APPENDIX B

RANGE INFORMATION/DESCRIPTIONS/CELLS

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RANGE INFORMATION / DESCRIPTIONS / CELLS

Range cells included in this appendix were created, which included *historical* regulations, manuals, photos, drawings, and documents. They represent typical (general) layouts, which include firing lines, target areas, target berms, and danger areas (aka SDZ). Each cell is a two-dimensional model, which does not take into account (during time of use) terrain, boundaries, or local requirements and/or restrictions.

As stated in an obsolete Army Regulation, AR 750-10, *Range Regulations for Firing Ammunition in Time of Peace,* dated May 22, 1939, "It is obviously impossible for any general range regulation to cover each local situation completely. Such additional regulations as may be necessary to meet local condition will therefore, be prepared and enforced by the post, camp, or station commander."

When the ranges were established, regulations such as AR 750-10 (now obsolete), along with others, such as TM 9-855, *Targets, Target Material, and Training Course Lay-Outs,* dated August 17, 1944 (now obsolete) would have been referenced. These guidelines would have been applied to the local environment at the time of construction.

Where applicable, right and left firing limits and down-range limits were required and set based on the local conditions. Taking in-to account the scores of ranges and the lack of first-hand knowledge, many ranges were estimated using the best available resources. Topographic maps were analyzed to determine if terrain features could be used to limit the extent of the range.

For most sites it's likely to locate numerous historical maps displaying firing ranges drawn in a various configurations, but not necessarily with a true representation. For instance, they may show the range as nothing more than a dot, a box, circles, or a V-shaped fan. However, in rare cases, a range map displays what appears to be a true fan with a calculated danger area. In these cases, the range fans may be a true representation of the actual range boundaries, and therefore be considered for use instead of the general *Range Cells.* An example where this applies is shown below:

A historical range map found for Fort Custer, Michigan identified numerous ranges, all having range fans drawn. The fans displayed on this map appear to be proportioned, and closely represent correct angles and distances according to regulations. It is believed this map was done with a high degree of accuracy; therefore the range fans were used instead of the general *Range Cells.* Also recovered, was a document referring to the artillery range. It explained the necessity to discontinue firing of artillery on this facility because of the inconvenience of reducing the propelling charges

on 155mm Artillery Shells. The rational behind this reduced charge was to minimize the down-range distance the projectile would travel. At charge 7 (max), a 155mm projectile had a maximum range of approximately 17,400 yards. In addition to this distance, regulations required a mandatory 1,000-yard buffer zone beyond the max range. If the max charge had been used to calculate the danger area, the downrange distance for this artillery range would have extended more than 6-miles beyond the installation boundary. Maximum distance on artillery munitions can be calculated using appropriate Ammunition Firing Tables.

Unfortunately, this detailed information is seldom available. Other options to consider are included in the following example where the use of topographic maps and site inspections were used to determine the boundaries of Spencer Mountain Rifle Range in North Carolina.

The only available map displayed the range as a small rectangular box. Documents recovered stated that the range was positioned at the base of the mountain in order to reduce the danger area. The *range cell* for a rifle range was designed to include 50 firing positions, which calculates to a width of 400 yards. However, during the site inspection, the actual width of the range was determined to be no more than 150 feet. By reducing the width of the *range cell,* and using contour lines on a topographic map the delineated boundaries was realistically reduced from the standard 1259 acres down to 72 acres.

As indicated, there are many variables to account for when developing range boundaries, and it is unlikely that all of the data used when the range was originally laid out will be available. Therefore, the historical data found during research (maps, aerial photos, documentation, etc.) was utilized to represent the range as accurately as possible. In most cases, the only option was to use the general *Range Cell*.

Each range description contains a list of Ammunition Data sheets. The intention of this list is to provide a general idea of the ordnance that could have been used on the range. It is not intended to be all-inclusive and by no-means is an indication that these munitions are actually present.

A significant number of manuals, drawings, letters, instructions, reports, and miscellaneous documents were referenced in order to calculate the *Range Cells*. The following non-inclusive list are published Range Manuals that were referenced to create the range cells.

- TR 140-5, *Range Regulations for Firing Ammunition in Time of Peace,* dated November 1931
- AR 750-10, *Range Regulations for Firing Ammunition in Time of Peace,* dated May 1939

- AAF Manual 85-0.1, *Army Air Forces Gunnery and Bombardment Ranges,* dated June 1945
- AD-A954 905, *Training in the Ground Army 1942-1945, Study No. 11,* dated May 1948
- *Second Air Force Ground Gunnery Range*, dated July 24, 1943
- TM 9-855, *Targets, Target Material, and Training Course Lay-Outs,* dated August 1944
- TM 9-855, *Targets, Target Material, and Training Course Lay-Outs,* dated November 1951
- AFM No. 66, *Poorman Flexible Gunnery Trainer,* dated March 1945
- TC 25-1, *Training Land*, dated August 1978
- TC 25-8, *Training Ranges,* dated February 1992
- AFI 13-212, Vols 1,2,3, *Space, Missile, Command, and Control, Weapons Ranges,* dated July 1994
- AR 210-21¸ *Army Ranges and Training Land Programs,* dated May 1997
- AR 385-62¸ *Regulation for Firing Guided Missiles and Heavy Rockets for Training, Target Practice, and Combat,* dated June 1983
- AR 385-63, *Policies and Procedures for Firing Ammunition for Training, Target Practice, and Combat,* dated November 1983

HISTORIC USE: AIR-TO-AIR

AIR to AIR

Range Type: Air-to-Air

Cell Name(s): None available

Description, range boundaries, and range layout should be extracted from historical documents. Typically, this type of range covers a very large landmass, in which small arms ammunition is generally used.

The length and width of an air-to-air range was determined by the altitude at which the firing was done. The length of the range also depends upon the true airspeed of the towing aircraft, the types of attacks being made on the target, and the number of aircraft that are to fire on the target at any one time. The following figures are given for firing up to altitudes of 20,000': For training type aircraft, towing at true airspeed up to 150 mph, a firing range 10 miles long is sufficient. For tactical type aircraft, towing up to 200 mph true airspeed, a firing range 15 miles long is advisable. Danger zones will extend at least eight miles beyond each end of the firing range. For firing above 20,000', the firing range should be at least 20 to 25 miles long with danger zone areas extending at least 10 miles beyond each end of the firing range.

There must be a danger area or restricted area in the direction of fire. This may be designated the width of the range. The dimensions of this area will be determined by the effective range of the ammunition being fired.

All information is based on Caliber .50 machine guns firing to the rear or forward from the aircraft with A.P. M2 ammunition.

Altitude of 30,000', airspeed 450 mph, Rear: 15,500 yds., Forward: 18,300 yds.
Altitude of 30,000', airspeed 150 mph, Rear: 16,700 yds., Forward: 17,600 yds.
Altitude of 20,000', airspeed 450 mph, Rear: 12,350 yds., Forward: 14,450 yds.
Altitude of 20,000', airspeed 150 mph, Rear: 13,250 yds., Forward: 13,900 yds.

Ammunition (probable)	Max Range (yards)
Small arms	N/A

Data sheet(s):

CTT01 Small arms, general

Reference(s): AAF Manual 85-0-1, *Army Air Forces Gunnery and Bombardment Ranges,* June 1945

HISTORIC USE: AIR-TO-GROUND

AIR to GROUND GUNNERY

Range Type: Air-to-Ground

Cell Name(s): A2GGUN

The location and size of the air-to-ground gunnery installation will vary considerably with local conditions.

An area of approximately five miles behind the targets, subject to fire and ricocheting bullets, will be designated a danger zone. A safety area in front of the targets will be marked off. A foul line should be clearly marked 600' in front of and parallel to the target line, and a range line should be marked 600' in front of and parallel to the foul line. These two lines should be the length as the target lines or, where only one or two targets are installed on a range, should be of sufficient length to be visible to the pilot from a position directly over them.

Targets should have been of sufficient size to provide a 6' x 6' scoring area. Targets must be placed a minimum of 100' apart. The number of targets on the range will vary, according to space provided.

Extract from the *History of the Army Air Forces Proving Ground Command* – "In ground gunnery, the 6 X 10 targets . . . are attacked from an altitude of 800 feet, at an angle of 30° and an air speed of 150 mph. The attack begins at 1,200 feet, and ends at 600 feet, when an abrupt 90° turn is made, with a shallow climb for recovery. Four planes may fire simultaneously on a range of four targets . . ."

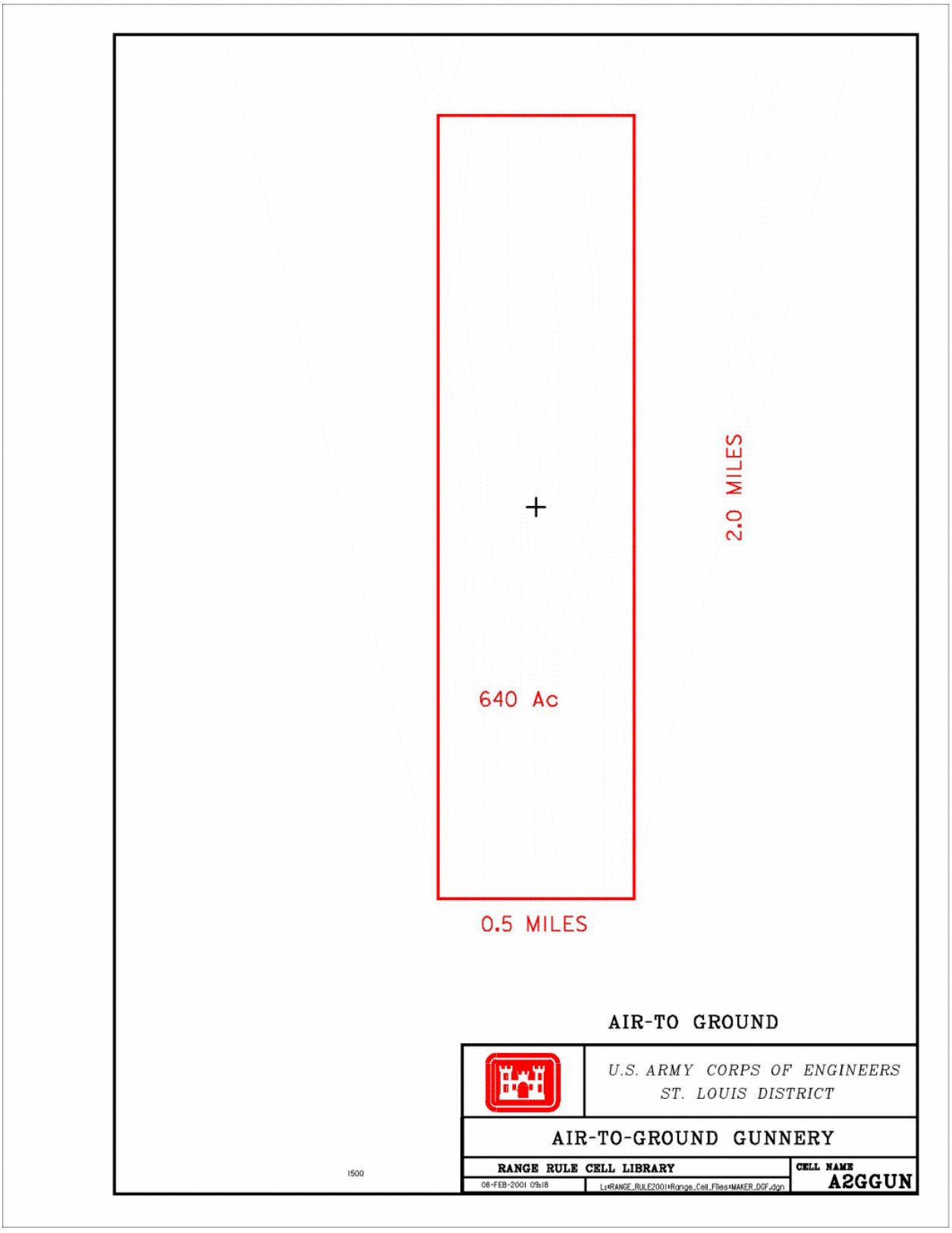
The range cell, which was taken from the referenced letter, was derived using the following assumptions: .30 caliber single gun from P-36 aircraft and At-6 flying at 210 mph and 150 mph, respectively; gun fires at least 600 rounds per minute, uses 50-yard belts, and can fire 50 rounds in a maximum of 5 seconds; a single row of targets located 4,060 feet into the range; and the worst accident that can happen. This worst accident is a runaway gun firing 50 rounds beginning 700 feet from the targets and stopping 800 feet beyond the targets. The range boundary, which is 2.0 miles by 0.5 miles, accounts for this worst accident.

Ammunition (probable)	Max Range (yards)
Small arms	N/A

Data sheet(s):

CTT01 Small arms, General

Reference(s): AAF Manual 85-0-1, *Army Air Forces Gunnery and Bombardment Ranges,* June 1945; Letter from the War Department, Office of the Chief of the Air Corps, addressed to Maj. Partridge, Southeast Air Corps Training Center, dated July 18, 1940; Extract from *History of the Army Air Forces Proving Ground Command, Gunnery Training 1935-1944*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ROCKET, AIR TO GROUND

Range Type: Air-to-Ground

Cell Name(s): RKTA2G

The range cell was derived using a target area approximately 500 feet by 500 feet. A safety fan of 15° originates from the ends of the 500-foot firing line, which is a minimum of 4,375 yards in front of the target area, and extends 2,734 yards beyond the target area.

It was common for air-to-ground rocket ranges to be co-located within a practice bombing target. Targets may have consisted of derelict vehicles, wooden structures, or merely outlines on the ground.

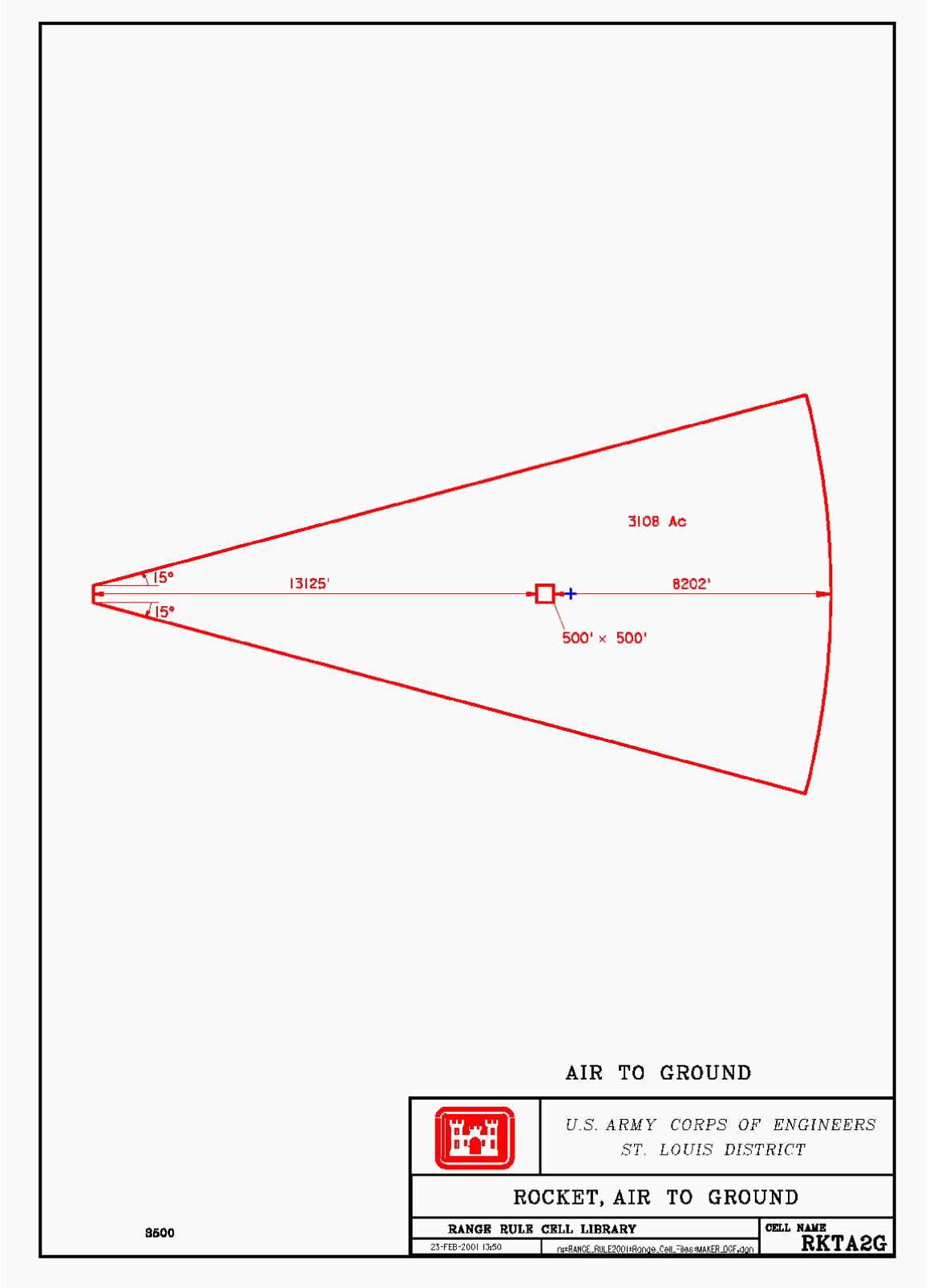
Information may not be available in which to determine the approach line; therefore, best judgment is necessary when laying out this range cell.

Ammunition (probable)	Max Range (yards)
Aircraft Rockets, Practice	2,000 yards
Aircraft Rockets, Live	2,000 yards

Data sheet(s):

CTT19	3.5-inch, Rocket, Aircraft, Mk4
	5-inch, Rocket, HVAR
CTT21	2.25-inch Practice Rocket, Mk6
	2.25-inch Practice Rocket, Mk4
	2.25-inch Practice Rocket
	2.75-inch Practice Rocket, FFAR

Reference(s): AR 385-63*, Policies and Procedures for Firing Ammunition for Training, Target Practice, and Combat*, November 1983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