Classified By: USAACECC1975
Derived From: Multiple Sources
~~Declassify On: 20360826~~

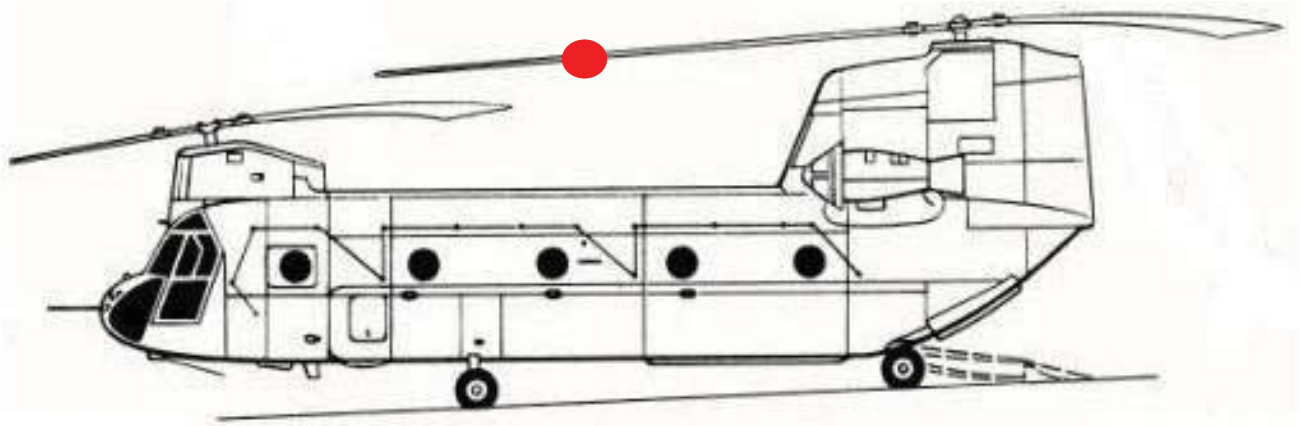
JCAT Mission (U)

(U/~~FOUO~~) The Joint Combat Assessment Team investigates battle damage and shoot downs to determine the threat weapon system used in the attack and the enemy TTP employed, enabling the commander to determine the best counter-tactics to defeat the threat. Additionally JCAT cooperates with the acquisition and test community, and the Survivability Information Analysis Center to share lessons learned, archive survivability data, and reduce future aircraft vulnerabilities.

Executive Summary (U)

Incident Date (U)	05 AUG 2011	**Threat Class (~~S~~)**	Probable RPG
Initial Assessment (U)	05 AUG 2011	**Weapon (~~S~~)**	Probable OG-7
Aircraft (U)	CH-47D	**Assessors (U/~~FOUO~~)**	(b)(3), (b)(6)
Unit (U)	B/2-158 ((b)(3), (b)(6))		(b)(3), (b)(6)
Tail Number (U)	84-24175		(b)(3), (b)(6)
Airspeed/Altitude (~~S~~)	~50 kts / ~150 ft AGL		(b)(3), (b)(6)
			(b)(3), (b)(6)

~~(S)~~ While conducting an infil and on short final to the HLZ, EXTORTION17 was struck by a probable OG-7 in the red blade of the aft rotor disk, severing approximately 10 ft of rotor blade. The ensuing imbalance led to separation of the aft pylon, followed immediately by the forward pylon. The extreme forces exerted on the airframe, as well as the post-crash fire which consumed 80% of the fuselage, led to the catastrophic loss of all 38 personnel aboard EXTORTION17.



CH-47D EXTORTION17

84-24175

05 AUG 2011

B/2-158 ((b)(3), (b)(6))

Team Insertion

Tangi Valley (Wardak Province), Afghanistan

PROBABLE OG-7

Joint Combat Assessment Team – Bagram

Operation Enduring Freedom

IJC SIGACT: 08-0796, USCENTCOM PR Event: 11-021
CIDNE: 20110806030042SVC8019464682, CJTF-1: CRS3

Team Composition (U)

(b)(3), (b)(6)

(b)(3), (b)(6)

(b)(3), (b)(6)

(b)(3), (b)(6)

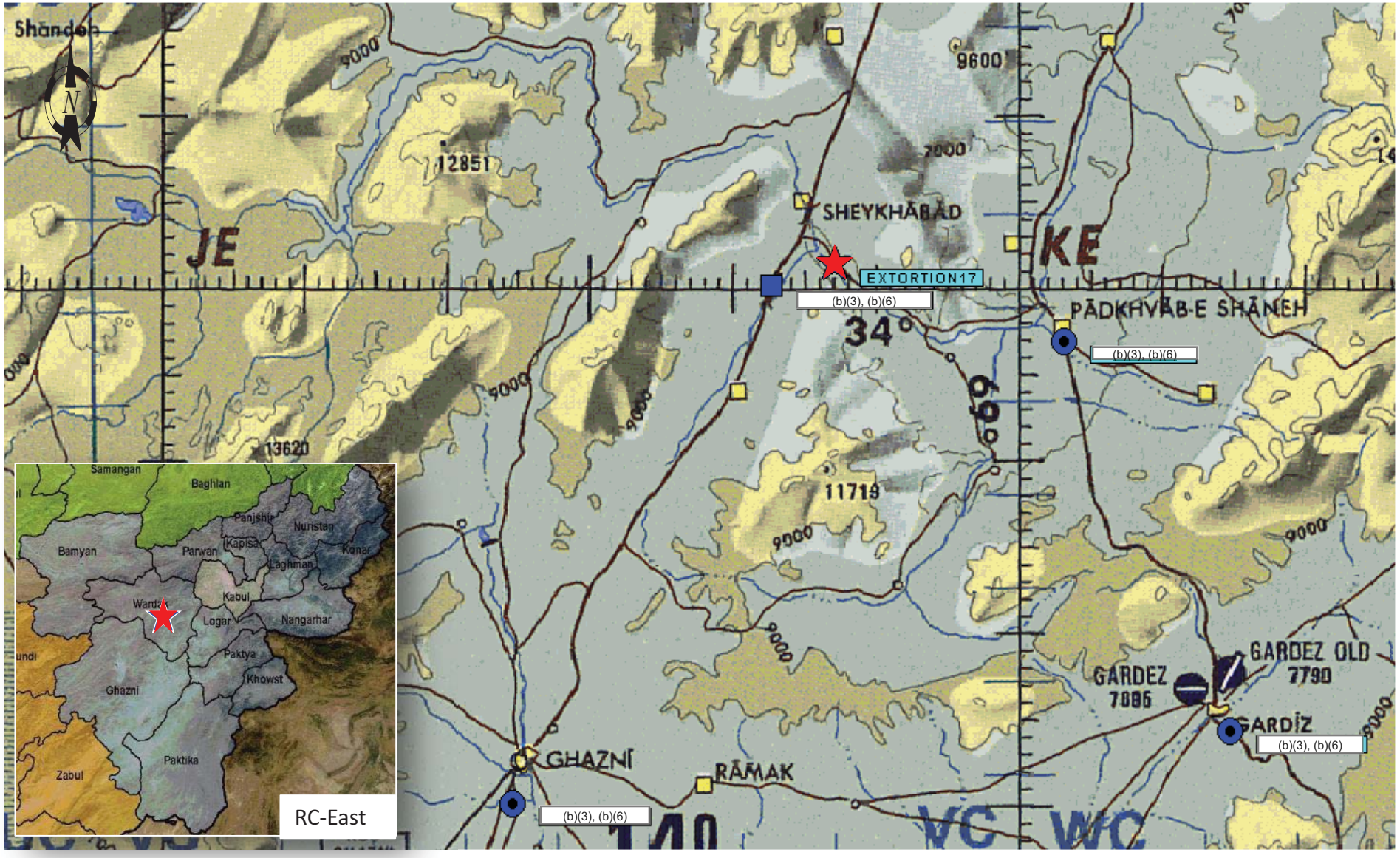
(b)(3), (b)(6)

Date Assessment Conducted: 05–26 Aug 2011

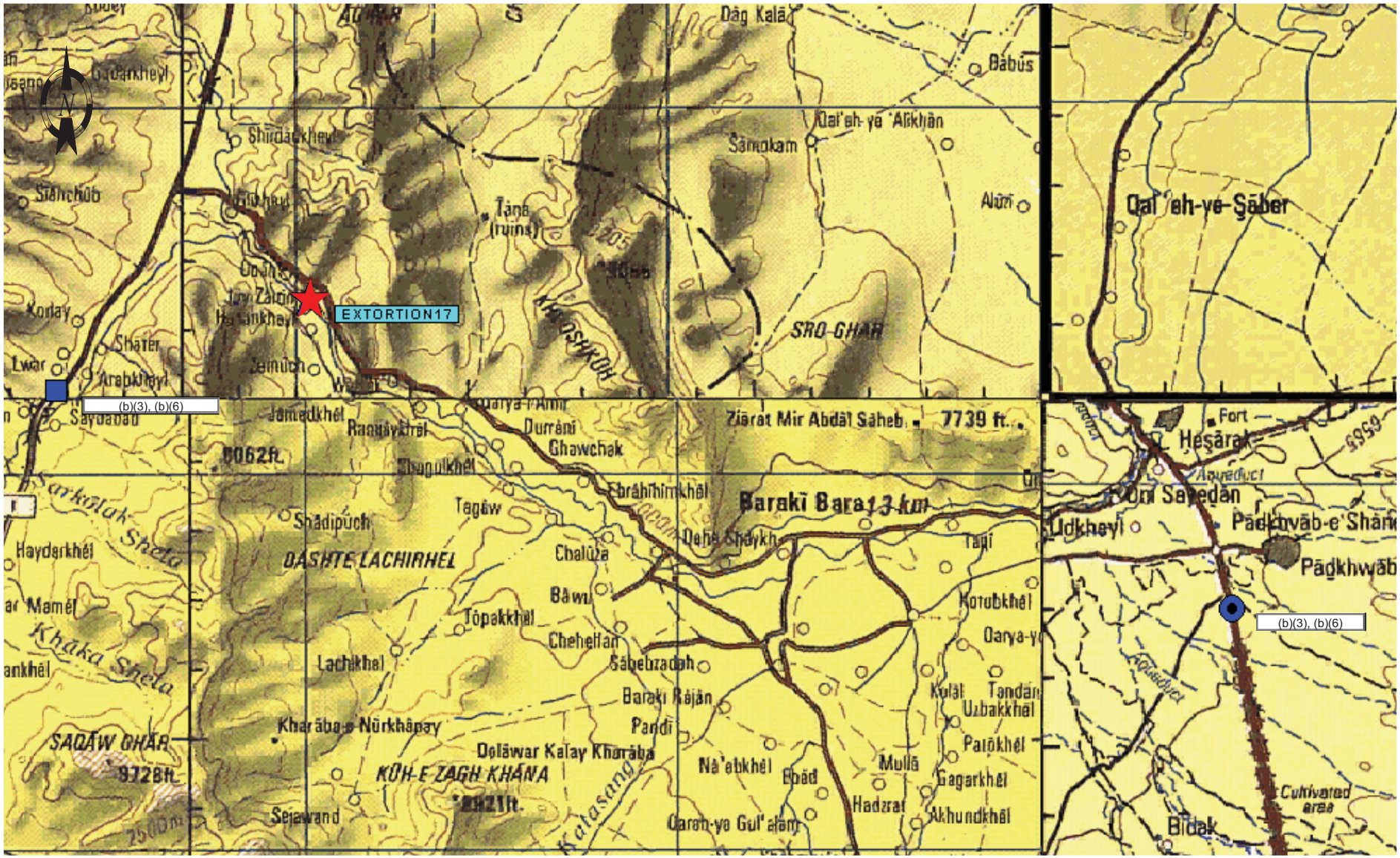
Overview of Incident (U)

Aircraft (U)	CH-47D
Tail Number (U)	84-24175
Mission (U)	Team Insertion
Unit (U)	B Co/ 2-158 ((b)(3), (b)(6))
Time (U)	05 2209Z AUG 2011 / 06 0239D AUG 2011
Formation (U)	Single ship
Flight Profile (U)	Final approach to landing zone
Province / Locality (U)	Wardak / Tangi Valley
Specific Location (U)	MGRS: 42S VC 80190 64700 LAT/LON: N 34° 01' 21.93" E 068° 47' 07.55"
Terrain (U)	Populated mountain valley
Weapons Load (U)	3 x M240-H
Airspeed / Altitude (U)	~50 kts, decelerating / ~100-150 ft AGL
Heading (U)	~137° M
Attitude (U)	UNK (< 326 ft AGL)
ASE (U)	AN/ALQ-212(V)/ICMD, APR-39A(V)1
ASE Response (U)	UNK
Weather (U)	Winds: 10005KT, Vis: 9000 HZ, Ceil: FEW 120, 22°C, PA 6605
Illumination Level (U)	Red: Night, 0% illumination (Moon at -54°, set at 1702Z)
Crew/Pax (U/~~FOUO~~)	5x Crew; Pax: 25 USMIL, 7 Afghan National Army, 1 Afghan civilian interpreter, 1 combat assault dog
Casualties (U/~~FOUO~~)	30 US KIA, 7 ANA KIA, 1 AFCIV KIA, 1 CAD KIA
Threat (~~S~~)	**Probable OG-7 via RPG**
Damage (~~S~~)	Weapon detonation caused 122” of aft red rotor blade to depart the aircraft resulting in a severe mechanical and dynamic imbalance causing loss of control with simultaneous catastrophic structural failure.
Est. Repair Time (U)	N/A. Aircraft to be attrited.

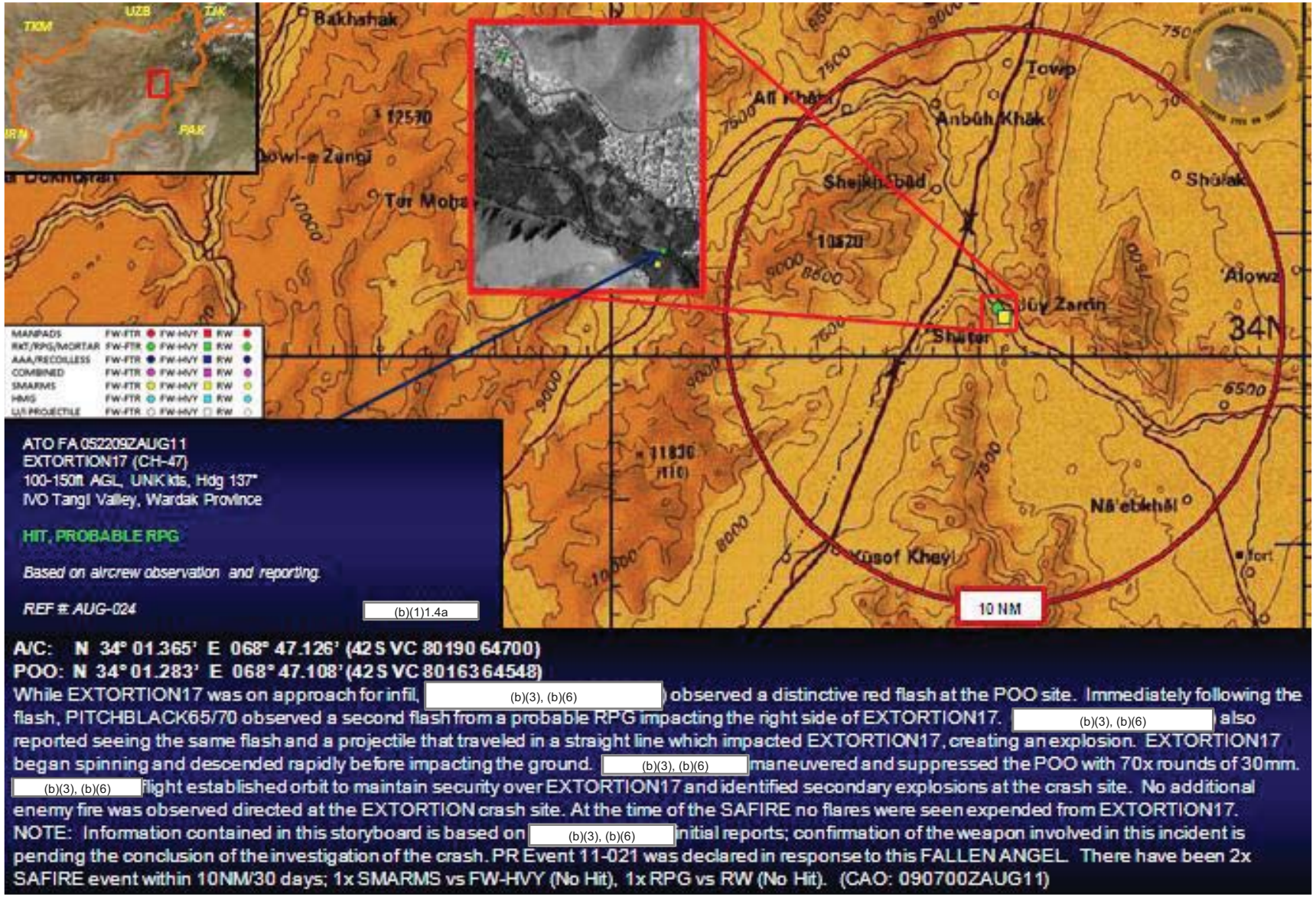
Area Overview (1:1M ONC)(U)



Area Overview (1:250K JOG)(U)

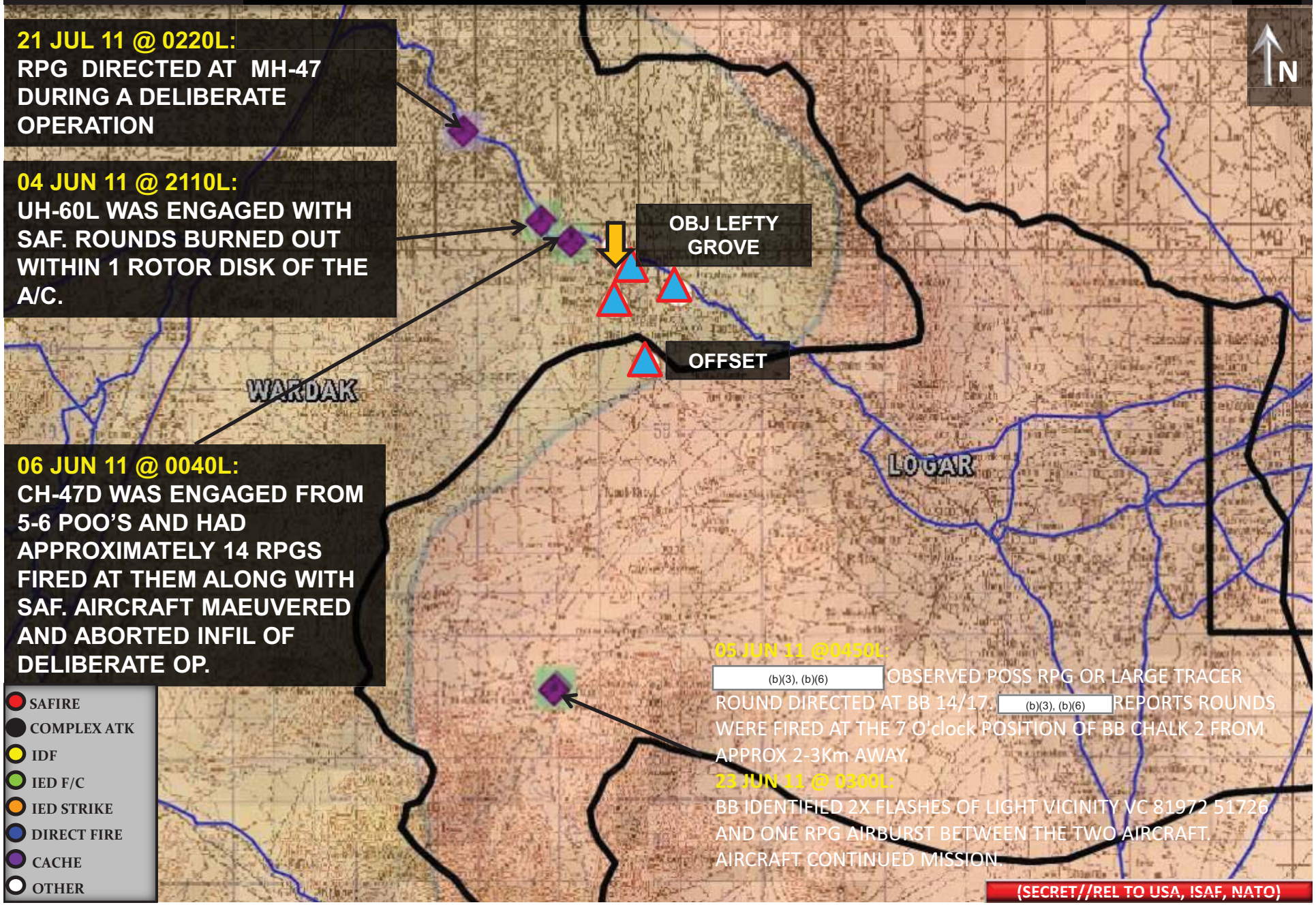


AUAB-CAOC/ISRD SAFIRE Report (U)

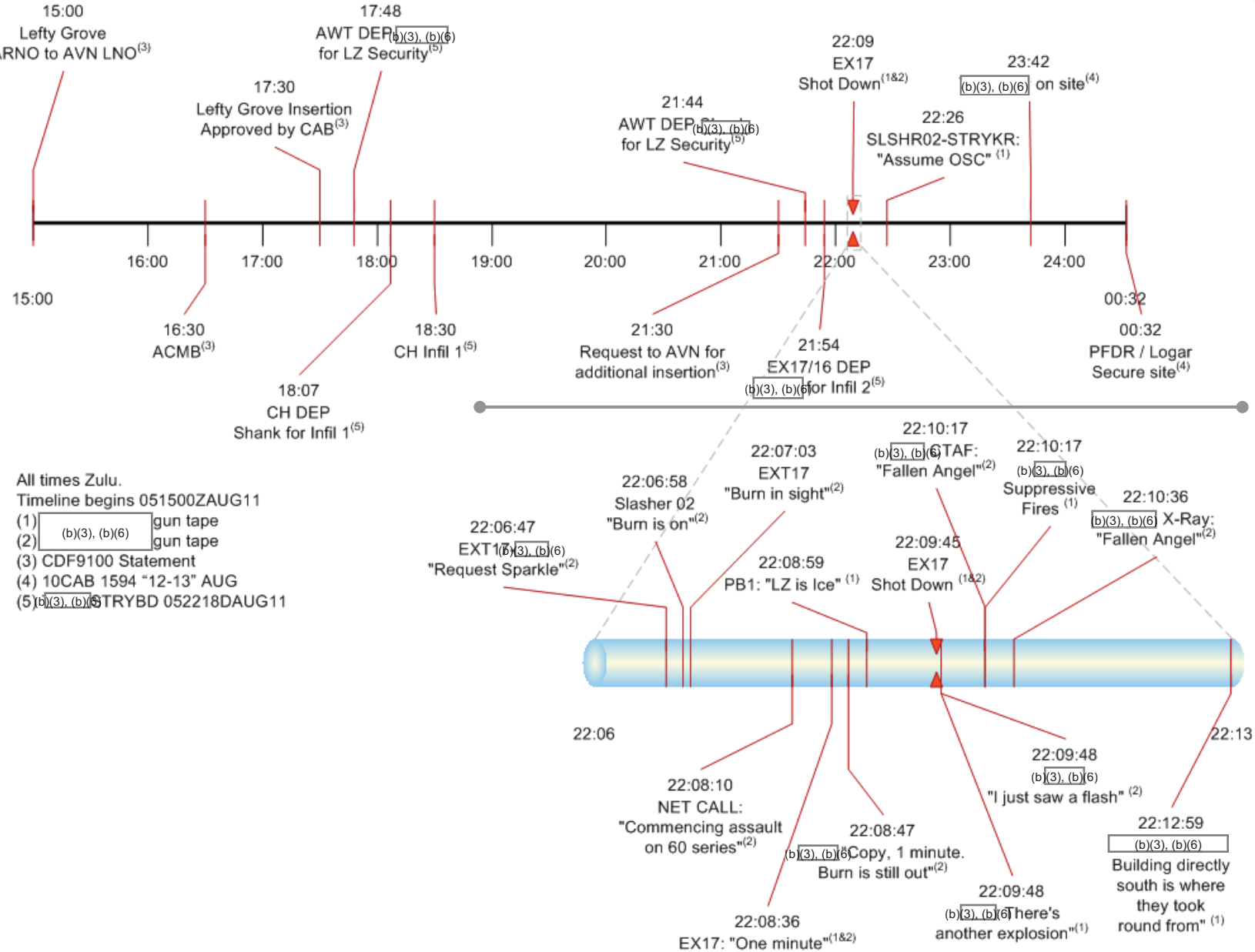


SAFIRES LAST 90 DAYS

[Threat brief from AMB]

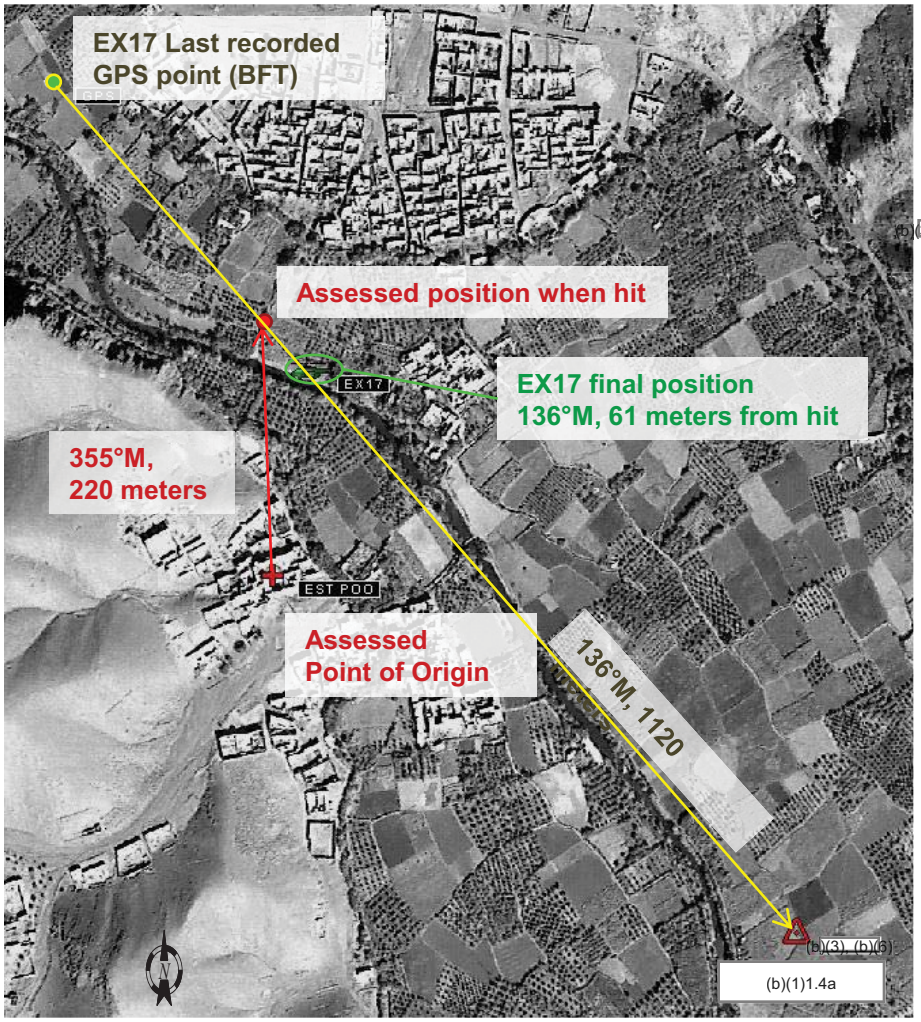


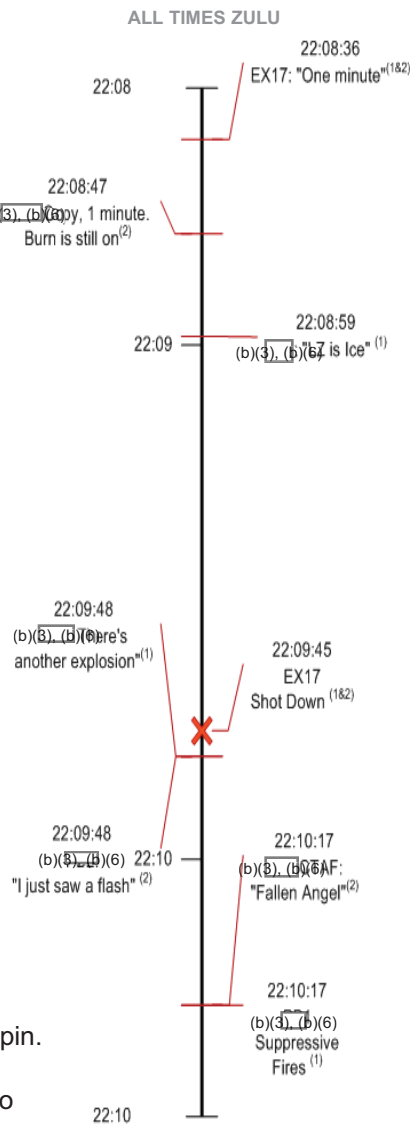
Mission Timeline (U)



One Minute Inbound(U)

~~(S)~~ At 22:08:36Z Extortion 17 (EX-17) announced they were 1 minute from landing at (b)(1)1.4a 11 seconds later at 22:08:47Z, (b)(3), (b)(6) replied, informing E still being "burned" then at 22:08:59Z that the LZ was "Ice." At approximately 22:09:40Z EX-17 was engaged by a volley of a minimum of two and a maximum of three RPGs. (b)(3), (b)(6) later described the POO as an enemy position in the qalats to the southeast of EX-17. At ~22:09:45Z the second PG in the volley impacted EX-17 on the underside of the aft red rotor blade. At the time of impact, the blade was located within the retreating half of rotation relative to the longitudinal axis of the aircraft (right side). The PG detonated 5.5 inches from the leading edge and 122 inches inboard of the blade tip on the bottom of the rotor blade. The PG detonated on contact and immediately compromised the structural integrity of the blade spar box (comprised of a steel rod surrounded by a titanium and fiberglass box). As the spar box distorted due to weapon and flight dynamics, a 10-foot portion of the blade body (behind the spar box and constructed of lightweight fiberglass and honeycomb) was severed from the rotor blade. The resultant imbalance affected the entire airframe and drive-train subsystem. A sudden and violent ~3.75 Hz oscillation of the entire aft rotor system led to the separation of the aft pylon within 2 seconds. This caused an immediate loss in lift as well as an unrecoverable clockwise spin. The forward rotor system, unable to compensate for the loss of lift and stability throughout the airframe, was stressed beyond design limits and separated in flight. The fuselage subsequently impacted the ground. The entire event (from weapon impact to crash) likely lasted less than 5 seconds.





(b)(3), (b)(6)

Interview (~~S~~)

• (~~S~~) During the interview of the (b)(3), (b)(6) crews, the two front seat pilots stated they witnessed a flash. They associated this with a suspected PG weapon, viewed from their peripheral vision. They stated that the weapon appeared to detonate on the aft pylon of EXTORTION 17, viewed through their Night Vision Goggles.

• (U) To ensure accurate weapons characterization, the pilots were provided a series of 8 videos from the VSIS (Visual Signatures of Improvised SAMs) collection, to assist in the identification of the suspected munition. The signature identification videos included MANPADS, RPGs, and Rockets.

• (~~S/REL~~) The video which best represented the munition was "RPG Rear View NVG", as identified by the crews of (b)(3), (b)(6).

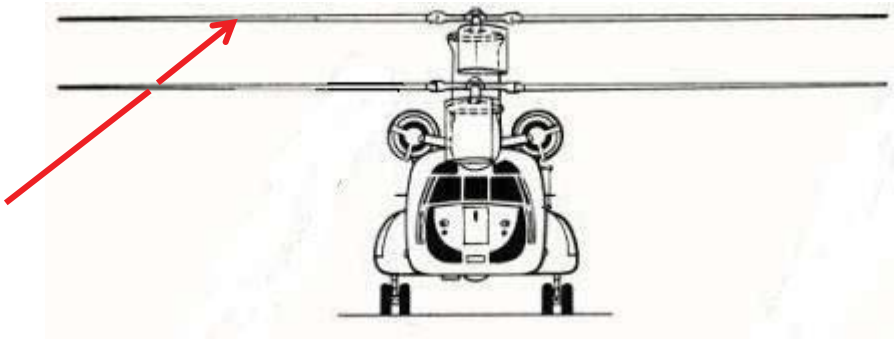
Visual Signatures of Improvised SAMs

http://www.msic.dia.smil.mil/misc_documents/vsis/VSIS.php

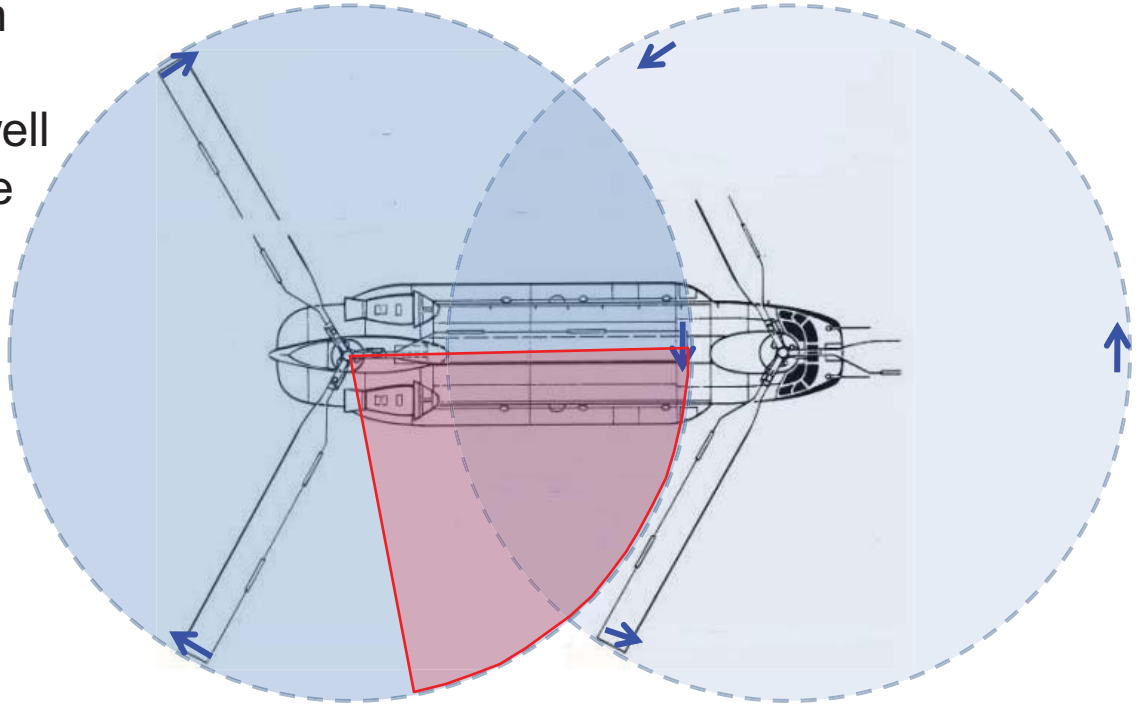
RPG In Flight

RPG Rear View NVG Video

Angle of Arrival and Impact Area (U)

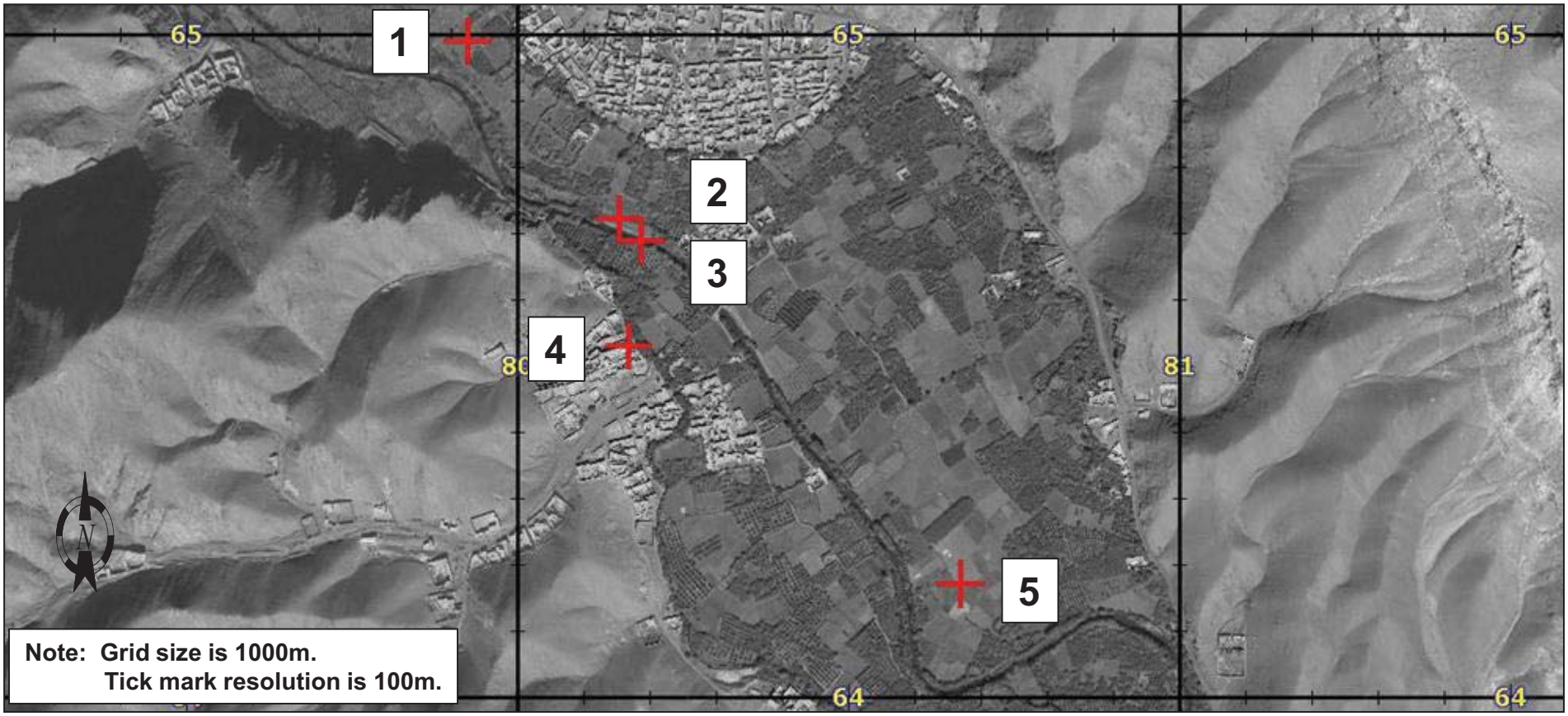


(U/~~FOUO~~) The angle of arrival and the area if impact within the rotor disk is an approximation based on evidence derived from EX17 as well as event specific live fire testing.



TIGR Imagery (U)

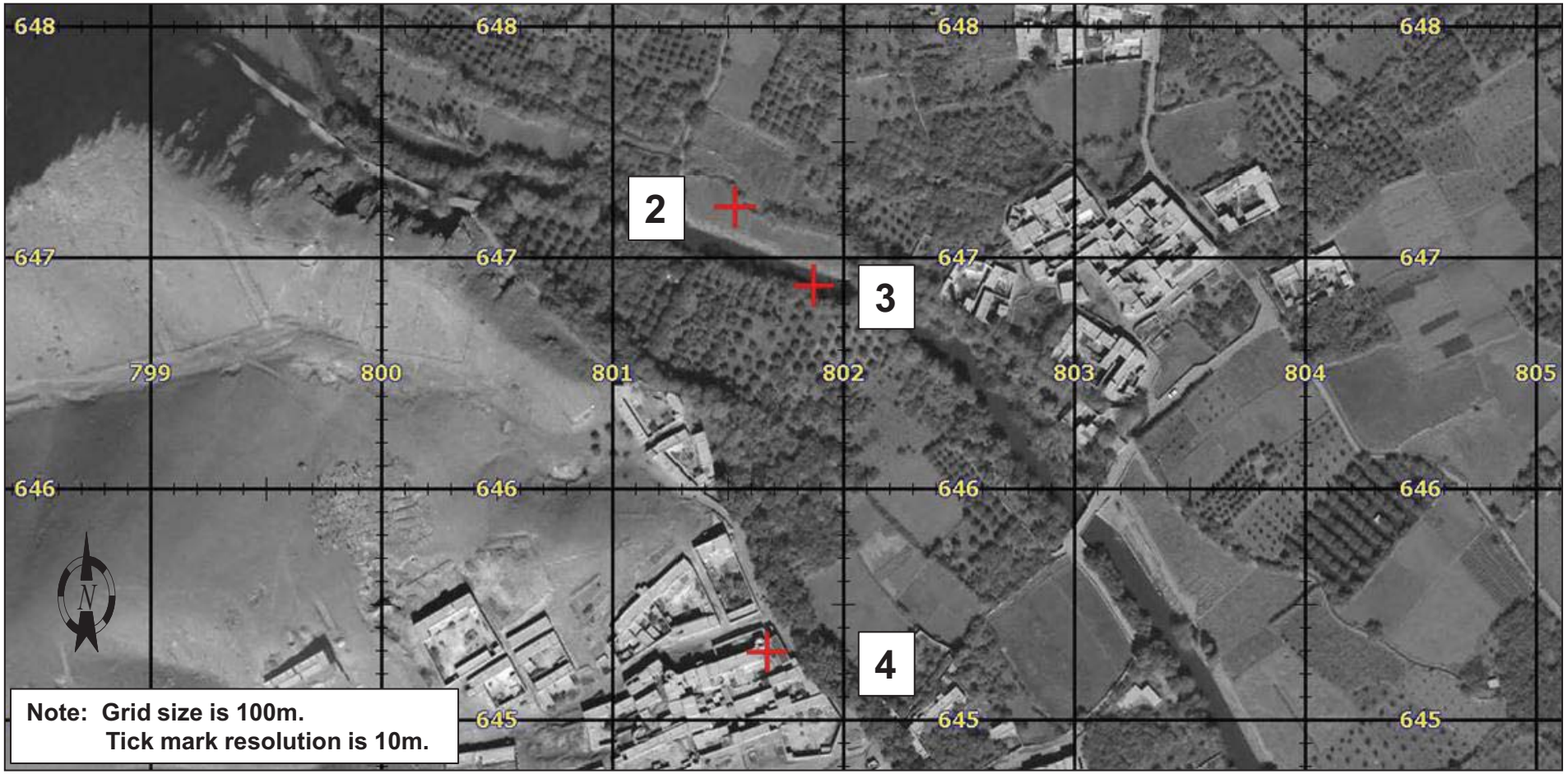
1. **Final BFT Point:** 42S VC 79926 64990 (57 kts; 326 ft AGL; Heading 137°)
2. **Probable Location at Hit:** 42S VC 80153 64722 (50m from FA site @ Heading 317°)
3. **Final Wreckage Location:** 42S VC 80187 64688 (location of main fuselage)
4. **AFIRE POO:** 42S VC 80167 64530 (as reported by (b)(3), (b)(6))
5. (b)(1)1.4a: (b)(1)1.4a (planned HLZ for insertion)



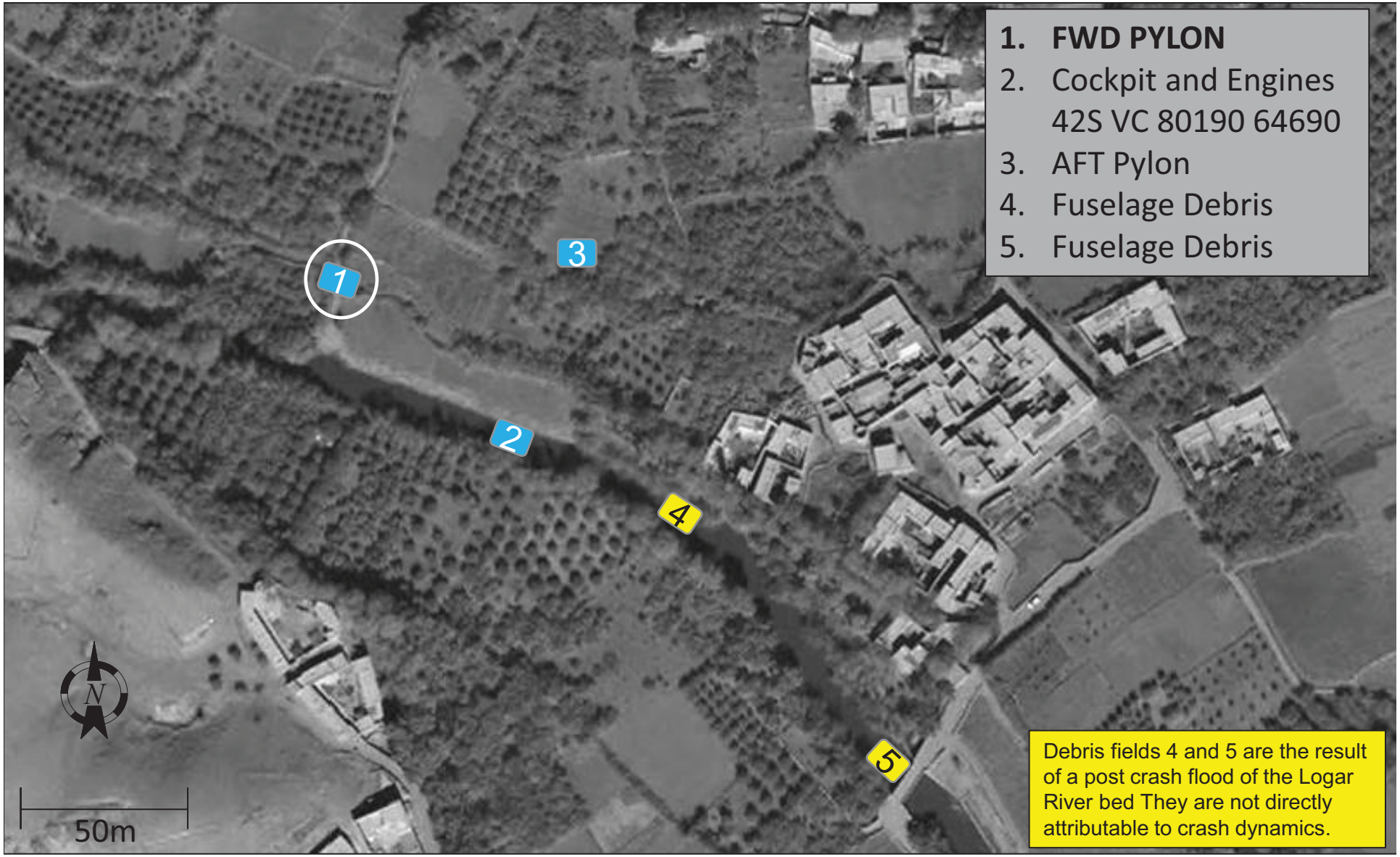
(b)(1)1.4a

Imagery (U)

2. **Probable Location at Hit:** 42S VC 80153 64722 (50m from FA site @ Heading 317°)
3. **Final Wreckage Location:** 42S VC 80187 64688 (location of main fuselage)
4. **Probable SAFIRE POO:** 42S VC 80167 64530 (as reported by (b)(3), (b)(6))



Debris Field (U)



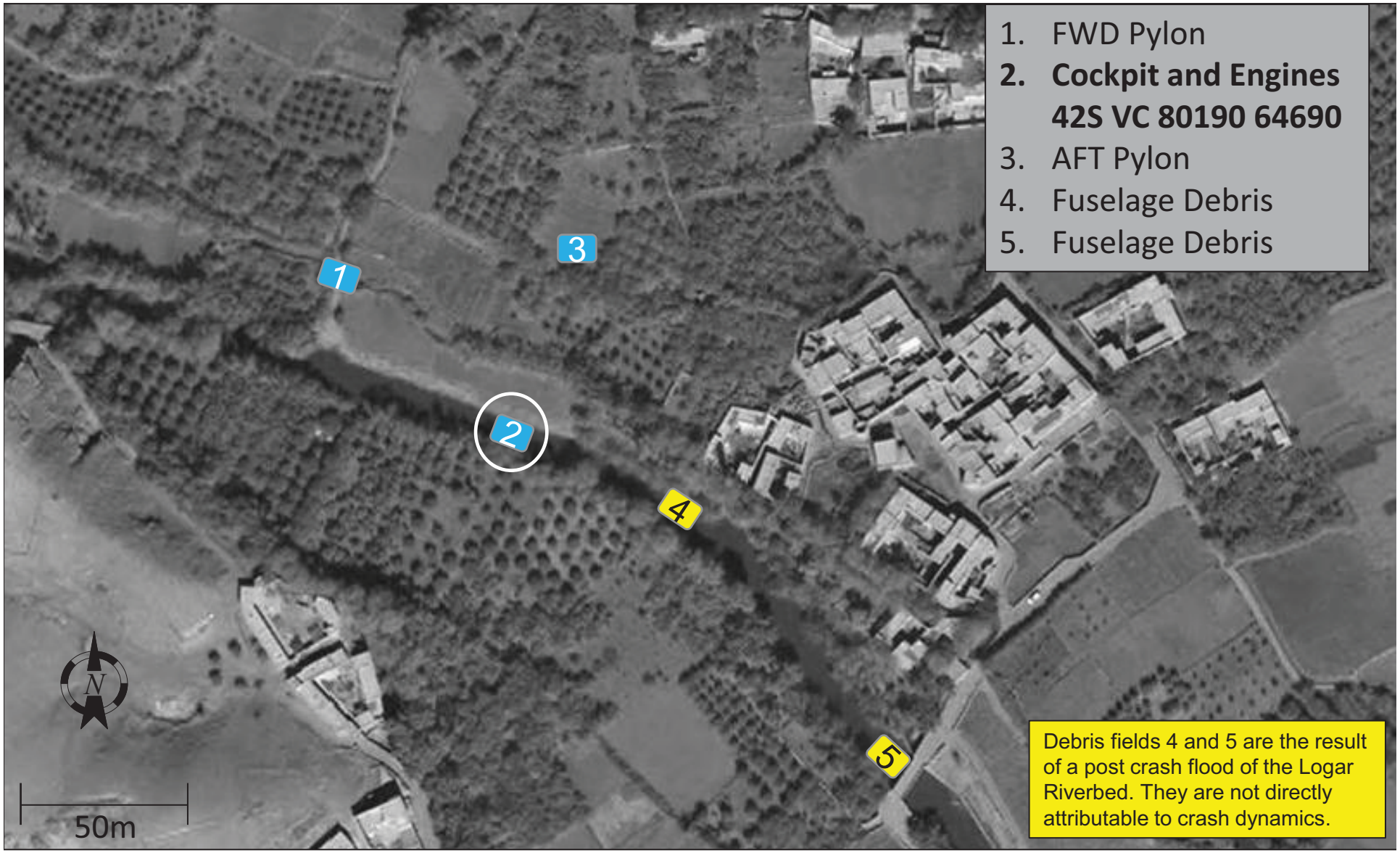
Forward Pylon (U)

Forward Pylon (U)

(~~C~~) This portion of aft red rotor blade showing weapon effects was located near the forward pylon and associated debris.

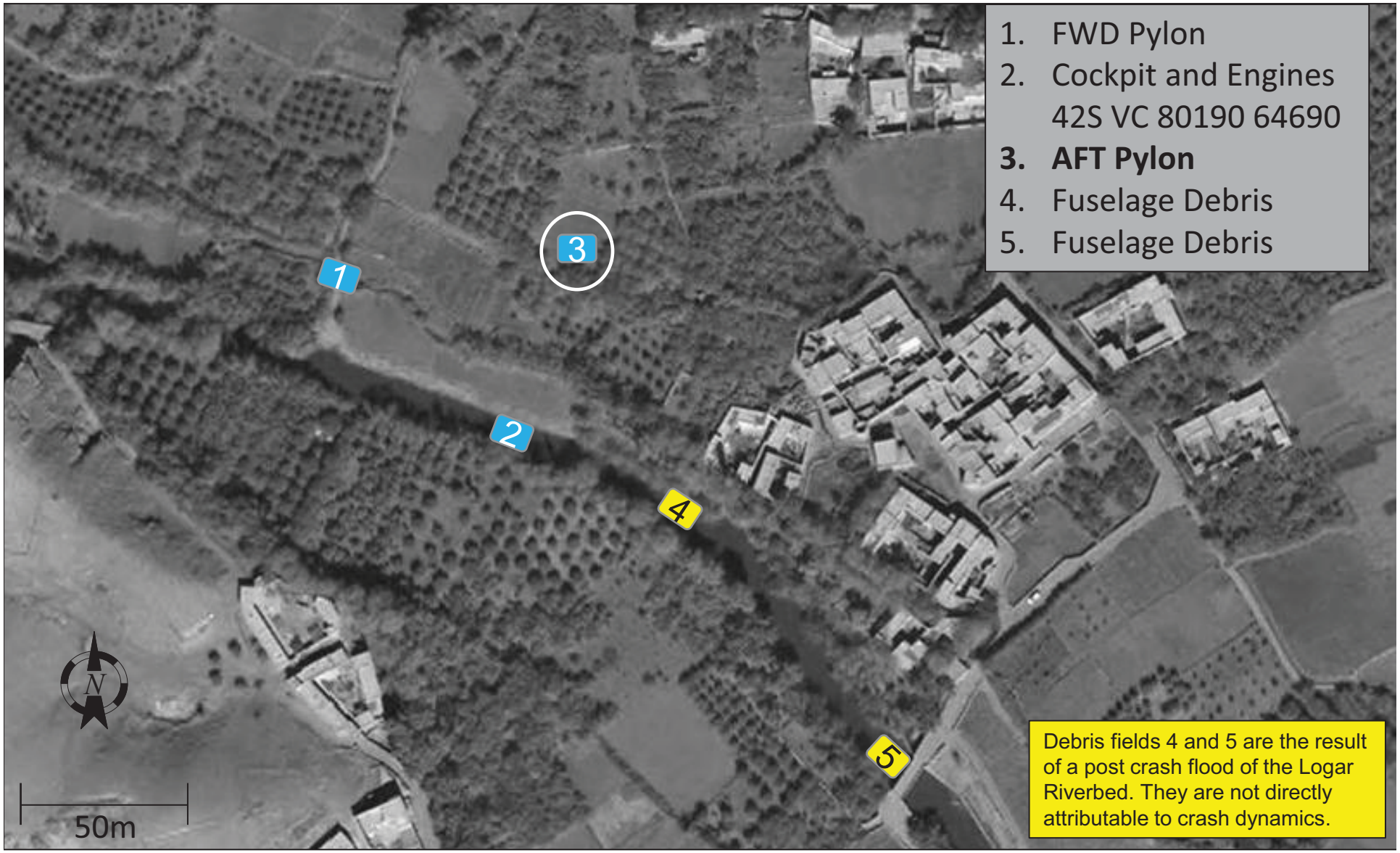
(U) It is unknown if this portion of blade was placed there by the recovery team or by event dynamics.

Debris Field (U)



Cockpit and Engines (U)

Debris Field (U)



Aft Pylon (U)

Aft Red Rotor Blade (U)

(~~C~~) Weapons effects were found on the red aft rotor blade. Prior to JCAT arrival on the scene, first responders cut the rotor blade in two locations, and piled all the aft rotor blades together next to the aft pylon (located out of frame to the right in the picture below).

Aft Red Rotor Blade (U)

Collection Methodology (U)

1. (U/F~~OUO~~) On site, a Joint Combat Assessment Team forensic expert initially identified aircraft components showing visible signs of weapons effects.

2. (U) On BAF, recovered aircraft components were unloaded, methodically inspected then sorted and placed in a two-dimensional layout by position on the aircraft.

3. (U) All minor aircraft components and residual soil were sifted and thoroughly inspected for weapon effects and contextual forensic evidence.

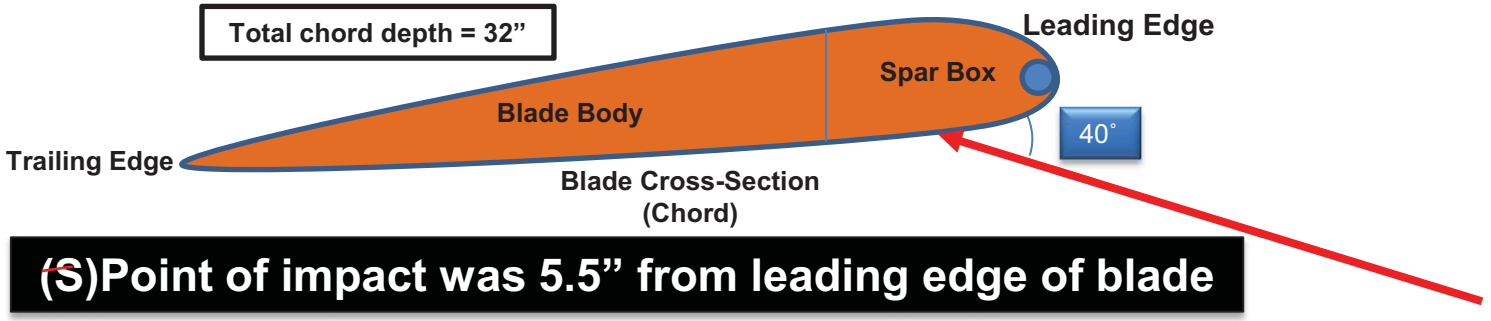
Wreckage Recovered to Bagram AB (U)

(U/~~FOUO~~) The wreckage was reduced on site, packed into a container, and shipped to Bagram AB where JCAT thoroughly examined all pieces for weapons effects.

Correlated View of Weapon Impact Site on Aft Red Blade (~~S~~)

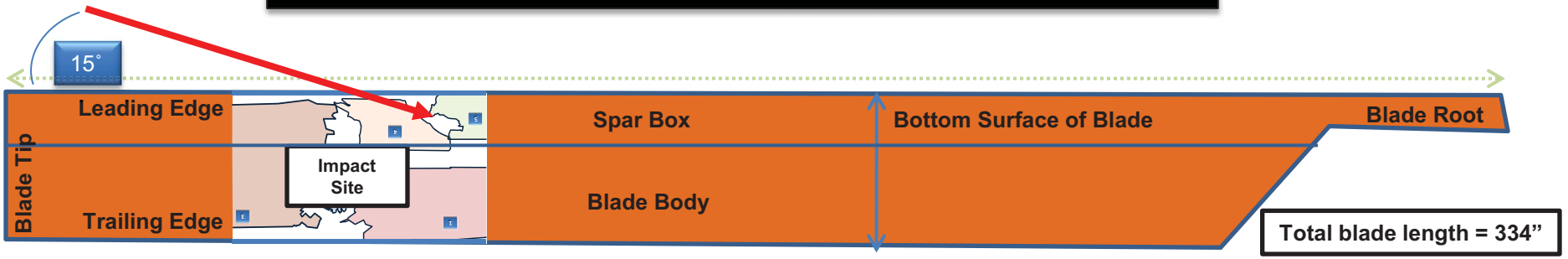
(Bottom Side-Leading Edge)

(~~S~~) Weapon angle of impact was approximately 40˚ relative to the bottom surface of the blade



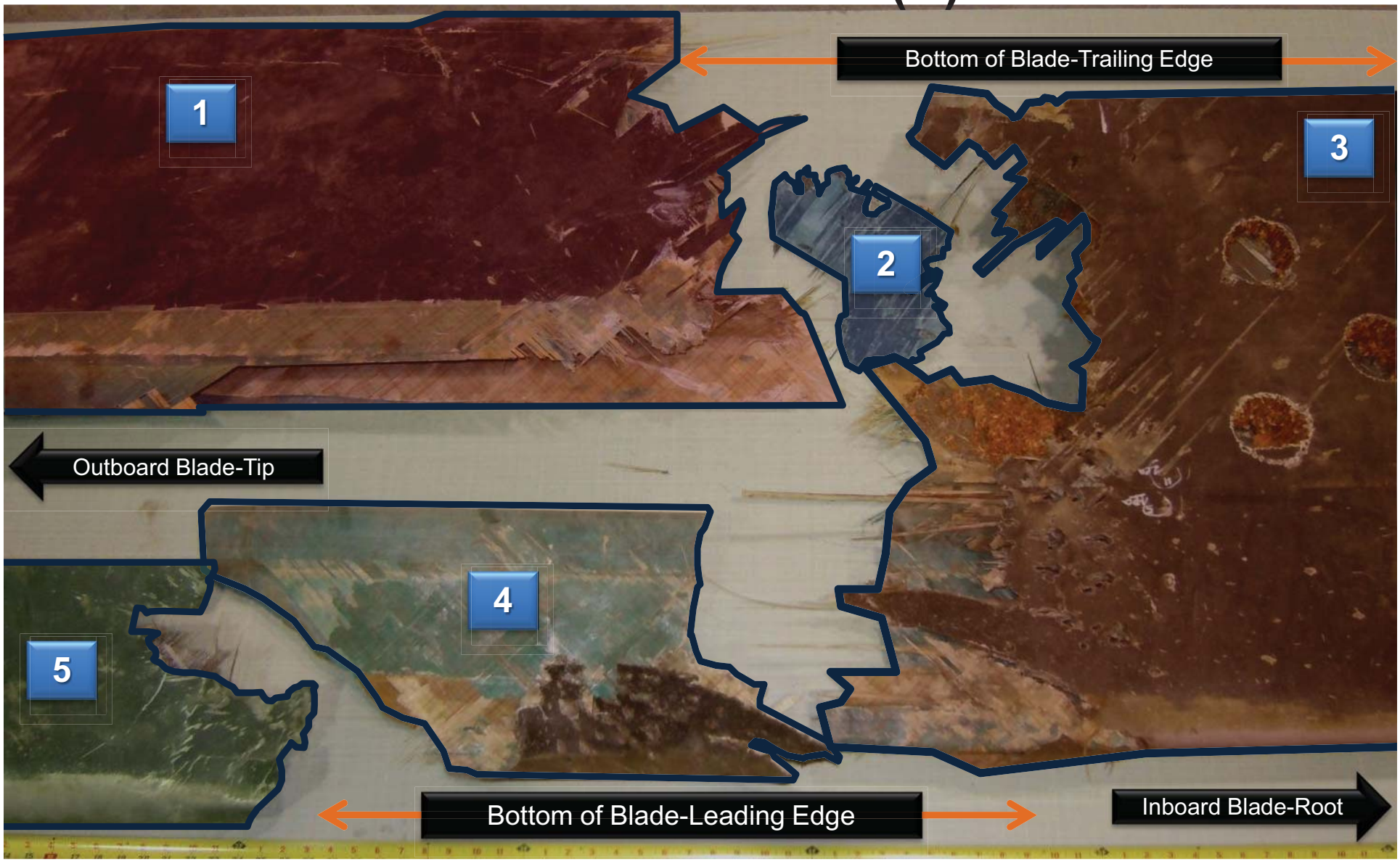
(~~S~~)Point of impact was 5.5” from leading edge of blade

(~~S~~)Weapon angle of impact was approximately 15˚ relative to the leading edge of the blade



(~~S~~)Point of impact was 122” from blade tip

Expanded View of Weapon Impact Site on Aft Red Blade (~~S~~)



Expanded View of Weapon Impact Site on Aft Red Blade (~~S~~)

ARL Testing (U)

(U) Background

~~(C)~~ On 22 August 2011, the U.S. Army Research Laboratory, Survivability/Lethality Analysis Directorate (ARL/SLAD) executed four test events at the request of the ASDAT with Bulgarian OG-7V and Iranian Saegheh Anti-Personnel RPGs (provided by NGIC).

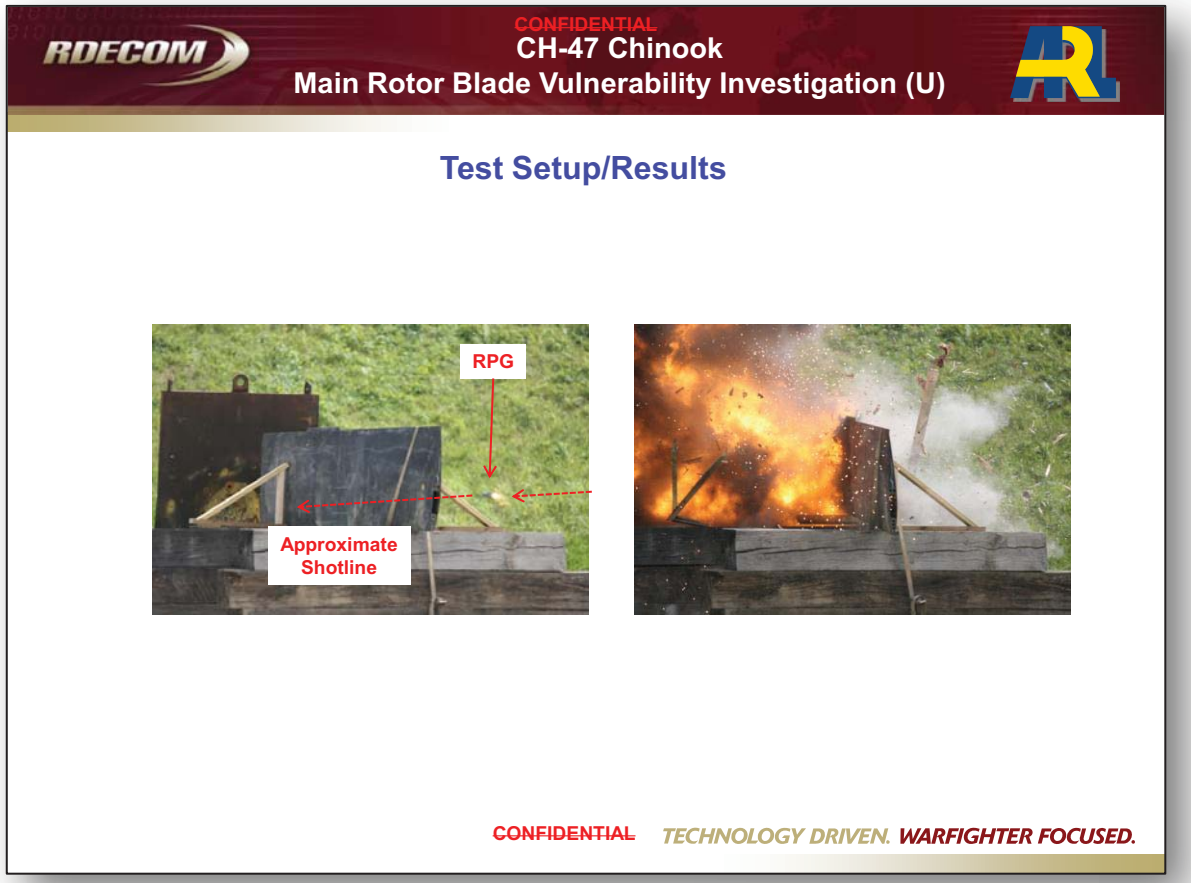
~~(C)~~ The results from test B4 (OG-7V) nearly matched the results witnessed in the combat event.

(U) Test Setup

(U) Initial threat engagement scenario was based upon ASDAT data from the combat incident.

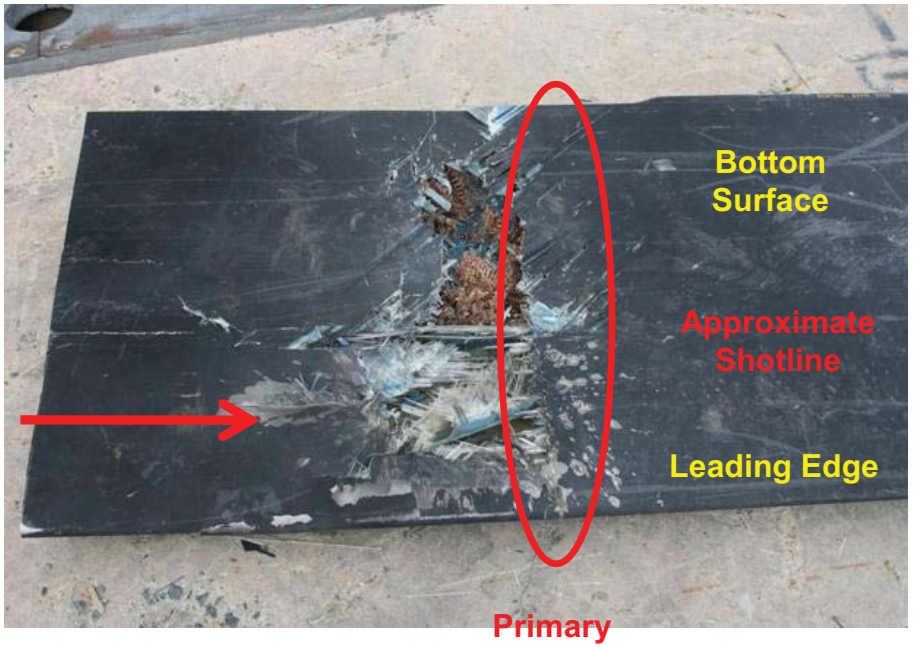
(U) The RPG was detonated in a dynamic configuration (launched from RPG-7 launcher).

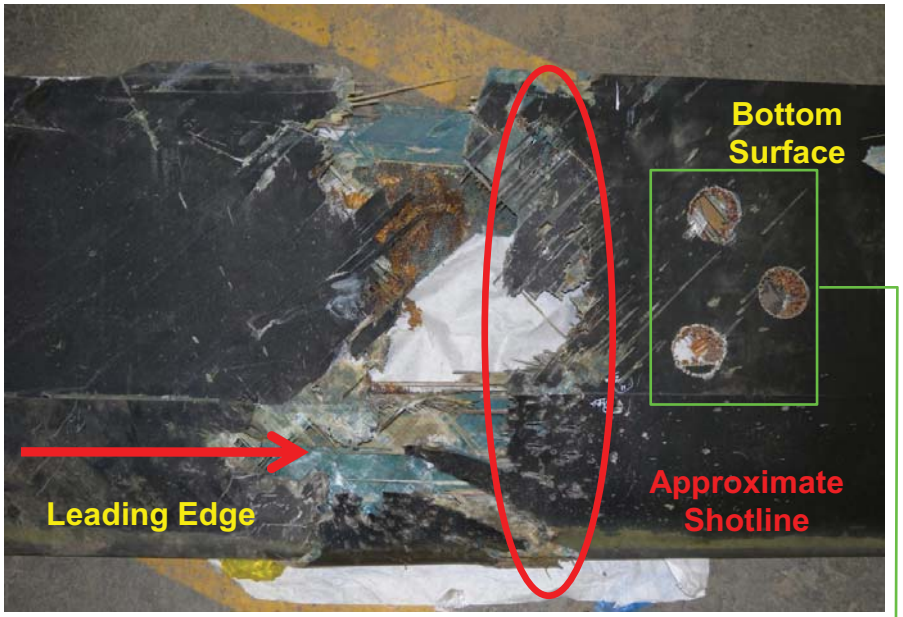
(U) Blade was not structurally loaded.



Test Results – Bottom (Impact) Surface

Comparison to Combat Incident





(U) ASDAT INSERT: 3 fragment sample cores in incident blade are not the result of weapon impact

Conclusions

•The Threat that caused the damage to the CH-47 MRB in the combat incident was an RPG.

• The RPG was an anti-personnel variant, likely an OG-7V.

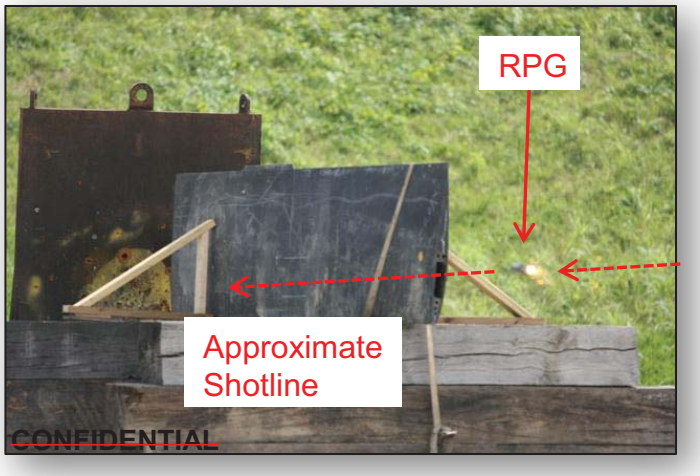
ARL Assessment

•The test results from ARL Test B4 nearly matched the data (images) provided by the ASDAT.
• Minor variances in the results (test versus combat incident), mostly the loss of material in the trailing edge, were due to the blade spar separation and material contact with the ground.
•While the spar did not sever in test B4, if loaded, it is highly likely that the spar would have failed as witnessed in the combat event.

ARL Test Fragment Analysis

~~(C)~~ ??? Waiting for ARL Data ???.

PENDING



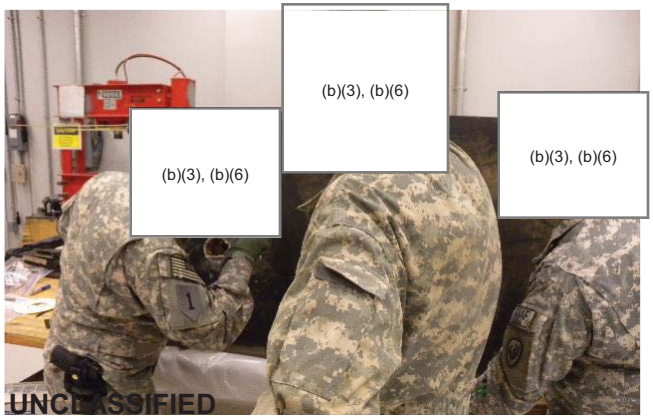
Bulgarian OG-7V Fragmentation Sample Lot

Incident Fragment Analysis

~~(C)~~ The aft red rotor blade was X-rayed by the Craig Hospital (Bagram) radiology department.

(U) Retained fragment locations were identified and marked on the blade surface.

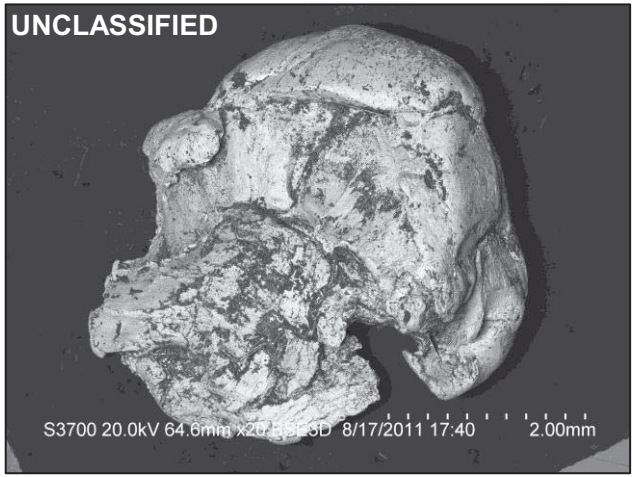
(U) Fragment locations were cored from the blade. Fragments were removed from the cores and shipped to the Missile and Space Intelligence Center for analysis.



Fragment Comparison

~~(S)~~ Incident Fragment

2x3x4mm
Iron 95.78%
Aluminum 2%
Silicon 1.47%
Manganese 0.76%.



~~(C)~~ ARL Test OG7V Fragment

2x3x4mm
Iron xx.xx%
Aluminum x%
Silicon x.xx%
Manganese 0.xx%.

PENDING

PENDING

Probable Threat Weapon
OG-7 Variant (~~S~~)

(U) Introduced in 1970, produced by Russia, Bulgaria, Romania, Iran, and Egypt. The OG-7 was developed to provide RPG-7-equipped forces an accurate direct-fire fragmentation round out to 170 meters and an indirect-fire fragmentation round capable of reaching nearly 1 kilometer.

(U) MAX EFFECTIVE RANGE: 170 m (Direct)
(U) MAX RANGE: 1000 m (In-Direct)

(U) MUZZLE VELOCITY: 150 m/s

(U) FUZE: Point Initiating, Point Detonating (PIPD)

(U) WARHEAD: Fragmentation body, which is little more than a hollow steel pipe filled with explosive. On impact more than 65% of the warhead body is converted into fragments having masses of more than .5 grams. The warhead is filled with 210 - 350 grams of explosive (model dependant) which is 95% RDX and 5% binder.

(U) PG rocket motors use a double base propellant of nitroglycerin and nitrocellulose.

OG-7 Antipersonnel Round

Summary (U)

(~~S~~) At 052209Z AUG11 EXTORTION17 was subjected to a volleyed RPG attack and shot down while inserting an Immediate Reaction Force in the Tangi valley, Wardak province, Afghanistan.

(~~S~~) EXTORTION17 was the lead element of two CH-47Ds with security being provided by an AWT conducting an insertion mission in the Tangi Valley. The flight had entered the Tangi valley traveling from NW to SE when EXTORTION17 at less than one minute from touchdown was engaged by multiple RPGs from a point of origin approximately 200m to their south. The second in a 2-3 round volley of RPG munitions fired struck EXTORTION17 along the bottom forward surface of the aft red rotor blade spar-box. The weapon caused 122 inches of the outboard blade to depart the rotor system. The resultant imbalance effected the entire airframe and drive-train subsystem. A sudden and violent ~3.75 Hz oscillation of the entire aft rotor system led to the separation of the aft pylon within 2 seconds. This caused an immediate loss in lift as well as an unrecoverable clockwise spin. The forward rotor system, unable to compensate for the loss of lift and stability throughout the airframe, was stressed beyond design limits and separated in flight. The fuselage and separated pylon assemblies then impacted the ground. The entire event (from weapon impact to crash) likely lasted less than 5 seconds. Forensic lab analysis and comparative live fire testing indicate the propelled grenade was a variant of the OG-7.

(~~S~~) The enemy engagement of EXTORTION17 resulted in a catastrophic and total loss of the aircraft, aircrew and all passengers.

Tactical Observations (U)

Planning

AMC considerations:

- Designate a crewmember to go into TOC and receive a mission update
- Team Brief/Rehearsal with revised METT-TC
- Direct AWT scheme of maneuver and actions on contact
  - ❑ Prioritize signature reduction and security for insertion aircraft
  - ❑ Ensure that both AH-64Ds are on station supporting the insertion
- Properly account for team integrity/security

Tactical Observations (U)

Planning (Continued)

- Accurate threat assessment of area surrounding intended HLZ
  - ❑ Prior operations and threats encountered within the past 30 days
  - ❑ SIGINT/HUMINT
- ISR deck and distribution of sensors
  - ❑ Wealth of assets, ineffective coordination and asset awareness
  - ❑ AC-130 did not engage POO, or coordinate actions against it
  - ❑ No designation, storing, or transmission of POO coordinates by any platform
- ARSOA mission familiarity and proficiency versus RA, NG, AR

Tactical Observations (U)

Other Considerations

- One set of objective products provided to one crewmember
  - ❑ Eliminated any opportunity to establish a COP
  - ❑ Denied crews mission analysis process to identify limitations and resultant capabilities even if it was at the cockpit level
- Lack of threat weapon signature familiarity
  - ❑ The primary ASE system is the aircrew member
  - ❑ During and after being engaged, the ability to accurately characterize a weapon system allows for the timely application of TTPs even if it is the next crew being briefed at the FOB

Tactical Observations (U)

Other Considerations (Continued)

Hostile Fire Detection System (HFDS)

- Participating aircrews were not aware EX17 was being fired upon until it was hit
  - ❑ Point of origin was never positively identified or actioned
- The ability to detect hostile fire in a timely manner directly effects mission survivability
  - ❑ Crew may maneuver out of harm's way
  - ❑ Enemy location is immediately available for suppression and engagement
  - ❑ Enemy location can be passed to supporting platforms and ground forces
  - ❑ Enemy location and activity is immediately available as SIGACT or for follow on IPB
- HFDS message architecture must be non proprietary and Joint

Appendix 1. Multiple Source References (U)

TITLE (U)	DATE (U)	ORIGINATOR (U)
Vulnerability Red./Ballistic Hardening SCG	02 OCT 95	PM-AEC
CH-47D SCG	3 May 2005	PEO, Aviation
OEF, ONE SCG	28 Mar 2002	OASD
ALARACT 031/2004	09 MAY 04	DAMO-ODI
CJTF-101 SCG	01 NOV 08	
CH-47D Technical Manual (TM 1-1520-240-23-1)	08 Nov 2006	US Army
KO-7V Lethality Analysis	Jun 2007	ASIC
OG-7M Lethality Analysis	Mar 2007	ASIC
OG-7V Lethality Analysis	Mar 2007	ASIC
OG-7VMZ Lethality Analysis	Mar 2007	ASIC
Interview with (b)(3), (b)(6) Crew Members	11 Aug 2011	ASDAT
Interview with EX16 Crew Members	14 Aug 2011	ASDAT
Final Report for S-5KP Vulnerability/Lethality Characterization	20 Mar 2007	JASP
S-5K/S-5K1 - NAIC-1340-333-99	Jan 1999	NASIC
S-5 Rocket Threat to Aircraft D-AIM-1346-001-09	Feb 2009	MSIC
Milan Anti-Tank Guided Missile System Digest (DIA-15-1107-009)	5 Jul 2011	DIA
Fagot Missile Description (DI-1145-0038Q-07)	Jul 2007	MSIC
SA-7 Surface-to-Air Missile System Description (DI-1346-0051Q-08)	Jan 2008	MSIC

Appendix 2: Maintenance Data (U)

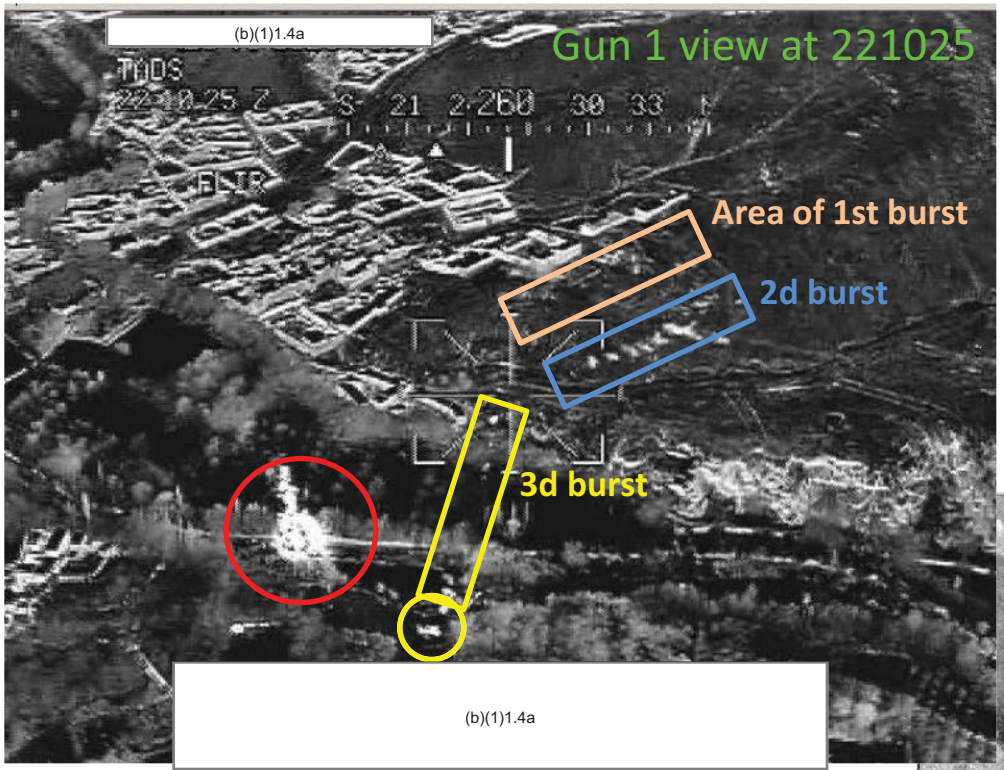
1. Aircraft 84-24175 is a total loss and will be attrited.

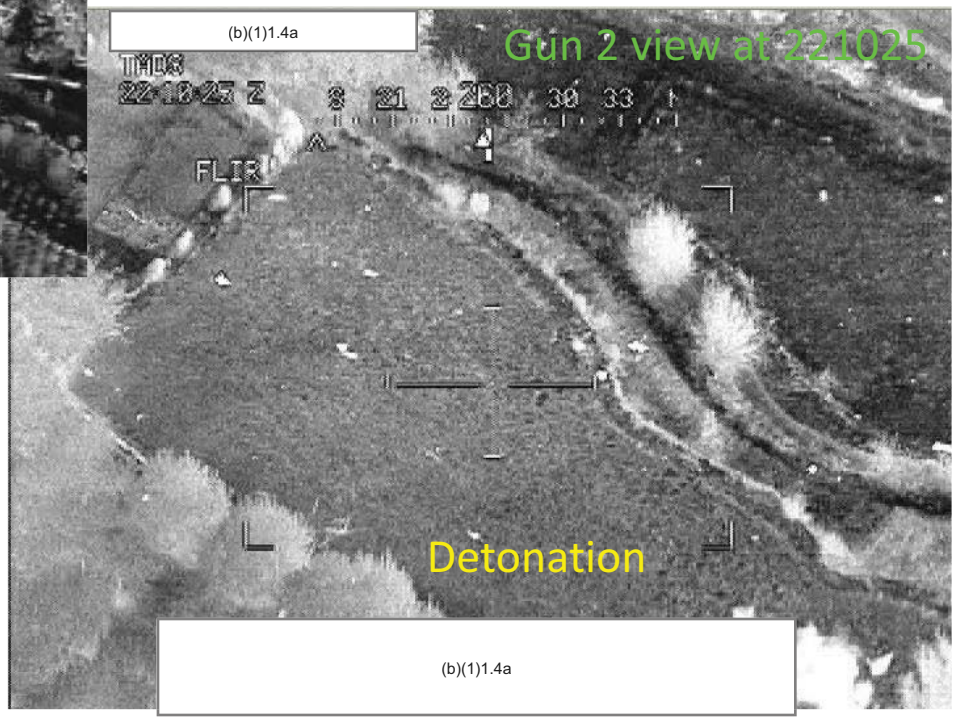
Appendix 3: Medical Data (U)

1. Medical data for the crew and passengers are not available for this report at time of publishing.

Appendix 4: Contributing Data (U)

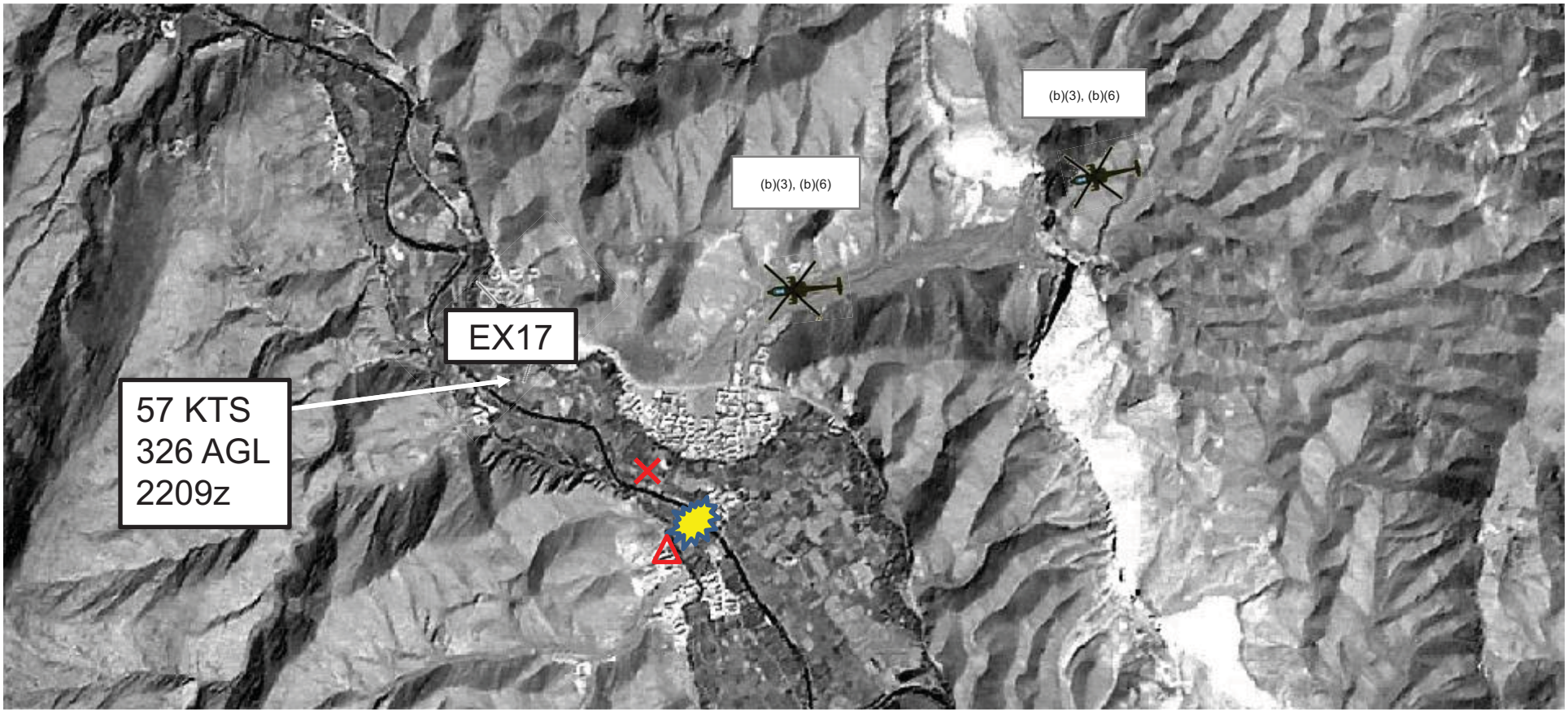
Speculated RPG Impact – AH Gun Tape (U)





- Flash visible to both AH crews @ 220948
- AC130 crews report 3 shots in ~9 seconds
- Gun 1 begins shooting @ 221019
- Detonation first visible at 221025
- Detonation associated with 1st round of 3rd 30mm burst

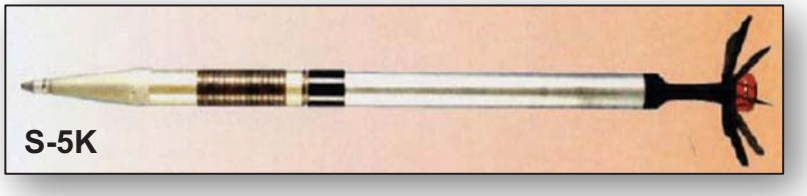
Aircraft Positions – 052209ZAUG (U)

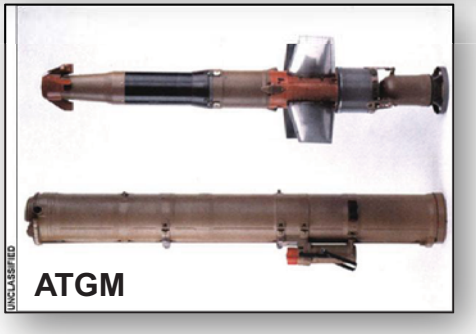


(U/~~FOUO~~) The only available flight tracks from participating aircraft are derived from (b)(1)1.4a (b)(1)1.4a. As (b)(1)1.4a has a 1/minute capture rate, exact positions at the time of weapon impact were not recorded. Extortion's position in this graphic is derived from eyewitness accounts and debris field dispersion. (b)(3), (b)(6) positions are derived from gun tape footage at the GPS time noted.

Dismissed Candidate Weapons

In any engagement assessment, the process begins with consideration given to all weapons. Facts of the individual event guide the assessment toward a particular family of weapons and eventually to a specific model of weapon. The following pages provide information regarding weapon systems discounted in the Extortion 17 engagement.





Dismissed Candidate Weapons
PG-7 Variants (U)

Fielded in 1961, millions have been produced

Max Effective Range: 300 m (moving)
500 m (stationary)

Max Range: 950 m (self-destruct)

Initial Velocity: 120 m/s

Max Velocity: 300 m/s

Armor Penetration: 260 – 500 mm RHA

Warhead Types: CE Unitary, CE Tandem, FRAG, HE, Thermobaric, ILLUM, Incendiary

Explosive Composition: 95% RDX (PG-7L uses HMX only).

Propellant: Double base propellant of nitroglycerin and nitrocellulose.

PG-7S

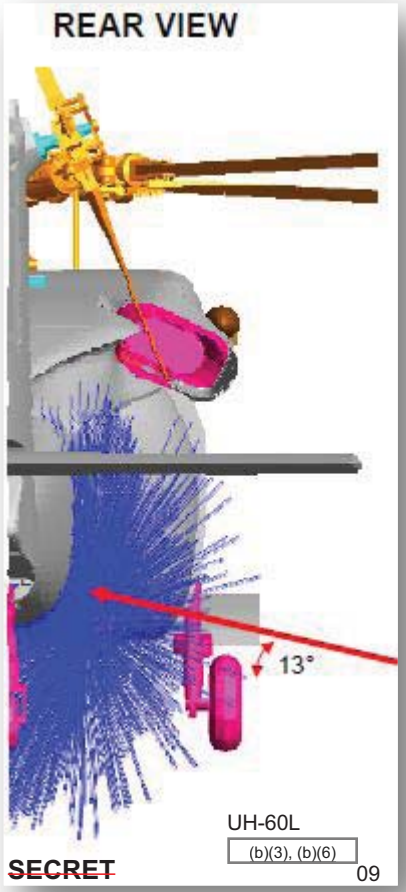
Iranian Nader

PG-7 HEAT

Source: NGIC SPIRIT

PG-7 Damage and Fragmentation (U)

~~(S)~~ These pictures illustrate damage caused to a UH-60 transition section and tailboom by a PG-7 variant. Of note are the two concentric rings of damage. At center is the most severe damage caused by the explosively formed copper penetrator (EFP). Naturally formed fragmentation radiates outward from the impact location.



PG-7 Damage and Fragmentation (U)

~~(C)~~ These pictures illustrate damage caused to a CH-47 rotor blade via a static test with an Iranian Nader (PG-7 variant). The Nader is a High-Explosive Anti-Tank (HEAT) round and possesses similar capabilities to the standard PG-7 variant seen throughout the OEF theater.

(U) The picture at left shows the bottom of the blade. The round was oriented in the direction of the ruler (from left to right, top to bottom). A hole caused by the copper penetrator is clearly visible toward the right side of the ruler. The picture at right shows the top surface of the blade, where the penetrator exited the structure.

(U) Note the lack of fragmentation damage on both the bottom and top surfaces of the blade. Other distinguishing characteristics include the hole from the copper penetrator and minor, natural fragmentation damage to the bottom surface of the blade.

Dismissed Candidate Weapons
S-5 Rocket (U)

(U) Production began in USSR in 1950s. Originally designed as an unguided air-to-ground rocket for attack aircraft. Highly proliferated, still in production.

(U) Currently employed by INS in Afghanistan as an improvised RPG, constructed using metal tubing and hand grips.

~~(S)~~ Max Effective Range: 500 m

~~(S)~~ Max Range: 6 km (motor burnout at 375 m)

~~(S)~~ Burn Time: 0.71 – 1.1 seconds

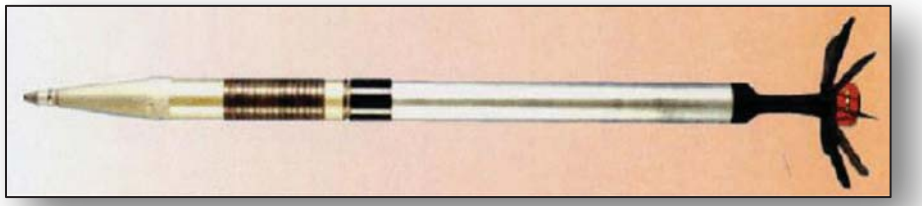
~~(S)~~ Max Velocity: 530 m/s (at motor burnout)

(U) Dimensions: 55 mm diameter, ~1 m in length (included warhead and rocket motor), 3.9 kg

~~(S)~~ Explosive Composition: 95% RDX, 5% Wax

~~(S)~~ Fragment Dimensions: 0.13 in x 0.33 in x 0.47 in; 1.6g

~~(S)~~ Armor Penetration: 228 mm of RHA steel



S-5 Damage and Fragmentation (U)

(~~S~~) These pictures illustrate damage caused to an AH-1 fuselage by an S-5K rocket static test.

(~~S~~) The picture at left details the entry damage. Note the natural fragmentation damage, as well as the increased size of fragments as compared to a PG-7 variant.

(~~S~~) The picture at right shows the exit damage, where the penetrator passed through the opposite side of the fuselage.

Dismissed Candidate Weapons
Milan and Fagot (AT-4) ATGMs (U)

(U) Milan: French and German Anti-Tank Guided Missile. First variant was fielded in 1974. Over 330k produced, deployed in at least 42 countries.

(~~C~~) Fagot: Russian ATGM, first variant fielded in 1982. Produced by 4 countries, deployed in at least 26 countries.

(U) Dimensions: ~120 cm long; ~13 cm in diameter; 11-13 kg

(U) Max Range: 2000 - 2500 m

(U) Initial Velocity: 75 m/s

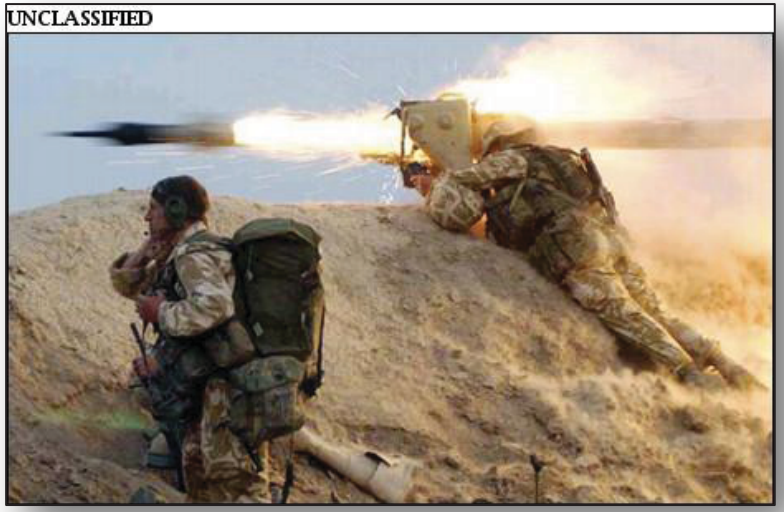
(U) Max Velocity: 205 m/s

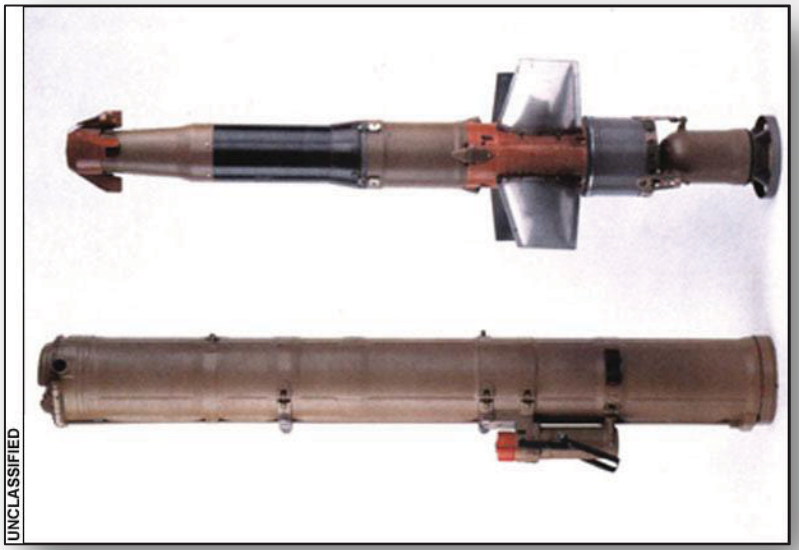
(~~C~~) Armor Penetration: 450 - 600mm RHA

(U) Fuze: Crush/Impact

(~~S~~) Milan Explosive Composition: 80% RDX, 20% TNT

(~~C~~) Fagot Explosive Composition: 97% HMX, 3% Wax





Milan ATGM
Damage and Fragmentation (U)

~~(S)~~ These pictures illustrate damage caused to a Polish Rosomak vehicle by a Milan ATGM.

~~(S)~~ The picture at left details the damage caused by the penetrating function of the warhead.

~~(S)~~ The picture at right shows the general damage.

~~(S)~~ Note the lack of fragmentation damage to the vehicle. The primary destructive mechanism is the explosively-formed penetrator as well as blast overpressure.

Polish Rosomak Vehicle
May 2010

Polish Rosomak Vehicle
May 2010

Fagot ATGM
Damage and Fragmentation (U)

~~(S)~~ This picture illustrates the damage caused to an AH-1 helicopter by a Fagot (AT-4) test fire.

~~(S)~~ Most of the damage to the aircraft was actually due to blast overpressure as opposed to the shaped-charge jet. The shaped-charge jet punched a fairly small, localized hole through the aircraft doing little collateral damage. Furthermore, little fragmentation damage was observed to the aircraft. The majority of the damage appeared to be caused by the associated blast wave.

Dismissed Candidate Weapons
MANPADS (U)

(U) Man-Portable Air Defense System
Designed to be carried/operated by 1-2 personnel

(U) Gen 1 MANPADS first produced in early 1960s
Most prolific system is Russian SA-7 series

(U) Dimensions: 50-60 in long, 3 in-diameter, 10-11 kg

(U) Minimum Range: ~203 – 592 m

(U) Maximum Range: ~4.0 – 7.0 km

(U) Max Effective Altitude: ~4,000 – 25,000 ft

~~(C)~~ Arming Time: 1.5 seconds

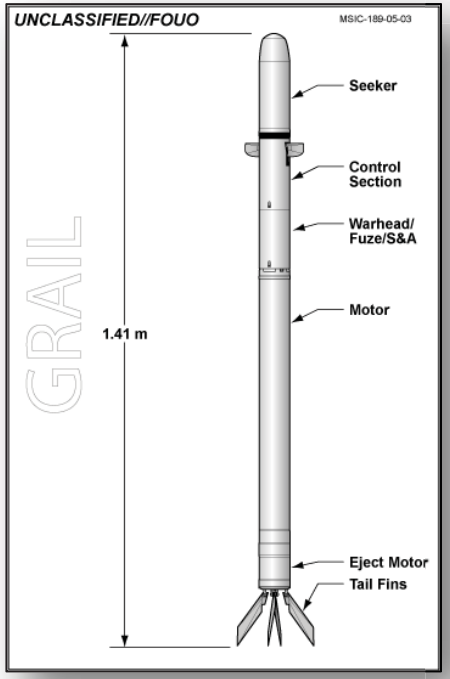
(U) 13-15 second post-launch self-destruct

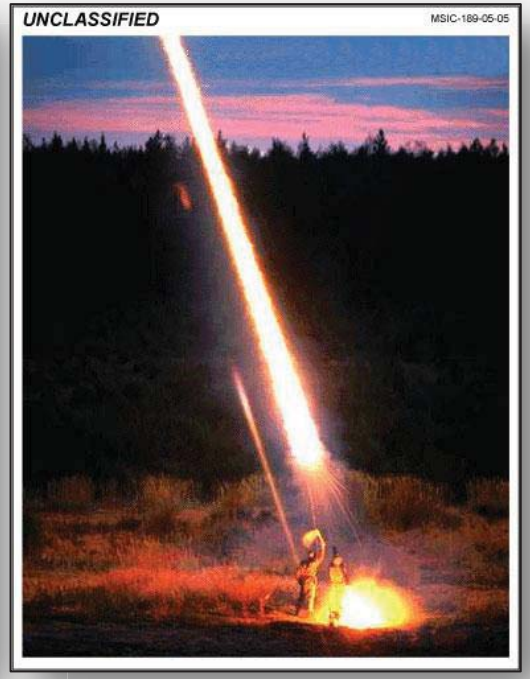
(U) Max Velocity: ~Mach 1.3 – 2.2

(U) Fuze: Contact; penetration; proximity

(U) Warhead Types: HE blast; HE fragmentation

(U) Explosive Material: RDX; HMX; Al; Wax;





MANPADS Damage and Fragmentation (U)

~~(S)~~ This DHL aircraft was hit by a confirmed SA-7 MAPADS. Note the extensive damage to the wing structure.

MANPADS Damage and Fragmentation (U)

~~(S)~~ This AH-64 was hit by a confirmed SA-16. Note the extensive fragmentation damage to the number two engine nacelle, right side wing and fuselage.

AH-64 – IVO Habbaniyah, Iraq – 13 Jan 2004

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US Army Aviation Center of Excellence ASDAT

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~~Declassify On: 20360826~~