

Information Disorder in Science: The Juvénal Habyarimana case

Jos van Oijen,¹ July 8, 2026

Introduction

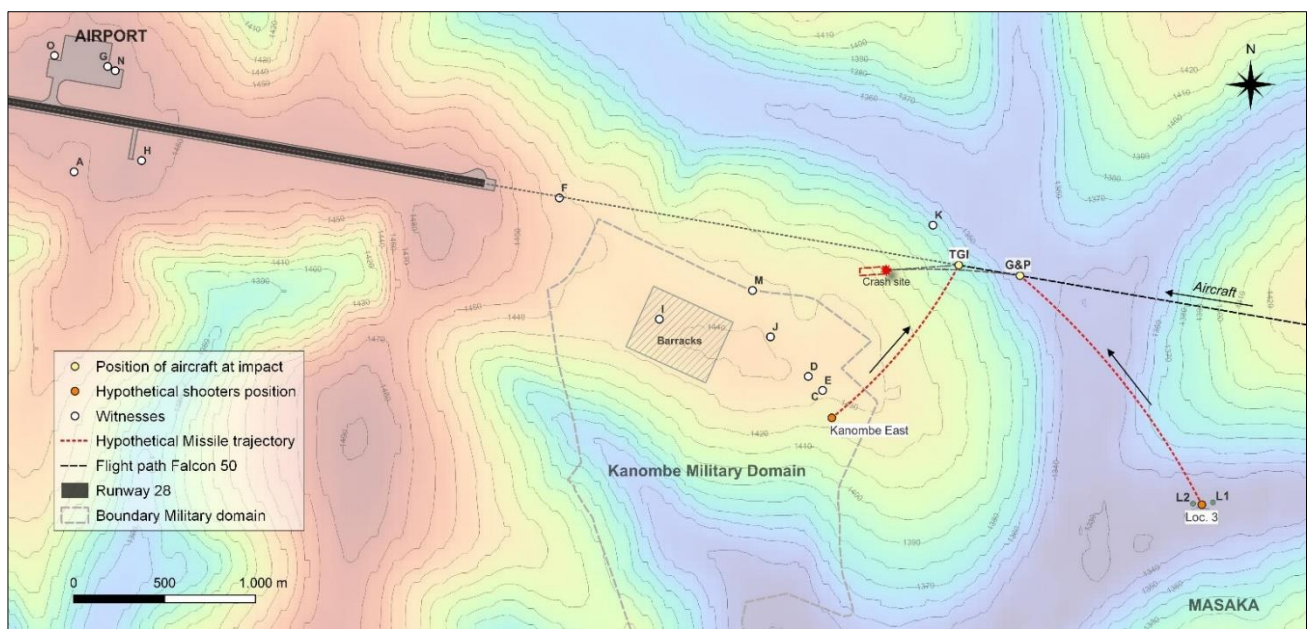
This document addresses the mis- and disinformation in “Inference Accuracy About an Aircraft Crash,” an article by François Graner and Stefano Panebianco about the April 6, 1994, assassination of the Rwandan and Burundian presidents.² Presented as an accuracy discussion to train students’ critical minds, the authors promise to demonstrate *‘the importance and limits of scientific expertise during a judicial process,’* and claim that, according to their calculations, *‘the question of the shooters’ position is still open.’* This promise and the calculations, it turns out, are deceitful.

A brief case history:

On the eve of the genocide against the Tutsi in Rwanda, unidentified assassins shot down President Habyarimana’s private jet, killing everyone on board.³ The genocide against the Tutsi began within hours, prompting commentators to assume a causal link. Speculations about the responsible party – Hutu Power extremists⁴ or Rwandan Patriotic Front rebels⁵ – focused on possible motives and clues such as the shooters’ location and the type of missile used. However, scholars, journalists, and activists intent on proving personal suspicions put the cart before the horse by cherry-picking or fabricating evidence, rather than analysing the facts in context and taking it from there.

The pivotal point was a multidisciplinary forensic investigation commissioned by the *Tribunal de Grande Instances* in Paris (TGI).⁶ This is the *‘scientific expertise during a judicial process’* that G&P refer to. The TGI-project involved six subject matter experts, five of whom spent a week in Kigali on a fact-finding mission under the auspices of two investigating magistrates. The research results were reported in January 2012 and May 2013.⁷

Influential scholars,⁸ convinced that an RPF-commando launched the missiles from a valley north of Masaka Hill, expected the TGI reports to confirm their scenario. To their dismay, the experts refuted it as a technical impossibility.⁹ The rejection should not have come as a surprise, considering that the Masaka hypothesis was introduced on RTLM radio, the infamous Hutu Power propaganda station, on April 13, 1994.¹⁰ Rather than embracing the expert reports,¹¹ the critics targeted some minor details to discredit the entire enterprise.¹² Inference Accuracy follows in their footsteps, albeit with different suspects and in a more “sciency” fashion.



An overview of the situation east of Kigali airport on the evening of April 6, 1994. The hypothetical missile trajectories are displayed on the right. The coordinates of location 3, excluded by the TGI team as a possible shooter’s position, are used for convenience as they mark the area of G&P’s missile launch sites L1 and L2.

The primary difference between the methodologies of the TGI team and its critics lies in the spatial context. The TGI team surveyed the relevant areas around the airport, created a digital terrain model, and used 3D simulations to analyse the data.¹³ Their critics, on the other hand, looked at 2D maps, thereby assuming a flat-earth context.

Because the authors invite ‘feedback on possible mistakes’ (p. 19), I compiled examples of erroneous premises, biased data collection, violations of self-imposed selection criteria, puzzling omissions and inclusions, and misrepresented facts, but the correspondence about these issues only inspired new misinformation.

Examples of misleading and manipulated content are discussed thematically, although the two-dimensional thinking is the common thread that runs through all of them:

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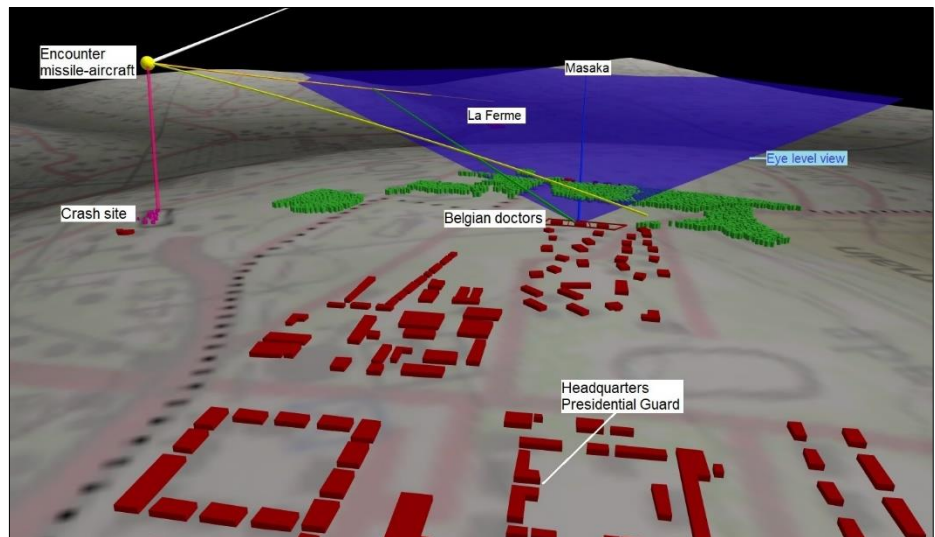
NB: The transcripts of most witness hearings and reports referred to in this document are available on Jacques Morel’s invaluable database <https://francegenocidetutsi.org/att6avril.html.fr>.¹⁴ French and Dutch texts cited in this document were translated by ICTR interpreters or by me.

A few words on methodology:

The competing scenarios were tested using a digital terrain model prepared by the Japan Aerospace Exploration Agency (JAXA) and calibrated with field data published in the TGI reports. The 3D analyses employed profile tools, viewsheds (GDAL and GRASS), intervisibility networks, and a simple 3D model created with the three.js tool in QGIS. The sound factor was analysed with iNoise and OpeNoise. Samples of the results were verified by recalculating them in Excel.

The example shown here is a test of which launch site best fits the observations of reliable witnesses (Belgian doctors) who, looking out the window in the direction of Masaka Hill, saw the missiles pass from right to left.¹⁵

The blue line represents their line of sight, and the blue plane their eye-level view. The yellow line is the trajectory of a missile launched from the shooters’ area in Kanombe as determined by the TGI team.¹⁶ The orange line behind it represents Filip Reyntjens’ alternative launch site at ‘La Ferme’ in the valley.



Conclusion: Missiles from the valley would emerge far left of the line of sight, which is inconsistent with the right-to-left observations. Noteworthy is that the most likely shooters’ position was a ten-minute stroll from the army barracks, a scenario not sufficiently pursued by critics or judges in their search for the ‘truth.’

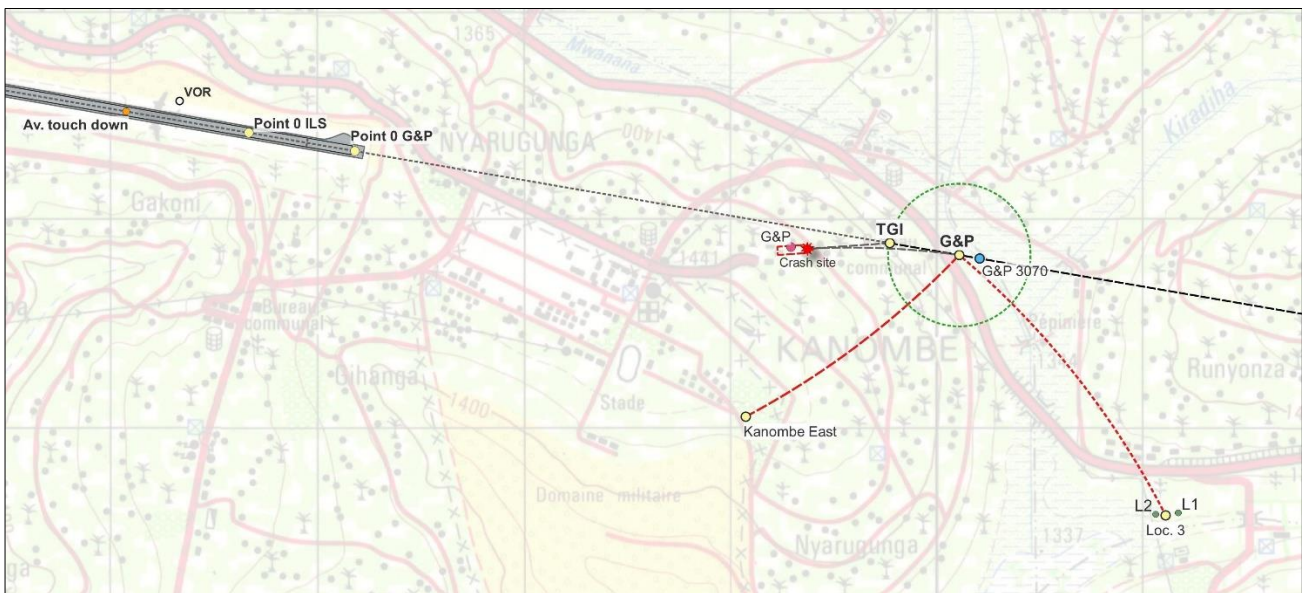
1. Basic Mistakes

Example 1.1

G&P (p. 5): 'In 2012, French investigators combined their own geometrical measurements with the 1994 Belgian report to determine within a few meters the impact position *I* coordinates as $x I = 2160$ m, $y I = -100$ m and $z I = 1410$ m (Ref.12 p. 188, 192).'

Correction: The TGI's team of experts determined the impact position at **X = 2760 m**, not 2160 m.¹⁷ The 2012 experts report mentions it on p. 193, and repeats it in the conclusion on p. C4 (318). However, another error almost canceled it out, reducing the 600 m difference to 80 m, which, apparently, was small enough to go unnoticed.

The first mistake is a typo or the result of foggy glasses, but the second one is caused by using different charts for the instrument approach procedure. G&P rely on a corrected chart from 2006,¹⁸ whereas the TGI team used an older chart, more likely to resemble the information guiding the pilots in 1994.¹⁹ For instance, the Points 0 of the Instrument Landing System (ILS) are 520 m apart, which explains the 80-meter shift (600-520) of the crash location.



Visualisation of this basic error. The TGI team used Point 0 ILS of a 1999 chart, whereas G&P used Point 0 of the 2006 chart. The green circle depicts the 345 m confidence interval of G&P's missile-aircraft encounter 'E'. The original 'E', calculated by the TGI team, is still inside it. Note that Figures 2, 4, and 5 of Inference Accuracy place 'E' at 3070 m (blue dot).

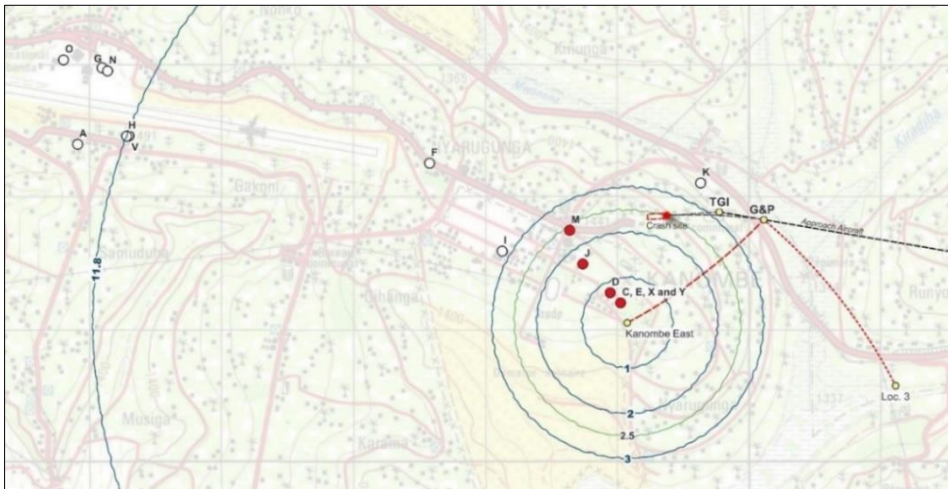
Example 1.2

G & P (p.9): 'Since no witness mentioned any loud sound from missile launching, [...] one can reasonably exclude that a witness has been close to the launching place.'

Correction: All witnesses within a kilometer of the Kanombe site reported loud sounds from missile launches:

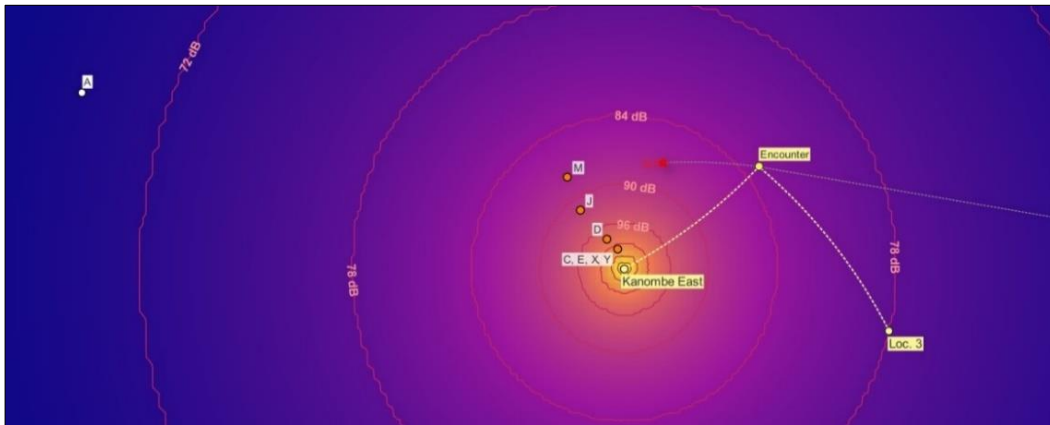
- Witness C described the noise as a rocket-type or missile;²⁰
- Witness D described the noise as rocket launchers;²¹
- Witness E compared the noise to an RPG7 shot;²²
- Witness J compared the noise to mortar fire;²³
- Witness M described the noise as gunshots ("coup de tir");²⁴
- Witness X (C's wife) described the noise as explosions;²⁵
- Witness Y (E's colleague) compared the sound to FNC fire.²⁶

Note that mortar fire, RPG7 shots, etc., are louder than surface-to-air missiles. FNC (gun)shots are comparable.



The circles represent the sound wave, travelling at 343 m/s. The red dots mark witnesses who reported loud noises.

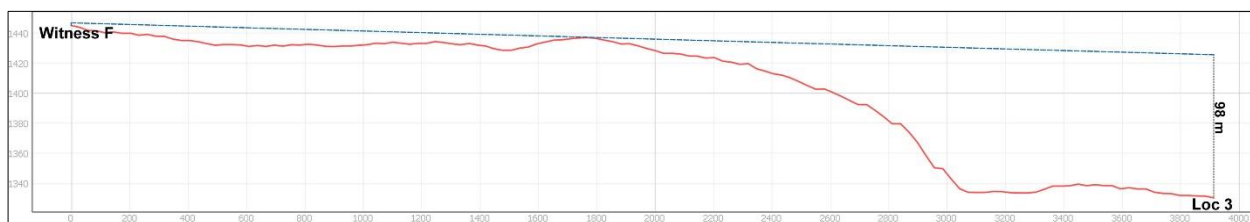
Witness A also reported explosions,²⁷ but he was too far away to connect those noises to the missile launches.



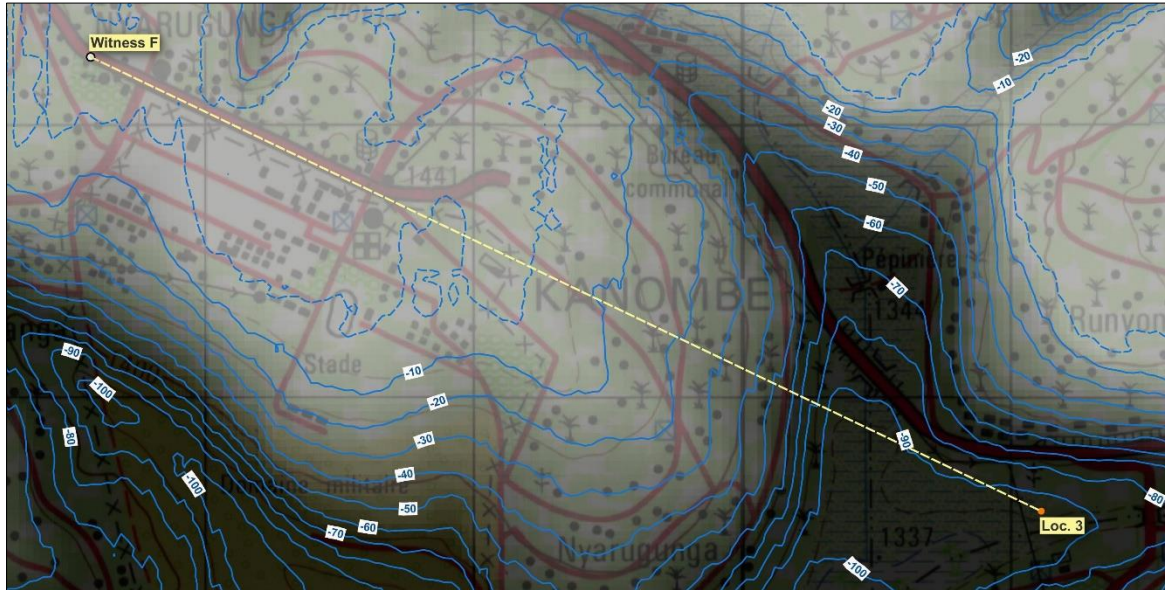
Example 1.3

G&P (p.10): 'Witness F explicitly stated the launching took place near the factory (called "Guttanit"). At that time, the factory was only a $80\text{ m} \times 40\text{ m}$ rectangle [...] centered at $x = 3660\text{ m}$ and $y = -870\text{ m}$. Given that this landmark size was less than 100 m and its distance to the closest other landmarks was more than 300 m , we rather arbitrarily attribute to this indication a confidence interval of 200 m .'

Correction: Witness F could not see the Guttanit factory, nor a launch site in that area.²⁸ These places were hidden from his view in a valley almost four kilometers away.



The same information, but viewed from the top, is displayed on the next page.



Example 1.4

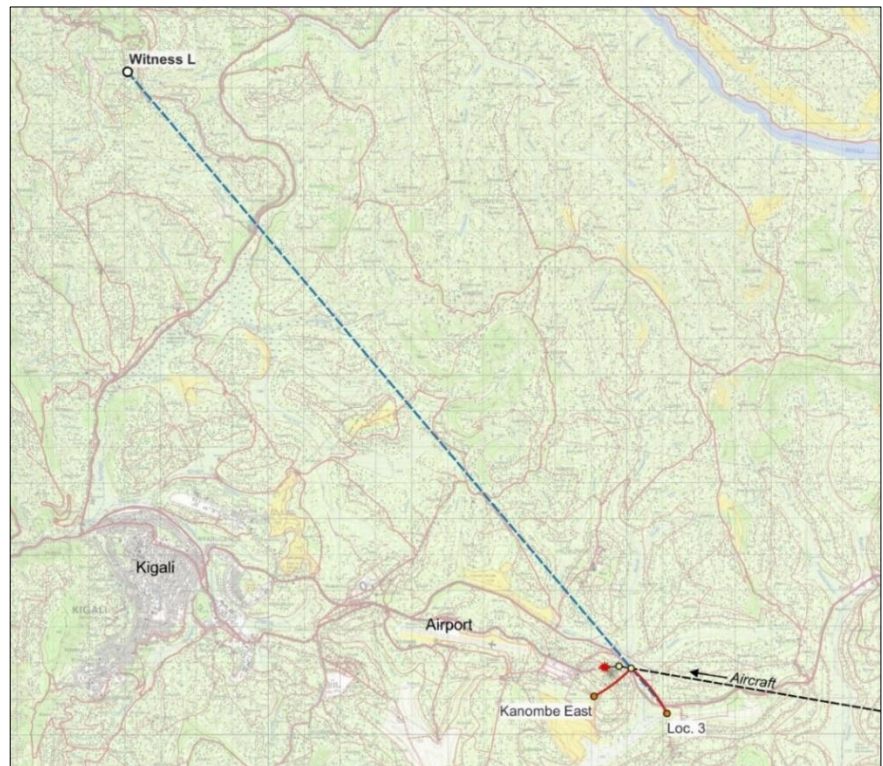
G&P (p. 14): 'Another witness (L) was situated in the direction of North-northwest at 20 km distance from E (off the top of Figs. 4, 5), and indicated: "the origin of the two missiles came from the left to head towards the sky towards the right. The angle of the shot was more or less 70 degrees." (L-1, Ref.9 p. 23).

Correction: Missiles from the Guttanit area would have headed in L's direction. He could not see them moving from left to right.

Witness L's position on a hill,²⁹ 23 kilometers from the Guttanit factory, was higher than the aircraft's altitude. With that perspective, discerning such details as the missile's angle of ascent is not a realistic option.

Witness L's information makes sense if it refers to missile trajectories from Kanombe. The lateral angle would have made them perfectly visible, even from that distance.

Mixing up left and right is a common occurrence and a likely explanation for the confusion.³⁰



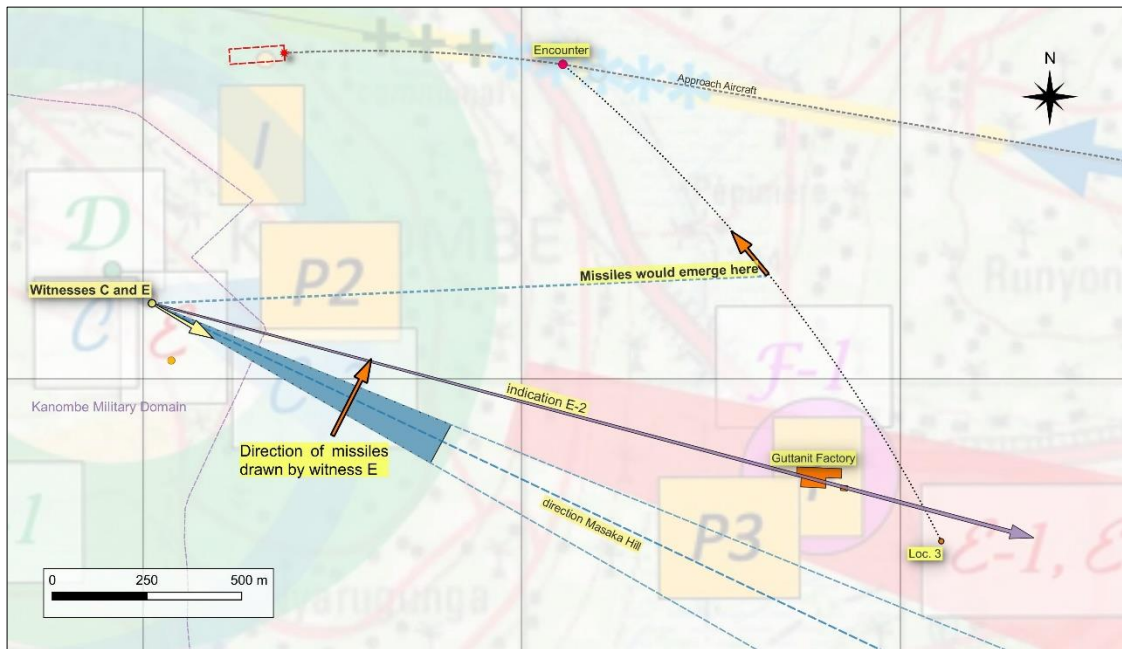
Example 1.5

G&P (p. 4): 'Since E was at C's house [...] and precisely indicates the direction of Masaka valley (E-2), we drew a truncated angular sector originating from C's house (pale red).'

G&P (p. 11): 'But later, during hearings, E accurately reported the direction on a map, while C merely sketched it by hand, thus we attribute a better accuracy and higher weight to E-2 than to C-2.'

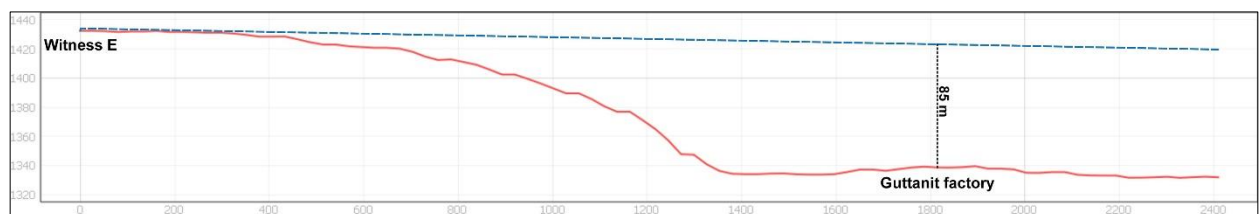
Correction: During his hearings, E indicated the direction of Masaka Hill. The hill is, of course, not the valley to its north. Although indication E-2 is mentioned 13 times in Inference Accuracy, it is not the direction that Witness E reported.

Having georeferenced and digitized E's drawing, I overlaid it on fig. 2 of Inference Accuracy (p. 4) and added other elements.



The blue beam on the left was E's view through the window. The yellow arrow indicates where he saw the missile appear. The orange arrow crossing his line of sight represents the reported direction of the missiles. The combined information makes it clear that indication E-2 and G&P's red 'truncated angular sector' are off the mark. These discrepancies will be explored further in Sections 2 and 4.

Although E-2's direction is clearly incorrect, it may still leave the impression that the witnesses could have seen the missiles moving from right to left in the valley. However...³¹



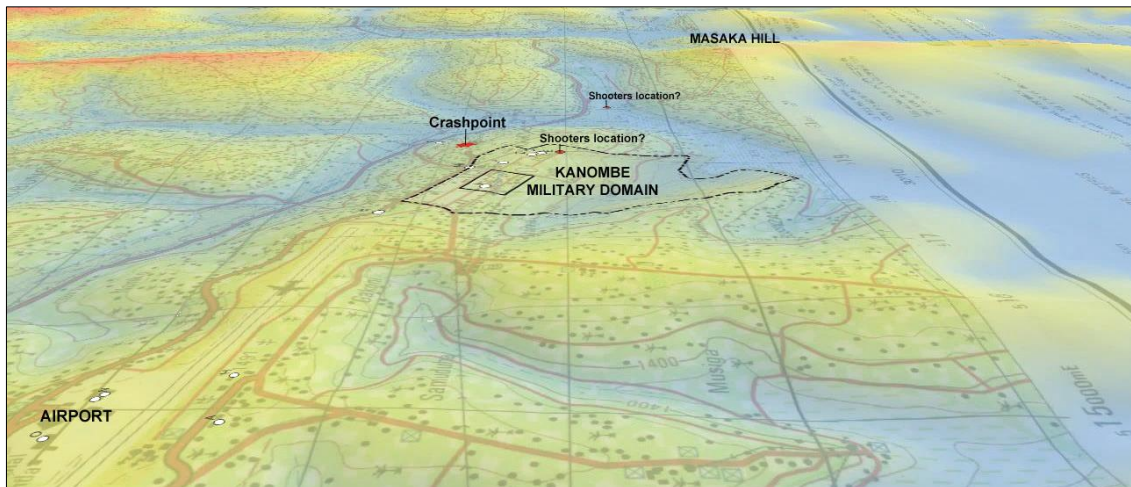
Note that the dashed blue line represents the lowest possible line of sight. The profile graph does not include 'above-ground' obstacles such as woodlots on the edge of the hill and a two-meter-high perimeter wall.

2: The 'flat earth' delusion

Example 2.1

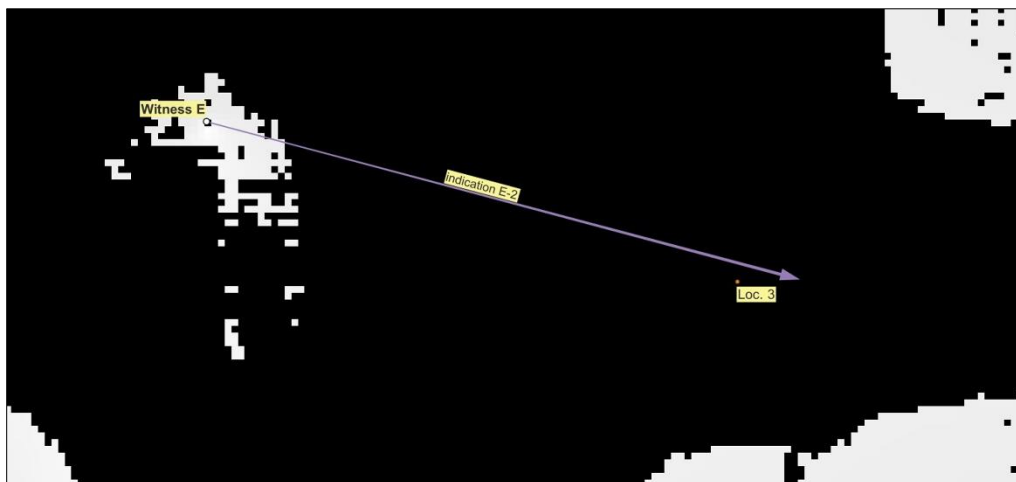
G&P (p. 9): 'determining the position L from where the missiles were launched [...] is a two-dimensional problem.'

Correction: It is, of course, a three-dimensional problem. The case involves an aircraft, hills and valleys, surface-to-air missiles, and, as examples 1.3, 1.4, and 1.5 made clear, witnesses and landmarks at various elevations of the undulating landscape.

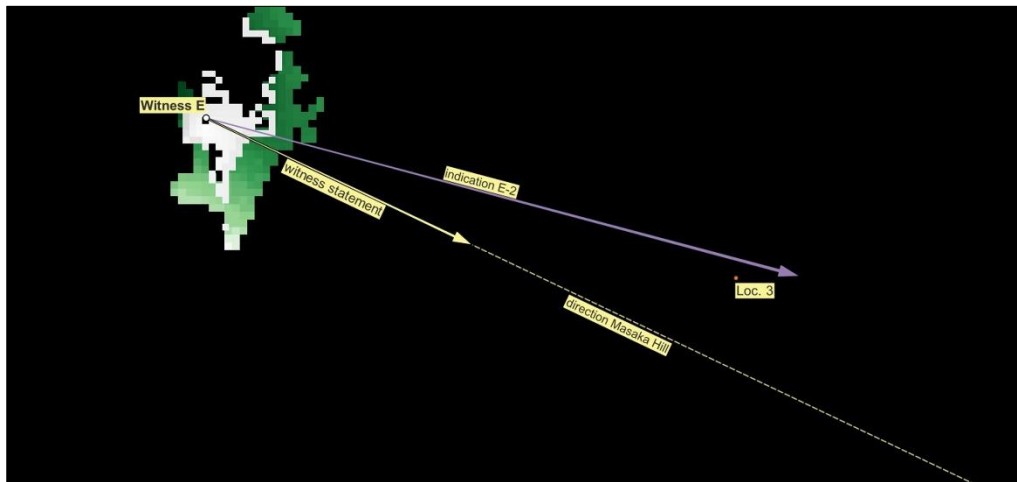


Example 2.2:

To verify what the witnesses could and could not see, several methods were employed, such as the profile graphs in Section 1. In this section, I use Viewshed analyses to get a 360° perspective. Utilizing the elevation data stored in the digital terrain model, viewshed applications determine which areas are visible from a specified coordinate. The viewsheds for Witness E's position confirm that he could not see the valley.

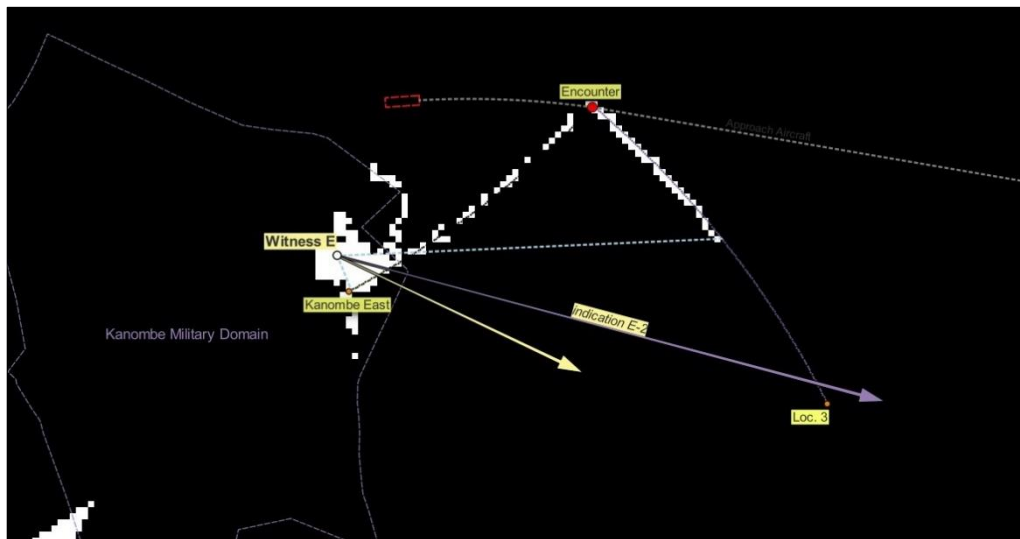


When the visual obstacles (trees and fences) are taken into account, the visible area is reduced to less than 200 m. Hilltops in the distance would be visible (outside the frame of this screenshot), but not the slopes.



Because humans are notoriously bad at estimating distances, especially in the dark,³² E must have seen a missile from Kanombe passing at a distance of 190-200 meters. The alternative: near the church on Masaka Hill, 4.8 kilometers away, or somewhere in between, would be inconsistent with the sound-light sequence.

If we go a step further and add the altitudes of ascending missiles to the elevation data, the viewshed reveals what the witness could have seen of the hypothetical missile trajectories. The first half of the Guttanit missiles would have been invisible.



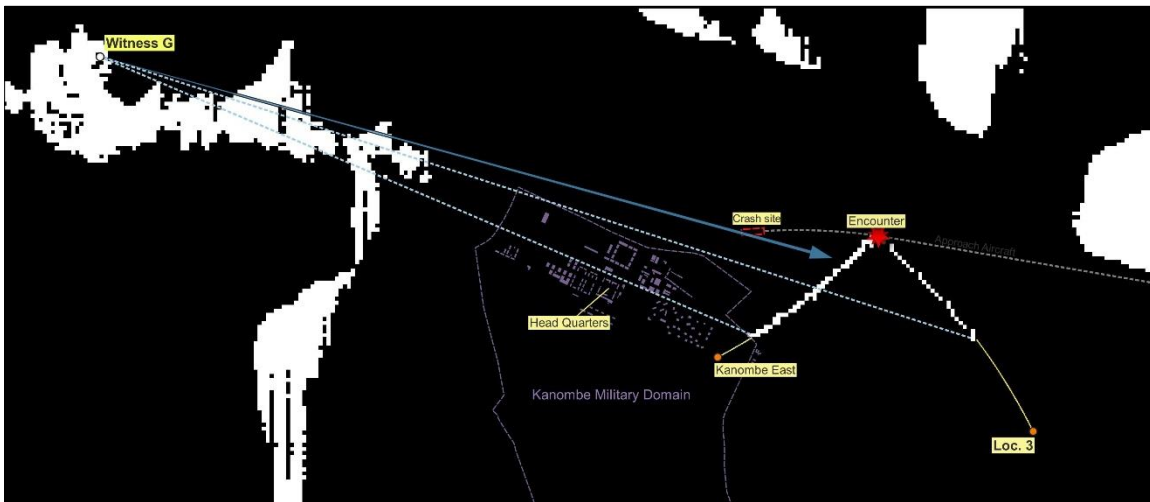
Applying the Viewshed method to indications ascribed to witnesses at the airport yields similar results. Two examples are discussed on the next page.

Examples 2.3 and 2.4

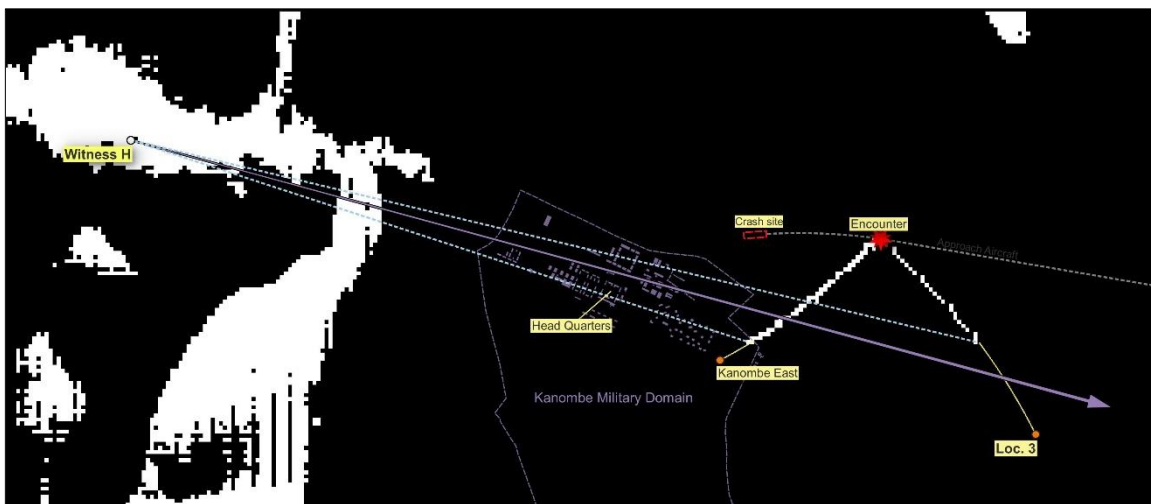
G&P (p. 12): 'Some indications have less importance; for instance, the witnesses placed at or near the airport saw both Kanombe military camp and Masaka in the same direction, thus their direction indications (H-1. G-1) do not discriminate.'

Corrections: Like witnesses F, C, and E in the previous examples, G and H could not see the possible launch sites. However, because the Guttanit area was 100 m lower than the military camp, missiles from these locations would have emerged in different directions.

Additionally, indication G-1 does not point in the direction of the military camp or 'Masaka,' but in the direction of the crash site.



Witness H did indicate the direction of the military camp. The viewshed confirms that a missile from Kanombe East would have been visible in that direction. However, a missile from the valley would not emerge in the same direction. In both these cases, half the trajectory would be obscured in the valley.



Conclusion: Real-world observations should not be interpreted in a 2D context.

3. Misinformation about the sound factor

Example 3.1

G&P (p. 10): ‘three indications (A–1, B–1, C–1), mentioned a specific time sequence: these witnesses have heard a noise before they have seen the upper part of the missile trajectories.’

Correction: Not three, but eight witnesses mentioned the time sequence. Witnesses A and B are outliers, located far from the events (A was 5.3 kilometers from the encounter, and B 7.2 kilometers).

Curiously, on page 10, G&P propose an equation to identify ‘sound-light’ sequence witnesses: $LE/LW > MA$ (LE is the distance Launch site-Encounter; LW is the distance Launch site-Witness; $MA = 2$).

The equation returns seven positive results for a missile launch in Kanombe, all within 600 m from the source, and none for a launch in the valley:

Code TGI	G&P	LW1 (KanE)	LE (TGI)	LE _{TGI} /LW1	>2	LW2 (Loc3)	LE (G&P)	LE _{G&P} /LW2	>2
1	H	4050	1297	0,32	N	6128	1559	0,25	N
2	-	500	1297	2,59	Y	2488	1559	0,63	N
3	J	559	1297	2,32	Y	2544	1559	0,61	N
4	F	1926	1297	0,67	N	3914	1559	0,40	N
5	M	825	1297	1,57	N	2736	1559	0,57	N
6	-	4556	1297	0,28	N	6561	1559	0,24	N
7	G	4426	1297	0,29	N	6479	1559	0,24	N
8	-	4589	1297	0,28	N	6665	1559	0,23	N
9	K	1196	1297	1,08	N	2128	1559	0,73	N
10	I	1093	1297	1,19	N	3152	1559	0,49	N
11	-	4719	1297	0,27	N	6777	1559	0,23	N
12	B	6510	1297	0,20	N	8551	1559	0,18	N
name	E	159	1297	8,16	Y	2177	1559	0,72	N
name	C	159	1297	8,16	Y	2177	1559	0,72	N
name	(Y)	159	1297	8,16	Y	2177	1559	0,72	N
name	(X)	159	1297	8,16	Y	2177	1559	0,72	N
name	D	262	1297	4,95	Y	2276	1559	0,68	N
-	L	21703	1297	0,06	N	23341	1559	0,07	N
-	(V)	4035	1297	0,32	N	6112	1559	0,26	N
-	A	4380	1297	0,30	N	6464	1559	0,24	N
-	N	4378	1297	0,30	N	6432	1559	0,24	N
-	O	4719	1297	0,27	N	6777	1559	0,23	N

G&P’s method refutes Pair 1 (A and B). It also produces false negatives (M and I). The TGI calculation seems more reliable: $\frac{d}{v} < t$, where d is the distance witness-source, v is the speed of the sound wave (343 m/s), and t is the duration of the missile trajectory. In the case of an SA-16 trajectory, t is the sum of three phases:

- t1: The ejection phase, which the TGI team estimated at **0.4** seconds.
- t2: The acceleration phase, according to G&P, took **2.0** seconds (p. 16, table 2).
- t3: The remaining trajectory is 607 m for a launch from Kanombe East and 869 m for a launch from Loc 3. At Mach 2, these distances are covered in **0.885 s** (Kanombe) or **1.267 s** (Loc 3).

Thus $t = 0.4 + 2.0 + 0.885 = \mathbf{3.285\ s}$ for Kanombe, and $0.4 + 2.0 + 1.267 = \mathbf{3.667\ s}$ for the Masaka valley.

Code TGI	G&P	d (Kan)	v	d/v	< t	d (Loc3)	v	d/v	< t
1	H	4050	343	11.81	N	6128	343	17.87	N
2	-	500	343	1.46	Y	2488	343	7.25	N
3	J	559	343	1.63	Y	2544	343	7.42	N
4	F	1926	343	5.62	N	3914	343	11.41	N
5	M	825	343	2.41	Y	2736	343	7.98	N
6	-	4556	343	13.28	N	6561	343	19.13	N
7	G	4426	343	12.90	N	6479	343	18.89	N
8	-	4589	343	13.38	N	6665	343	19.43	N
9	K	1196	343	3.49	N	2128	343	6.20	N
10	I	1093	343	3.19	Y	3152	343	9.19	N
11	-	4719	343	13.76	N	6777	343	19.76	N
12	B	6510	343	18.98	N	8551	343	24.93	N
+	E	159	343	0.46	Y	2177	343	6.35	N
+	C	159	343	0.46	Y	2177	343	6.35	N
+	(Y)	159	343	0.46	Y	2177	343	6.35	N
+	(X)	159	343	0.46	Y	2177	343	6.35	N
+	D	262	343	0.76	Y	2276	343	6.64	N
-	L	21703	343	63.27	N	23341	343	68.05	N
-	(V)	4035	343	11.76	N	6112	343	17.82	N
-	A	4380	343	12.77	N	6464	343	18.85	N
-	N	4378	343	12.76	N	6432	343	18.75	N
-	O	4719	343	13.76	N	6777	343	19.76	N

This way, we get nine positive results, two of which are uncertain. Witness X was interviewed 17 years after the facts. By that time, she was unsure about the sequence. Witness 2 was not asked about it, so we do not have his information.

Conclusion: At least seven witnesses, located within 1.1 kilometers of Kanombe East, mentioned the sound-light sequence. In contrast, G&P only refer to Witness C and the outliers A and B.

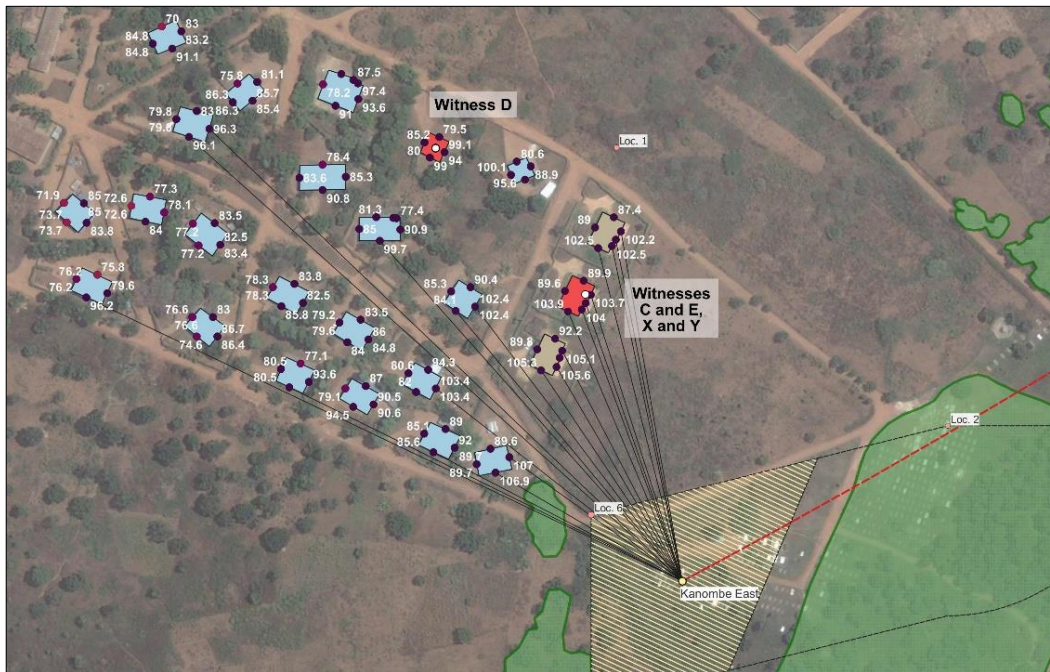
Example 3.2:

G&P (p. 9): *One mission of the acoustics expert was to determine how the sound amplitude decreases with distance (Ref.12 p. 224). His conclusion was that the missile launching sound amplitude was perceived as 160 dB near the launching place. 133 dB at 80 m. 125 dB at 200 m. 104 dB at 2100 m (Ref.13 p. 18).'*

Correction: Due to a calculation error, the sound pressure levels were overestimated. The correct values are: 111 dB (at 79 m). 103 dB (at 203 m) and 82 dB (at 2177). It is unclear why G&P altered the cited data.

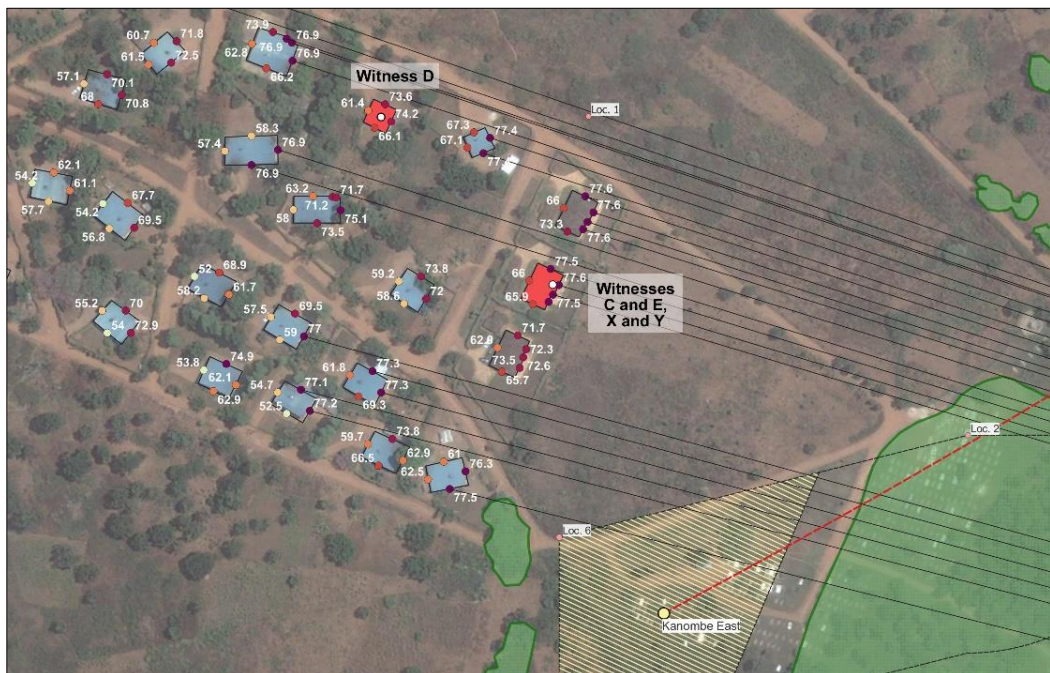
These values are 'free-field', which accounts for air absorption, but not the other attenuation factors. The acoustic supplement notes: 'Given the slope of the terrain and the uneven absorption of the terrain along the path, caution should be exercised when interpreting the calculated values, particularly for positions 3 and 4.'³³

Calculating precise values of noise exposure is a complex and time-consuming procedure, best left to experienced scientists of outdoor acoustics. However, for the purpose of evaluating witness accounts, a reasonable approximation will suffice. Perceptions of loudness double when sound intensity increases by 10 dB and vice versa.³⁴ This relation can serve as a rule of thumb. Fortunately, computer models have been developed that fairly accurately predict noise exposures under various circumstances.³⁵ For the examples below, I used iNoise, a DGMR Software program that runs several sophisticated models, and the more basic OpeNoise tool in QGIS.



These screenshots display OpeNoise predictions of sound pressure levels (dBA) in the French Quarter of the Kanombe Military Domain, overlaid on a 2010 satellite image.

On top: The 104 dB and 99 dB at the facades of the witness locations (marked red) are for a missile launch at Kanombe East. These values represent (very) loud noises.



The second image displays the dB levels for a missile launch in the valley, at 77.6 dB and 74.2 dB. These values indicate that the noise would be perceived as 1/6 as loud as in the Kanombe East scenario; still louder than a conversation but not so loud as to have startled the witnesses.

NB: The hatched yellow area represents the shooters' location as the TGI team defined it. The green surface represents the woodlot in 1994.

The iNoise predictions, using the ISO 9613-2:2024 calculation, are 4-8 dB lower. This is caused by the elevation differences across the terrain (hills and valleys), a factor not calculated in the OpeNoise model.

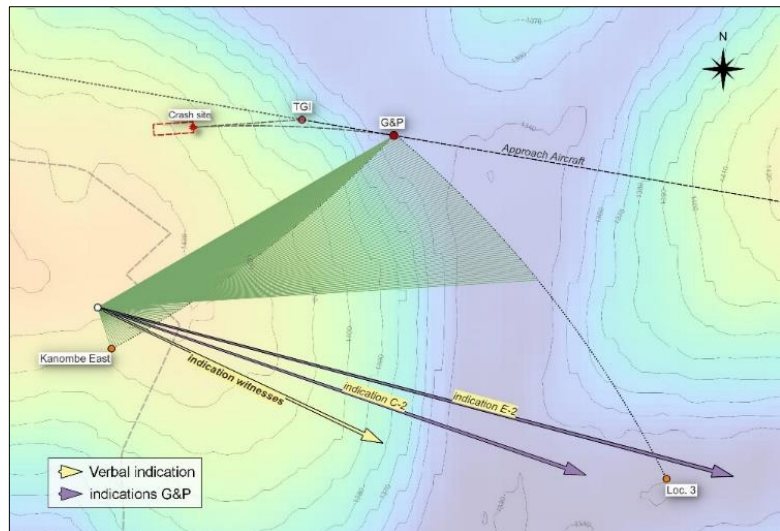
At the airport, OpeNoise predicts levels around 70 dB for missile launches in Kanombe East. iNoise predicts 67 dB or lower, 1/10 of the loudness perceived by witnesses near the source. For launches in the Masaka valley, iNoise predicts levels of 63 dB or less at the airport. These values represent moderate sound levels, unlikely to be interpreted as explosions in the vicinity of the receivers.

4. Distorted witness accounts

The previous sections revealed some questionable departures from the facts in Inference Accuracy. This section examines if and how such practices affected the dataset used to triangulate the launch location.

G&P selected eight witness indications for the dataset. To verify those indications, I used an application that creates intervisibility networks. The advantage of this tool, compared with viewsheds, is that it checks for unobstructed visibility between the observer point and a range of 3D point vectors, which in this case are placed at ten-meter intervals along the missile trajectories.

The first example is already familiar from examples 1.5 and 2.2. Indications C-2 and E-2 were found to be incorrect. This is confirmed by the intervisibility networks (green lines). Yet both were included in G&P's dataset.

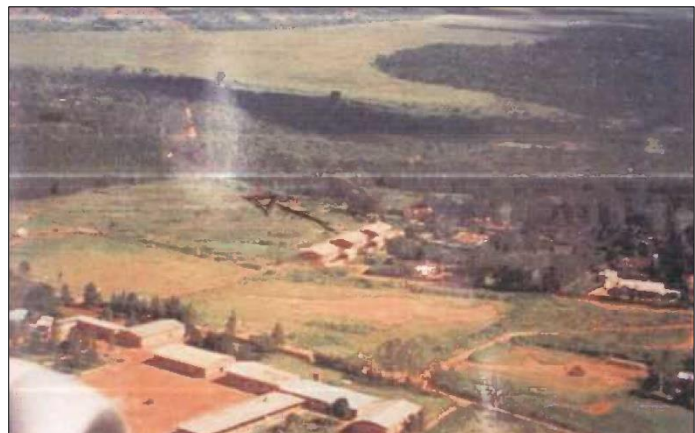


Examples 4.1 and 4.2: Witnesses C and E (and X, and Y) ³⁶

G&P (p.11): *'Directions indicated by C-2, E-2. [...] are drawn by us according to their indications.'*

Correction: In their statements of 1994 and 2011, witnesses C and E consistently reported the direction of Masaka Hill, not the northern valley as G&P claim.

In 1994, Witnesses C, E, and Y reported their observations to investigators in Belgium. In 2011, they and Witness X were heard in France. Their indications were documented in signed transcripts, sketches, and aerial photographs.³⁷ In 2013, Witness Y recalled her experience on camera in the RTBF documentary "Rwanda: L'enquête manipulée."



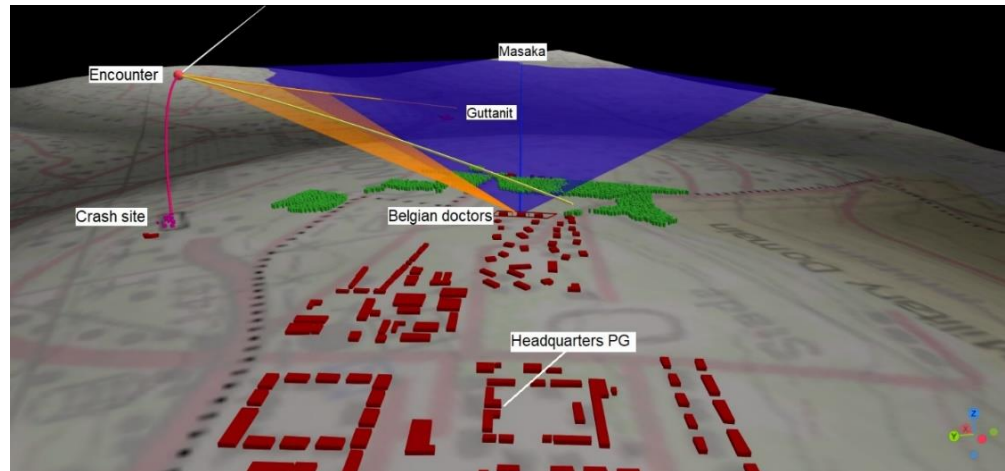
Remarkably, their statements have since been distorted by prominent scholars, ignored by revisionists, and framed as propaganda by renowned journalists. Now they are misrepresented by physics professors. So, here is a final recap: Witnesses C, E, X, and Y were at the dinner table in C and X's house. C and E, who faced the window oriented toward Masaka Hill, saw the missiles passing from right to left. Witness Y, seated across the dinner table with her back to the window, heard the noises on her left, moving to her right, which corroborates the visual

observations.³⁸ Witness Y heard the noises behind her, indicating the bottom of the garden in the direction of the Nyaborongo valley, which is on the west side of Masaka Hill. C gave the same direction.

Adjusting the 3D model to G&P's suggestions, the encounter position moves back a few hundred meters, and the alleged launch location moves forward in relation to Reyntjens' La Ferme scenario (see page 2). However, the argument remains the same.

Seen from C and E's position, missiles from the valley would still emerge too far left of their line of sight.

The intervisibility network for the Guttanit scenario, shown in orange here for contrast, emphasizes the fact that missiles from that direction were never going to cross the line of sight.



Example 4.3: Witness J

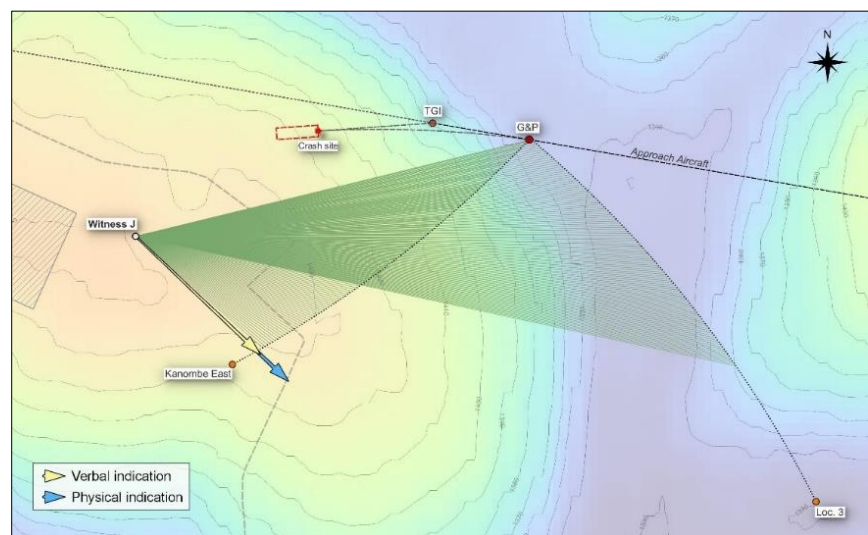
G&P (p. 10): 'From tens of visual indications (not shown), we have extracted a subset of 8 indications which obey all the following criteria: First, the witness position should be clearly known; Second, the direction details (whether by words, gesture or drawing) are known with enough accuracy to be used quantitatively; Third, the indication should unambiguously point at the launching L, without confusion with encounter E or impact I.'

Correction: Only one of the eight selected witness indications meets these criteria: indication J-1. Ironically, G&P regard J-1 as 'the most distant outlier' in their dataset.

Witness J's verbal and physical indications are aligned, leaving no room for confusion. This indication obeys all of G&P's selection criteria and points in a direction very close to a launch site.

The intervisibility network confirms that the witness could have seen what he told the investigators.

Treating J-1 as an outlier and removing it from the triangulation (p. 11) has a significant impact on the result, as in its absence, the launch location moves into the valley towards the Guttanit area.



Example 4.4: Witness I

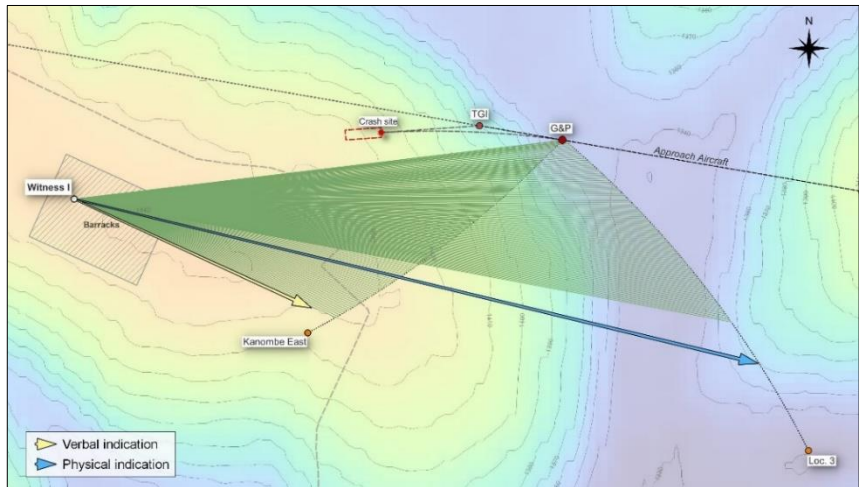
G&P do not discuss Witness I separately, but they assign a higher accuracy to indication I-1 than to four of the other indications.

This is problematic because I-1 does not obey the selection criteria. It does not point to a launch site and its accuracy is unclear because it deviates from the verbal indication. Moreover, the TGI team wrote in their 2012 report that they found it difficult *'to determine whether he is referring to the moment a shot was fired or the moment the plane exploded'*. Despite these uncertainties, I-1 still made it into the triangulation dataset

One of the neglected details of Witness I's hearing is a notable fact.

During his on-site interview, he resolved the confusion by taking the investigators to the indicated site: the cemetery between the residences of the Belgian doctors and the woodlots on the edge of the hill (yellow arrow).

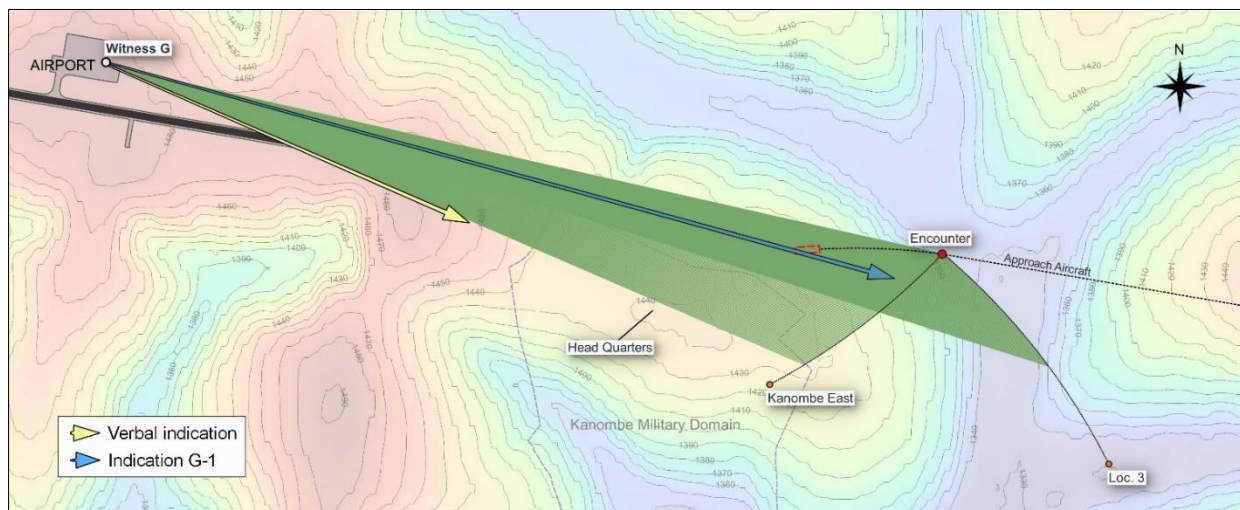
It would seem that bringing investigators to the indicated site is very specific. The intervisibility network confirms that the witness could have seen the missiles in that direction, but this indication is absent in G&P's dataset.



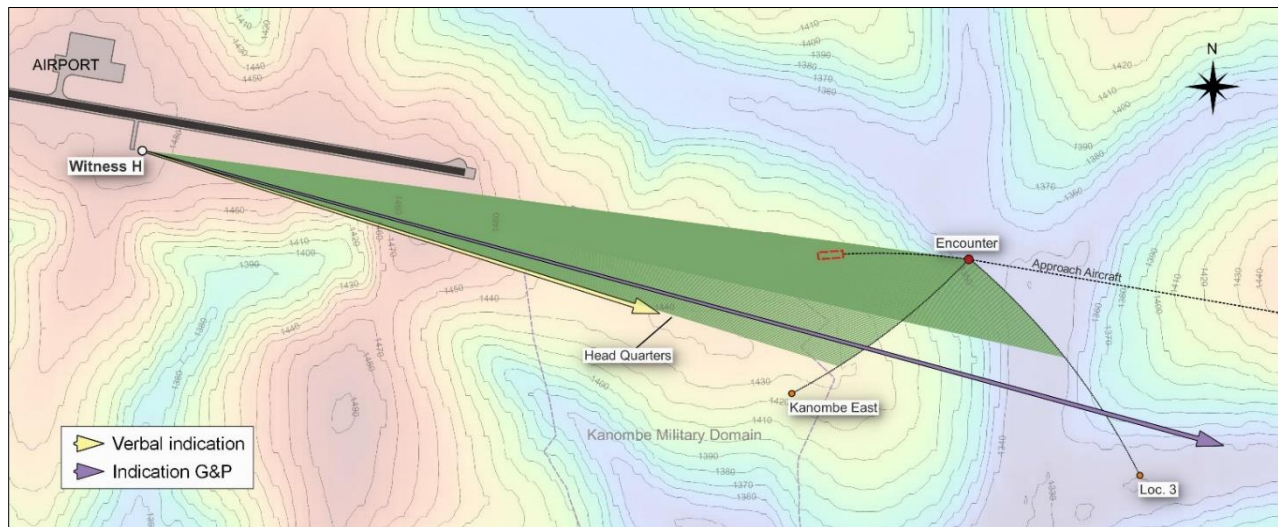
Examples 4.5 and 4.6: Witnesses G and H

The intervisibility networks for Witness G and Witness H confirm a trend of omitting accurate verbal indications in favour of inaccurate or unclear physical directions.

In the case of Witness G, the physical indication points in the direction of the crash, or a launch site near the Habyarimana residence, both of which violate the third selection criterion.



Witness H:

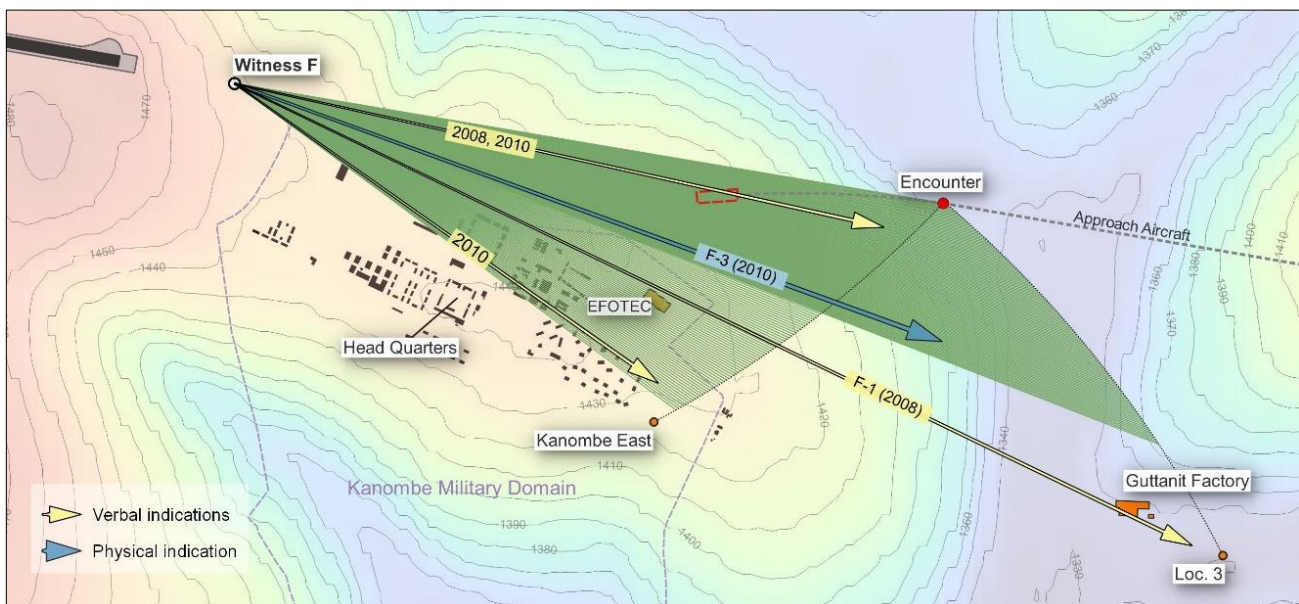


Example 4.7: Witness F

G&P (p. 10): ‘The third criterium happens to exclude all witnesses who place L near I, i.e. at the fence of the President’s residence.’

Correction: During his on-site hearing in 2010, Witness F located the launch site at or near the Habyarimana residence. Despite this violation of their third criterion, G&P did not exclude him.

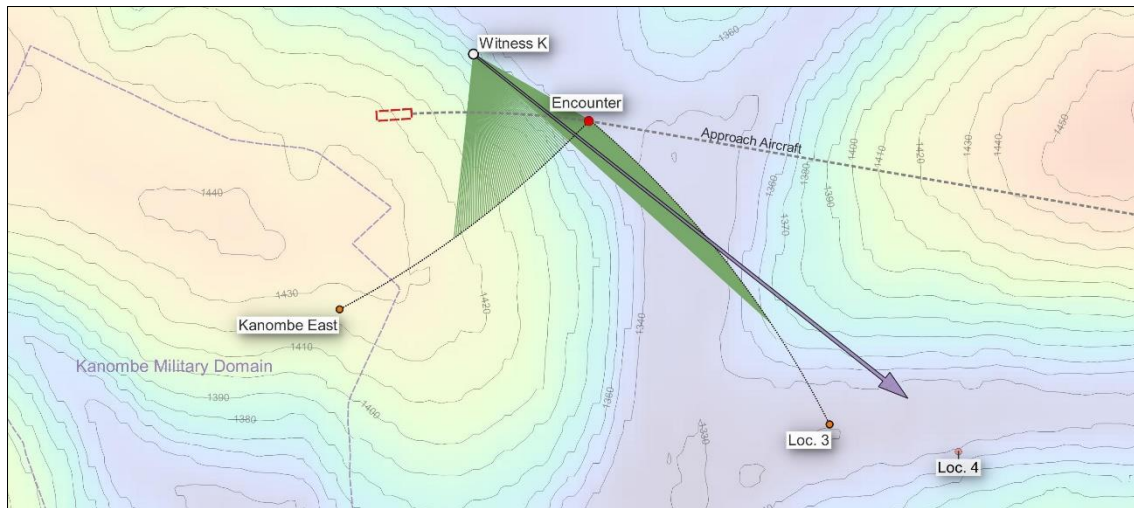
The reason may be the multiplicity of indications to pick and choose from. G&P refer to F-1 as a reliable launch site indication (p. 4), but switch to F-3 in section 3B, although F-3 points to nowhere in particular. A fourth direction, let’s call it F-4, is where the witness located the residence: “south of the military camp, below the EFOTEC school,” which broadly points in the direction of Kanombe East.



It's hard to make sense of F's indications. The only useful information that could be derived from his statements is what he saw in the sky: the relative movements of the aircraft and the missiles. According to F, the missiles approached the aircraft from a frontal angle, which would exclude missiles launched from the valley.

Example 4.8: Witness K

The final witness in the dataset is Witness K.



Witness K's position was not clearly known (G&P use an arbitrary 140 m circle), and indication K-1 points to La Ferme (Loc 4), another potential shooter's position examined and rejected by the TGI team.

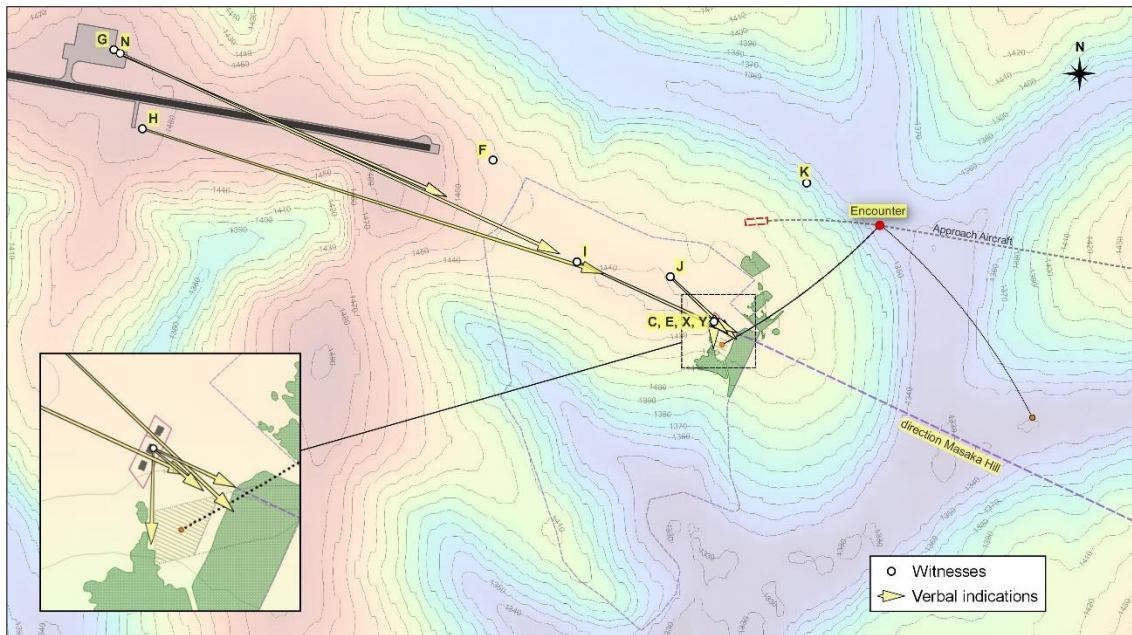
Conclusion: These “lessons for pedagogical purposes,” as G&P call them (p. 17), are not examples of teaching students the scientific method. Quite the opposite.

Of the eight witness indications selected for triangulating the launch site, six are inaccurate. They do not obey the selection criteria and do not point in the direction of a suggested launch site. Another one (K) pointed to a different launch site. The only indication that obeyed all selection criteria (J-1) was treated as an outlier and removed, which served the purpose of arriving at a site in the valley. These decisions suggest that inaccurate indications were hand-picked to validate a preconceived conclusion.



Verbal witness indications that fairly accurately point in the direction of Kanombe East or its vicinity should have been compared with the indistinct physical indications to evaluate their worth. Instead, the verbal indications, the

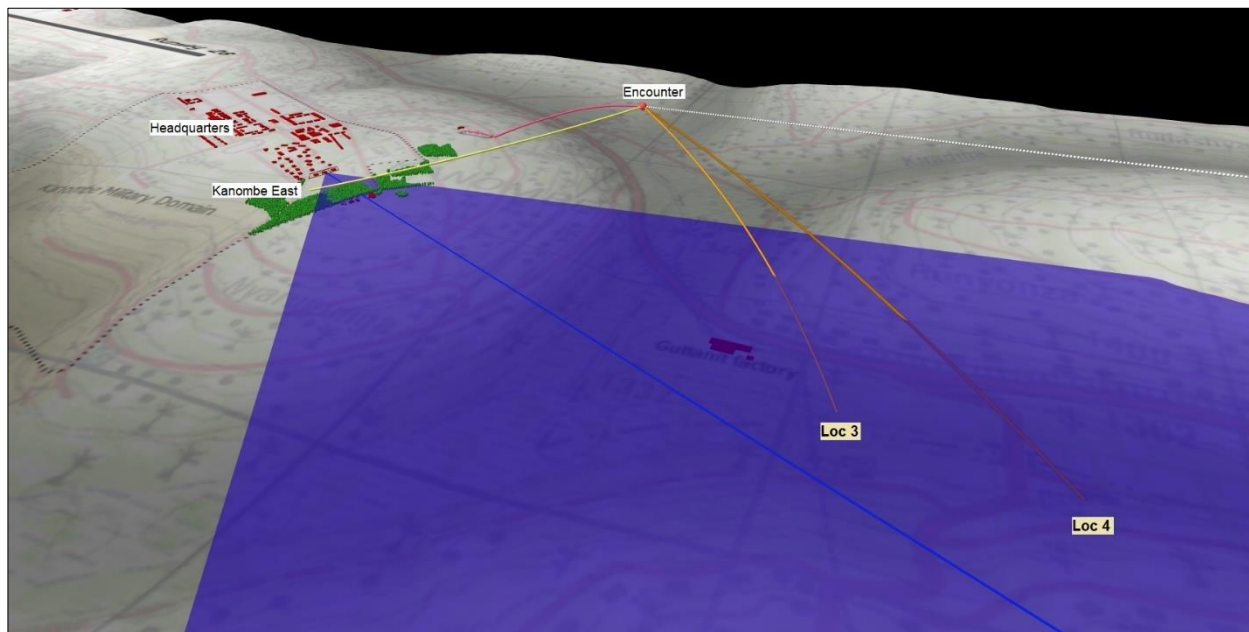
sketches documenting them, a witness showing the investigators the indicated launch site, etc., were either omitted or distorted in Inference Accuracy.



The discussions of the sound factor in Inference Accuracy and the treatment of the sound-light sequence can be understood in the same context.

Discussion

G&P justify their focus on the encounter position E by pointing out its influence on determining the missile launch position and the missile trajectory (p. 17). However, shifting the encounter position has no impact on these aspects. Missiles from the valley would still approach the aircraft from the rear, causing different damage than observed, and the witnesses would still see them appear in directions that are different from what they reported.



The reasons given by the TGI team for excluding the launch sites in the valley were not limited to witness statements. For instance, when G&P suggest the possibility of *'larger damages by the missile on the left engine than to the right one'* (p. 7), they omit the inspection of the debris. The TGI team found no evidence of damage on the jet engines caused by a missile explosion, nor on the tail or the hind part of the fuselage.³⁹

The experts did report evidence of an explosion in the left wing, which could not have been caused by a missile from behind, or even by a miss, as the wings of Falcon 50s are placed lower than the engines.

The image on the right, a screenshot of page 305 of the 2012 TGI report, explains this concept

As far as evasive manoeuvres are concerned (G&P, p. 6), the TGI team dedicated their 2013 report exclusively to research into this issue. That report is not mentioned in Inference Accuracy.



Finally, in the correspondence, one of the authors suggested a theory of “vertical” launches with missiles curving towards the aircraft. However, that theory contradicts the observations of the best-placed witnesses, such as Witness H on the balcony of the old control tower, who reported straight trajectories.⁴⁰

The authors' response

Instead of withdrawing Inference Accuracy, François Graner responded with a new article called “Attentat du 6 avril 1994 au Rwanda. L'enquête rebondit?” (March 26, 2026). It does not address the issue of the false dataset, nor does it admit or mend the other flaws. Instead, it tries to salvage Inference Accuracy by rationalizing false information with irrational arguments, some of which are discussed below

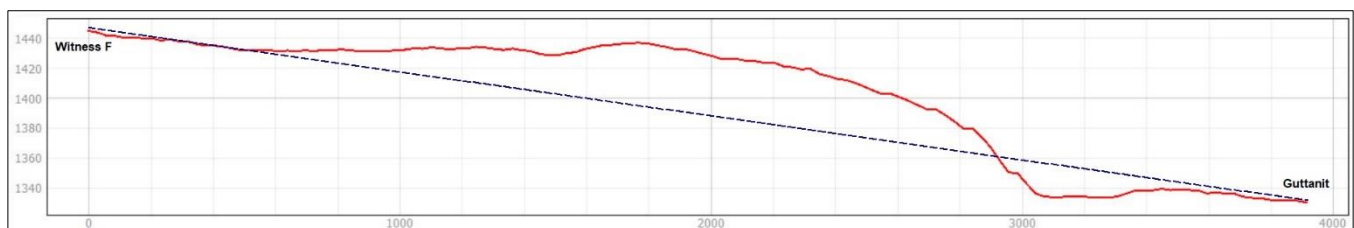
NB: Graner's text was translated by DeepL to avoid a myside bias:

*'Our article, whose title translates as: 'Accuracy of inferences regarding a plane crash' [1], appears in the *American Journal of Physics*. Although its name does not suggest it, this is an international journal in the field of physics education. Our article was edited by Claire Marrache-Kikuchi (IJCLab, Université Paris-Saclay) and peer-reviewed by anonymous reviewers. These reviewers, who are physicists, scrutinised our article in detail, both in terms of methodology and writing.'* (p. 4)

Correction: Referring to reviewers who failed to notice mistakes is not an excuse for those mistakes.

'In this case, it is advisable to avoid an 'all-or-nothing' approach to reject certain arguments as utterly implausible, whilst elevating others to the status of absolute certainties. It is better to weigh up all the sources and draw out the main points, whilst ensuring that the chain of reasoning behind the hypotheses, arguments, and interpretations remains fully traceable.' (p. 4)

Correction: The main point is that unless people dig tunnels, it is utterly implausible that they see through hills.



'Another significant source of bias stems from the collection of witness statements: there are more witnesses from the Kanombe side than from the Masaka side.' (p. 4)

Graner fails to identify the missing witnesses from the Masaka side and does not enlighten us about the added value of their information. The suggestion is not true, either. The TGI team and the magistrates considered a multitude of witness statements, most of whom were 'Masaka' witnesses interviewed during an earlier stage of the investigation. Several were heard again and discussed in the *Ordonnance de Non-Lieu* (December 2018). However, the judges noted that none of them were direct witnesses and that their statements contradicted each other on key points, concluding: *'Thus, the testimonies collected and on which the accusation is mainly based are largely contradictory or unverifiable.'*⁴¹

'It is difficult to make use of information expressed in decibels, as, of course, no witness was walking around with a sound level meter switched on that would have allowed them to take such an absolute measurement.' (p. 5)

Correction: People do not need dB meters to report loud noises or the absence of loud noises. A scale of sound level pressures is useful to analysts who calculate exposure, and in this case, a tool to verify witness statements (see example 3.2).

'The French expert made a factual error. [...] An anonymous acoustics specialist pointed out this error to Jos van Oijen, who brought it to my attention on 12 March 2026.[...] The fact that such an error goes unnoticed seems to reveal that the decibel is a unit about which humans have little concrete intuition.' (p. 5)

Correction: The expert who noticed the error is Professor Timothy Van Renterghem of Ghent University, a specialist in outdoor acoustics whom I consulted about the discrepancy. The error is unfortunate because it overestimated the sound pressure levels but had little impact on the conclusions, except that the updated values further reduce the plausibility of missile launches in the valley. Graner could have accepted this fact and adjusted his hypothesis accordingly, without being the pot that calls the kettle black.

'It is simply worth noting that, according to experts, the sound is audible for miles around in all scenarios. This is consistent with the accounts of the three witnesses located several kilometres from Kanombe, further to the west, who also claim to have heard the missiles being launched.' (p. 6)

Correction: No experts support that.⁴² For instance, Witness B's position was 7,239 m from the encounter and 8,552 m from Loc 3. This means she would have heard the exploding fuel tank before the missile launch. This knowledge is immaterial, however, as B would have seen the light of the explosion immediately, then had to wait 21 seconds for the sounds to arrive. The sound of the first missile launch, the one that missed the aircraft, would also have arrived long after the witness had seen the explosion. A missile launched from B's vicinity could not have reached the aircraft, the distance being beyond its maximum range.

- *Either all these witnesses are reliable. In that case, there would be a major inconsistency between their accounts and those of the witnesses in Kanombe, as no single location can satisfy all these accounts simultaneously.*
- *Either only the accounts from Kanombe are reliable. In that case, we would need to explain why the others are less so.*

- Or none of them, neither those from Kanombe nor the others, can clearly recall the order in which the events took place. This last interpretation is plausible. That is why, in my view, based on the data currently available, **this whole line of reasoning based on the speed of sound may well be unusable.** (Graner's emphasis). (p. 6)

Correction: It is not difficult to distinguish between reliable and unreliable witnesses, see example 1.2. The statements of witnesses in Kanombe, the Belgian doctors, and three others, were consistent. The inconsistent witnesses were located very far from the source, see the example of Witness B. In the case of Witness A, other witnesses near him (H and V) did not hear explosions. The logical explanation would be that outliers like Witness A and B reported reconstructed memories.

*'Indeed, the British investigators ([11] p. 9) report having found damage caused by metal fragments both at the rear of the left wing and in a lower section of the tail and fuselage. This suggests an explosion outside the wing, rather than within it. Thus, **the analysis of the metal fragments calls into question the hypothesis that the missile entered the wing from below, thereby weakening the main argument in favour of Kanombe** (see Section IV A).' (Graner's emphasis) (p. 11).*

Correction: The British investigators analysed fragments they had collected on-site. None of the samples contained tungsten or other elements that might support Graner's claims. To cite the report's conclusion: *'The composition of the warhead metal is different from that of the debris. This is in terms of both minor and trace components of the metals. This suggests the warhead material analysed is not a match with the source of the debris.'*⁴³

'Based on this comprehensive analysis of the available information, weighted according to its respective reliability, it seems likely to me that the missiles were fired from a point located 1,500 metres south-east of the point where they struck the aircraft, that is to say, 4 km to the east (and 150 m below in altitude) of the runway threshold.

The corresponding location, determined with an accuracy of approximately 350 m, lies between the checkpoint manned by the Rwandan army at the junction known as 'Km 19', the Dairy Cattle Breeding Centre (CEBOL, or 'Masaka Farm'), and the corrugated iron factory ('Guttanit factory'). It is plausible: it is flat, open and offers good visibility.

To be consistent with the observed impact of the missile on the aircraft, this launch location would suggest that the missile dispersed tungsten pellets, and therefore that it was a Mistral.' (p. 13).

Correction: This type of reasoning, disregarding the facts, is an example of belief perseverance, not an argument.

Missing in Graner's response is an explanation of the false dataset used to triangulate the launch site. The likely reason for wanting to shift it to the Guttanit factory is the old rumor that, before the assault, the missiles were stored there. On the right is a version spread in 2001 by the American conspiracy theorist Wayne Madsen. Madsen believed the assault was a covert US operation using mercenaries and SA-16s.⁴⁴

Replacing the SA-16s with Mistrals paves the way for implicating the Mitterrand government. Graner's theory of a covert French operation may be more realistic than the CIA version, but not in the valley. Either way, the falsehoods in Inference Accuracy and the February 2026 'explanation' are not helpful. They pollute rather than clarify the case.

missile attack. According to the investigators, the search for the assassins ultimately led to a warehouse in Kanombe, near the airport. From this warehouse, during the afternoon of April 6, the missile launchers were assembled and readied for action by the mercenaries. As the UN investigation team was nearing its final conclusion and was prepared to turn up evidence indicating the warehouse had been leased by a Swiss company, said to be linked to U.S. intelligence, its mandate was swiftly terminated.

Notes:

- ¹ My work on Rwanda comprises 60 articles, published and/or republished in ten countries (four languages). Regarding the subject of the plane crash, I refer to my article "Rwanda: Who lit the fuse in 1994?" *African Arguments*, 7 April 2025. <https://africanarguments.org/2025/04/rwanda-who-lit-the-fuse-in-1994/>. And for a discussion of hoaxes such as the Hourigan affair, see "Real and Imagined Facts in Rwandan History," *the ROAPE*, 14 October 2021. <https://roape.net/2021/10/14/real-and-imagined-facts-in-rwandan-istory/>. During my research, I consulted several experts, including a member of the TGI team, the air crash specialist at Delft Technical University, and a Belgian professor of outdoor acoustics. Relevant qualifications: Certified spatial analyst with a background in tropical engineering. Professional experience includes positions as a GIS specialist/3D-CAD modeler/co-author at several research departments, as well as a two-year stint as a land surveyor using the same equipment as the TGI team. Additionally, I have seven years of experience running or consulting on development projects in rural Africa.
- ² <https://arxiv.org/abs/2501.07261>
- ³ "Presidents Killed in Attack on Plane", *The Guardian*, 7 April 1994.
- ⁴ "Belgians Say Rebels Could Not Have Killed President," *The Guardian*, 12 April 1994; "Violence Lurks around Every Corner," *The Daily Telegraph*, 12 April 1994; "Papers Imply Hutu Hard-Liners Downed President's Plane," *Inter Press Service*, 8 April 2004.
- ⁵ "Rwanda: l'attentat contre l'avion présidentiel. Le récit en direct de la famille Habyarimana," *Jeune Afrique*, 28 April 1994; Theoneste Bagosora, *L'assassinat du Président Habyarimana ou l'ultime opération du Tutsi pour sa reconquête du pouvoir par la force au Rwanda*. Yaounde, 30 octobre 1995; Jean-Louis Bruguière, *Délivrance de Mandats d'arrêt Internationaux*. Tribunal de Grande Instance de Paris, 17 November 2006.
- ⁶ "Le juge Trévidic en Septembre à Kigali", *Jeune Afrique*, 1 July 2010; "French judges launch week-long Rwanda probe," *Radio France Internationale*, 13 September 2010.
- ⁷ Claudine Oosterlinck, Daniel van Schendel, Jean Huon, Jean Sompayrac, and Olivier Chavanis. *Destruction En Vol Du Falcon 50 - Kigali (Rwanda)*. Paris: Cour d'Appel de Paris; Tribunal de Grande Instance de Paris, 5 January 2012; Oosterlinck et al, *Rapport d'Expertise: Complément De Mission (Manoeuvre d'évitement)*. Cour d'Appel de Paris, Tribunal de Grande Instance de Paris, 10 May 2013.
- ⁸ E.g., "Afrika heeft baat bij postkoloniale bevoogding," [Africa Benefits from Postcolonial Patronage], *Historisch Nieuwsblad*, 16 March 2004. <https://www.historischnieuwsblad.nl/afrika-heeft-baat-bij-postkoloniale-bevoogding/>. The article quotes Filip Reyntjens saying, "the Tutsis could have known that the attack would trigger a genocide against their own people."
- ⁹ Oosterlinck et al. 2012, p. C 23 (337).
- ¹⁰ Georges Ruggiu, *RTLM* radio broadcast of 13 April 1994. Cassette A/910, Exhibit P103/064 in Case N°. ICTR-99-52-T: The Prosecutor vs Nahimana et al, International Criminal Tribunal for Rwanda (ICTR).
- ¹¹ "Attentat contre Habyarimana: 'Le rapport d'expertise est à prendre au sérieux'." *France 24*, 11 January 2012. <https://www.france24.com/fr/20120111-rwanda-andre-guichaoua-enquete-avion-attentat-genocide-relation-france-kagame-rapport-justice>
- ¹² Bernard Lugan, "Rwanda: Réponse de Bernard Lugan à l'Association Enquête Citoyenne Rwanda", *L'Afrique Réelle*, 14 January 2012. <https://bernardlugin.blogspot.com/2012/01/rwanda-reponse-de-bernard-lugan.html> ; Filip Reyntjens, "Attentat de Kigali: 'la vérité a gagné'?" *Le Monde*, 31 January 2012. https://www.lemonde.fr/idees/article/2012/01/31/attentat-de-kigali-la-verite-a-gagne_1636326_3232.html ; Pierre Péan, "Récit d'une manipulation," *Le un Hebdo*, 1 February 2017; Filip Reyntjens, *The RPF Did It*, Working Paper, Universiteit van Antwerpen 2020, p. 3. According to Reyntjens, "it is unlikely that the RPF would have carried out the attack from the military domain or its immediate surroundings, but it could have accessed the area of Masaka." How the RPF would have accessed the Masaka area is not explained.
- ¹³ Oosterlinck et al. 2012, pp. 20, 47-52, 291.
- ¹⁴ Witnesses mentioned in Inference Accuracy, and some of the absent ones:

Witness	Code G&P	TGI	Cranfield	Date of statement	Source
Leiding, Philippe	A	name	-	30/05/1994	Auditeur Militaire Belgium (transcript)
				11/10/2011	TGI report (Oosterlinck et al.) 2012 , 31
Mukazitoni, Joséphine	B	12	-	19/11/1998	TGI report 2012, 30, 87, 284
	C	name	name	13/04/1994	Auditeur Militaire Belgium (transcript)

Pasuch, Massimo				09/05/1994	Auditeur Militaire Belgium (transcript); Warden/McClue 2009 (Cranfield), 20-22
				21/10/2011	TGI hearing (transcript); TGI report 2012, 32, 286-290
De Saint-Quentin, Grégoire	D	name	-	08/06/2000	TGI hearing (transcript)
				07/12/2011	TGI hearing (transcript); TGI report 2012, 34, 286-290
Daubresse, Daniel	E	name	-	13/04/1994	Auditeur Militaire Belgium (transcript)
				26/10/2011	TGI hearing (transcript); TGI 2012, 33, 286-290
Ngirumpatse, Pascal	F	4	-	15/10/2008	Hearing Mutsinzi Comm.(transcript)
				14/09/2010	TGI hearing (transcript); TGI report 2012, 74, 268-269
Nsengiyumva, Théogene	G	7	name	14/09/2010	TGI hearing (transcript); TGI report 2012,80, 274-275; Warden/McClue 2008, 20
Gerlache, Mathieu	H	1	name	13/04/1994	Auditeur Militaire Belgium; Warden/McClue 2009, 16-18; TGI report 2012, 70, 262-263
				30/05/1994	Auditeur Militaire Belgium; TGI report 2012, 70, 262-263
Turatsinze, Samson	I	10	name	17/09/2010	TGI hearing (transcript); TGI report 2012, 85, 280-281; Warden/McClue 2009, 27-28
Siborurema, Silas	J	3	name	13/06/2008	Hearing Mutsinzi Comm (transcript); Warden/McClue 2009, 24-25
				14/09/2010	TGI report 2012, 72-73, 266-267
Gashoke, Jacques	K	9	-	01/01/1995	Auditeur Militaire Belgium (transcript); TGI report 2012, 29, 84, 287-288
Moreau, Nicolas	L	name	name	03/06/1994	Auditeur Militaire Belgium (transcript); Warden/McClue 2009, 22-24; TGI report 2012, 24, 65-67
Mutwarangabo, Jean-Bosco	M	5	-	14/09/2010	TGI hearing (transcript); TGI report 2012, 76-77, 270-271
Sindano, Cyprien	N	-	name	08/04/2008	Hearing Mutsinzi Comm.(transcript); Warden/McClue 2009, 19
Kamali, Elisaphan	O	-	-	21/06/2008	Hearing Mutsinzi Comm.(transcript)
Van Deenen. Denise	(Y)	name	-	13/04/1994	Auditeur Militaire Belgium (transcript)
				12/10/2011	TGI report 2012, 31, 286-290
Delneuve. Brigitte	(X)	name	-	20/11/2011	TGI report 2012, 32, 286-290
Nsengiyumva, Tharcisse	-	2	name	04/06/2008	Warden/McClue 2009, 25-26; TGI report 2012, 71, 264-265
Bwanakweri, Isidore	-	6	name	14/09/2010	TGI report 2012, 78-79, 272-273
Ntwarane, Anastase	-	8	name	03/07/2008	Warden/McClue 2009, 29-30
				14/09/2010	TGI report 2012, 82-83, 276-277
Munyaneza, Patrice	-	11	-	14/09/2010	TGI hearing (transcript); TGI report 2012, 86, 282-283
Rwamakuba, Faustin	-	-	name	29/02/2008	Hearing Mutsinzi Comm.(transcript); Warden/McClue 2009, 19-20
Voituron, Pascal	(V)	name	-	30/05/1994	Auditeur Militaire Belgium; TGI report 2012, 25
Bicamumpaka, Sylvestre	-	-	name	20/10/2008	Warden/McClue 2009, 26-27
Habimana, Gonzague	-	-	name	03/10/2008	Warden/McClue 2009, 31

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- ¹⁵ Hearing of Witness E, Paris, 26 October 2011; summary in Oosterlinck et al. 2012, p. 33.
- ¹⁶ Oosterlinck et al. 2012, p. C 22 (336)
- ¹⁷ Oosterlinck et al. 2012, p. 193.
- ¹⁸ Mike C. Warden and W. Alan McClue, *Investigation into the Crash of Dassault Falcon 50 Registration Number 9xr-NN on 6 April 1994 Carrying Former President Juvenal Habyarimana*. Cranfield University, 27 February, 2009.
- ¹⁹ Oosterlinck et al. 2012, pp 184-185.
- ²⁰ Oosterlinck et al. 2012, p. 32.
- ²¹ Hearing of Witness D, Paris, 8 June 2000, p. 3.
- ²² Brussels, Auditoriat Militaire, 13 April 1994; Oosterlinck et al. 2012, p. 33.
- ²³ Jean Damascène Bizimana and Francine Uwamahoro. "Témoignage N° 3." Nyaruguru, 13 June 2008, p. 37.
- ²⁴ Hearing of Witness M, Kanombe, 14 September 2010.
- ²⁵ Oosterlinck et al. 2012, p. 32
- ²⁶ Oosterlinck et al, 2012, p. 31
- ²⁷ Hearing of Witness A, 30 May 1994.
- ²⁸ Hearing of Witness F, Nyaruguru, 15 October 2008; Hearing in Kanombe 14-09-2010.
- ²⁹ Hearing of Witness L, Brussels, 3 June 1994.
- ³⁰ <https://www.bbc.com/future/article/20230112-why-some-people-cant-tell-left-from-right>
- ³¹ Oosterlinck et al. 2012, p. 287.
- ³² E.g., Jessica M. Dukes, J. Farley Norman, and Challee D. Shartzer. "Visual distance perception indoors, outdoors, and in the dark." *Visual Research* 194, 2022, 107992.
<https://www.sciencedirect.com/science/article/pii/S004269892100242X?via%3Dihub>
- ³³ Jean-Pascal Serre. *Rapport Complémentaire en Acoustique*. Les Authieux, 4 January 2012, p. 18.
- ³⁴ Andrew J. Oxenham. "The Perception of Musical Tones." *The Psychology of Music* (3rd edition), ed. Diana Deutsch. Academic Press, 2013, 1-33, p. 7. ISBN: 978-0-12-381460-9
- ³⁵ Keith Attenborough and Timothy van Renterghem. *Predicting Outdoor Sound* (second ed.). CRC Press, 2021, pp. 583-639. ISBN: 978-0-4294-7080-6 (eBook).
- ³⁶ Statements of 13 April 1994 (C, E and Y), 9 May 1994 (C) in Brussels, and on 12 October 2011 (Y), 21 October 2011 (C), 26 October 2011 (E), 20 November 2011 (X) in Paris.
- ³⁷ Hearing in Paris, 2011; Oosterlinck et al. 2012, p. 286.
- ³⁸ Catherine et Philippe Lorisignol, "Rwanda: Enquête manipulée," 00:45:45 – 00:46:05, Devoir d'enquête, *RBTF.be* 2013. <https://www.dailymotion.com/video/xyxzqx>
- ³⁹ Oosterlinck et al. 2012, pp. 100-101. Marc Herbaut and Nathalie Poux, "Ordonnance de Non-Lieu", Paris, 21 December 2018. The judges summarized it as follows (in translation):
'Examination of the debris recovered revealed that the aircraft's three jet engines were not affected by the explosion and that the left wing of the aircraft was significantly more damaged than the right wing, as certain parts of the wing had been subjected to a very high heat flux. Finally, it appeared that the bursting of the rivet line was typical of an internal explosion in the wing tank.'
- ⁴⁰ Even Witness L reported a straight trajectory: "Leur trajectoire était cependant rectiligne."
- ⁴¹ Herbaut and Poux 2018, p. 46.
- ⁴² Oosterlinck et al. 2012, p. 284.
- ⁴³ Warden and McClue, p. 198.
- ⁴⁴ Wayne Madsen. "Prepared Statement by Wayne Madsen," in *Covert Action In Africa: A smoking gun in Washington*, D.C., Cynthia McKinney, Newsbriefs, 16 April 2001.