Transmission of Data Message through Contact Type Fuze Setter

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Introduction

□ K21 development program

✓ from armored personnel carrier to infantry fighting vehicle

K21*1)

K200

✓ Specifications

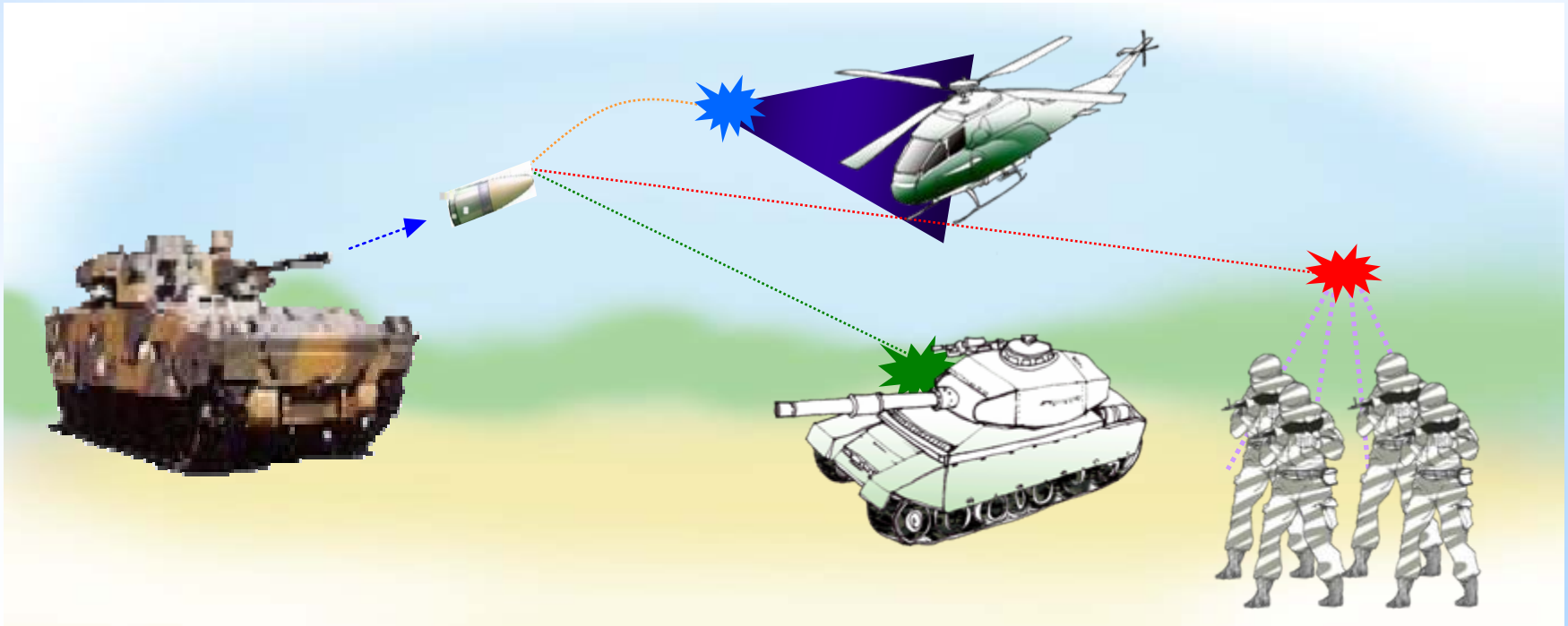
***1) K21 : Korean Infantry Fighting Vehicle**

***2) MMFA : Multi-Mode Fused Ammunition**

Model		K21	K200
Armament	main	40mm	12.7mm
	secondary	7.62mm	7.62mm
Crew		3+9	3+9
Ammunition types		APFSDS, MMFA*2), HEI	-

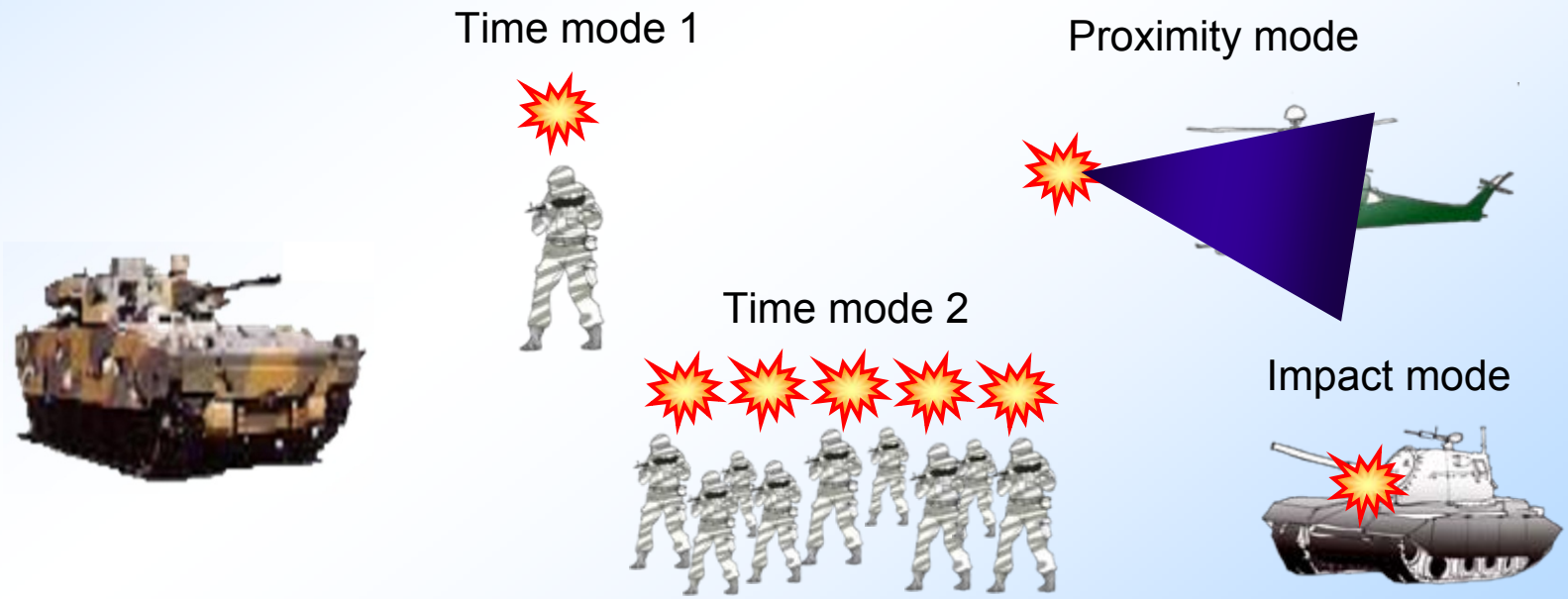
Introduction

- Necessity of MMFA
  - ✓ Threats : soldiers, light armoured vehicles, helicopters & bunkers
  - ✓ Function Modes : time mode, proximity mode & impact mode



Brief for Fuze Programming System

- Function modes of MMFA
  - ✓ Time mode 1 : accurate time function
  - ✓ Time mode 2 : increased time function
  - ✓ Proximity mode : proximity function
  - ✓ Impact mode : impact function, as default



Brief for Fuze Programming System

□ Fuze programming method

Country	Ammunition	Fuze set method	Remark
Sweden	40mm 3P*1)	Contact + HF	Contact : power
Swiss	35mm AHEAD*2)	Electro-induction	Device on the muzzle
Germany	30mm ABM*3)	Electro-induction	Device on the muzzle
U.S.A.	25mm HEAB*4)	Contact	-
	30mm HEAB	Contact	-
Korea	**40mm MMFA**	**Contact**	

•1) 3P : Prefragmented Programmable Proximity fuzed (BAE Systems-Bofors Defence)

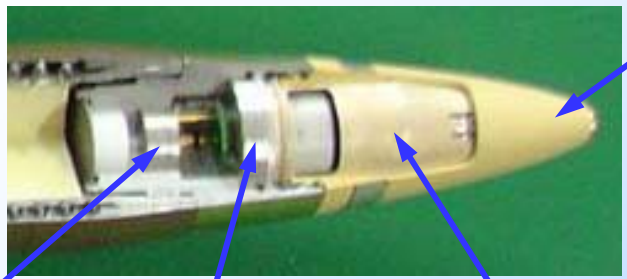
•2) AHEAD : Advanced Hit Efficiency And Destruction (Rheinmetall Detec-Oerlikon Contraves)

•3) ABM : Air Bursting Muniton (Rheinmetall DeTec -Mauser-Werke Oberndorf Waffensysteme GmbH)

•4) HEAB : High Explosive Air Bursting (GD-OTS)

Brief for Fuze Programming System

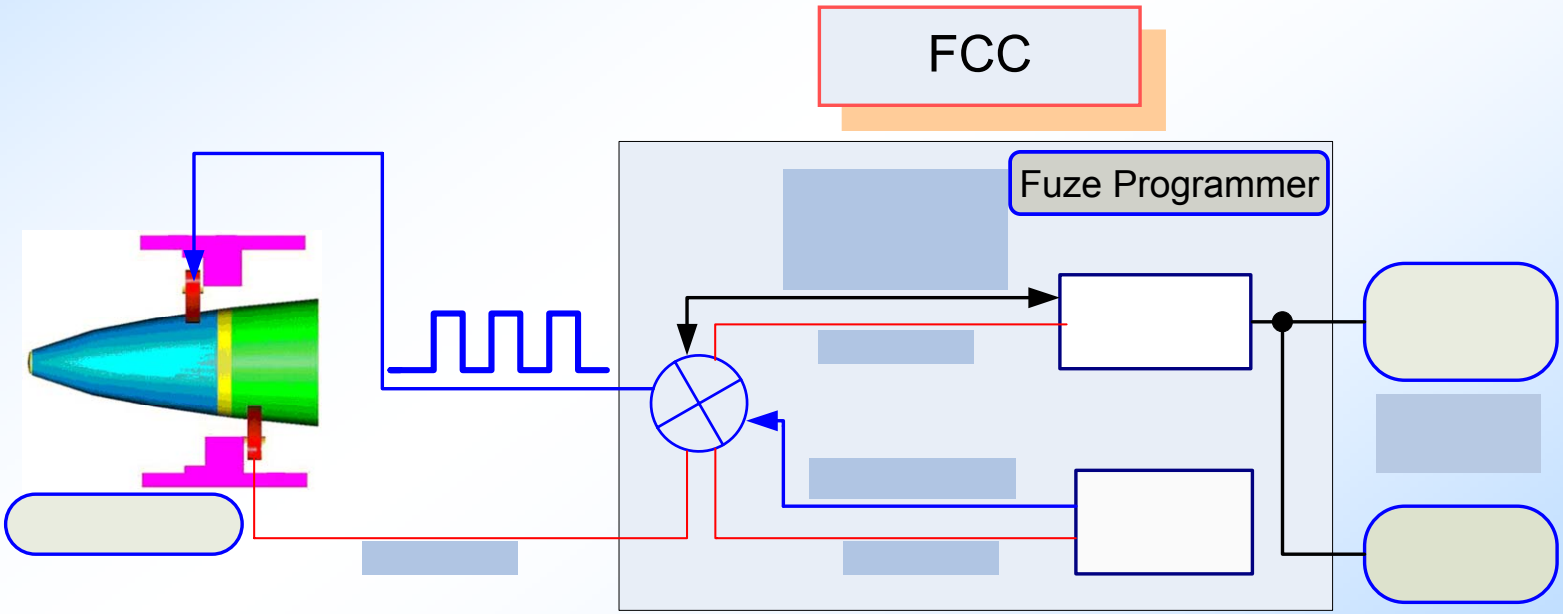
□ MMFA Configuration



Brief for Fuze Programming System

□ Data Flow

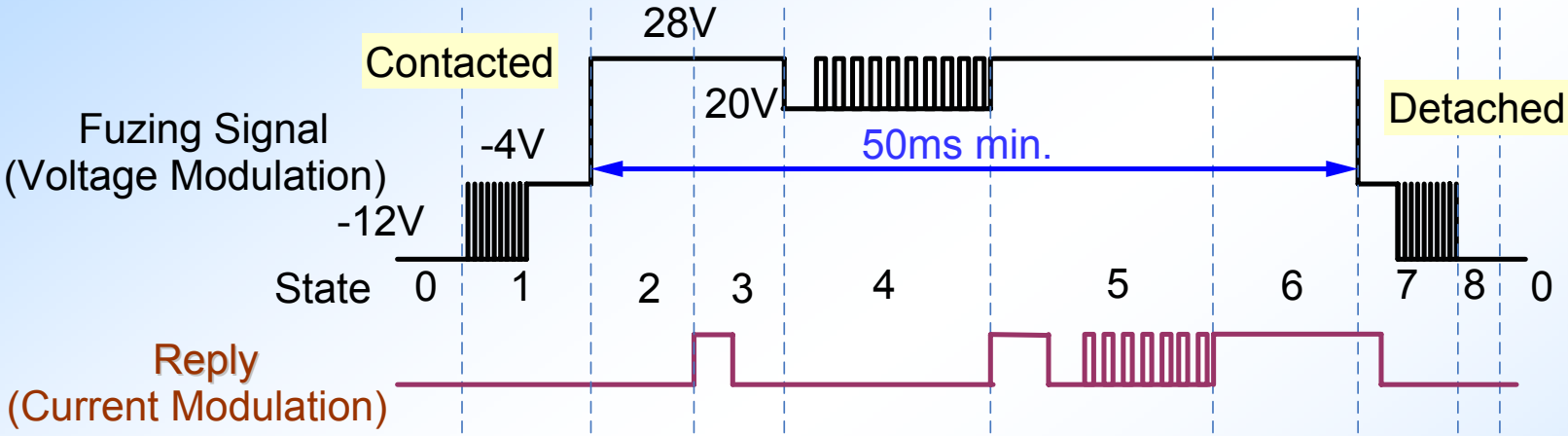
- ✓Able to check on contact state between fuze & fuze setter
- ✓Able to keep up stable contact during transmitting data set
- ✓Able to sense the detachment of ammunition from fuze setter



Fuze Programming System Configuration

Brief for Fuze Programming System

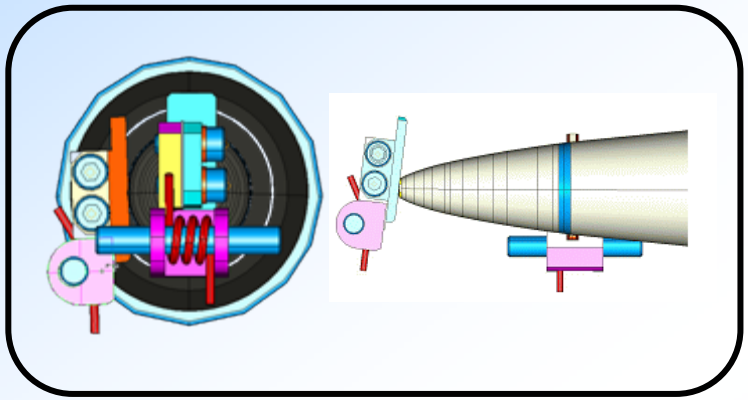
□ Fuzing Signal Arrangement



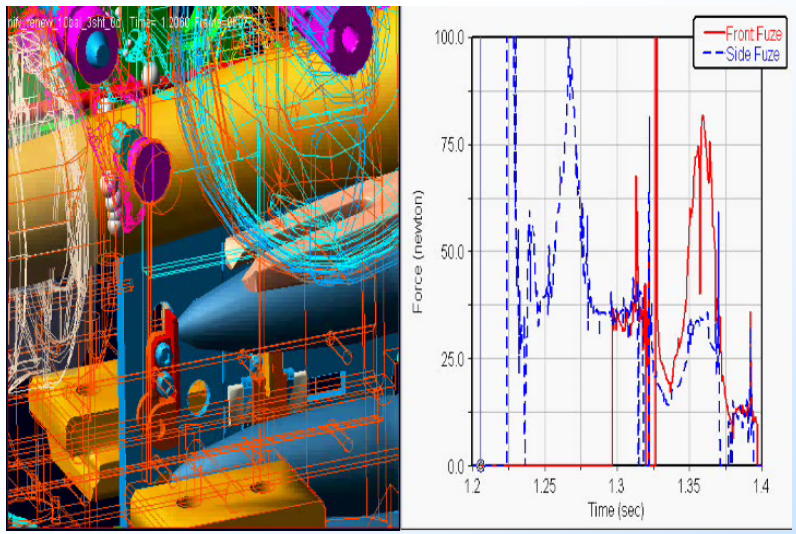
Step	State
0	Non contact state
1	Stabilized contact state between fuze & fuze setter
2	Powering up fuze
3	Activating the circuit &reply ready signal
4	Transmitting the data message to fuze
5,6	Storing the data to EEPROM & reply verified signal
7	Detaching of ammunition from fuze setter
8	Non contact state

Design of Fuze Setter

- Case 1 : Plate & Torsion Spring Type



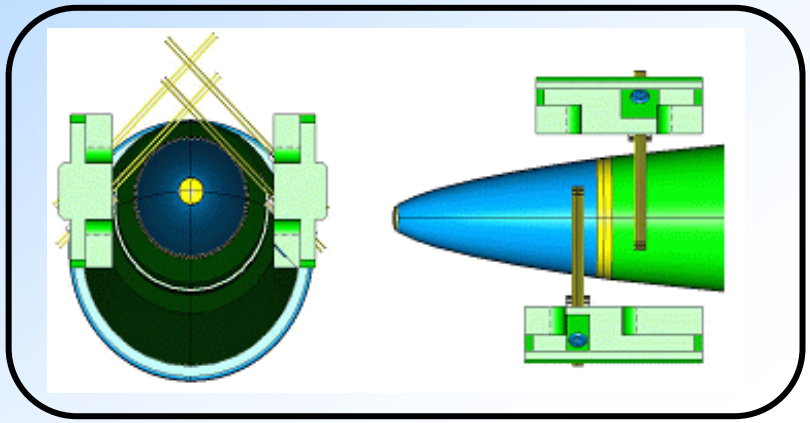
Configuration



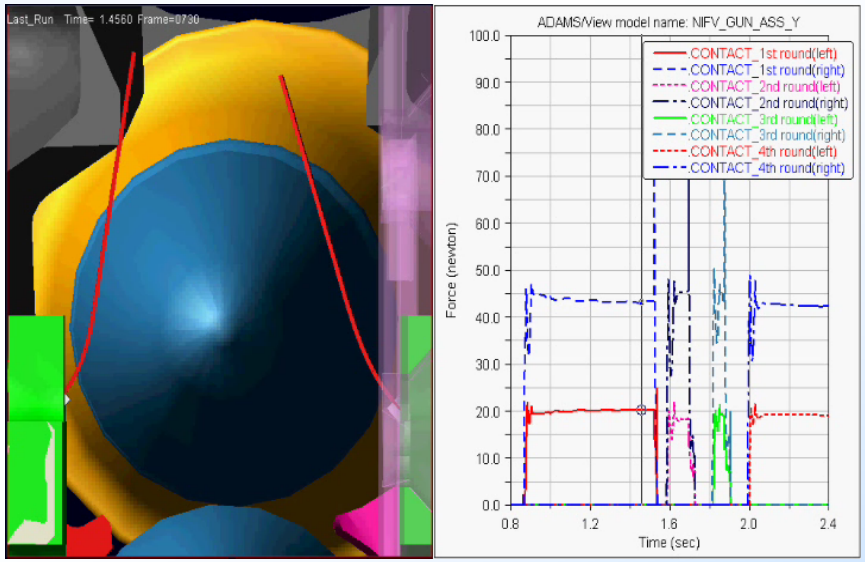
Virtual Simulation

Design of Fuze Setter

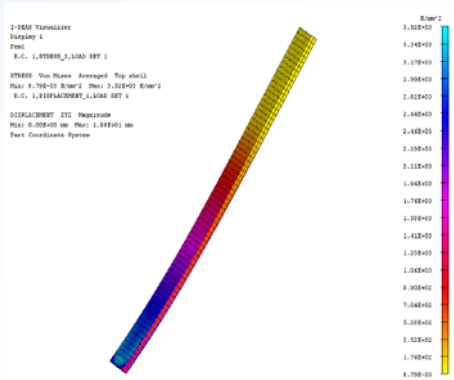
□ Case 2 : Multi-wired Brush Type



Configuration



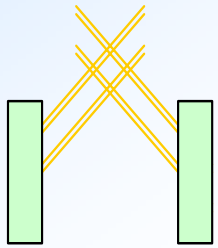
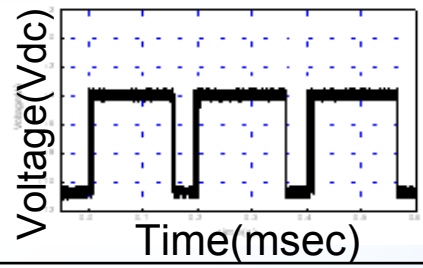
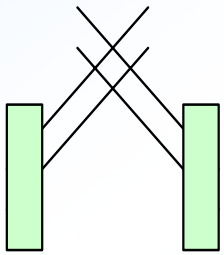
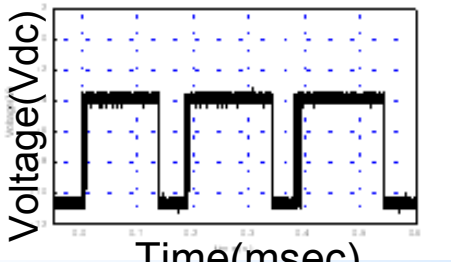
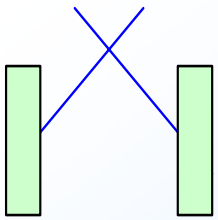
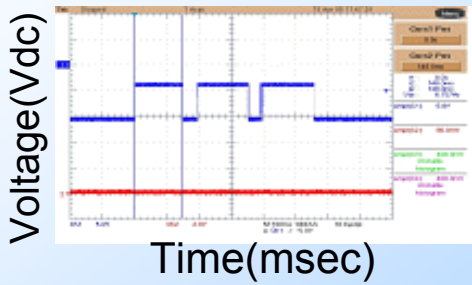
Virtual Simulation



Stress Analysis

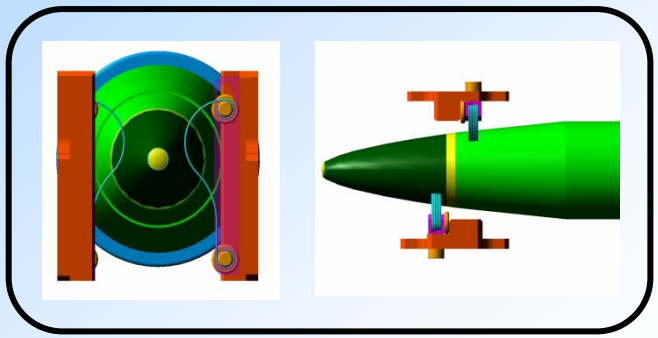
Design of Fuze Setter

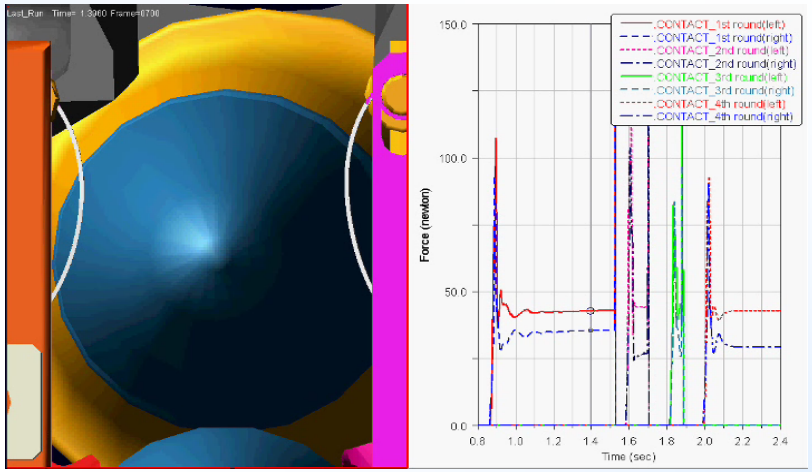
□ Design Parameters Study on Case 2

	Material	Configuration		Test Results
1	Alloy Steel with Gold		Φ0.5 * 6 pieces * 4 layer	
2	Stainless Steel		Φ0.5 * 6 pieces * 2 layer	
3	Stainless Steel		t0.5 * w4.0	

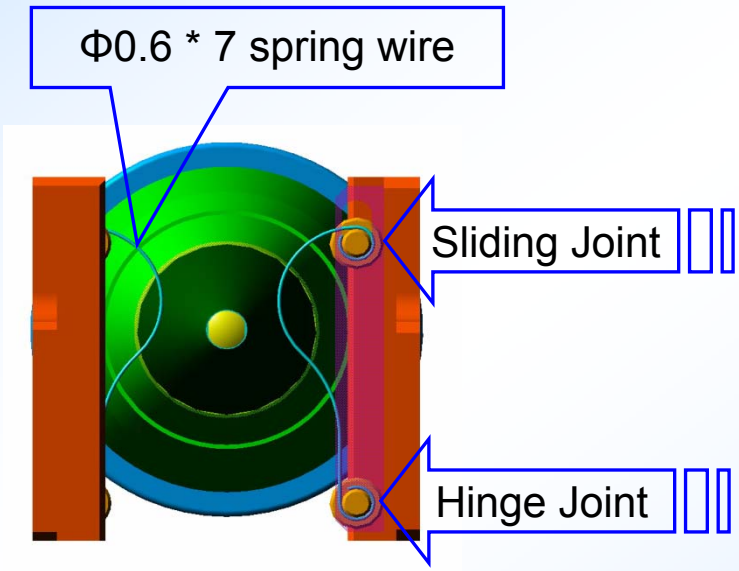
Design of Fuze Setter

□ Case 3 : Hinge & Sliding Joint Type with Multi-wired Spring





Virtual Simulation



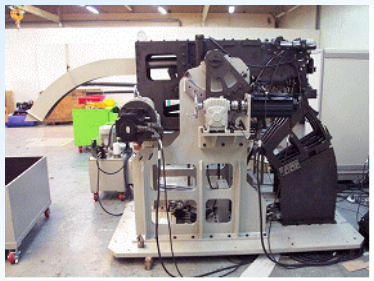
Configuration

Stress Analysis

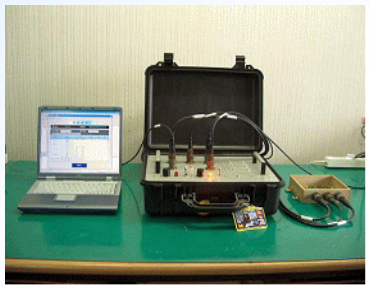
Test Results

- Simulation with No-Fire

Fuze setter

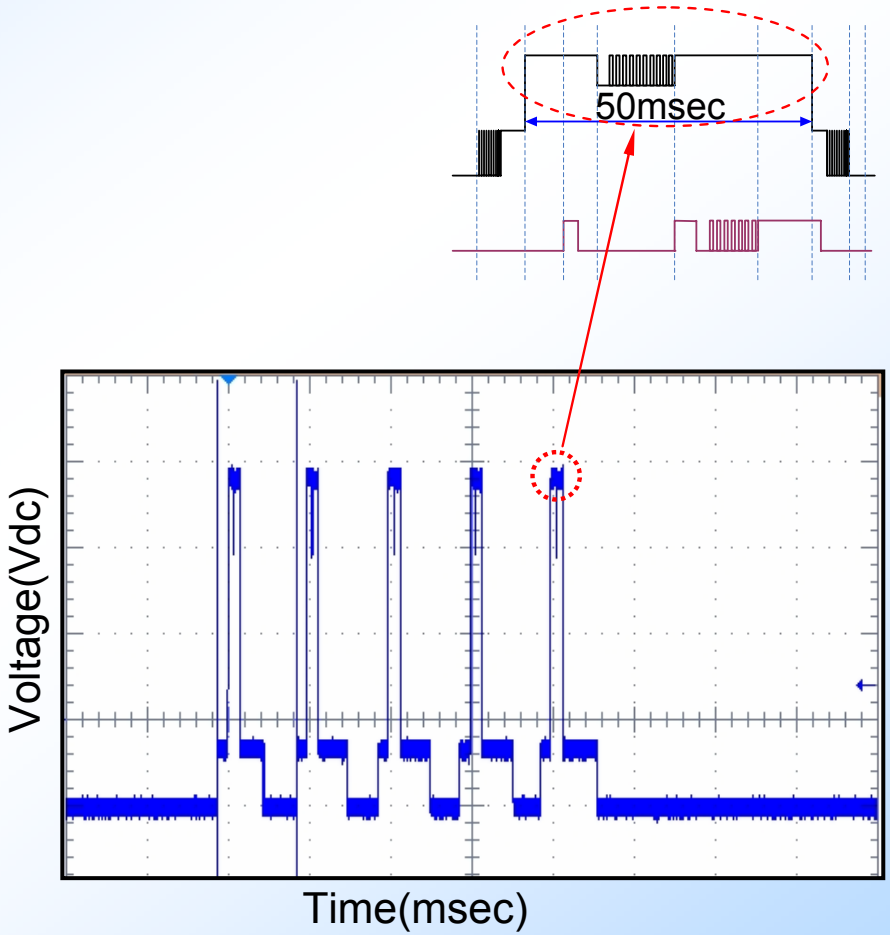


Test Simulator



Tester

Dummy MMFAs



Test result (5 burst rounds)

Test Results

- Live Firing Test

Time mode 1 Time mode 2

Test Results

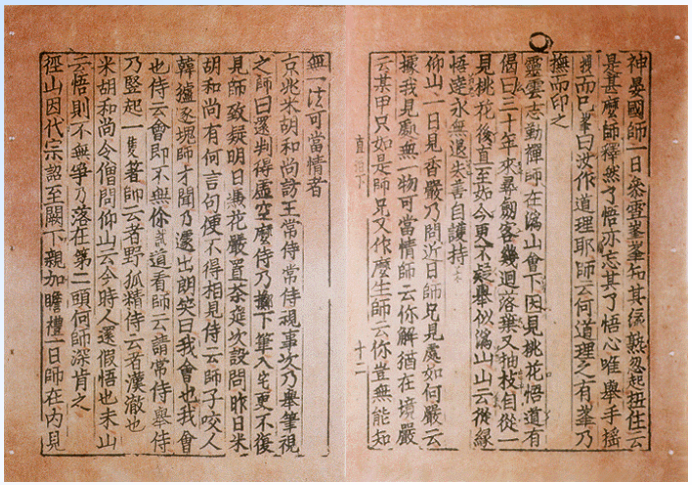
- Demonstration

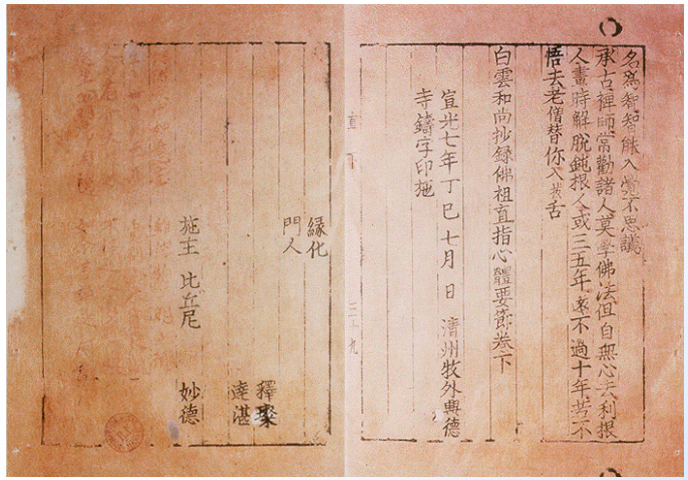
Summary

- Fuze programming system with contact type fuze setter has been successfully developed for K21's MMFA.
  - ✓ The method of transmitting power and data message through voltage modulation have been developed. Also the verified signal through current modulation has been developed.
  - ✓ Contact type fuze setter proves its stability of contact state against burst firing mode through multi-wired spring combination.
  - ✓ Fuze programming system has been verified by firing test.

Korean cultural legacy

"Jikjii", the oldest book printed by metalloid type





It had been made in 1377, which was 78 years earlier than "the Bible in 48 lines" made by Gutenberg.

THANK YOU