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Escape Velocity: India's Space Sector Needs Cadence, Not Aura

 **THE HINDU**

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SCIENCE & TECH**GS3**

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Escape Velocity: India's Space Sector Needs Cadence, Not Aura

 The Hindu

26 August 2026

GS3



INTERVIEW ANGLE

"India is widely admired for launching missions cheaply. If its cost per kilogram to orbit is nonetheless among the world's highest, what exactly has India been cheap at?"

✓ Every fact web-verified against primary sources

THE LIFT LINE

India is not expensive because its rockets are costly to build. It is expensive because it does not fly them often enough to divide the overhead.

WHY THIS EDITORIAL MATTERS FOR YOUR EXAM

Space is a standing GS3 topic, and answers typically recite missions and institutions. This editorial supplies an economic argument about the sector, which is far rarer and far more useful in a Mains answer.

GS Paper 3: Awareness in the field of space; achievements of Indians in science and technology; indigenisation of technology; investment models.

CONCEPT	MEANING	WHY IT IS TESTABLE
Cost per kilogram to orbit	The price of placing one kilogram of payload into a target orbit	The commercial competitiveness metric, distinct from mission cost
Launch cadence	The number of launches conducted in a period	The variable that drives unit cost through fixed-cost amortisation
Anchor order	A committed government purchase that lets a private supplier justify capital investment	The instrument that breaks a low-cadence equilibrium

BACKGROUND AND CONTEXT

The Institutional Reforms

BODY OR INSTRUMENT	YEAR	ROLE
ISRO	1969	India's space agency, under the Department of Space
Antrix Corporation	1992	Earlier commercial arm of ISRO
NewSpace India Limited (NSIL)	2019	Present commercial arm, a public sector undertaking
IN-SPACe	2020	Single-window authorisation, promotion and regulation of private space activity
Indian Space Policy 2023	2023	Formally opened end-to-end space activity to non-governmental entities

IN-SPACe stands for the **Indian National Space Promotion and Authorisation Centre**, and is the body an aspirant must be able to distinguish from NSIL: **IN-SPACe authorises and promotes; NSIL commercialises.**

India's Launch Vehicles

VEHICLE	ROLE
PSLV	Polar Satellite Launch Vehicle; the workhorse, known for reliability
GSLV	Geosynchronous Satellite Launch Vehicle
LVM3	Heaviest operational Indian launcher, used for Chandrayaan-3
SSLV	Small Satellite Launch Vehicle, aimed at the small-satellite market

Launch operations are conducted from the **Satish Dhawan Space Centre, Sriharikota**, in Andhra Pradesh.

THE ANALYSIS

1. The paradox dissolves once the metrics are separated. India's fame rests on **mission cost**, the total budget of a scientific undertaking, where frugal engineering genuinely delivers. **Cost per kilogram to orbit** measures the launch service. A country can be excellent at the first and uncompetitive at the second, and India is.

- 2. Cadence drives unit price because launch is a fixed-cost business.** Pads, integration buildings, range infrastructure, test facilities and standing expert teams must be maintained whether a vehicle flies twice a year or forty times. Dividing that overhead across more flights is the single largest lever on price, and it requires no new technology.
- 3. The low-cadence equilibrium is self-reinforcing.** Low flight rate keeps unit cost high; high unit cost suppresses commercial demand; suppressed demand keeps the flight rate low. A system in this loop does not exit it through [incremental](#) engineering improvement. It exits through an external demand commitment.
- 4. Reform has addressed permission, not demand.** IN-SPACe, NSIL and the 2023 policy solved the problem of **who may operate**. They did not solve the problem of **who will buy**. A private launch company with authorisation but no multi-year manifest cannot justify the capital required to build the infrastructure that would make it cheap.
- 5. The counter-argument is legitimate and should be stated.** India's programme was not built to win a commercial launch market. It was built to deliver communications, remote sensing, navigation through **NavIC**, meteorology and disaster warning at a fraction of the cost of importing those services, and it has done so. Judging it by cost per kilogram applies a yardstick from a competition India did not enter. The honest position is that **if** India now intends to compete commercially, the editorial's diagnosis is correct.

DATA AND INSTITUTIONS VAULT

PRELIMS-GRADE FACTS:

Cost per kilogram to orbit cited by the editorial: approximately USD 13,302. This is an academic estimate from a Cambridge study, not an ISRO or Government of India figure. Comparators in the same study: Europe about USD 9,897, Russia 6,682, China 5,809, Japan 5,287, the United States 3,225.

ISRO established 1969, under the Department of Space.

Antrix Corporation (1992) was the earlier commercial arm; NewSpace India Limited (NSIL) was incorporated in 2019.

IN-SPACe, the Indian National Space Promotion and Authorisation Centre, was created in 2020 as the single-window authorisation body.

The Indian Space Policy 2023 opened end-to-end space activity to non-governmental entities.

Launch vehicles: PSLV, GSLV, LVM3, SSLV. Launches are conducted from the Satish Dhawan Space Centre, Sriharikota.

India's regional navigation system is NavIC.

*Distinguish **mission cost** from **cost per kilogram to orbit**. India's reputation for cheap missions concerns the former. Also distinguish **IN-SPACE** (authorises and promotes private activity) from **NSIL** (commercialises ISRO products and services); they are frequently interchanged in answers.*

THE DEBATE

FOR (cadence is the binding constraint): Launch is a fixed-cost business, so unit price falls with flight rate. India's technology is proven; its flight rate is not high enough to amortise overhead. Private players cannot invest without assured demand, so the loop persists without external intervention.

AGAINST (commercial metrics misjudge the programme): ISRO was created as a developmental and strategic capability, not a launch business. Its returns are in communications, remote sensing, navigation and disaster warning, delivered far below the cost of importing them, plus **strategic autonomy** that no price comparison captures.

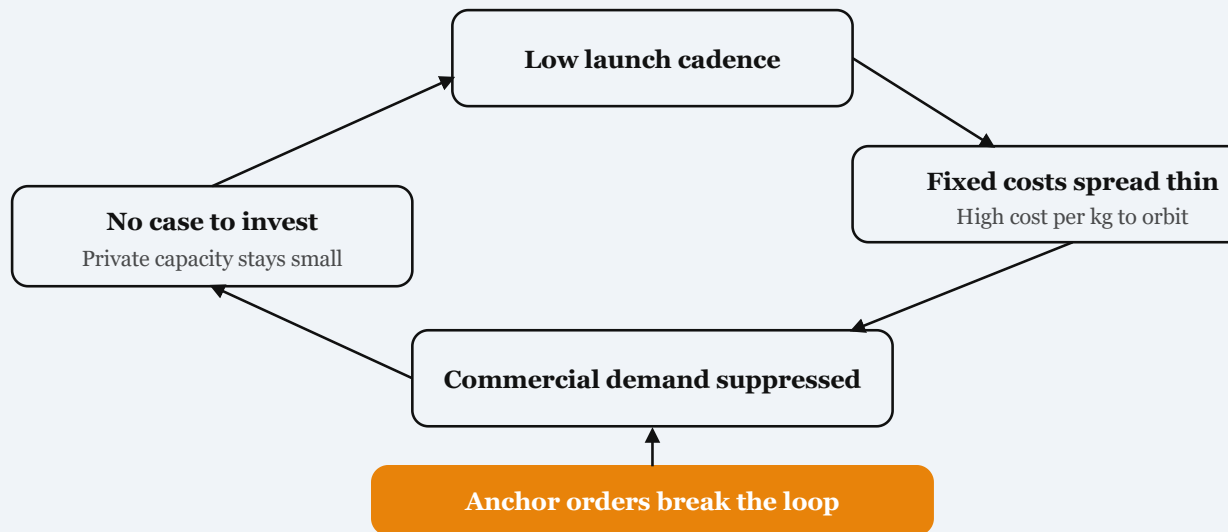
Balanced verdict: Both are correct about different objectives, and the choice between them is a policy decision India has not explicitly made. If the goal remains developmental and strategic, current cadence is adequate and cost per kilogram is the wrong measure. If the goal is a share of the global commercial launch market, then cadence is the whole problem, and the instrument is **demand certainty**: anchor orders, technology transfer to industry, expanded pad capacity so availability stops capping frequency, and a regulatory pipeline permitting multi-year manifests. Choosing neither, while measuring against both, is the position most likely to disappoint.

HOW TO THINK ABOUT THIS

When an industry is described as uncompetitive, establish first whether the cost driver is **variable** or **fixed**. If variable, the remedy is process efficiency, cheaper inputs or better technology. If fixed, the remedy is volume, and no amount of engineering improvement substitutes for it.

Launch is a fixed-cost industry, which is why the answer is cadence rather than cleverness. The same analysis applies to semiconductor fabrication, vaccine manufacturing, shipbuilding and any capital-intensive sector where India debates competitiveness. Asking which kind of cost dominates, before recommending anything, is what separates a diagnosis from an **exhortation**.

DIAGRAM-IN-WORDS



Each stage causes the next, and the loop closes on itself. Nothing inside it breaks the cycle; the intervention has to come from outside, as committed demand.

TAKEAWAY BOX

India is not expensive because its rockets are costly to build. It is expensive because it does not fly them often enough to divide the overhead.

Cost per kilogram to orbit estimated at about USD 13,302 in a Cambridge study, not an official figure, against Europe 9,897, Russia 6,682, China 5,809, Japan 5,287 and the US 3,225; ISRO founded 1969 under the Department of Space; Antrix 1992, NSIL 2019, IN-SPACe 2020, Indian Space Policy 2023; PSLV, GSLV, LVM3, SSLV; Satish Dhawan Space Centre, Sriharikota; NavIC.

Should a public space agency be judged by scientific return, strategic autonomy, or commercial competitiveness, and who should decide which?

Connects to past UPSC Mains questions on private participation in the space sector, on ISRO's contribution to development, and on indigenisation of technology.

"India's space sector has solved the problem of who may launch without solving the problem of who will buy." Critically examine.

Source: Escape Velocity: India's Space Sector Needs Cadence, Not Aura — Ujjayari.com | Free UPSC & State PCS Editorial Analysis

● KEY ARGUMENTS AT A GLANCE

The Hindu argues that India's cost per kilogram to orbit, estimated at roughly USD 13,302 in a Cambridge study rather than in any official figure, is among the world's highest not because of any technology gap but because launch frequency is low, and that commercial competitiveness therefore requires reliable high-cadence launches, indigenous manufacturing and predictable demand for private players rather than prestige narrative.



SUPPORTING

- Launch vehicle economics are dominated by fixed costs in facilities, integration infrastructure and skilled teams, so unit cost falls with the number of launches across which those fixed costs are spread, making cadence the primary determinant of price.
- India's celebrated low mission costs refer to the total budget of individual scientific missions, which is a different metric from cost per kilogram to orbit, so the reputation for cheapness and the high launch price are not contradictory but measure different things.
- Private launch providers cannot amortise investment without a predictable order pipeline, so the absence of assured demand keeps private cadence low, which keeps unit costs high, which in turn suppresses commercial demand.



COUNTER

The counter-view is that India's space programme was never designed as a commercial launch business but as a developmental and strategic capability, delivering communications, remote sensing, navigation and disaster warning at a fraction of what importing those services would cost, and that judging it by cost per kilogram imports a metric from a market India did not set out to win. On this reading, scientific returns and strategic autonomy are the appropriate measures.



WAY FORWARD

Breaking the low-cadence equilibrium requires demand certainty before cost reduction: anchor orders for private launch vehicles, transfer of proven launch-vehicle technology to industry, expansion of launch infrastructure so that pad availability ceases to cap frequency,

and a regulatory pipeline through IN-SPACe that lets private operators plan multi-year manifests rather than bidding mission by mission.


MAINS ANSWER FRAMEWORK
QUESTION

India's space programme is celebrated for low mission costs yet has a high cost per kilogram to orbit. Examine this apparent paradox and discuss what would make India's launch sector commercially competitive. (250 words)

INTRODUCTION

India's space programme enjoys a global reputation for achieving missions at remarkably low budgets. Writing in The Hindu, the argument is that this reputation obscures a commercial weakness: India's cost per kilogram to orbit is among the highest in the world, and the reason is not technological but industrial.

BODY

The two figures that appear contradictory measure different things. Mission cost refers to the total budget of a scientific undertaking, where India has genuinely excelled through frugal engineering, lean teams and design reuse.

Cost per kilogram to orbit measures the price of the launch service itself, and here the editorial cites an academic estimate of roughly USD 13,302 per kilogram, drawn from a Cambridge study rather than from any ISRO or government figure. The explanation offered is cadence.

Launch economics are dominated by fixed costs: assembly and integration buildings, launch pads, range infrastructure, test facilities and standing teams of specialists must be maintained whether or not a vehicle flies. Those fixed costs are divided across the number of launches conducted, so a provider flying dozens of times a year carries a fraction of the per-launch overhead of one flying a handful.

India's constraint is therefore the number of flights, not the sophistication of the vehicle, and reliability at high frequency rather than capability at low frequency is what would reduce price. The institutional reforms of recent years address exactly this chain.

IN-SPACe was created in 2020 as the single-window authorisation and promotion body, NewSpace India Limited was incorporated in 2019 as ISRO's commercial arm, and the Indian Space Policy 2023 formally opened end-to-end activity to non-governmental entities. What these reforms have not yet supplied is demand certainty, without which private operators cannot amortise the capital required to fly often.

CONCLUSION

A balanced answer should concede that India's programme was built as a developmental and strategic capability rather than as a commercial launch business, and that its returns in communications, remote sensing, navigation and disaster warning are real. The editorial's point stands nonetheless: if India intends to compete for commercial launch, cadence is the variable, and cadence follows assured demand rather than further engineering.

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