

Radar experts' findings

In various requests for legal assistance, the Public Prosecution Service asked for primary radar images of the airspace above Lugansk and Donetsk. In a reaction to this, the Russian Federation supplied two radar sets from the "Ust-Donetsk" radar station.

The first radar set (hereafter: radar set 1) was not delivered in the ASTERIX-format.¹ At the request of the Public Prosecution Service, the authorities of the Russian Federation subsequently delivered that radar set in (among others) the ASTERIX-format (hereafter: radar set 2).

Two independent radar experts, appointed by the examining magistrate, have examined the radar images. Each expert meticulously examined one radar set.

Findings radar set 1

On the radar images, just before and at the time of the downing of flight MH17, no other objects are visible that proceed in the vicinity and in the direction of MH17. A BUK-missile is not detected.

The expert explained why a BUK-missile is not visible on the radar images from a civil radar station such as Ust-Donetsk. This relates to the supersonic speed of a flying BUK-missile. Because this speed lies much higher than the speed of civil aircraft, the settings of a civil radar station (*such as the radar processing*) will make that such fast objects in general are not visible on the radar images. Also display filters could limit the visibility. This is to avoid clutter on the radar image. The same goes for the acceleration of a BUK-missile. That is so enormously high, that the radar processing will prevent registrations. The consequence is that therefore a BUK cannot be seen. The same applies when a BUK-missile is launched from the launching location established by the JIT.

On 26 September 2016 during a press conference a spokesman from the Russian Ministry of Defence disclosed, among other things, that the Russian civil radar has been able to detect a surveillance drone (an Orlan-10). A BUK-missile, according to this spokesman, is larger than this type of drone and would be easier to detect than such a drone. The spokesman seems to suggest with this that the fact that this drone actually had been detected, means that also a BUK-missile should have been detected by the radar.

According to the expert appointed by the examining magistrate, the detection of a drone, however, does not prove that the "Ust-Donetsk" radar station should (also) have detected a BUK-missile, if that would have flown there. As it is, the flight properties of such a drone, such as speed and acceleration, show much more similarities to the flight properties of civil air traffic. This as opposed to the flight properties of a BUK-missile (see figure 1). This explains why a drone can be visible on the radar images and a BUK-missile can't.

¹ ASTERIX-format is a standard for exchanging surveillance (radar) data between computer systems.

	Airliner	BUK-missile
Acceleration in g ² .	0 (transit) -2g (max)	20g
Speed in meters per second	200-260 m/s (transit)	600-730 m/s (upon impact)

Figure 1. Comparison table with flight properties (acceleration and speed in meters per second) of both an airliner and a BUK-missile.

Findings Radar set 2

Radar set 2 included data from the same radar station “Ust-Donetsk” from 17 July 2014 during a limited period (16.02 hours – 16.32 hours local time). According to the Russian Federation, primary data would have gone lost during the transfer of the radar data to the ASTERIX format.

The expert concludes that there is no reason to assume that the conversion has led to the loss of relevant data. The data set included both primary and secondary data, which were delivered partly in ASTERIX format. The information relevant for the assessment proves to have been delivered in the ASTERIX format. Consequently, the data set included all data that are necessary to be able to make an assessment of all detected objects in the airspace involved.

The expert furthermore concludes that no plots are visible on the radar images that indicate the presence of other flying objects in the direct vicinity of MH17. The only primary plots that are visible around the time of the downing, originate from MH17 itself (figure 2).

MH17 with primary data in the vicinity

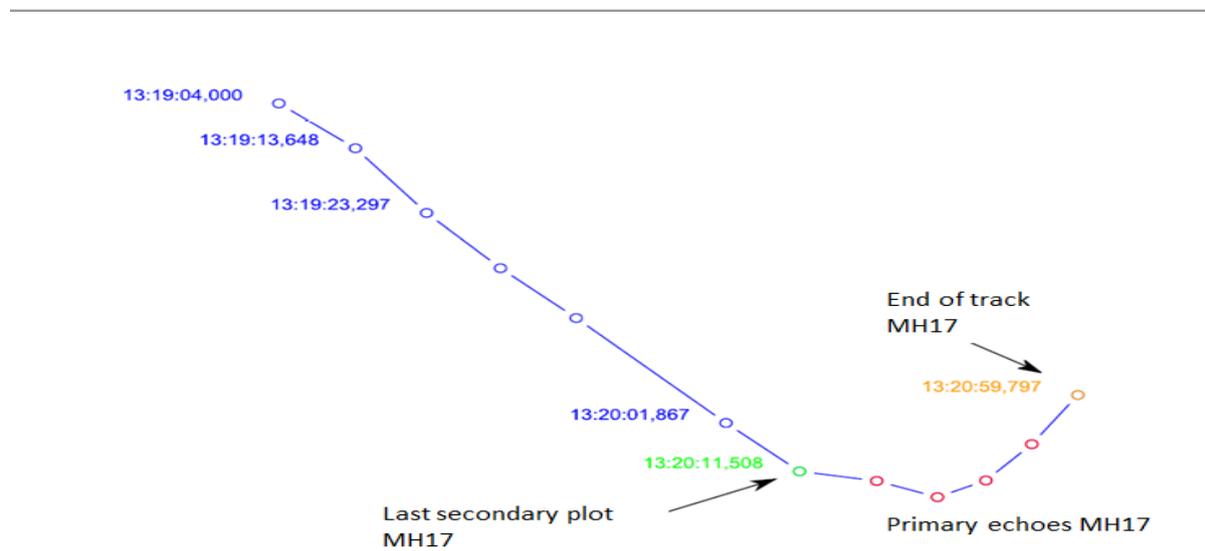


Figure 2. The primary radar data of the airspace in the vicinity of MH17 (16:19-16:20 local time / 13:19 -13:20 UTC). The combined primary and secondary plots of MH17 are visible in blue. There is nothing visible to indicate an object that moves in the direction of MH17.

² 'g' means G-force and stands for the amount of force created by acceleration of gravity.

Therefore, no objects such as a BUK-missile in the vicinity of MH17 are visible. According to the expert, causes of that may be:

- there was no object in the vicinity of MH17;
- there was an object near MH17, but the object was too small to be detected by the radar;
- there was an object near MH17 and it was detected, but the detection was removed by filters of the radar station;
- the object was detected, but the data were removed manually afterwards.

Based on previous findings the JIT has already established that flight MH17 was taken down by a BUK-missile. Therefore the first cause does not apply.

The requests and reactions in chronological order

- In October 2014 the Public Prosecution Service asked the authorities of the Russian Federation, in a request for legal assistance, to transfer all primary radar images of the airspace above Lugansk and Donetsk in the period from 14 July 2014 up to and including 18 July 2014.
- In April 2015 the Public Prosecution Service received from the authorities of the Russian Federation a video recording of radar images and a number of screen prints from the Ust-Donetsk radar station.
- In June 2016 the Public Prosecution Service once again asked the authorities of the Russian Federation, in an additional request for legal assistance, for the primary radar images of the airspace above Lugansk and Donetsk in the period from 14 July up to and including 18 July 2014.
- End of September 2016, during a press conference, the Russian Federation showed new radar images from the Ust-Donetsk radar station. End of October 2016 a data set containing radar images from Ust-Donetsk radar station was provided for the first time. This data set was not supplied in the ASTERIX-format, but in an unusual and deviating format.
- In March 2017 the Public Prosecution Service asked the authorities of the Russian Federation to provide the radar images (from 14 July 2014 up to and including 18 July 2014) from the Ust-Donetsk and Buturinskoe radar stations, or other radar stations that had the environment of Lugansk and Donetsk within their reach, in the ASTERIX format.
- In reaction to this latest request, in August 2017 the Russian Federation provided a data set from Ust-Donetsk radar station. No data from the Buturinskoe radar station were provided. The data that were provided relate to radar images of 17 July 2014 during a limited period (16.02 hours – 16.32 hours local time).