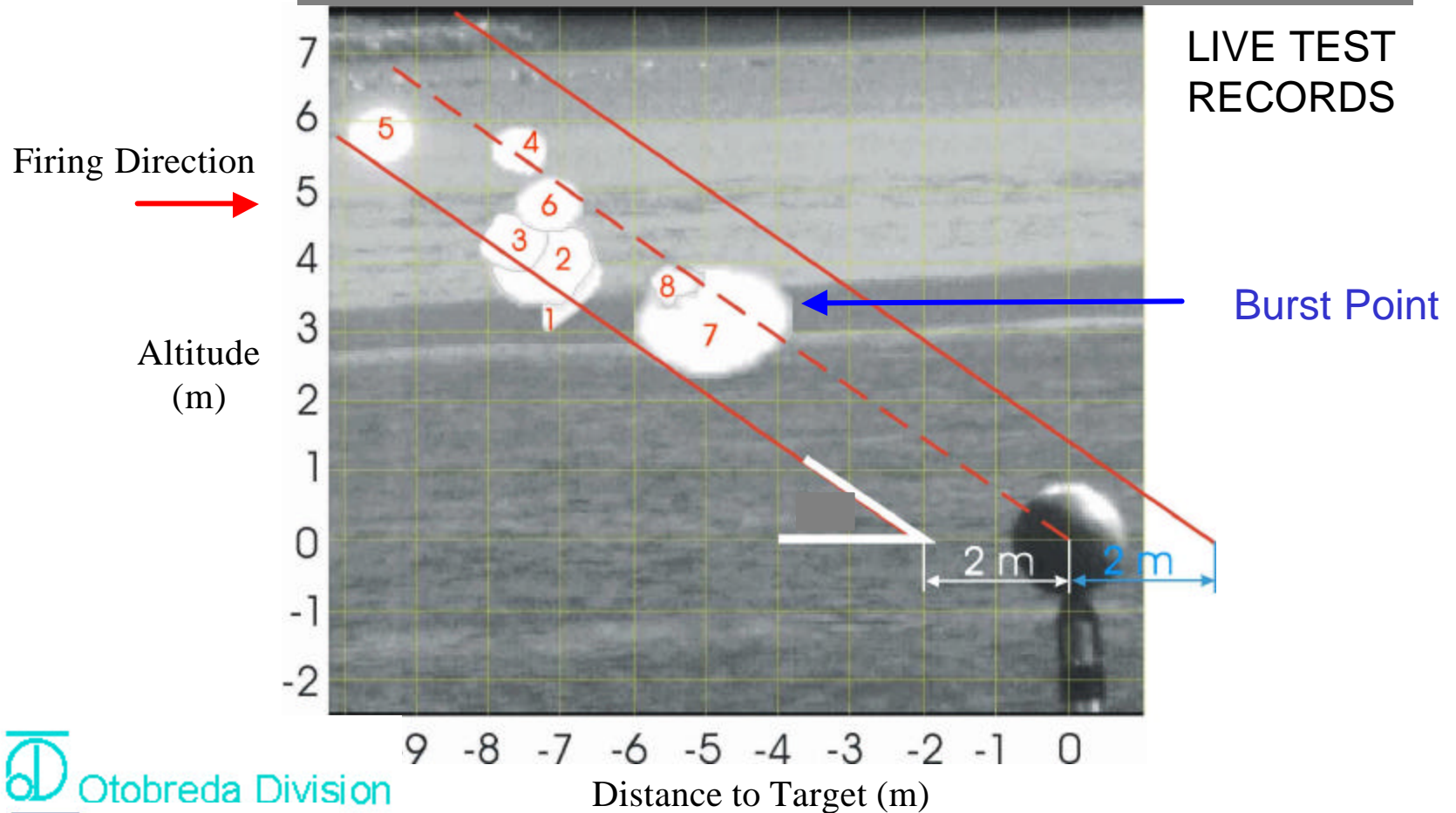


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ACCURACY OF BURST POINT

ACHIEVED BY

- HIGH SPEED COMPUTATION FOR SIGNAL FREQUENCY ANALYSIS
- TRIGGER DECISION MADE BY ADVANCED SIGNAL PROCESSING INSTEAD OF TIME/AMPLITUDE ANALOG PROCESSING



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DEVELOPMENT PROGRAM AND INDUSTRIALIZATION

Nr.	PHASE	96-97	1998	1999	2000	2001	2002	2003	2004	
1	DEVELOPMENT									
2	INDUSTRIALIZATION AND QUALIFICATION									
3	EARLY DELIVERIES									

