

CHAPTER EIGHT

**LASER OPERATIONS**

801. LASER OPERATIONS AT PINECASTLE IMPACT RANGE

a. LASER Pre-Brief. Prior to lasing at Pinecastle Impact Range (R-2910), clearance must be obtained from Pinecastle Control. Pinecastle Range LASER Safety Officer shall perform a range clearance check prior to scheduled LASER missions to ensure there is no encroachment of civilian personnel or standing water puddles in the vicinity of the selected target. Authorized targets are the Red Box, SAM Site, Special Weapons (Main Bull), Live Impact, Mini Convoy, Conventional Day/Night, and Laser Evaluator System Target Board. All aircrews shall be familiar with LASER Hazard Zones and Firing Fans as delineated in the FACSFACJAX Operations Manual. **Upon Check-in with Pinecastle Control for LASER Operations, aircrew will identify the type of laser system to be used.**

b. The conditions of the General Range Procedures and Precautions for the safe use of airborne LASERS and ground-based LASER sections of this chapter shall be met. NAS Jacksonville Detachment (NASJAXDET) LASER range is considered safe for both ground-based and airborne LASER operations, with the following restrictions:

(1) For aircraft systems, only the aircraft-mounted LASER systems listed in Figures 8-40 through 8-43 are permitted. The LASER must be operated from aircraft against the target and within the established firing fans as illustrated in Figures 8-11 through 8-28.

(2) No unprotected personnel will be allowed within the LASER hazard zone (outlined area) per Figures 8-11 through 8-39, unless eyewear of the proper wavelength and Optical Density (OD) are worn as specified in Figures 8-40 through 8-43.

(3) For ground-based systems, only the man-portable LASER systems listed in Figures 8-40 through 8-43 are permitted. The LASER must be operated from Spotting Towers 2-1 and 2-2 against the target area and within the established firing fans as illustrated in Figures 8-11 through 8-21 and 8-29 through 8-39. **NOTE:** Figures 8-40 through 8-43 - The Nominal Ocular Hazard

Distance (NOHD) is the distance from the LASER at which the energy concentration has dropped below the eye protection standard from the LASER being considered. Magnifying optics increase the NOHD. Personnel required to be within the NOHD should have eye protection of the proper wavelength and Optical Density (OD) in place during LASER operations. Figures 8-40 through 8-43 lists the airborne and ground-based LASER systems, which can be safely operated on the Pinecastle Impact LASER Range, their assigned buffer zones, NOHD, and the OD necessary to protect personnel for both aided and unaided viewing of the beam.

(4) Aircraft-mounted LASER systems will only operate against the appropriate targets utilizing the specified operating fans as illustrated in Figures 8-11 through 8-39.

(5) Lasing shall not begin until the aircraft is within five (5) NM and on the approach zone to the appropriate target.

(6) No unprotected personnel will be allowed within the LASER hazard zone. The LASER hazard zone (Figures 8-21 through 8-39) is 150 feet left or right of the LASER line-of-sight extending from the near to far boundary.

(7) Personnel who are required to be within the LASER hazard zone (Figures 8-21 through 8-39) must wear eye protection of the proper wavelength and OD as specified in Figures 8-40 through 8-43.

(8) Aircraft must be on one of the headings or approach zones and at or above the flight profiles contained in Figures 8-11 through 8-21.

c. NASJAXDET is also considered safe for LASER operations utilizing the LASER Designator/Simulator System (LD/SS) in the simulator mode provided the device is placed on any of the targets within the target area per Figures 8-11 through 8-39.

d. The tripod-mounted LD/SS, MULE, or G/VLLD may be safely operated against the Laser Evaluator System (LES) target board provided the system is positioned along the established run-in heading, not more than 2,300 feet away from the location of the target board.

802. Procedures and Precautions for Airborne Lasers

- a. NASJAXDET LASER System Safety Officer (LSSO) shall keep a log showing the date, time and number of firings.
- b. The target and the target area must be free of any specular reflectors (mirrors, glass, still water, etc.).
- c. The range boundaries must be posted to advise the public of the presence of LASER operations.
- d. Unprotected personnel shall not be allowed to view the LASER beam or its specular reflection from within the beam's path and its associated buffer, with or without optics. Such eye protection shall have curved lenses and an OD of six (6) or greater at the LASER wavelength (OD of four (4) is adequate for personnel in other aircraft). The eye protection is adequate to protect personnel under all view conditions for the systems listed in Figures 8-40 through 8-43.
- e. All future targets must be free of mirror-like (specular reflective) objects.
- f. Only the authorized target may be designated or ranged.
- g. Do not designate or range still water, flat glass, mirrors, glazed ice, Plexiglas or any other specular reflector.
- h. Do not designate or range other aircraft.
- i. Prior to lasing, the target shall be positively identified under the crosshairs of the scope or on the operator's monitor.
- j. Lasing shall cease if the operator or range control is dissatisfied with target tracking.
- k. Lasing shall cease if unprotected and/or unauthorized personnel enter the LASER hazard zone.
- l. A fly-over of the range shall be made to ensure that no unprotected and/or unauthorized personnel are in the LASER hazard zone.

m. Lasing shall cease if unprotected and/or unauthorized aircraft enter the operations area or the buffer zone between the lasing aircraft and the target. The buffer zone is defined as a five-degree (half angle) cone surrounding the LASER line-of-sight to the target with the lasing aircraft at the apex.

n. Two-way communications must be maintained between the LASER system operators and all affected range personnel.

o. LASER operations shall take place only on laser approved ranges established in accordance with OPNAVINST 5100.27A and MIL-HDBK-828A.

p. No special precautions are necessary for firing LASERs during rain, fog, or snowfall. Ranges shall be closed to LASER operations if water begins to pond either on the ground, snow or ice. Lasing operations shall cease when standing water is observed.

#### 803. Procedures and Precautions for Ground-Based Lasers

a. NASJAXDET LASER System Safety Officer (LSSO) shall keep a log showing the date, time, place and number of LASER firings.

b. The target and the target area must be free of any specular reflectors (mirrors, glass, still water, etc.).

c. The range boundaries must be posted to advise the public of the presence of LASER operations.

d. All future targets must be free of mirror-like (specular reflective) objects.

e. Only the authorized target may be designated or ranged. The LASER must always be pointed down-range (toward the target).

f. All personnel in the immediate area of the LASER firing position must be behind the operator while the LASER is in use. LASER eye protection is not required for LASER operators or observation personnel viewing the target area with or without binoculars when they remain behind the operator. However, personnel shall never wander into the beam path, its associated buffer, or the LASER target area, without appropriate eye

protection. Such eye protection shall have curved lenses and an optical density of six (6) or greater at the LASER wavelength. This eye protection is adequate to protect personnel under all viewing conditions for the systems listed in Figures 8-40 through 8-43.

- g. Only authorized targets may be designated or ranged.
- h. Do not designate or range still water, flat glass, mirrors, glazed ice, Plexiglas, or any other specular reflector.
- i. Do not designate or range aircraft.
- j. The target must be positively identified under the crosshairs of the scope or on the operator's monitor prior to activation of the LASER.
- k. Lasing shall cease if the operator or the range control is dissatisfied with target tracking.
- l. Lasing shall cease when unprotected and/or unauthorized personnel enter the LASER hazard zone.
- m. The LASER will not be operated or used experimentally outside the range area without such operation being specifically authorized by the local LASER Safety Officer, comm: (352)759-2929).
- n. The LASER exit port of all ground-based LASER systems will be covered by an opaque dust cover when the LASER is located outside the range area or is not in use.
- o. No special precautions are necessary firing LASERs during rain, fog, or snowfall. Lasing operations shall cease when standing water is observed. Ranges shall be closed to LASER operations if water begins to pond on the ground, or if snow, or ice is present.
- p. LASER operations personnel shall read the range SOP periodically and agree to follow it at all times.
- q. Personnel must report to their supervisor immediately any suspected injury or defective equipment (e.g., misalignment of

the LASER beam with the pointing optics) so the appropriate action can be taken.

r. Operation shall be permitted only on the LASER approved range established in accordance with OPNAVINST 5100.27A and MIL-HDBK-828A.

s. Two-way communications must be maintained between the LASER system operators and all affected range personnel.

#### 804. LASER Operations in OPAREA

##### a. References

(1) Space and Naval Warfare Systems Command (SPAWAR-00F), Open Ocean Laser Safety, Recommendations for Lasing U. S. Naval Ships During Training exercises of 30 September 1993

(2) Laser Safety Review Board Minutes of 13 August 1997; The Nominal Ocular Hazard Distances (NOHD) and Optical Densities (OD)

(3) Laser Safety on Ranges and in Other Outdoor Areas, MIL-HDBK-828 of 15 April 1993.

(4) OPNAVINST 5100.27A Safe Use Of LASERS

#### 805. General

a. Purpose. To establish standard operating procedures for laser operations in the FACSFACJAX (FFJ) AOR.

b. Discussion. The SH-60B and HH-60H Seahawk helicopters are capable of carrying the AN/AAS-44 Laser Targeting/Designator Rangefinder (LTDR) and AGM-114 Hellfire missiles. Due to the power and capabilities of the AN/ASS-44 LTDR these special procedures are established for laser operations in accordance with references (a), (b), (c), and (d).

c. Scope. This chapter pertains to laser operations in the FACSFACJAX AOR by aircraft utilizing the AN/AAS-44 LTDR. Other laser systems should be evaluated on a case-by-case basis for addition to this chapter.

806. Definitions.

Green Range for Lasing: Announcement made by FACSFACJAX Range Control Officer (RCO) that all requirements of this document have been satisfied and participating aircraft are cleared to conduct laser operations. *This does not grant permission to arm or for firing of any ordnance.* Specific hazard zones for any ordnance must be met in accordance with a published Letter of Instruction (LOI).

Laser Eye Protection (LEP): Goggles or visors required for participants in laser operations. Each laser has specific requirements for the frequency and optical density that LEP must cover. Additionally, LEP must be inspected periodically. Pitting, cracking, and scratches on the surface may render the LEP useless.

Laser System Safety Officer (LSSO): An individual, designated by the Officer Conducting Exercise (OCE), trained in laser safety and certified Cat I (Technical and Management) or Cat II (Management only). A LSSO from each unit conducting laser operations shall be present at FACSFAC or in the lasing aircraft during laser operations.

Laser Training Range (LTR): NOTMARED area in which laser operations are conducted. This range encompasses the target area plus required safety buffer areas to account for the laser's Nominal Ocular Hazard Distance (NOHD).

Nominal Ocular Hazard Distance (NOHD): Distance along laser beam that intra-beam viewing will cause injury.

Officer Conducting Exercise (OCE): Officer in charge of Laser Operations. Gives the command "Clear to Arm", "Clear to Lase". This command may be delegated as per the units SOP/LOI for the event. The OCE or designated representative shall be present at FACSFACJAX.

Optical Density (OD): Amount of a specific wavelength filtered by LEP.

Red Range: This call, made at any time and by any unit, cancels any clearance to lase.

807. Laser Training Range (LTR) Location.

Figures 8-44 and 8-45 contain a diagram and coordinates for the LTR. Figure 8-44 covers the period between 01 April and 31 November, Non-Right Whale Season. Figure 8-45 locates the LTR further East for Right Whale Season from 01 December to 31 March.

808. Laser Training Procedures.

Prior to entering the Warning Area, aircraft shall contact SEALORD Control on 133.95 VHF or 267.5 UHF with request to enter the LTR. SEALORD Control will clear the aircraft onto the range and switch the aircraft to Bristol Control on a pre-briefed discreet frequency for commencement of aircraft LTR clearance.

After completing range clearance and ensuring range is clear of contacts, the aircraft commander will request "Green Range for Lasing".

809. Laser Training Range (LTR) Clearance.

The LTR is segmented allowing fouled segments to be restricted from use. Range clearance aircraft will report any contacts in the vicinity of the LTR to Bristol Control. If, after conducting range clearance, there are no contacts within the LTR, then the full LTR is authorized. If any contact is within a segment of the LTR, but other segment(s) are clear, then the RCO may grant "Green Range for Lasing" specifically for the clear segment(s) only by calling both the points of the permitted segment(s) and the firing bearings allowed. The RCO will issue "Green Range for Lasing" after participating aircraft reports range or specific segments clear of contacts, the weather meets requirements, and all participants are wearing Laser Eye Protection (LEP).

810. Lasing.

Lasing aircraft shall call "In Hot" at the beginning of each lasing run. Before each use of the laser, lasing aircraft shall call "Laser On" and after each use of the laser they shall call "Laser Off". At the end of each lasing run, the lasing aircraft shall call "Off Cold". Bristol control shall maintain a log of all pertinent events during the exercise.

NOTE: Any participant that spots a fouler entering the range shall call "Red Range".

#### 811. Training Completion.

After completion of laser operations, RCO will issue "Red Range" and ensure all participants are informed events are complete.

#### 812. Flight Profiles.

a. Lasing aircraft shall only lase within allowed firing bearings from aircraft to target. If the full LTR is authorized, firing bearings are from 045 degrees true clockwise to 135 degrees true. If "Green Range for Lasing" is authorized for only one or more segments of the LTR, then the restricted firing bearing will be specified by the RCO and shall be as described in Figure 8-44 or Figure 8-45 as appropriate.

b. Laser operators shall ensure the laser is never fired above the horizon. As range from the target increases, it will be necessary to increase altitude to maintain laser reticle below the horizon. This altitude will vary depending upon height of target point above the water line. At no time shall aircraft operate below minimum altitudes specified in Squadron standard operating procedures.

#### 813. Safety.

a. Pre-Brief. Before conducting Laser Operations, all participants shall receive a brief specifying conduct of exercise, LEP requirements, role of each participant, and outline of LTR. Prior to commencement of each range period, FACSFAC shall ensure participants acknowledge that they have read and understand this section of the FACSFACJAX Operations Manual.

b. LEP. The AN/AAS-44 LTDR transmits on a wavelength of 1064 nanometers and requires LEP with an OD of 4.0 or greater in that wavelength for unaided viewing. Any aided viewing requires an OD of 5.5 or greater in the 1064 nanometer wavelength and must be specifically cleared by FACSFAC (see paragraph 11.h.). All personnel on participating units and aircraft within the LTR shall wear appropriate LEP. Additionally, personnel shall

periodically perform inspections of LEP.

c. Range Clearance. Range clearance will be the primary responsibility of the lasing aircraft or a supporting asset if the lasing aircraft does not have onboard radar. All units on the range however, have the responsibility of reporting any potential range fouler to Bristol Control and if the fouler may be on an active segment of the LTR, immediately call "Red Range".

d. Notice to Mariners. FACSFAC shall issue a Notice to Mariners to cover the affected target area during laser operations.

e. Laser Employment. The lasing aircraft shall only lase on a positively identified target within the approved laser bearings. Lasing shall be discontinued if the Forward Looking Infra-Red (FLIR) system is not maintaining steady lock on the target. It is the ultimate responsibility of the aircraft commander to ensure the safe employment of the laser.

f. Communications. If at any time participating aircraft are not able to communicate with Bristol Control, they shall assume Red Range and discontinue lasing operations until communication is re-established. Participating aircraft may normally relay information from Bristol Control to participating surface units.

g. Target Preparation. Any target used for laser operations shall be inspected for specular reflection hazards. All bright work, chrome, mirrors, glass, or similar reflective surfaces shall be covered or removed prior to laser operations. Paper or thin plywood is an acceptable covering.

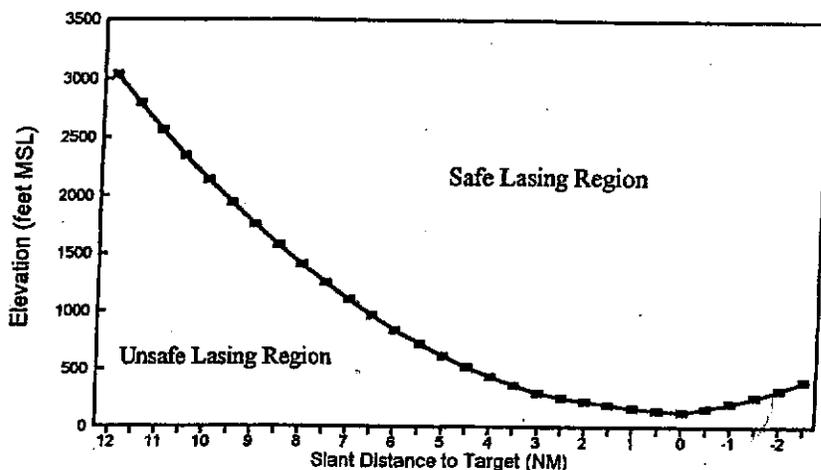
h. Aided Viewing. Any aided viewing of the target using binoculars or any other optic must be cleared through the LSSO to ensure proper NOHD and LEP requirements are followed.

#### 814. Weather Requirements.

Lasing operations shall only be conducted when cloud ceiling and visibility allow VFR operations. The FLIR operator shall have sufficient visibility to identify the target before lasing. Lasing operations shall not be conducted during flat sea state conditions due to specular reflection hazards.

LASER SAFETY SURVEY REPORT  
 PINECASTLE AIRCREW COMBAT TRAINING RANGE (ACTR)

LTA "Mini Convoy" Aerial Lasing  
 Aircraft Heading: 122-152 degrees

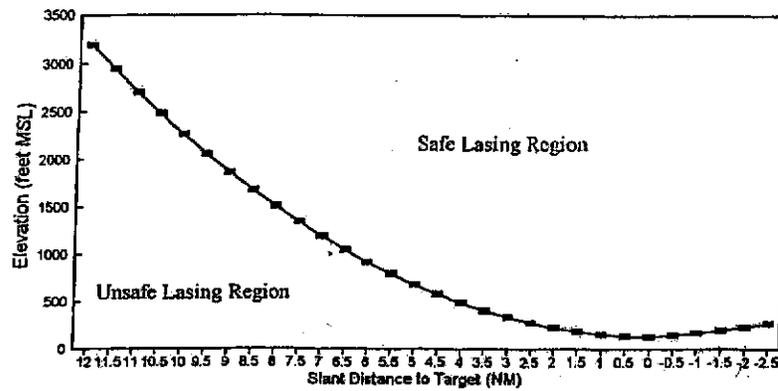


**AERIAL LASING PROFILE**

SLANT DISTANCE TO TARGET (nmi)	MINIMUM SAFE LASING ALTITUDE (feet MSL)	SLANT DISTANCE TO TARGET (nmi)	MINIMUM SAFE LASING ALTITUDE (feet MSL)
12	3030	4.5	515
11.5	2790	4	430
11	2560	3.5	356
10.5	2340	3	292
10	2131	2.5	252
9.5	1933	2	217
9	1744	1.5	187
8.5	1566	1	162
8	1399	0.5	141
7.5	1241	0	125
7	1094	-0.5	157
6.5	958	-1	200
6	832	-1.5	253
5.5	716	-2	316
5	610	-2.5	390

LASER SAFETY SURVEY REPORT  
 PINECASTLE AIRCREW COMBAT TRAINING RANGE (ACTR)

LTA "Mini Convoy" Aerial Lasing  
 Aircraft Heading: 302-332 degrees

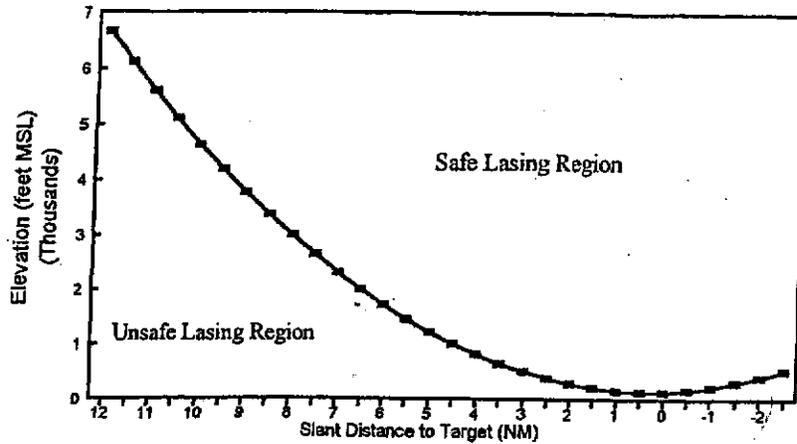


AERIAL LASING PROFILE

SLANT DISTANCE TO TARGET (nm)	MINIMUM SAFE LASING ALTITUDE (feet MSL)	SLANT DISTANCE TO TARGET (nm)	MINIMUM SAFE LASING ALTITUDE (feet MSL)
12	3186	4.5	574
11.5	2940	4	483
11	2703	3.5	402
10.5	2477	3	331
10	2262	2.5	271
9.5	2057	2	221
9	1862	1.5	181
8.5	1677	1	152
8	1503	0.5	133
7.5	1339	0	125
7	1186	-0.5	144
6.5	1043	-1	168
6	910	-1.5	196
5.5	788	-2	229
5	675	-2.5	267

LASER SAFETY SURVEY REPORT  
 PINECASTLE AIRCREW COMBAT TRAINING RANGE (ACTR)

LTA "Sam Site" Aerial Lasing  
 Aircraft Heading: 122-152 degrees

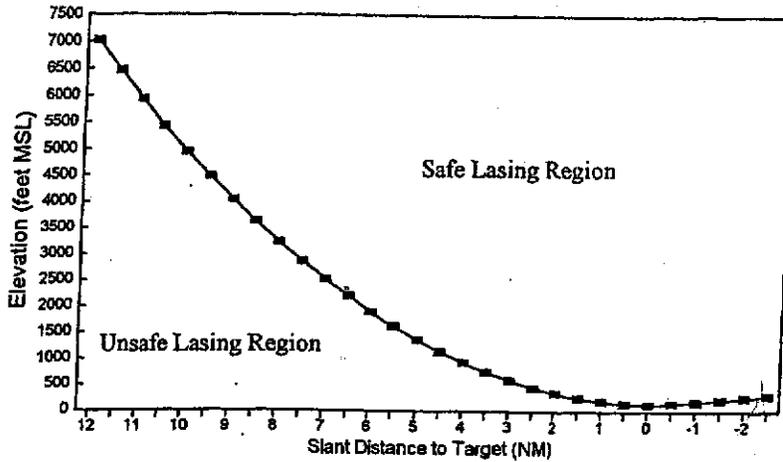


AERIAL LASING PROFILE

SLANT DISTANCE TO TARGET (NM)	MINIMUM SAFE LASING ALTITUDE (FEET MSL)	SLANT DISTANCE TO TARGET (NM)	MINIMUM SAFE LASING ALTITUDE (FEET MSL)
12	6654	4.5	1001
11.5	6114	4	810
11	5597	3.5	643
10.5	5104	3	499
10	4634	2.5	379
9.5	4187	2	281
9	3764	1.5	207
8.5	3363	1	157
8	2987	0.5	137
7.5	2633	0	125
7	2303	-0.5	160
6.5	1996	-1	217
6	1712	-1.5	298
5.5	1452	-2	403
5	1215	-2.5	530

LASER SAFETY SURVEY REPORT  
 PINECASTLE AIRCREW COMBAT TRAINING RANGE (ACTR)

LTA "Sam Site" Aerial Lasing  
 Aircraft Heading: 302-332 degrees

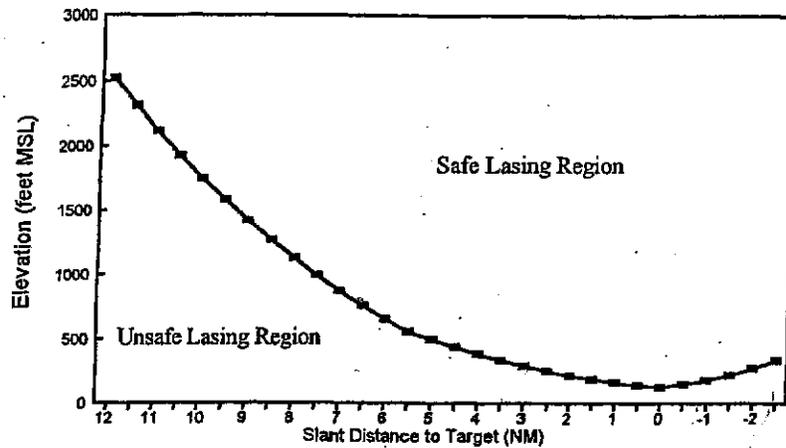


**AERIAL LASING PROFILE**

SLANT DISTANCE TO TARGET (NM)	MINIMUM SAFE LASING ALTITUDE (FEET MSL)	SLANT DISTANCE TO TARGET (NM)	MINIMUM SAFE LASING ALTITUDE (FEET MSL)
12	7017	4.5	1137
11.5	6462	4	931
11	5930	3.5	749
10.5	5422	3	590
10	4936	2.5	454
9.5	4474	2	342
9	4036	1.5	252
8.5	3620	1	187
8	3228	0.5	144
7.5	2860	0	125
7	2514	-0.5	149
6.5	2192	-1	178
6	1893	-1.5	213
5.5	1618	-2	253
5	1365	-2.5	302

LASER SAFETY SURVEY REPORT  
 PINECASTLE AIRCREW COMBAT TRAINING RANGE (ACTR)

LTA "Red Box" Aerial Lasing  
 Aircraft Heading: 122-152 degrees

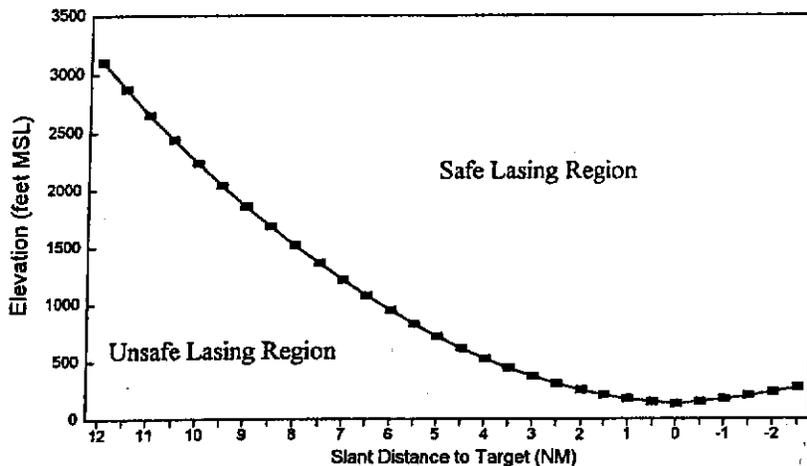


**AERIAL LASING PROFILE**

SLANT DISTANCE TO TARGET (NM)	MINIMUM SAFE LASING ALTITUDE (FEET MSL)	SLANT DISTANCE TO TARGET (NM)	MINIMUM SAFE LASING ALTITUDE (FEET MSL)
12	2519	4.5	437
11.5	2312	4	383
11	2114	3.5	335
10.5	1926	3	291
10	1747	2.5	252
9.5	1577	2	217
9	1417	1.5	187
8.5	1266	1	162
8	1124	0.5	141
7.5	992	0	125
7	869	-0.5	148
6.5	755	-1	180
6	651	-1.5	222
5.5	557	-2	273
5	495	-2.5	333

LASER SAFETY SURVEY REPORT  
 PINECASTLE AIRCREW COMBAT TRAINING RANGE (ACTR)

LTA "Red Box" Aerial Lasing  
 Aircraft Heading: 302-332 degrees

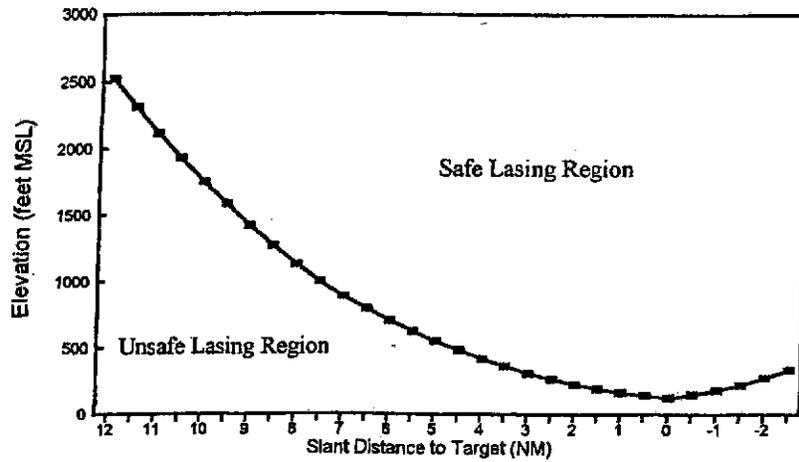


**AERIAL LASING PROFILE**

SLANT DISTANCE TO TARGET (NM)	MINIMUM SAFE LASING ALTITUDE (FEET MSL)	SLANT DISTANCE TO TARGET (NM)	MINIMUM SAFE LASING ALTITUDE (FEET MSL)
12	3101	4.5	612
11.5	2870	4	520
11	2648	3.5	438
10.5	2435	3	366
10	2232	2.5	302
9.5	2038	2	248
9	1853	1.5	203
8.5	1678	1	168
8	1512	0.5	142
7.5	1356	0	125
7	1208	-0.5	144
6.5	1070	-1	168
6	942	-1.5	196
5.5	822	-2	229
5	712	-2.5	267

LASER SAFETY SURVEY REPORT  
 PINECASTLE AIRCREW COMBAT TRAINING RANGE (ACTR)

LTA "Main Bull" Aerial Lasing  
 Aircraft Heading: 122-152 degrees

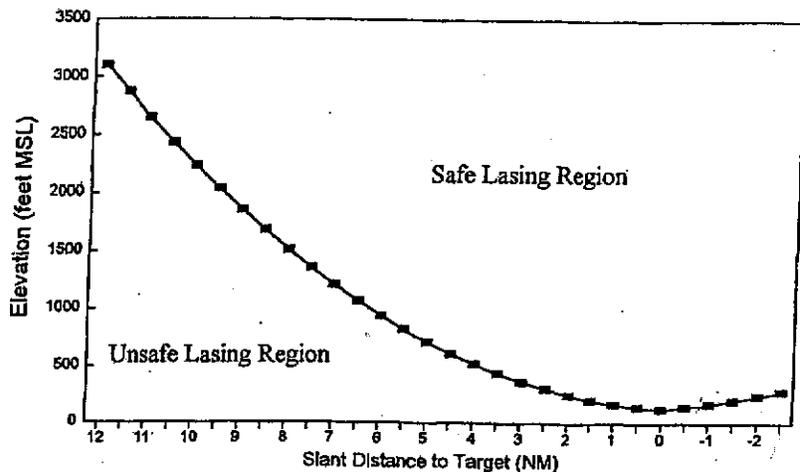


AERIAL LASING PROFILE

SLANT DISTANCE TO TARGET (NM)	MINIMUM SAFE LASING ALTITUDE (FEET MSL)	SLANT DISTANCE TO TARGET (NM)	MINIMUM SAFE LASING ALTITUDE (FEET MSL)
12	2519	4.5	480
11.5	2312	4	418
11	2114	3.5	361
10.5	1926	3	310
10	1747	2.5	264
9.5	1577	2	225
9	1417	1.5	191
8.5	1266	1	163
8	1124	0.5	141
7.5	992	0	125
7	882	-0.5	148
6.5	790	-1	180
6	704	-1.5	222
5.5	624	-2	273
5	549	-2.5	333

LASER SAFETY SURVEY REPORT  
 PINECASTLE AIRCREW COMBAT TRAINING RANGE (ACTR)

LTA "Main Bull" Aerial Lasing  
 Aircraft Heading: 302-332 degrees

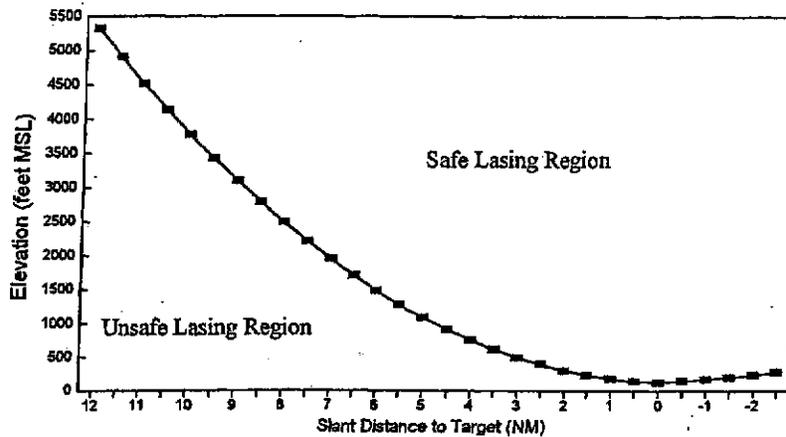


**AERIAL LASING PROFILE**

SLANT DISTANCE TO TARGET (NM)	MINIMUM SAFE LASING ALTITUDE (FEET MSL)	SLANT DISTANCE TO TARGET (NM)	MINIMUM SAFE LASING ALTITUDE (FEET MSL)
12	2666	4.5	553
11.5	2470	4	475
11	2283	3.5	404
10.5	2103	3	341
10	1931	2.5	285
9.5	1767	2	238
9	1611	1.5	198
8.5	1462	1	166
8	1322	0.5	142
7.5	1188	0	125
7	1063	-0.5	145
6.5	946	-1	171
6	836	-1.5	203
5.5	734	-2	240
5	640	-2.5	283

LASER SAFETY SURVEY REPORT  
 PINECASTLE AIRCREW COMBAT TRAINING RANGE (ACTR)

LTA "Live Ordnance" Aerial Lasing  
 Aircraft Heading: 122-152 degrees

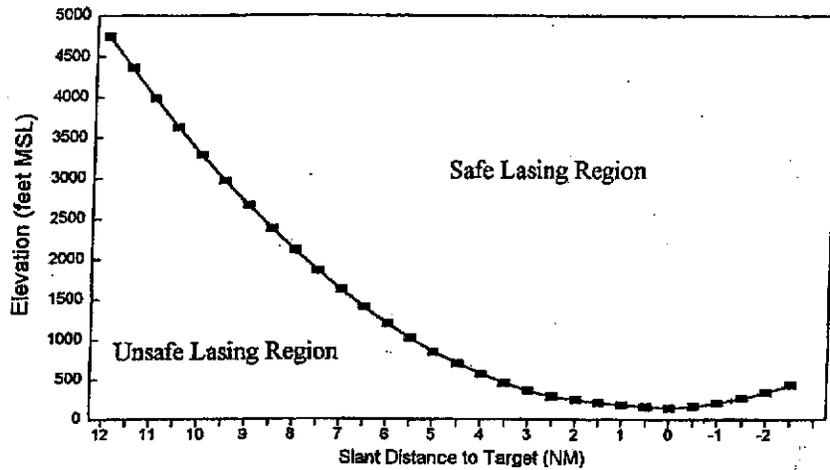


AERIAL LASING PROFILE

SLANT DISTANCE TO TARGET (NM)	MINIMUM SAFE LASING ALTITUDE (FEET MSL)	SLANT DISTANCE TO TARGET (NM)	MINIMUM SAFE LASING ALTITUDE (FEET MSL)
12	5471	4.5	971
11.5	5050	4	809
11	4647	3.5	664
10.5	4260	3	537
10	3891	2.5	427
9.5	3539	2	334
9	3205	1.5	258
8.5	2888	1	200
8	2588	0.5	159
7.5	2305	0	135
7	2039	-0.5	153
6.5	1791	-1	176
6	1560	-1.5	205
5.5	1347	-2	240
5	1150	-2.5	279

LASER SAFETY SURVEY REPORT  
 PINECASTLE AIRCREW COMBAT TRAINING RANGE (ACTR)

LTA "Live Ordnance" Aerial Lasing  
 Aircraft Heading: 302-332 degrees

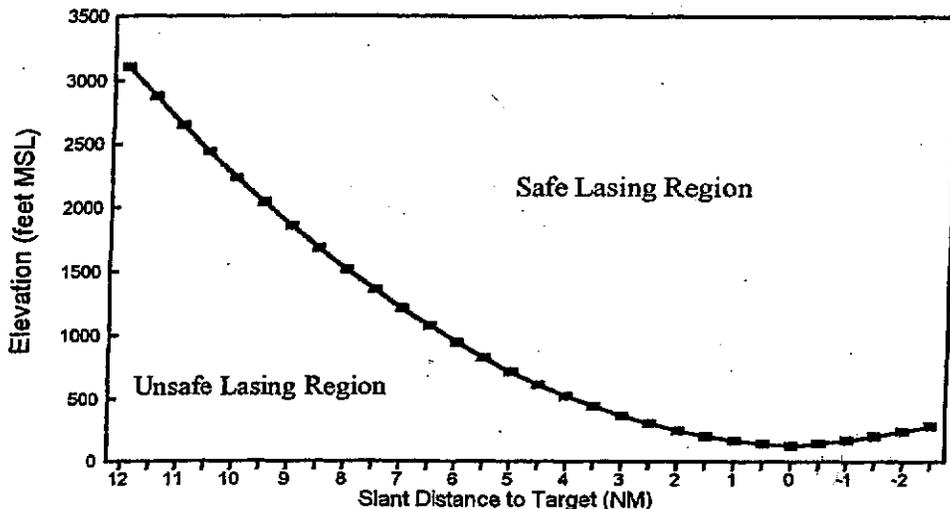


**AERIAL LASING PROFILE**

SLANT DISTANCE TO TARGET (NMI)	MINIMUM SAFE LASING ALTITUDE (FEET MSL)	SLANT DISTANCE TO TARGET (NMI)	MINIMUM SAFE LASING ALTITUDE (FEET MSL)
12	4742	4.5	697
11.5	4351	4	566
11	3978	3.5	452
10.5	3622	3	355
10	3284	2.5	280
9.5	2962	2	240
9	2658	1.5	205
8.5	2371	1	176
8	2101	0.5	153
7.5	1849	0	135
7	1614	-0.5	159
6.5	1396	-1	200
6	1195	-1.5	258
5.5	1015	-2	334
5	846	-2.5	427

LASER SAFETY SURVEY REPORT  
 PINECASTLE AIRCREW COMBAT TRAINING RANGE (ACTR)

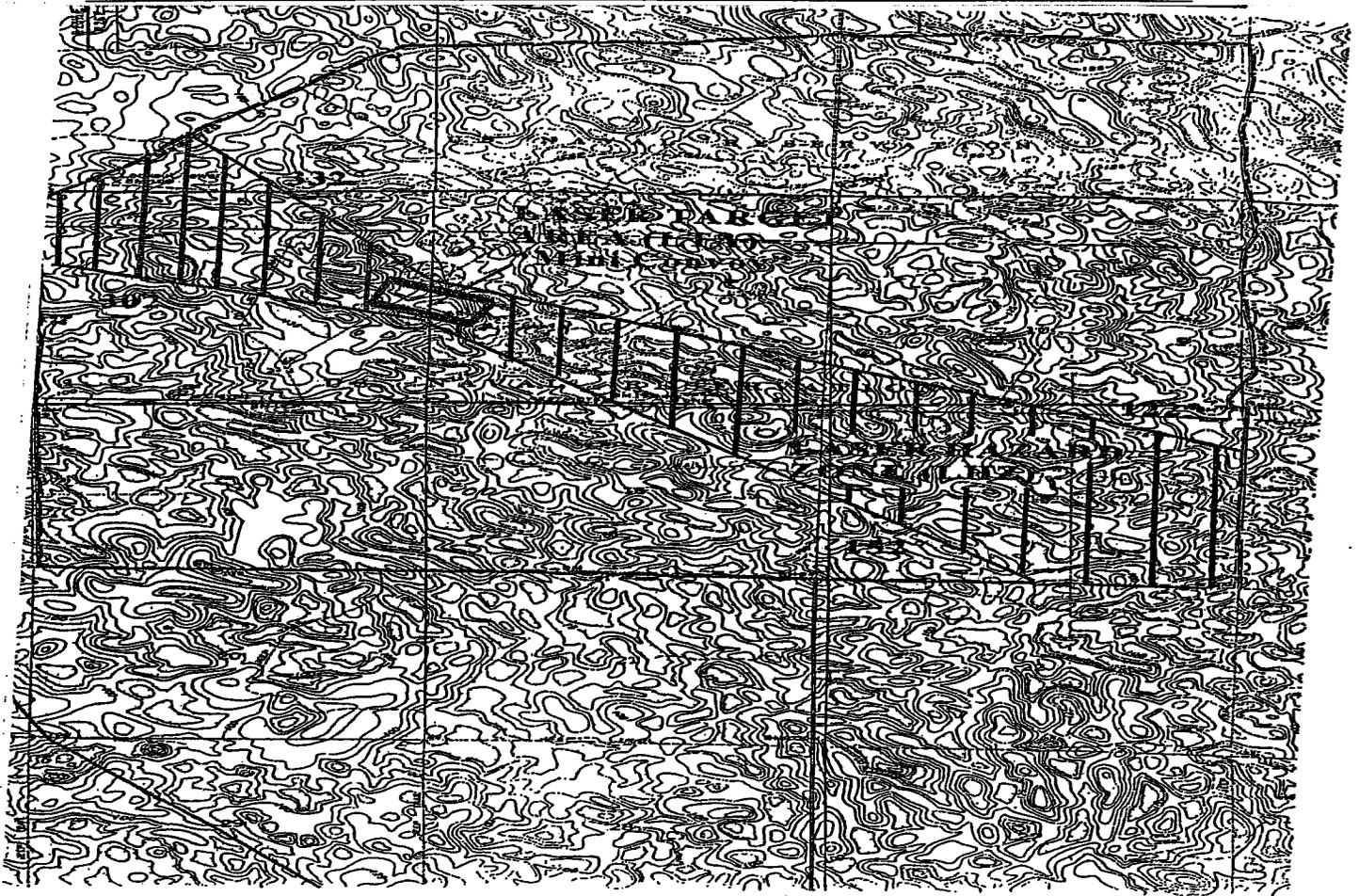
LTA "LSVRS Board" Aerial Lasing  
 Aircraft Heading: 302-332 degrees



**AERIAL LASING PROFILE**

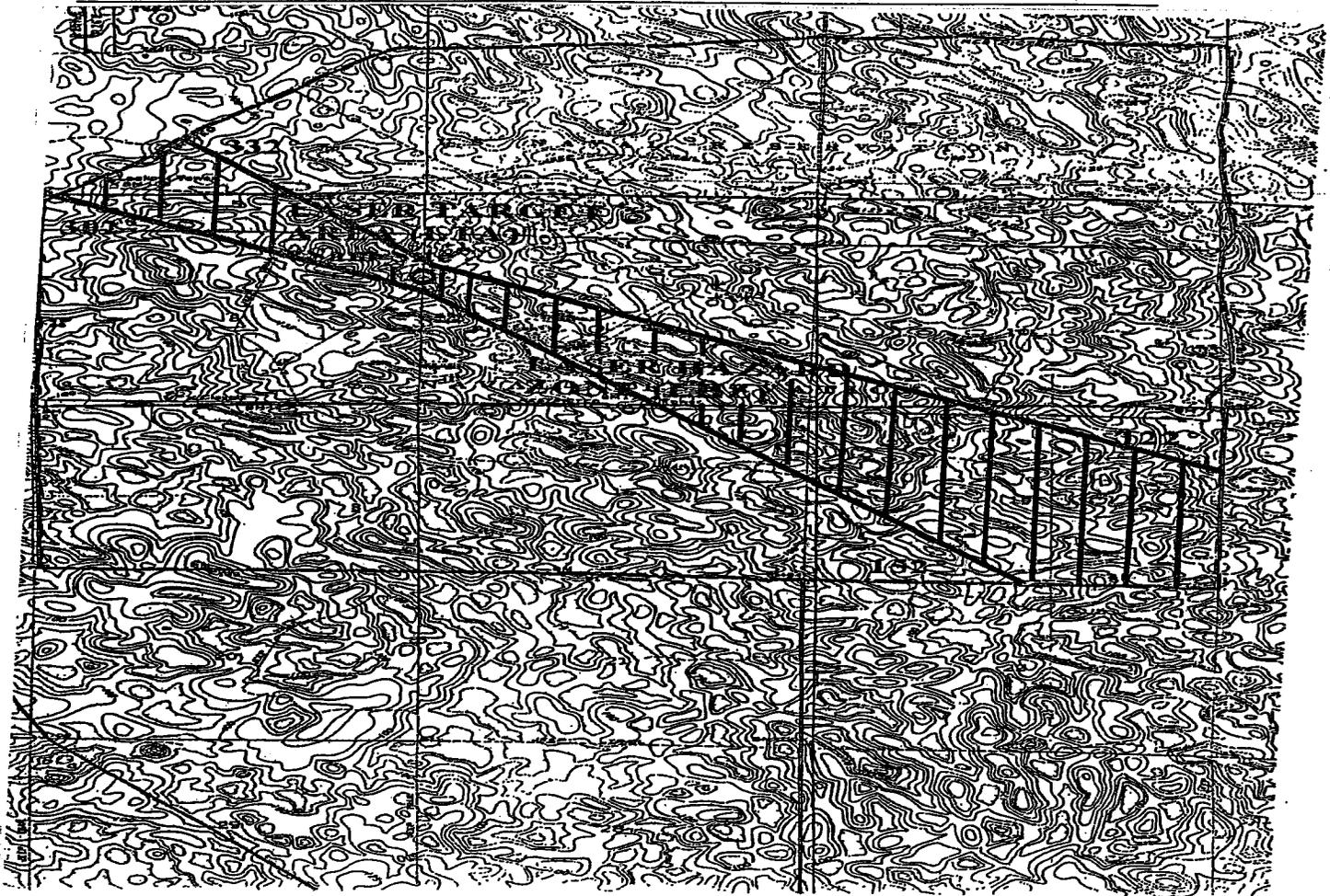
SLANT DISTANCE TO TARGET (NMI)	MINIMUM SAFE LASING ALTITUDE (FEET MSL)	SLANT DISTANCE TO TARGET (NMI)	MINIMUM SAFE LASING ALTITUDE (FEET MSL)
12	3101	4.5	612
11.5	2870	4	520
11	2648	3.5	438
10.5	2435	3	366
10	2232	2.5	302
9.5	2038	2	248
9	1853	1.5	203
8.5	1678	1	168
8	1512	0.5	142
7.5	1356	0	125
7	1208	-0.5	145
6.5	1070	-1	171
6	942	-1.5	203
5.5	822	-2	240
5	712	-2.5	283

LASER SAFETY SURVEY REPORT  
PINECASTLE AIRCREW COMBAT TRAINING RANGE (ACTR)



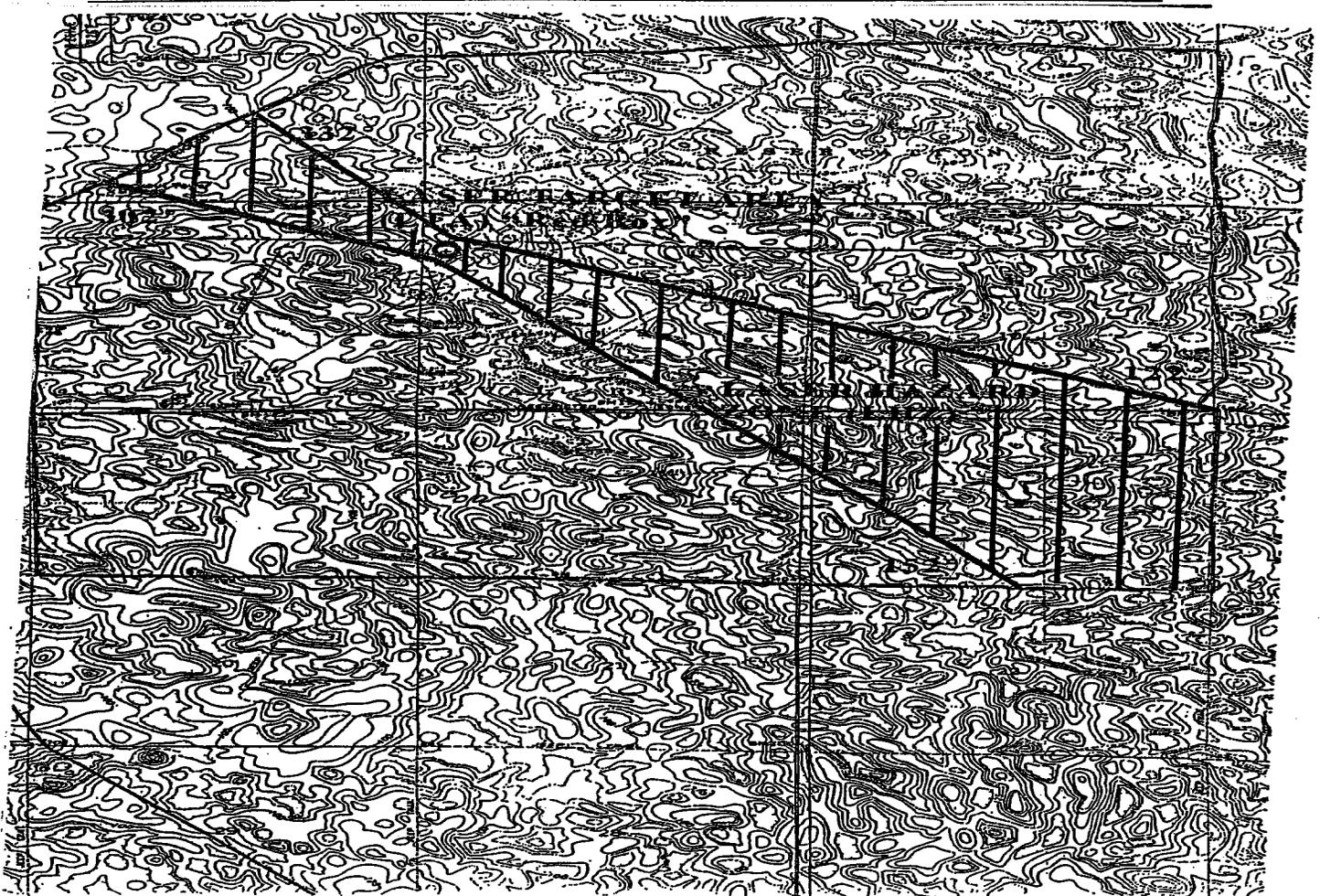
<b>Page: A-1</b>	<b>1</b>	<b>Figure A-1</b>	<b>Heading Availability: 122° clockwise to 152°, and 302° clockwise to 332° true north</b>
<b>Scale: 1 grid = 1 km</b>			<b>Laser Surface Hazard Zone LTA "Mini Convoy" from Aircraft</b>

LASER SAFETY SURVEY REPORT  
PINECASTLE AIRCREW COMBAT TRAINING RANGE (ACTR)



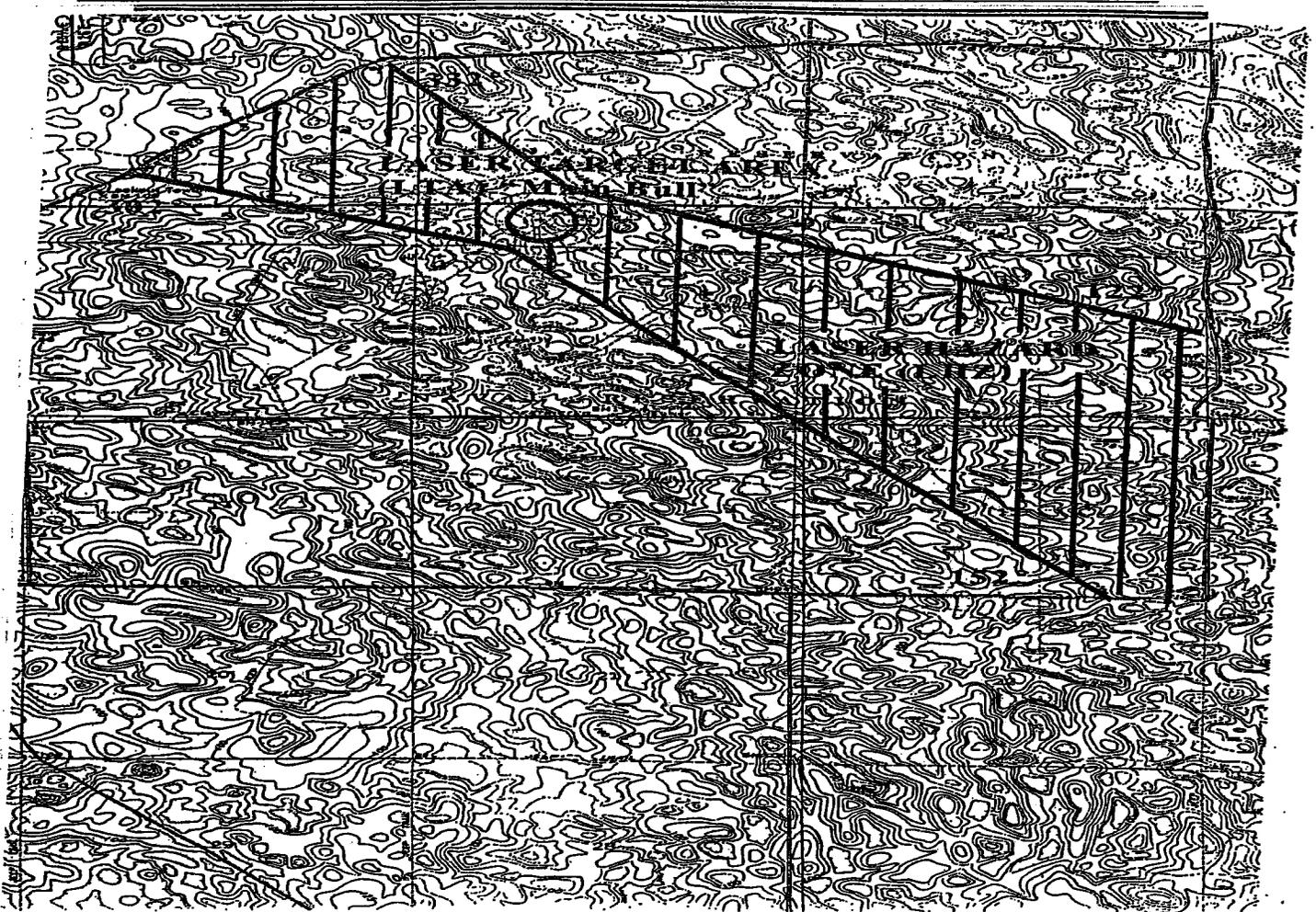
<b>Page: A2</b>	<b>1</b> Grid North	<b>Figure A-2</b>	Heading Availability: 122° clockwise to 152°, and 302° clockwise to 332° true north
Scale: 1 grid = 1 km		Laser Surface Hazard Zone LTA "Sam Site" from Aircraft	Maximum Buffer Zone Angle: 5 mrad

LASER SAFETY SURVEY REPORT  
PINECASTLE AIRCREW COMBAT TRAINING RANGE (ACTR)



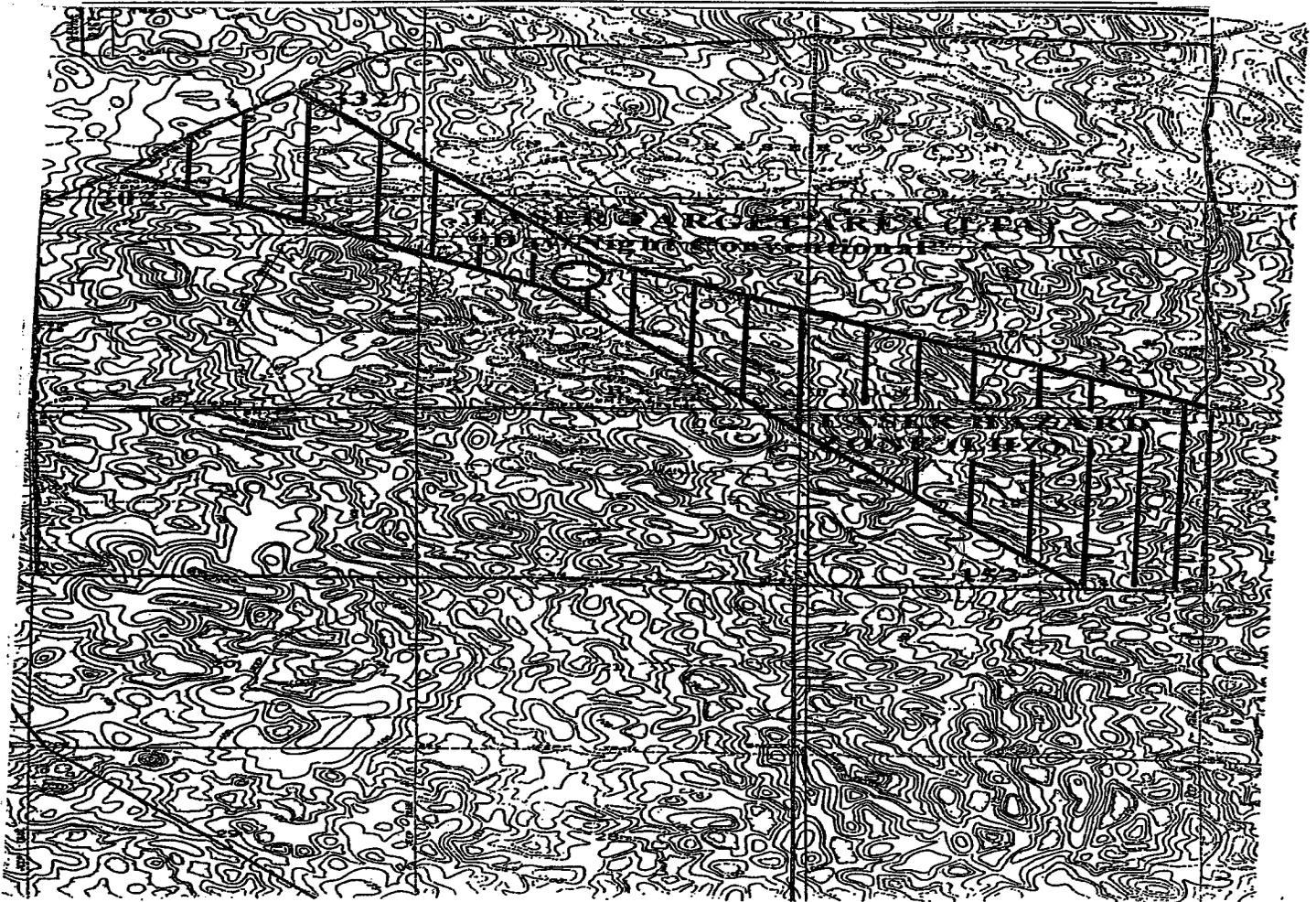
<b>Page: A-3</b>	<b>1</b>	<b>Figure A-3</b>	Heading Availability: 122° clockwise to 152°, and 302° clockwise to 332° true north
Scale: 1 grid = 1 km	Grid North	Laser Surface Hazard Zone LTA "Red Box" from Aircraft	Maximum Buffer Zone Angle: 5 mrad

LASER SAFETY SURVEY REPORT  
 PINECASTLE AIRCREW COMBAT TRAINING RANGE (ACTR)



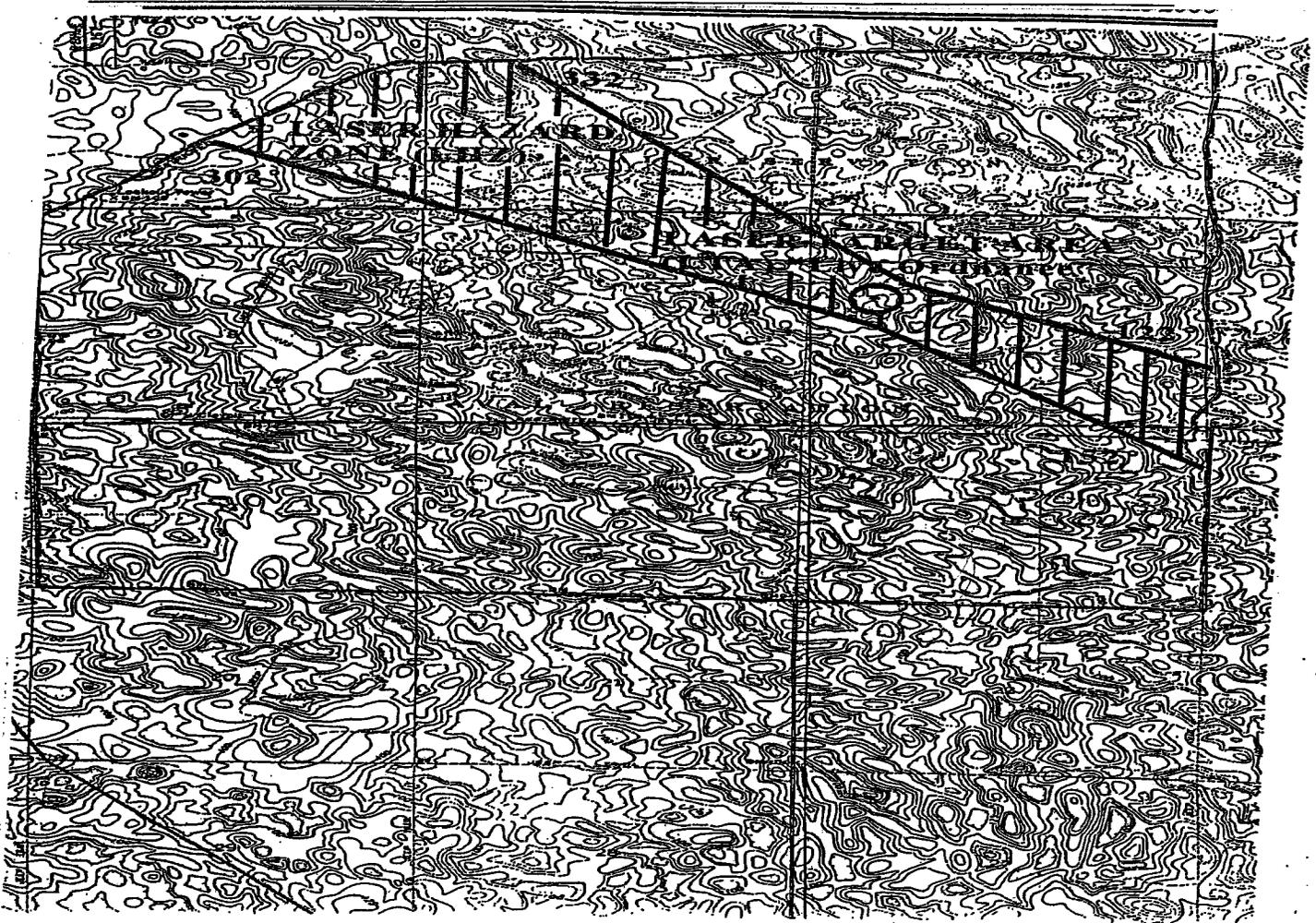
<p>Page: A-4</p>	<p>1</p>	<p><b>Figure A-4</b></p>	<p>Heading Availability: 122° clockwise to 152°, and 302° clockwise to 332° true north</p>
<p>Scale: 1 grid = 1 km</p>	<p>Grid North</p>	<p>Laser Surface Hazard Zone LTA "Main Bull" from Aircraft</p>	<p>Maximum Buffer Zone Angle: 5 mrad</p>

LASER SAFETY SURVEY REPORT  
PINECASTLE AIRCREW COMBAT TRAINING RANGE (ACTR)



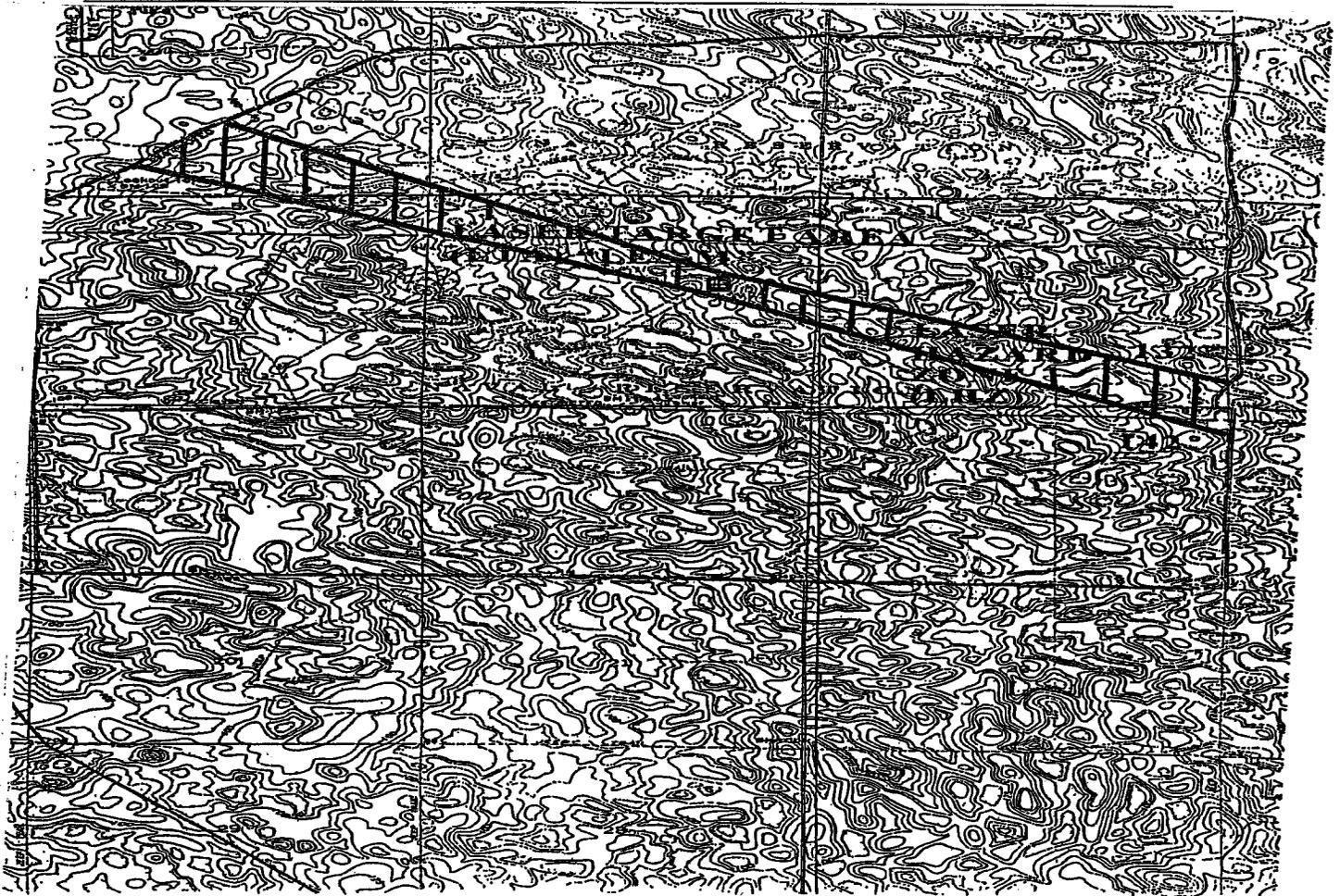
<b>Page: A-5</b>	<b>1</b>	<b>Figure A-5</b>	<b>Heading Availability: 122° clockwise to 152°, and 302° clockwise to 332° true north</b>
Scale: 1 grid = 1 km			Grid North

LASER SAFETY SURVEY REPORT  
PINECASTLE AIRCREW COMBAT TRAINING RANGE (ACTR)



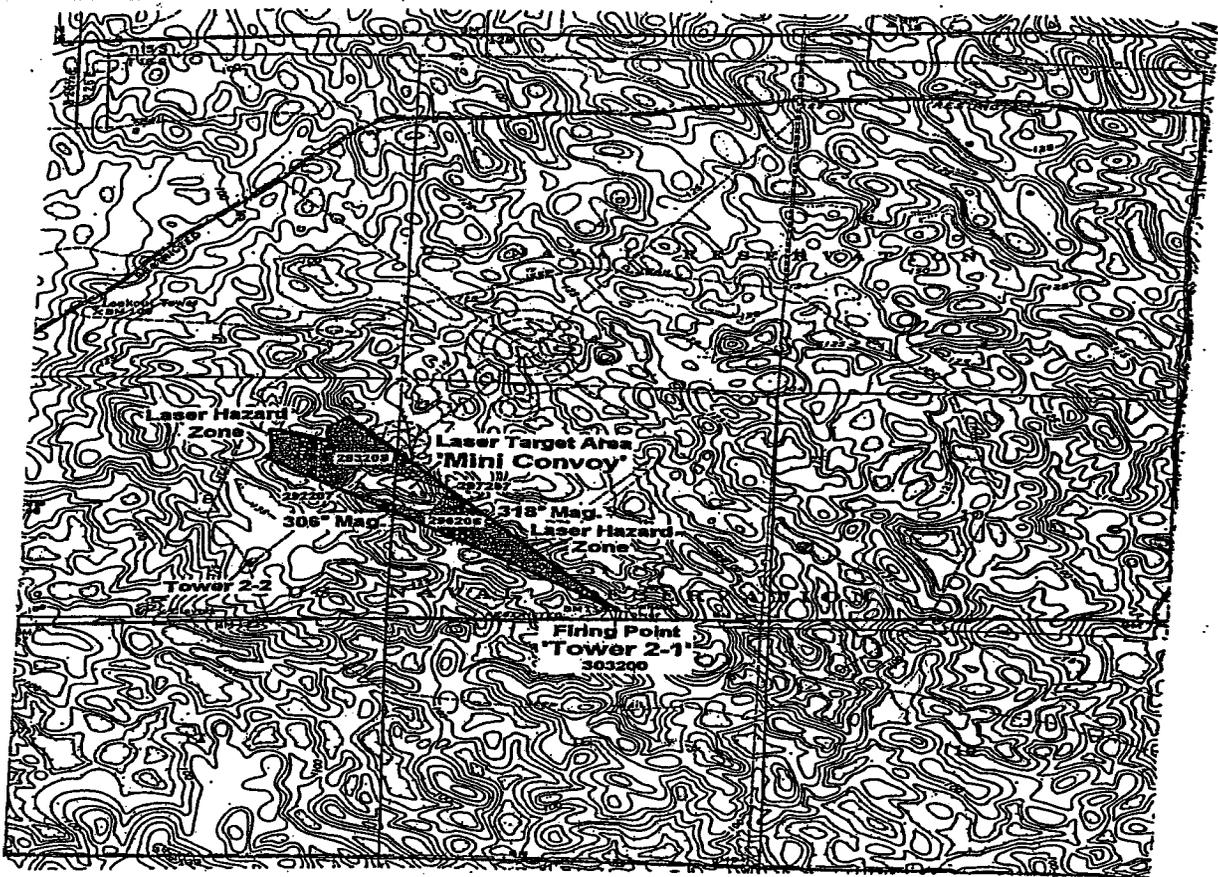
<b>Page: A-6</b>	<b>1</b> Grid North	<b>Figure A-6</b>	Heading Availability: 122° clockwise to 152°, and 302° clockwise to 332° true north
Scale: 1 grid = 1 km		Laser Surface Hazard Zone LTA "Live Ordnance" from Aircraft	Maximum Buffer Zone Angle: 5 mrad

LASER SAFETY SURVEY REPORT  
PINECASTLE AIRCREW COMBAT TRAINING RANGE (ACTR)



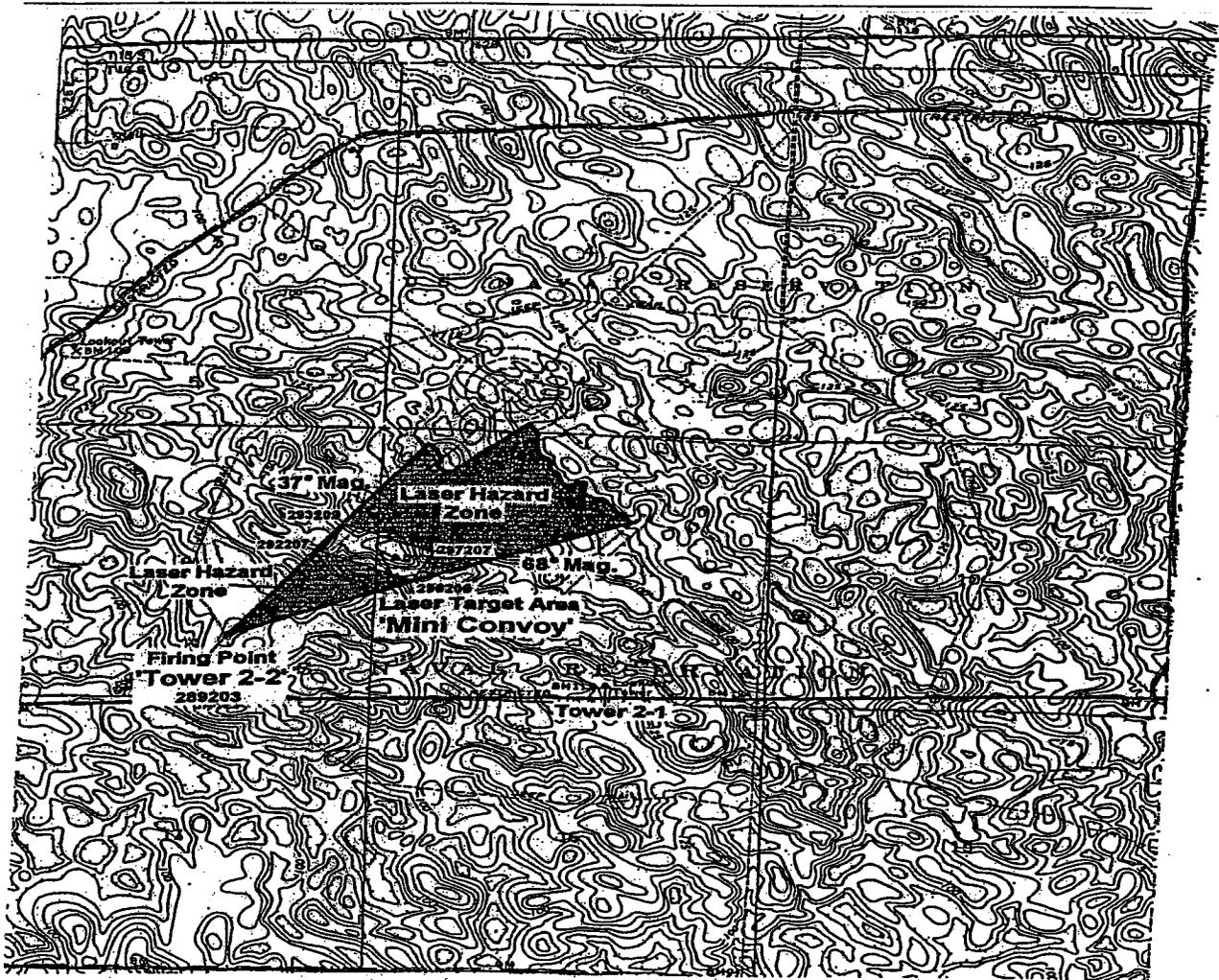
<b>Page: A-7</b>	<b>1</b>	<b>Figure A-7</b>	<b>Heading Availability: 132° clockwise to 142° true north</b>
Scale: 1 grid = 1 km	Grid North	Laser Surface Hazard Zone LTA "LES-M" from Aircraft	Maximum Buffer Zone Angle: 5 mrad

LASER SAFETY SURVEY REPORT  
 PINECASTLE AIRCREW COMBAT TRAINING RANGE (ACTR)



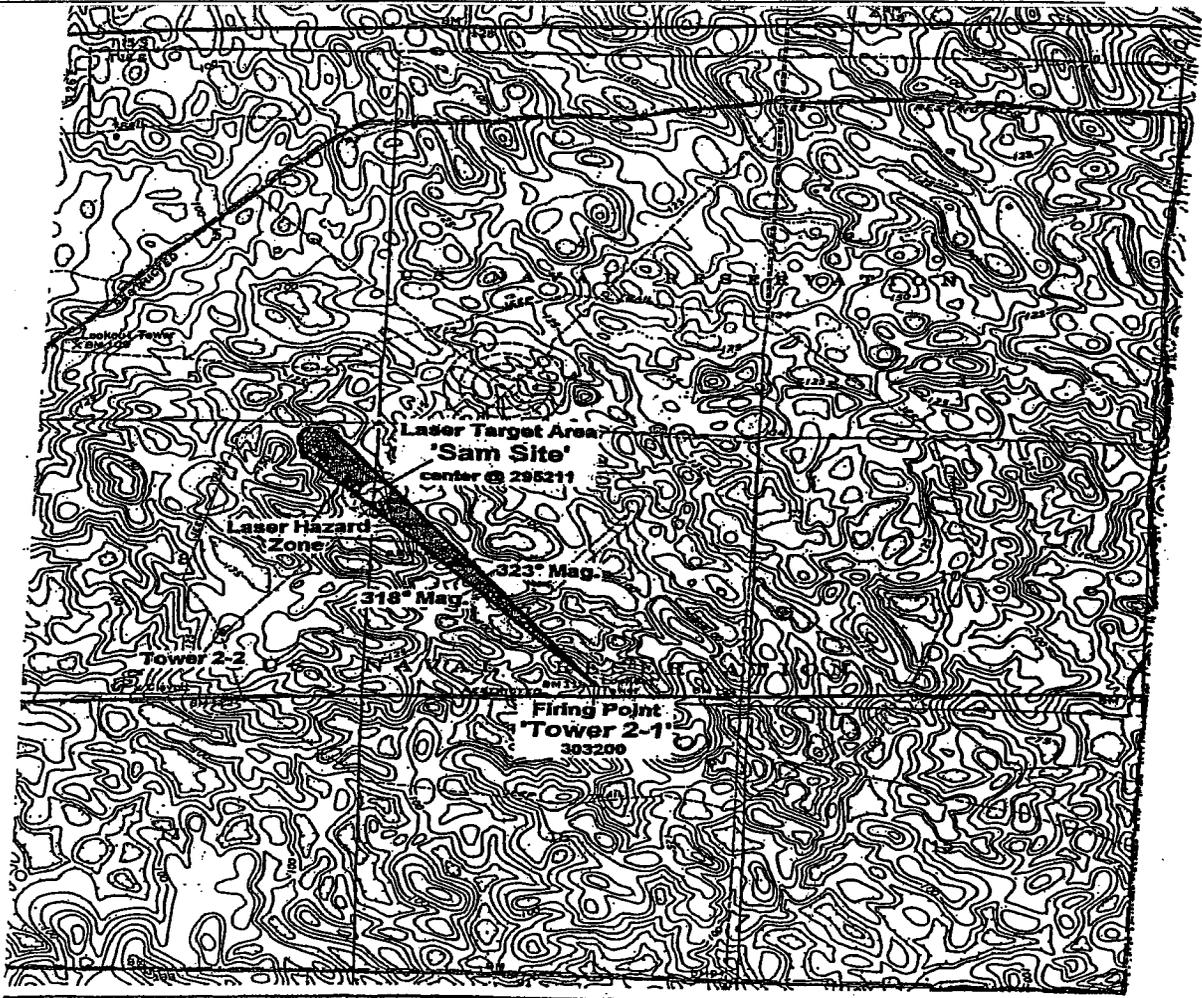
Page: C-1	<div style="font-size: 48pt; font-weight: bold;">1</div> <p>Grid North</p>	<div style="font-size: 24pt; font-weight: bold;">Figure C-1</div>	Lateral Firing Limits: 306 ° to 318° Clockwise True North Minimum Elevation: 160 feet MSL
Scale: 1 grid = 1 km		Laser Surface Hazard Zone LTA: "Mini Convoy" from FP "Tower 2-1"	Maximum Buffer Zone Angle: 5 mrad

LASER SAFETY SURVEY REPORT  
 PINECASTLE AIRCREW COMBAT TRAINING RANGE (ACTR)



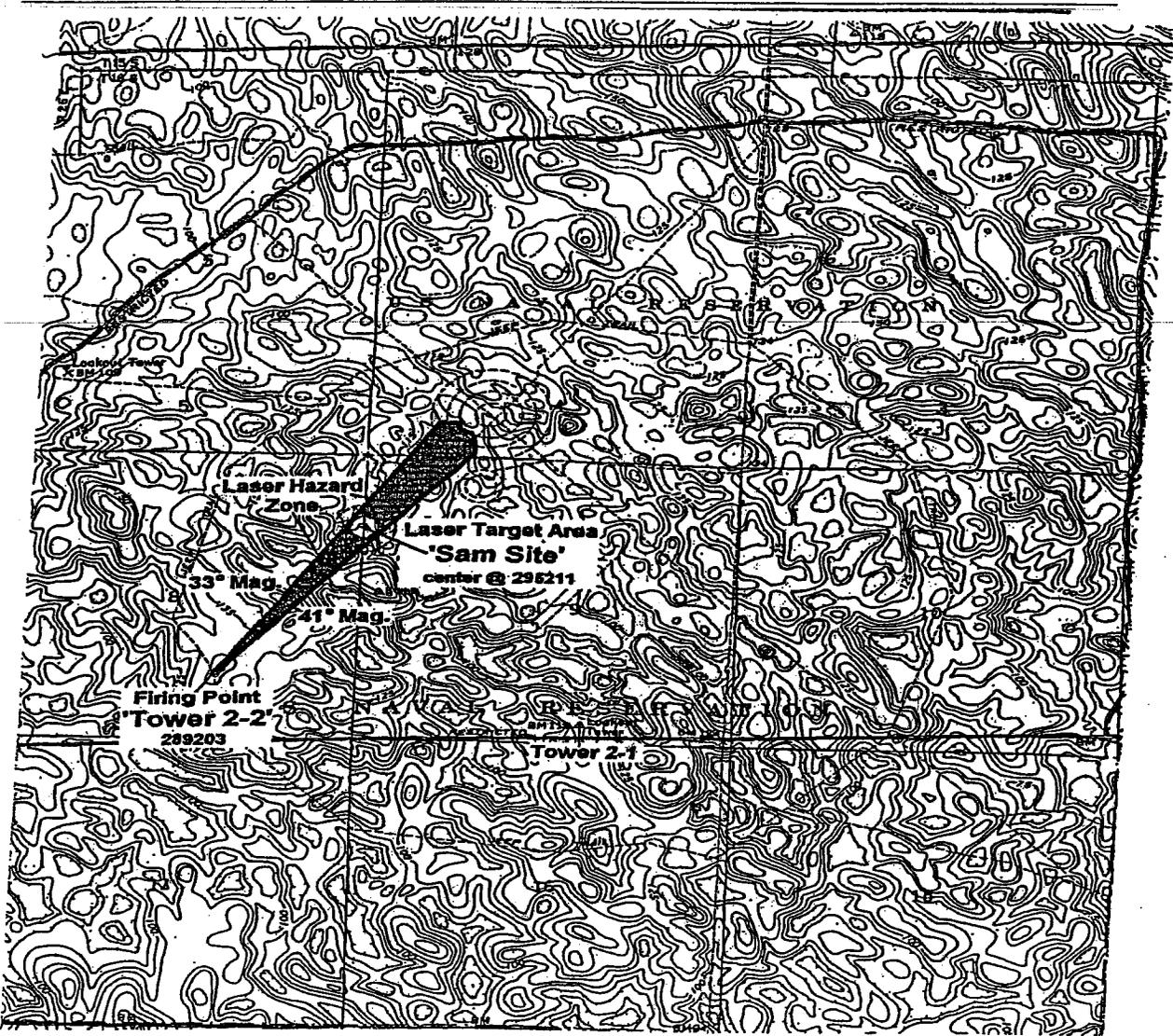
<p>Page: C-2</p>		<h1>Figure C-2</h1>	<p>Lateral Firing Limits: 037°              to 068° Clockwise True              North              Minimum Elevation: 200 feet              MSL</p>
<p>Scale: 1 grid = 1              km</p>	<p>Grid              North</p>	<p>Laser Surface Hazard Zone              LTA "Mini Convoy" from FP "Tower 2-2"</p>	<p>Maximum Buffer Zone              Angle: 10 mrad</p>

LASER SAFETY SURVEY REPORT  
 PINECASTLE AIRCREW COMBAT TRAINING RANGE (ACTR)



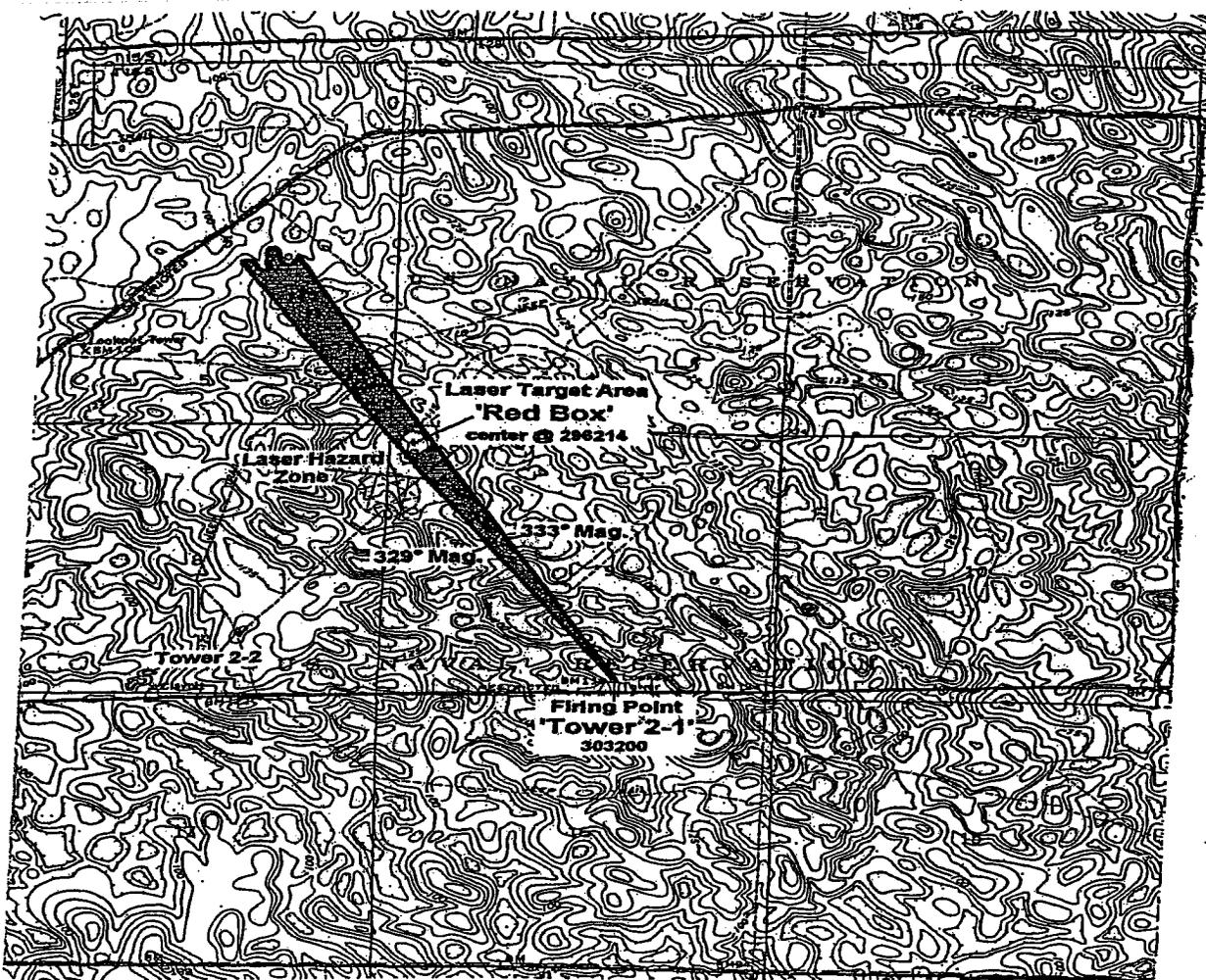
Page: C-3	<div style="font-size: 48pt; font-weight: bold;">1</div> <p>Grid North</p>	<div style="font-size: 24pt; font-weight: bold;">Figure C-3</div>	Lateral Firing Limits: 318 to 323° Clockwise True North Minimum Elevation: 160 feet MSL
Scale: 1 grid = 1 km		Laser Surface Hazard Zone LTA: "Sam Site" from FP "Tower 2-1"	Maximum Buffer Zone Angle: 5 mrad

LASER SAFETY SURVEY REPORT  
 PINECASTLE AIRCREW COMBAT TRAINING RANGE (ACTR)



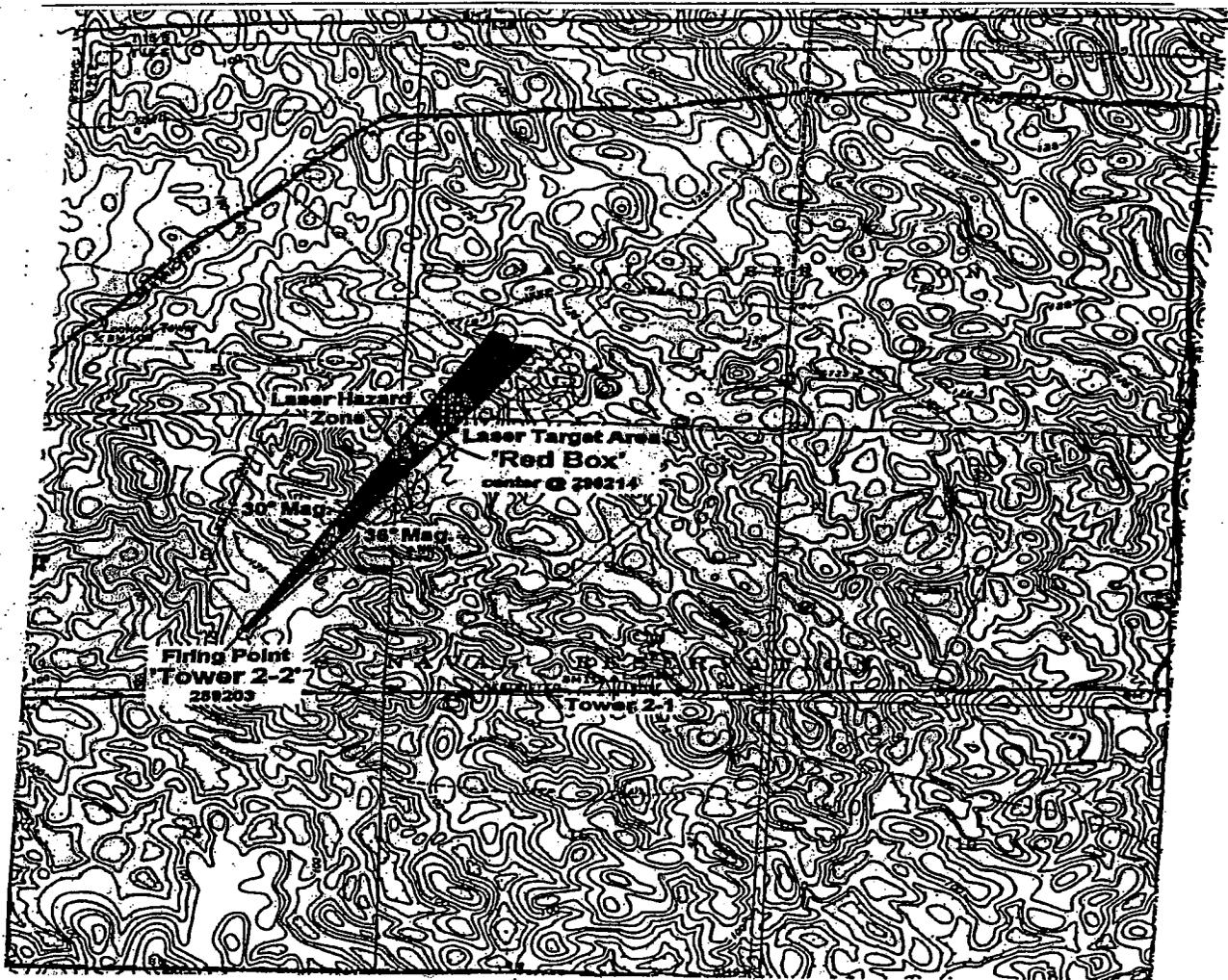
<p>Page: C-4</p>	<p>1</p>	<p><b>Figure C-4</b></p>	<p>Lateral Firing Limits: 033°              to 041° Clockwise Magnetic              True North              Minimum Elevation: 200              feet MSL</p>
<p>Scale: 1 grid = 1              km</p>	<p>Grid North</p>	<p>Laser Surface Hazard Zone              LTA "Sam Site" from FP "Tower 2-2"</p>	<p>Maximum Buffer Zone              Angle: 10 mrad</p>

LASER SAFETY SURVEY REPORT  
 PINECASTLE AIRCREW COMBAT TRAINING RANGE (ACTR)



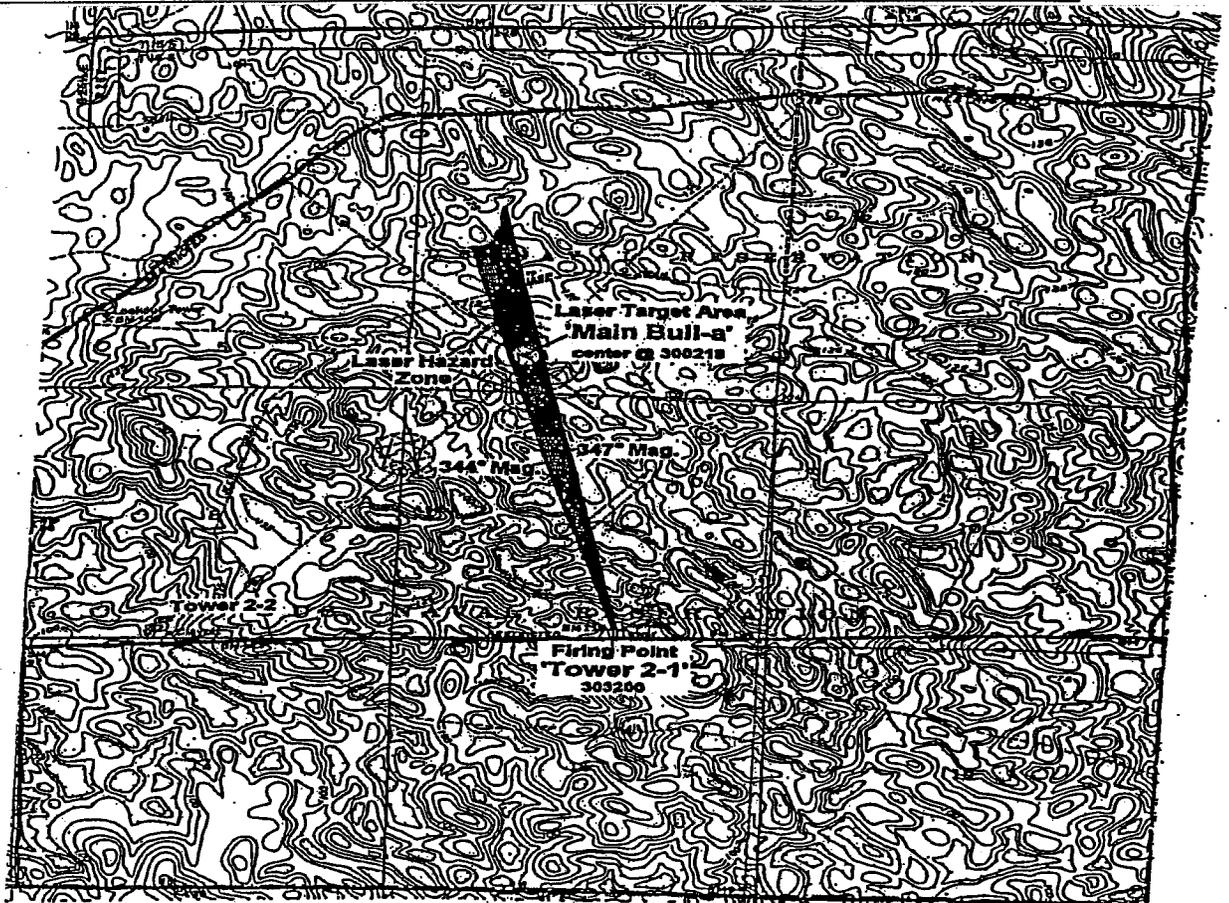
Page: C-5	1	<b>Figure C-5</b>	Lateral Firing Limits: 329° to 333° Clockwise True North Minimum Lasing Elevation: 160 feet MSL
Scale: 1 grid = 1 km	Grid North	Laser Surface Hazard Zone LTA "Red Box" from FP "Tower 2-1"	Maximum Buffer Zone Angle: 5 mrad

LASER SAFETY SURVEY REPORT  
 PINECASTLE AIRCREW COMBAT TRAINING RANGE (ACTR)



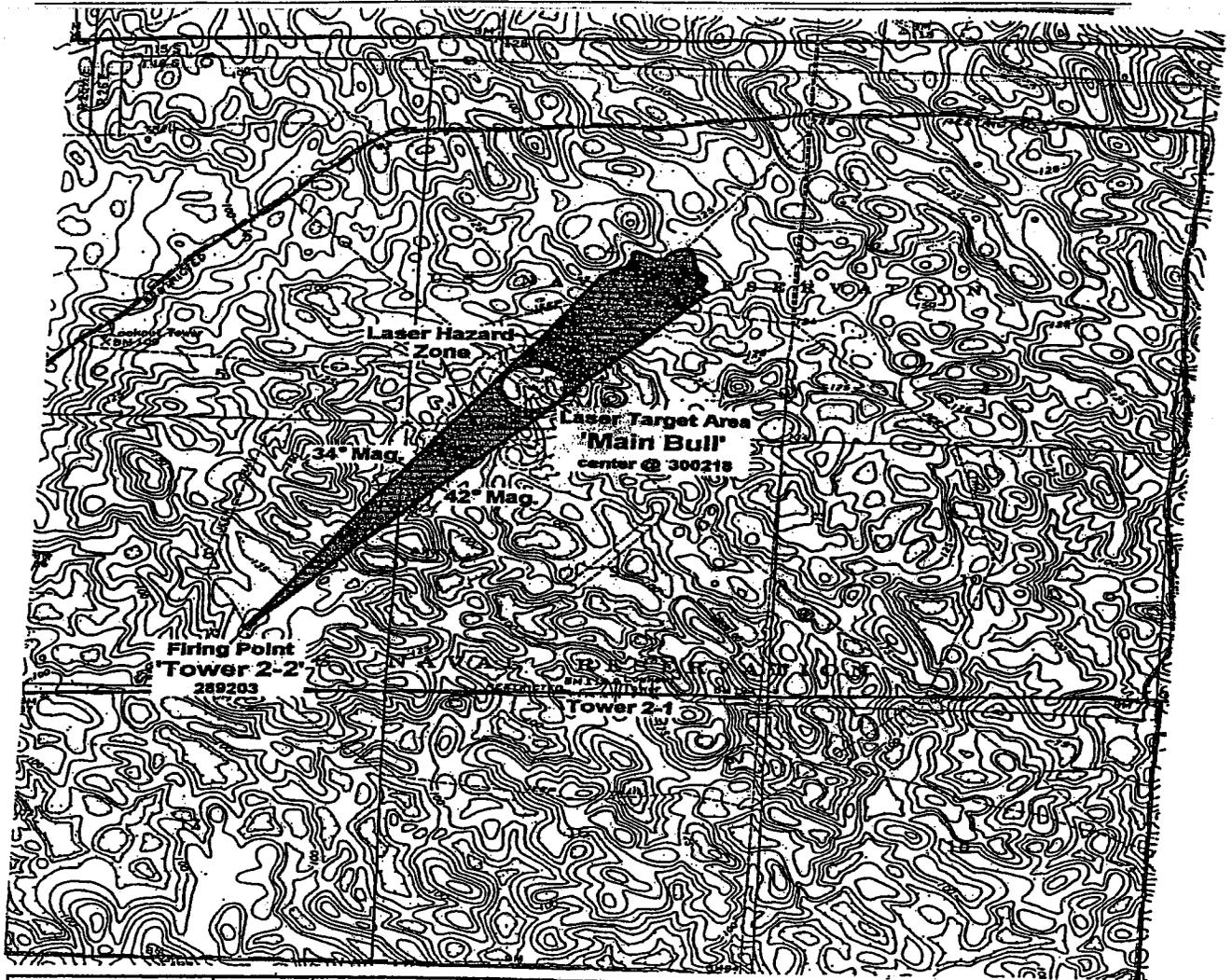
<p>Page: C-6</p>	<p>1</p>	<p><b>Figure C-6</b></p>	<p>Lateral Firing Limits: 030° to 036° Clockwise True North                  Minimum Lasing Elevation:                  200 feet MSL</p>
<p>Scale: 1 grid = 1 km</p>	<p>Grid North</p>	<p>Laser Surface Hazard Zone                  LTA "Red Box" from FP "Tower 2-2"</p>	<p>Maximum Buffer Zone Angle:                  10 mrad</p>

LASER SAFETY SURVEY REPORT  
 PINECASTLE AIRCREW COMBAT TRAINING RANGE (ACTR)



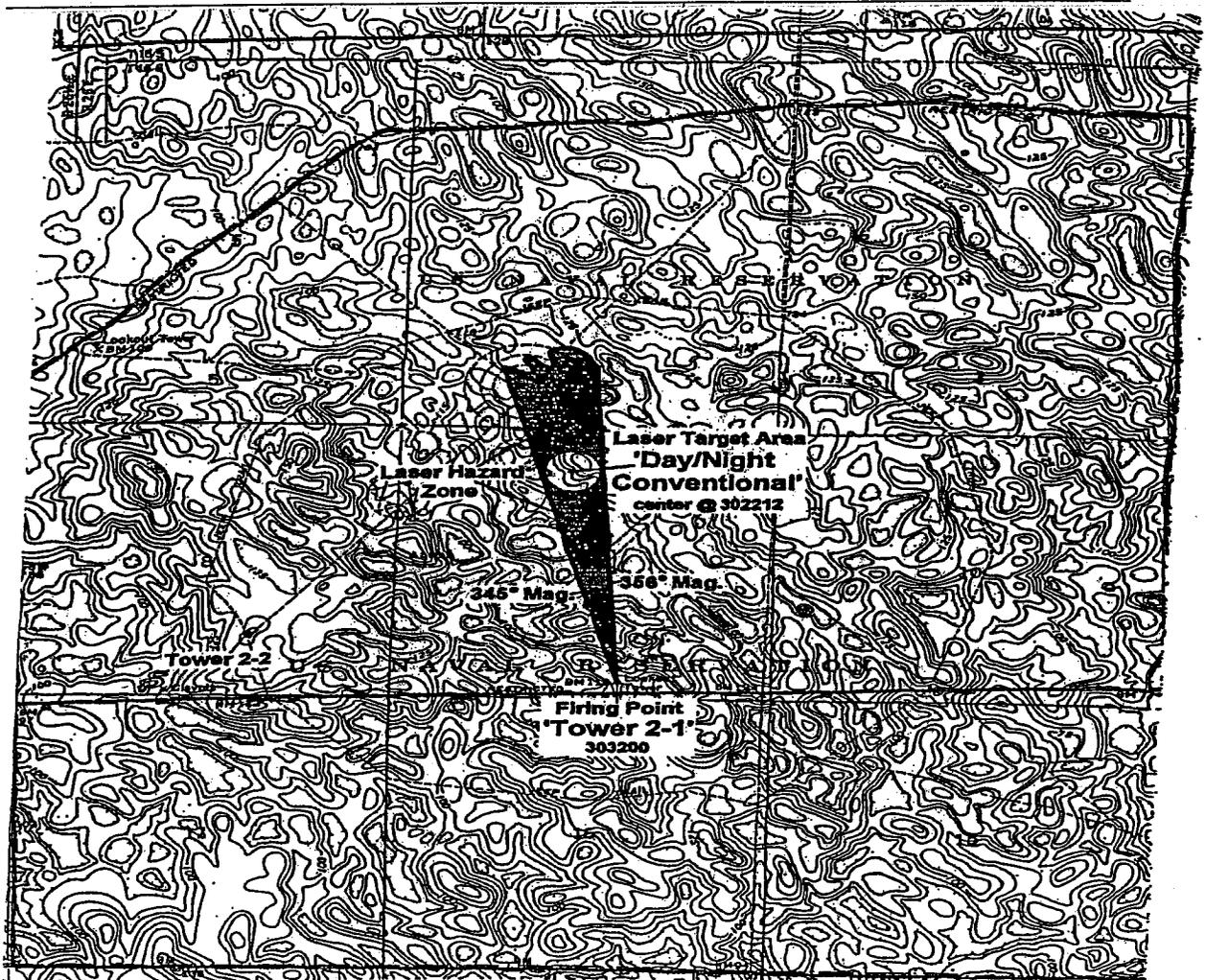
<p>Page: C-7</p>	<p>1</p>	<p>Figure C-7</p>	<p>Lateral Firing Limits:              to 347° Clockwise True              North              Minimum Lasing              Elevation:              160 feet MSL</p>
<p>Scale:              1 grid = 1              km</p>	<p>Grid              North</p>	<p>Laser Surface Hazard Zone              LTA: "Main Bull" from FP "Tower 2-1"</p>	<p>Maximum Buffer Zone              Angle: 5mrad</p>

LASER SAFETY SURVEY REPORT  
 PINECASTLE AIRCREW COMBAT TRAINING RANGE (ACTR)



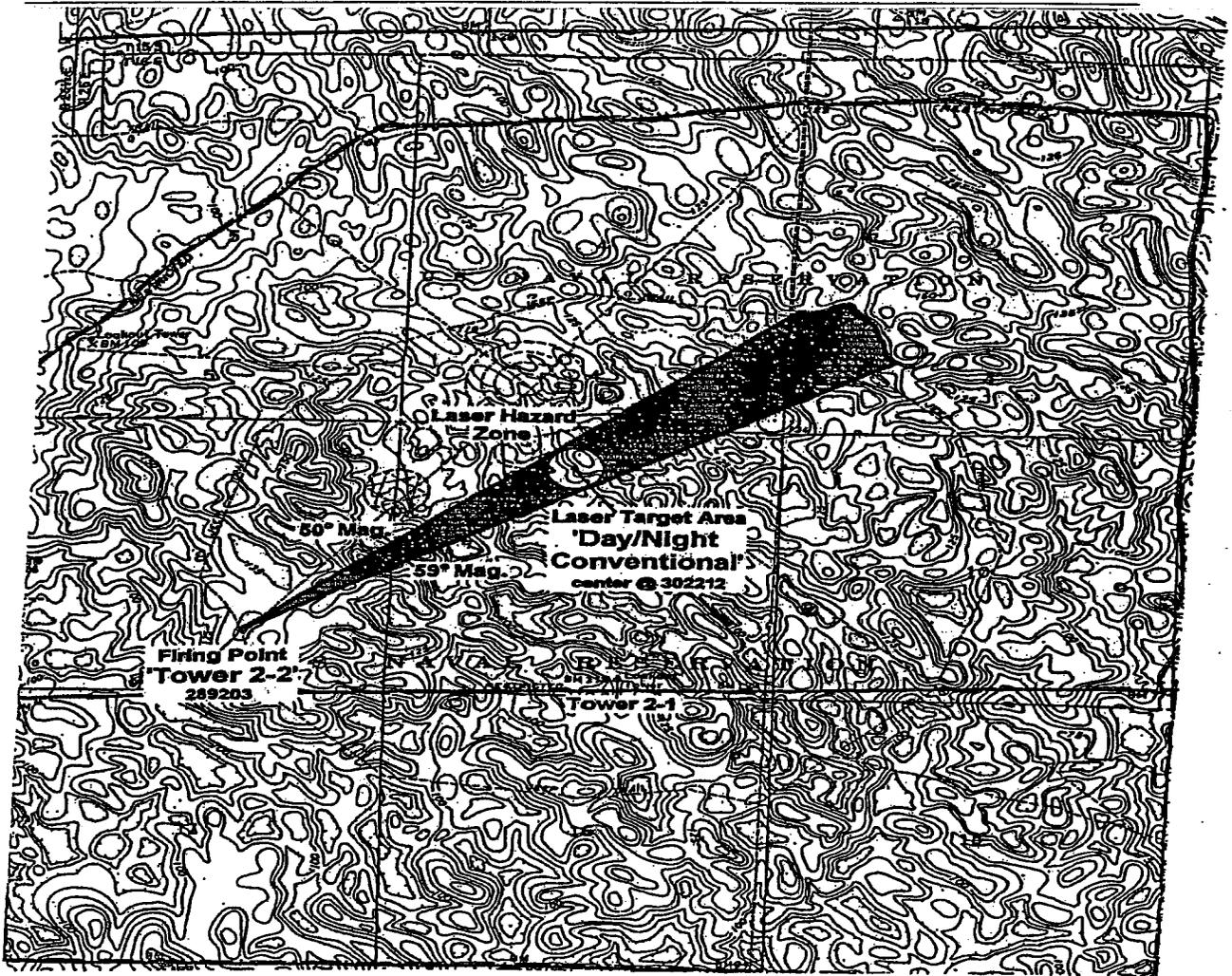
<p>Page: C-8</p>	<p>1</p>	<p><b>Figure C-8</b></p>	<p>Lateral Firing Limits: 034°              to 042° Clockwise True              North              Minimum Lasing Elevation:              200 feet MSL</p>
<p>Scale: 1 grid = 1              km</p>	<p>Grid              North</p>	<p>Laser Surface Hazard Zone              LTA "Main Bull" from FP "Tower 2-2"</p>	<p>Maximum Buffer Zone              Angle: 5 mrad</p>

LASER SAFETY SURVEY REPORT  
 PINECASTLE AIRCREW COMBAT TRAINING RANGE (ACTR)



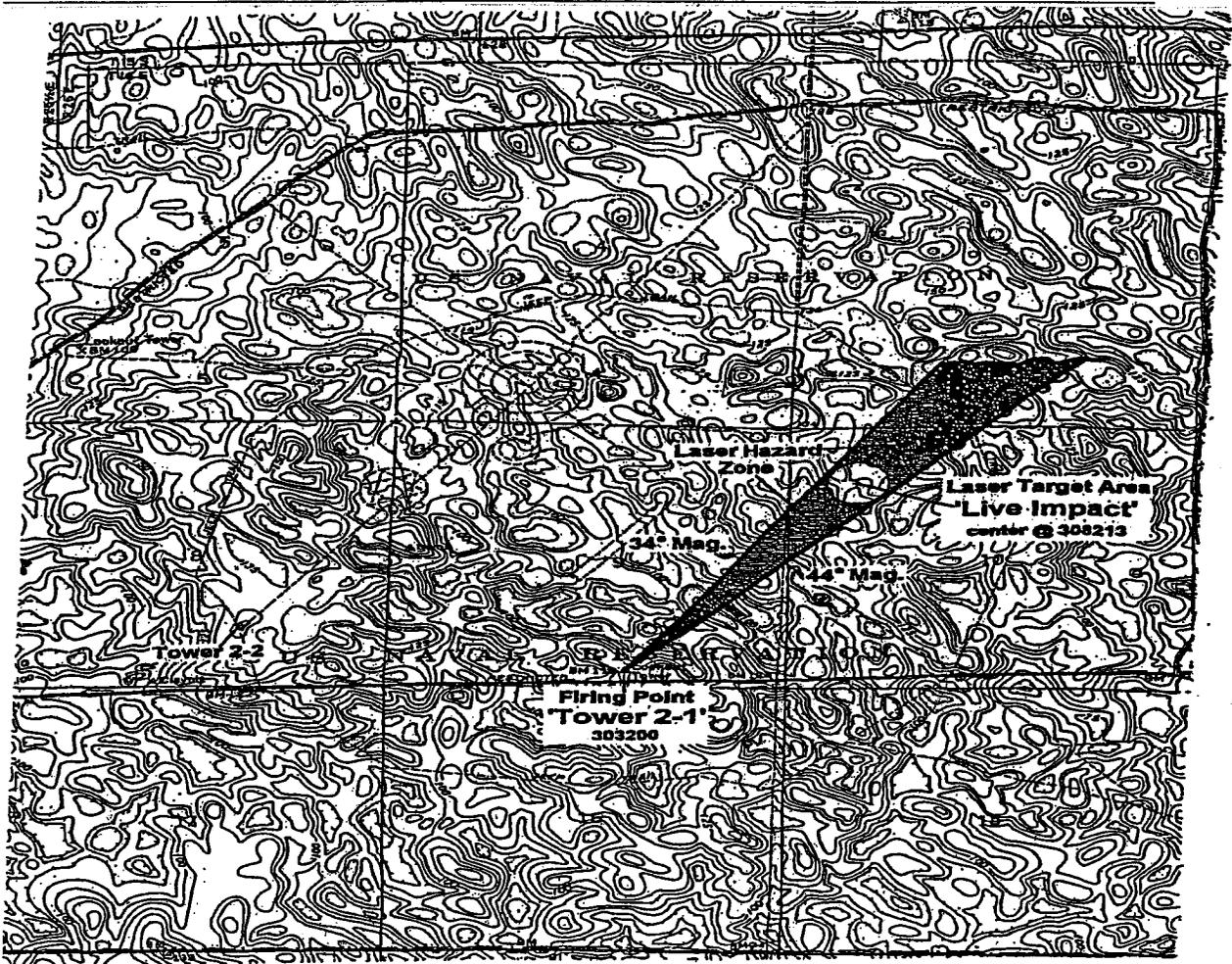
<p>Page: C-9</p>	<p>1</p>	<p><b>Figure C-9</b></p>	<p>Lateral Firing Limits: 345°              to 356° Clockwise True              North              Minimum Lasing Elevation:              160 feet MSL</p>
<p>Scale: 1 grid = 1              km</p>	<p>Grid              North</p>	<p>Laser Surface Hazard Zone              LTA "Day/Night Conventional" from FP "Tower 2-1"</p>	<p>Maximum Buffer Zone              Angle: 5 mrad</p>

LASER SAFETY SURVEY REPORT  
 PINECASTLE AIRCREW COMBAT TRAINING RANGE (ACTR)



<p>Page: C-10</p>	<p>1</p>	<p><b>Figure C-10</b></p>	<p>Lateral Firing Limits: 050°              to 059° Clockwise True              North              Minimum Lasing Elevation:              200 feet MSL</p>
<p>Scale: 1 grid = 1              km</p>	<p>Grid              North</p>	<p>Laser Surface Hazard Zone              LTA "Day/Night Conventional" from FP "Tower 2-2"</p>	<p>Maximum Buffer Zone              Angle: 10 mrad</p>

LASER SAFETY SURVEY REPORT  
 PINECASTLE AIRCREW COMBAT TRAINING RANGE (ACTR)



Page: C-11	1	<b>Figure C-11</b>	Lateral Firing Limits: 034° to 044° Clockwise True North Minimum Lasing Elevation: 160 feet MSL
Scale: 1 grid = 1 km	Grid North	Laser Surface Hazard Zone LTA "Live Ordnance" from FP "Tower 2-1"	Maximum Buffer Zone Angle: 5 mrad

LASER SAFETY SURVEY REPORT  
 PINECASTLE AIRCREW COMBAT TRAINING RANGE (ACTR)

LASER WEAPON SYSTEM	BUFFER (MRAD)	WAVE LENGTH (nm)	NOMINAL OCULAR HAZARD DISTANCE			OPTICAL DENSITY	
			OPTICS (km)			OPTICS	
			EYE	8 cm	12 cm	UNAIID	AID
TADS/PNVS (AAH-TADS) <sup>a</sup>	5	1,064	26	68		4.0	5.5
LAAT (AH-1S) <sup>a</sup>	5	1,064	5	15	30	3.5	4.8
MMS (OH-58D) <sup>a</sup>	5	1,064	35			4.1	5.3
AN/AVQ-25 (F-111F PAVE TACK) <sup>a</sup>	5	1,064	16	52	70	4.3	5.8
ANAAS-33A (A-6E TRAM) <sup>a</sup>	5	1,064	14.6	58	58	4.6	5.8
ANAAS-37 (OV-10D NOS) <sup>a</sup>	5	1,064	11.2	56	59	5.2	5.6
ANAAS-38A (F/A-18 LTDR) <sup>a,1</sup>	5	1,064	17	63	73	4.3	5.4
LANTIRN LTDR <sup>a,2</sup>	5	1,064	22.7			4.15	
NITE EAGLE LTDR <sup>b</sup> (multi pulse to ground)	5	1,064	15	54.9	64.6	4.1	5.2
AN/ASQ-153 (F-4E PAVE SPIKE) <sup>a</sup>	5	1,064	10	48	58	4.2	5.6
LANTIRN RANGEFINDER <sup>a,2,3</sup>	5	1,540					
CLD <sup>a</sup> handheld	10	1,064	9.7	48	58	4.5	5.4
LLTD <sup>a</sup> handheld	10	1,064	7	38		4.0	4.9
AN/GVS-5 <sup>a</sup> handheld	10	1,064	2.7	21	27	3.7	4.4

LASER SAFETY SURVEY REPORT  
 PINECASTLE AIRCREW COMBAT TRAINING RANGE (ACTR)

LASER WEAPON SYSTEM	BUFFER (MRAD)	WAVE LENGTH (nm)	NOMINAL OCULAR HAZARD DISTANCE			OPTICAL DENSITY	
			OPTICS (km)			OPTICS	
			EYE	8 cm	12 cm	UNAIID	AID
AN/PAQ-1 (LTD) <sup>a</sup> handheld	10	1,064	7	15	33	4.2	5.8
AN/GAQ-T1 (LDSS) <sup>b</sup> tripod (no lens)	5	1064	12.7	54.4	62.5	4.4	5.4
AN/GAQ-T1 (LDSS) <sup>b,4</sup> tripod (2x lens)	5	1064	4	19.3	33.2	5	5.4
AN/GAQ-T1 (LDSS) <sup>b,4</sup> tripod (5x lens)	5	1064	1.7	9.8	19	5.4	5.4
AN/GAQ-T1 (LDSS) <sup>b,4</sup> tripod (10x lens)	5	1064	.9	5.5	11.5	5.4	5.4
AN/TVQ-2 (GVLLD) <sup>a</sup> tripod	2	1,064	25	80	87	3.8	5.5
AN/PAQ-3 (MULE) <sup>a</sup> tripod	2	1,064	20	64	78	3.9	5.6
AN/PAQ-3 (MULE) <sup>a</sup> tripod night	5	1,064	20	64	78	3.9	5.6
AN/PAQ-3 (MULE) <sup>a</sup> handheld	10	1,064	20	64	78	3.9	5.6
AN/PAQ-3 (MULE) <sup>a</sup> handheld night	15	1,064	20	64	78	3.9	5.6
SOFLAM <sup>b</sup> (10 sec exp)	5	1,064	9.6	45	54	4.0	5.3
F-117	5	1,064	18.5	45	56	4.5	6.0

LASER SAFETY SURVEY REPORT  
 PINECASTLE AIRCREW COMBAT TRAINING RANGE (ACTR)

LASER WEAPON SYSTEM	BUFFER (MRAD)	WAVE LENGTH (nm)	NOMINAL OCULAR HAZARD DISTANCE			OPTICAL DENSITY	
			OPTICS (km)			OPTICS	
			EYE	8 cm	12 cm	UNAIID	AID
AN/ASQ-211 NTS LDRS (AH-1W)	5	1,064	15	48	59	3.5	5.2
AN/GVS-5 (19 db red filter)	10	1,064	0.29	1.8	1.8	3.7	4.4
AN/GVS-5 (29 db yellow filter)	10	1,064	0.05	0.55	0.55	3.7	3.7
AN/PEQ-2 (ITPAIL) aim mode, low pw	0	830	0	0	0	0	0
AN/PEQ-2 (ITPAIL) dual, low mode	10	830	0.07 8	0.61 5	0.88	2.2	2.2
AN/PEQ-2 (ITPAIL) dual, high mode	10	830	0.26 3	1.81	2.8	2.2	2.2
AN/PEQ-2 (TPAIL) aim or illum low	0	830	0	0	0	0	0
AN/PEQ-2 (TPAIL) dual, low mode	10	830	0.02 5	0.16	-	0	0
AN/PEQ-2 (TPAIL) dual, high mode	10	830	0.22	1.3	-	2.0	2.0
AN/PVS-X (MLRF)	1600**	1,064	3	16	29	3.7	3.7
AN/PVS-6 (MELIOS)	10	1,540	0	0.01 8	0.037	0	0.5

LASER SAFETY SURVEY REPORT  
PINECASTLE AIRCREW COMBAT TRAINING RANGE (ACTR)

LASER WEAPON SYSTEM	BUFFER (MRAD)	WAVE LENGTH (nm)	NOMINAL OCULAR HAZARD DISTANCE			OPTICAL DENSITY	
			OPTICS (km)			OPTICS	
			EYE	8 cm	12 cm	UNAIID	AID
IZLID 2	10	870	0.24 8	1.63	2.55	3.0	3.0
AN/AAS-44 LAMPS	5	1064	22.3 6	72.6 7	87.59	4.5	5.6
MPLI & HPLI	10	830-835	280	2900	4800	3.2	3.2
AN/VVG-3 (M1)	5	1064	7	35	44	4.7	4.7
AN/VVG-3 (LAV-105)	5	1064	8.2	41	50	4.7	4.7
AIM-1/DLR	10	830	0.23 6	1.56	2.43	1.7	1.7
LPL-30	10	800-850	0.08 5	0.68	1.1	1.7	1.7

SOURCES FOR DATA IN TABLE

- A MIL-HDBK-828 OF 15 APRIL 1993
- B LSRB MINUTES OF 1992
- C LSRB MINUTES OF 1993
- D LSRB MINUTES OF 1997

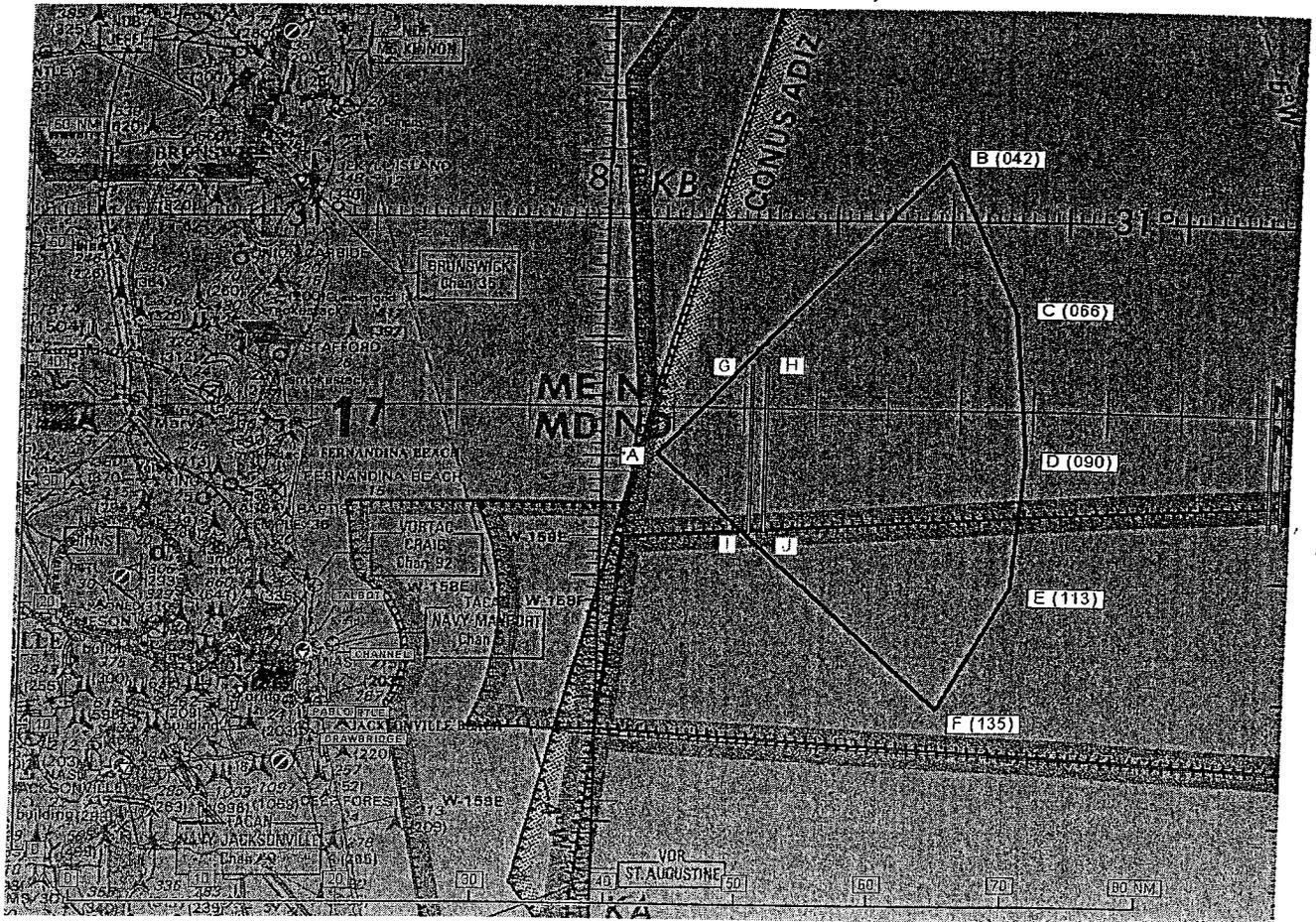
NOTES

- 1 LIMITED USE AS REQUIRED BY OPERATIONAL NECESSITY SEE LSRB MINUTES SER 223-2/007 OF 25 JANUARY 1993
- 2 THIS SYSTEM WAS TESTED BY BROOKS AIRFORCE BASE WHICH USES 2MRAD AS THEIR BUFFER ZONE. HOWEVER THE NAVY IS RESTRICTING THE BUFFER ZONE TO 5 MRAD.
- 3 THE AIRFORCE CONSIDERS THE OPERATIONAL PARAMETERS OF THE RANGEFINDER MODE TO BE OPERATIONALLY EYESAFE DUE TO THE WEAK PULSE AND TIME BETWEEN PULSES.
- 4 THERE IS A SKIN HAZARD DISTANCE AND A DIFFUSE REFLECTOR DISTANCE. SEE LSRB MINUTES SER 223-2/191 OF 16 JANUARY 1992
- \*\* 90 DEGREE BUFFER ZONE REQUIRED FOR RCA VERSION AN/PVS-X WITH SECONDARY BEAM; 10 DEGREES FOR BRUNSWICK VERSION.

### LASER TRAINING RANGE NON-RIGHT WHALE SEASON

The following coordinates apply to the points depicted for the Laser Training Range diagram for Non-Right Whale Season (01 April to 31 November):

PT	LAT/LONG	FIRING BRG FROM PT A (IN DEGREES TRUE)
A.	30 40 00N 080 55 00W	N/A
B.	31 05 00N 080 30 00W	042
C.	30 52 00N 080 24 00W	066
D.	30 40 00N 080 23 00W	090
E.	30 29 00N 080 24 00W	113
F.	30 19 00N 080 30 00W	135
G.	30 47 30N 080 46 30W	N/A (TARGET BOX)
H.	30 47 30N 080 45 30W	N/A (TARGET BOX)
I.	30 33 30N 080 46 30W	N/A (TARGET BOX)
J.	30 33 30N 080 45 30W	N/A (TARGET BOX)



### LASER TRAINING RANGE RIGHT WHALE SEASON

The following coordinates apply to the points depicted for the Laser Training Range diagram for Right Whale Season (01 December to 31 March):

PT	LAT/LONG	FIRING BRG FROM PT A (IN DEGREES TRUE)
A.	30 40 00N 080 10 00W	N/A
B.	31 05 00N 079 45 00W	045
C.	30 50 00N 079 40 00W	070
D.	30 40 00N 079 39 00W	090
E.	30 28 00N 079 40 30W	115
F.	30 18 00N 079 45 00W	135
G.	30 47 00N 080 02 00W	N/A (TARGET BOX)
H.	30 47 00N 080 01 00W	N/A (TARGET BOX)
I.	30 34 00N 080 02 00W	N/A (TARGET BOX)
J.	30 34 00N 080 01 00W	N/A (TARGET BOX)

