

Supplementary material

High-resolution digital elevation models and orthomosaics generated from historical aerial photographs (since the 1960s) for the Bale Mountains in Ethiopia

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Table S1. Camera number, calibrated focal length (CFL) in millimetres, magazine number, roll number, exposure date, photo number, and lens serial number for historical aerial photographs (HAPs) for the year 1965/67

Camera number	CFL (mm)	Magazine number	Roll number	Exposure date	Photo number (from to)	Lens serial number
63-142	151.625	63-144	140	13-Feb-65	12842 – 12828 and 12793 - 12809	114/486
62-048	152.688	64-010	324	30-Nov-67	34400 - 34384	497/126
63-048	150.996	64-010	338	5-Dec-67	36252 - 36268	237/570
63-094	151.338	64-151	333	3-Dec-67	35406 - 35422	324
63-048	150.996	64-128	348	10-Dec-67	37750 - 37735	237/570
63-048	150.996	64-148	349	10-Dec-67	37830 - 37844	237/570
62-048	152.688	64-010	376	18-Dec-67	41006 - 41021	497/126
63-111	152.263	64-128	373	17-Dec-67	40723 - 40709	522

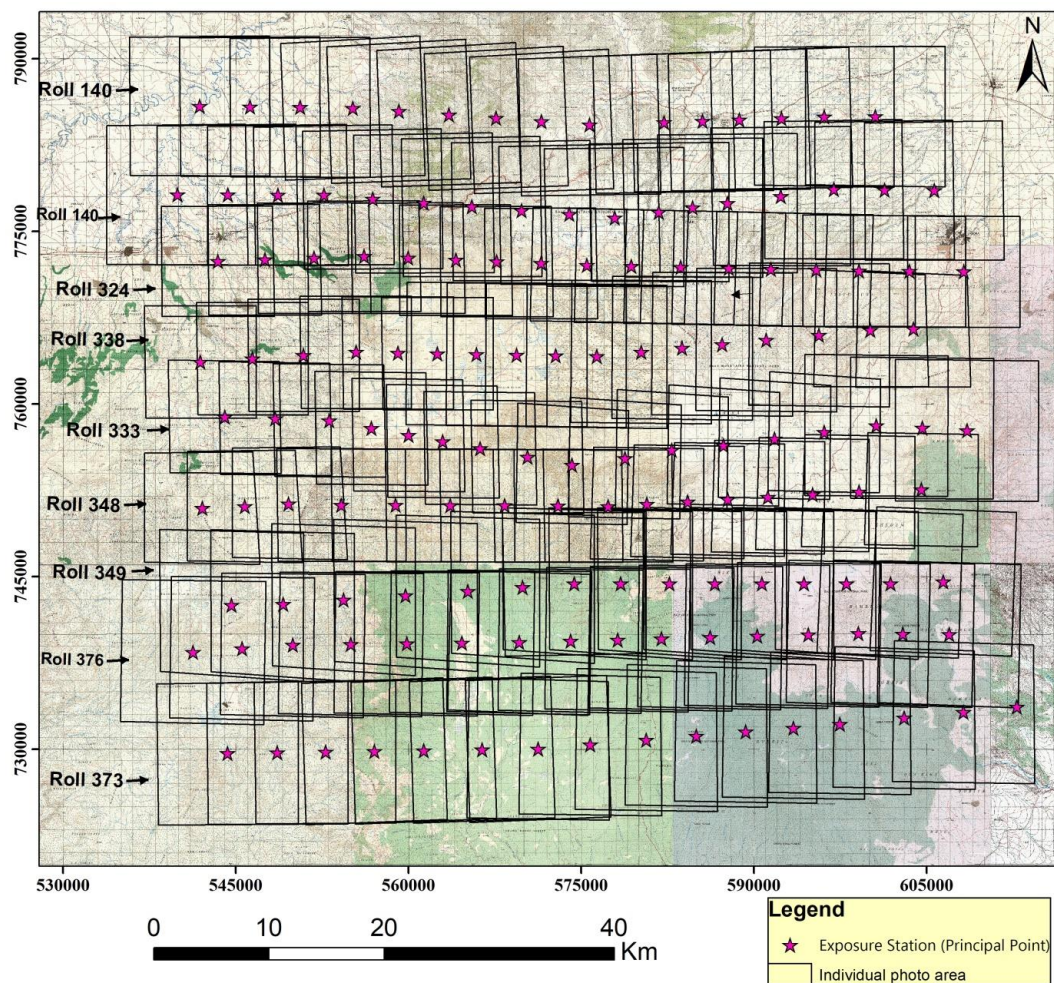


Figure S1. Block diagram (flight index) showing camera exposure stations (ground principal points), areal extent, forward overlap, and side lap of individual aerial photographs for the year 1965/67 (source background map: Ethiopian Geospatial Information Institute).

Table S2. Roll number, strip number, acquisition date, and photo number ranges for historical aerial photographs for the year 1984

Roll number	Strip number	Acquisition date	Photo number (from to)
R- S9	27	17-01-1984	1714 - 1725
R- S9	26	17-01-1984	1680 - 1696
R- S9	25	17-01-1984	1643 - 1660
R- S9	24	17-01-1984	1606 - 1624
R- S8	23	17-01-1984	1569 - 1585
R- S8	22	16-01-1984	1533 - 1548
R- S7	21	16-01-1984	1498 - 1516
R- S7	20	16-01-1984	1463 - 1480
R- S6	19	15-01-1984	1426 - 1443

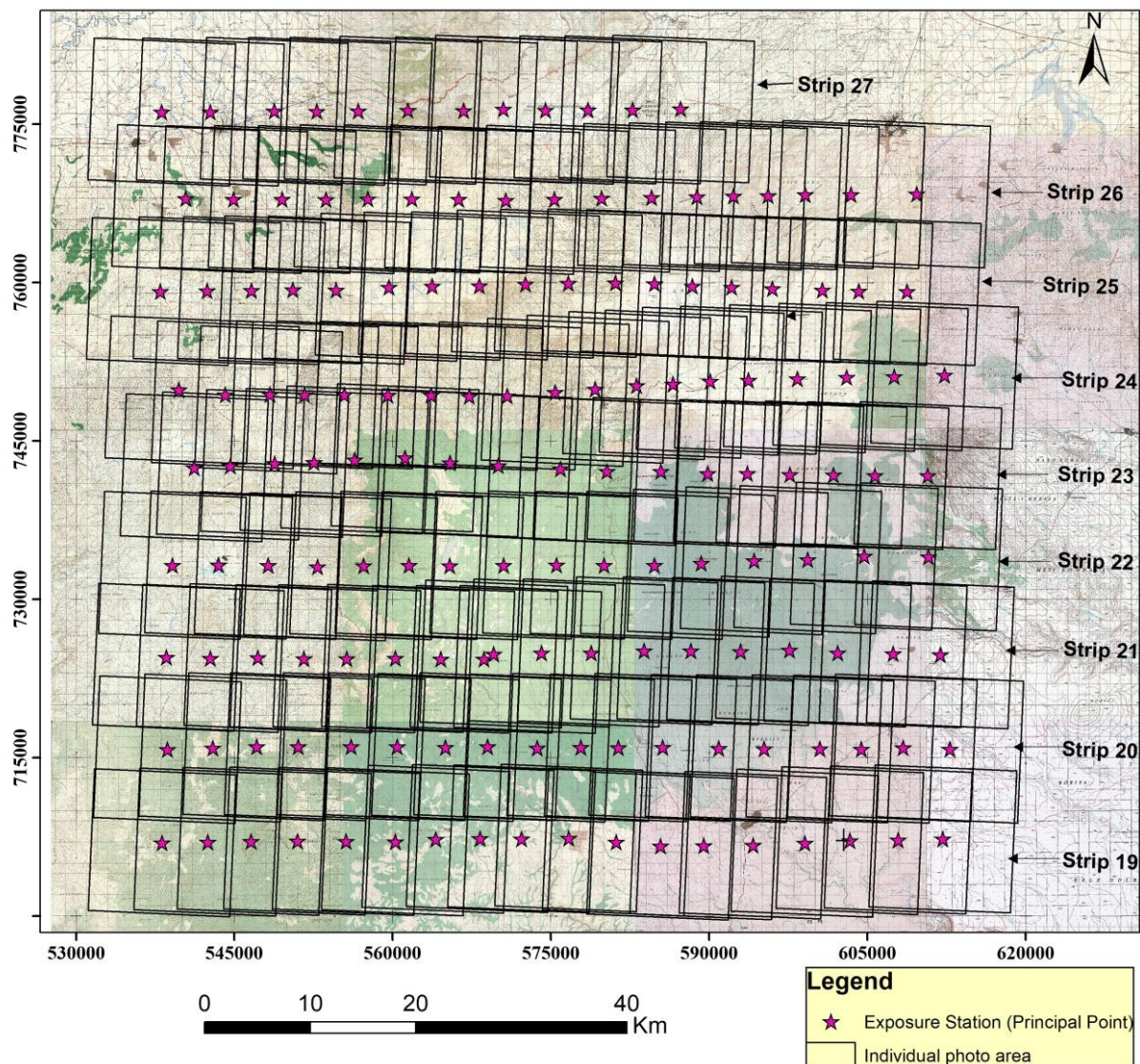


Figure S2. Block diagram (flight index) showing camera exposure stations (ground principal points), areal extent, forward overlap, and side lap of individual aerial photographs for the year 1984 (source background map: Ethiopian Geospatial Information Institute).

Table S3. Easting, northing, and altitude of the camera positions (principal points) for the year 1967 using the Adindan UTM Zone 37 North reference system. Each image indicates the roll number and photo number used with file name extension

Label	X/Easting	Y/Northing	Z/Altitude
R_ROLL_333_0.0_35406.jpg	544042	758873	12564
R_ROLL_333_0.0_35407.jpg	548427	758719	12653
R_ROLL_333_0.0_35408.jpg	553115	758554	12965
R_ROLL_333_0.0_35409.jpg	556768	757881	13184
R_ROLL_333_0.0_35410.tif	559984	757290	13236
R_ROLL_333_0.0_35411.tif	562965	756741	13046
R_ROLL_333_0.0_35412.tif	566222	756142	12851
R_ROLL_333_0.0_35413.tif	570314	755389	12296
R_ROLL_333_0.0_35414.tif	574181	754678	13170
R_ROLL_333_0.0_35415.tif	578777	755277	13427
R_ROLL_333_0.0_35416.tif	582863	755979	13600
R_ROLL_333_0.0_35417.tif	587342	756394	13590
R_ROLL_333_0.0_35418.tif	591780	756972	13615
R_ROLL_333_0.0_35419.tif	596104	757536	13629
R_ROLL_333_0.0_35420.tif	600613	758124	13510
R_ROLL_333_0.0_35421.tif	604600	757907	13175
R_ROLL_333_0.0_35422.tif	608505	757696	12590
Roll_R_140_00_12793.tif	539931	778186	11838
Roll_R_140_00_12794.tif	544297	778170	11857
Roll_R_140_00_12795.tif	548663	778153	11910
Roll_R_140_00_12796.tif	552666	778138	11996
Roll_R_140_00_12797.tif	556881	777808	12064
Roll_R_140_00_12798.tif	561324	777460	12611
Roll_R_140_00_12799.tif	565482	777135	12649
Roll_R_140_00_12800.tif	569805	776796	13256
Roll_R_140_00_12801.tif	573947	776472	13040
Roll_R_140_00_12802.tif	577896	776163	12979
Roll_R_140_00_12803.tif	581737	776664	12953
Roll_R_140_00_12804.tif	584673	777048	12977
Roll_R_140_00_12805.tif	587687	777442	12978
Roll_R_140_00_12806.tif	592310	778045	12787
Roll_R_140_00_12807.tif	596922	778648	12522
Roll_R_140_00_12808.tif	601330	778593	12276
Roll_R_140_00_12809.tif	605647	778541	12120
Roll_R_140_00_12828.tif	600533	784959	12311
Roll_R_140_00_12829.tif	596084	784937	12299
Roll_R_140_00_12830.tif	592375	784811	12516
Roll_R_140_00_12831.tif	588712	784686	12613
Roll_R_140_00_12832.tif	585535	784579	12572
Roll_R_140_00_12833.tif	582194	784465	12876
Roll_R_140_00_12834.tif	575702	784245	12730
Roll_R_140_00_12835.tif	571547	784540	12781
Roll_R_140_00_12836.tif	567599	784821	12471

Label	X/Easting	Y/Northing	Z/Altitude
Roll_R_140_00_12837.tif	563495	785112	12841
Roll_R_140_00_12838.tif	559148	785421	12311
Roll_R_140_00_12839.tif	555156	785705	12027
Roll_R_140_00_12840.tif	550579	785765	11864
Roll_R_140_00_12841.tif	546222	785822	11837
Roll_R_140_00_12842.tif	541857	785879	11818
Roll_R_324_00_34384.tif	608200	771503	12240
Roll_R_324_00_34385.tif	603489	771530	12478
Roll_R_324_00_34386.tif	599101	771554	12827
Roll_R_324_00_34387.tif	595398	771639	12839
Roll_R_324_00_34388.tif	591445	771715	13178
Roll_R_324_00_34389.tif	587796	771791	13328
Roll_R_324_00_34390.tif	583624	771879	13291
Roll_R_324_00_34391.tif	579332	771969	13010
Roll_R_324_00_34392.tif	575476	772050	12993
Roll_R_324_00_34393.tif	571513	772209	13115
Roll_R_324_00_34394.tif	567648	772364	13079
Roll_R_324_00_34395.tif	564104	772506	12750
Roll_R_324_00_34396.tif	559974	772671	12682
Roll_R_324_00_34397.tif	556125	772826	12331
Roll_R_324_00_34398.tif	551802	772678	12211
Roll_R_324_00_34399.tif	547517	772532	12049
Roll_R_324_00_34400.tif	543436	772393	11991
Roll_R_338_00_36252.tif	541912	763648	12331
Roll_R_338_00_36253.tif	546433	763930	12347
Roll_R_338_00_36254.tif	550881	764208	12623
Roll_R_338_00_36255.tif	555443	764493	12925
Roll_R_338_00_36256.tif	559064	764430	13183
Roll_R_338_00_36257.tif	562500	764371	13182
Roll_R_338_00_36258.tif	565891	764313	13230
Roll_R_338_00_36259.tif	569382	764253	13118
Roll_R_338_00_36260.tif	572773	764194	13133
Roll_R_338_00_36261.tif	576334	764133	13258
Roll_R_338_00_36262.tif	580193	764503	13414
Roll_R_338_00_36263.tif	583754	764845	13375
Roll_R_338_00_36264.tif	587225	765178	13485
Roll_R_338_00_36265.tif	591057	765545	13329
Roll_R_338_00_36266.tif	595639	765985	13443
Roll_R_338_00_36267.tif	600101	766413	13053
Roll_R_338_00_36268.tif	603826	766511	12735
Roll_R_348_00_37735.tif	604519	752548	12821
Roll_R_348_00_37736.tif	599103	752350	13437
Roll_R_348_00_37737.tif	595075	752119	13494
Roll_R_348_00_37738.tif	591208	751896	13479
Roll_R_348_00_37739.tif	587718	751696	13373
Roll_R_348_00_37740.tif	584224	751495	12910
Roll_R_348_00_37741.tif	580698	751292	12594

Label	X/Easting	Y/Northing	Z/Altitude
Roll_R_348_00_37742.tif	577333	751099	12970
Roll_R_348_00_37743.tif	572972	751152	12159
Roll_R_348_00_37744.tif	568328	751169	11821
Roll_R_348_00_37745.tif	563606	751186	12139
Roll_R_348_00_37746.tif	558883	751204	11931
Roll_R_348_00_37747.tif	554160	751221	12248
Roll_R_348_00_37748.tif	549573	751329	13123
Roll_R_348_00_37749.tif	545782	751086	12664
Roll_R_348_00_37750.tif	542089	750945	12902
Roll_R_349_00_37830.tif	544632	742502	12521
Roll_R_349_00_37831.tif	549102	742608	12782
Roll_R_349_00_37832.tif	554358	742977	12257
Roll_R_349_00_37833.tif	559737	743354	11637
Roll_R_349_00_37834.tif	565142	743732	11437
Roll_R_349_00_37835.tif	569895	744065	11499
Roll_R_349_00_37836.tif	574387	744380	11748
Roll_R_349_00_37837.tif	578414	744381	11992
Roll_R_349_00_37838.tif	582660	744382	12386
Roll_R_349_00_37839.tif	586589	744383	12404
Roll_R_349_00_37840.tif	590677	744384	12785
Roll_R_349_00_37841.tif	594328	744385	13202
Roll_R_349_00_37842.tif	598019	744386	13142
Roll_R_349_00_37843.tif	601840	744387	12293
Roll_R_349_00_37844.tif	606427	744568	12056
Roll_R_373_00_40708.tif	612827	733667	10813
Roll_R_373_00_40709.tif	608189	733217	11151
Roll_R_373_00_40710.tif	603027	732717	11223
Roll_R_373_00_40711.tif	597443	732176	11582
Roll_R_373_00_40712.tif	593409	731846	11548
Roll_R_373_00_40713.tif	589272	731507	11329
Roll_R_373_00_40714.tif	584982	731156	11324
Roll_R_373_00_40715.tif	580640	730800	11341
Roll_R_373_00_40716.tif	575781	730402	11266
Roll_R_373_00_40717.tif	571254	730032	11238
Roll_R_373_00_40718.tif	566394	729957	11213
Roll_R_373_00_40719.tif	561317	729879	11294
Roll_R_373_00_40720.tif	557034	729813	11781
Roll_R_373_00_40721.tif	552793	729748	12097
Roll_R_373_00_40722.tif	548606	729697	11809
Roll_R_373_00_40723.tif	544275	729644	11618
Roll_R_376_00_41006.tif	541296	738426	12094
Roll_R_376_00_41007.tif	545549	738734	11853
Roll_R_376_00_41008.tif	549942	739051	12035
Roll_R_376_00_41009.tif	554995	739109	11999
Roll_R_376_00_41010.tif	559837	739164	11697
Roll_R_376_00_41011.tif	564639	739219	11307
Roll_R_376_00_41012.tif	569605	739276	11313

Label	X/Easting	Y/Northing	Z/Altitude
Roll_R_376_00_41013.tif	574074	739395	11395
Roll_R_376_00_41014.tif	578149	739503	11606
Roll_R_376_00_41015.tif	581953	739605	11688
Roll_R_376_00_41016.tif	586185	739717	11651
Roll_R_376_00_41017.tif	590262	739826	11903
Roll_R_376_00_41018.tif	594724	739945	13118
Roll_R_376_00_41019.tif	599048	740060	11785
Roll_R_376_00_41020.tif	602922	740018	11562
Roll_R_376_00_41021.tif	606943	739975	11506

Table S4. Easting, northing, and altitude of the camera positions (principal points) for the year 1984 using the Adindan UTM Zone 37 North reference system. Each image indicates the project name, roll number, strip number, and photo number used with file name extension

Label	X/Easting	Y/Northing	Z/Altitude
ET1.5_S6_19_1426.tif	537715.13	707143.18	9394.86
ET1.5_S6_19_1427.tif	541948.28	707228.87	9391.73
ET1.5_S6_19_1428.tif	546205.37	707278.97	9396.92
ET1.5_S6_19_1429.tif	550462.43	707333.36	9397.13
ET1.5_S6_19_1430.tif	554770.59	707344.83	9399.08
ET1.5_S6_19_1431.tif	559043.44	707308.16	9401.46
ET1.5_S6_19_1432.tif	563355.06	707157.55	9399.01
ET1.5_S6_19_1433.tif	567694.93	706920.63	9402.14
ET1.5_S6_19_1434.tif	572071.86	706672.56	9400.12
ET1.5_S6_19_1435.tif	576424.12	706437.98	9402.79
ET1.5_S6_19_1436.tif	580853.28	706295.13	9401.57
ET1.5_S6_19_1437.tif	585287.96	706203.11	9401.99
ET1.5_S6_19_1438.tif	589723.57	706116.39	9401.69
ET1.5_S6_19_1439.tif	594137.21	706056.37	9403.18
ET1.5_S6_19_1440.tif	598559.98	706105.18	9401.32
ET1.5_S6_19_1441.tif	602997.51	706199.43	9401.14
ET1.5_S6_19_1442.tif	607422.44	706339.78	9400.79
ET1.5_S6_19_1443.tif	611803.85	706445.53	9395.08
ET1.5_S7_20_1463.tif	537657.00	715589.00	9694.00
ET1.5_S7_20_1464.tif	542055.11	715677.15	9700.77
ET1.5_S7_20_1465.tif	546464.93	715714.08	9710.15
ET1.5_S7_20_1466.tif	550871.08	715769.05	9704.97
ET1.5_S7_20_1467.tif	555249.99	715794.04	9701.87
ET1.5_S7_20_1468.tif	559657.74	715818.52	9705.05
ET1.5_S7_20_1469.tif	564081.58	715846.86	9701.59
ET1.5_S7_20_1470.tif	568504.28	715868.26	9688.18
ET1.5_S7_20_1471.tif	572657.60	715930.82	9688.86
ET1.5_S7_20_1472.tif	577119.73	716026.07	9747.25
ET1.5_S7_20_1473.tif	581504.65	716123.27	9748.77
ET1.5_S7_20_1474.tif	585893.71	716178.31	9751.60
ET1.5_S7_20_1475.tif	590276.85	716190.24	9749.19
ET1.5_S7_20_1476.tif	594673.53	716209.84	9750.69
ET1.5_S7_20_1477.tif	599057.07	716236.61	9747.46
ET1.5_S7_20_1478.tif	603449.25	716250.04	9738.47
ET1.5_S7_20_1479.tif	607856.44	716263.38	9738.84
ET1.5_S7_20_1480.tif	612278.02	716295.29	9725.21
ET1.5_S7_21_1498.tif	537488.29	724251.68	9737.99
ET1.5_S7_21_1499.tif	542179.37	724433.21	9737.47
ET1.5_S7_21_1500.tif	546870.28	724525.02	9732.14
ET1.5_S7_21_1501.tif	551505.39	724522.03	9741.79
ET1.5_S7_21_1502.tif	555852.49	724562.98	9745.83
ET1.5_S7_21_1503.tif	560050.05	724648.80	9745.94

Label	X/Easting	Y/Northing	Z/Altitude
ET1.5_S7_21_1504.tif	564348.27	724599.62	9755.78
ET1.5_S7_21_1505.tif	568721.03	724558.87	9757.76
ET1.5_S8_21.1_1507.tif	569564.00	724792.00	9312.00
ET1.5_S8_21.1_1508.tif	574120.61	724918.33	9275.93
ET1.5_S8_21.1_1509.tif	578707.89	724813.11	9748.32
ET1.5_S8_21.1_1510.tif	583366.98	724600.63	9753.15
ET1.5_S8_21.1_1511.tif	588023.30	724207.61	9757.27
ET1.5_S8_21.1_1512.tif	592681.48	723943.00	9761.00
ET1.5_S8_21.1_1513.tif	597389.49	723853.51	9755.08
ET1.5_S8_21.1_1514.tif	602022.83	723862.92	9749.85
ET1.5_S8_21.1_1515.tif	606627.87	723938.40	9746.66
ET1.5_S8_21.1_1516.tif	611646.28	724006.93	9738.46
ET1.5_S8_22_1533.tif	538484.96	732853.65	9872.71
ET1.5_S8_22_1534.tif	543127.24	732769.71	9882.14
ET1.5_S8_22_1535.tif	547727.27	732743.86	9879.38
ET1.5_S8_22_1536.tif	552355.65	732672.66	9885.13
ET1.5_S8_22_1537.tif	557002.09	732559.00	9888.01
ET1.5_S8_22_1538.tif	561643.26	732477.72	9889.92
ET1.5_S8_22_1539.tif	566261.27	732398.84	9893.80
ET1.5_S8_22_1540.tif	570935.31	732320.46	9898.92
ET1.5_S8_22_1541.tif	575567.71	732235.27	9899.69
ET1.5_S8_22_1542.tif	580227.66	732238.14	9897.46
ET1.5_S8_22_1543.tif	584884.85	732280.74	9899.99
ET1.5_S8_22_1544.tif	589517.13	732375.52	9900.06
ET1.5_S8_22_1545.tif	594264.90	732508.14	9904.64
ET1.5_S8_22_1546.tif	599508.26	732748.53	9898.63
ET1.5_S8_22_1547.tif	604725.11	733119.97	9898.85
ET1.5_S8_22_1548.tif	609943.03	733437.81	9883.32
ET1.5_S8_23_1569.tif	540791.33	742540.22	10047.72
ET1.5_S8_23_1570.tif	544802.96	742849.56	10043.49
ET1.5_S8_23_1571.tif	548827.45	743113.53	10049.56
ET1.5_S8_23_1572.tif	552761.21	743371.94	10049.13
ET1.5_S8_23_1573.tif	556756.38	743624.57	10045.97
ET1.5_S8_23_1574.tif	560874.06	743882.47	10047.39
ET1.5_S8_23_1575.tif	565002.60	744135.24	10046.84
ET1.5_S8_23_1576.tif	569137.67	744366.35	10048.57
ET1.5_S8_23_1577.tif	573278.88	744383.93	10048.68
ET1.5_S8_23_1578.tif	577419.97	744122.93	10046.81
ET1.5_S8_23_1579.tif	581580.41	743629.95	10048.96
ET1.5_S8_23_1580.tif	585726.89	743162.20	10050.96
ET1.5_S8_23_1581.tif	589915.56	742721.18	10051.03
ET1.5_S8_23_1582.tif	594050.89	742281.51	10052.31
ET1.5_S8_23_1583.tif	598193.25	741877.35	10049.58
ET1.5_S8_23_1584.tif	602360.77	741469.15	10050.16
ET1.5_S8_23_1585.tif	606501.75	741130.75	10046.25
ET1.5_S9_24_1606.tif	539991.95	748682.13	10512.99
ET1.5_S9_24_1607.tif	544070.86	748589.15	10512.57

Label	X/Easting	Y/Northing	Z/Altitude
ET1.5_S9_24_1608.tif	548158.39	748494.07	10516.00
ET1.5_S9_24_1609.tif	552287.53	748386.11	10510.73
ET1.5_S9_24_1610.tif	556356.00	748276.55	10512.72
ET1.5_S9_24_1611.tif	560128.14	748177.11	10524.38
ET1.5_S9_24_1612.tif	563856.99	748115.63	10510.28
ET1.5_S9_24_1613.tif	567612.03	748179.53	10516.04
ET1.5_S9_24_1614.tif	571416.60	748238.89	10515.52
ET1.5_S9_24_1615.tif	575182.46	748356.96	10514.84
ET1.5_S9_24_1616.tif	578974.43	748590.82	10519.25
ET1.5_S9_24_1617.tif	582704.53	748872.14	10514.06
ET1.5_S9_24_1618.tif	586452.46	749164.97	10513.82
ET1.5_S9_24_1619.tif	590163.30	749468.62	10515.69
ET1.5_S9_24_1620.tif	593924.63	749856.52	10516.53
ET1.5_S9_24_1621.tif	597799.82	750264.25	10515.84
ET1.5_S9_24_1622.tif	602366.82	750870.05	10515.12
ET1.5_S9_24_1623.tif	606955.65	751318.31	10516.88
ET1.5_S9_24_1624.tif	611767.82	751696.73	10517.01
ET1.5_S9_25_1643.tif	537753.95	758435.58	10517.27
ET1.5_S9_25_1644.tif	542312.53	758580.54	10517.72
ET1.5_S9_25_1645.tif	546773.14	758740.20	10516.02
ET1.5_S9_25_1646.tif	551016.07	758870.13	10512.21
ET1.5_S9_25_1647.tif	555287.40	758960.57	10514.26
ET1.5_S9_25_1648.tif	559552.10	759023.85	10512.16
ET1.5_S9_25_1649.tif	563821.75	759075.27	10515.61
ET1.5_S9_25_1650.tif	568068.92	759098.97	10516.42
ET1.5_S9_25_1651.tif	572334.28	759141.85	10520.26
ET1.5_S9_25_1652.tif	576538.16	759063.07	10523.91
ET1.5_S9_25_1653.tif	580757.54	758937.20	10521.26
ET1.5_S9_25_1654.tif	584968.94	758701.11	10523.80
ET1.5_S9_25_1655.tif	588912.23	758550.61	10526.56
ET1.5_S9_25_1656.tif	592927.11	758417.68	10528.73
ET1.5_S9_25_1657.tif	596838.61	758210.44	10526.30
ET1.5_S9_25_1658.tif	600708.07	757949.12	10527.67
ET1.5_S9_25_1659.tif	604587.74	757672.09	10525.87
ET1.5_S9_25_1660.tif	607965.56	757457.74	10531.74
ET1.5_S9_26_1680.tif	540897.75	766860.46	10527.52
ET1.5_S9_26_1681.tif	545154.19	766837.59	10522.06
ET1.5_S9_26_1682.tif	549424.51	766818.17	10525.47
ET1.5_S9_26_1683.tif	553737.26	766811.28	10524.54
ET1.5_S9_26_1684.tif	558025.41	766854.66	10525.24
ET1.5_S9_26_1685.tif	562319.54	767025.97	10530.73
ET1.5_S9_26_1686.tif	566643.27	767135.73	10533.71
ET1.5_S9_26_1687.tif	570960.83	767148.36	10527.54
ET1.5_S9_26_1688.tif	575278.77	767180.85	10532.91
ET1.5_S9_26_1689.tif	579637.74	767276.99	10524.99
ET1.5_S9_26_1690.tif	584007.87	767455.68	10531.76
ET1.5_S9_26_1691.tif	588359.29	767639.24	10530.51

Label	X/Easting	Y/Northing	Z/Altitude
ET1.5_S9_26_1692.tif	592737.27	767723.56	10521.86
ET1.5_S9_26_1693.tif	597153.36	767815.60	10522.55
ET1.5_S9_26_1694.tif	601522.63	767915.79	10526.12
ET1.5_S9_26_1695.tif	605927.12	767937.66	10513.47
ET1.5_S9_26_1696.tif	610317.55	767910.81	10522.04
ET1.5_S9_27_1714.tif	538310.03	775575.97	10509.62
ET1.5_S9_27_1715.tif	543115.33	775604.96	10505.21
ET1.5_S9_27_1716.tif	547867.92	775477.19	10511.35
ET1.5_S9_27_1717.tif	552579.85	775356.01	10508.91
ET1.5_S9_27_1718.tif	557223.22	775316.51	10514.62
ET1.5_S9_27_1719.tif	561763.57	775333.96	10515.06
ET1.5_S9_27_1720.tif	566261.85	775361.59	10513.26
ET1.5_S9_27_1721.tif	570388.83	775391.17	10517.81
ET1.5_S9_27_1722.tif	574380.05	775417.40	10515.87
ET1.5_S9_27_1723.tif	578326.44	775450.86	10521.31
ET1.5_S9_27_1724.tif	582289.96	775490.61	10520.18
ET1.5_S9_27_1725.tif	586189.88	775527.50	10518.29

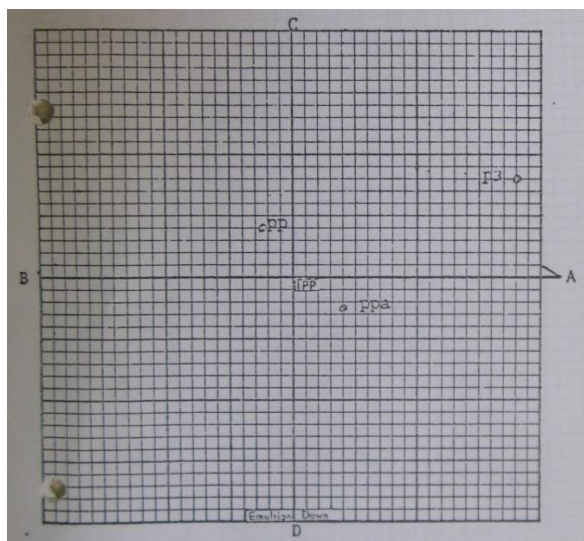


Figure S3. Fiducial mark orientation of KC-1(B) camera used to acquire the 1967 HAPs (source: picture taken from the calibration certificate document inside Ethiopian Geospatial Information Institute).

Table S5. Fiducial point coordinates of KC-1(B) camera used to acquire the 1967 HAPs (mm)

Point	X	Y
A	120.428	0.000
B	-117.419	0.000
C	0.006	117.465
D	-0.006	-117.596
Principal point	0.009	0.009
Principal point symmetry	0.020	0.006
Principal point auto collimation	0.015	0.023

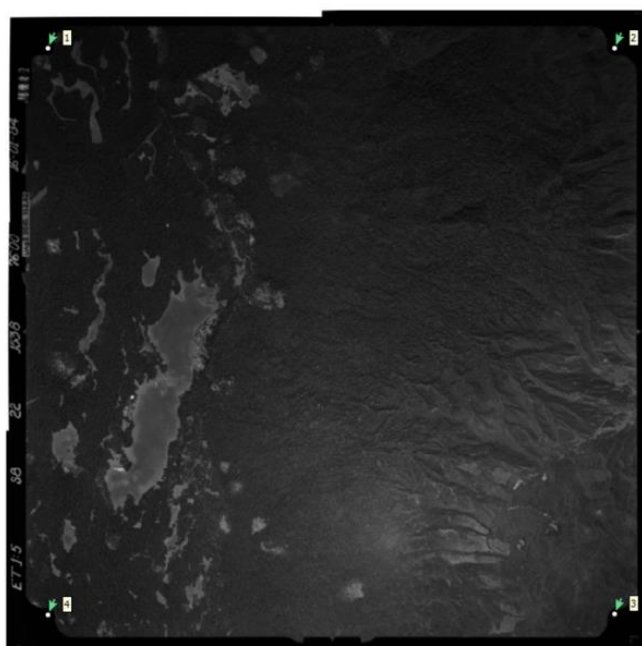


Figure S4. Fiducial mark orientation of Wild RC 10 camera, UAG II 3045 used to acquire the 1984 HAPs (source background: Ethiopian Geospatial Information Institute).

Table S6. Fiducial point coordinates of the Wild RC 10 camera used to acquire the 1984 HAPs (mm)

Point	X	Y
1	-105.997	+106.00
2	+105.994	+106.00
3	+106.005	-106.006
4	-106.001	-105.997
Fiducial centre	0.000	0.000
Principal point symmetry	-0.013	+0.008
Principal point auto collimation	+0.012	-0.006

Table S7. Ground control points used for processing historical aerial photographs for the years 1967 and 1984 using the Adindan UTM Zone 37 North reference system

1967				1984			
Label	X/Easting	Y/Northing	Z/Altitude	Label	X/Easting	Y/Northing	Z/Altitude
GCP 1	542670.00	760290.00	2927.0	GCP 1	590007.61	754371.54	4284.0
GCP 2	573896.65	762188.10	3784.0	GCP 2	604782.00	748797.00	3487.0
GCP 3	590007.61	754371.54	4284.0	GCP 3	541486.73	745287.65	2906.9
GCP 4	598370.00	754695.00	4026.0	GCP 4	563715.72	742751.64	1894.3
GCP 5	577668.72	742529.64	2309.4	GCP 5	543127.73	733679.65	2168.0
GCP 6	574836.00	748778.00	3284.0	GCP 6	577409.15	748680.23	3047.0
GCP 7	563965.72	738686.64	1807.0	GCP 7	595504.13	735689.24	2479.0
GCP 8	554858.73	739177.65	2480.2	GCP 8	547946.00	773026.00	2492.0
GCP 9	554497.00	749063.00	2698.0	GCP 9	573609.00	773443.00	3488.0
GCP 10	545277.00	748360.00	3280.0	GCP 10	606183.00	763414.00	3594.0
GCP 11	542122.73	739019.65	2603.4	GCP 11	594248.78	740548.63	3611.4
GCP 12	551087.73	737187.65	2516.2	GCP 12	554858.73	739177.65	2480.2
GCP 13	604843.71	745305.63	3286.4	GCP 13	557479.72	734734.65	3032.5
GCP 14	604085.70	734959.63	1577.8	GCP 14	551087.73	737187.65	2516.2
GCP 15	594603.71	743598.63	3704.8	GCP 15	571152.72	734271.64	1770.1
GCP 16	543127.73	733679.65	2168.0	GCP 16	585077.71	734716.64	1920.8
GCP 17	545807.73	743245.65	3076.5	GCP 17	560800.72	735135.65	2156.2
GCP 18	550149.73	734102.65	2253.1	GCP 18	603742.12	735542.24	1609.0
GCP 19	571152.72	734271.64	1770.1	GCP 19	559212.72	725877.65	2297.4
GCP 20	584750.71	743716.64	3124.9	GCP 20	582792.71	725097.65	1708.5
GCP 21	585077.71	734716.64	1920.8	GCP 21	570162.72	725669.65	1722.5
GCP 22	607113.70	738426.63	1911.7	GCP 22	594263.70	726911.64	1935.7
GCP 23	560800.72	735135.65	2156.2	GCP 23	603975.70	729614.64	1706.1
GCP 24	608758.12	741019.23	2069.0	GCP 24	539248.73	725519.66	2319.2
GCP 25	596821.14	749115.23	3853.0	GCP 25	607128.11	718891.25	1242.0
GCP 26	562138.17	744357.24	1952.0	GCP 26	575789.14	708745.27	1399.0
GCP 27	590468.17	739349.76	2332.0	GCP 27	544777.18	711893.28	1840.0
GCP 28	595504.13	735689.24	2479.0				
GCP 29	596187.02	756801.59	4131.0				
GCP 30	558209.17	755864.23	3377.0				
GCP 31	589444.14	749070.23	3864.0				
GCP 32	603160.13	756946.22	3718.0				
GCP 33	572718.70	756616.12	3513.0				
GCP 34	586126.24	781658.28	3198.0				
GCP 35	600765.00	788851.00	2538.0				
GCP 36	546048.00	787236.00	2331.0				
GCP 37	547946.00	773026.00	2492.0				
GCP 38	600499.00	774231.00	2964.0				
GCP 39	573057.00	788056.00	3308.0				
GCP 40	573609.00	773443.00	3488.00				
GCP 41	603014.00	763242.00	3672.00				

GCP 42	578731.55	762338.12	3822.00
GCP 43	546273.00	754283.00	3130.00
GCP 44	578344.00	753994.00	3427.00
GCP 45	548203.73	726303.65	2026.80
GCP 46	559212.72	725877.65	2297.40
GCP 47	570162.72	725669.65	1722.50
GCP 48	583102.71	725497.65	1716.00
GCP 49	598316.70	728967.64	1976.90

Table S8. List of filenames and content description used for showing data examples 1 and 2

1967	1984	Content description
File name		
PP_1967.shp	PP_1984.shp	A point shapefile that has easting, northing, and altitude of the exposure station
flight_index_1967.shp	flight_index_1984.shp	A polygon showing coverage of a single aerial photograph and overlap of all historical aerial photographs
DE1_Orthomosaic_1967.tif	DE1_Orthomosaic_1984.tif	Clipped orthomosaic for data examples 1 and 2
DE2_Orthomosaic_1967.tif	DE2_Orthomosaic_1984.tif	
DE1_DEM_1967.tif	DE1_DEM_1984.tif	Clipped elevation data used for volumetric calculation
DE2_DEM_1967.tif	DE2_DEM_1984.tif	

Table S9. The values and settings used for processing the historical aerial photographs in each step

Major steps	Values and settings
Add Photos	Import references
Reference settings	Coordinate system for camera and marker reference: Adindan / UTM Zone 37N (EPSG::20137); Rotation angles: Omega, Phi, Kappa
Camera calibration settings	Camera type: frame; enable rolling shutter compensation: unchecked; film camera with fiducial marks: enabled; focal length: 152.822 mm
Image alignment	Accuracy: highest; generic preselection: yes; reference preselection: source; key point limit: 100,000; tie point limit: 10,000; exclude stationary tie points: checked
Settings for contrast enhancement	Down sampling and denoising
Gradual selection and removal of the outliers and erroneous points	Three-stage selection based on reconstruction uncertainty: 10; reprojection error: 0.57; projection accuracy: 6
Optimisation of the sparse point cloud	Parameters: f, cx, cy, B1, B2, K1, K2, K3, K4, P1, and P2
Dense point cloud generation	Quality: ultra-high; depth filtering mode: aggressive: calculate point colours; checked: calculate point confidence; checked
Dense points cloud classification parameters	Max angle (°): 37.5; max distance (m): 0.5; cell size (m): 30
DEM generation	Source data: dense cloud; Interpolation: enabled; point classes: ground
Calibrate colours	Source data: DEM; calibrate white balance: checked
Orthomosaic generation	Surface: DEM; blending mode: mosaic; enable hole filling checked; refine seamlines: checked