



# Range Safety 101

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# What is a Range?

10 U.S. Code § 101

**(1) RANGE.**—The term “[range](#)”, when used in a geographic sense, means a designated land or water area that is set aside, managed, and used for [range activities](#) of the Department of Defense. Such term includes the following:

- (A)** Firing lines and positions, maneuver areas, firing lanes, test pads, detonation pads, impact areas, electronic scoring sites, buffer zones with restricted access, and exclusionary areas.
- (B)** Airspace areas designated for military use in accordance with regulations and procedures prescribed by the Administrator of the Federal Aviation Administration.



# Types of Ranges

Test (MRTFB)

Training (PTR)

Test & Training



# DoDD 3200.11

## ARMY:

- White Sands\*
- Kwajalein\*
- Yuma\*
- Cold Regions
- Tropic Regions
- Dugway\*
- Aberdeen\*
- Ft Huachuca

## NAVY:

- Pt. Mugu\*
- China Lake\*
- PAX River\*
- Newport\*
- Keyport\*
- PMRF\*

## AIR FORCE:

- Patrick\*
- Vandenberg\*
- Nellis
- Edwards\*
- Arnold\*
- Hill
- Eglin\*

# DoDI 3200.18

- Gives Secretaries their MRTFB duties
- Gives Range Cmdr their duties
- Manages test safety program





# Definitions

## DODI 3200.18

**T&E range** = Specifically bounded or designated geographic areas or volumes, including OPAREAs, that may encompass a landmass, body of water (above and/or below surface), and/or airspace; to include all associated physical assets within an MRTFB Activity used to conduct T&E and produce data products.



# Range Commander Duties

## **DODI 3200.18**

“...prevention of test objects including targets from violating established safety, security, or range boundaries.”





# USAF Policy for ALL ranges

## AFMAN 13-212 / AFI 13-212 (OLD)

- Range Commander appoints a Range Safety Officer, and a Laser Safety Officer.
- Details Wing Chief of Safety responsibilities.
- RSO
  - Ensures applicable hazard area/footprint has been applied.
  - Monitors flight path and wpn status, range boundaries, executes FTS.
  - Ensure hazard area is clear, use of PPE, have real-time SA, etc.
  - Mandates use of Weapon Danger Zone(WDZ)/Surface Danger Zone (SDZ) on PTRs.



# Our MAJCOM weighs in

## AFI 91-202 AFMC\_Sup

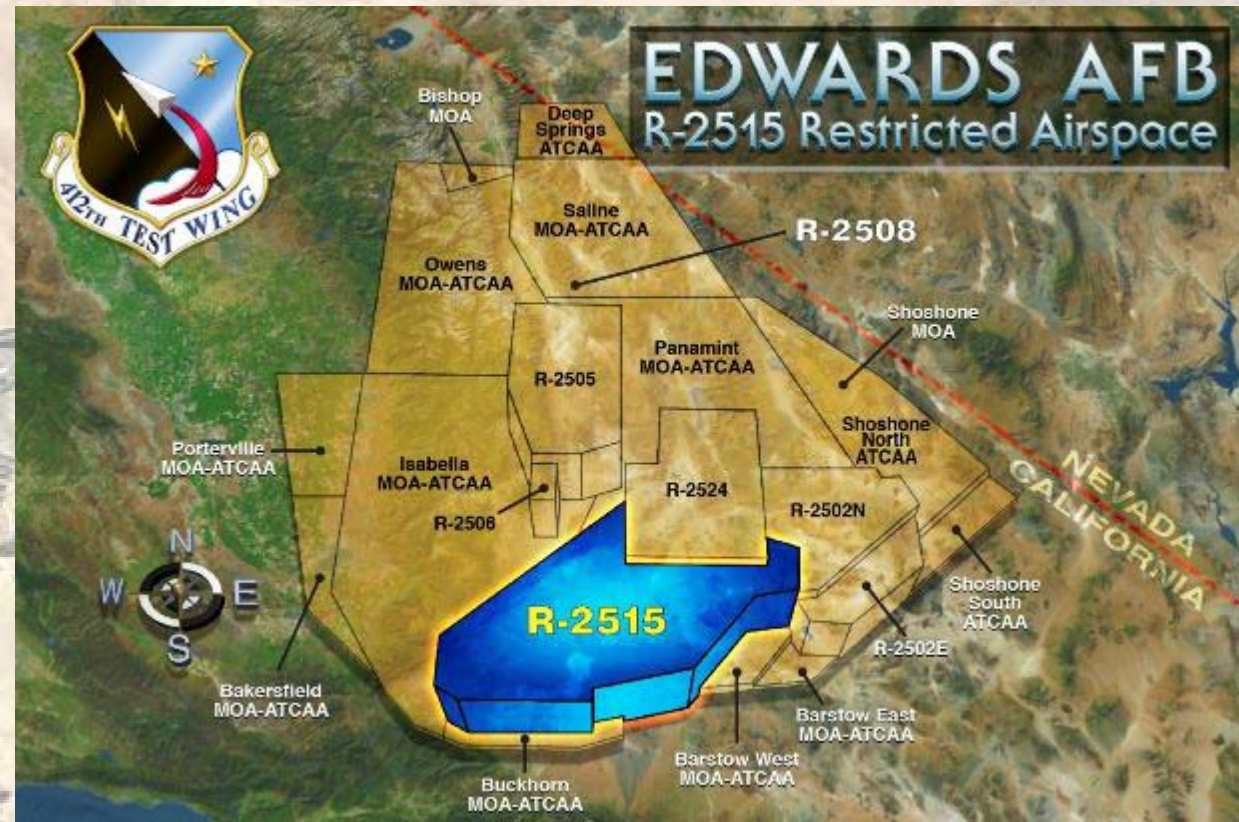
- Covers training for RSOs
- Assist the ROA with development, analysis and implementation of non-inventory item footprints.
- Obtain and maintain analysis tools (e.g. WDZ/SDZ)
- Conduct test hazard analysis, employ FTS, coord mishap investigations, inform AFTC of high risk.
- Ensure appropriate measures taken to not endanger public/property.
- Safety footprints for all aircraft, weapons, and tactics.
- UAS – all hazards of flight (ref. RCC 323 and 321)
- Laser and directed energy systems use certified range or SRB process.



# Edwards AFB



# Unmanned Aerial Systems





An aerial photograph of a desert landscape. In the lower-left quadrant, there is a military installation with several buildings, parking lots, and a long, straight road or runway. A bright, intense white beam of light, representing a laser, originates from the installation and extends diagonally across the desert floor towards the upper-right corner of the image. The beam is very bright and creates a visible path through the terrain. The surrounding desert is arid, with sparse vegetation and various shades of brown and tan.

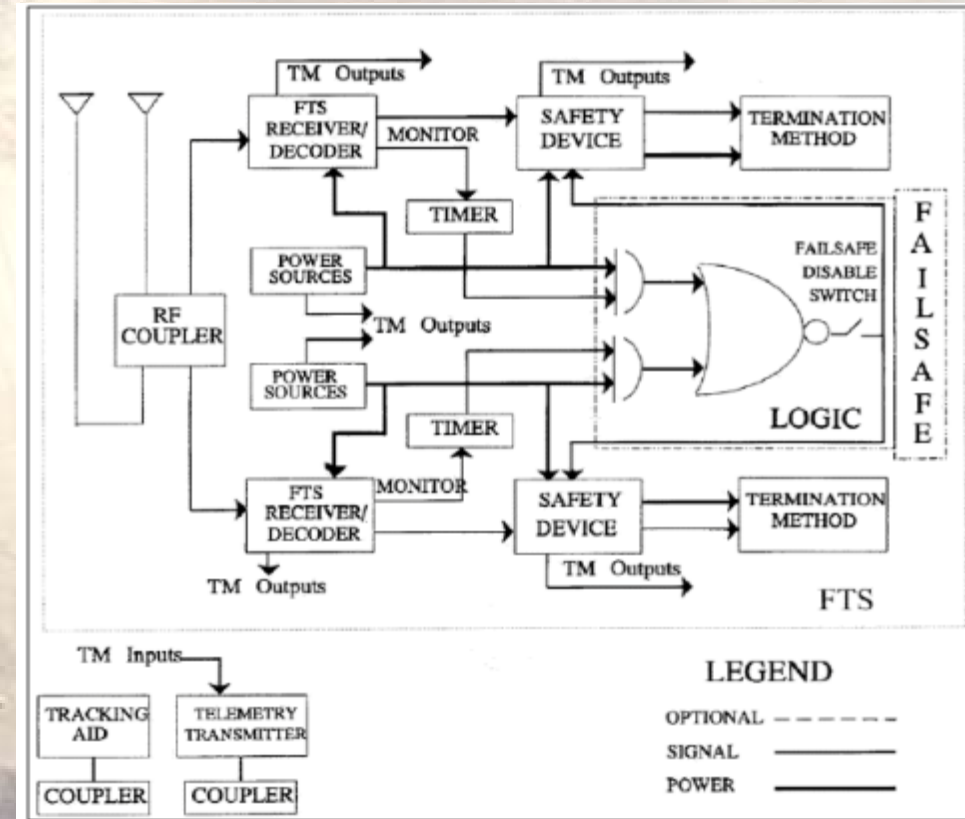
# Laser & Directed Energy Weapons

- MIL-STD-828E
- ANSI Z136.1
- ANSI Z136.6
- DoDI 6055.15
- AFRL-RH-BR-2018

# Flight Termination Systems



- RCC-319
- RCC-323
- RCC-321
- RCC-313





# Definitions

- Range Safety Criteria for UAS (RCC 323)
  - Expected casualties must be less than one in a million flight hours.  
( $E_c = 10E-6$  or lower)
- Routes avoid high-population density areas
- Ensure UAV can be contained within defined restricted or warning area boundaries.

# Definitions

- Flight Safety System (RCC 319)
  - Reduces overall risk of mission to acceptable level
  - Contains an FTS, tracking, and method to receive status
- Flight Termination System
  - Disables thrust, minimizes debris footprint (lat/long).
  - Ensures debris impact under worst-case winds does not endanger protected areas. Irrevocable.
  - Result in aerodynamic control surface manipulation making vehicle unable to glide/auto-rotate.
  - Reliability of at least 0.999 with 95% confidence level





# Rules

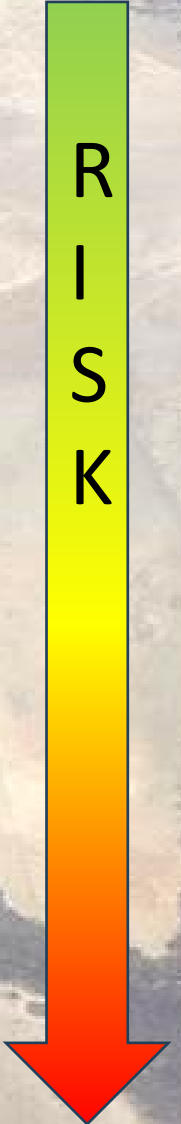
- Special Airworthiness Certificate (Form 8130-7)
  - 21.193 Experimental certs for UAS
    - Purpose for use of the aircraft
    - Submit photographs to identify
    - Estimated time or number of flights required
    - Areas over which experiment to be conducted
    - Submit 3-view drawings or 3-view dimensioned photos
    - Any pertinent information found necessary by FAA to safeguard general public.



# Range Safety Containment Posture

- RCC 319 Tailored FTS
- RCC 319 Tailored FTS, Significant Waivers
- Robust and proven C2 LL methodology
- Embedded FTS
- Geo-fencing with mature autopilot s/w
- RTB
- Automatic Fail-Safe (timer)
- No containment methods
- F-89D's outfitted with mighty mouse rockets

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# Range Safety Tracking Solutions

- C-band dedicated radar tracking
- RCC 324 Compliant TSPI solution
- ADS-B (future)
- Chase outfitted with C-band beacon, ARDS pod
- Separate S-band TM TSPI feed
- Mode 3 transponder
- Skin Track (heavily vehicle dependent)
- C2 link (not independent)

An aerial photograph of an airport. A large, billowing plume of white dust or smoke rises from the tarmac area, partially obscuring the view of the runways and taxiways. The surrounding landscape is a mix of brown, dry earth and some green vegetation. The word "Questions?" is overlaid in the center of the image.

**Questions?**



# Instruction Trees

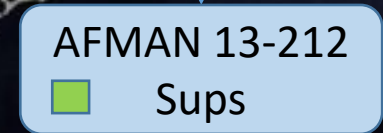
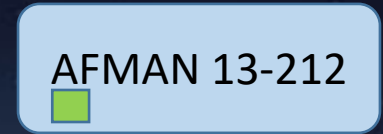
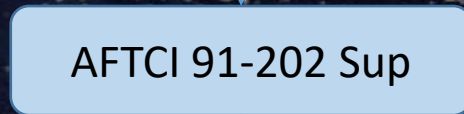
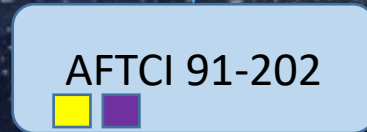
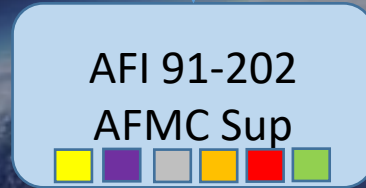
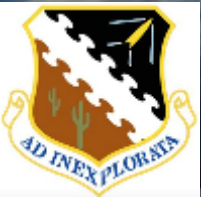


DoDI 3200.18



- Range Safety
- Test Safety
- Sys Safety

- Occ Safety
- Flt Safety
- Wpns Safety



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