Indian Air Defense System - Educational Website Content

Page 1: Home / Introduction

An air defense system is a network of radars, missiles, guns and interceptors designed to detect, track and destroy airborne threats such as enemy aircraft, drones and missiles. These systems form a multi-layered shield ranging from short-range guns and MANPADS to long-range missile systems.

Importance for India:
- Faces two-front threats (China and Pakistan)
- Protects strategic infrastructure like cities, airbases, nuclear sites
- Enhances strategic deterrence and independence

Short History:
- 1960s-70s: Imported Soviet SAMs (SA-2, SA-3)
- 1980s: Akash missile project launched by DRDO
- 1990s: Ballistic Missile Defence (BMD) program started
- 2000s-2020s: Induction of SPYDER, Barak-8, S-400
- 2025: Operation Sindoor showcased live performance under threat

Page 2: Key Air Defense Systems

1. Akash (India, DRDO)
- Type: Medium-range SAM | Range: 25-30 km | Altitude: up to 20 km
- Mobile, 360° coverage, multi-target tracking
- IAF inducted in 2014, Army in 2015

2. Barak-8 (India-Israel)
- Type: Medium/Long-range SAM | Range: 70-100 km
- All-weather, intercepts aircraft, UAVs, missiles
- Navy inducted in 2016, Army in 2025

3. SPYDER (Israel)
- Short/Medium-range mobile SAM | Range: 15-35 km
- Uses Python-5 (infrared) & Derby (radar) missiles
- Inducted in 2012, used during 2019 drone shootdown

4. S-400 Triumf (Russia)
- Long-range SAM | Max range: 400 km | Altitude: 30 km
- 3 out of 5 regiments delivered by 2025
- Can engage 36 targets with 72 missiles simultaneously

5. Iron Dome (Israel - Not inducted)
- Short-range rocket/artillery interceptor | Range: 4-70 km
- India explored co-development; inspired Project Kusha

Page 3: Radar and Surveillance Infrastructure

Radar Systems:
- Rohini: DRDO-made 3D radar for Akash | Range: ~200 km | Tracks 150-200 targets
- Rajendra: Fire control radar for Akash | Range: 4-150 km | Tracks 64 targets
- Swordfish: Long-Range AESA radar for BMD | Range: 600-800 km | Based on Israeli Green Pine

- Green Pine: Acquired from Israel in 2002-2005 | Used for missile defense
- AWACS (Phalcon): Israeli radar on IL-76 aircraft | 360° dome, real-time surveillance
- Netra AEW&C: Indigenous radar system on Embraer platform

All radar systems are integrated via IACCS (Integrated Air Command and Control System):
- Collects data from radars, AWACS, UAVs
- Creates Recognized Air Picture (RASP)
- Real-time threat detection and automatic weapon allocation

Page 4: Strategy, Threats & Operation Sindoor

India uses a layered defense architecture:
- Layer 1: MANPADS, Counter-UAS (0-6 km)
- Layer 2: SPYDER, QRSAM (15-30 km)
- Layer 3: Akash, Barak-8 (30-100 km)
- Layer 4: S-400, Project Kusha (150-400+ km)

Recent Threats:
- Drone Swarms: Countered with D4 System, Indrajaal, Bhargavastra
- Ballistic Missiles: Swordfish + BMD interceptors (PAD/AAD)
- Stealth Aircraft and Hypersonics: Addressed via multi-sensor tracking

Operation Sindoor (May 2025):
- Pakistan launched >500 aerial threats (drones, missiles)
- Akash, Barak-8, S-400 and IACCS coordinated to intercept with high success rate
- No major damage reported, validated India's integrated defense model

Page 5: Future Developments & Challenges

Future Systems:
- Akash-NG: Improved variant with 70 km range, active RF seeker
- Project Kusha: Indigenous S-400 alternative, ~350 km range
- BMD Phase 2: AD-1/AD-2 interceptors for missiles up to 5,000 km
- QRSAM & VSHORAD: Mobile systems for Army protection
- AI in Defense: Used in drone neutralization (Indrajaal)

Challenges:
- High cost of foreign systems and R&D
- Technological gaps (e.g., hypersonic defense)
- Geopolitical constraints (e.g., US sanctions on S-400)
- Rapidly evolving threats from China and Pakistan require continuous innovation