

## REPORT OF UNOMIG ON THE INCIDENT OF 20 APRIL INVOLVING THE DOWNING OF A GEORGIAN UNMANNED AERIAL VEHICLE OVER THE ZONE OF CONFLICT

### Introduction

1. On 20 April 2008, the Abkhaz side informed UNOMIG that at 9:57 the same day one of their fighter jets L-39 had shot down with an air-to-air missile a Georgian unmanned aircraft that had entered Abkhaz-controlled territory in violation of the Moscow agreement on the ceasefire and separation of forces of 1994. After initially denying that a Georgian UAV flew on that day, the Georgian government subsequently acknowledged that one of their mid-size Hermes 450 had been downed over Abkhaz-controlled territory and claimed that a Russian aircraft had destroyed the aircraft. The Georgian authorities released a video reportedly shot by the UAV showing the unmanned vehicle being tracked and destroyed by a jet fighter. (The Georgian government sent to UNOMIG a written "notification" about the flight dated 19 April, but delivered to the Mission on 20 April several hours after the downing of the aircraft).

2. In order to maximize transparency, UNOMIG's Chief Military Observer offered to convene a Joint Fact-Finding Group, a mechanism with the participation of the Georgian and Abkhaz sides, the CIS PKF and UNOMIG created in 2000 to investigate potential violations of the Moscow Agreement as well as crimes with political motivation. The Georgian side declined to participate on the grounds that such a format would not be conducive to investigating successfully this incident, but undertook to cooperate with UNOMIG investigation. The CIS PKF agreed to participate and the Abkhaz side did not answer. In these circumstances, UNOMIG decided to carry out an independent investigation into the incident as it is authorized under its mandate.

3. This was not the first UNOMIG investigation into the downing of a UAV. One month earlier, on 18 March, the Abkhaz side already claimed that one of their L-39 had destroyed a Georgian UAV off the coast of Ochamchira, in Abkhaz-controlled territory. At the time, the Georgian authorities denied having lost any UAV. After examining the debris from the UAV, the initial investigation by UNOMIG concluded that a Hermes 450 UAV was most probably involved, the maximum range of which was consistent with Georgian ownership. UNOMIG informed the Georgian Ministry of Defence that it considered that a reconnaissance mission by a military aircraft, whether manned or unmanned, constituted "military action" and therefore contravened the Moscow Agreement, which stipulates that the parties "shall scrupulously observe the ceasefire on land, at sea and in the air and shall refrain from all military actions against each other". The Mission also called both sides' attention to the fact that the Georgian action and the Abkhaz reaction had generated a threat to those who use the airspace over the Zone of Conflict and its surroundings. The Department of Peacekeeping Operations expressed these concerns in the verbal update presented to the Security Council on 14 April.

4. In order to carry out its investigation into the 20 April incident, UNOMIG's Fact-Finding Team brought together specialists who included two military radar controllers, an information technology officer who develops software for UAV systems, a UN staff member in charge of UAV procurement, a senior fighter pilot and graduate of fighter weapons school, an L-39 pilot, and an expert in imagery analyses with 20 years of experience in video and satellite analysis. The Fact-Finding Team called upon the sides and the CIS PKF to cooperate with its efforts. Regrettably, the Abkhaz side declined to do so, but it nevertheless provided UNOMIG with access to the debris collected from the incidents of 18 March, 20 April and 12 May 08. (The Abkhaz side claims that it has downed 7 UAVs in the period 18 March – 12 May however UNOMIG can confirm only the debris from the incidents on 18 March, 20 April and 12 May to be from Hermes 450.)

5. The following summarizes the work of the Fact-Finding Team with regard to the information gathered by UNOMIG patrols from witnesses at the location of the incident, and the analysis and assessment performed on the evidence that was made available to the Team, with an emphasis on the video and radar records provided by the Georgian authorities.

#### **Testimonies of witnesses**

6. Local residents interviewed in DIKHAGUDZBA by UNOMIG patrols a few hours after the incident on 20 April 2008 described seeing a jet aircraft operating over the sea between 09:30 and 10:00 on 20 April 2008. The aircraft was travelling north to south. Two loud bangs were heard in quick succession and an 'object' was observed leaving the aircraft before igniting shortly after and parachuting into the sea, approximately 250 m from the shoreline. The aircraft then gained height and flew in a south to north direction.

7. The CIS PKF stated in a meeting with the UNOMIG Chief Military Observer that the UAV had first been observed over ANAKLIA (GR 1299) and then by CIS PKF OP 210 near PICHORI (GR 1104) on the north side of the CFL. Soldiers observed it flying at an altitude of about 3000 m; then they heard the explosions and saw it exploding in the air approximately 1 km NW of PICHORI. They heard the jet but it was not visible from the OP.

#### **Analysis and assessment of the video footage**

8. On 21 April the Georgian Ministry of Internal Affairs released a piece of video footage on their internet website, containing clips from the camera of the UAV. It provides a total video stream of 2:27:04 min. Furthermore the footage contains a part of the recording from the radar that, supposedly, tracked the jet aircraft taking off from GUDAUTA before flying south to shoot down the UAV and then returning back north across the Russian border.

9. On 29 April UNOMIG was given some additional pieces of footage, containing a missing part of 12 seconds of the footage initially released and a close up recording of the radar tracks from the same initial release.

10. On 14 May, after the visit to the radar site in POTI, a full DVD was given to UNOMIG providing nearly the full video stream of the UAV camera taken on 20 April. However, the starting procedure was left out. The video was presented by the master controller and camera operator of the UAV that was shot down on 20 April

11. After careful analysis, the FFT assessed that the video footage was recorded over all the mentioned areas, without any manipulation or cut-outs or copy/paste actions. There were no hiccups in the sequence, or strange colour changes, time jumps or geographical jumps observed. Major landmarks found in the video and, more specifically, the last scans passing the coast and the final minutes with the coast visible, have been cross-referred to mapping software and accurately reflect the physical ground surveyed by the UAV. All correlate with a coherent picture, meaning that the full video was actually taken in the areas recorded.

12. Explanations given by the operator and remarks made by him correlate with the video. Furthermore, the track that the UAV followed during its mission appears to correlate with the radar data, which has been presented to the FFT. The authenticity of the date raises some questions. The operator stated that it was generated by the computer from the ground station where the video feed was received, and he had no evidence to qualify that it was or was not the correct date. However, the video correlates with the radar record: in particular, it could be assessed where the UAV was located when it was shot down. By freezing the video clip at 09:54:22 - shortly before the jet aircraft launches the missile - it can be seen that the camera of the UAV is focusing at a point of 42 48.290 N 41 14.321 E, located 44,26 km away from its own location. It can also be seen that the bearing of the camera is 330 (NNW) and as the camera is looking almost exactly to the rear through the landing gear of the UAV, it can be assessed that the heading of the UAV itself is 150 (SSE). This heading is in accordance with the heading that can be derived from the radar record. On this record the UAV is heading 144 (SSE) just before it was shot down.

13. The video also correlates with eyewitnesses: By plotting the latitudes and longitudes of the camera focal point into Google Earth and collating this with the distance to the focal point and the bearing of the UAV, as shown on the display, the location of the UAV when it was shot down is assessed to be west of the coast near PICHORI (GR 1105). This indicates the same area as the Abkhaz side, CIS PKF and local residents have pointed out.

14. Taking into account the preceding, the FFT concluded that the video was authentic.

#### **Conclusions based on the video**

15. On this basis, the FFT could conclude that, owing to the distinctive twin-fin configuration of the jet aircraft and the location of the air intakes, the aircraft seen on the video is either a MiG-29 "Fulcrum" or a Su-27 "Flanker". It was not possible to decide

between the two aircrafts because the quality of the video did not allow to ascertain the angle of the fins, or to determine whether the missile was launched from an outer pylon below the wing, characteristic of the MIG-29, or from a wingtip launcher, characteristic of the SU-27.

16. On the same basis, it is assessed that the type of missile used in the video was an AA-11 ARCHER (VYMPEL R-73). Prior to the explosion of the missile, one can see that the missile has a curved head similar to the AA-11 ARCHER and it exploded just prior to the target by 50 feet, which means that the Infra Red missile used a proximity fuse to ensure the kill. The missile is a close range missile, which produces a heavy white smoke trail characteristic for older missiles. If it is fired within visual range (WVR), this missile uses infrared homing guidance, which depends on an IR signature from the target. This type is a close range or 'dog fight' missile, which means that the attacking aircraft has to manoeuvre to a position behind the target before firing in order to increase the possibility of a kill, since the highest infrared signature comes from the engine.

#### **Analysis and assessment of the radar record**

17. After receiving on 7 May explanations from Georgian officials from the Ministry of Internal Affairs and Ministry of Defence, on 14 May the FFT visited the radar site in POTI and met with the head of the radar operators. The FFT saw that a 36D6 radar and two P-180 radars were located at the site, but the operator stated that the P-180 radars were only operating when the 36D6 was shut down. According to the radar operator, the maximum range of the radar in POTI was 360km.

18. According to the radar operator the system has the capability to track surface-to-air missiles (SAM) and possibly small air-to-air missiles (AAM), but only if the time of flight of the missile is sufficient; i.e. minimum of 30 seconds (at a rate of 10 seconds per sweep) as the system needs to track for at least three sweeps in sequence in order to determine a target.

19. He presented to the FFT the radar record of more than one hour from the 20 April, including the sequence where the UAV was shot down. The replay capacity of the system was limited (could not go back and forward), and therefore the record was only shown once, in normal speed. The playing was set to make all primary radar returns appear and the overall picture was assessed to be very realistic. There were many returns from clutters in the area of the radar coverage; there were many clutters over the sea and also close to the radar station. This all indicates a normal radar picture.

#### *Overall operational assessment*

20. From an operational point of view, the overall behaviour seen on the radar record, of both the UAV and the interceptor, can be assessed as realistic under the circumstances presented above. The sequence of the interceptor maneuvers, the threat calls from the controller to the UAV operator and the defensive reactions of the UAV seem realistic.

### *Tracks Trails*

21. The tracks trails of both the UAV and the interceptor are not completely straight, but they have small deviations or curves. The General Air Traffic (GAT) does not have these deviations from a straight track because commercial aircraft are flying with the autopilot engaged. (See annex). If the radar record had been created by a simulator, those kind of small deviations would not have been expected, because simulators normally only create straight tracks.

### *Track Turns*

22. The track turns of the UAV and the interceptor are imperfect but look normal for real aircraft and not as simulated tracks. Especially for the UAV, it can be seen that when the UAV makes a sharp turn to the left, heading south, in order to avoid the interceptor, the radar loses contact for a while and after that it finds it again, resulting in a small 'jump' in the track.

23. Furthermore, the interceptor, after its take off, follows an easterly course and performs a sharp turn that in the radar video looks very steep. This kind of turn would not be expected from simulated tracks, because these normally follow circular courses. These kinds of turn can be seen in several places in the radar record, but the two described above are the most representative and obvious examples of non-simulated track movement.

### *Track Altitude and Airspeed*

24. In all the tracks of the GAT, UAV and interceptor, the altitude and the ground speed is not steady but changing all the time as the radar computer is recalculating all the flight data continuously. Simulated tracks are expected to have steady indications, or smooth changes between two steady values. For instance, if a simulated track should show an aircraft changing altitude from 080 to 110, one should expect a smooth change like the following: 080, 080, 080, 092, 098, 103, 107, 110, 110, 110. The same applies for the speed. However, this is not the case on this radar record.

### *Tracks Tabs Swap*

25. From the radar record it can be seen that, when the interceptor is heading back north after having shot down the UAV, the interceptor has adopted the track number of the UAV. This track label swap is a common computer mistake that may occur when two tracks are very close to each other and then merged. This kind of deliberately created mistake never occurs on simulated tracks.

### *Additional elements of authentication*

26. Regarding simulation capabilities, the Georgian radar operator stated that there was no simulation capability in the ACC. Simulated tracks could only be initiated at

POTI or SENAKI sites. The POTI radar simulator had very limited capabilities, as it could create tracks at any position the operator wanted, but the only input that could be entered was heading, speed and altitude. If the operator initiated a track, it followed a straight course at a steady altitude with a steady speed. There was no capability to turn a track or to change any other parameters. During the demonstration of the simulator it was attempted to change the heading of the tracks, but this resulted in initiation of a new track while the first track disappeared.

27. Supportive of the authenticity of the recorded track data is the fact that the speed of the track shown on radar is commensurate with the capabilities of the Hermes 450, which has a maximum cruise speed of 65 knots, and never-exceed speed of 95 knots. The turning circle of the UAV recorded track is also commensurate with this type of aircraft, typically 0.25 – 0.5 NM diameters. The video display shows the UAV at a height of 16 000' which is comfortably below the typical Hermes 450 ceiling of 19 000'.

#### **Conclusions based on the radar record**

28. Based on the authentication of the radar record, the FFT could confirm that the interceptor - a MiG-29 "Fulcrum" or a Su-27 "Flanker" – headed south towards the UAV and the Ceasefire Line and after the interception and the shooting down of the UAV, turned back to north heading toward MAYKOP/ KRASNODAR into the Russian airspace. Absent compelling evidence to the contrary, this leads to the conclusion that the aircraft belonged to the Russian air force.

29. The location from where the fighter jet took off still remains unclear. According to the report of the Georgian duty officer, the UAV crossed the ceasefire line at 09:31, and the first detection of the interceptor was at 0948 approximately 12,6 km east of GUDAUTA airfield at an altitude of 2800m. This could indicate that the interceptor took off from the GUDAUTA runway, which is heading 330. However, another scenario is that the interceptor came in at low altitude, probably below 2000m, from somewhere else and then ascended in the vicinity of GUDAUTA. This is consistent with the radar playback screen seen on 14 May at the radar site in POTI, which showed some radar blips in the area north of GUDAUTA, which could be the first blips of what was later tracked as the fighter jet. The blips moved south before turning east slightly before they merged into the point, where a radar controller initiated the track of the unidentified aircraft.

30. The endurance and performance of the MiG-29 and the Su-27 are adequate to cover the distance of 366 km from KRASNODAR to the ceasefire line (coast) and back, resulting in a flight time of roughly 20-35 min before the shooting down. One needs to bear in mind, though, that this distance of around 700 km is close to the limit of the fighter jets' capabilities.

31. The radar record confirms that the interceptor must have fired a short-range missile, because the interception took place very close to, or even inside, an international airway at a time where civilian aircraft were flying. The UAV footprint starts exactly in

the limit of airway A277. According to the AIP (Aeronautical Information Publication) Georgia, this corridor begins at 1000 ft and it is 10 nm wide. The UAV first appears to be about 6 nm off the corridor's centre line. By choosing a short-range missile, the interceptor needs to acquire visual contact with the target before launching the missile. In order to engage a track as hostile, it is necessary first of all to identify it. In an area where other aircraft are flying, the best way to eliminate the risk of wrong targeting and potential collateral damage is the visual identification of the track. This explains the relative proximity between the jet and the UAV at the time of the launch. At the same time the use of a short-range missile minimizes the possibilities of collateral damage in case of radar or missile defect.

32. In the radar footprint of the interceptor, it is obvious that initially it is heading east, accelerating and ascending, following a sharp right turn (south) towards the UAV position, which is when the interceptor probably received directions to the target from the Ground Control. The interceptor is approaching the target with high speed and performs high 'G' turns above the target in order to decelerate and to obtain the right parameters for a short-range shot.

#### **Abkhaz radar capability**

33. The findings mentioned above are borne out by the Abkhaz radar capability, which is consistent with the capacity to control a fighter aircraft against a target like the UAV in this area. Based on a preliminary study of the radar located in BABUSHARA Airport, south of SUKHUMI, it is assessed to be the 36D6 "Tin Shield" Early Warning/Ground Control Radar. It is a mobile radar system that can be used, most likely, as Command and Control Centre or a general traffic approach radar, which is less likely. The maximum range is 360 km. This is the same system as the Georgian side has in POTI and SENAKI. The 36D6 is designed to detect air targets and to perform friend-or-foe identification (IFF).

34. The 36D6 radar system is highly effective in detecting low, medium and high altitude targets, moving in wide speed range, including winged missiles with Radar cross section (RCS) equal to 0.1 m. Based on a study of the 36D6, it is assessed that it can detect UAVs. If one takes into consideration the radar horizon (Line of sight), the radar specifications and the clear-of-obstacles area, it is assessed that the 36D6 radar is completely able to pick up, track, and control a fighter aircraft against a target like the UAV in this area.

#### **Observations**

35. The frame of reference of the ceasefire and separation of forces regime in the case of the Georgian-Abkhaz conflict is the Moscow Agreement. It provides for the CIS PKF and no one else to perform the separation of forces. From a strict peacekeeping perspective, therefore, the Mission considers that enforcement action by third-parties – in this case the Russian Federation - in the zone of conflict is fundamentally inconsistent

with the Moscow Agreement and, aside from possible considerations under international law, undercuts the ceasefire and separation of forces regime.

36. By the same token, and from the same peacekeeping perspective, the Mission reiterates its position stated to the Georgian Minister of Defence on 7 April 2008 that the overflight of the zone of conflict by surveillance aircraft constitutes a breach of the Moscow Agreement. In their explanation of the purpose of the 20 April overflight, Georgian officials have referred to the need to conduct reconnaissance of Abkhaz military formations and movements north of the Ceasefire line. However legitimate this purpose may seem to the Georgian side, it stands to reason that this kind of military intelligence-gathering is bound to be interpreted by the Abkhaz side as a precursor to a military operation, particularly in a period of tense relations between the sides. (It is worth recalling that the Abkhaz side reported 16 UAV overflights since last August). A ceasefire regime has a major advantage – preventing war. It does however impose, in return, limitations on the freedom of the sides, including the undertaking by one side of measures that can and will be perceived as threats by the other side.

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