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# LOMAH – Location Of Miss And Hit

## What is it?

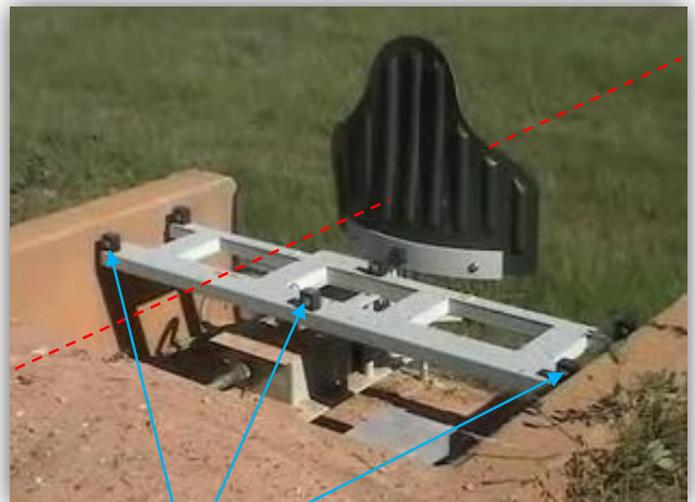
Basically, it's a computerized scoring system for rifle or pistol.  
In military situations it can also be used with mortars and tanks.

A sensor at the target end of the range detects the passage of the projectile through a target and feeds back an "X / Y" coordinate to a video display screen at the shooting station.

The sensor system is a set of microphones that detect the supersonic "boom" of the projectile passing overhead. This information is wirelessly transmitted back to the computer at the shooter's side which displays a graphic interpretation of the **L**ocation **O**f the **M**iss **A**nd **H**it.



The target shape is irrelevant – it is only the position of the "hole" that is relayed back to the shooter's monitor. The target can be any shape.



There are six microphones that detect the "sonic boom" of the projectile passing overhead and then relay the "X & Y" coordinate to the shooter's screen.

(Note: Projectile must be traveling at supersonic speed when it passes over the LOMAH – See Appendix for suitable ammunition)



Shooter's scores are kept and then printed out at the end.



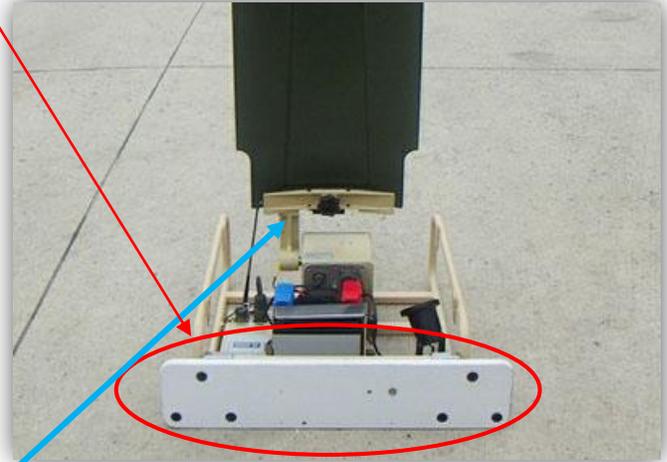
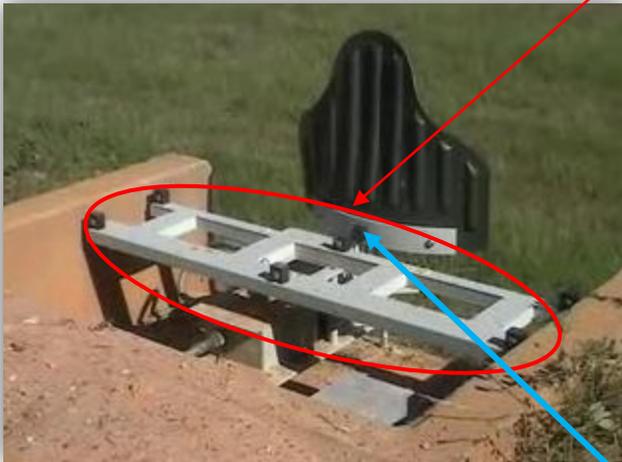


**The alternative;** In competitions, “spotters” have to go onto the field to “spot” or mark the hits on the target and relay that information back to the shooter. They would hide behind the protective berm then come round the front to score. For the shooter to see an approximate score, the spotters would use colored paddles to cover the hits or misses.



At long distances there had to be a compromise between the size of the paddle and the accuracy of the hit. Too small a paddle = accuracy, but not visible to the shooter..... Too large a paddle = very visible to the shooter but it covered a too larger area. Exact score had to be relayed back via telephone etc. In some ranges the targets would be retrieved via cables.

There are variations on the LOMAH system, which incorporate “reactive targets”. Here we have two different, although the same, LOMAH systems.



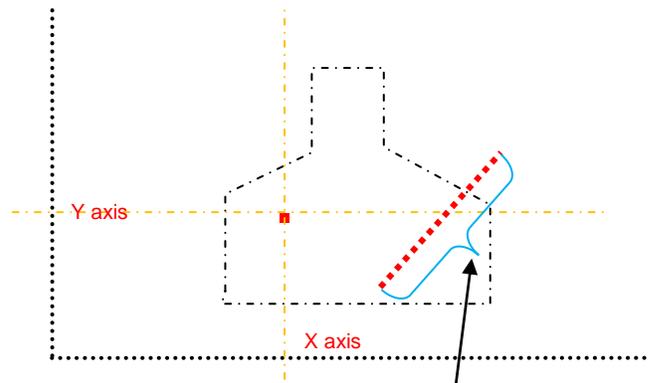
Here is a 6 microphone system (**Suis Acor**)

Behind each “BAR” is a target “lifter” system, both unnecessary to the LOMAH operation.

As a projectile passes over the “listening” microphones, it generates a sonic boom that is detected by the system. The X/Y coordinates are calculated, and if the “hit” position is within the target defined outline, the “lifters” drop the target flat, to simulate a hit. (The projectile doesn’t knock the target down, the computer does – and upon control, puts it back up.)

The target shape can have a shock-sensor “glued” to it; when the sensor is activated / vibrated, the “Lifter” can lower the target for a short time (programmed in), then raise it back up, independent of the LOMAH sensing.

Scenarios can be built in to the software to “play” various games or sniper practice drills. (e.g. it may take 3 fast hits to kill / lower the target. OR, one to the head and two heart shots to “kill” the target.)



Further, the LOMAR system is **FAST**..... It can record multiple shots in quick succession, even from a machine gun. (These systems are in extensive military use.)



So, the target “lifter” is really a “glorified” target. (For those on a budget, somewhat unnecessary.)

So how do we define our target? .... Software.

If we take a LOMAH bar and lay it on the ground, we can then set a target frame behind it, holding a sheet of cardboard (3' x 3') with a “Bulls-Eye” target painted or stuck to it..

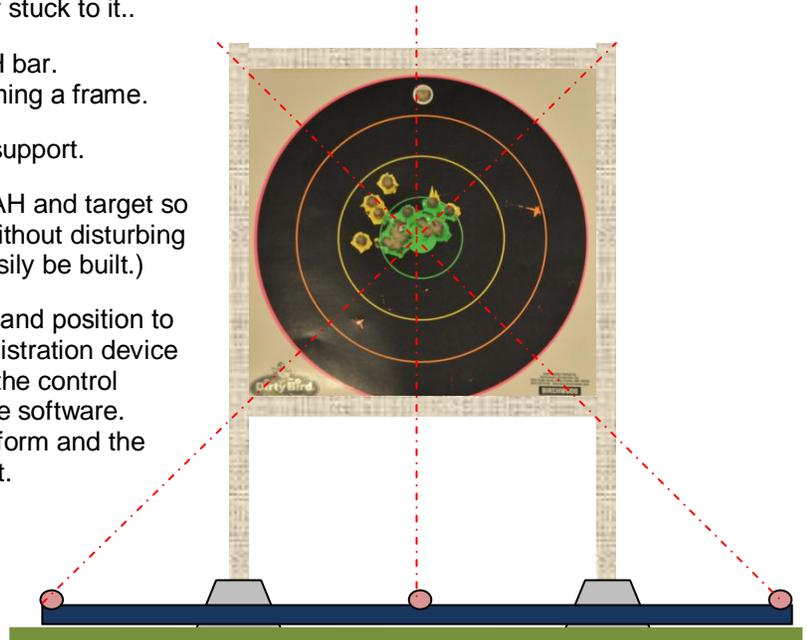
Concrete blocks will be positioned behind the LOMAH bar.  
The target sheet will be mounted on 2” x 3” studs forming a frame.

The frame will then drop into the concrete blocks for support.

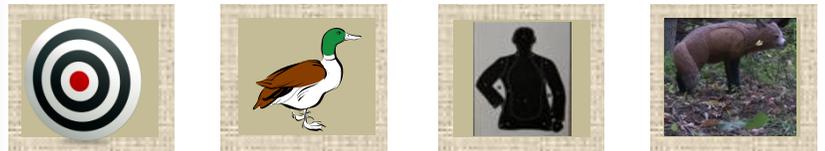
There needs to be a fixed relationship between LOMAH and target so that replacing target frames can be easily achieved without disturbing their relationship to each other. (A steel frame can easily be built.)

The initial setup requires “matching” the target shape and position to the LOMAH bar and the computer image. A laser registration device is used to achieve this – feeding its readings back to the control computer. An image of the target is imbedded into the software. Once calibrated, the computer remembers the target form and the user / shooter can select what shape he is shooting at. A library of targets and images can be stored. Once the library is built (1, 5, 20, 100 target shapes), there is no need to set up the system each time.

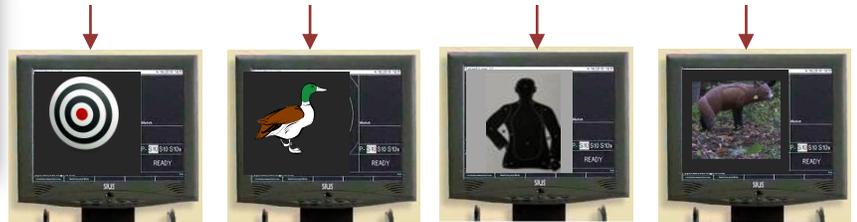
On the video, the background target is manipulated to lineup with the three red lines matching the target.



Any shape or form can be used as a target.



Just take a photograph of the image and scan it into the computer, using the software provided. Using the editing software, just draw around the target shape and assign scores to various areas. All the LOMAH system does is to record X & Y “hit” positions and relate them back to the computer, which in turn, translates them onto the image on the video display as Hits or Misses.



Obviously, the “lifter” system gives some reality to the shooting experience, i.e. to see a terrorist or animal fall over when hit, but this can also be embedded into the Video monitor software to give the same visual effect, but at the video end instead of the target end. As the lifter unit is priced around \$3500 – that could purchase a lot of ammo.

This system is being installed at the BSA Jamboree site in WV. Because the high caliber rifle is shooting across a deep ravine, it would be impossible to go out to the target to score or retrieve the paper targets. This system makes it very easy to score, ensures a faster throughput of shooters (there is no “stop shooting” while targets are retrieved) and it ensures a much safer shooting environment with all shooters behind the firing line.

For private use, the client has the luxury of being able to shoot continuously regardless of weather conditions, and there is no need to have a “target scorer” at the target end to report scores back to the shooter. You can shoot continuously without having to retrieve targets or have a scorer / spotter present. (I guess it’s more fun with a partner than shooting alone though.) With continual shooting possible, I’d recommend the Lead-Sled – shown later.



Target scoring system will be LOMAH.  
 (Location Of Miss And Hit)  
 Microphones pick up bullet trajectory  
 and display hit back on VDU

For a club environment or with multiple shooting positions, there could be an overlap from one shooter encroaching on another shooter's target. (8' window at 300 yards?)

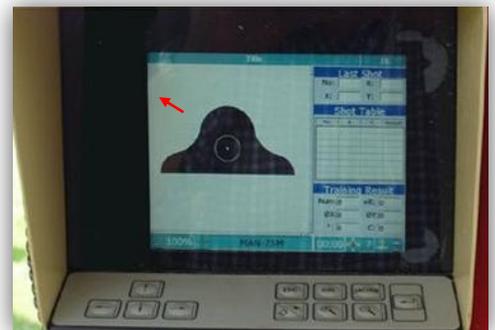
To manage this, the system comes with an optional "Lane Discriminator".



This is a unit (bar), in a way similar to the LOMAH bar, but it lies in front of the shooter beneath the barrel of the gun.

When the shooter fires a shot, the lane discriminator detects the projectile leaving the barrel and "opens" the LOMAH listening device for a short period of time (1/4 second – 2 seconds), determined by the shooter at setup time when the target distance is fed into the software. This opens the sensing microphones for a period of time to allow the bullet to leave the barrel, travel the distance then pass over the LOMAH bar. The LOMAR then closes. This more or less cancels out any shots from neighboring shooter's errant or "lousy" shots. The video unit reports registering a "hit" but colors the dot different and gives an error message. If you get a lot, someone is shooting at the wrong target.....

The LOMAH system also has a feature that lets a shooter know if he totally missed the target area. i.e. it records the correct shooter's "hit" (verified by the lane discriminator), but the sonic boom was detected "way-off" the target area. If this happens an "arrow" is displayed on the screen, relaying "Somewhere over there." You don't want too many of those!



The combination of using a LOMAR system, the Caldwell Lead-Sled FCX and the Beretta SAKO TRG .308 fitted with a Burris Eliminator scope **and..** Federal Premium 168gr Sierra Gold Medal Match – I've had extreme accuracy and a lot of fun... and gone through a lot of ammo.



# Options and Prices:

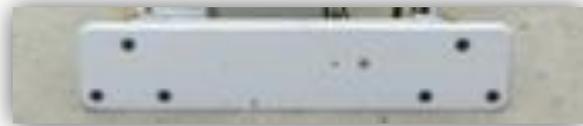
There are several components making up the “Target Reporting System”

## 1: Reporting Video (Receiver)



This unit receives data transmitted from the LOMAH system. It represents the information as a “dot” on the screen, showing where the projectile passed through or near the target, downrange. This unit also controls the target reactor to raise or lower targets when hit, then reset. It can be programmed to alter display times of target i.e. edge on, then full face for 3 seconds, then back to edge-on. OR.. lay flat, pop up for 4 seconds, then back flat. Giving “shoot” windows for the shooter.

## 2: LOMAH detection bar (Scorer and transmitter)



This unit “listens” for the supersonic “boom” of the projectile passing over the six microphones. It transmits the X/Y position back to the Reporting Video.

## 3: Target Reactor (Raising and Lowering Target)



This unit is independent of the LOMAR. It raises or lowers the target shape under commands from the computer at the shooter’s Reporting Video. There is the option of a “shock sensor” being “glued” to the target shape. When the sensor picks up a vibration from a projectile piercing the target, it lowers the target, waits a few seconds, (programmed in), then resets.

## 4: Target Registration Frame (Inanimate target holder)



This target “holder” is basically a framework holding a sheet of cardboard (with a target shape imprinted on it,) in exact registration with the LOMAH detection bar. The shape of the target and its exact position on the cardboard is registered in the computer so that when the X/Y coordinates are transmitted back to the Reporting Video, the software knows where to put the “dot” so it replicates the exact position of the “hit” on the cardboard shape downrange. Any number of shapes can be stored and scored providing the shape is registered in exact relation to the LOMAH.

With any combination chosen the target definition software and laser registration device are included.

**Option 1:** Complete system – Video, LOMAH and Target Reactor.

\$ Please call. 602 432 7878 or [sales@shooting-academy.com](mailto:sales@shooting-academy.com)

**Option 2:** Limited system – Video, LOMAH and Target Registration Frame.

\$ Please call. 602 432 7878 or [sales@shooting-academy.com](mailto:sales@shooting-academy.com)

**Option 3:** Option 1 plus Target Registration Frame.

\$ Please call. 602 432 7878 or [sales@shooting-academy.com](mailto:sales@shooting-academy.com)

### **Accessories:**

**Scoring Printer:** For output of target shape with “hits” shown.

\$ Please call. 602 432 7878 or [sales@shooting-academy.com](mailto:sales@shooting-academy.com)

**Lane Discriminator:** For multiple shooters, to record correct shooter’s shots.

\$ Please call. 602 432 7878 or [sales@shooting-academy.com](mailto:sales@shooting-academy.com)

All options include: Equipment detailed above, software, cabling, receivers and transmitters, batteries and chargers, instruction manuals, training video.

# Appendix: Suitable Ammunition

For the LOMAH to work, the projectile has to be traveling faster than the speed of sound, i.e. supersonic, when it passes over the LOMAH recording bar. This is because, the LOMAH picks up the “sonic boom” of the projectile and calculates its X / Y position to relay back to the shooter. Supersonic speed is 1,125 ft./sec.

Most modern firearm bullets are supersonic, with rifle projectiles often travelling at speeds approaching and in some cases well exceeding Mach 3.

BUT... they lose their velocity as distance increases... In the charts below (compliments Hornady Ammunition) you can see the “slow-down” as distance increases. I’ve just listed .223 / .270 / .308 which shows up to 500 yards the system will work except the 22 Hornet. If you want to go out to 1200 yards, better use a Barrett .50ca.

Ammo Description			Velocity (fps) / Energy (ft/lb)						
CARTRIDGE	BULLET	ITEM #	MUZZLE	100 yds	200 yds	300 yds	400 yds	500 yds	
V	22 Hornet	35 gr. V-MAX	8302	3100/747	2271/401	1590/197	1126/99	923/66	806/50
V	222 Rem	50 gr. V-MAX w/Moly	83153	3140/1094	2743/835	2380/629	2045/464	1740/336	1471/240
V	223 Rem	40 gr. V-MAX	8325	3800/1282	3249/937	2762/677	2324/479	1928/330	1578/221
V	223 Rem	40 gr. V-MAX w/Moly	83253	3800/1282	3249/937	2762/677	2324/479	1928/330	1578/221
M	223 Rem	53 gr. HP W/C	8023	3330/1305	2873/971	2460/712	2083/510	1742/357	1446/246
V	223 Rem	55 gr. V-MAX	8327	3240/1282	2854/995	2500/763	2172/576	1871/427	1598/312
V	223 Rem	55 gr. V-MAX w/Moly	83273	3240/1282	2854/995	2500/763	2172/576	1871/427	1598/312
T	223 Rem	55 gr. TAP-FPD	83278	3240/1282	2854/995	2500/763	2172/576	1871/427	1598/312
T	223 Rem	60 gr. TAP-FPD	83288	3115/1293	2754/1010	2420/780	2110/593	1824/443	1567/327
M	223 Rem	75 gr. BTHP Match	8026	2790/1296	2561/1092	2344/915	2137/760	1941/627	1757/514
T	223 Rem	75 gr. TAP-FPD	80268	2790/1296	2561/1092	2344/915	2137/760	1941/627	1757/514
C	270 Win	130 gr. InterBond	80549	3060/2702	2851/2345	2651/2028	2460/1746	2277/1496	2101/1275
LM	270 Win	130 gr. InterBond LM	85549	3215/2983	2998/2594	2792/2249	2595/1943	2406/1671	2225/1429
C	270 Win	130 gr. SST InterLock	8054	3060/2702	2851/2345	2651/2028	2460/1746	2277/1496	2101/1275
C	270 Win	130 gr. SP InterLock	8055	3060/2702	2825/2304	2603/1955	2391/1649	2188/1382	1996/1150
C	270 Win	140 gr. BTSP InterLock	8056	2940/2687	2747/2345	2562/2040	2384/1767	2214/1523	2050/1307
LM	270 Win	140 gr. BTSP LM InterLock	8556	3100/2987	2900/2614	2709/2280	2525/1982	2349/1715	2180/1477
C	270 Win	140 gr. SST InterLock	80564	2940/2687	2750/2351	2569/2051	2394/1781	2226/1540	2065/1325
C	270 Win	150 gr. SP InterLock	8058	2840/2686	2642/2324	2452/2002	2270/1716	2095/1462	1929/1239
T	308 Win	110 gr. TAP-FPD	80898	3165/2446	2830/1956	2519/1549	2228/1212	1957/935	1708/712
C	308 Win	150 gr. InterBond	80939	2820/2648	2601/2252	2392/1905	2192/1601	2003/1336	1823/1107
LM	308 Win	150 gr. SST LM InterLock	8593	3000/2997	2772/2558	2555/2173	2348/1836	2151/1540	1963/1283
LM	308 Win	150 gr. SP LM InterLock	8590	3000/2997	2721/2466	2459/2014	2212/1629	1979/1305	1762/1034
C	308 Win	150 gr. BTSP InterLock	8091	2820/2648	2560/2183	2315/1785	2084/1446	1866/1159	1664/922
C	308 Win	150 gr. SST InterLock	8093	2820/2648	2601/2252	2392/1905	2192/1601	2003/1336	1823/1107
T	308 Win	155 gr. TAP-FPD	80928	2785/2669	2577/2285	2379/1947	2189/1649	2008/1387	1836/1160
LM	308 Win	165 gr. BTSP LM InterLock	8598	2880/3038	2668/2607	2465/2226	2272/1890	2087/1595	1911/1337
C	308 Win	165 gr. BTSP InterLock	8098	2700/2670	2496/2282	2301/1939	2115/1638	1937/1375	1770/1147
M	308 Win	168 gr. BTHP Match	8097	2700/2719	2503/2336	2314/1997	2133/1697	1960/1433	1797/1204
M	308 Win	168 gr. BTHP Match w/Moly	80973	2700/2719	2503/2336	2314/1997	2133/1697	1960/1433	1797/1204
M	308 Win	168 gr. A-MAX Match	8096	2700/2719	2513/2355	2333/2030	2161/1742	1996/1486	1839/1261
T	308 Win	168 gr. TAP-FPD	80968	2700/2719	2513/2355	2333/2030	2161/1742	1996/1486	1839/1261

For a complete list of Ammunition Specifications, go to the FREE documentation section of my website:

[www.shooting-academy.com/Range%20Plans](http://www.shooting-academy.com/Range%20Plans)