



Introduction to Range Safety and Surface Danger Zones

Overview of AR 385-63/MCO 3570.1B
and DA PAM 385-63





Range Safety Regulations and Guidelines



AR 385-63
MCO 3570.1B

Regulatory Policy Guidance

Published as Joint Army Regulation/
Marine Corps Order

DA PAM 385-63

Technical Guidance



DA PAM 385-63

Safety: Range Safety

Department of the Army Pamphlet 385-63

Headquarters, Department of the Army

Washington, D.C. 20310-0200

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Safety Considerations and SDZ Construction



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Chapter 1. Introduction

Deviations

Range Program Guidelines

Guidance for Certification Programs

A deviation is a departure from the requirements in DA PAM 385-63 and the policy in AR 385-63/MCO 3570.1B, Range Safety.



Granting of Deviations

Deviations may be granted based on critical mission requirements which conflict with regular standards in accordance with AR 385-63/MCO 3570.1B



Scope of Deviations

Deviations are limited to the following:

- Reducing SDZ dimensions when terrain, artificial barriers, or other compensating factors make smaller SDZs safe
- Modifying prescribed firing procedures to increase training realism
- Allowing personnel who are not directly participating in the training within the SDZ



SDZs That Extend Beyond The Installation Boundary



Deviations applied to SDZs that extend beyond installation boundaries must be based on the following:

- Ability to contain projectiles, hazardous fragments, laser beams, and both vertical and horizontal ricochet within the installation boundaries and areas under military control
- Probability of hazardous fragment escapement must not be greater than 1:1,000,000 (10^{-6})



Request for Deviation

- Description of the specific condition requiring the deviation
- Statement as to why a deviation is necessary and impact on training if not granted
- Description of the existing conditions and anticipated hazards, subsequent hazard analysis, and risk analysis
- Control measures taken to eliminate hazards and/or minimize risk and residual risk level



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Chapter 1. Introduction

Deviations

Range Safety Program Guidelines

Guidelines for Live Training Programs

Range Safety Responsibilities of:

- Installation Commander
- Installation Safety Manager
- Installation Range Control Officer
- Battalion/Squadron Commander
- Unit Commander
- Officer in Charge (OIC)
- Range Safety Officer (RSO)



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- Restricting access to impact areas
- Posting warning signs and markers
- Controlling other range usage
- Coordinating use of special use airspace
- Coordinating use of navigable waterways
- Safety requirements for indoor firing ranges



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- Positioning and issuing ammunition and explosives (A&E)
- Qualification and restriction of A&E
- Suspension of A&E involved in malfunctions
- UXO (dud) and misfire procedures and reporting
- Disposition of A&E involved in malfunctions and accidents
- Destruction of UXO (dud)
- Police of the training complex
- Army requirements for ICMs and submunitions



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- Airborne and ground targets
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- Ballistic Aerial Targets (BATS)



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Chapter 18. [Illegible]

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- Chemical agents
- Riot control agents (RCA)
- Smoke
- Smoke pots
- Oil smoke candles



Safety Considerations

- Establish a minimum safe distance for friendly troops for protection from downwind vapor hazards
- Use of Riot Control Agents (RCAs) in training is limited to CS, CSX, CS-1, CS-2, and CR. All other RCAs are prohibited for training use
 - CSX, CS-1, CS-2, and CR no longer in training inventory
- Establish minimum safe distances to heavily traveled installation roads, railroad right of ways, airfields, or inhabited areas when using RCAs
- Personnel will carry a protective mask when participating in exercises that use smoke.



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Chapter 18. [Obscured]

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- Charges
- Mines
- Trip flares
- Simulators



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Chapter 19. Laser Safety

- Fundamentals
- Range usage
- Force-on-force tactical exercises



LASER



- **L**ASER - **L**ight **A**mplification by **S**timulated **E**mission of **R**adiation
- A laser is a device that amplifies light



Laser Hazards

- Lasers produce light beams of varying intensity
- Categorized in accordance with the emitted power
- Class 1 represents the weakest laser
- Power gets progressively higher through Class 4

Class 4	Fire or skin hazard or a diffuse reflection hazard
Class 3	Direct beam viewing is hazardous
Class 2	Emit visible laser beam; extended viewing is hazardous
Class 1	Emit no harmful radiation



Laser Range Safety

- Fundamental concept is to prevent direct or collateral injury or damage resulting from laser use
- Definitive guidance for laser operations, characteristics, and general procedures are found in MIL-HDBK-828A and Joint Pub 3-09
- Tactical lasers are treated as direct-fire weapons. Precautions associated with direct-fire weapons shall be applied to all lasers operated on military ranges



Surface Danger Zones (SDZs)

The ground and airspace designated within the training complex (to include associated safety areas) for vertical and lateral containment of projectiles, fragments, debris, and components resulting from the firing, launching, or detonation of weapons systems to include explosives and demolitions



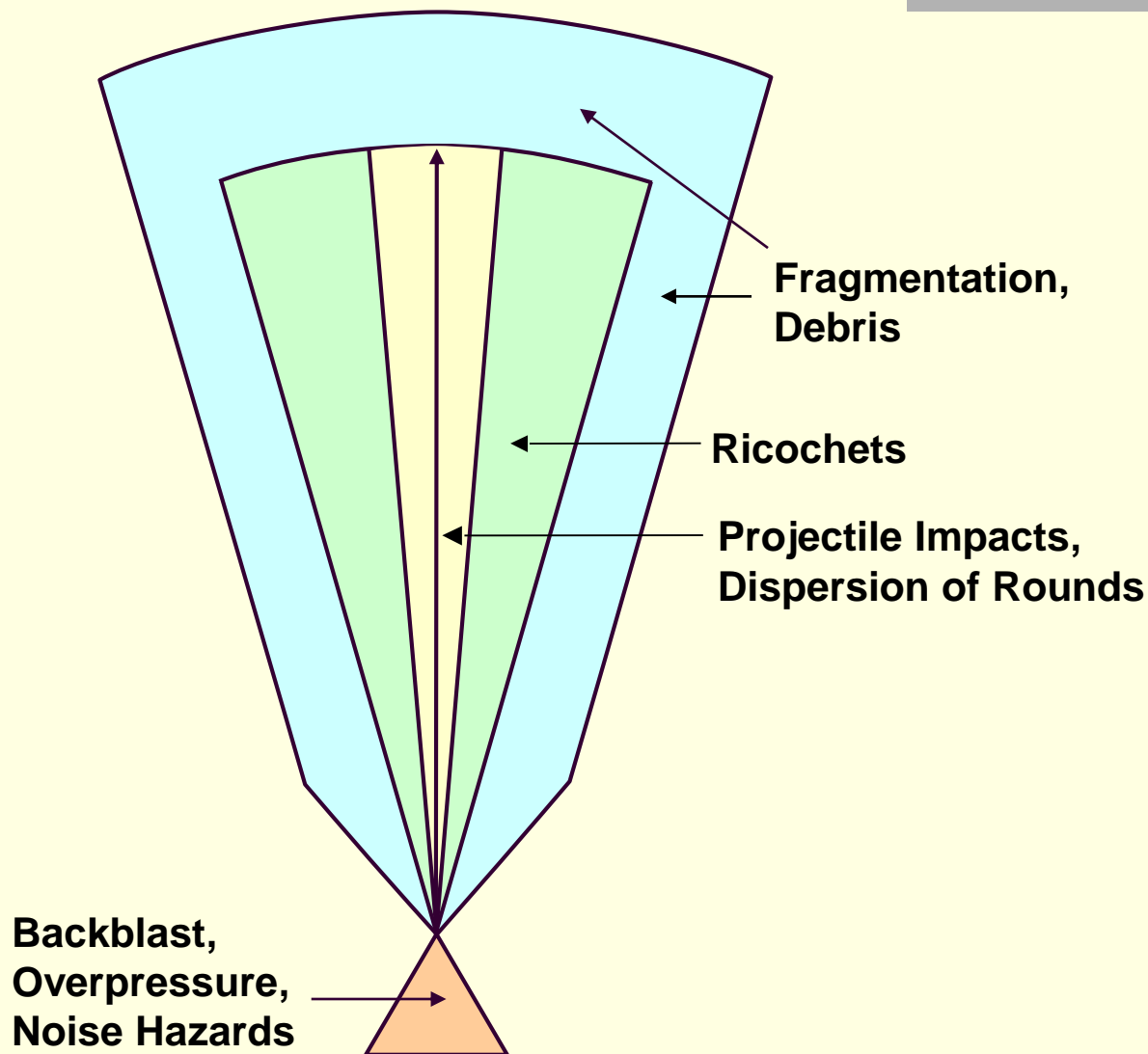
Safety of Personnel and Property

The purpose of an SDZ is to designate areas that protect personnel and property from the following dangers:

- Projectile Impacts
- Dispersion
- Ricochets
- Fragmentation and Debris
- Backblast
- Hazardous Overpressure and Noise



SDZ Incorporating Danger Areas





Designated Areas

An SDZ clearly delineates:

- Where personnel may operate, move, and engage targets
- Limits of fire
- Areas for target placement
- What type of protection must be afforded personnel in specific areas
- Areas off-limits to personnel



Factors Affecting SDZ Dimensions



- Type of Weapon/Weapon System
- Type of Ammunition
- Target Impact Media
- Terrain
- Altitude



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Appendix C.	Surface Danger Zone Design

- Prescribes Safety Precautions
- Details SDZ Requirements



Distance X

Determined by weapon/weapon system and type of ammunition being fired/launched

Distance X -- The maximum distance a projectile (to include guided missiles and rockets) will travel when fired or launched at a given quadrant elevation with a given charge or propulsion system.

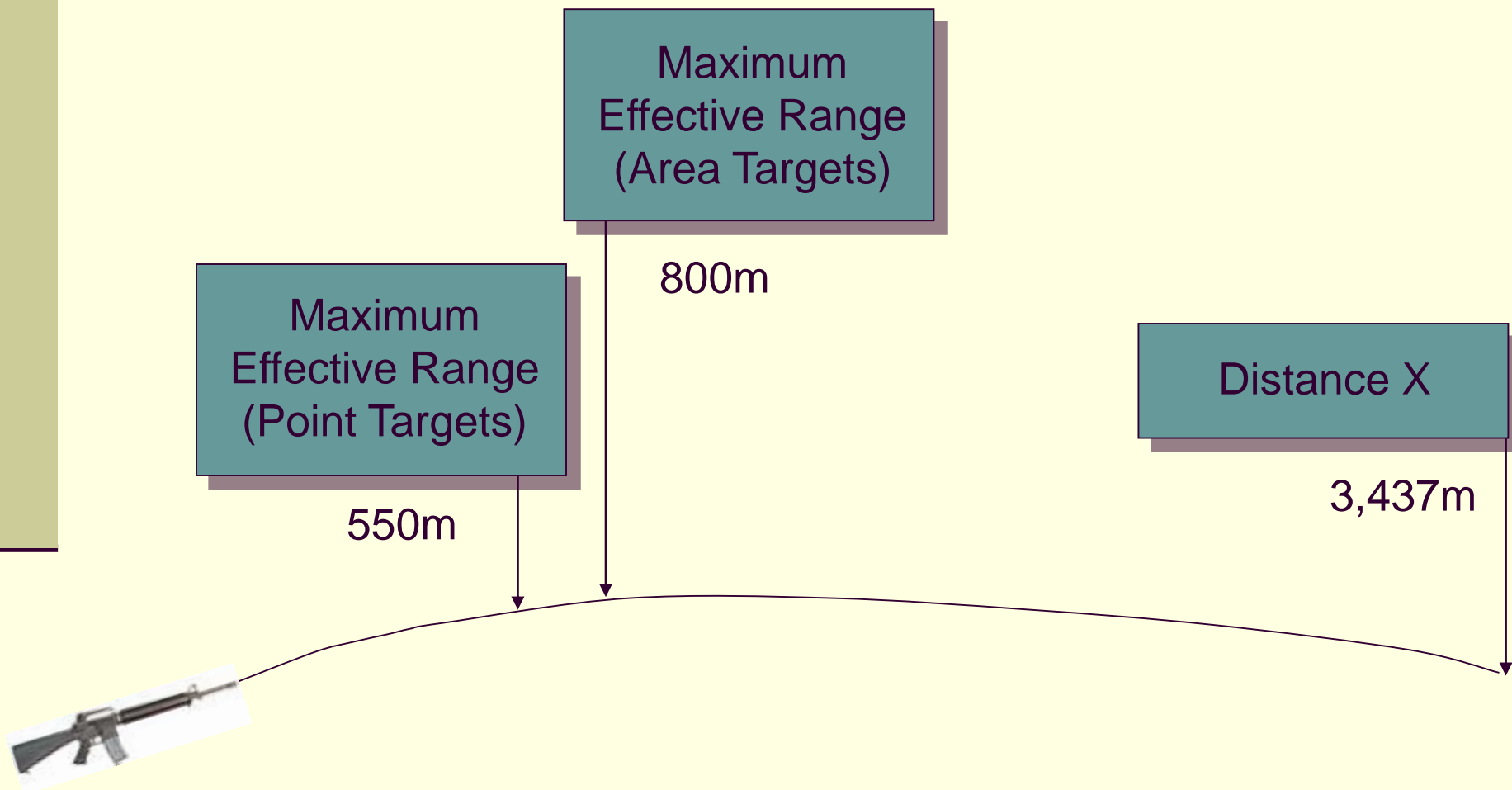


DA PAM 385-63 Table B-1

SDZs for direct-fire weapons without explosive projectiles		
Caliber	Impact Media	Distance X
Shotgun	12-Gauge Slug	Earth/Water 1073
		Steel/Concrete 1073
M9 Pistol MP5 Machinegun	9mm M882 Ball	Earth/Water 1800
		Steel/Concrete 1800
.45 Pistol	.45 Caliber, M1911 Pistol/SMG	Earth/Water 1690
		Steel/Concrete 1690
M16 & M4 Rifle M249 SAW	5.56mm, M193 Ball	Earth/Water 3100
		Steel/Concrete 3100
	5.56mm, M196 Tracer	Earth/Water 3100
		Steel/Concrete 3100
	5.56mm, M855 Ball	Earth/Water 3437
		Steel/Concrete 3437
M240 & M60 Machinegun M14 Rifle	7.62mm, M80 Ball	Earth/Water 4100
		Steel/Concrete 4100
M2 .50 caliber Machinegun	.50 Caliber, M858 Ball, Plastic	Earth/Water 700
		Steel/Concrete 700
	.50 Caliber, M860 Tracer, Plastic	Earth/Water 700
		Steel/Concrete 700
	.50 Caliber M2 AP	Earth/Water 6100
		Steel/Concrete 6100
	.50 Caliber M2 Ball	Earth/Water 6500
		Steel/Concrete 6500



Trajectory of a Round - M855





SDZ Shapes

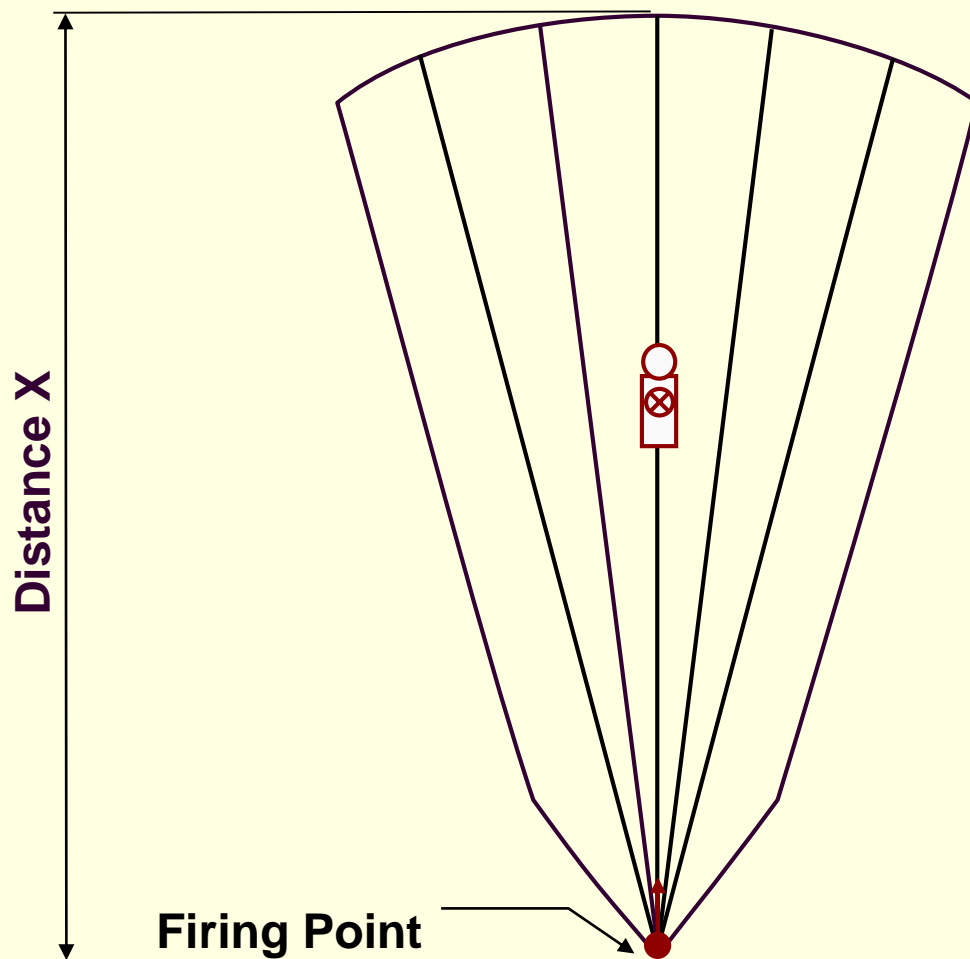


Examples of SDZs for several different weapons/weapons systems



Basic Cone SDZ

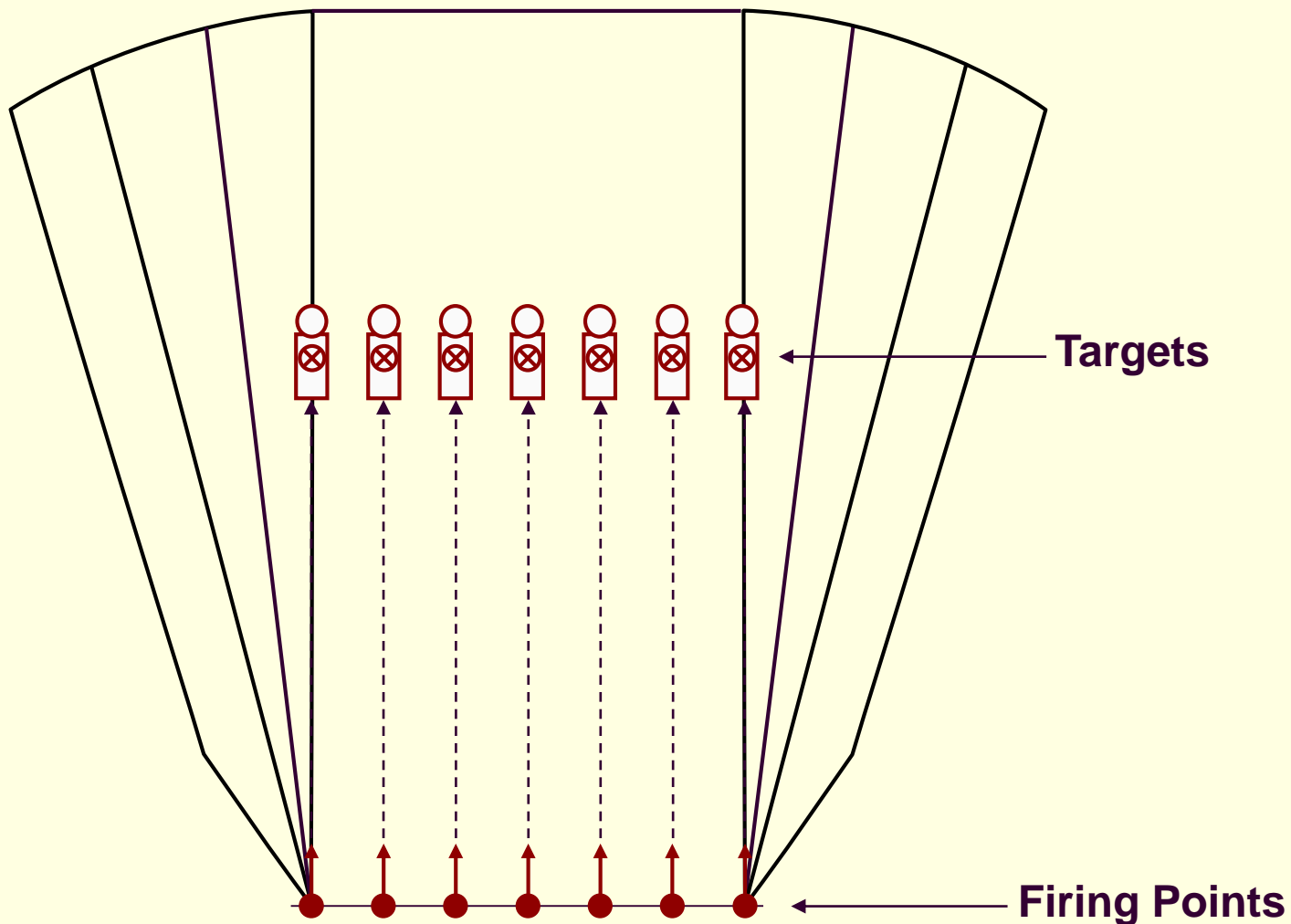
Single firing point, single target





Cone SDZ

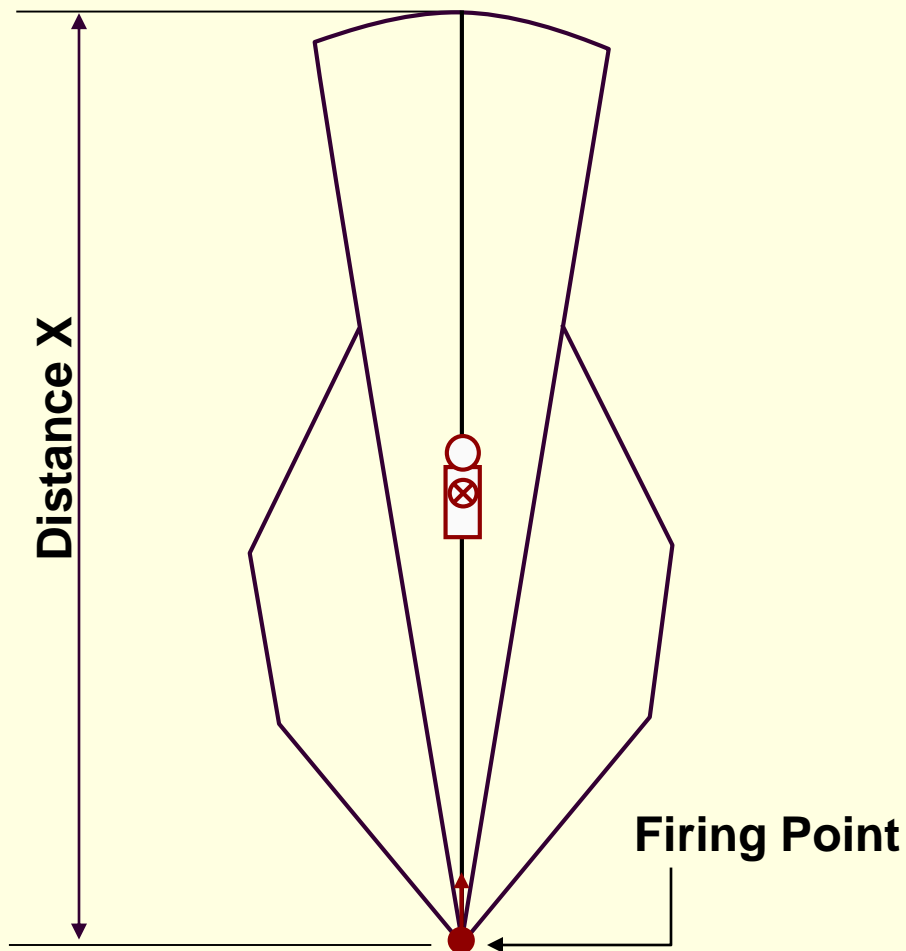
Multiple firing points, multiple targets





Basic Batwing SDZ

Single firing point, single target





Batwing vs. Cone SDZs

- Batwing SDZs provide for greater containment of all ricochets
- Target impact media affects dimensions of SDZ ricochet area
- Computer simulation models, based on and validated by actual weapon system firing, generate ballistic “footprints” which are the basis for batwing SDZs



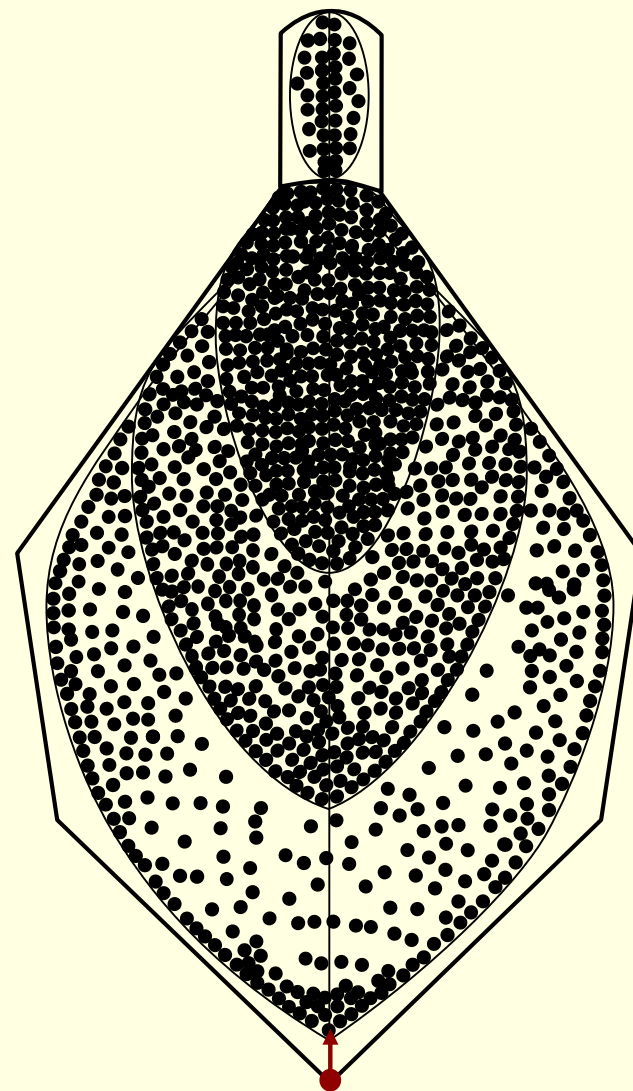
Batwing vs. Cone SDZs

- Batwing SDZs should be considered when designing ranges that involve fire and movement, or where ricochet hazards outside the range complex boundary may endanger nonparticipating personnel, or the general public
- Where batwing SDZs have already been applied or can be employed without significant impact on range operations, the batwing SDZ should be implemented



Batwing SDZ

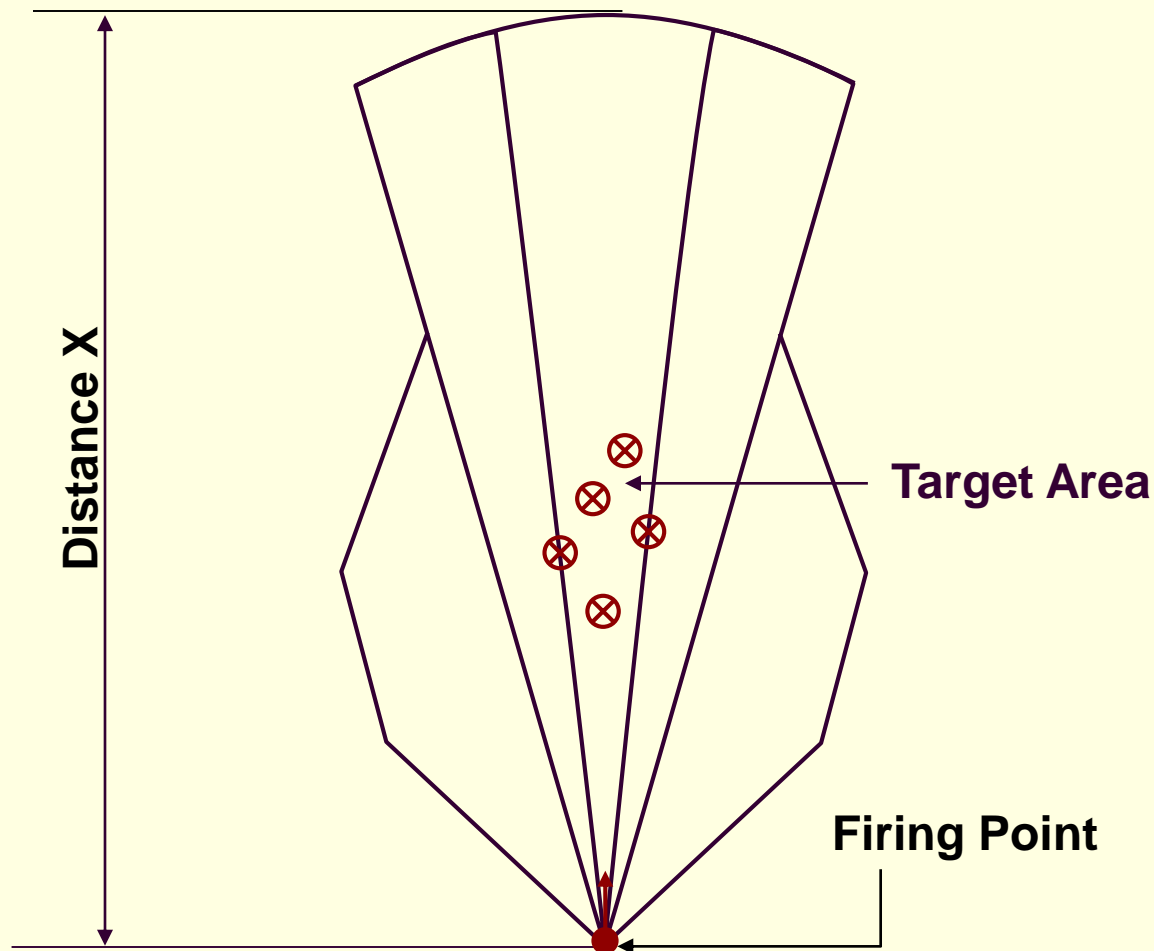
- Ballistic footprint represents actual weapon system performance
- Does not include 5° dispersion for human sighting error and inherent weapon system characteristics
- Provide greater containment of ricochets at closer ranges
- Lateral SDZ requirements are generally greater at shorter ranges because of higher projectile velocities.





Batwing SDZ

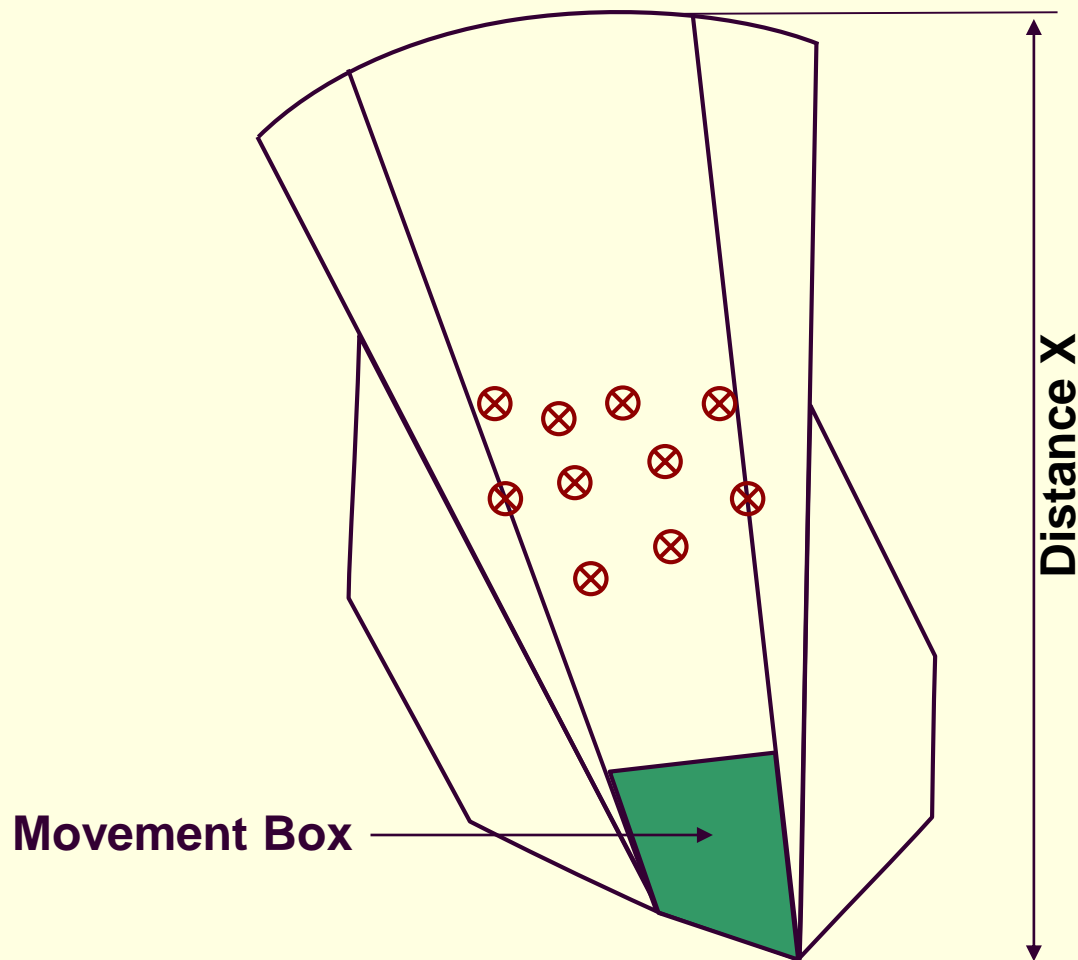
Single firing point, multiple targets





Movement Box SDZ

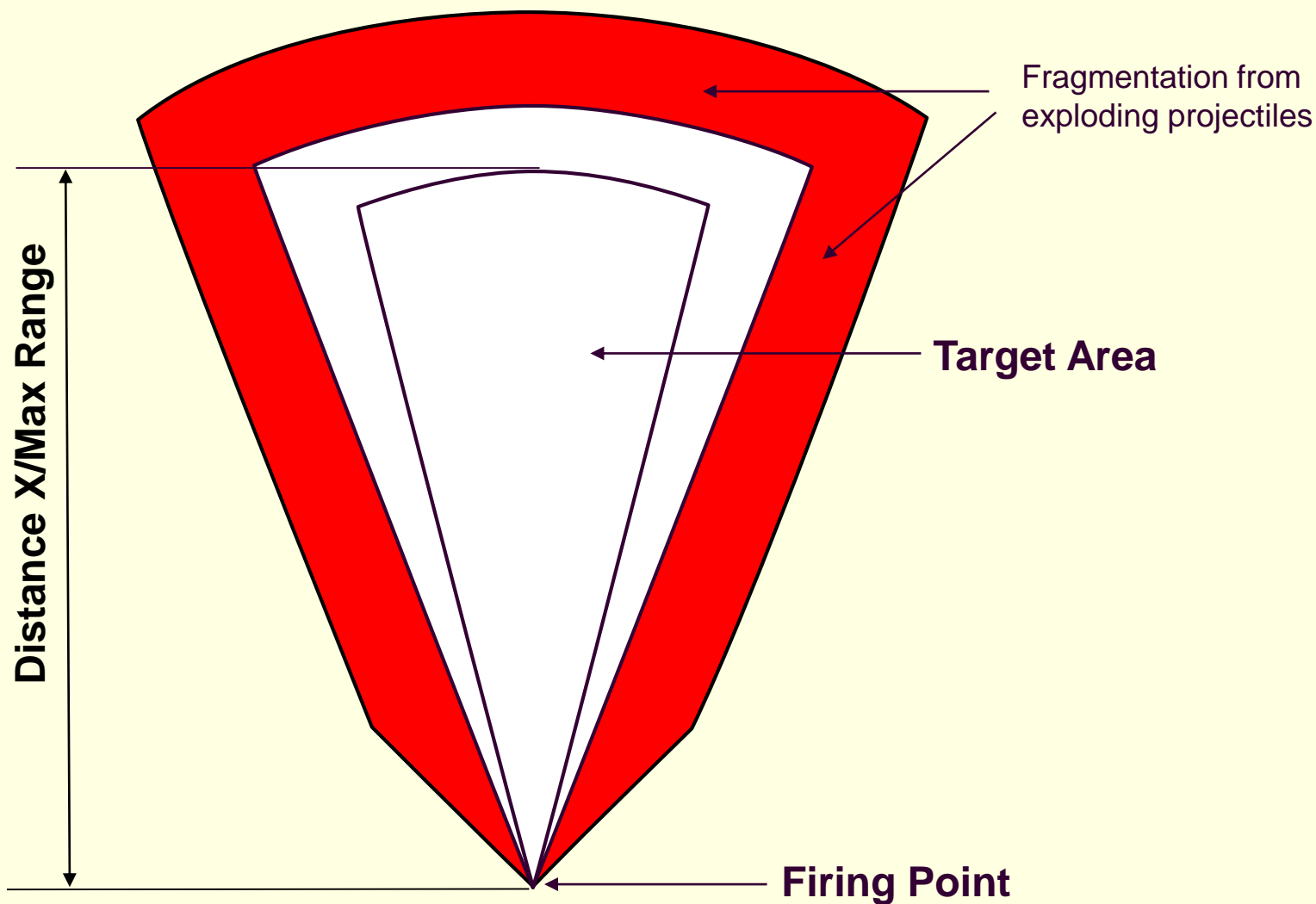
Multiple firing positions, fixed or moving targets





Indirect Fire SDZ - Mortar

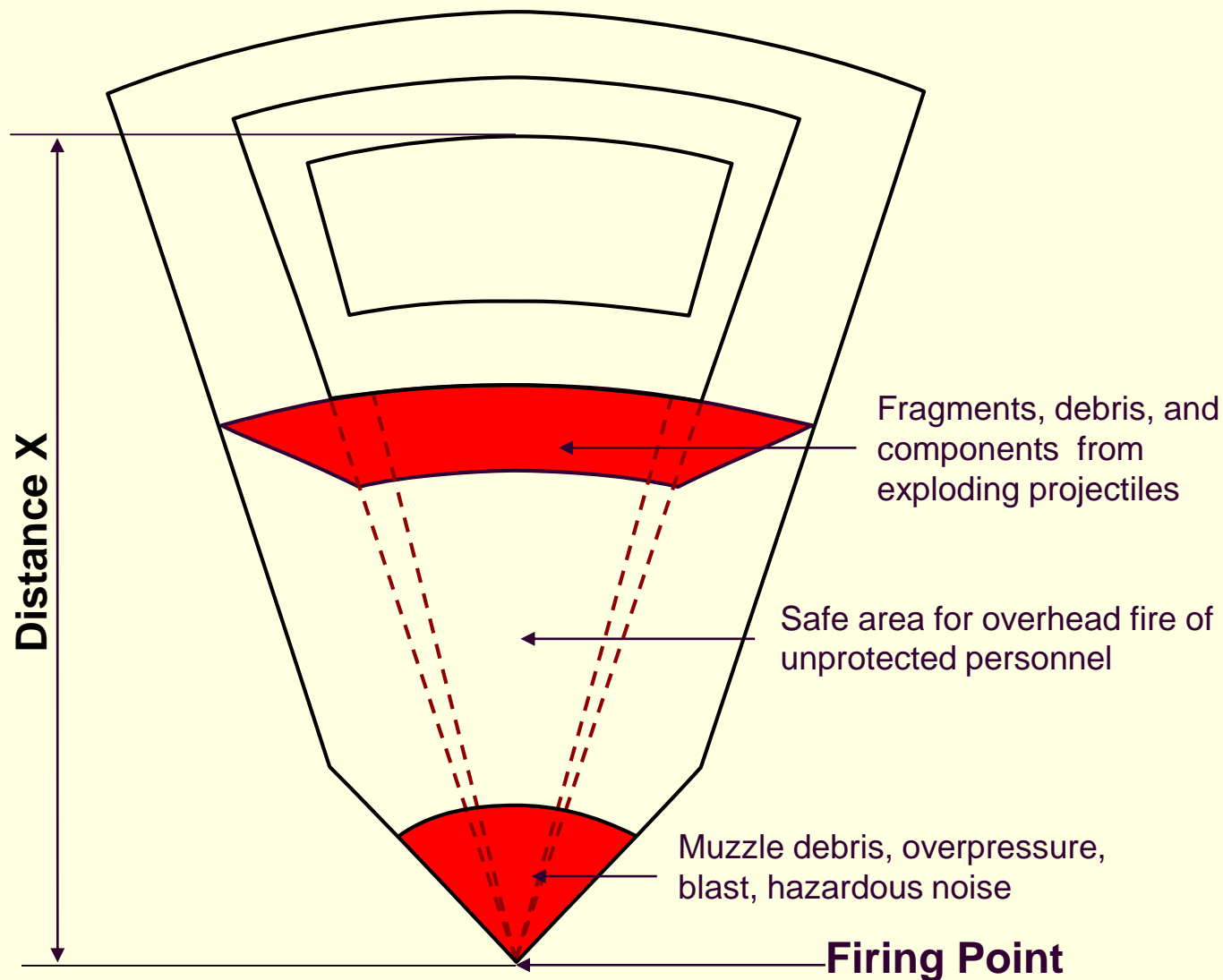
Single firing point, single target area





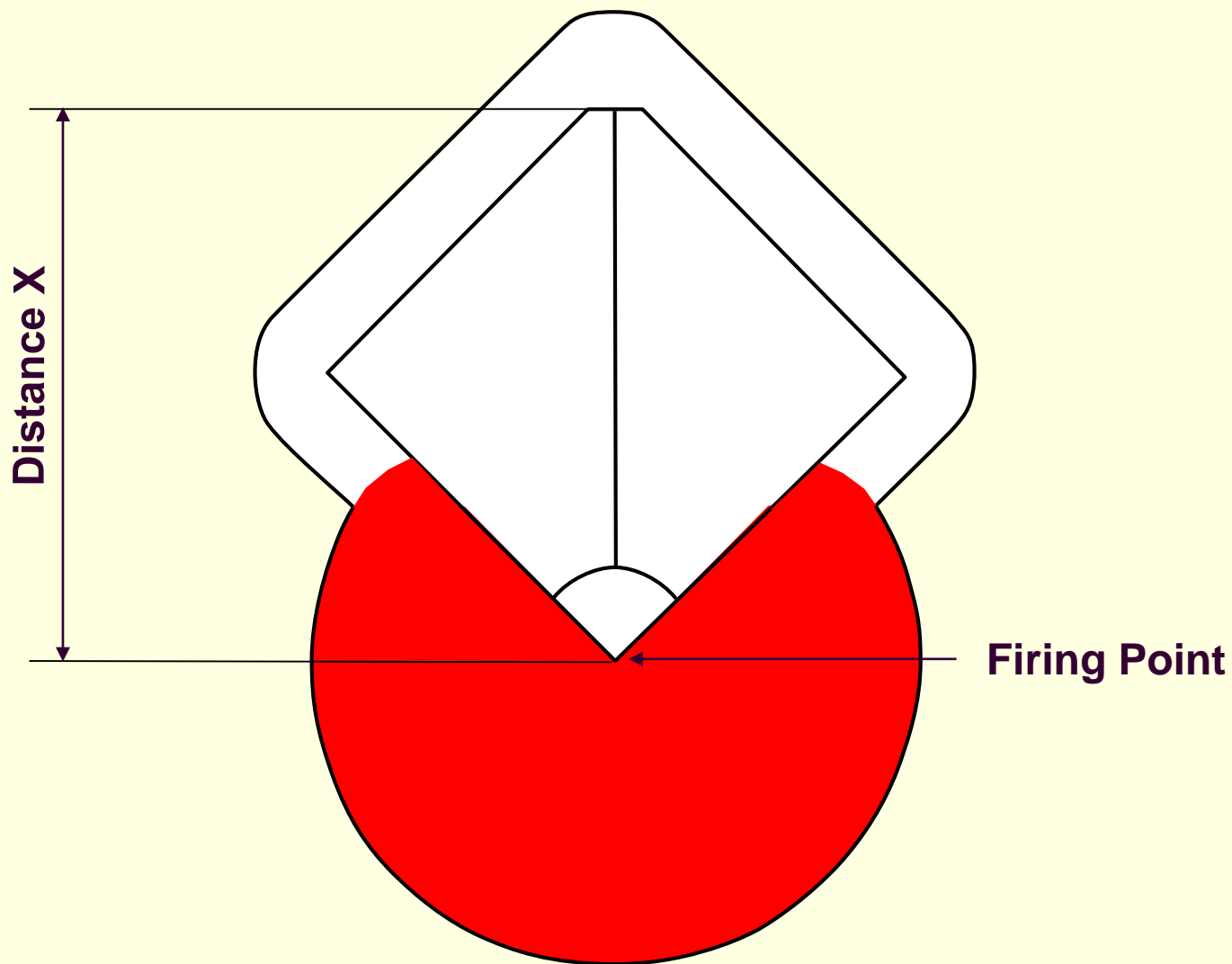
Indirect Fire SDZ - Artillery

Single firing point, single target area





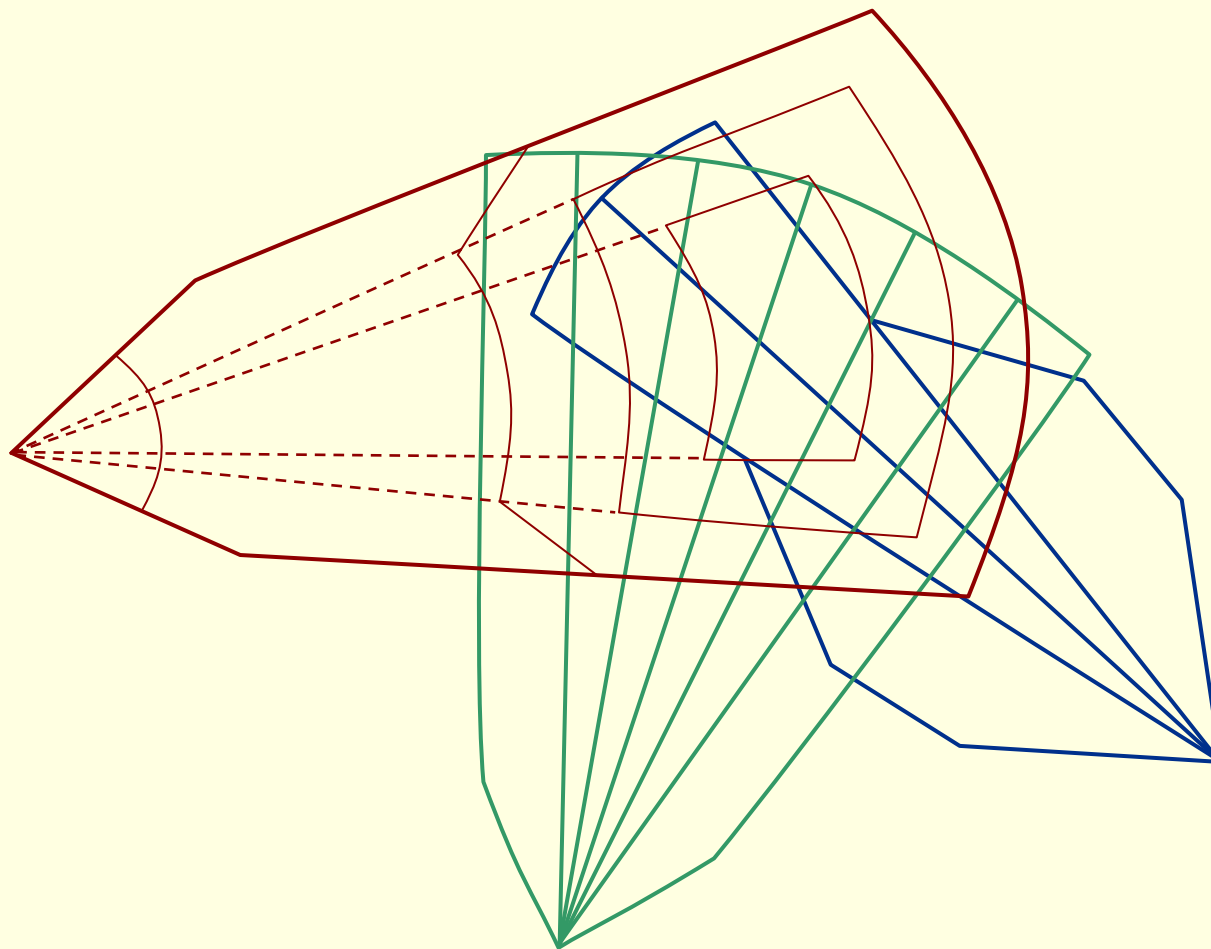
Special SDZ - TOW





Composite SDZ

Combined Arms Live Fire Exercise - CALFEX





Range Safety Questions

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