

# CAATSA and S-400: The American Dilemma- An Analysis

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# **CAATSA and S-400: The American Dilemma - An Analysis**

After flashing in fury about an year back and eventually loosing much of its sheen and venom thereafter, the threat of CAATSA is alive, dangling yet again like the proverbial 'Sword of Damocles' over the fate of India's purchase of S-400 system from Russia. This work is an attempt to analyse this issue in all its dimensions.

## **The Fundamental Question**

In specific terms, the content searches for an answer to the fundamental question – 'What is the truth behind the consistent American resistance to the purchase of S-400 by India; is it S-400 or is it something else?'

## **Flow of Content**

The search for the answer flows through as under:-

1. CAATSA revisited
2. Demystifying S-400:-
  - a. Air Defence Matrix of India.
  - b. Place of S-400 in the Indian Air Defence Matrix of India.
3. Analysing the American dilemma

## CAATSA Revisited

The much talked about CAATSA is an acronym for a US Federal law titled 'Countering America's Adversaries Through Sanctions Act'. It was passed by the US Senate on 27 July 2017 and was signed into Law by the US President on 02 August 2017. Following points are stated regarding CAATSA<sup>1</sup>:-

1. The legislation has a unique distinction (is it?) of being levelled as 'seriously flawed' by President Trump himself, who signed it into a law in the first place (visited later).
2. Very briefly, the Act intends to punish three countries (Iran, Russia and North Korea) for their respective actions considered by the US Congress as contrary to the US national interests.
3. For Iran the alleged wrong doings include- a) Continuance of the ballistic missile defence programme that involves the use of nuclear weapons of mass destruction (WMD). b) Human rights violation of the Iranian establishment against persons in Iran (detailed text not quoted).
4. The villainy of North Korea included its relentless pursuit of weapons of mass destruction (detailed text not quoted).
5. For Russia these acts included –a) Alleged Russian interference in 2016 US elections. b) Continued and aggressive cyber-attacks on US administration and critical infrastructures. c) Destabilising involvement in Ukraine and arms sale to Syria. In essence, the Act aimed to counter the growing Russian influence in Europe and Eurasia through arms sales and oil exports, gas-pipeline projects (Nord Stream 2 – Russia to Germany) and more (detailed text not quoted).
6. It is relevant to carry forward the thread of Presidential remarks about the legislation in order to draw out some sense about the American dilemma. Following two statements are worthy of note<sup>2,3</sup>:-
  - a. As stated, right at the moment of signing, the President called the legislation as 'seriously flawed'. This was not an 'off-the-cuff' remark. The President expressed his unhappiness in strong words. He let it be conveyed that the signing was under some sort of compulsion, (fait-accompli?).

- b. The President stated on record that the Act stymied his free conduct of the foreign policy based on ever-emerging realities and as per the powers vested in him as the President.
  - c. The President stated that 'in a haste' to get it through, the CAATSA ended up having some 'unconstitutional provisions' and its clauses limited the 'flexibility' in his conduct of foreign policy. This could be interpreted to say that 'CAATSA will get applied as 'fait-accompli' even if the President in his wisdom desired not to apply it or have some other outcome.
  - d. Driven by this suffocating thought, the President made it known that he might opt not to press ahead with certain provisions (sanctions) of the bill. He went a step further when he said that he expected the US Congress to 'refrain' from using this flawed bill to hinder American businesses or conduct of foreign policy with friends and allies.
  - e. The helplessness of the President was also reflected in the reaction of the Russian President Dmitry Medvedev when he said words to the effect that CAATSA represents an overwhelming victory of the US administration over the President.
7. All the above and more clearly indicates the difference of opinion between the US Congress and the then US President (not deliberated further).
8. The senior dignitaries of the US administration have been vocal in expressing their reservations and talking of waivers aimed at protecting and preserving US interests with friends and allies. Sample the following<sup>4</sup>:-
  - a. The then US Defence Secretary Jim Mattis in his letter to the Chairman of Senate Armed Services Committee in July 2018 sought waiver of sanctions under CAATSA for certain countries that are making a transit from their erstwhile military dependence on Russia.

He asked a fundamental question whether US wanted to strengthen its partners in key regions to align with US vision on global security or letting them (by applying CAATA sanctions) align with Russia thus letting an opportunity of a generation pass by? Several similar statements can be cited.
  - b. Mr Clarke Cooper, the US Assistance Secretary of State for Political Military Affairs in December 2020, while responding to a query on US imposed sanctions on Turkey for the purchase of S-400 stated that CAATSA is not aimed at taking punitive actions against friends and allies.<sup>5</sup>

## On Sanctions and Waivers

An attempt has been made to state in matter-of-fact terms the complex regime of sanctions and waivers contained in sections 235, 231 and corresponding Executive Orders issued from time-to-time. The focus is on Russia specific sanctions.

The sanctions are purported to be applied against a 'person' who knowingly engages in a 'significant transaction' with a person who is a part of Russia's defence or intelligence sector. What will constitute a 'significant transaction' remains undefined. The underlined aim of all this and more is to prevent revenue flow to Russia by sanctioning personnel engaging in business transactions with the Russian defence or intelligence sector<sup>6</sup>.

Very briefly, the 12 sanctions contained in Section 235 of CAATSA are as under:-<sup>7</sup>  
( only stated in essence)

1. Restrictions on sanctioned persons to get any export licence, bank guarantee, extension of credit etc. from the Export Import Bank of US regarding the export of any goods and services.
2. Withholding the issuance of licence or grant of any permission for export under the following Acts:-
  - a. Export Administration Act (EAA) 1979.
  - b. Arms Control Act (AECA) 1976.
  - c. Atomic Energy Act (AEA) 1954.
  - d. Any other statute requiring licence or specific permission for export of goods and services.
3. Prohibition of loans to the sanctioned person in excess of \$10,000,000 in any 12 month period from any US financial institution.
4. US voice and vote opposition for grant of loan to the sanctioned person from any International Financial Institution.
5. Prohibition to either be a primary dealer or an agent of the US Govt or a repository, if the sanctioned person is a financial institution himself.

6. Ban on procurement or entering into Contract by US Govt with the sanctioned person.
7. Prohibition for any transaction in foreign exchange with sanctioned person.
8. Prohibition of any transaction with US banking and financial establishment.
9. Prohibition from acquiring, holding, withholding, transferring (etc.) any property in US.
10. Prohibition of US citizens from investing in any equity or debt instrument of the sanctioned person.
11. Visa denial/exclusion from US for the sanctioned person or any other person controlling the interest of the sanctioned person.
12. Application of sanctions on principal executive officers (et al) of the sanctioned person.

### **Impact of Sanctions**

Following points are stated

1. For CAATSA to take effect, the President, under the provisions of Sec. 231 of Act is required to impose five or more of the 12 sanctions described above (Sec. 235).
2. The entire content of sanctions can be grouped in the following four categories under their respective controlling Acts (legislations).
  - a. Sanction on the export of all defence related items (Arms Export Control Act or AECA).
  - b. Sanction on the export of all dual use high technology goods and related technologies (Export Administration Act or EAA).
  - c. Sanction on export of all nuclear related items Atomic Energy Act or AEA).



- d. Sanction on export of all other items not specifically covered under the above Acts but which requires prior approval of the US Govt before these can be exported.
3. While the impact of sanctions will be experienced in varying degrees for each of the above four verticals, the one which will impact the most will be the one that sanctions export of defence related equipment.
4. This if applied, will bar India from procuring any defence equipment from US, be it under the Foreign Military Sales (FMS) procedure or under the Strategic Partnership Model (SPM) riding on the enabling provisions of make-in-India under Atmanirbhar Bharat.
5. Keeping the Indian defence procurement structures in mind the connotation of the 'sanctioned person' will probably imply the Defence Acquisition Council (DAC) or the Defence Procurement Board (DPB) as no single person (PM/RM/Defence Secretary etc.) gets involved as a 'person' in procurement of defence equipment.
6. Incidentally, the sanctions regime does not debar the procurement of spares and sustenance support for the equipment already inducted into India.

## **On Waivers**

While the issue of sanctions (yes/no) will be debated later, the contextual content of CAATSA will stand completed if the provisions of waivers per se, as contained in the Act are mentioned at this juncture of the analysis.

Two provisions of waivers to the above sanctions have been described in the Act: (exact text not quoted)<sup>8</sup>.

1. Under Sec. 231(b) of the Act the President may waive the initial application of the sanctions if he submits in writing to the Congressional Committee that the said waiver is in the vital security interest of the US or the Russian Federation has made significant efforts to reduce the number and intensity cyber intrusions.
2. There is another provision of waiver brought about by the National Defence Authorisation Act (NDAA) 2019 which allows for waiver, if the President certifies that the sanctioned person is taking/will take

steps to reduce its inventory of major Russian defence equipment or is cooperating with the US on other security matters which are critical to its security interests.

3. Under Sec. 236(b) the President may waive the sanctions if he determines that such a waiver is in the National security interest of the US. Also under 236 (c), the President may terminate the application of sanctions if he certifies to the Congress that the person is not engaging in the activity that was the basis if the sanction in the first place or that the President has received reliable assurance that the sanctioned person will not knowingly engage in the activity subject to sanction in the future.

So much for CAATSA, the sanction regime and its potential impact and the waivers built into the Act.

### **Demystifying S-400**

If there is one weapon system that has caused unprecedented uproar, debates, discussions, fears and apprehensions on such strategic issues as Indo-US, Indo-Russian relations and more; it is certainly the S-400. What is it that irks the US about S-400 like no other is a moot question.

To find an answer to this will demand an analysis on the following lines:-

1. What is the current air defence matrix in India?
2. Where does S-400 fit in the above matrix?
3. What is so special about S-400 that has aroused such strong reactions from US?

### **Air Defence Matrix of India**

All air defences on land sea and air world over, exist for the sole purpose of countering the 'air threat' from the adversary. The term 'air threat' will basically imply the cumulative capability of the adversary to cause damage and destruction from the medium of air on our national strategic assets and overall war-waging effort in furtherance of his war-aims. It is therefore fundamental to state that – AIR THREAT DRIVES AIR DEFENCE.

The face of air defence in India is therefore a direct outcome of what air threat we face from our potential adversaries on our northern and western borders. The way this threat has metamorphosed over the years has actually shaped our air defences. To understand the compulsions of air defence, it is imperative to understand how the air threat has forced such compulsions.

### **The Air Threat We Face<sup>9, 10</sup>**

We face a formidable air threat from our potential adversaries. There are two main signatures of this air threat, one, multiplicity of air threat vehicles and two, enabling technologies translating into enhanced lethality.

Talking of multiplicity, there was a time in late sixties and early seventies when the air threat was prosecuted by a binary pair of aircrafts and helicopters firing unguided bombs and rockets in the visual domain. To counter these, it was good enough to deploy some guns around the critical assets in single or multiple rings to draw fire on the attackers besides intercepting them in the air using the air power. What is the scene now? Sample the following<sup>11</sup>:-

1. Our adversaries have aircrafts that are third to fifth generation (Pak - F-16, JF 17, Mirages III, V, China-J-7, JH-7, J8, J10, J 11, H-6, SU-30, Q5 J20, J31 etc). Role-wise these are fighter bombers, air-superiority fighters, strategic bombers, multi-role aircrafts and more. The latest machines (J 20, J 31 etc.) exhibit strong stealth muscle capable of avoiding radar detection. Most of the aircrafts have the combat radii to strike deep within our territory and beyond (details not covered). Latest in avionics and munitions allow these aircrafts to achieve long range and deep strike capability with precision and accuracy.
2. The aircrafts are joined by a strong fleet of attack helicopters or AHs (Pak-AH 1F, K 8, China -WZ-9, 10, 11, 19, Z-11 etc.) These can fly nap-of-the earth and can prey on their targets in the Tactical Battle Area (TBA) avoiding radar detection.
3. China in particular (Pak to a lesser degree) has a strong muscle in the unmanned aerial systems in short the UAS.(Pak -Burraq, ASN 105, ASN 206. China - Wing long, CH3, GJ 1, GJ 2, Anjian etc). Besides the traditional ISTAR (intelligence, surveillance, target acquisition and reconnaissance) roles, the UAS platforms are capable of operating in combatised mode either as dedicated strike platforms or in combination

with manned platforms in what is called the 'Manned and Unmanned Teaming' (MUMT) operations. Capability also exists with China to mount attacks using swarm drones.

4. One threat to which India is particularly vulnerable is the threat from our adversary's Surface-to-Surface Missiles (SSMs). This capability standing on its three anchors; a) warhead and delivery means, b) command control and associated aspects and c) field infrastructure is a potent threat.

Pak SSMs cover a range of 80km (HATF 1) to 2750+km (Shaheen II) while the Chinese SSMs span a range bracket from 700 km (DF1) to 12000+ Km (DF41). While all the SSMs can carry conventional warheads quite a few can carry nuclear warheads deep into Indian continent and beyond. (Technical details not discussed)

5. Suited to the weapon carriage of various threat vehicles, there are limited holding of Precision Guided Munitions (PGMs) and smart munitions that can loiter in the battlefield and prey on the assigned targets through remote control mechanisms. (Pak - Shrike, Maverick etc., China-KD 88, D1-63, KH 59 etc.).
6. Both our adversaries have Cruise Missiles (Pak - Nasr, Babur. China-CJ 10, YJ 6 etc.). These are capable of being launched through multiple mediums and can strike their targets with precision and high accuracy. Following a typical low-level/sea-skimming cruise profile, such weapons are difficult to be detected by electronic sensors.
7. For suppressing our air defences by killing our sensors in what is called the SEAD (suppression of enemy air defence) operations, both our adversaries have Anti-Radiation Missiles or ARMs (Pak-MAR 1, China-KH31P, YJ91, YJ 93 etc.). Multiple delivery means are available to launch the ARMs.
8. Besides the kinetic means, both adversaries have a potent soft-kill capability through electronic warfare (EW) weapons. Besides warning and protection devices like radar warning receivers or automatic self-protection jammers, these weapons are configured as dedicated EW suits and Electronic Counter measure (ECM) pods. Dedicated EW aircrafts are available to accompany the strike package and launch a potent EW

attack (some EW weapons: Pak- ANALQ131, EL 70, ELT 55 etc. China-KJ 8601, 8608 etc.).

9. As regards the weapons of the future, these ride on the three verticals of laser, high power microwave and charged particle beams. The laser-based weapons have already become a reality (albeit early days) while the other two are at various design and testing stage.
10. In addition to the above, another niche field where testing and experimentation is going on in China is the hypersonic weapons. These are in two variants, namely Hypersonic Cruise Missiles (HCMs) and Hypersonic Glide Vehicles or HGVs ( China- HGV on board DF 17, HCM- Xingkong -2 or Starry Sky -2).
11. Finally there are capabilities being built for space warfare – anti-satellite weapons, co-orbital killers, space-based laser interceptors etc. These are not discussed further.

## **Countering the Threat**

Following are the three bottom-line requirements to counter the air threat as described above:-

1. The threat must be detected and identified as friendly or hostile as early as possible (implying at longest possible ranges).
2. Effective fire must be brought upon the threat till it is destroyed or the mission is called off.
3. This fire irrespective of the weapons on land, sea or air must be seamless and must successively shift from weapon-to-weapon without a gap as the threat draws in.

## **The Signature of the Air Defence Battle**

To achieve the above, the conduct of the air defence battle has a peculiar signature. An effort has been made to describe this signature simply and sequentially.

1. Air threat, owing to multiplicity of delivery means, can manifest at land, sea and air either simultaneously or in any combination.

2. Specific air defence weapons exist to counter the air threat in each medium.
3. These are different from one another as chalk and cheese in capabilities and method of operation.
4. Services (Army, Navy and Air Force) over decades have built core-competencies to operate air defence weapons in their respective mediums.
5. Such core-competencies not only relate to the expertise in operating the weapon systems per se, but also, and more importantly, these relate to the understanding of the conduct of the battle in the respective medium. For instance the core-competency of an air warrior in an aerial combat not only relates to flying of the aircraft, but also, to his thorough understanding of the air battle.

Similarly for an air defender providing protection to mechanized elements in the Tactical Battle Area (TBA), it is not only important for him to operate his weapon system, but also, to exhibit a total understanding of the ground battle. Same is true for air defence of the fleet-at-sea which of course, is an exclusive domain of sea-warriors.

Keeping in mind the above requirement each Service has exclusive air defence weapons for conduct of air defence in their exclusive mediums of land, sea and air; much like distinct arrows in the sheath of Air Defence or the three arms of the Trishul of Lord Shiva.

Above distinctness notwithstanding, the air defence weapons of the three Services are still integrated in what is called the Integrated Air Defence System or IADS. Following points are stated as to IADS:-

1. The prime component of the IADS is the air power. Represented by the aircrafts, AHs, AWACS, Air-to-Surface Missiles associated sensors and control structures this power is deployed at various air bases of the country to be employed in a flexible and a dynamic manner in multiple roles of which air defence is one role ( others- strike missions, counter air operations, offensive air support, EW operations and more).
2. The Ground based Air Defence Weapon Systems (GBADWS) have to meet the difficult challenge of bringing successive fire on the threat

seamlessly as it draws in .

Since each weapon system be it a gun or a SAM has a definitive range and altitude envelop in which it is effective, to ensure that we lay out a seamless and an effective envelope of weapons from very short ranges all the way to hundreds of kilometers, a variety of weapons are so deployed in layers that the fire arm starting from the innermost layer extends all the way. This deployment of GBADWS is called the layered and tired pattern of deployment.

3. The innermost layer is provided by air defence guns (L-70 and ZU 23; range 3-4 km) and Very Short Range Air Defence (VSHORADS) SAMs (Igla, Strela 2M- Strela 10M, OSA-AK; range bracket 5-10 Km). This innermost layer is successively patched up with the layer of Short range SAMs or SRSAMs ( Akash – 25-30km), Medium Range SAMs or MRSAMs ( Barak – upto 100km)and Long range SAMs ( >100 km). Quantum and deployment details are classified.



*Akash - our very own SRSAM (Source: <https://www.ndtv.com/india-news/>)*

4. Distinct from this layered-and-tiered defence are the elements providing mobile air defence to mechanized elements in the TBA. These include self-propelled guns and gun-missile systems (Schilka and Tunguska; range bracket 2.5-8 km) and Quick Reaction SAMs or QRSAMs (BEL QRSAM; range 20-30km).

Apart from the above classic air defences, other specialist types of defences are required to counter the threat of adversary's SSMs. These are called the Ballistic

Missile Defence (BMD) systems. Following points are stated about these weapon systems:-

1. These are specialist class of weapons capable of engaging the incoming missiles both in the endo-atmospheric, as well as, exo-atmospheric regions.
2. The strategy is to detect the missile at the longest possible ranges using Long Range Surveillance Radars (LRSRs), thereafter to track the incoming missile closely using the Multi-Function Radars (MFRs) and when the target gets into the range of our weapons, to launch missiles (interceptors) for destroying the threat missile/missiles before it can release its warhead.
3. BMD systems are not stand-alone systems. While these are deployed on a theatre grid with reference to the critical assets being protected, these superimpose on the layered-and-tiered deployments of IADS by further enriching them with surveillance and kill capability brought about by their deployed resources (typical deployment areas of BMD weapons - seat of power, national command post, nuclear assets, oil refineries, other critical infrastructures, war- waging assets etc.).
4. DRDO has provided the indigenous BMD system called Programme AD. It is a two tier system capable of defeating incoming missiles up to the range of 2000-5000 km both in the endo as well as exo-atmospheric range. The operationalisation details of this system are classified.
5. Since the requirement of BMD systems are far greater than what can be provided by the indigenous resources (quantum of voids classified), there has been a long felt need to go in for more BMD systems. The contract for S -400 and the US National Advanced SAM (NASAM II) is to address this need (discussed later) .

While the air defence weapons are deployed as distinct core-competencies as described above, the one thing that binds them together as one integrated whole is the Battle Management Command and Control (BMC2) System. In air defence parlance it is called the Air Defence Control and Reporting System or ADCRS for short. ADCRS is called the life-line of the air defence battle because actually MAKES THE AIR DEFENCE HAPPEN by carrying out the following functions:-



1. Surveillance of the air space.
2. Detection of aerial targets in the pan of area under surveillance.
3. Combining the inputs from various sensors to remove duplication of same targets getting reported by multiple devices.
4. Creation of Air Situation Picture (called ASP) and cumulating the same upwards up to the theatre level.
5. Classifying the detected targets into friendly or hostile.
6. Setting priority to targets based on immediacy and lethality.
7. Selection of optimal weapon across Service domains to engage the threat.
8. Auto-designation of the target to the selected weapon system.
9. Shifting the fire from weapon-to-weapon dynamically ensuring that a seamless and successive fire is brought upon the target as it presses home its attack.
10. Minute-to-minute control of the air defence battle in near-real time.

In short, NO AIR DEFENCE WEAPONS FIRE UNLESS CLEARED BY ADCRS. No wonder therefore that it is called the life-line of air defence battle.

In execution of its responsibility of the air defence of the national air space, the Indian Air Force has established the ADCRS system on a national grid. It is called the Integrated Air Command and Control System or IACCS for short.

This system establishes connectivity from the highest national level entities responsible for air defence and reaches all the way down to the Command Posts of deployed units by patching with ADCRS systems of the Army and the Navy. Based on SATCOM and riding on the WAN it establishes connectivity over the Air Force Net (AF Net) over which flows the data related to the execution of the ADCRS functions as described above.

At the present moment there are certain voids related to sensors for long range early warning and certain hiccups in the seamless hand-shake of the IACCS with the ADCRS of the other two Services and Civil aviation. These are being addressed at high priority.

IACCS besides the ADCRS also controls the execution of air power through offensive air support function. It also is responsible for carrying out battle function called Air Space Management or ASM for short. ASM ensures the optimal utilization of the national air space by its multiple users (air force, army aviation, artillery, air defence, SATA, civil aviation etc).

## **Overall Configuration**

In the arrangement explained above, the overall configuration of the national air defence exists as explained below:-

1. The air combat power is deployed at various air bases of the nations based on the assessed threat priorities. (Details classified).
2. While there are dedicated air defence aircrafts, many others are multi-role. In any case, the air power is never straight-jacketed into rigid roles. The essence of application of air power is flexibility. These assets are ready to execute the air defence function through aerial combat.
3. GBADWS are deployed on various Vulnerable Areas and Vulnerable Points (VAs/VPs- in short, the assets requiring air defence protection). The priority of VAs/ VPs for deployment and the type and quantum of GBADWS deployed on each is decided and approved at the highest level (details classified).
4. The above deployment in the field force takes the form of the layered-and-tired defence as explained earlier (guns-VSHORADS-SRSAMs-MRSAMs-LRSAMs + air defence of mobile mechanized forces).
5. While the naval assets on shore are protected by the GBADWS of the Army, the air defence of the fleet-at-sea is an exclusive naval domain.
6. All the air defence assets (air assets + GBADWS) are integrated into one IADS by the IACCS of the Air Force controlling the air defences of the nation through the ADCRS function as explained above.
7. In essence while the Services retain and deploy air defence resources in their core-competency domain, these are all integrated as one IADS on which the Air Force exercises the Battle Management and Control through the IACCS.

8. The BMD systems are deployed with reference to the assets to be protected. Based on where these get deployed, they superimpose and complement the IADS in place in terms of enhanced surveillance and fire cover as will be intrinsically available due to the resources possessed by the BMD system. These also get hooked in the chain of IACCS for the ADCRS support as explained before.

So much for the air defence matrix of India

### **Place of S-400 in the Air Defence Matrix of India**

The stage is now set to bring in the S-400, as its place in the overall air defence matrix of India.

### **Technical Muscle of S -400**

1. S-400 is a long range air defence and anti-missile (BMD) system. A contract for 5 regiments of S -400 has been signed between India and Russia in Oct 2016 for a cost of 39000Cr/5.85 Bn USD. The deliveries of the first regiment are due to start in 2021.



Source: <https://www.youtube.com/watch?v=UQCPPXJq2KQ>

2. The conceptual configuration of S-400 is typical of any BMD system as briefly stated above. The main components of S-400 include the following:-

**a. Long Range Surveillance Radars (LRSRs)**

These include a variety of long range sensors whose task is to detect the adversary's incoming missiles at longest possible ranges and designate the selected targets to Multi-Function Radars (MFRs) for tracking and engagement.

**b. Multi-Function Radars (MFRs)**

These radars are capable of auto-tracking the incoming missile threat and guiding the interceptors on to them. It will be seen that while the function of LRSR is long range surveillance and detection, the function of MFRs is close tracking of the targets and missile- guidance for destruction. MFRs get their targets either from LRSRs or can even pick them up directly (those which have successfully evaded detection by LRSRs).

**c. Interceptors**

This is the teeth of the system. It consists of a variety of missiles of different ranges and altitudes that are launched to kill the incoming missile threat.

**d. BMC2 System**

This is the system that not only controls all the resources of the weapon system but also connects the weapon on to the IACCS grid.

**e. Associated Support Systems**

These include multiple systems - power supply, missile storage, preparation, loading, unloading, air filling, maintenance back up, spare support etc.

3. The above conceptual configuration translated to actual combat equipment is as under:-

**a. LRSRs**

One of the strongest muscles of S-400 is the variety of LRSRs configured with the system. These have actually evolved over decades of development (1978-2016). Some of these are:-

**i. 36 D6 (NATO Codename –Tinshield)**

Early eighties design, Medium and high altitude radar. E&F band radar (Radar bands are operating frequency bands 20MHz-400 GHz. E&F band is 2-4 GHZ). Range 180-360 km.

Capability to simultaneously track 120 targets.

**ii. 76N6 (NATO Codename –Clampshell)**

I band radar (8-10 GHz) optimized for low altitude detection of incoming missiles. Range 120 km ; Capability to simultaneously track 300 targets.

**iii. 64 N6 ( NATO Codename – Bigbird)**

Early nineties design; Configured on lower end of E band. Optimised for detection of ballistic missiles and stealthy targets; can detect ballistic missile type of targets some 1000 km away coming in up to the maximum speed of 10,000 km/h. (2.7 km/s).

**iv. 91N6 (NATO Codename – Tombstone)**

It is an upgraded version of 64N6 radar. It is a panoramic three dimensional all altitude radar with a range of 600 km and a capability to track 300 targets simultaneously (3D- means it detects bearing, range and altitude of the target).

**v. 96N6E (NATO Codename – Cheese board)**

Combining the capabilities of 36D6 and 76N6, this is three dimensional (3D) all-altitude detection radar (medium +low); it has a range of 600 km and can simultaneously track 300 targets.

**b. MFRs**

The MFR associated with S 400 is 30 N6 (NATO Codename –Flap lid). It is an I/J band radar with a range of 140-150km (later upgraded to 200Km) .

**c. Interceptors**

S-400 has very strong interceptor (missile) punch. There are two very unique features about the launcher and missiles:-

- i. Using the same launcher, multiple missiles, each with a distinct range-altitude envelope and guidance system can be launched with nil/minimal changes on action stations. This niche feature is not present in most of the missile launchers (almost 99%).

- ii. As to missiles, each category is configured on a different guidance philosophy. This will ensure that one single pattern of an EW attack (soft kill) by the adversary will not be able to kill all.

Basically there are three types of interceptors

- i. 9M96E

This is the basic missile which has two versions called 9M96 E1 and 9M96E2. E1 has a range of 40 km while E2 has a range of 120 km. These are active radar homing missiles which implies that missiles having been guided to some point towards the target by the MFR are thereafter capable of detecting and homing on to their target on their own. The connotation of 'homing on' is that once the missile is homed on (locked), it will continue to chase the target irrespective of its dynamic movement. The missiles have a high probability of hitting the target (90%) - measured as 'single shot kill probability or SSKP and high resistance to enemy's EW attacks.

- ii. 48 N6

This is the next level of kill capability. As stated, two missiles in this category are configured on different guidance techniques. The one based on semi-active radar homing or SARH has a range of 250 km (SARH-radar illuminates the target, the missile guides itself to target by following reflected radar waves from target. The other one based on the technique of Track-via missile or TVM has a range of 200 km. (TVM- radar illuminates the target, reflected waves received by the missile are relayed back to a ground station which accurately guides the missile on to the target). Technicalities of the guidance systems and the rationale of their selection are not explained further.

Both these missiles are multi-Mach missiles (8.2-14 Mach)

- iii. 40 N6

This is the longest fire arm of the system extending all the way to 400kms and rising to an exo-atmospheric altitude of 40km at apogee. It is a radar-guided missile with a semi-active homing seeker (closer to the target, the seeker will pick up the radar reflections from the target and ride on to the same to make an accurate catastrophic collision with the target). This missile is particularly optimized for Anti-Ballistic Missile (ABM) role.

## Deployment of S-400

Following points are stated as to the deployment of S-400 in the overall air defence scenario of the country:-

1. Just to get a sense of the quantum of weapon contracted by India, following is noteworthy:-
  - a. India has contracted for 5 Regiments of S-400.
  - b. Each Regiment has the following:-
    - i. 8 Launchers.
    - ii. 32 Missiles (@4missiles per launcher). This could be a combination of the three types of missiles as selected by user (quantum details classified).
    - iii. LRSRs (combination of 36D6, 76N6, 64N6, 96N6E - exact configuration classified).
    - iv. MFR (30N6) - quantum classified.
    - v. Associated control, support and administrative echelon (details not covered).
  - c. Basically 5 Regiments mean a capability of 40 Launchers and 1600 missiles (actually contracted figures are not mentioned being classified). The above number excludes the first and second line stocks and war wastage reserves - details not covered).
2. With the type of background covered earlier, it would be possible for the reader to now comprehend why the S-400 is called both the air defence, as well as, the Anti-missile system. In that, while 9M96 E1 (40km) and 9M96E2 (120 Km) are in the MRSAM, LRSAM category respectively, 48 N6 (200, 250 Km) and 40N6 (400Km) are more suited to the ABM role.

While this is stated purely on range considerations, no such division actually exists in the air defence/ABM parlance; the aim being to kill the threat at the longest possible range.

3. With the kind of capability as explained above, S -400 will be able to take on any known threat from our potential adversaries be it fifth generation aircrafts, AHs, ARMs, cruise missiles, ballistic missiles or more.

4. The system is likely to get deployed by fire units or FUs (two fire units of 4 launchers each in a Regiment. (Russians are known to deploy such FUs either in Kvadrat- implying square pattern, or in the extended line formation pattern).
5. The deployment of S-400 FUs will be in conjunction with the FUs of Programme AD and NASAM II. The deployment is likely to provide air defence and ABM cover to such strategic assets which are vulnerable to the adversary's missile threat. Some of these could be:-
  - a. Seat of Power/ National Command post.
  - b. Nuclear installations.
  - c. Nuclear command and control structures/assets/storage sites.
  - d. Strategic oil refineries.
  - e. Critical war waging assets/stores/installations/airbases etc.
6. Wherever it is be deployed, the FUs will get hooked up in the ADCRS chain provided by the IACCS thus integrating itself into the IADS. Forging system integration in the ADCRS under the IACCS regime will be a HUGE, HUGE task that would have to be implemented at TOP PRIORITY.

### **Impact of Deployment of S -400**

Based on the deployment of the S-400 on a theatre grid, the air defence capability of the nation will be impacted as under:-

1. Long range radars of S-400 will add to the surveillance and tracking capability of the IACCS in range and reach.
2. The fire-arm of the GBADWS will be effectively stretched way ahead from the current 100+ km to many hundreds of km ( 200, 250, 400 km).
3. Very large swaths of areas will get covered for air defence based on the huge foot-print of the S-400 FUs. This could be in one theater or many different theaters of war.



4. The BMD capability of the nation will get a paradigm enhancement. With S 400 + Programme AD + NASAAM II FUs this capability will actually reach a new unprecedented high.

So much for S-400

## **Analysing the American Dilemma**

It is now possible to analyse the American dilemma in all its dimensions. This has been attempted in the following manner:-

1. Analysing the stated objection to the purchase of S-400.
2. Getting to the real reason.
3. What next?

### **Analysing the Stated Objection to the Purchase of S-400**

Stated many times in the media and expressed overtly in many a fora, the American objection to India's purchase of S -400 runs like this:-

### **Loss of Electronic Signatures of Critical High Technology Equipment**

1. Over a period of last 8-10 years, a lot of high technology equipment has been inducted into India.
2. Some of these include C-130s Super Hercules, P-81 Long Range Maritime Reconnaissance and Anti-Submarine helicopters, C-17 Globe master heavy transport aircraft, AH 64 Attack Helicopters, CH -17 Chinook Heavy Lift helicopters, (NASAAMs, Sikorsky MH 60 R anti-submarine helicopters, Sea Guardian drones in near future) and more.
3. With a system like S-400 in place, the electrical signatures (explained later) of the high technology US equipment are likely to be compromised.
4. The above apprehension also gets strength due to the fact that India and US have signed COMCASA (Communication and Information Security Memorandum of Understanding) which enables the US authorities to transfer such high-end defence equipment to India that features

encrypted communication network, as also BECA (Basic Exchange and Cooperation Agreement) which permits sharing of geospatial intelligence based on maps and satellite images<sup>12</sup>. Both these agreements combined ensure that not only high-technology US equipment will find its way into India; the country will also have authorized access to encrypted communications networks (Link16) as well as, sensitive geospatial intelligence.

### **The Apprehension is Unsubstantiated with Facts**

The fears though appear to be genuine are unsubstantiated with facts. Following points are stated:-

1. First issue is – what is electronic signature? Well, moment an aerial threat vehicle is being tracked (implying locked for weapon-launch), several parameters about the said vehicle get to be known. These so called electronic ( more appropriately, digital) signatures could include one or more of the following:-
  - a. Locational Parameters in 4D - Azimuth, Range, Altitude, Time.
  - b. Radar Cross Section (RCS) - basically a measure of the detectability of vehicle. Higher the RCS, greater will be the electronic visibility of the vehicle at a given range and altitude.
  - c. Degree and type of stealth muscle and its effectiveness over radar frequencies (known by actual track details) .This may lead to the information about what can beat it.
  - d. Effectiveness in carrying out suppression of air defence (SEAD) operations (again judged by actual performance over own frequency spectrum).
  - e. Type of EW suit and its effectiveness over the frequency continuum in disabling own sensors.
2. While there is no doubt that the type of sensors carried by S-400 as explained earlier, are unprecedented in their technical muscle, the fact remains that such ‘electronic signatures’ (may be to a little lesser degree) can be obtained when such vehicles are tracked by many other sensors ( apart from S -400) which are already available in the country. Some of these could include :-

- a. Sensors integrated with the IACCS.
  - b. Russian origin sensors (albeit vintage) associated with a host of Russian GBADWS:- ( technical details not explained):-
    - i. Sensors of SAM 6 Kvadrat System ( P-18,P19, PRV 11, PRV 16, AR and GR of SPAGU).
    - ii. Acquisition and Tracking radars ( TAR, TTR) of SAM-8 OSA-AK.
    - iii. Upgraded radar of SAM 19 Tunguska system.
    - iv. EO tracking devices of SAM 13 Strela system.
  - c. Besides Russian equipment these details could have also had from latest technology sensors held by India. Some of these include the following :-
    - i. Very strong sensors of Akash Weapon system. (Details not covered).
    - ii. 3D and 4D tactical Control radars produced by India indigenously.
3. Another apprehension doing the rounds is that there could be embedded software tools in the S-400 architecture that may secretly pass sensitive details to Russia. Following is stated:-
- a. The system architecture of S-400 will be fully known and in fact the same will be adapted to the IACCS chain of ADCRS.
  - b. It is highly unlikely that electronic signatures are passed out to a third party without the information of the end users (no hidden/embedded chips - we are not novice greenhorns but an established IT power).
4. Following is stated before closing this point:-
- a. The apprehension is unsubstantiated with facts.
  - b. S-400 aside, there are many other options of obtaining the electronic signatures – Russian/non-Russian.
  - c. The bottom line is the India will have the details, S-400 or otherwise. It is for US to decide whether it is safe in Indian hands! (COMCASA, LEMOA, BECA and more...)

## Getting to the Real Reason

Having seen the truth behind the much hyped US objection, it is now time to get to the real reason – why no S-400? These are elaborated:-

### Reason No 1 – Prevent Revenue Flow to Russia

Following points are stated:-

1. The CAATSA anchored on sanctioning a person who indulges in a 'significant transaction' with the Russian defence or intelligence sector actually exposes its raison-d'être for being there in the first place, and that reason is TO PREVENT REVENUE FLOW TO THE RUSSIAN DEFENCE OR INTELLIGENCE SECTOR.
2. 39000Cr/5.85 Bn USD is a huge sum indeed. Moreover, this is only initial up-front cost, the above figure is likely to go up substantially when other essentials are added up like – recurring costs of missiles (new purchase, life-extension), sustenance and upgrade costs, cost of simulators, overhaul costs et al.
3. In fact S-400 will mean a huge fillip to the Russian Defence and Intelligence set up.
4. Such a development needs to be objected tooth and nail – CAATSA.

### Reason No 2 – Missing the Boat for a Generation and More.

Following points are stated:-

1. In letting S-400 go through, the likely feeling in the US establishment will be akin to missing the boat for a generation and more.
2. In fact, when the global search for a BMD system to augment Programme AD was on, US offered two systems, namely MIM 104 Patriot long range air defence and anti-missile system and Terminal High Altitude Area Defence System (THAAD) .
3. The due diligence system of technical scan found the S-400 system superior to the US systems on many counts (technical comparison not covered).

4. Stand-alone from the above, it was reported in July 2018 that the DAC has cleared the acquisition of NASAAM II at a cost of 1 billion USD. This emergency purchase was presumably to extend BMD cover over the national capital as probably there was still time for Programme AD to operationalise fully (Delhi Area Defence Plan – not discussed further).<sup>13</sup>
5. Notwithstanding the multiple high technology aerial platforms and some artillery howitzers, it is a fact that US has not been able to make any significant entry into the domain of GBADWS which remains predominantly Russian with ever increasing muscle by the Indian domestic sector – Akash, QRSAM, all types of radars, BMC2 system-IACCS etc.).
6. In fact NASAAM was one odd (surprise) spike-pushed under an ‘emergent need’. This is unlikely to be followed through as Programme AD FUs kick in and Make-in-India fervour gets stronger under Atmanirbhar Bharat.
7. US realizes very well, that a system like S-400 is not for ‘sometime’, it is for generations ( at least 30-40 years). That being so there is a feeling of LOOSING AN OPPORTUNITY OF A GENERATION in kicking into the multi-billion GBADWS industry. Hence every effort to dissuade over/covert, CAATSA and more!

## What Next?

### Difficult Position

It is indeed a difficult position for US. Sample the following:-

1. Going by the law, there is no such thing whether CAATSA will be applied or not applied. It GETS APPLIED FAIT ACCOMPLI moment the clause of ‘significant transaction’ is satisfied. Surely 5.85bn (and counting) is significant.
2. What is at stake is not only a missed opportunity to sell a BMD system; it goes far, far beyond in range and depth.
3. The US has achieved the current end state of foundational agreements (COMCASA, LEMOA, BECA.), institutional arrangements like 2+2 and

multiple high-tech platforms in Indian defence inventory ( mentioned earlier) after a NO GO of 20-25 years. Few words on this remarkable journey, the way it unfolded are presented<sup>14,15</sup>

- a. Right through the eighties and a larger part of nineties, US firms stood out as India went ahead with multiple capital procurements of GBADWS (mostly from Russia). This was primarily because of two reasons:-
    - i. The Foreign Military Sales (FMS) procedure of US had a mismatch with the Defence Procurement Procedure (DPP) of India. While the former demanded Govt.-to-Govt. deals, the later (which was followed by all others) involved competitive selection amongst multiple vendors.
    - ii. There was a total reluctance (in fact, a firm NO) when it came to even sharing niche technologies in the equipment under offer; Transfer of Technology was a dream too far.
  - b. The first thaw was seen around the turn of the millennium in overt statements from top US functionaries about a major reset in their military sales policy with an aim to engage with India (read –catching on missed opportunities in billions of USD). This was followed by the establishment of an Indo-US institutional platform for interaction called Defence Trade and Technology Initiative or DTTI.
  - c. DTTI coupled with a mind-set of a little more leg-space in sharing of niche technologies started to make a slow headway. This initiative actually got a shot-in-the-arm when the Make-in-India got going in September 2014 and there were huge attempts by the US to show alignment (read willingness) between DTTI and the Make in India initiative.
  - d. Rest is history – 2+2 followed, foundational agreements came along bringing with them some major announcement under the Atmanirbhar Bharat.
4. All this and more resulted in a steady flow of US equipment in the Indian defence inventory.
  5. This much of painstaking effort, billions of dollars, and above all, TRUST AS A RELIABLE DEFENCE PARTNER is up in stakes if the dark shadow of CAATSA eclipses everything achieved drop-by-drop. No wonder President Trump talked more of waivers and less of sanctions!
  6. Besides the defence procurement scene, the rest of geo-politics is well known. To recount some in point form:-

- a. India's importance in the Asia Pacific region (China calling) – not discussed further).
  - b. India's importance in the Quad (strategic alliances to counter 'shared maritime threats').
  - c. 'Indian market'- nothing more need be said.
7. Making India 'comprehensive strategic partner', renaming of Pacific Command, foundational agreements, 2+2, Malabar and more, are not for nothing.
8. What about the 'roaring' US defence Industry and the pressure there from on the US administration? Let us just cut to Aero India 2021 and cite a few facts<sup>16</sup>:-
- a. Boeing offers top of the line F/A 18 Block III and F-15 EX fighter solutions to India. Launches Boeing India Repair Development and Sustainment (BIRDS) hub.
  - b. Beyond Sea Guardian and Predator B, General Atomics eyes Indian Defence and aerospace sector with more niche products in the UAS sector.
  - c. Lockheed Martin announces F-21 'especially configured' for Indian Air Force. Their catchy slogan- 'F-21 for India, From India' was meant to catch eye-balls -it did.

The effect of CAATSA on this 'national movement' so to say will have to be factored by the US.

### **What could be coming?**

At the end of all that has been stated, what could be coming? Some points:-

1. As stated, it is not the question whether CAATSA will be applied or otherwise, it gets applied fait accompli when 'significant transaction' (as not defined!) takes place.
2. The questions are next two:-
  - a. Whether waivers will be given?
  - b. If sanctions are applied, which among the 12?

3. It is the sense of the author that EVERY EFFORT IS LIKELY TO BE MADE BY THE US ADMINISTRATION to so work around the CAATSA that waiver becomes available under one of the two clauses – direct/modified on the grounds that it is in the ‘vital security interest of the US’.
4. The above is the only route open since the other route based on assurances (1. sanctioned person assuring that he is taking/will be taking steps to reduce its inventory of major Russian defence equipment or 2. President assuring that the person is not engaging in the activity that was the basis of the sanction in the first place or that the President has received reliable assurance that the sanctioned person will not knowingly engage in the activity subject to sanction in the future) are likely to be NO GO from the Indian side.
5. Finally if the waivers do not come through the President under section 231 in applying 5 or more sanctions under Section 235 is likely to avoid the one out of 12 Sanctions which attracts the Arms Export Control Act or AECA and shuts the gate on all procurements of defence equipment from US, be it under the FMS procedure or under the Strategic Partnership Model (SPM)-25 years of effort –DOWN THE DRAIN!
6. Even in this mild version – THE STRATEGIC LOSS FOR US WILL BE HUGE AND DISPROPORTIONATE.
7. On the one side is CAATSA on the other are SUCH HUGE STRATEGIC STAKES – THIS IS THE AMERICAN DILLEMA

## **For India**

What about us?

1. STAY THE COURSE.



## Endnotes

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The Vivekananda International Foundation is an independent non-partisan institution that conducts research and analysis on domestic and international issues, and offers a platform for dialogue and conflict resolution. Some of India's leading practitioners from the fields of security, military, diplomacy, government, academia and media have come together to generate ideas and stimulate action on national security issues.

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