BACAR-14 (2026) Payload Report-Back

Meshtastic ZS6DCC_23c0 | 17 October 2026 | Report prepared 21 October 2026

Summary

The HAMNET LoRa tracker ZS6DCC_23c0 operated as expected, but a power supply failure at 08H35 SAST rendered the device inoperable. The last packet was logged at 08:35:46 SAST at 15238 m (49993 ft), and the same position reached APRS.fi via the ZS6DAB base at 08:35:47 SAST. That final packet still reported a battery level of 91% (4.07 V), so the cells themselves were not depleted at the time of failure.

Raw data in ZS6LMG2 was unavailable, as its u-blox GPS refused to lock and only locked after ZS6DCC_23c0 had stopped functioning. All the data we recovered came from ZS6LML2, which was parked in the driveway at home with a Nagoya UT-106UV antenna on the roof.

ZS6LMGB, the LoRa base, did a timed reboot because its WiFi module has a tendency to crash, so the raw data in ZS6LMGB was not available. We have since developed a plan to dump the raw packets onto the local network.

ZS6DMX2 was part of the tracking team and was received by the ZS6DAB base. Screenshots taken at the ZS6DAB base (image_xx.jpg) provide an independent second record of the ZS6DCC_23c0 telemetry, including SNR and RSSI, and are summarised later in this report.

Key flight data

Measurement	Result
Tracker node	ZS6DCC_23c0 (!06f323c0), TLORA_V2_1_1P6
Records logged by ZS6LML2	20 position fixes, 06:46:38–08:35:46 SAST; 18 signal logs, 07:34:57–08:35:46 SAST
Launch site (last ground fix)	26° 45.49' S 29° 16.51' E at 1568 m (5144 ft)
Launch time	07:59:10 SAST (independently reported for BACAR-14)
First airborne fix	08:07:37 SAST at 4438 m (14560 ft)
Highest recorded altitude	15238 m (49993 ft) at 08:35:46 SAST
Height gained above launch site	13670 m (44849 ft)
Mean ascent rate	6.39 m/s (1259 ft/min), 08:07:37–08:35:46 SAST
Last packet (power supply failure)	08:35:46 SAST (ZS6LML2); 08:35:47 SAST (APRS.fi via ZS6DAB)
Maximum slant range to ZS6LML2	134.5 km (72.6 NM) at 08:35:46 SAST
Range to ZS6DAB base (app display)	97–100 km throughout the ascent
RSSI / SNR at ZS6LML2	-95 to -120 dBm / 3.25 to 9.75 dB

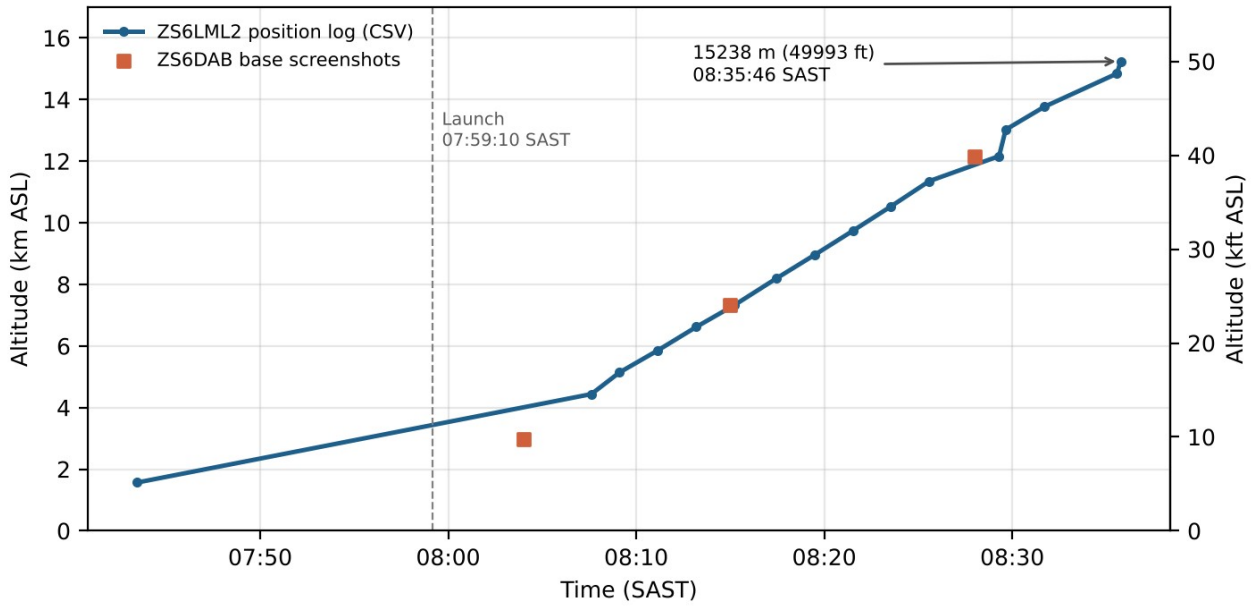
LoRa parameters deployed

Parameter	Value
Frequency	434.950 MHz
Bandwidth	62.5 kHz
Spreading factor	7
Coding rate	5 (4/5)
Frequency channel	12
Subject	HG
Output power	100 mW (20 dBm)
Antenna	Handheld with copper tape ground
Battery power	2× lithium-ion cells (1000 mAh)
Power supply	LM2596 buck converter
GPS	ATGM336H (unrestricted height)

Flight path

Our flight path terminated unexpectedly, but here is the data we extracted from ZS6LML2. Coordinates are shown in DD MM.MM format; speeds are as reported by the tracker in km/h and converted to knots. ZS6LML2 was located at 26° 11.97' S 28° 06.68' E, 1720 m (5643 ft) ASL.

Height report



Altitude against time from the ZS6LML2 position log, with three ZS6DAB base screenshot readings. The 08:04 SAST reading of 2988 m (9803 ft) from ZS6DAB fills the gap between the last ground fix and the first airborne fix in the ZS6LML2 log.

Tracking data received by ZS6LML2

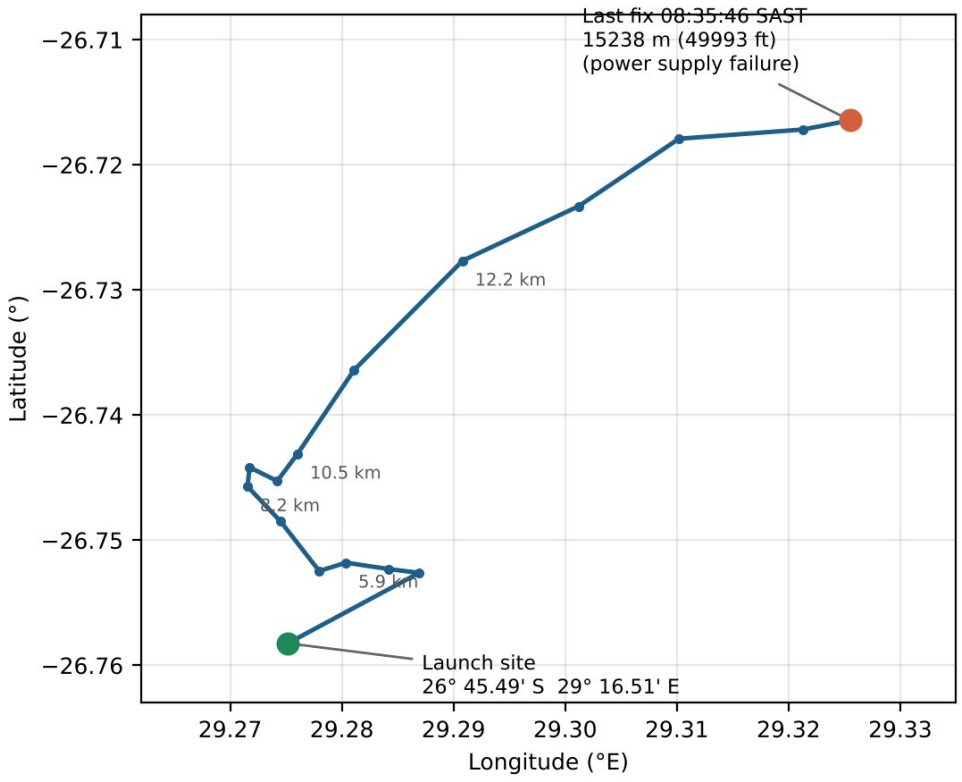
Date/Time	Longitude	Latitude	Height (ft)	Height (m)	Speed (km/h)	Speed (knots)
2026-10-17 06:46:38 SAST	29° 16.51' E	26° 45.49' S	5089	1551	0	0.0
2026-10-17 06:55:39 SAST	29° 16.51' E	26° 45.49' S	5138	1566	0	0.0
2026-10-17 07:04:41 SAST	29° 16.51' E	26° 45.49' S	5138	1566	0	0.0
2026-10-17 07:13:43 SAST	29° 16.51' E	26° 45.49' S	5138	1566	0	0.0
2026-10-17 07:43:28 SAST	29° 16.51' E	26° 45.49' S	5144	1568	0	0.0

Date/Time	Longitude	Latitude	Height (ft)	Height (m)	Speed (km/h)	Speed (knots)
2026-10-17 08:07:37 SAST	29° 17.22' E	26° 45.16' S	14560	4438	11	5.9
2026-10-17 08:09:07 SAST	29° 17.05' E	26° 45.14' S	16873	5143	18	9.7
2026-10-17 08:11:09 SAST	29° 16.82' E	26° 45.11' S	19216	5857	21	11.3
2026-10-17 08:13:12 SAST	29° 16.68' E	26° 45.15' S	21719	6620	9	4.9
2026-10-17 08:15:14 SAST	29° 16.47' E	26° 44.91' S	24052	7331	12	6.5
2026-10-17 08:17:27 SAST	29° 16.29' E	26° 44.74' S	26873	8191	5	2.7
2026-10-17 08:19:29 SAST	29° 16.30' E	26° 44.65' S	29380	8955	4	2.2
2026-10-17 08:21:31 SAST	29° 16.45' E	26° 44.72' S	31946	9737	0	0.0
2026-10-17 08:23:33 SAST	29° 16.56' E	26° 44.59' S	34557	10533	7	3.8
2026-10-17 08:25:35 SAST	29° 16.87' E	26° 44.18' S	37241	11351	36	19.4
2026-10-17 08:29:18 SAST	29° 17.45' E	26° 43.66' S	39908	12164	44	23.8
2026-10-17 08:29:39 SAST	29° 18.07' E	26° 43.40' S	42723	13022	43	23.2
2026-10-17 08:31:42 SAST	29° 18.61' E	26° 43.07' S	45157	13764	31	16.7
2026-10-17 08:35:34 SAST	29° 19.28' E	26° 43.03' S	48701	14844	39	21.1
2026-10-17 08:35:46 SAST	29° 19.53' E	26° 42.99' S	49993	15238	27	14.6

The fixes from 06:46:38 to 07:43:28 SAST are pre-launch ground positions. Pairs of fixes logged close together (08:29:18/08:29:39 and 08:35:34/08:35:46 SAST) show height jumps of several hundred metres in seconds, which suggests the timestamps are reception times of delayed or relayed packets rather than GPS fix times. Per-fix climb rates should therefore not be derived from these pairs; the mean ascent rate above is calculated over the whole airborne period.

Flight profile

Here is the flight profile up to the point where the power supply failed.



Track plot of ZS6LML2 position fixes from launch to the last packet at 08:35:46 SAST; no basemap or wind-field interpretation. The balloon drifted only a few kilometres north-east of the launch site during the 36-minute ascent.

Signal reports

Signal strength reported by ZS6LML2

The ZS6LML2 signal log holds 18 entries between 07:34:57 and 08:35:46 SAST; the 15 line items listed in the screenshots are tabulated below. Where a log entry coincides with a position fix, the balloon altitude and the calculated distance to ZS6LML2 are added. Entries without a matching fix (08:33:44, 08:28:54 and 08:27:38 SAST) are presumed to be non-position packets such as telemetry.

Date/Time	SNR (dB)	RSSI (dBm)	Signal	Balloon height	Ground range (km)	Slant range (km)
2026-10-17 08:35:46 SAST	9.75	-112	Good	15238 m (49993 ft)	133.8	134.5
2026-10-17 08:35:34 SAST	8.75	-110	Good	14844 m (48701 ft)	133.5	134.1
2026-10-17 08:33:44 SAST	8.50	-110	Good	—	—	—
2026-10-17 08:31:42 SAST	9.50	-109	Good	13764 m (45157 ft)	132.5	133.1
2026-10-17 08:29:40 SAST	3.25	-120	Fair	13022 m (42723 ft)	132.0	132.5
2026-10-17 08:29:18 SAST	9.50	-106	Good	12164 m (39908 ft)	131.3	131.7
2026-10-17 08:28:54 SAST	8.50	-109	Good	—	—	—
2026-10-17 08:27:38 SAST	9.50	-106	Good	—	—	—
2026-10-17 08:25:35 SAST	8.00	-113	Good	11351 m (37241 ft)	130.8	131.2
2026-10-17 08:23:33 SAST	6.00	-116	Fair	10533 m (34557 ft)	130.7	131.0
2026-10-17 08:21:31 SAST	9.75	-106	Good	9737 m (31946 ft)	130.7	130.9
2026-10-17 08:15:14 SAST	7.25	-115	Fair	7331 m (24052 ft)	130.9	131.0
2026-10-17 08:13:17 SAST	9.50	-106	Good	6620 m (21719 ft)	131.4	131.5
2026-10-17 08:11:10 SAST	9.75	-95	Good	5857 m (19216 ft)	131.6	131.6
2026-10-17 08:09:08 SAST	9.75	-95	Good	5143 m (16873 ft)	131.9	132.0

Range method: ground range is the great-circle distance between ZS6LML2 and the transmitted balloon latitude/longitude. Slant range adds the height difference between the balloon and ZS6LML2 (1720 m / 5643 ft ASL) as the vertical separation.

Tracking data extracted from the ZS6DAB base screenshots

The image_xx.jpg screenshots were taken of the Meshtastic app connected to the ZS6DAB base. The ZS6DCC_23c0 entries extracted from them are listed below. Times are taken from the phone clock in each screenshot; distance is the app's own reading from ZS6DAB to the balloon.

Time	Source	Balloon height	Distance (km)	SNR (dB)	RSSI (dBm)
08:04 SAST	image_02/03	2988 m (9803 ft)	99	0.25	-122
08:11 (approx.) SAST	image_04	5857 m (19216 ft)	98	5.25	-117
08:15 SAST	image_06	7331 m (24052 ft)	98	—	—
08:17 SAST	image_05	8191 m (26873 ft)	97	5.75	-117
08:21 SAST	image_07/10	9737 m (31946 ft)	98	3.00	-119
08:24 SAST	image_09	10533 m (34557 ft)	98	6.25	-116
08:28 SAST	image_11	12164 m (39908 ft)	98	-1.75	-124
08:31 SAST	image_12	13764 m (45157 ft)	99	6.25	-117
08:35:47 SAST	image_14 (aprs.fi)	15238 m (49993 ft)	—	2.5	-114
08:36 (seen at 08:37) SAST	image_13	15238 m (49993 ft)	100	-2.00	-125

Additional observations from the ZS6DAB screenshots:

- Before launch (image_01) the app showed ZS6DCC_23c0 at -26.75844, 29.27522 (26° 45.51' S 29° 16.51' E), 1566 m (5138 ft) MSL, 98 km from ZS6DAB.
- The final APRS.fi entry (image_14), gated by ZS6DAB at 08:35:47 SAST, reported 17 satellites with a fixed position, RSSI -114 dBm, SNR 2.5 dB, battery 91% at 4.07 V, airtime 0.50%, channel utilisation 12.6%

and an uptime of 1 hour.

- ZS6DMX2 was heard by ZS6DAB throughout, at 98–100 km and 1564–1569 m (5131–5148 ft); its battery read 64% (3.84 V) at 08:04 SAST and 97% (4.15 V) from about 08:11 SAST.
- At 08:15 SAST ZS6LMGB (ZS6LMG Base 4c18) was shown 34 km from ZS6DAB at 1720 m (5643 ft) MSL.
- The ZS6DAB base itself reported 100% battery (4.12 V), 1595–1604 m (5233–5262 ft) MSL, channel utilisation 0.0–5.6% and airtime 1.0–1.1%. The mesh view showed 14 nodes online of 25.
- At 08:28 SAST ZS6DAB already displayed the 12164 m (39908 ft) position that ZS6LML2 only logged at 08:29:18 SAST, supporting the view that some packets reached ZS6LML2 late or via a relay.

ZS6DAB base node statistics

Time	Uptime	Ch. util.	Air util. TX	Pkts TX	Pkts RX	Bad RX	RX dupes	Relayed	Nodes
07:43:22 SAST	66 min	6.31%	0.36%	66	301	6	179	31	14/15
08:17:12 SAST	100 min	5.94%	0.78%	154	635	39	362	79	14/15

Between 07:43:22 and 08:17:12 SAST the ZS6DAB base received 334 additional packets (33 bad) and relayed 48, with 14 of 15 known nodes online. The noise floor field was empty in the export.

Lessons learnt and points proven

- Only two stations (ZS6LML2 and the ZS6DAB base) monitored the flight. We need more monitoring stations.
- A more reliable power source is needed. The final packet still showed 91% battery at 4.07 V, which points to the supply chain after the cells (LM2596 buck converter and wiring) rather than battery capacity.
- The signal strength over the distance is really amazing. At 08:35:46 SAST ZS6DCC_23c0 was at 15238 m (49993 ft), 133.8 km ground range and 134.5 km slant range from ZS6LML2, and was still received with SNR 9.75 dB and RSSI -112 dBm (Signal Good). The ZS6DAB base heard the tracker at 97–100 km throughout the ascent.
- This proves that a mesh LoRa network has a very low required RF power budget compared to VHF FSK data: 100 mW from a handheld antenna delivered positive SNR at more than 130 km.
- For the next flight, log the hop count and relaying node with each received packet, so that direct reception can be separated from relayed reception when distances are quoted.