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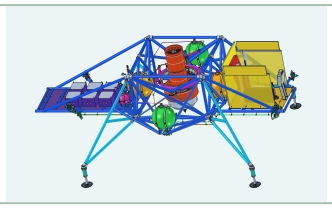
TEACHING AI TO MAKE THINGS

Evidence brief · 25.11.2026

LLTV R4D.1 passport

Dimensions, mass, flight scenarios, servicing and cost estimates for the NASA 952 reconstruction.



FreeCAD envelope	Empty vehicle	Liquid hydrogen peroxide	Airborne · 100% hover case
6.548 × 4.086 × 2.817 m	1 173.771 kg	208.5 L / 291.9 kg	98.76 s

This brief presents the key data. The HTML passport and machine-readable dataset have the full table, source files and reproduction method.

Technical and economic parameters

Parameter	Value	Evidence type	Conditions and source
Dimensions and crew			
Length × width × height	6.548 × 4.086 × 2.817 m	CAD / ledger	World-space envelope of visible BRep solids, including landing gear. CAD
Mass, balance and inertia			
Empty vehicle	1 173.771 kg	CAD / ledger	Without pilot or working tank contents; fixed equipment per R4D.1. MASS
Vehicle with helium only	1 174.541 kg	Derived	Empty vehicle plus He, without pilot, JP-4 or liquid H_2O_2. MASS FLUID
Full start mass with pilot	1 768.071 kg	CAD / ledger	95% of geometric liquid tank volume and full modelled He. Maximum takeoff weight remains unverified. MASS
Tanks, liquid peroxide and gas			
JP-4 tanks · internal capacity	2 × 146.46 L = 292.93 L	CAD / ledger	Two CF700 fuel tanks, geometric internal capacity. FLUID
JP-4 · full usable load	278.28 L / 222.63 kg	CAD / ledger	95% of volume. Model density 0.8 kg/L. FLUID
Liquid hydrogen peroxide H_2O_2 tanks · capacity	2 × 109.74 L = 219.48 L	CAD / ledger	Two liquid tanks supply the lift engines and RCS. FLUID
Liquid H_2O_2 · full usable load	208.5 L / 291.9 kg	CAD / ledger	Solution mass at 95% of volume. Density 1.4 kg/L. FLUID
He bottles · internal volume	2 × 12.78 L = 25.56 L	CAD / ledger	Internal volume of two bottles. Free gas is listed separately. FLUID
Helium · mass and standard gas volume	0.77 kg / 4.312 Nm³	Derived	At model charge. Referenced to 0 °C and 101.325 kPa absolute; ideal-gas conversion from mass. FLUID
Speed, acceleration and endurance			
Peak horizontal speed · baseline run	0.832 m/s	Simulation	Highest ground speed in calm air between liftoff and touchdown. TRACE
Peak horizontal acceleration · baseline run	0.283 m/s²	Derived	From velocity-vector change over an approximately 0.5 s window. Not a rated limit. TRACE
Liftoff to touchdown · baseline run	31.74 s	Derived	Full record 43 s, including ground phases. MISSION
Three-point route · time airborne	82.89 s	Derived	R04 calm-air scenario. Time from liftoff to first touchdown. ROUTE
Airborne time · 100% load hover case	98.76 s	Simulation	Includes takeoff, climb and descent in calm air. See the scenario table for translation and wind. ENDURE
Refilling and maintenance			
Helium refill flow and duration	No verified data	Unverified	Requires station data, residual He and a timed turnaround. Onboard He quantity does not determine fill rate. FLUID

Parameter	Value	Evidence type	Conditions and source
Liquid H_2O_2 fill rate and duration	**No verified data**	**Unverified**	Volume and mass are available. The archive gives no approved servicing unit or timed operation. FLUID
Economics			
High-test peroxide procurement price	**No verified data**	**Unverified**	The estimate has no verified price. Multiply a quoted price per kg by 291.904 kg; the calculator accepts a custom rate. PRICE

The scenarios describe the digital model. Physical flight limits, helium delivery and turnaround require measurements.

Flight scenarios

Airborne time runs from liftoff to first touchdown. Range is horizontal displacement. Headroom above the criterion is assessed before descent or the first approach. Wind and circuit budgets include a retry. A dash indicates a value not computed or not carried over from the source.

Airborne time by liquid load

50%

Hover **49 s**

1 m/s translation **48.5 s**

75%

Hover **75.4 s**

1 m/s translation **74.4 s**

100%

Hover **98.8 s**

1 m/s translation **97.8 s**

Parameter	Fill, %	Airborne, s	Start to touchdown, m	Ground track, m	H_2O_2 used, kg	H_2O_2 remaining, kg	H_2O_2 above reserve criterion, kg	Source
Baseline · calm	100	31.74	4	4.01	100.81	191.1	—	MISSION
Hover · calm	50	48.97	0	0	124.96	20.99	0.68	ENDURE
Translation at 1 m/s · calm	50	48.47	17.5	17.51	125.28	20.67	0.37	ENDURE
Hover · calm	75	75.36	0	0	198.25	20.68	0.19	ENDURE
Translation at 1 m/s · calm	75	74.36	43.5	43.51	197.43	21.5	1	ENDURE
Hover · calm	100	98.76	0	0	271.03	20.88	0.2	ENDURE
Translation at 1 m/s · calm	100	97.76	67	67.01	270.2	21.7	1.02	ENDURE
2 m/s headwind · retry	100	94.75	47	—	262.44	29.46	0.2	WIND
1.5 m/s crosswind and gusts · circuit	100	86.74	16.53	32.3	247.65	44.25	1.29	CIRCUIT
R04 route · 3 points	100	82.89	4.47	19.95	236.1	55.8	34.98	ROUTE

Cost estimates · Russia / US / EU

Prices and assumptions come from archived 2026 estimates. The first-fill subtotal uses a local JP-4 price proxy and packaged-helium equivalents. Liquid H_2O_2 and ground servicing are excluded from that subtotal. The lifecycle case uses three vehicles, 100 attempts each over five years and an assumed peroxide unit price. These are scenario figures, not a quotation.

Item	Russia · RUB	US · USD	EU · EUR	Source
Full helium charge	22 696	382	284	PRICE
First fill · JP and He only	61 087	954	1 190	PRICE
Jet fuel top-up after baseline run	1 618	24	38	PRICE
Production of one vehicle	284 561 022	4 257 552	3 737 030	CAPITAL
Development and test programme	1 166 853 312	22 562 500	18 768 754	CAPITAL
First vehicle including development	1 451 414 335	26 820 052	22 505 784	CAPITAL
Variable cost per attempt	505 483	8 526	7 296	LIFE
Lifecycle cost per attempt	7 384 503	128 060	108 821	LIFE

Sources and reproducibility

LLTV-R4D1-PASSPORT-20261125-R01
CAD SHA-256 `7dc381fa76287df3a95466836f0e7f981ef8f78d9f5dce02485e6b42af4cce7d`

- **CAD** · Native FreeCAD assembly
- **FLUID** · Tank volumes and working fluids
- **MISSION** · Baseline mission
- **ROUTE** · Reference R04 route trajectory
- **WIND** · Headwind and retry
- **CAPITAL** · Development and production estimate
- **LIFE** · Lifecycle model examples
- **NASA3023** · NASA TN D-3023, Tables III–IV · Online original
- **NASA7112** · NASA TN D-7112, LLTV profile · Online original
- **MASS** · Mass and centre-of-gravity analysis
- **GEOM** · Engine and thrust-channel geometry
- **TRACE** · Baseline mission time series
- **ENDURE** · Load and endurance
- **CIRCUIT** · Crosswind, gusts and circuit
- **PRICE** · 19 November 2026 price and fill estimate
- **BELL** · Bell 7260-954002: archived extraction and link · Online original
- **NASA3689** · NASA TN D-3689, Fig. 16 · Online original
- **H952** · NASA 952: historical source review · Online original