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K-9 자주포

사격 메커니즘 CATIA로 구현하기



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- 설계
- *Part Design Process*
- *DMU Kinematics Process*
 - *Simulation & Sequences*

Video

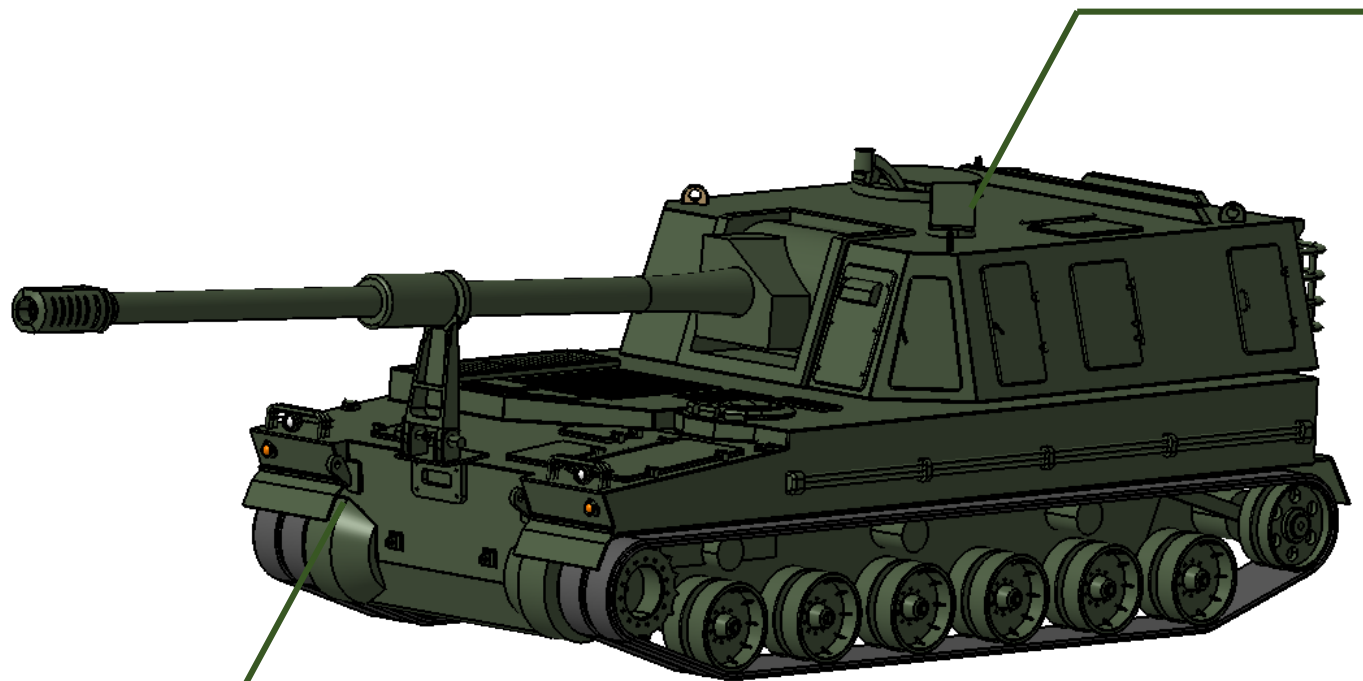
고찰

Q&A

PROJECT INTRODUCTION

*다양한 형상
사격 과정에서 다양한 종류의 움직임 발생
CAD 수업에서 배운 내용들을 적용하기 좋은 주제*

역할 분담



권태욱

- 자료조사
- *Part Design (Turret)*
- *DMU kinematics (Turret)*
- *Simulation*

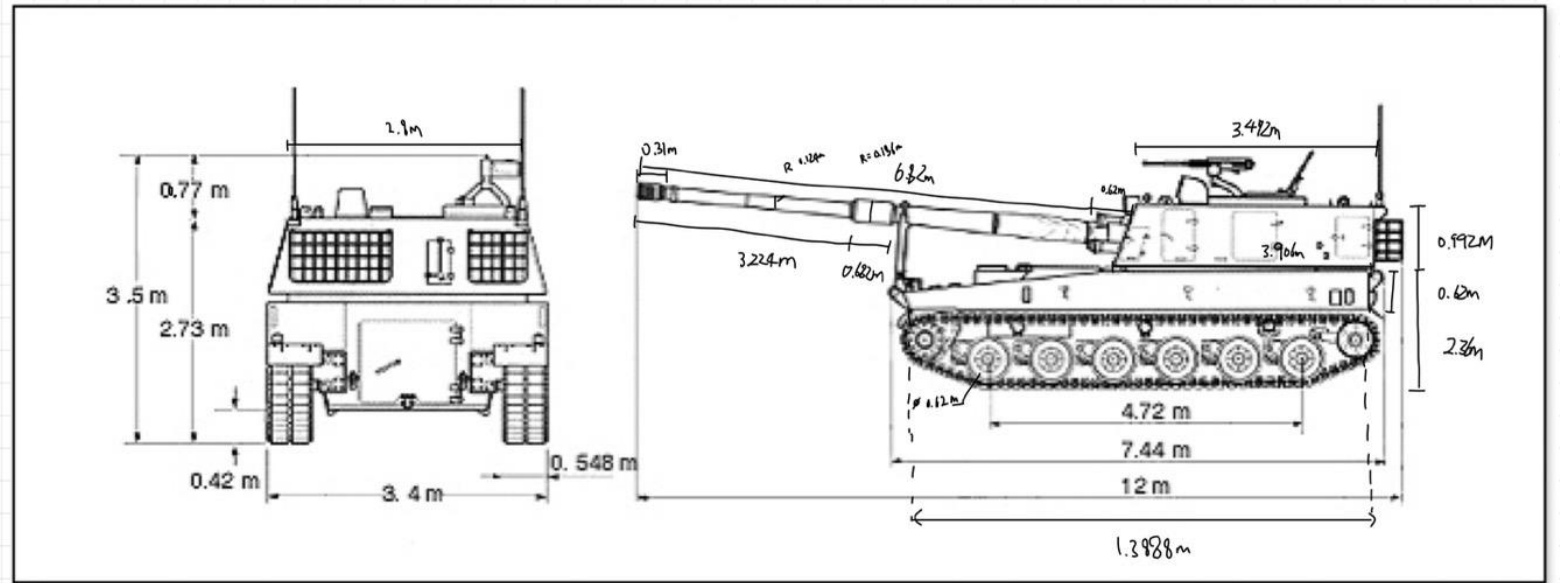
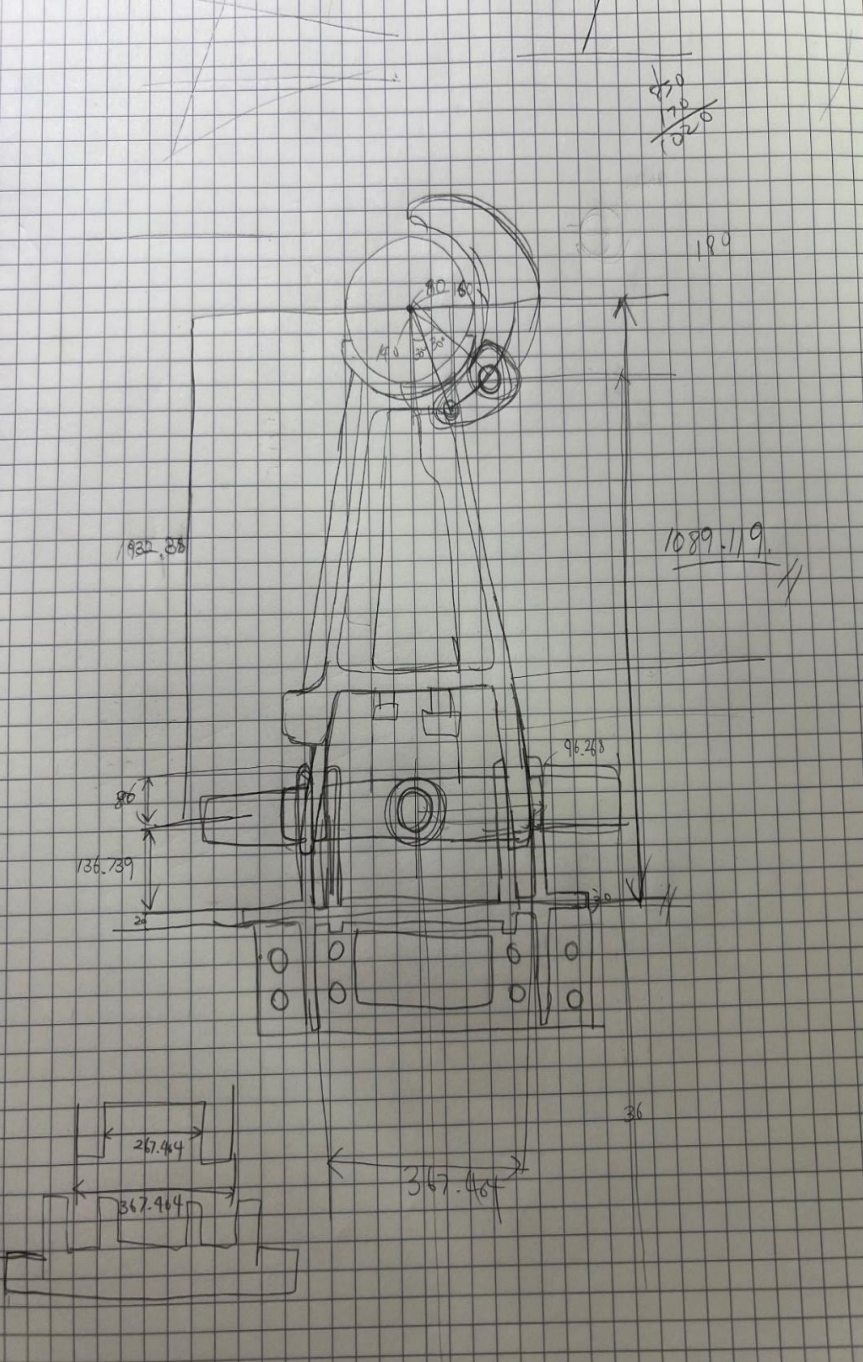
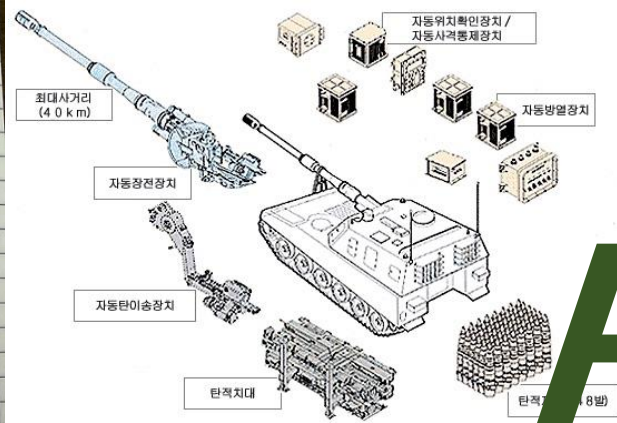
이주섭

- 자료조사
- *Part Design*
- *DMU kinematics (Holder)*
- *Video Editing, PPT*



조준 장전 발사

DESIGN PROCESS



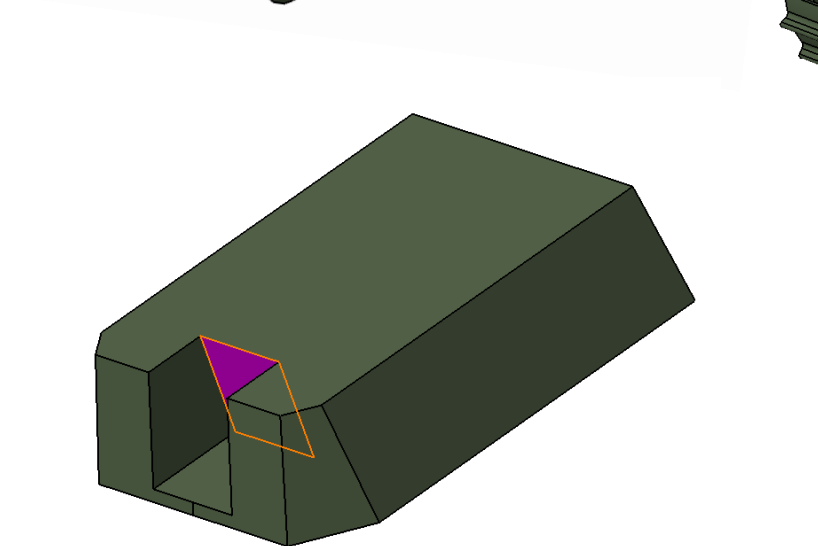
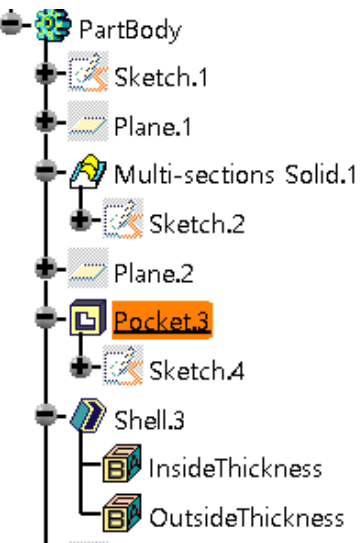
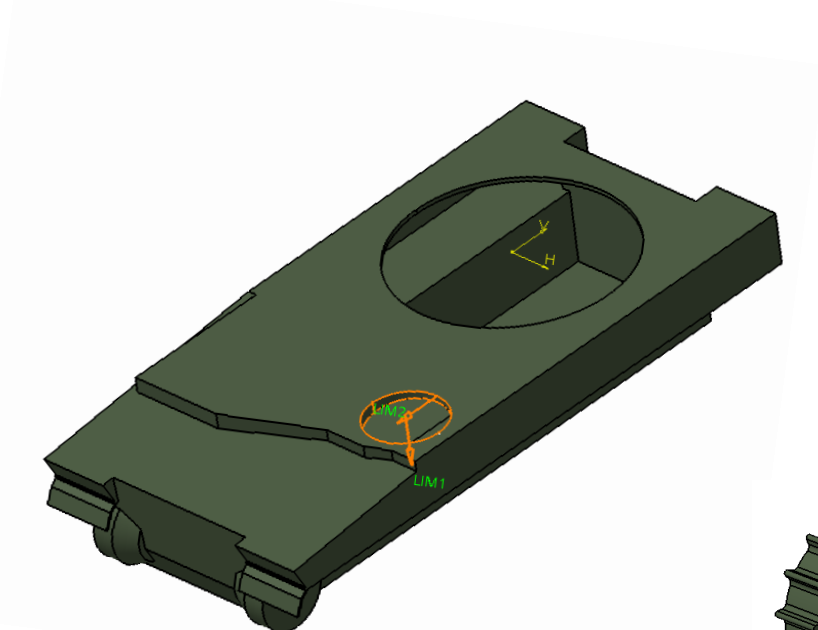
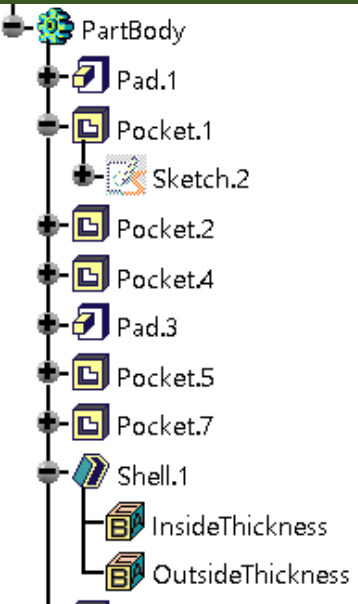
설계도: [Google](#) 검색 참고

PART DESIGN PROCESS

PART 39개로 구성

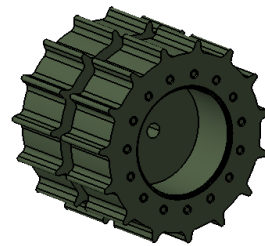


Part Design

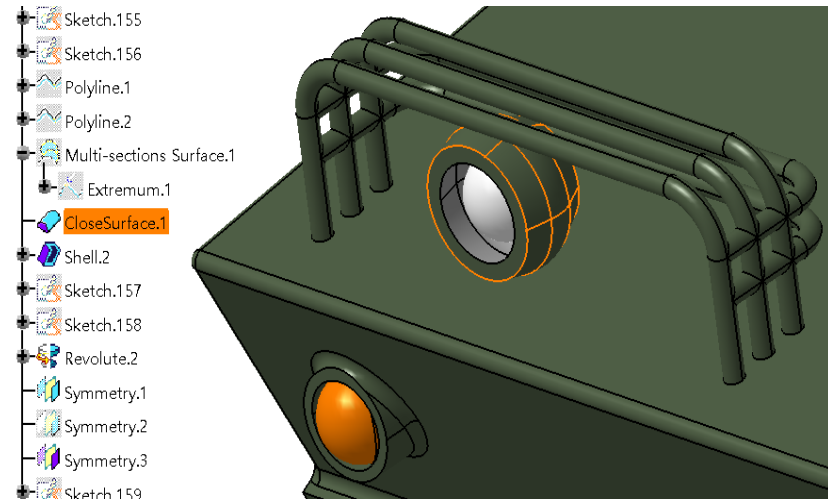
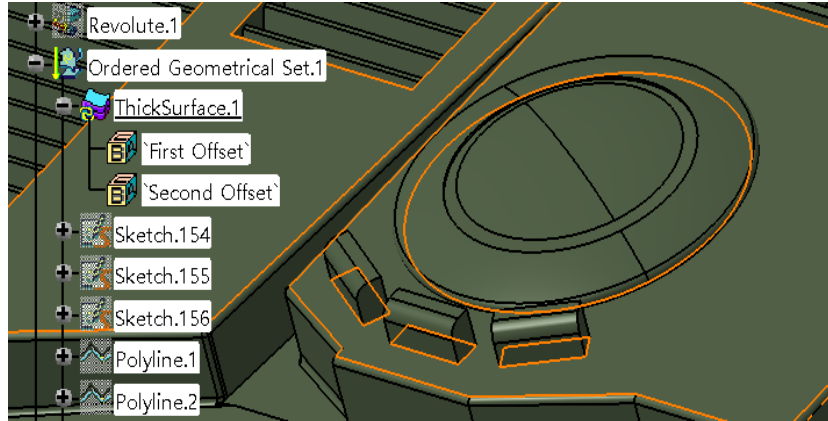


Part Design

기능을 활용해
Frame, 부품 제작

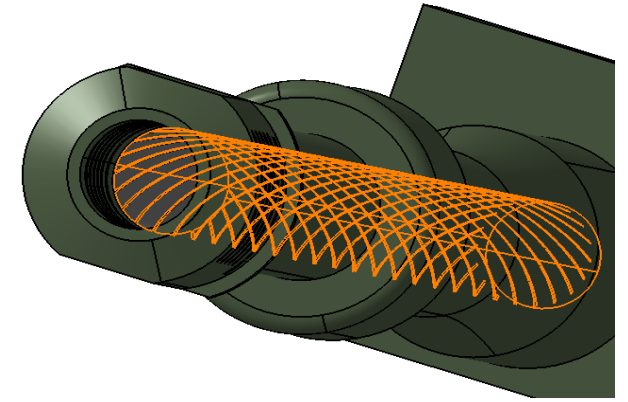
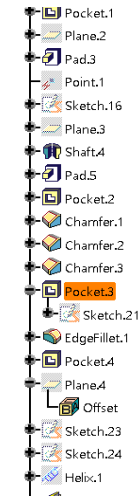
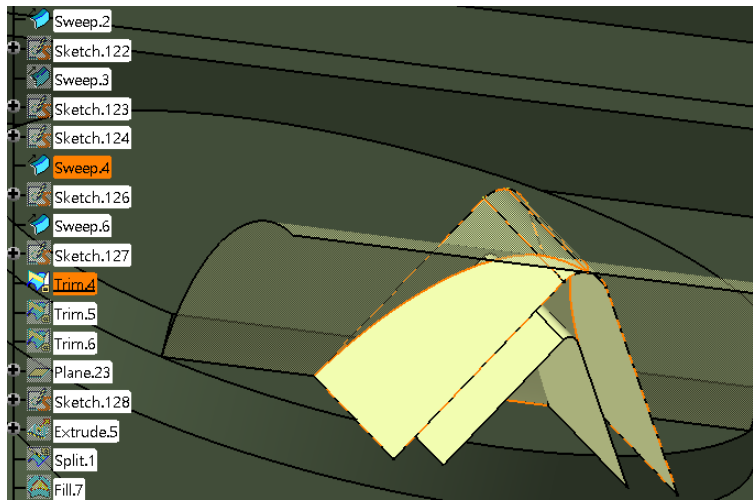


Part Design



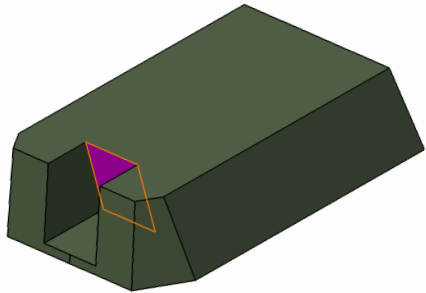
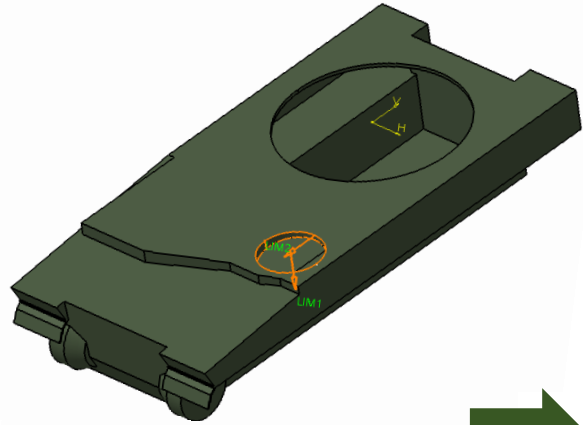
Part Design, GSD

기능을 활용해
디테일 추가

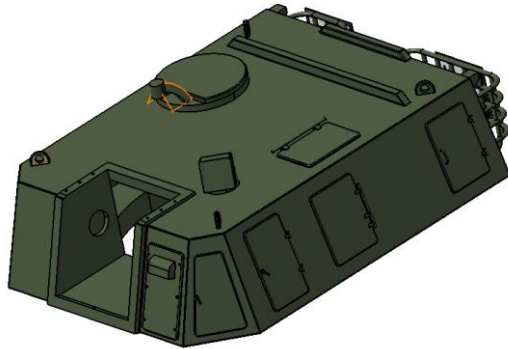
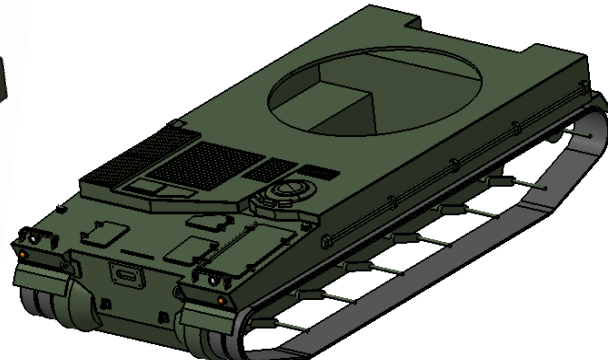


Multi-sections Surface.1 Revolute.1 Shell.2 Sweep.4

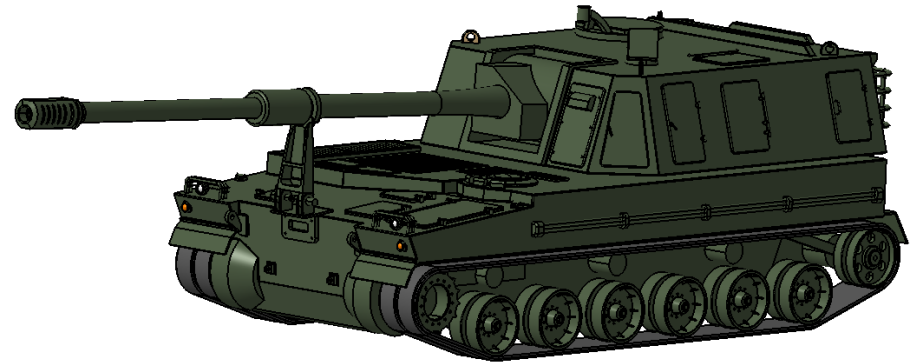
Part Design



Frame



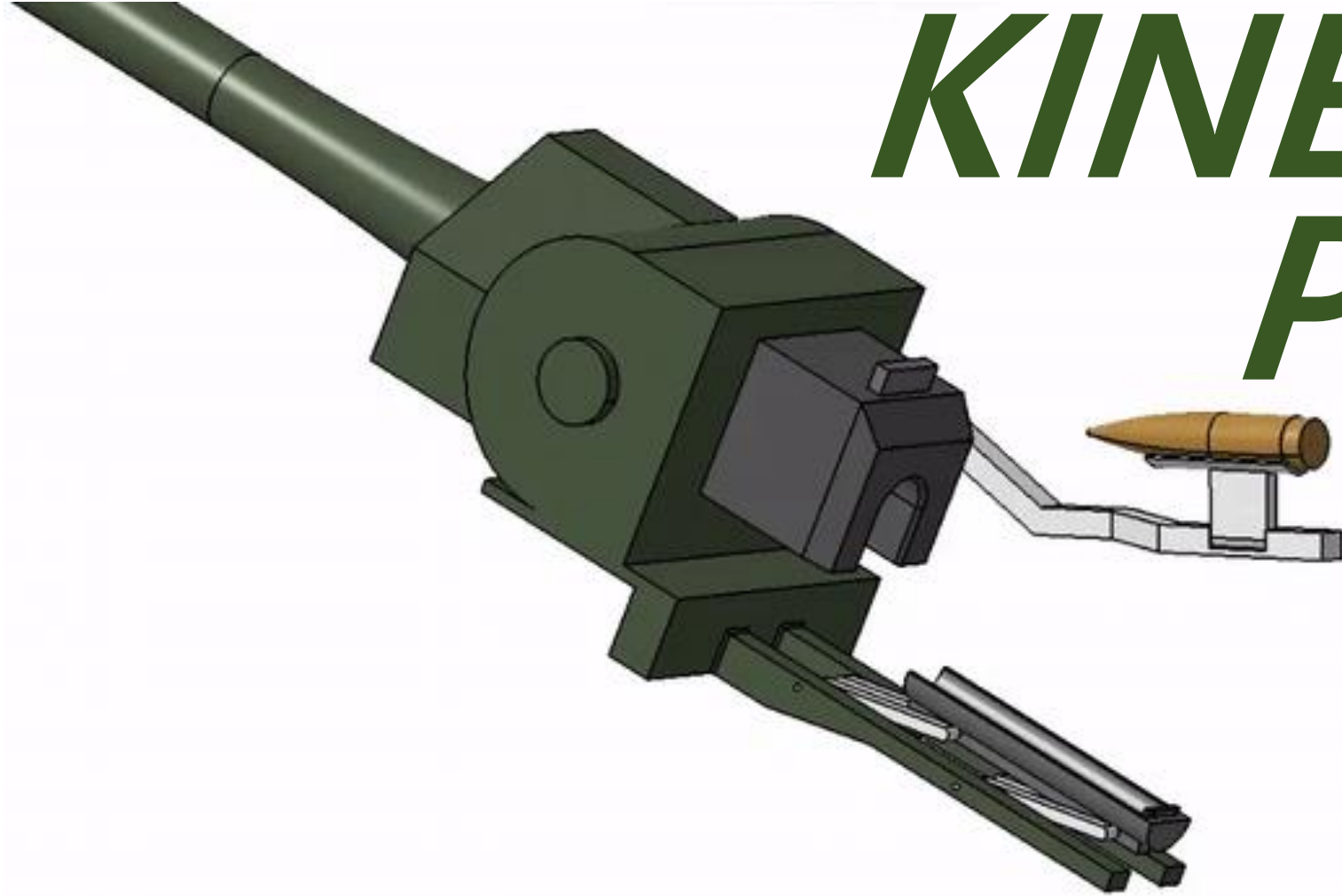
디테일 추가



Assembly

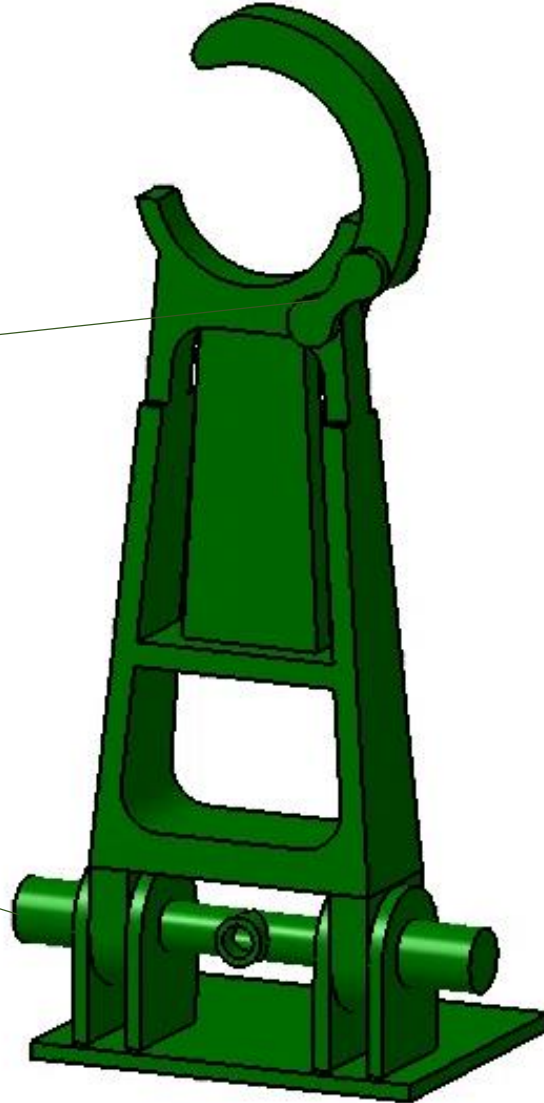
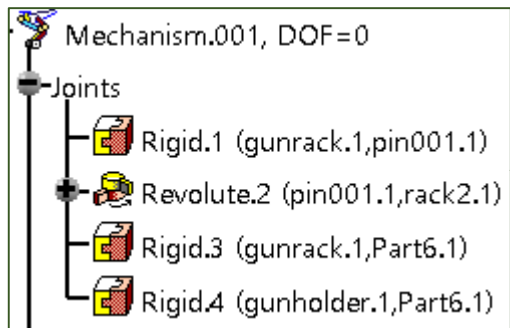
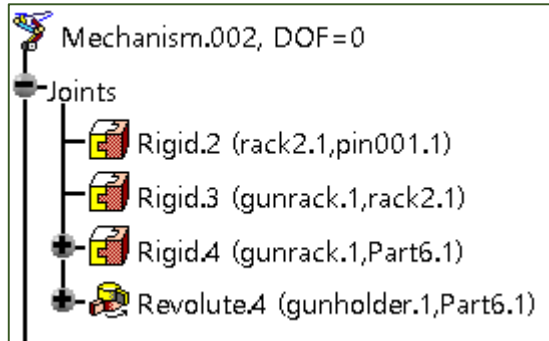
KINEMATICS PROCESS

4개의 과정으로 구성
(11개의 Mechanism)



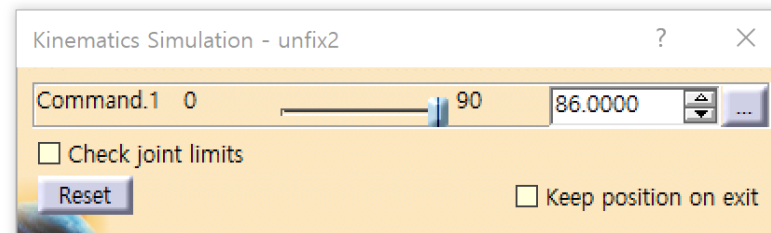
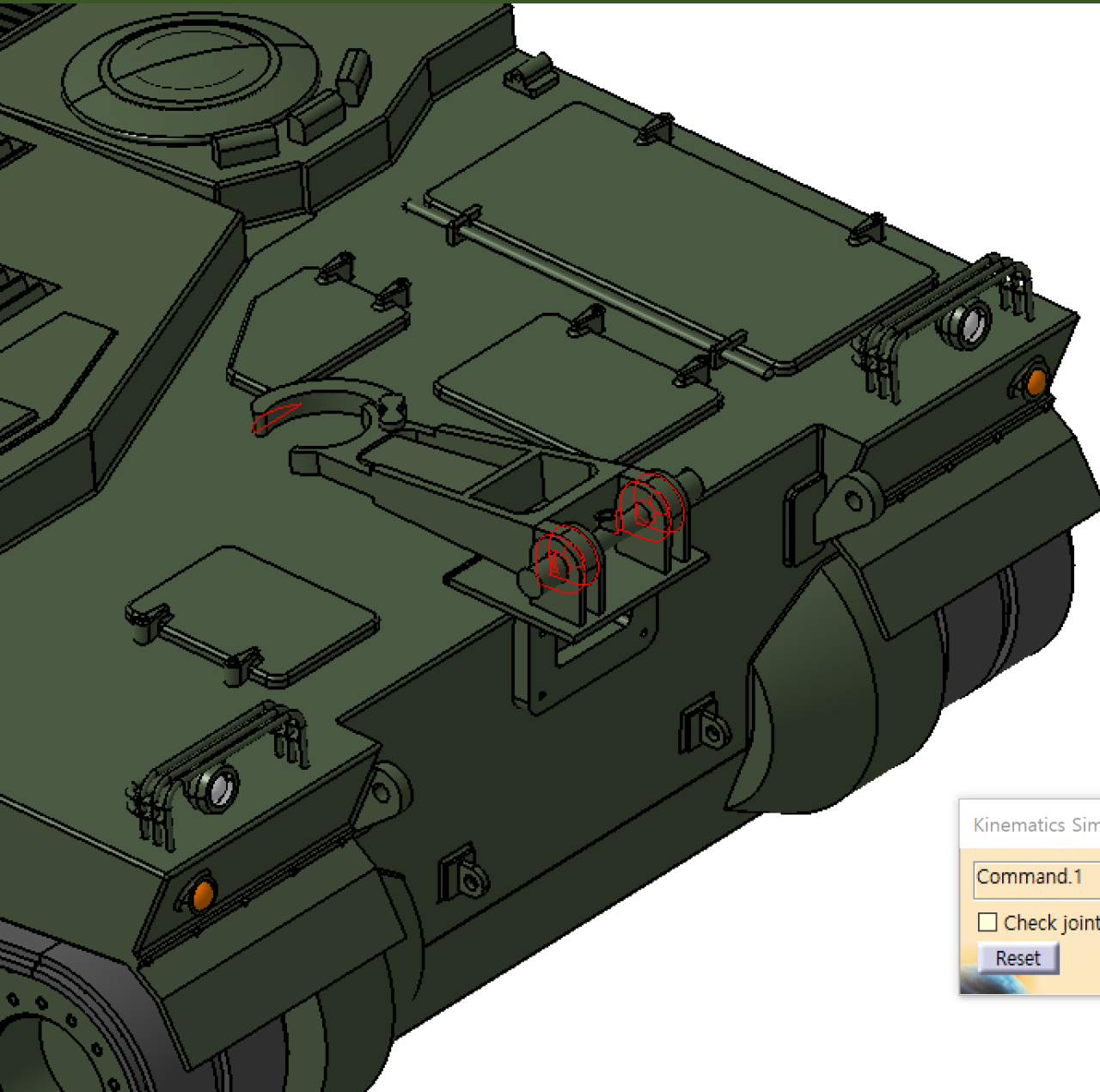
Unfixing

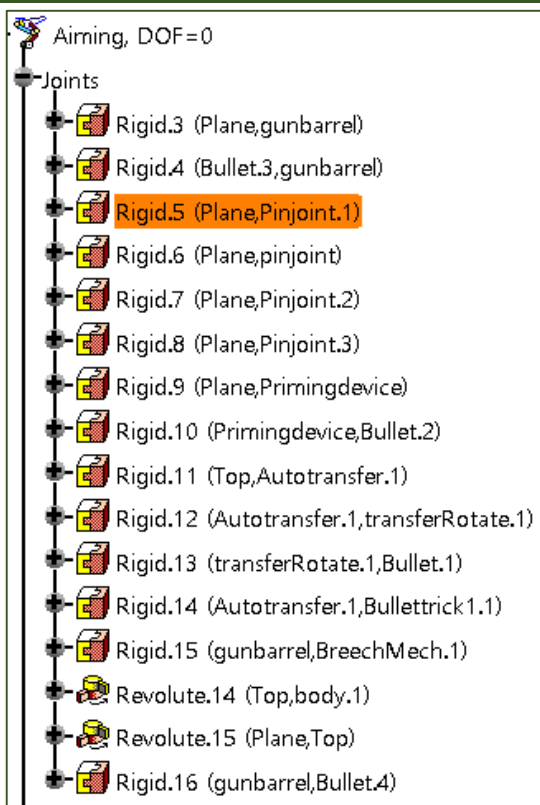
사격 전 포신을 고정하는 역할
사격 시 고정해제



Unfixing

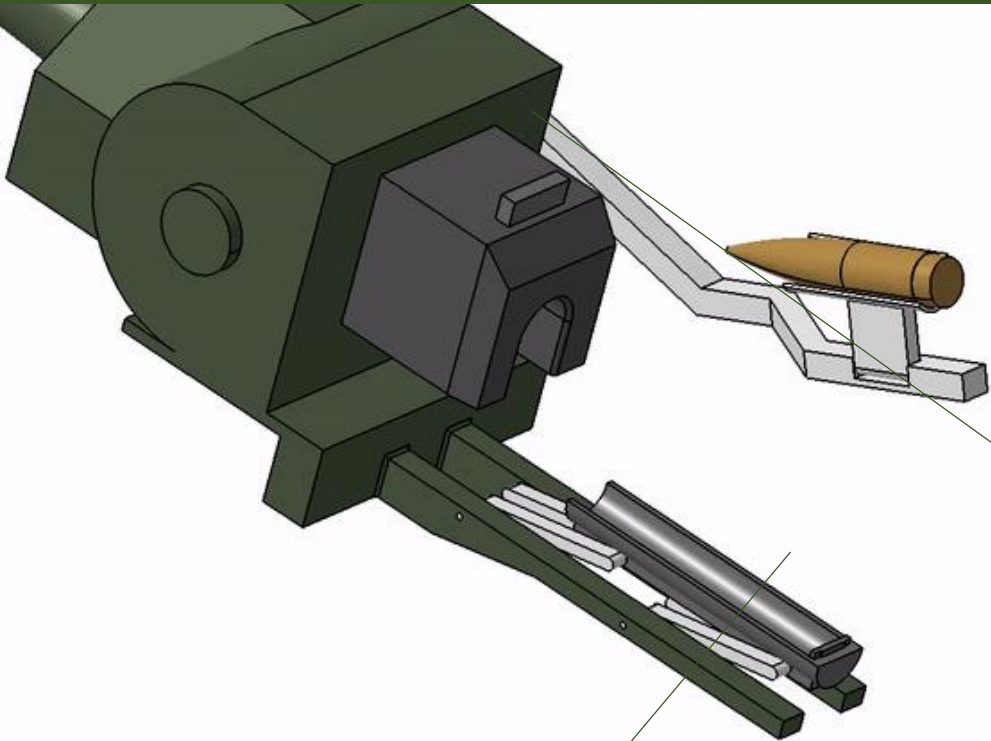
Clash Detection 기능을 이용하여
회전할 각도 결정





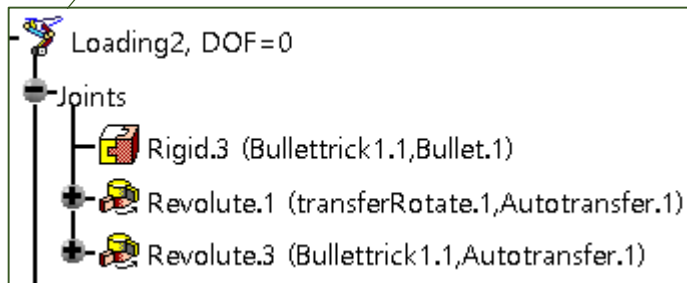
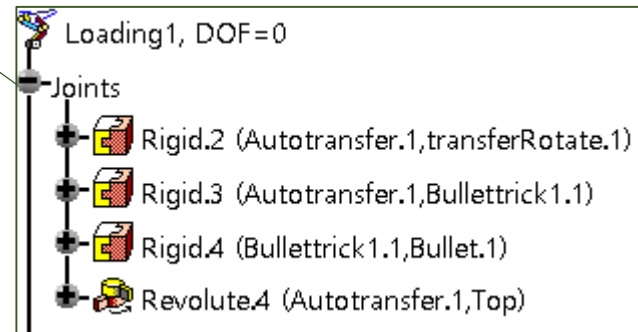
Aiming

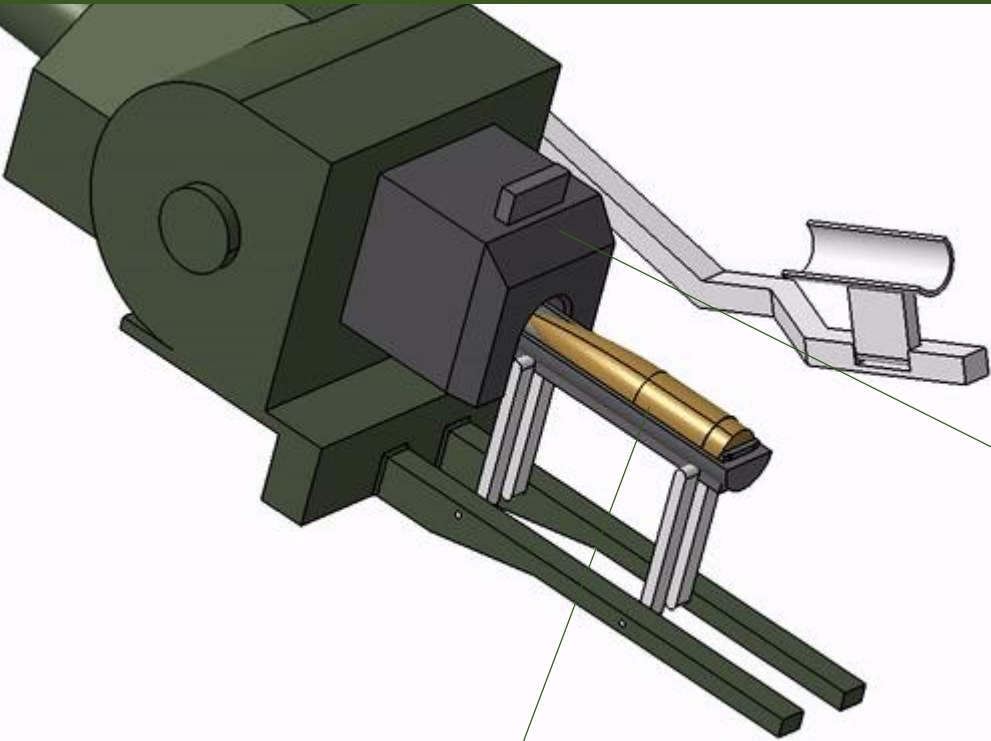
포탑이 목표 지점을 향해 조준
(회전각도 임의로 설정 가능)



Bullet Loading

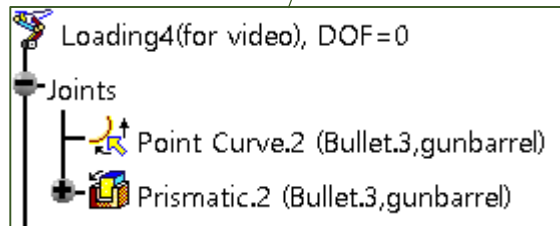
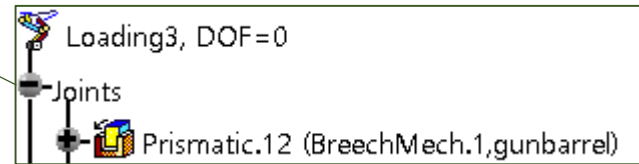
포탄이 사격되기 전까지 장전되는 과정





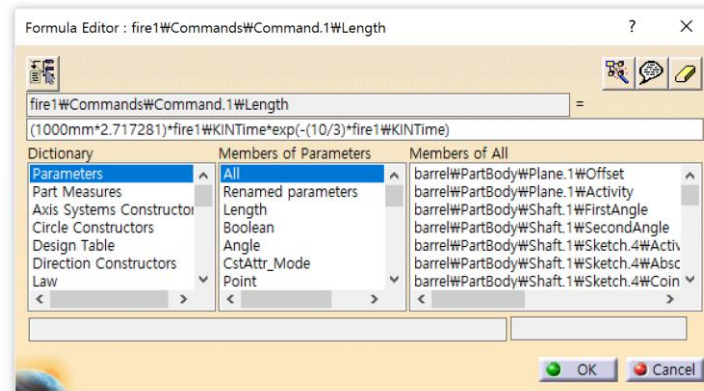
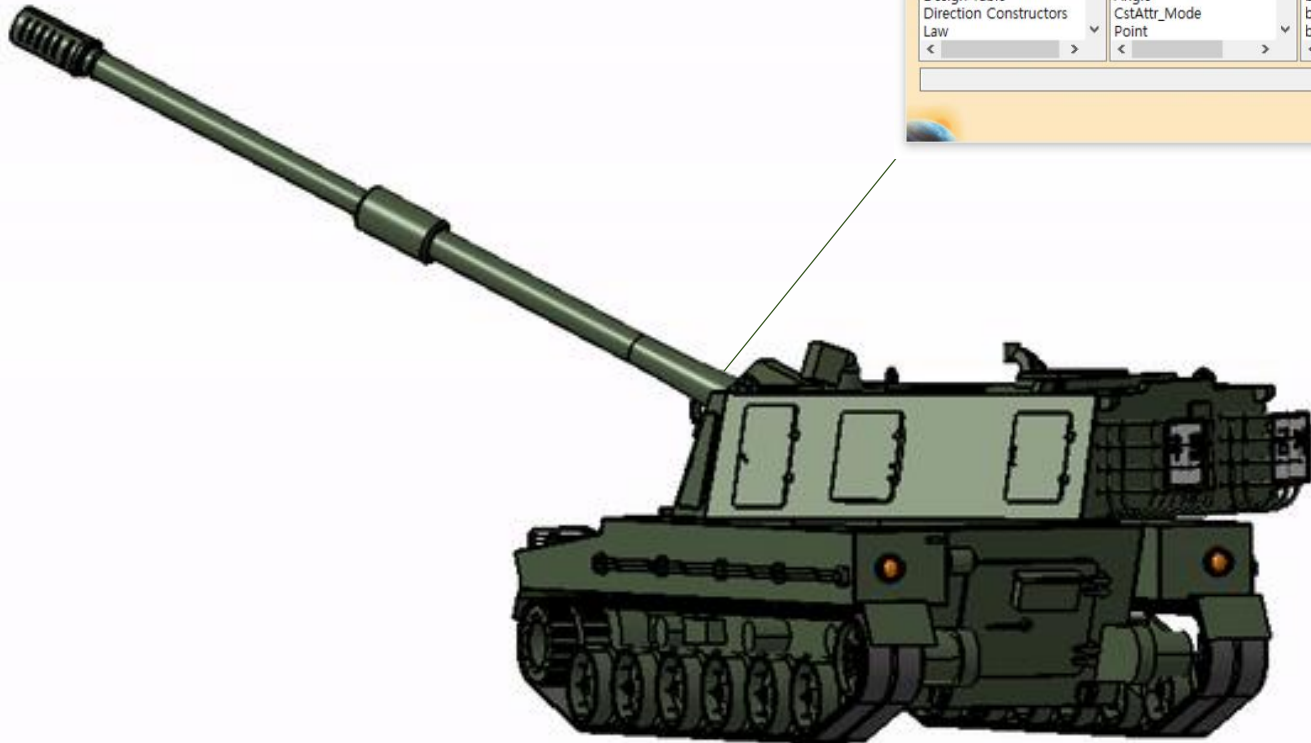
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포탄이 사격되기 전까지 장전되는 과정

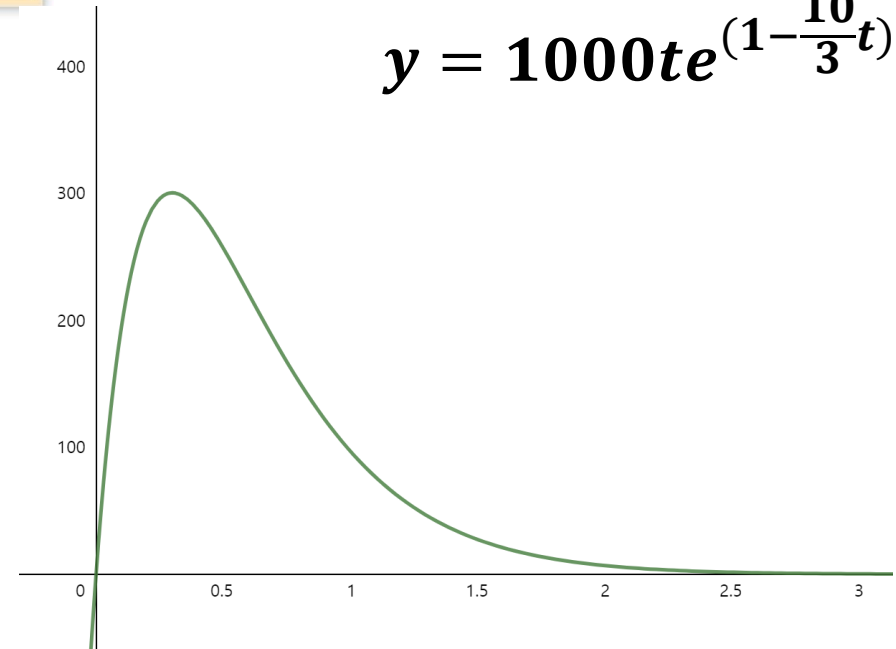


FIRE!

Critically damping을 이용한
Simulation with Laws

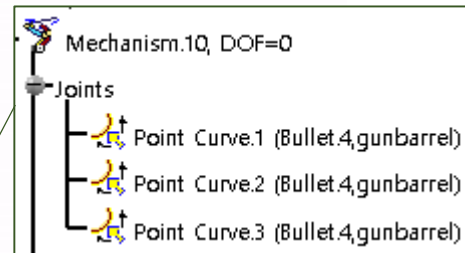


$$y = 1000te^{(1-\frac{10}{3}t)}$$



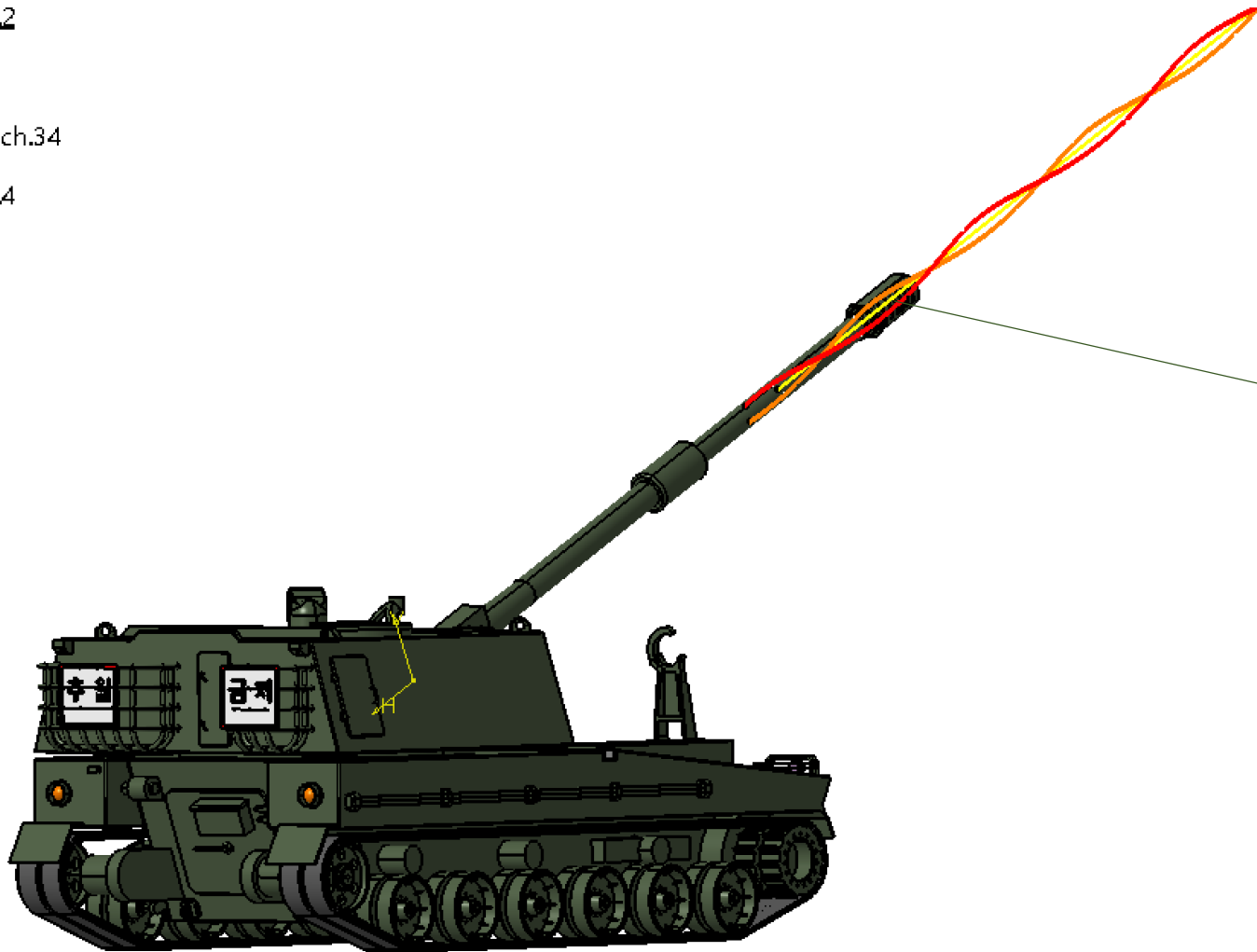
FIRE!

포탄의 회전



Kinematics

- Sketch.33(forhelix)
- Sweep.1
- Line.2
- Fill.1
- Sketch.34
- Line.4



Line Definition

Line type: Angle/Normal to curve

Curve: Sweep.1#Edge.1

Support: Sweep.1

Point: Sketch.32

Angle: 98deg

Start: 0mm

Up-to 1: No selection

End: 20mm

Up-to 2: Sweep.1#Edge.2

Length Type

☒ Length ☐ Infinite Start Point

☐ Infinite ☐ Infinite End Point

☐ Mirrored extent

☒ Geometry on support

Normal to Curve

Reverse Direction

Next solution

☐ Repeat object after OK

OK Cancel Preview

FIRE!

포탄의 회전

Creating Simulations & Sequence

Edit Sequence

?

×

Edit Action | Edit Analysis

Action in session

- fire1
- Simulation.1
- Simulation.2
- Simulation.3
- Simulation.4
- Simulation.5
- Simulation.6
- Simulation.7
- Simulation.8
- Simulation.9
- Simulation.10
- Simulation.11
- Simulation.12
- Simulation.13
- Sequence.2

Action in Sequence

Step	Action	Duration (s)	Delay (s)
1	Simulation.1	4	0
2	Simulation.2	4	0
3	Simulation.3	5	5
4	Simulation.4	2	2
5	Simulation.5	5	3
6	Simulation.6	6	2
7	Simulation.7	2	20
8	Simulation.8	1	15
9	Simulation.9	5	3
10	Simulation.10	2	5
10	Simulation.11	5	5.5

Move Up

Move Down

Merge Up

Merge Down

Action duration (s) 4

Reset duration

Action delay (s) 0

Action add mode

☒ Create last step and add

☐ Add in last step

☐ Iterative create last step and add

☒ Highlight the simulated action(s)

OK

Cancel



https://www.youtube.com/watch?v=_OxpHP7q_Vo

고찰

1. 원래는 체인까지 구현하려고 했으나 구현 시간, 많은 부품 수 때문에 구현하지 못하였다.

2. 서로 다른 두 메커니즘 사이 구속 조건이 충돌
-> 각 Mechanism마다 다른 파트 사용

Q&A