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BACKGROUNDER

July 11, 2012

SYRIAN AIR DEFENSE FORCE ATTACK ON TURKISH RECONNAISSANCE AIRCRAFT

On Friday, 22 June, at approximately 11:45 local time, a Syrian air defense artillery battery engaged and shot down a Turkish Air Force RF-4E reconnaissance aircraft. The Turkish RF-4E was overwater when it was shot down off the Syrian coast near Latakia. Although the Turkish and Syrian navies immediately engaged in a combined search and rescue effort, neither the pilot nor the backseat systems operator was rescued. This backgrounder provides a technical description of the Turkish RF-4E, the Syrian air defenses, analysis of the differing radar snapshots provided by Syria and Turkey, and analysis of the current situation.

TECHNICAL BACKGROUND

TURKISH RF-4E

- The RF-4E is a two seat, supersonic reconnaissance aircraft equipped with high resolution cameras.[1]
- US manufactured, it entered service with Turkish Air Force in 1978.
- It is easy to detect, track, and target due to large radar cross section and no stealth characteristics.[2]
- The Turkish Air Force website indicates they operate 54 total RF-4E aircraft, but no longer operate the combat model of the F-4.[3]
- The approximately 150 combat capable F-4 aircraft the Turkish Air Force acquired between 1978 and 1991 have probably been used for replacement parts for the F-4E.[4]

SYRIAN AIR DEFENSE FORCE (ADF)

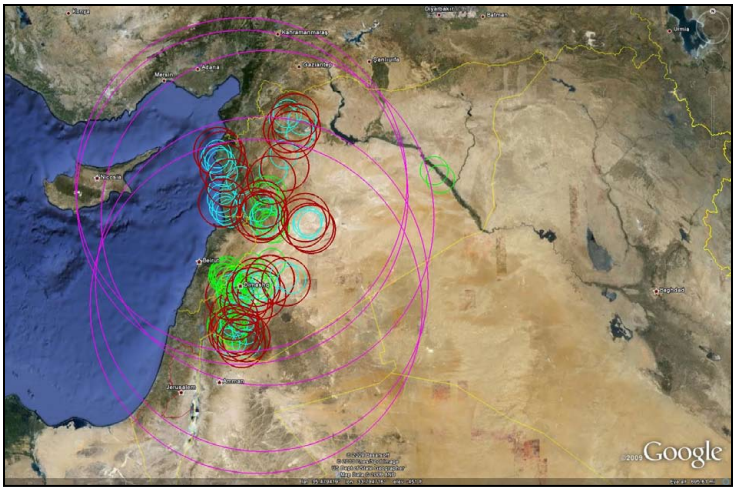
- ADF is an independent command of the Syrian Defense Forces.[5]
- ADF operates what is known in the West as an Integrated Air Defense System (IADS).
- IADS consists of geographically dispersed radars, Surface to Air Missile (SAM) sites, Anti-Aircraft Artillery (AAA) guns and Man Portable Air Defense Systems (MANPADS) that are networked and able to share radar and targeting data.
- Syrian ADF operates the SAM components of the IADS; Syrian Army operates the AAA and MANPADS components of the IADS.
- Although mobile elements of the IADS, such as vehicle mounted AAA guns and MANPADS, are not continuously linked with the IADS, they still provide capability.[6]
- Syrian IADS is equipped with a mix of legacy Soviet and modern Russian systems.[7]
- Syrian IADS shot down a US Navy A-6 over Lebanon in 1983.[8]
- Although Syrian IADS equipment is old, it is assessed by General James Mattis, Commander, US Central Command, as very capable and "extremely challenging."[9]

SYRIAN ADF IADS RADARS

Syrian IADS operates a mix of early warning, height finding, and targeting radars.[10] While many of these radars are several decades old, they are still largely functional. Additionally, the high density of the Syrian IADS means there is a tremendous amount of redundant and overlapping radar coverage built in to the system.[11] The following list contains the alphanumeric designators and NATO code names of the array of Syrian IADS systems.[12]

EARLY WARNING RADAR[13]

- Tall King (P-14): 400 kilometer range
- Flat Face (P-15): 150 kilometer range
- Spoon Rest (P-18): 250 kilometer range
- Flat Face (P-19): 260 kilometer range
- Long Track (P-40): 370 kilometer range
- Back Trap (P-80): 410 kilometer range



SYRIAN SURFACE TO AIR MISSILE THREAT RINGS: SOURCE: HTTP://GEIMINT.BLOGSPOT.COM.

HEIGHT FINDING RADAR[14]

- Thin Skin B (PRV-9): 300 kilometer range
- Odd pair (PRV-13): 350 kilometer range
- Odd Group (PRV-16): 400 kilometer range

FIRE CONTROL RADAR[15]

- Fansong A/B/E/F/G: 145 kilometer range
- Low Blow: 80 kilometer range
- Straight Flush: 75 kilometer range
- Land Roll: 30 kilometer range
- Square Pair: 255 kilometer range

SYRIAN ZSU-23. SOURCE: WIKIMEDIA COMMONS.

SYRIAN IADS ANTI-AIRCRAFT ARTILLERY (AAA)[16]

Syrian IADS includes a mix of visually aimed and radar guided AAA guns operated by the Syrian Army, ranging in size from 14.5 millimeter to 100 millimeter weapons.[17] The alphanumeric designations given are the NATO designators, and not the Russian designators.

- ZPU (14.5 millimeter): 2 kilometer range
- ZSU-23 (23 millimeter): 3 kilometer range
- M1939 (37 millimeter): 8 kilometer range
- S-60 (57 millimeter): 6 kilometer range
- KS-12 (85 millimeter): 8 kilometer range
- KS-19 (100 millimeter): 13 kilometer range

SA-2 SURFACE TO AIR MISSILE. SOURCE: WIKIMEDIA COMMONS.

SYRIAN IADS MANPADS[18]

Syrian IADS includes five types of shoulder fired, heat seeking MANPADS missiles operated by the Syrian Army.[19]

- SA-7: 4 kilometer range
- SA-14: 4 kilometer range
- SA-16: 5 kilometer range
- SA-18: 5 kilometer range
- SA-24: 6 kilometer range

SYRIAN IADS SURFACE TO AIR MISSILES (SAM)[20]

Syrian IADS includes a wide variety of SAM capabilities. All of these are either legacy Soviet systems, or modern Russian systems.[21]

- SA-2: 45 kilometer range
- SA-3: 35 kilometer range
- SA-5: 160 kilometer range
- SA-6: 25 kilometer range
- SA-8: 15 kilometer range
- SA-10: 75 kilometer range
- SA-11: 50 kilometer range
- SA-15: 15 kilometer range
- SA-19: 10 kilometer range
- SA-22: 20 kilometer range

SYRIA & TURKEY PROVIDE COMPETING RADAR SNAPSHOTS

Shortly after the attack, the Syrian Arab News Agency (SANA) released a radar snapshot which shows the RF-4E violating Syrian airspace before being shot down.[22] SANA says that the Turkish RF-4E was over Syrian territorial water and approximately one kilometer off the beach when it was shot, and eventually crashed approximately ten kilometers off the shore, well within the twelve nautical mile territorial water limit established by the United Nations Convention on the Law of the Sea.[23] While the alleged flight path appears plausible, there is no way to verify the accuracy of this radar snapshot.

Turkey disputes this account, and maintains that the aircraft strayed into Syrian airspace temporarily and was shot down over international waters after exiting Syrian airspace.[24] Additionally, some sources claimed there were two RF-4E aircraft on the flight, with one flying away unharmed.[25] While Turkey acknowledged that its aircraft did momentarily violate Syrian airspace over Syrian territorial waters, the Turkish Armed Forces released its own radar snapshot to dispute the Syrian version. The Turkish radar snapshot shows the RF-4E temporarily violating Syrian airspace, then exiting Syrian airspace prior to being shot down.[26]

SYRIAN RADAR SNAPSHOT & ANALYSIS OF EVENTS

SOURCE: SYRIAN ARAB NEWS AGENCY, WWW.SANA.SY.
ALL HEADINGS AND DISTANCES APPROXIMATE.

INITIAL CONTACT: On June 22, 2012 at 1112 local time, Syrian radar detects a Turkish RF-4E just northeast of Cypress in international airspace, over international waters.

FIRST LEG: RF-4E proceeds northeast on a heading of 070 degrees for 85 miles and passes over land in Turkey just north of the city of Samandag. At this position, the RF-4E is 20 miles north of Syrian airspace.

SECOND LEG: RF-4E makes a right hand turn and proceeds southwest on a heading of 225 degrees for 70 miles. This first turn takes the RF-4E closer to Syrian airspace. As it crosses over the Turkish coast and back over water, it is approximately 10 miles north of Syrian airspace.

THIRD LEG: RF-4E then makes a left hand turn back to northeast and picks up a heading of 045 degrees for 60 miles. This second turn takes the RF-4E closer to Syrian airspace. As the RF-4E makes the turn, it is in

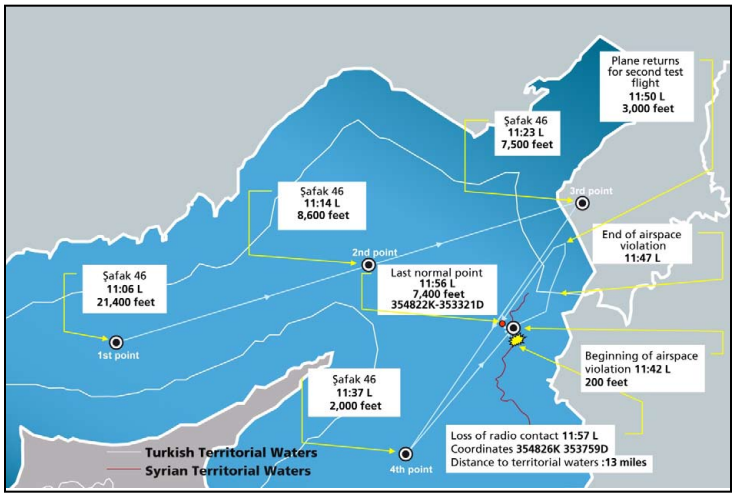
international airspace, over international water. However, as it approaches the coastline, it appears to cross into Syrian airspace, over Syrian territorial water, although its heading is taking it towards Turkish airspace.

FOURTH LEG: Immediately before crossing the Turkish coastline, the RF-4E makes a left hand turn and proceeds southwest on a heading of 225 degrees for approximately 20 miles. This third turn takes the RF-4E further away from Syrian airspace.

FINAL LEG: RF-4E makes a left hand turn and heads southeast on a heading of 135 degrees for approximately 10 miles. This fourth turn put the RF-4E on a heading that runs perpendicular to the coastline and aims directly for the Syrian coast approximately 10 miles north of Latakia. Shortly after making this turn, the RF-4E enters Syrian airspace, over Syrian territorial waters.

SHOOTDOWN: At approximately 11:40 local time, Syrian Air Defense Artillery directly engages the RF-4E, approximately one kilometer offshore, west of the town of Om Al Tuyour. According to SANA, the Turkish aircraft is hit one kilometer offshore, but crashes ten kilometers offshore. The Syrian radar track does not show the aircraft movement between being hit 1 kilometer offshore and crashing 10 kilometers offshore. The Syrian account states that the Turkish aircraft was shot down with AAA, which further supports the allegation that the Turkish aircraft was in Syrian airspace, since no Syrian AAA has long enough range to engage targets outside of its airspace.

TURKISH RADAR SNAPSHOT & ANALYSIS OF EVENTS



SOURCE: HURRIYET DAILY NEWS, WWW.HURRIYETDAILYNEWS.COM
ALL HEADINGS AND DISTANCES APPROXIMATE.

INITIAL CONTACT: On June 22, 2012 at 11:06 local time, Turkish radar track picks up the RF-4E over water, north of Cyprus, with flight call sign "Safak 46." On the Turkish radar track, this is labeled "1st point."

FIRST LEG: On the Turkish radar track, this leg starts at label "1st point" at 11:06, overflies "2nd point" at 11:14, and ends at "3rd point" at 11:23. On this first leg, the RF-4E proceeds northeast on a heading of 070 degrees for 150 miles and passes over land in Turkey about 20 miles north of the city of Samandag. At this position, the RF-4E is about 30 miles north of Syrian airspace. This leg starts at 11:06 and ends at 11:23. This shows a total time of 17 minutes to transit 150 miles, or approximately 530 miles per hour. This translates into a subsonic speed of approximately Mach 0.71 at the final altitude for this leg of 7,500 feet.[27] This subsonic speed is consistent with a typical flight profile over water.

SECOND LEG: On the Turkish radar track, this leg starts at "3rd point" at 11:23 and ends at "4th point" at 11:37 local. RF-4E starts this leg with a right turn to southwest on a heading of 220 degrees for 90 miles. This first turn takes the RF-4E closer to Syrian airspace, and puts it on a course that skirts Syrian territorial water and airspace, but does not violate it. This leg records a speed of approximately 385 miles per hour, which translates into a subsonic speed of approximately Mach .50 at the final altitude for this leg of 2,000 feet. The RF-4E was flying slower on this leg than on the first leg – it may have been conserving fuel, or slowing to prepare equipment and complete checklists to conduct a reconnaissance run along the Syrian coast.

THIRD LEG: On the Turkish radar track, this leg starts at "4th point" at 11:37 local and continues through the points labeled "Beginning of airspace violation" at 11:42 and "end of airspace violation" at 11:47. This leg starts with a left turn back to northeast, heading 050 degrees for 55 miles. Speed for this leg was approximately 330 knots, or Mach .43 at the final altitude of 200 feet. This is the slowest leg of the flight.

MANEUVERING LEG: On the Turkish radar track, this leg starts at the point labeled "end of airspace violation" at 11:47, continues through "plane returns for second test flight" at 11:50, "last normal point" at 11:56, and "loss of radio contact" at 11:57. On this maneuvering leg, the RF-4E exits Syrian airspace, headed roughly northeast at 030 degrees, then turns back to the southwest at 220 degrees.

SHOOTDOWN: At approximately 11:57, Syrian Air Defense Artillery directly engages the RF-4E. According to the Turkish radar track, this is labeled "Distance to territorial

waters: 13 miles." The label is inaccurate. According to previous Turkish government statements, the RF-4E was shot down 13 miles off shore, or 1 mile outside of Syrian territorial water and airspace. The label should read "Distance to Syrian coast: 13 miles."

BOTH RADAR TRACKS PLAUSIBLE, NEITHER CONCLUSIVE

Neither radar track can be accepted at face value. Both portray flight paths that appear plausible, and both radar tracks roughly correspond with each other for most of the flight. The only serious discrepancy between them lies in the fact that the Syrian radar track shows the RF-4E being shot down in Syrian territorial airspace, while the Turkish radar track shows the RF-4E temporarily transiting through Syrian airspace, but then being shot down outside of it. Given that no other government has released radar tracks which show what happened, there is no way to reasonably conclude where the RF-4E was when it was shot down. It is reasonable to conclude that the RF-4E did in fact violate Syrian airspace; both Turkey and Syria agree on this point, but disagree when it happened, and for how long.

WAS THE AIRCRAFT IN SYRIAN AIRSPACE?

US government officials have been cited by the Wall Street Journal as saying that the Turkish RF-4E was hit inside Syrian airspace. Additionally, these same officials said there was no evidence of a SAM being fired, indicating that the plane was hit by Anti-Aircraft Artillery (AAA).[28] While the State Department condemned the leak, it did not deny the accuracy of the statement by the anonymous government official stating the Turkish aircraft had been hit in Syrian airspace.[29] If the plane was hit by AAA fire from near Latakia, it was in Syrian airspace. The biggest AAA gun in the Syrian inventory, the KS-19, has a maximum range of 13 kilometers, which means it does not have sufficient range to shoot from the beach, through Syrian airspace, and reach out to a target in international airspace.[30] If the Turkish aircraft was hit by AAA, as claimed by Syria and reported by anonymous US government officials, it was certainly in Syrian airspace when that happened.

Given that Turkey is a US ally and member of NATO, and that the US government has spoken out repeatedly against the excesses of the Assad regime, it is reasonable to conclude that if the US government had data indicating that the Turkish aircraft was outside of Syrian airspace, that data would be released. Given that the Turkish government has acknowledged that the aircraft was in Syrian airspace for at least four minutes, and given that multiple US government officials have been quoted anonymously as saying the plane was in Syrian airspace when it was shot down, the cumulative technical and analytical evidence supports the conclusion that the aircraft was in Syrian airspace when it was shot down.

WHAT WAS THE RF-4E DOING?

There are several plausible explanations for what the RF-4E was doing.

First, the RF-4E may have been on an assigned mission to fly a reconnaissance course just north and west of the maritime border between Turkey and Syria. It is not unusual for states to police their borders with reconnaissance missions just outside the territorial waters of neighboring states. This is the scenario that led to the USN EP-3E collision with the Chinese F-9 in 2001.[31]

Second, the Turkish military may have been "probing" the Syrian IADS, looking for gaps in radar coverage, or even looking to provoke a response.[32] This is a common military tactic to assess radar coverage, response times, and response norms. Turkey may simply have been trying to gather intelligence on the Syrian IADS, and the plane crossed into Syrian airspace inadvertently.

Third, the entire episode may have just been a case of poor navigation by the pilot, or a failure of navigational instruments on board the aircraft. The violation of Syrian airspace occurred overwater; with no visual reference to landmarks during overwater flight, pilots are entirely dependent on instruments for accurate navigation. If any of the navigation instruments on the RF-4E failed, the Turkish aviators may simply have been inadvertently off course. It may not have been an intentional violation at all.

POSSIBLE EXPLANATIONS FOR THE SYRIAN RESPONSE

Syrian and Russian press describe the direct engagement of the Turkish RF-4E by the Syrian Air Defense Forces as warranted in the literal context of a violation of Syrian airspace by a Turkish military aircraft.[33] However, no mention has yet been made of steps taken to escalate force in order to deter the Turkish aircraft prior to shooting it down. Typically when a potential adversary probes air defenses, the country targeted will scramble jet fighters to intercept the intruder and escort him from their airspace. Between April and September of 2011, Japan scrambled

jet fighters 83 times to intercept Chinese aircraft probing Japanese airspace.[34] While the number of Chinese probes seems atypically large, the Japanese response—launching jet fighters to intercept and escort the intruders away—is the norm.

Syria did not follow the norm of launching jet fighters to intercept and escort the Turkish RF-4E in this case, but instead went straight to ground based targeted engagement. Why? It is possible that the Syrian regime made a calculated decision to shoot down the Turkish airplane in order to send a message to Turkey that Syria would no longer look the other way if Turkey takes an active role in the uprising.[35] It is also possible that the regime meant to signal the international community to their willingness and capability to defend Syrian airspace.

However, in the aftermath of the shootdown, the Syrian regime has been consistently apologetic for the incident. In an interview with Turkish newspaper Cumhuriyet, President Bashar Assad is quoted as saying,

> "I don't wish this for anything other than an enemy plane. Especially for a Turkish plane, I am saying I wish it hadn't happened' 100%. In this environment, the coming of a plane like that is perceived as an enemy plane. Those who understand military understand these things. A country anywhere in the world would behave like this. This definitely isn't a political decision."[36]

Given the Syrian response is so apologetic for the incident, it seems plausible that a Syrian Air Defense Force commander made a tactical decision based upon the appearance of an immediate threat and chose to forgo preliminary steps to escalate a traditional response. According to U.S. Rules of Engagement (ROE), local commanders and individual soldiers always have the inherent right of self-defense.[37] If this decision to shoot down the Turkish aircraft was made by a local Syrian commander because he thought he was under attack, on his own territory, by a foreign plane in Syrian airspace, he would certainly have been acting in a manner consistent with U.S. ROE.

TURKEY INVOKES ARTICLE IV, NATO DECLINES TO ACT

In the aftermath of the incident, Turkey invoked article IV of the NATO Charter, which reads, "The Parties will consult together whenever, in the opinion of any of them, the territorial integrity, political independence or security of any of the Parties is threatened."[38]

NATO considered Turkey's request to consider a No Fly Zone over Syria, and while this request has not been rejected, it appears that NATO is not going to act to establish or even prepare for a No Fly Zone.[39]

IMPLICATIONS FOR THE US

The US must consider the implications of this demonstration. At an operational level, while Turkish routine reconnaissance activities are vulnerable to attack, the U.S. should consider what the Syrian regime may attempt on the ground to exploit the opportunity to operate without Turkish reconnaissance. While it appears unlikely that a No Fly Zone will be implemented at this time, US strategic planners must consider how to degrade the Syrian ADF IADS should a No Fly Zone become necessary.

NOTES

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