STRUCTURE · CONTRIBUTIONS · ROBUSTNESS

Global Launch Activity Concentration, 2006–2025: Structure, Drivers and Robustness

A reproducible study of how launch counts are distributed across exact vehicle names. Activity concentration is not a measure of corporate ownership, revenue or market power.

Source snapshot: 2026-10-29T16:12:15.885228+00:00 · Methodology deep-concentration-1

Contents

1. Executive Summary
2. Scope, Coverage and Analytical Definitions
3. The Long-Term Concentration Trajectory
4. Leaders, Challengers and the Long Tail
5. Where Did the HHI Change Come From?
6. Growth Without Diversification?
7. Entry, Exit and Persistence
8. Concentration Within Launch Geographies
9. Orbital vs Deep-Space Activity
10. How Sensitive Are the Results?
11. Dependence on the Leading Model: A Mechanical Scenario
12. Methodology & reproducibility appendix

EXECUTIVE SUMMARY

The principal results

Summary findings link to their owning analytical sections. They are not additional independent evidence.

- HHI changes from 0.0399 in 2006 to 0.2612 in 2025, a signed change of +0.2213. Evidence ↗
- Falcon 9 has the largest absolute endpoint contribution to the HHI change: +0.2515, as its launch share moves from 0.00% to 50.15%. Evidence ↗
- Launch volume changes from 66 to 329, while observed model names change from 39 to 56. Effective group counts change from 25.03 to 3.83. These are distinct descriptions of activity and its distribution. Evidence ↗
- Across the tested endpoint definitions, HHI ranges from 0.2598 to 0.2792 in 2025. This range measures definition sensitivity; it is not a confidence interval. Evidence ↗

- Removing Falcon 9 mechanically excludes 165 launches (50.15%) from the endpoint year. The remaining 164 launches have renormalized HHI 0.0391; no replacement launches are assumed. Evidence ↗

SECTION 01 · FULL

Scope, Coverage and Analytical Definitions

What is measured, and which boundaries constrain the conclusions?

> The selected period contains 2,426 launches across 20 calendar years and 174 exact vehicle names.

The unit of analysis is a unique launch identifier, grouped by the exact vehicle name stored in GCAT. The selected window is 2006–2025. Successful, failed and partial-outcome O/D launches remain in scope. N flights and no-liftoff events are outside the main database.

The snapshot contains 254 launches outside the selected complete-year window. The snapshot year 2026 is not annualized or compared directly with a complete year. “Complete” describes the calendar period, not a guarantee of perfect source coverage.

HHI is computed from launch shares, not revenue, payload mass or company ownership. A model-name grouping may split a family or combine variants. All later sections retain this unit unless a sensitivity scenario explicitly changes it.

Coverage audit

MEASURE	VALUE
Included launches	2426
Complete calendar years	20
Exact vehicle names	174
Unknown launch country	54
Uncertain source dates	31
Unspecified variant	1256

SECTION 02 · FULL

The Long-Term Concentration Trajectory

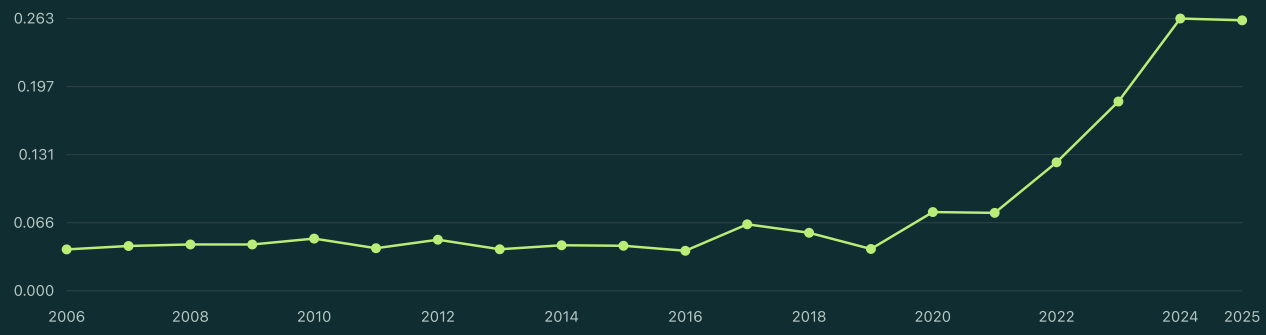
How has the distribution of launch counts changed over the selected years?

> HHI changes from 0.0399 in 2006 to 0.2612 in 2025, a signed change of +0.2213.

A higher HHI indicates that more launch activity lies in fewer groups. Its reciprocal expresses the number of equally sized groups that would produce the same HHI. These two metrics are mathematical transformations of the same evidence, not independent confirmations.

Endpoint comparisons summarize a long interval but can conceal reversals. The annual series and pooled windows below allow readers to distinguish a persistent shift from a single-year result. Pooling counts weights years by launch volume; it is not an average of yearly HHI.

Annual HHI



Scale starts at zero. Exact values and group counts are in the research bundle.

Non-overlapping pooled windows

PERIOD	LAUNCHES	GROUPS	POOLED HHI	EFFECTIVE GROUPS
2006–2010	355	71	0.0367	27.26
2011–2015	422	70	0.0359	27.85
2016–2020	505	89	0.0460	21.72
2021–2025	1144	101	0.1865	5.36

SECTION 03 · FULL

Leaders, Challengers and the Long Tail

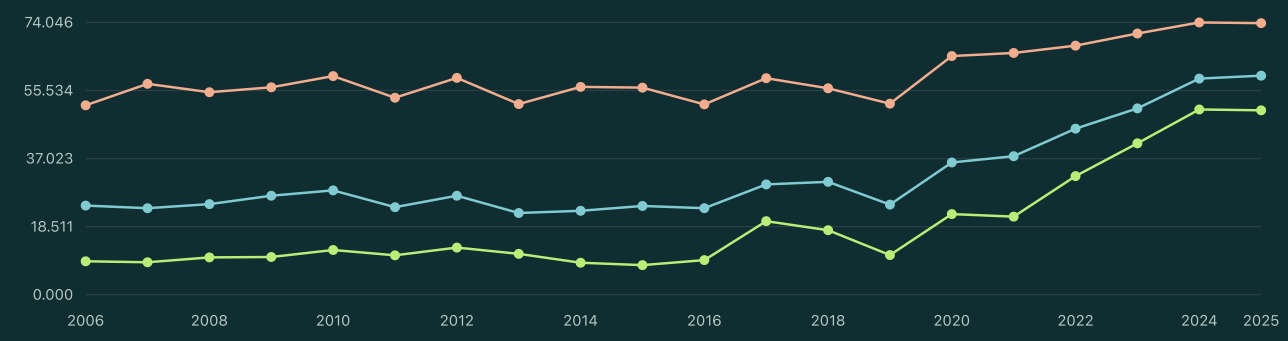
Is concentration mostly about the largest model, or a wider leading group?

> The leading model accounts for 50.15% of launches in 2025; the three largest account for 59.57%. The remainder outside the top ten accounts for 26.14%.

Top-k shares are recalculated independently in every year; membership can change. Comparing the largest group, the largest three and the largest ten separates single-leader concentration from a broader leading cluster.

The long tail consists of every model outside the specified leading set. A large count of low-frequency names can coexist with a highly concentrated distribution. “Challenger” here denotes rank position only, not a claim about competitive strategy.

Shares of leading groups (%)



Green: top one; blue: top three; coral: top ten. Shares use all launches in each year.

Leader and tail structure

YEAR	TOP 1	TOP 3	TOP 5	TOP 10	SINGLE-LAUNCH NAMES
2006	9.09%	24.24%	34.85%	51.52%	26
2007	8.82%	23.53%	35.29%	57.35%	21
2008	10.14%	24.64%	37.68%	55.07%	19
2009	10.26%	26.92%	38.46%	56.41%	26
2010	12.16%	28.38%	39.19%	59.46%	14
2011	10.71%	23.81%	33.33%	53.57%	24
2012	12.82%	26.92%	39.74%	58.97%	20
2013	11.11%	22.22%	32.10%	51.85%	21
2014	8.70%	22.83%	34.78%	56.52%	15
2015	8.05%	24.14%	35.63%	56.32%	18
2016	9.41%	23.53%	34.12%	51.76%	25
2017	20.00%	30.00%	38.89%	58.89%	26
2018	17.54%	30.70%	39.47%	56.14%	19
2019	10.78%	24.51%	34.31%	51.96%	26
2020	21.93%	35.96%	48.25%	64.91%	26
2021	21.23%	37.67%	48.63%	65.75%	20
2022	32.26%	45.16%	54.30%	67.74%	25
2023	41.18%	50.68%	57.92%	71.04%	28

YEAR	TOP 1	TOP 3	TOP 5	TOP 10	SINGLE-LAUNCH NAMES
2024	50.38%	58.78%	64.12%	74.05%	26
2025	50.15%	59.57%	64.74%	73.86%	26

SECTION 04 · FULL

Where Did the HHI Change Come From?

Which model shares account arithmetically for the endpoint change?

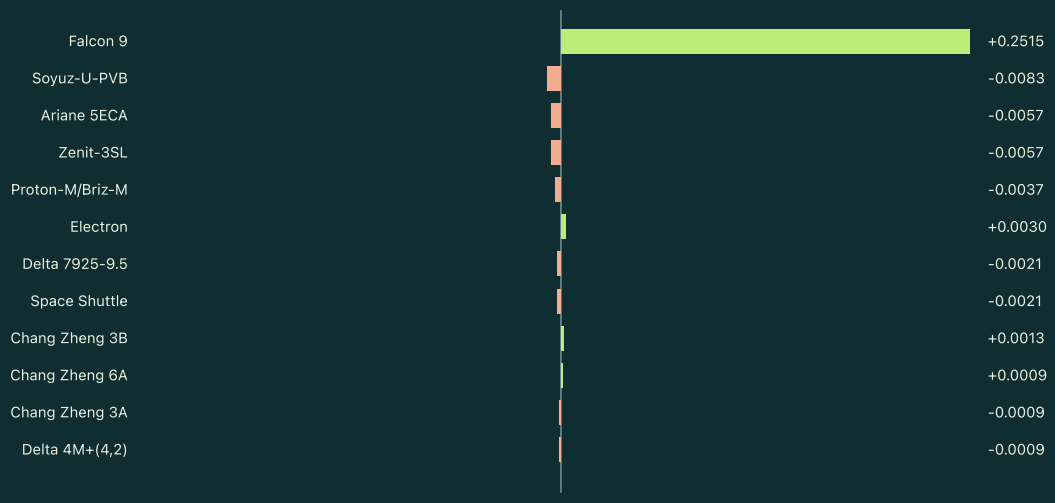
> Falcon 9 has the largest absolute endpoint contribution to the HHI change: +0.2515, as its launch share moves from 0.00% to 50.15%.

This decomposition compares 2006 with 2025. Each contribution is the difference between squared shares, using the union of names observed at either endpoint. A name absent from one covered endpoint has a zero share there.

The chart shows the 12 largest absolute contributions. The remaining 75 names contribute a net -0.006090. Positive and negative contributions sum exactly to the change in overall HHI before display rounding.

A contribution can change because the model's own count changes, because other counts change, or both. This identity does not distinguish demand, prices, procurement decisions or technological causes.

Signed contributions to HHI change



Right of zero increases HHI; left decreases it. Contributions are in HHI units, not percentage points.

Endpoint attribution, largest absolute contributions

MODEL	2006 SHARE	2025 SHARE	ΔHHI
Falcon 9	0.00%	50.15%	0.251522

MODEL	2006 SHARE	2025 SHARE	ΔHHI
Soyuz-U-PVB	9.09%	0.00%	-0.008264
Ariane 5ECA	7.58%	0.00%	-0.005739
Zenit-3SL	7.58%	0.00%	-0.005739
Proton-M/Briz-M	6.06%	0.00%	-0.003673
Electron	0.00%	5.47%	0.002993
Delta 7925-9.5	4.55%	0.00%	-0.002066
Space Shuttle	4.55%	0.00%	-0.002066
Chang Zheng 3B	1.52%	3.95%	0.001332
Chang Zheng 6A	0.00%	3.04%	0.000924
Chang Zheng 3A	3.03%	0.00%	-0.000918
Delta 4M+(4,2)	3.03%	0.00%	-0.000918
All remaining names	—	—	-0.006090

SECTION 05 · FULL

Growth Without Diversification?

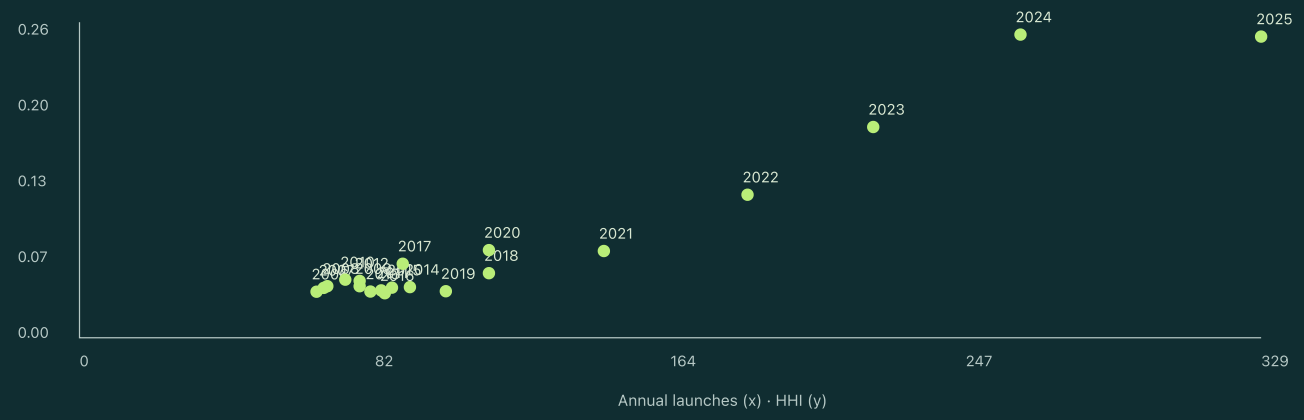
Does greater launch volume coincide with a broader effective model mix?

> Launch volume changes from 66 to 329, while observed model names change from 39 to 56. Effective group counts change from 25.03 to 3.83. These are distinct descriptions of activity and its distribution.

Observed group count measures how many names occur at least once. Effective group count measures how evenly the launch activity is distributed. They answer different questions: adding a rarely flown model may barely change concentration.

The scatter plot labels each year rather than fitting a causal model. Time trends, changing model definitions and other unobserved factors can produce association. No correlation significance test or causal inference is claimed.

Volume and concentration



Each point is a complete year. Horizontal axis: launches; vertical axis: HHI.

Activity versus diversity

YEAR	LAUNCHES	OBSERVED NAMES	EFFECTIVE NAMES
2006	66	39	25.03
2007	68	35	23.12
2008	69	35	22.35
2009	78	40	22.37
2010	74	32	19.84
2011	84	41	24.33
2012	78	36	20.28
2013	81	40	24.95
2014	92	35	22.75
2015	87	37	23.01
2016	85	43	25.90
2017	90	40	15.58
2018	114	43	17.85
2019	102	46	24.77
2020	114	42	13.15
2021	146	43	13.29
2022	186	51	8.06
2023	221	53	5.47
2024	262	54	3.80

YEAR	LAUNCHES	OBSERVED NAMES	EFFECTIVE NAMES
2025	329	56	3.83

SECTION 06 · FULL

Entry, Exit and Persistence

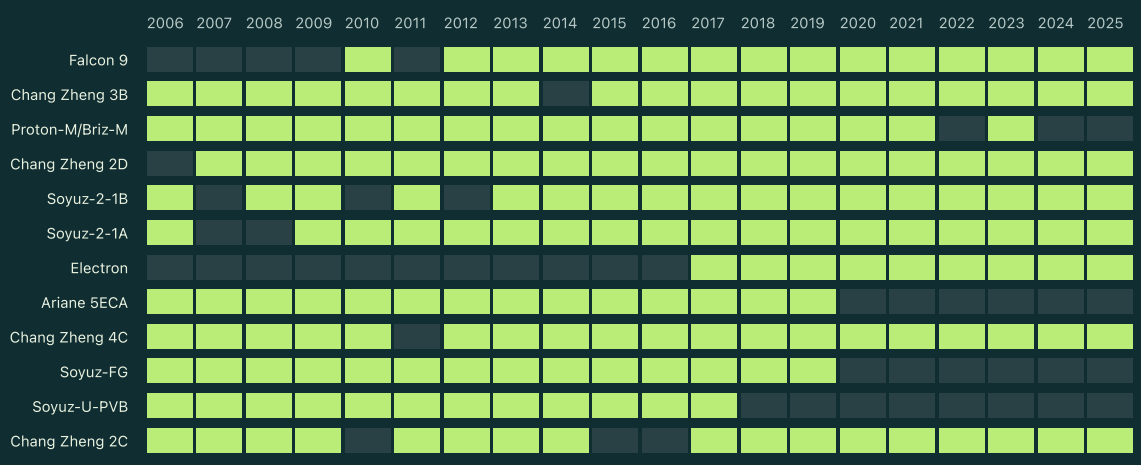
How stable are the observed model set and its leading members?

> Between the final adjacent years, 19 names enter the observed active set and 17 disappear from it. The top-five sets share 4 names, with Jaccard similarity 0.667.

An entry is a name observed this year but not the preceding year; an exit is the reverse. Neither is proof of a real-world debut or retirement. A model can reappear after a gap, and the study boundaries truncate its history.

Top-five membership uses descending counts and alphabetical tie-breaking, making selection reproducible. Jaccard similarity compares the intersection with the union of adjacent sets; ties can affect which models enter that set.

Presence of the most active models



Green means observed activity; dark means no launch recorded for that name in that year. Models are selected by total period activity.

Adjacent-year model turnover

YEAR	ENTRIES	EXITS	RETAINED	TOP-5 OVERLAP	JACCARD
2007	11	15	24	3	0.429
2008	11	11	24	3	0.429
2009	16	11	24	4	0.667
2010	12	20	20	4	0.667

YEAR	ENTRIES	EXITS	RETAINED	TOP-5 OVERLAP	JACCARD
2011	22	13	19	3	0.429
2012	9	14	27	4	0.667
2013	12	8	28	2	0.250
2014	11	16	24	2	0.250
2015	16	14	21	4	0.667
2016	17	11	26	2	0.250
2017	16	19	24	2	0.250
2018	15	12	28	2	0.250
2019	18	15	28	1	0.111
2020	18	22	24	3	0.429
2021	18	17	25	3	0.429
2022	21	13	30	3	0.429
2023	17	15	36	4	0.667
2024	18	17	36	4	0.667
2025	19	17	37	4	0.667

SECTION 07 · FULL

Concentration Within Launch Geographies

How concentrated is the model mix within different launch locations?

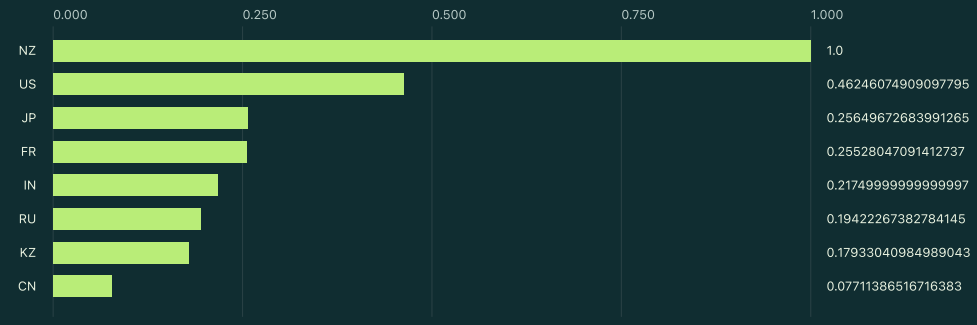
> Among geographic groups meeting the launch-count threshold, NZ has the highest pooled vehicle HHI (1.0000), based on 69 launches. This is a comparison of launch locations, not national operators.

Countries refer to liftoff geography, not operator nationality. We calculate pooled concentration inside each geographic group. A minimum of 30 launches is required for the comparative chart; this is an editorial eligibility rule, not a statistical guarantee.

Unknown launch countries remain visible in the audit table but do not become a synthetic country in the comparative ranking. Global HHI is not a weighted average of the within-country indices: the same model can operate across locations.

These results measure where recorded activity occurred. They do not establish licensing flexibility, spare capacity or the ability to substitute one launch site for another.

Within-country vehicle concentration



Pooled exact-vehicle HHI. Geography codes are retained from the normalized database.

Geographic eligibility and results

COUNTRY	LAUNCHES	GROUPS	SHARE OF STUDY	HHI	STATUS
AU	1	1	0.04%	—	not compared
BR	1	1	0.04%	—	not compared
CN	613	41	25.27%	0.0771	eligible
FR	152	10	6.27%	0.2553	eligible
IL	7	1	0.29%	—	not compared
IN	80	9	3.30%	0.2175	eligible
IR	21	5	0.87%	—	not compared
JP	71	11	2.93%	0.2565	eligible
KP	8	5	0.33%	—	not compared
KR	7	2	0.29%	—	not compared
KZ	308	17	12.70%	0.1793	eligible
MH	8	2	0.33%	—	not compared
NO	1	1	0.04%	—	not compared
NZ	69	1	2.84%	1.0000	eligible
RU	166	14	6.84%	0.1942	eligible
UNKNOWN	54	10	2.23%	—	not compared
US	859	52	35.41%	0.4625	eligible

Orbital vs Deep-Space Activity

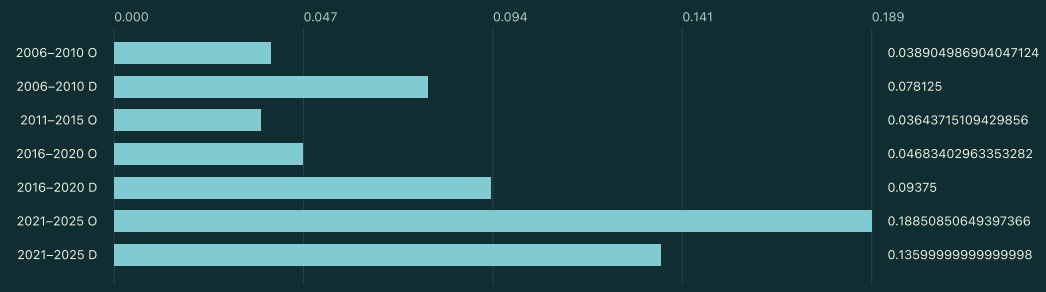
Does the concentration pattern differ between source categories?

> The latest eligible deep-space window, 2021–2025, contains 25 launches and 16 model names, with HHI 0.1360. Small windows below the threshold are withheld from concentration comparisons.

We use non-overlapping windows and require at least 15 launches per category-window for a concentration comparison. Counts below that threshold remain visible, while their HHI is withheld from the report.

O and D are GCAT categories, not classifications inferred from mission names. A launch can carry several payloads; launch count is not mission count. Small deep-space samples warrant caution even when they pass the threshold.

Concentration by category and window



Only eligible category-window observations are plotted.

Category sample sizes and concentration

WINDOW	CATEGORY	LAUNCHES	GROUPS	HHI	ELIGIBLE
2006–2010	O	339	66	0.0389	True
2006–2010	D	16	14	0.0781	True
2011–2015	O	411	69	0.0364	True
2011–2015	D	11	9	withheld	False
2016–2020	O	489	88	0.0468	True
2016–2020	D	16	12	0.0938	True
2021–2025	O	1119	98	0.1885	True
2021–2025	D	25	16	0.1360	True

How Sensitive Are the Results?

Which conclusions depend on the unit and inclusion rules?

> Across the tested endpoint definitions, HHI ranges from 0.2598 to 0.2792 in 2025. This range measures definition sensitivity; it is not a confidence interval.

The scenario table changes one definition at a time at the study endpoints: retaining O only, retaining GCAT S outcomes only, or splitting exact names by their recorded variants. These are alternative estimands, not competing corrections to the main series.

Variant information is unspecified for 1,256 selected launches. The name-plus-variant scenario retains an explicit unspecified bucket within each model and cannot substitute for a verified family mapping.

Pooled windows in the trajectory section also test temporal aggregation. Differences between pooled and annual indices reflect launch-weighted composition as well as within-year distribution. No confidence interval is inferred from the scenario range.

Endpoint definition sensitivity



Blue: baseline year; green: endpoint year. Connections guide reading across discrete scenarios; they are not time trends.

Alternative endpoint definitions

YEAR	DEFINITION	LAUNCHES	GROUPS	HHI	EFFECTIVE
2006	O + D	66	39	0.0399	25.03
2006	O only	64	37	0.0420	23.81
2006	GCAT S only	62	37	0.0421	23.73
2006	Exact name + variant	66	39	0.0399	25.03
2025	O + D	329	56	0.2612	3.83
2025	O only	324	56	0.2598	3.85
2025	GCAT S only	318	50	0.2792	3.58

YEAR	DEFINITION	LAUNCHES	GROUPS	HHI	EFFECTIVE
2025	Exact name + variant	329	61	0.2603	3.84

SECTION 10 · FULL

Dependence on the Leading Model: A Mechanical Scenario

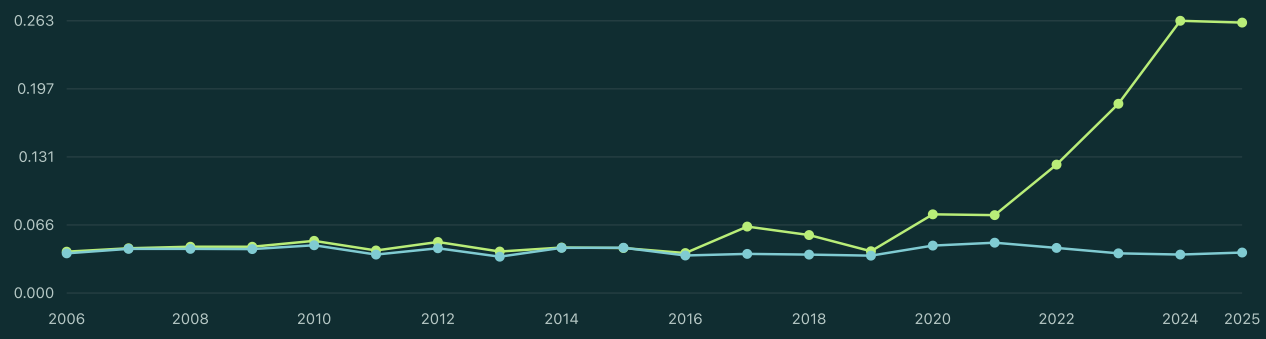
What does the distribution of the remaining activity look like without its largest group?

> Removing Falcon 9 mechanically excludes 165 launches (50.15%) from the endpoint year. The remaining 164 launches have renormalized HHI 0.0391; no replacement launches are assumed.

The largest model is identified independently in each year. We remove its observed launches, renormalize the remaining shares and recompute HHI. The scenario changes the population being measured and does not model replacement activity.

A lower residual HHI does not prove resilience; a higher residual HHI does not predict disruption. Neither result measures unused capacity, compatibility with payloads, prices or time to secure an alternative launch.

All activity versus remaining activity



Green: all activity; blue: renormalized remainder. The removed leader may differ between years.

Mechanical removal audit

YEAR	REMOVED MODEL	REMOVED LAUNCHES	REMOVED SHARE	REMAINING	RESIDUAL HHI
2006	Soyuz-U-PVB	6	9.09%	60	0.0383
2007	Soyuz-U-PVB	6	8.82%	62	0.0427
2008	Proton-M/Briz-M	7	10.14%	62	0.0427
2009	Proton-M/Briz-M	8	10.26%	70	0.0424
2010	Proton-M/Briz-M	9	12.16%	65	0.0462

YEAR	REMOVED MODEL	REMOVED LAUNCHES	REMOVED SHARE	REMAINING	RESIDUAL HHI
2011	Proton-M/Briz-M	9	10.71%	75	0.0372
2012	Proton-M/Briz-M	10	12.82%	68	0.0433
2013	Proton-M/Briz-M	9	11.11%	72	0.0351
2014	Proton-M/Briz-M	8	8.70%	84	0.0437
2015	Chang Zheng 3B	7	8.05%	80	0.0437
2016	Falcon 9	8	9.41%	77	0.0363
2017	Falcon 9	18	20.00%	72	0.0378
2018	Falcon 9	20	17.54%	94	0.0371
2019	Falcon 9	11	10.78%	91	0.0361
2020	Falcon 9	25	21.93%	89	0.0458
2021	Falcon 9	31	21.23%	115	0.0486
2022	Falcon 9	60	32.26%	126	0.0436
2023	Falcon 9	91	41.18%	130	0.0383
2024	Falcon 9	132	50.38%	130	0.0372
2025	Falcon 9	165	50.15%	164	0.0391

Methodology & reproducibility appendix

Formulas

Metric definitions

share	s_i = n_i / N
hhi	HHI = sum(s_i ** 2)
effective	effective_groups = 1 / HHI
top_k	CR_k = sum of the k largest shares
hhi_contribution	contribution_i = share_i(B)^2 - share_i(A)^2; sum = HHI(B)-HHI(A)
jaccard	J(A,B) = |A intersection B| / |A union B|
leader_removal	Remove the largest observed group, renormalize remaining counts, recalculate HHI; no substitution assumed
pooled	Pool launch counts across the stated years before calculating shares; not the mean of annual HHI

Grouping, dates and rounding

All calendar assignments use the nominal UTC year from GCAT. Uncertain source dates are retained in annual counts; the report does not infer missing precision. Exact model labels are not consolidated into families. Values are computed before rounding; displayed sums may differ slightly because of formatting.

Eligibility and evidence

Geographic and category thresholds are explicit report parameters. They suppress unsupported comparisons without deleting underlying counts. No hypothesis test, revenue estimate, causal explanation or forecast is implied. Findings have one owning section; the Executive Summary reuses those same finding records with links.

What additional data would change the scope?

A verified model-family crosswalk would support family concentration. Ownership history would support company concentration. Prices, contracts and capacity data would be required for economic or substitution analysis. None is inferred here.

Section eligibility log

- No analytical sections were skipped.

Data from GCAT, Jonathan C. McDowell, CC BY 4.0. Changes: filtering, normalization, aggregation and visualization. GCAT field definitions.

Source SHA-256: ee70d1d8b7cb72a239f60a996c061cd1ddf4fed493686f2d8e8333a83a91d5c3
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