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Q5

How is S-400 air defence system technically superior to any other system presently available in the world?

UPSC Civil Services Mains 2021 · GS III · 10 marks · Indian Economy

Indian Economy and issues relating to planning, mobilization of resources, growth, development and employment.

Core demand of the question

- How is S-400 air defence system technically superior to any other system presently available in the world?
- Do not claim magic superiority on every metric. **Compare range** mix and engagement capacity with Patriot and **THAAD**, and state limits
- Keep the explanation within a 10-mark length

Revision summary

S-400's advertised **40N6** reach of about 400 km and a mix of shorter missiles give a layered anti-aircraft umbrella.

High simultaneous-engagement capacity and mobile TELs are real design edges.

Patriot and **THAAD** are built for different range and ballistic jobs; they are not failed S-400s.

No system is magically superior on every metric, including stealth, saturation, and C2 fusion.

India's value in the system is long-range area defence plugged into national sensors, not a world-title slogan.

Introduction

The S-400 Triumf is a Russian long-range surface-to-air system that India contracted in 2018. It is often advertised as the best SAM in the world. That slogan is too large. Its real edges are a long-range missile mix, high engagement capacity, and mobility. Other systems beat it on some jobs, especially specialised ballistic-missile defence.

Body

Claimed technical edges

- The **40N6** interceptor is advertised at about **400 km**, which is a longer anti-aircraft reach than typical **Patriot** batteries field in the same role.
- A regiment can mix **40N6**, **48N6** (about 250 km class), and **9M96** shorter-range missiles, so one radar-and-launcher family covers aircraft, cruise missiles, and some ballistic profiles at different ranges.
- The battery is built to **track and engage many targets at once**, with a high advertised simultaneous-engagement count compared with older one-target-at-a-time SAMs.
- Launchers are **road-mobile**, which helps shoot-and-scoot survivability against enemy location of fixed sites.

- A 360-degree engagement picture and stacked missiles give a **layered** umbrella rather than a single short fence.

Careful comparison, not a world title

- **Patriot PAC-3** is a hit-to-kill system tightly integrated in NATO command-and-control. It is strong against some ballistic and aircraft threats at shorter ranges. It is not trying to be a 400 km area SAM, so "**S-400 beats Patriot at everything**" is a category error.
- **THAAD** is a high-altitude endo-atmospheric ballistic-missile defender. It is not a general-purpose long-range anti-aircraft grid. S-400 is not "better than **THAAD**" at **THAAD**'s job.
- Western **Aegis / SM-6**, Israeli **David's Sling**, and Chinese **HQ-9** families compete on sensors, networking, and specific interceptors. No open source can honestly rank one winner on every metric.
- Limits of S-400 include **electronic warfare, stealth and low-observable aircraft, saturation raids**, and the need to **plug into IAF and civilian radar networks**. Hardware without fusion is only a battery.
- Export geopolitics (CAATSA, spares, software) is not a radar fact, but it is an operational limit on how "available" the system stays in a long war.

How to answer the paper's wording

- State the 400 km-class reach, multi-missile mix, multi-target load, and mobility as **claimed edges**.
- Refuse the phrase **superior to any other system in the world** as a total ranking.

Flow diagram

S-400-400 -> 40N6 about 400 km
S-400 -> Mixed 48N6 and 9M96
S-400 -> Multi-target mobile
Patriot -> Shorter-range NATO BMD mix
THAAD -> High-altitude ballistic job
S-400 -> Not best at every job

Conclusion

S-400's technical case is a long-range layered mix and a large engagement book on mobile launchers. That is a serious area-defence edge, not a proof that Patriot, **THAAD**, or naval Aegis are inferior at their own designed tasks.

Facts & figures

40N6

Long-range S-400 interceptor advertised at about 400 km anti-aircraft reach.

48N6 and 9M96

Medium- and shorter-range missiles in the same S-400 family for a layered mix.

Patriot PAC-3

US hit-to-kill SAM/BMD battery with shorter typical engagement ranges and deep NATO C2 integration.

THAAD

US high-altitude ballistic-missile defence interceptor; not a 400 km general-purpose SAM.

India contract, 2018

Five S-400 regiments contracted with Russia for Indian air and missile defence layers.

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