Defence Technology

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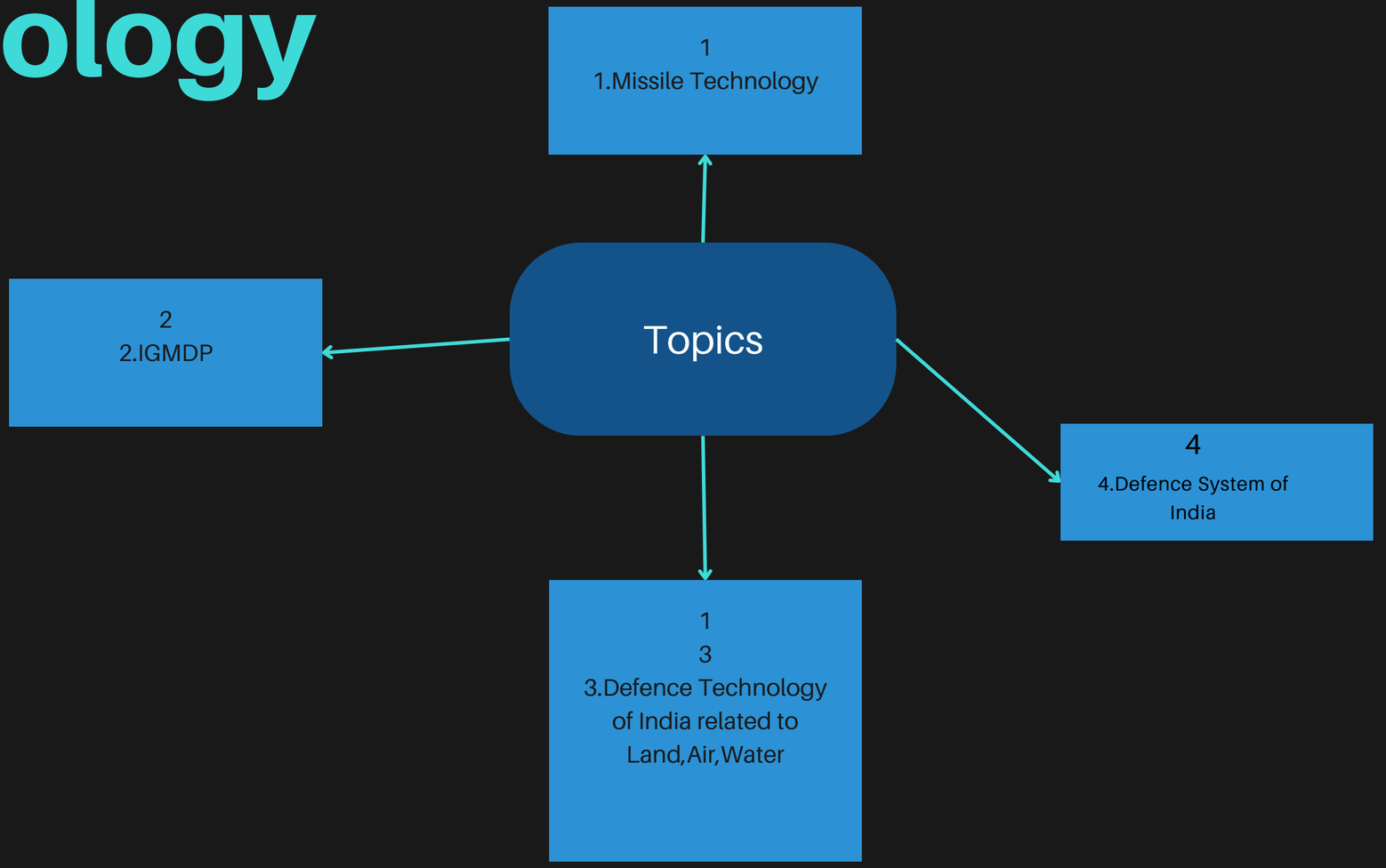
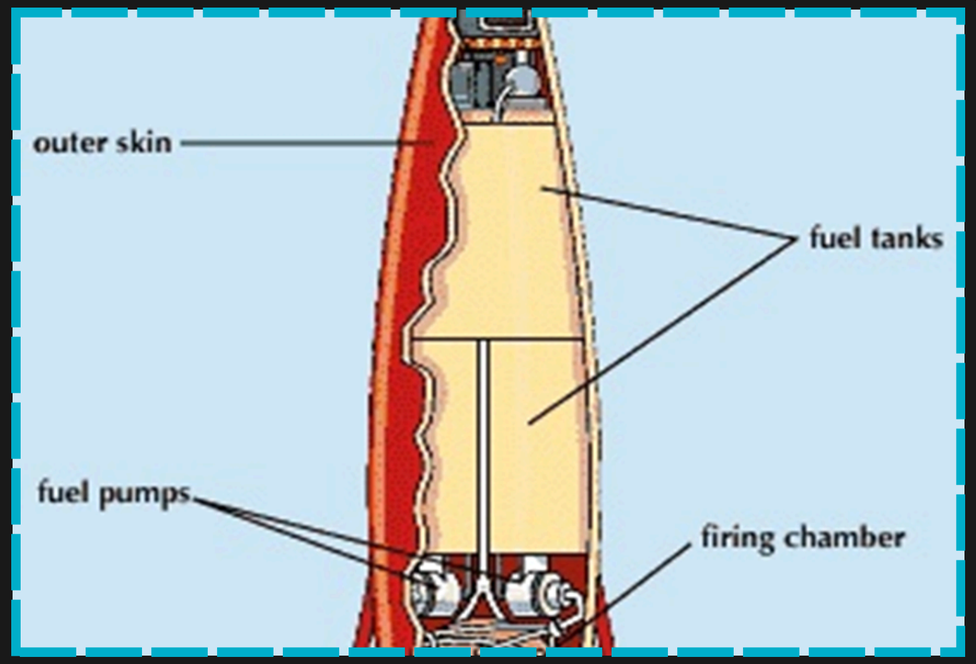


1.Missile Technology

- Missile

1



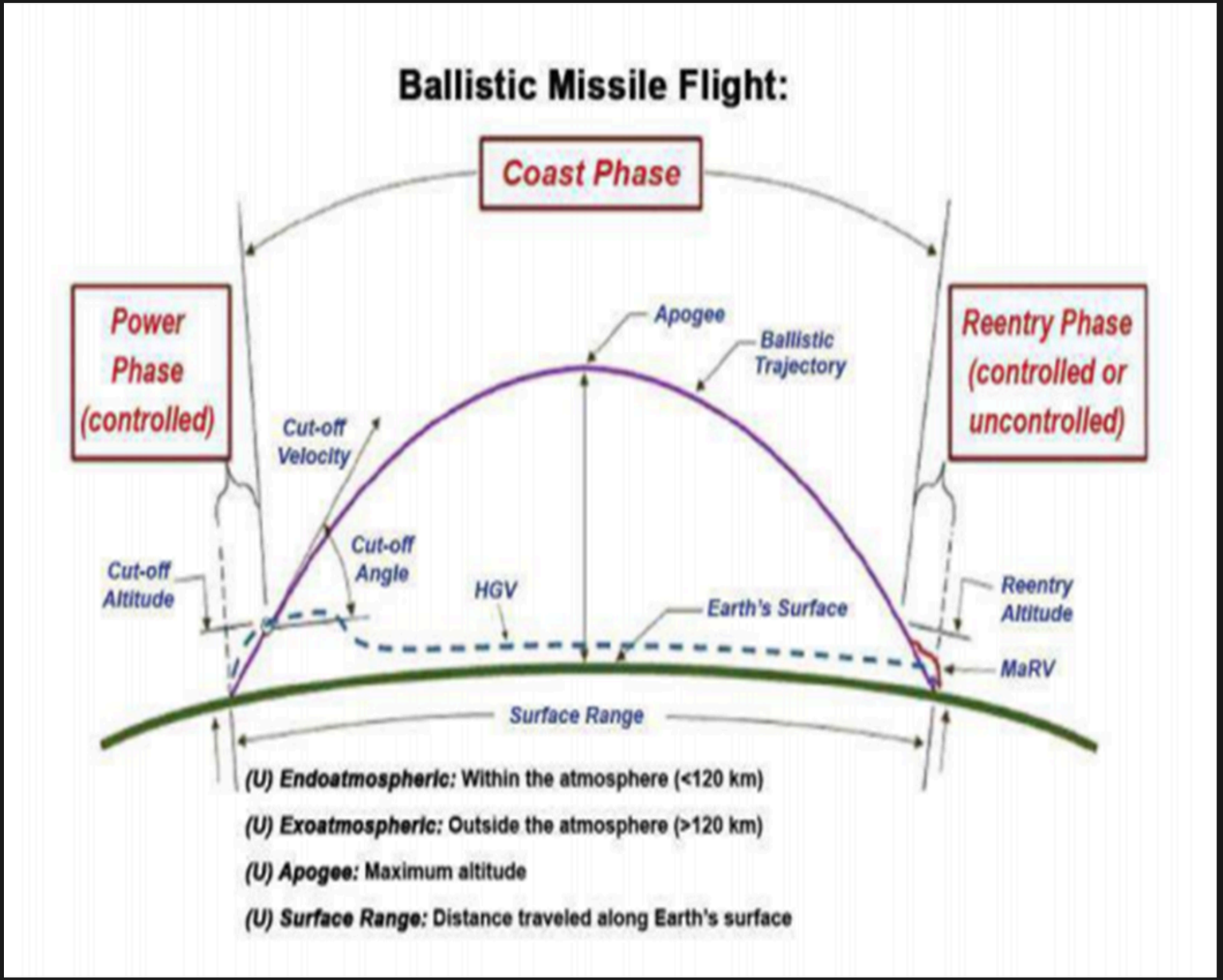
•Missile is a rocket-propelled weapon designed to deliver an explosive warhead with great accuracy at high speed.

•Missiles vary from small tactical weapons that are effective out to only a few hundred feet to much larger strategic weapons that have ranges of several thousand miles.

•Almost all missiles contain some form of guidance and control mechanism and are therefore often referred to as guided missiles.

- Types:

1.Ballistic Missile
•A ballistic missile follows ballistic trajectory (projectile trajectory) over most of its flightpath.



2.Cruise Missile

•Cruise missiles are self-propelled guided missiles which can carry large payloads with high precision.
•On basis of speed they can be categorised as:
- Subsonic cruise missile:
Speed around less than 1 Mach
- Supersonic Cruise missile:
Speed around 1-5 Mach
- Hypersonic Cruise Missile:
Speed is more than 5 Mach

▪UPSC PRE 2023 QS-MISSILE TECHNOLOGY

Q.Consider the following statements:
1.Ballistic missiles are jet-propelled at subsonic speeds throughout their flights, while cruise missiles are rocket-powred only in the initial phase of flight.
2.Agni-V is a medium-range supersonic cruise missile, while BrahmMos is a solid-fuelled

intercontinental ballistic missile.
Which of the statements given above is/are correct?
a.1 only
b.2 only
c.Both 1 and 2
d.Neither 1 nor 2

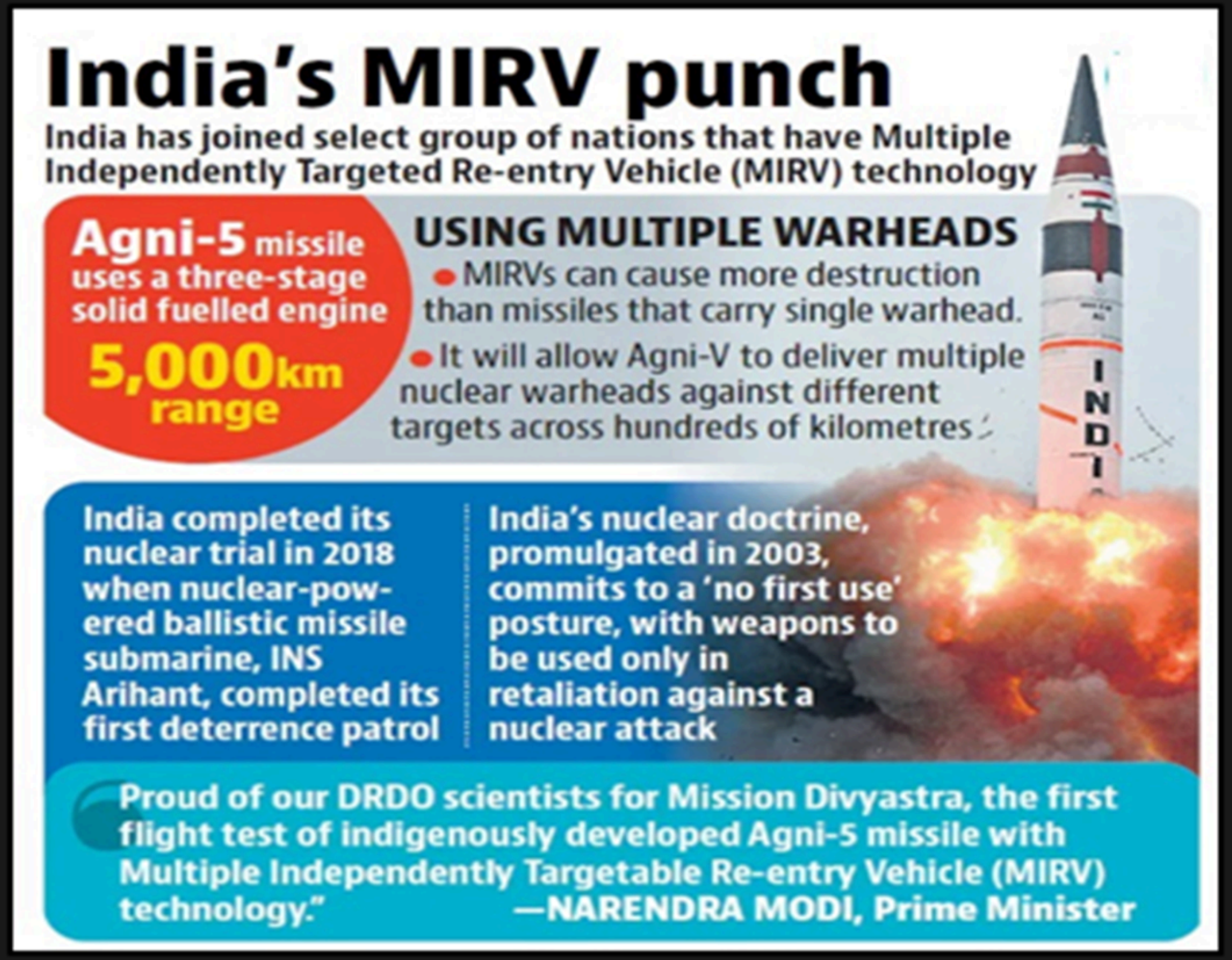
- IGMDP (Integrated Guided Missile Development Programme)

•It was conceived by renowned scientist Dr APJ Abdul Kalam to enable India to attain self sufficiency in the field of Missile technology.

The missiles developed under this programmes are:

1. Agni- Intermediate-range-surface to
surface ballistic missile
Variants of Agni:
- Agni I
- Agni II
- Agni III
- Agni IV
- Agni V

MIRV(Multiple Independently Targetable Re-entry Vehicle)



- The MIRV can target multiple targets that can be hundreds of kilometers apart with a single missile.
- In contrast to a traditional missile, which carries one warhead, MIRV missiles warheads can be released from the missile at different speeds and in different directions.
- Presently USA, Russia, China, France and the United Kingdom are known to have MIRV-equipped missiles.

UPSC Pre 2014 Qs-Agni Missile

Q.Which reference to Agni-IV Missile, which of the following statements is/are correct? (2014)

1.It is a surface-to-surface missile.

2.It is fuelled by liquid propellant only.

3.It can deliver one-tonne nuclear warheads about 7500 km away.

Select the correct answer using the code given below.

a.1 only

b.2 and 3 only

c.1 and 3 only

d.1, 2 and 3

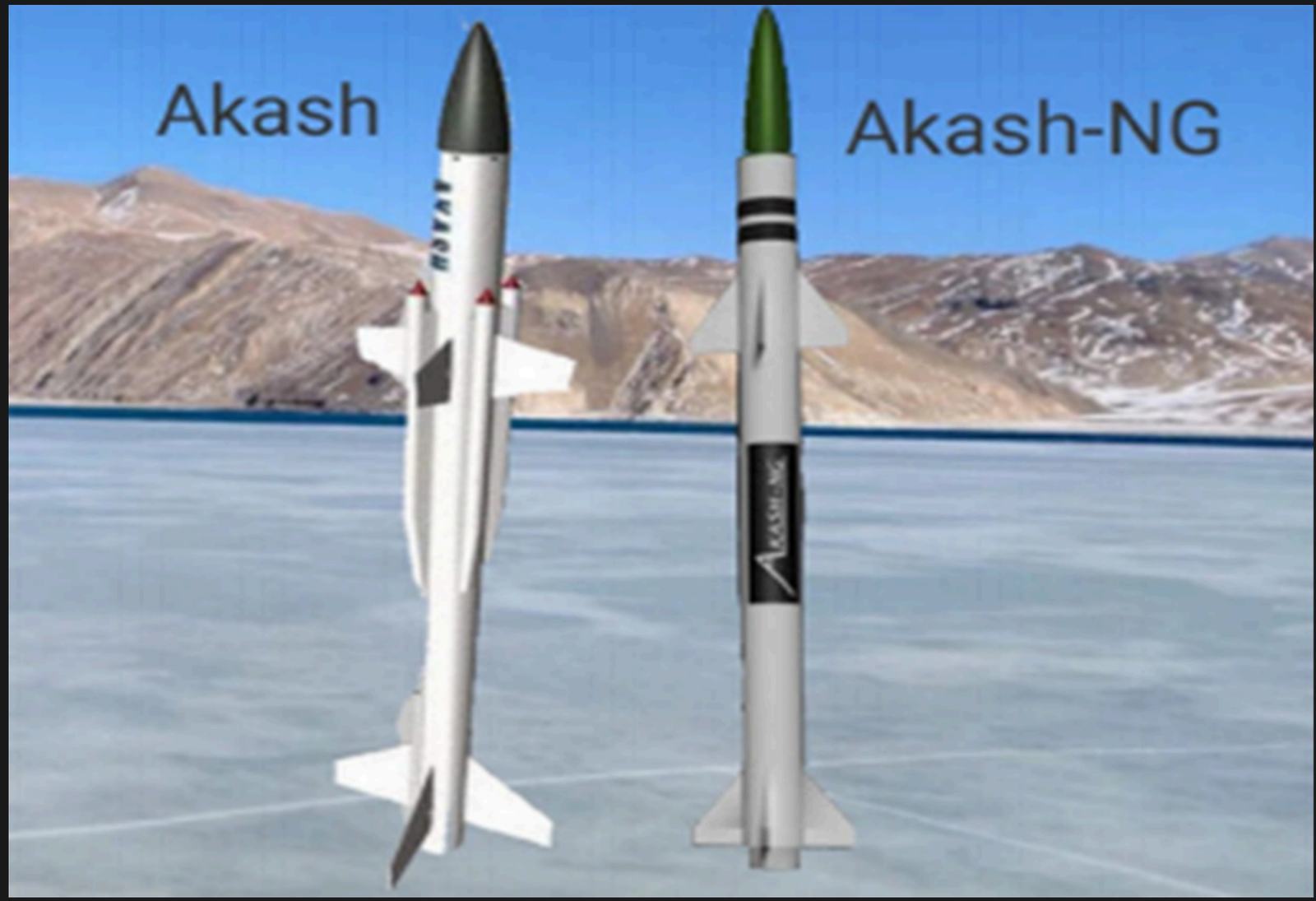
UPSC Pre 2014 Qs-Agni Missile

2.Prithvi- Short range surface to surface ballistic missile

Variants of Prithvi:

- **Prithvi I**
- **Prithvi II**
- **Prithvi III.**

3. Akash- Medium range surface to air missile



4.Trishul- Short Range low level surface to air missile

5. Nag- Third generation anti tank missile

3.Defence Technologies of India related to Land,Air,Water

- Land:
- Under IGMDP-Prithvi,Agni Series
- Cruise Missile:

.BrahMos
.Nirbhay
.Tanks
.ATGM-Nag
.Rockets:
.Pinaka
.Smerch

-Air:

- Fighter Jets

•Different generation of Aircrafts:

•1st Generation:
Subsonic speed, straight wings, unguided bombs, machine gun, lack of radar

•2nd Generation
Radar present, air to air missiles, supersonic speed.

•3rd Generation:
Advanced Avionics, air guide missiles, air to air missiles, radar system

•4th Generation:
Fly-by-wire: It replaces manual flight control with electronic devices,Thrust vector Control: Allows aircraft to manipulate the direction of thrust from its engine or motor.
•5th Generation:
Additional features like-greater weapon carriage, Some stealth features- less easily detectable
Enhanced avionics
Under IGMDP-Akash

- Cruise Missile-BrahMos Air variant

- BVRAAM:
•Astra
•Python & Derby Missile

- UAV(Unmanned Aerial Vehicle)/Drones

•Macro UAV
•Micro UAV
- UAV Regulations of India

UPSC Pre 2024 Qs-Generation of Fighter Aircrafts

Q.Consider the following aircraft:

1. Rafael
2. MiG-29
3. Tejas MK-1

How many of the above are considered fifth generation fighter aircraft?

(a) Only one

(b) Only two

(c) All three

(d) None

Fighter Jets of India

Sukhoi-MKI

Developed by Russia

- Build under license by HAL
- All weather, long range fighter
- Two-engine aircraft
- Maximum Speed: Mach 2
- Can be fitted with Brahmos Nirbhay missiles

Mirage 2000

Single engine aircraft

- Speed: Mach 2.2

Mig 29

Designed by Russian company Mikoyan.

- Multi role fighter
- Can be outfitted with a range of air to surface armaments.
- Capable to launch Beyond Visual Range Missile

Rafael

•Twin-engine, multirole combat aircraft.
•Capable of carrying all combat missions such as air defence, close air support, in-depth strikes etc.
•Can jam enemy radars.
•Capable of carrying nuclear weapons, deploying long range air to air missiles, laser guided bombs.
•Will carry Meteor BVRAAM

Tejas

Tejas

Single Seat, single engine, multirole light aircraft.
•Developed by Aeronautical Development Agency
IAF decided to integrate the Astra missile as a standard long range weapon for Tejas

Mig 27

single-engine, single-seater tactical strike fighter aircraft

- Earned the nickname of “Bahadur” during the Kargil War.
- Speed: 1.6 Mach
- Decommissioned in 2019.

UAV(Unmanned Aerial Vehicle)/Drones

- Macro UAV
- Micro UAV

UAV Regulations of India

- **Nishant**

- Lakshay

Rustom

Water: Naval Ships:

1. Destroyer
2. Frigates
3. Corvette

1.Destroyer

- A destroyer is a fast and maneuverable yet long endurance warship intended to escort larger vessels in a fleet, convoy or battle group and defend them against smaller, powerful, short-range attackers.
- A guided missile destroyer is a destroyer designed to launch guided missiles.
- Many are also equipped to carry out antisubmarine,anti-air, and anti-surface operations.

2.Frigates

- It is a medium size surface combat vehicle which is either suited for a specific role (like anti-submarine warfare) or with lesser all-round capabilities in comparison to a destroyer.
- They are armed with guided missiles and used as an escort for aircraft carrier.

3.Corvette

- Corvette is surface warship. The dimensions of corvette are slightly smaller as compared to the traditional frigate combat vessel.
- The most important feature of the Corvette, serving as a preparatory vessel in crucial wartimes, especially as a stopgap between the larger naval combat vessels.
- In addition to offering required support to large fleets, the other duties of the corvettes include coastal patrolling, participating in minor wars and partaking in show-the-flag missions.

INS Projects:

P75:
•Objective-Diesel Power Submarine Ships
-Kalvari Class

- P15B

•Objective-Stealth Guided Destroyer Ships

- P17A

•Objective-Stealth Guided Frigate Ships

- Submarines

- Nuclear Submarines

- Arihant Class

•propelled by nuclear power and Capable of launching nuclear weapons like ballistic missiles

- INS Arihant

•Indigenously developed by India
•India’s 1st nuclear ballistic missile submarine
•Its successful deployment completed India’s nuclear triad
•Capable of launching K-15 & K-4 Missiles

- Chakra Class/Akula II class

•propelled by nuclear power and launches conventional weapons like cruise missiles & torpedoes

- INS Chakra

•Leased from Russia in 1988 for 3 years.
INS Chakra II
•Leased from Russia in 2012 for 10 years.
•One of the quietest submarines in the world.
INS Chakra III
•India signed a USD 3 billion deal with Russia for leasing nuclear powered submarines. Russian will deliver it by 2025.

Other Naval Ships;

- IAC:
- INS Vikrant

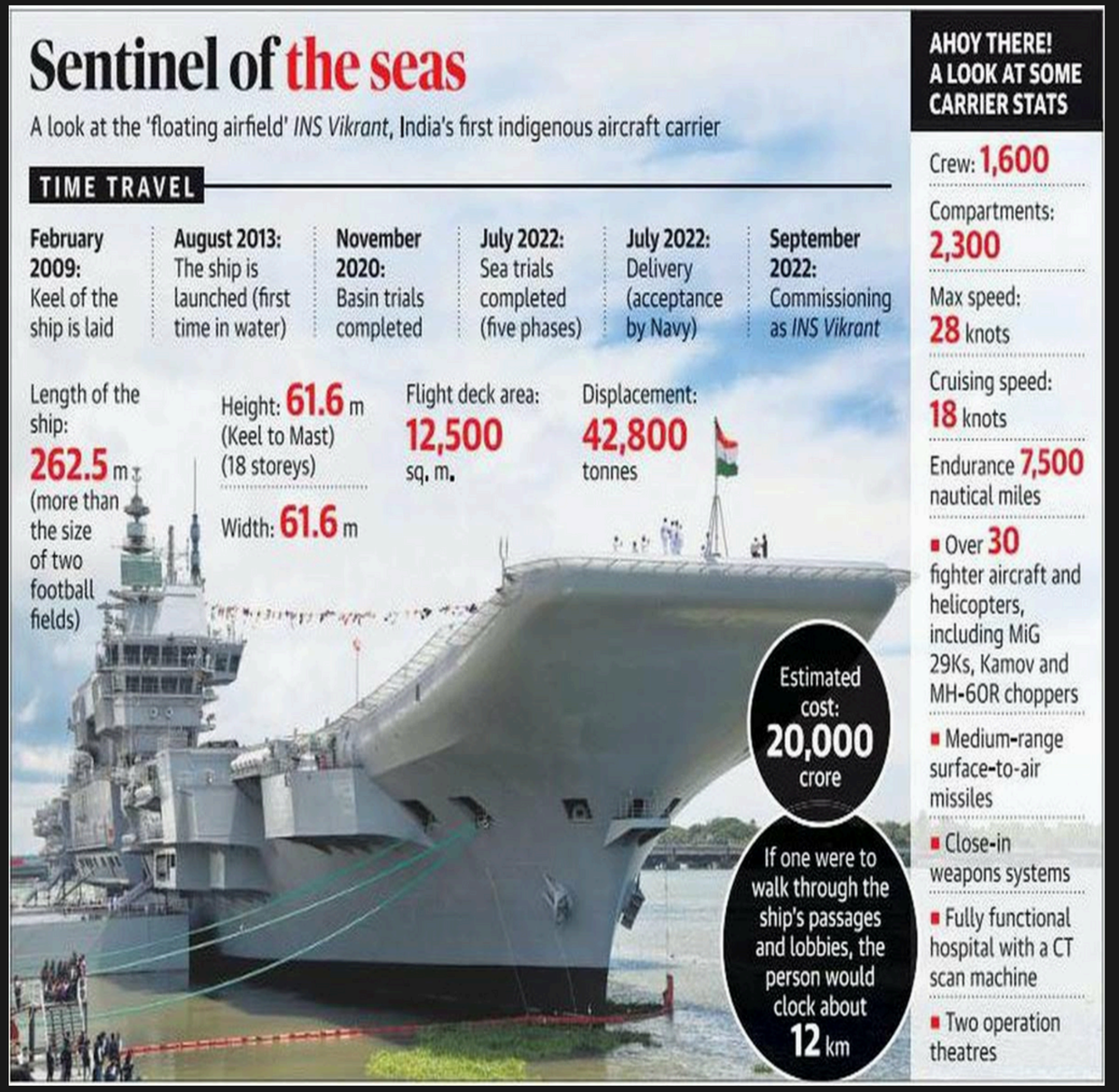
- ASW SWC:

- OPV/ICGS:

- SLBMs(Sub Marine Ballistic Missilea):
- K-4,K-15 SLBM

- SMART(Supersonic Missile Assisted release of Torpedo)

•A propeller-driven underwater missile is called a Torpedo,



- INS Vikramaditya

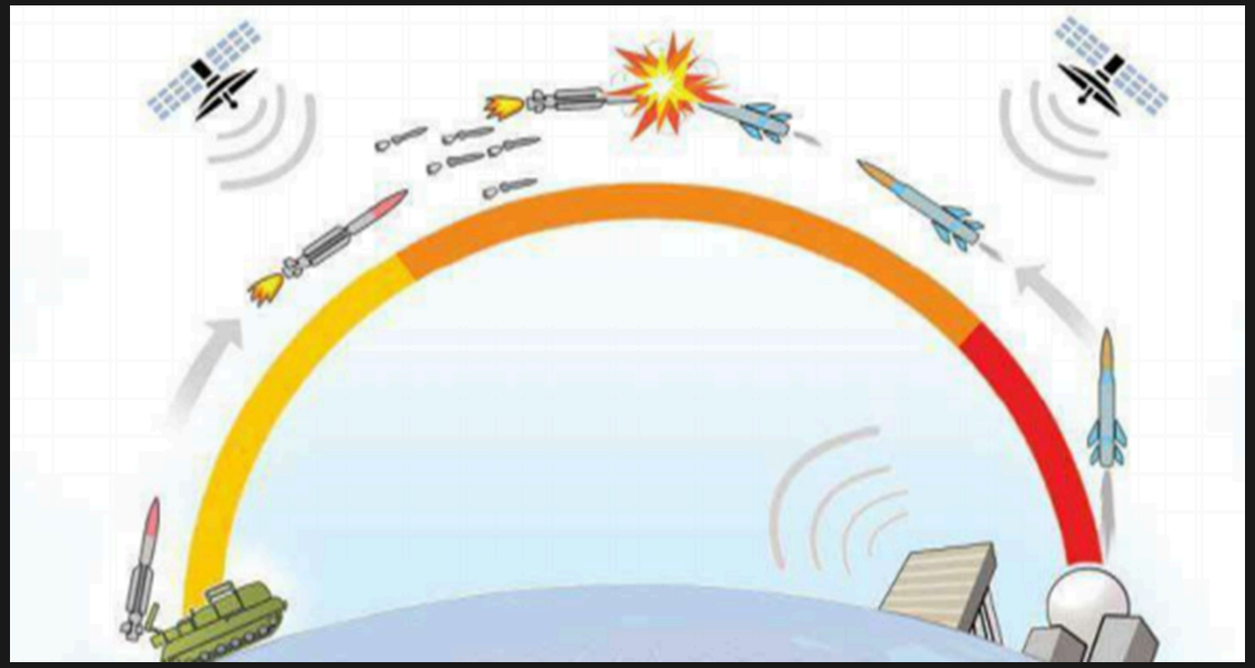
UPSC Pre 2016 Qs

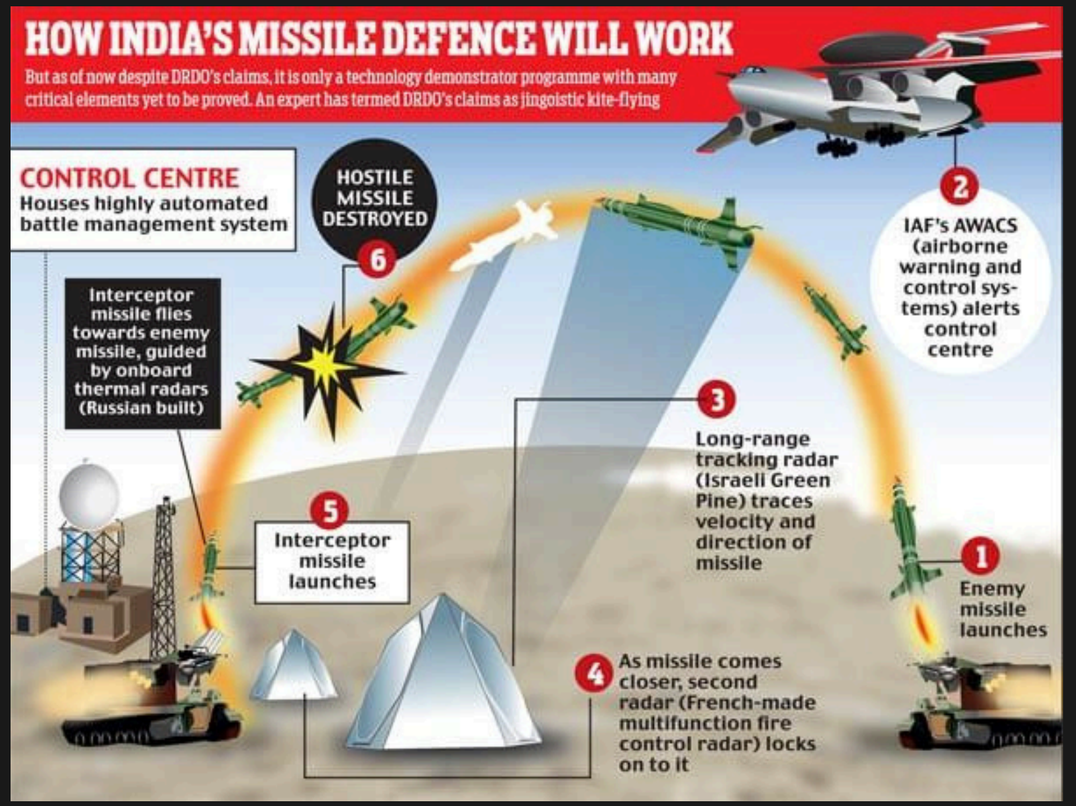
Q.Which one of the following is best description of 'INS Astradharini' that was in the news recently.

a.Amphibious warfare ship
b.Nuclear Powered Submarine
c.Torpedo launch and recovery vessel
d.Nuclear powered aircraft carrier

4.Defence System of India

BMD (Ballistic Missile Defence) System





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UPSC Pre 2022 Qs

Q.Which one of the following statements best reflects the idea behind the “Fractional Orbital Bombardment System” often talked about in media ?

(a) A hypersonic missile is -launched into space to counter the asteroid approaching the Earth and explode it in space.
(b) A spacecraft lands on another planet after making several orbital motions.
(c) A missile is put into a stable orbit around the Earth and deorbits over a target on the Earth.
(d) A spacecraft moves along a comet with the same speed and places a probe on its surface.'

THANK-YOU