# Joint Services Small Arms Systems Annual Symposium
# Albuquerque, N.M. May 18, 2006

## Mounts and Ancillary Equipment

## SERMON ON THE MOUNT

**Past, Present and Future**

**Presented By Mr. Dick E. Swan**
**Atlantic Research Marketing Systems (A.R.M.S.)**

# Abstract

**A brief history of where and how we were mounting early aiming devices.**

**How new mounting systems and devices evolved.**

**How developers for fire control are governed by weapon surface/s, ergonomics, and tactics.**

**Modularity was not always understood or practiced. Lasers were not always around, understood nor wanted. Dovetail rails were a hard sell at one time.**

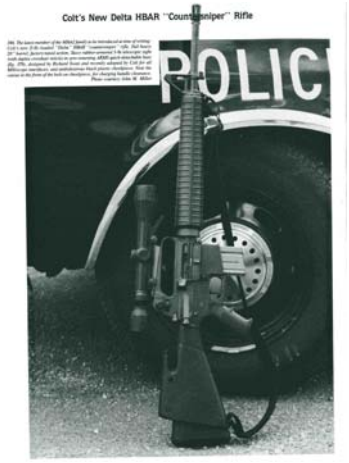
**Why weapons designers need to work with optic/laser/NV and mount makers; before, during, and after development.**

**Why all branches of the services, must have their specific needs in fire control be addressed in common interfacing. Human engineering factors.**

**Should we rely on electronics alone for hand held point of aim weapons?**

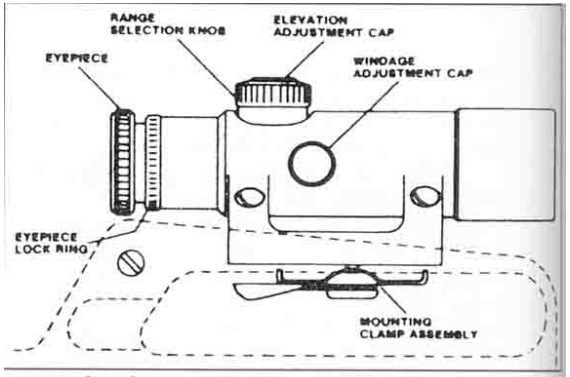
**What needs to be considered for providing reliable power to future weapons - is a battery the only way? Built in devices vs. field interchangeable systems. Importance of helping weapons run cooler thus longer, and keeping barrels free of direct attachment of rails and mounted devices. Helping electro-optic devices run longer without failures due to weapon heat and vibrations.**

**The common interface for mounting devices to man portable weapons, is dictated by the most common weapon used by the warfighter. In this case, the M16 A1,A2 with its carrying handle channel mount configuration.**



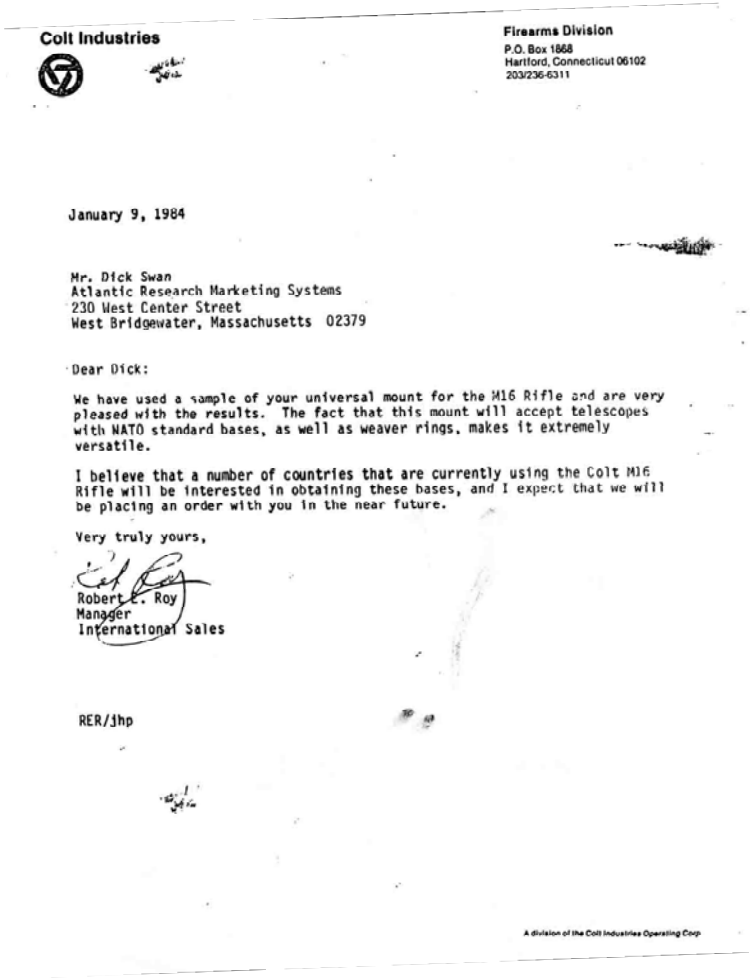

The Proposed Kodak Optical Sight System

379. Closeups of a civilian AR-15 (model SP1), fitted with experimental Kodak 3.5x Optical Sights.
Left: late model sight in Colt-adopted ARMS scope base.
Right: earlier model sight fitted with Kodak's 12-oz., slide-on "Night Adapter" with lithium-powered image intensifier, capable of presenting a 2x2-meter target area at ranges up to 500 meters. Note the early mount, which gave way to the ARMS design (above). Kodak has developed a unique insert-molding technique which imbeds polished but not edge-trued lenses, properly positioned, within the plastic body of the unit itself; thus dramatically reducing the cost of quality military optics.




556. A line drawing right side view of the Colt 3x20 and 4x20 scope, showing nomenclature.
The sight adjustments may be made with the rim of a 5.56mm cartridge.

**In 1983, A.R.M.S. had developed a dovetail rail similar to the commercial Weaver style, but with significant variations to what was available on the commercial market. Some of those variations included, standardizing on a dovetail dimension for its product line, rectangular cross notches vs. the Weaver half round notch, a 3/8" wide channel thru the center top of each dovetail rail, and when practical, the notched channel was set at a STANAG length with holes placed at either end to facilitate the mounting of STANAG optical devices. In 1983, A.R.M.S. also developed a self-locking thumbnut design, that was used in the carrying handle optic rail mount. That self-locking feature is currently used to secure the M16 carrying handle to the flat top receiver.**



Colt Industries

Firearms Division
P.O. Box 1868
Hartford, Connecticut 06102
203/236-6311

January 9, 1984

Mr. Dick Swan
Atlantic Research Marketing Systems
230 West Center Street
West Bridgewater, Massachusetts 02379

Dear Dick:

We have used a sample of your universal mount for the M16 Rifle and are very pleased with the results. The fact that this mount will accept telescopes with NATO standard bases, as well as weaver rings, makes it extremely versatile.

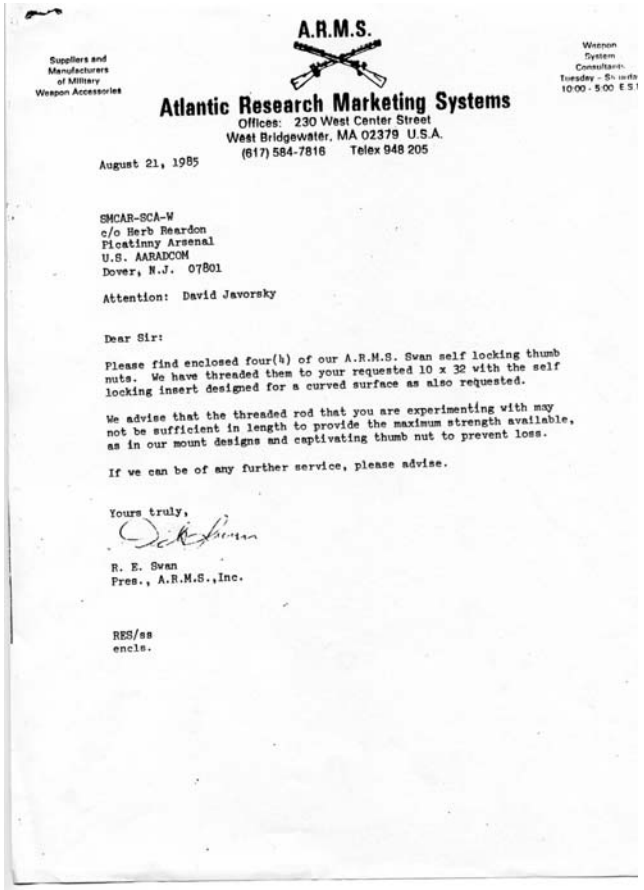
I believe that a number of countries that are currently using the Colt M16 Rifle will be interested in obtaining these bases, and I expect that we will be placing an order with you in the near future.

Very truly yours,

Robert E. Roy
Manager
International Sales

RER/jhp

A division of the Colt Industries Operating Corp



A.R.M.S.

Suppliers and Manufacturers of Military Weapon Accessories

Atlantic Research Marketing Systems
Offices: 230 West Center Street
West Bridgewater, MA 02379 U.S.A.
(617) 584-7816 Telex 948 205

August 21, 1985

SMCAR-SCA-W
c/o Herb Reardon
Picatinny Arsenal
U.S. AARADCOM
Dover, N.J. 07801

Attention: David Javorsky

Dear Sir:

Please find enclosed four(4) of our A.R.M.S. Swan self locking thumb nuts. We have threaded them to your requested 10 x 32 with the self locking insert designed for a curved surface as also requested.

We advise that the threaded rod that you are experimenting with may not be sufficient in length to provide the maximum strength available, as in our mount designs and captivating thumb nut to prevent loss.

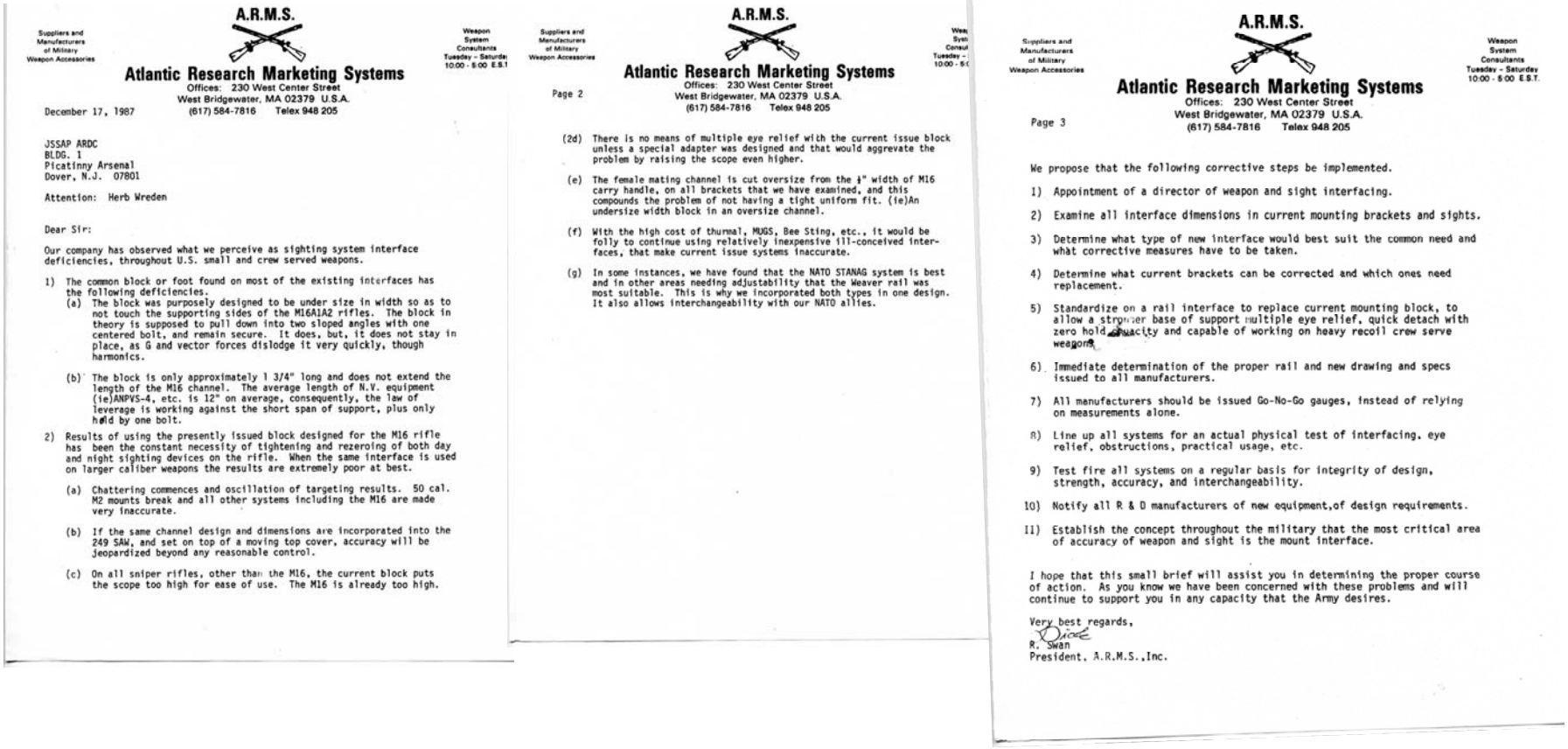
If we can be of any further service, please advise.

Yours truly,

R. E. Swan
Pres., A.R.M.S.,Inc.

RES/ss
encls.

**In late 1983 and on, A.R.M.S. started to receive requests from individual military personnel, for the ability to mount scopes to their carry handle M16 rifles. The integration of rails to replace carrying handles and other experiments with other weapons, showed a clear need to develop something better than the channel mount, from many sources.**



A.R.M.S.

Suppliers and Manufacturers of Military Weapon Accessories

Weapon System Consultants Tuesday - Saturday 10:00 - 5:00 E.S.T.

**Atlantic Research Marketing Systems**

Offices: 230 West Center Street
West Bridgewater, MA 02379 U.S.A.
(617) 584-7816 Telex 948 205

December 17, 1987

JSSAP ARDC
BLDG. 1
Picatinny Arsenal
Dover, N.J. 07801

Attention: Herb Wreden

Dear Sir:

Our company has observed what we perceive as sighting system interface deficiencies, throughout U.S. small and crew served weapons.

1) The common block or foot found on most of the existing interfaces has the following deficiencies.
   (a) The block was purposely designed to be under size in width so as to not touch the supporting sides of the M16A1A2 rifles. The block in theory is supposed to pull down into two sloped angles with one centered bolt, and remain secure. It does, but, it does not stay in place, as G and vector forces dislodge it very quickly, though harmonics.

   (b) The block is only approximately 1 3/4" long and does not extend the length of the M16 channel. The average length of N.V. equipment (ie)ANPVS-4, etc. is 12" on average, consequently, the law of leverage is working against the short span of support, plus only held by one bolt.

2) Results of using the presently issued block designed for the M16 rifle has been the constant necessity of tightening and rezeroing of both day and night sighting devices on the rifle. When the same interface is used on larger caliber weapons the results are extremely poor at best.

   (a) Chattering commences and oscillation of targeting results. 50 cal. M2 mounts break and all other systems including the M16 are made very inaccurate.

   (b) If the same channel design and dimensions are incorporated into the 249 SAW, and set on top of a moving top cover, accuracy will be jeopardized beyond any reasonable control.

   (c) On all sniper rifles, other than the M16, the current block puts the scope too high for ease of use. The M16 is already too high.

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(2d) There is no means of multiple eye relief with the current issue block unless a special adapter was designed and that would aggrevate the problem by raising the scope even higher.

(e) The female mating channel is cut oversize from the ¾" width of M16 carry handle, on all brackets that we have examined, and this compounds the problem of not having a tight uniform fit. (ie)An undersize width block in an oversize channel.

(f) With the high cost of thurmal, MUGS, Bee Sting, etc., it would be folly to continue using relatively inexpensive ill-conceived interfaces, that make current issue systems inaccurate.

(g) In some instances, we have found that the NATO STANAG system is best and in other areas needing adjustability that the Weaver rail was most suitable. This is why we incorporated both types in one design. It also allows interchangeability with our NATO allies.

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We propose that the following corrective steps be implemented.

1) Appointment of a director of weapon and sight interfacing.

2) Examine all interface dimensions in current mounting brackets and sights.

3) Determine what type of new interface would best suit the common need and what corrective measures have to be taken.

4) Determine what current brackets can be corrected and which ones need replacement.

5) Standardize on a rail interface to replace current mounting block, to allow a stronger base of support multiple eye relief, quick detach with zero hold capacity and capable of working on heavy recoil crew serve weapons.

6) Immediate determination of the proper rail and new drawing and specs issued to all manufacturers.

7) All manufacturers should be issued Go-No-Go gauges, instead of relying on measurements alone.

8) Line up all systems for an actual physical test of interfacing. eye relief, obstructions, practical usage, etc.

9) Test fire all systems on a regular basis for integrity of design, strength, accuracy, and interchangeability.

10) Notify all R & D manufacturers of new equipment,of design requirements.

11) Establish the concept throughout the military that the most critical area of accuracy of weapon and sight is the mount interface.

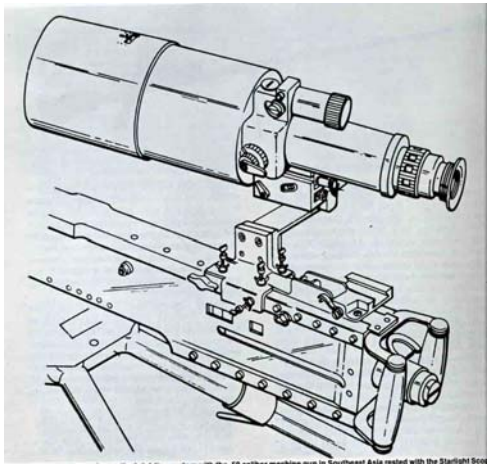
I hope that this small brief will assist you in determining the proper course of action. As you know we have been concerned with these problems and will continue to support you in any capacity that the Army desires.

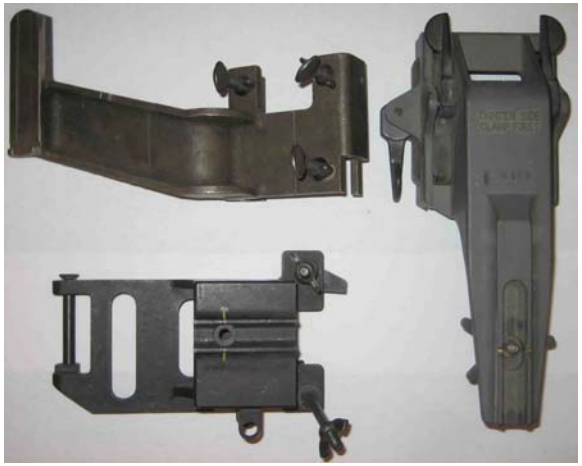
Very best regards,

R. Swan
President, A.R.M.S.,Inc.

**In the late 80's a lot of experimentation was being conducted in regards to rail interfacing vs. channel mounting. A much younger Gary Houtsma from Picatinny's Future Weapons Branch, is shown visiting A.R.M.S. facilities with a very special weapon system. Dovetail dimensioning, receiver height placement and notches to facilitate various known aiming devices, were experimented with. Attachment devices used by A.R.M.S. at the time, included the self-locking thumbnut and the then new A.R.M.S. throw lever system.**

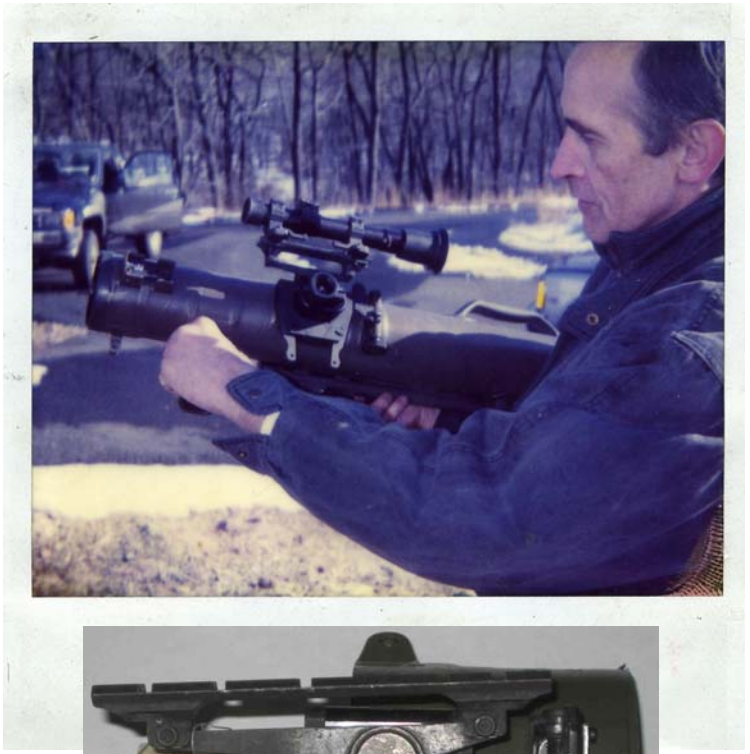
**The transition from a channel carry handle mount, to a dovetail rail mount, was a daunting task due to the vast array of weaponry and sighting devices that had to be considered, if interchangeability was also to be realized.**



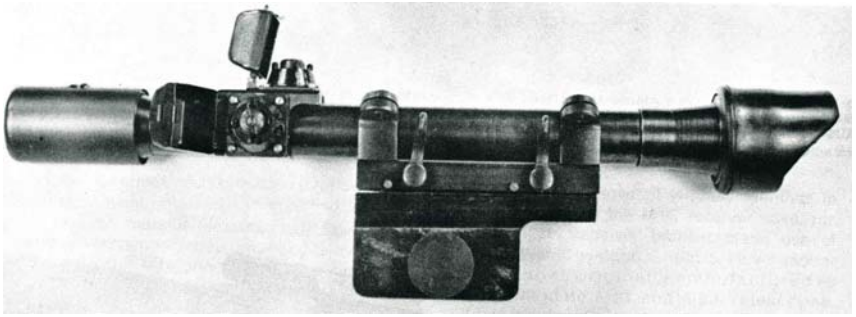


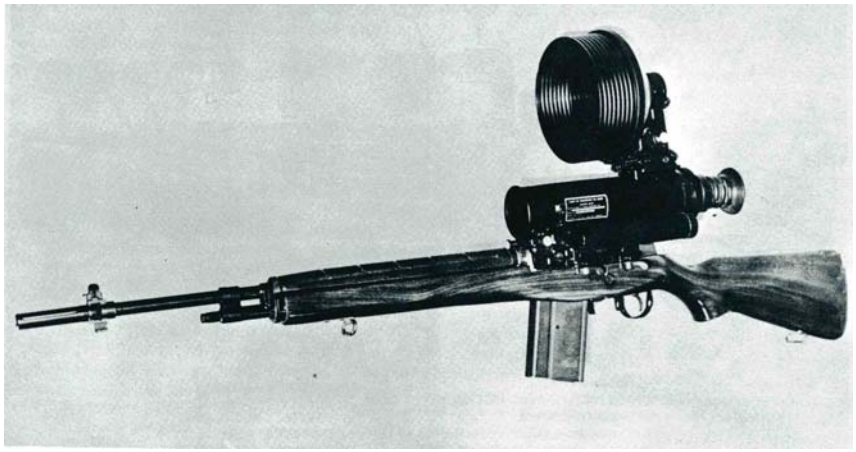
**Squad auto weapons created more mounting problems. Because the top cover had to be raised to load the weapon, mounting the optic so the objective lens didn't become damaged from hitting anything forward of the receiver.**

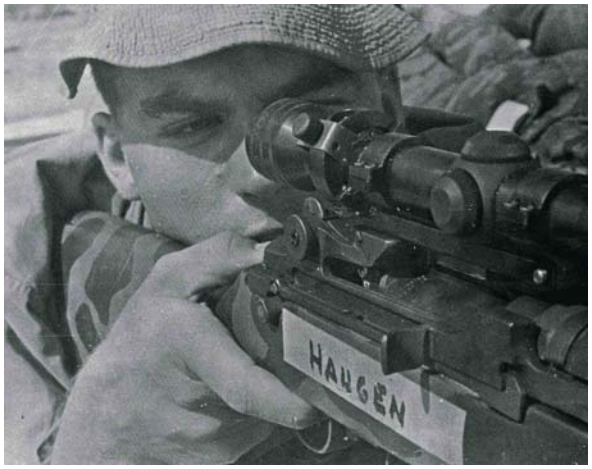

**Air defense and anti-armor weapons, also had to be able to interchange aiming devices that were available to the M16 weaponry. A stinger missile launcher, AT-4, and Carl Gustav are exampled, with A.R.M.S. mounting variations that provided commonality for interchangeability.**

**One of the most common but difficult weapons at the time to provide mounting ability to, was the M14. Because of its unusual side mounting provision and not having a straight line stock like the M16 rifle, height placement and eye relief were a challenge for practical interchangeability.**

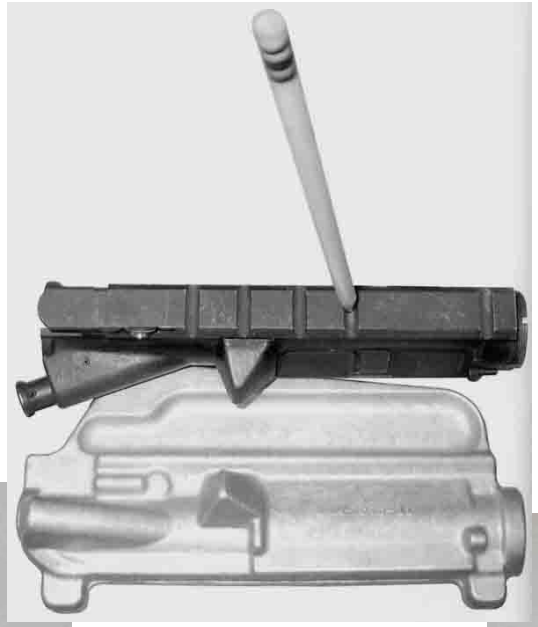






**Creating interchangeability between weapon types, different receivers, various interfaces on the bottom of optics, variations in eye relief, etc. was a difficult transition. A.R.M.S. 1990 photo.**

**Top center photo – Colt ACR receiver with half round notches, unmachined ACR receiver forging. Notice that the carrying handle ability was retained in the forging. The pencil driven into the bottom of the half round notch was a demonstration by yours truly that the next forging should have the dovetail raised .100 higher for a proper dovetail.**



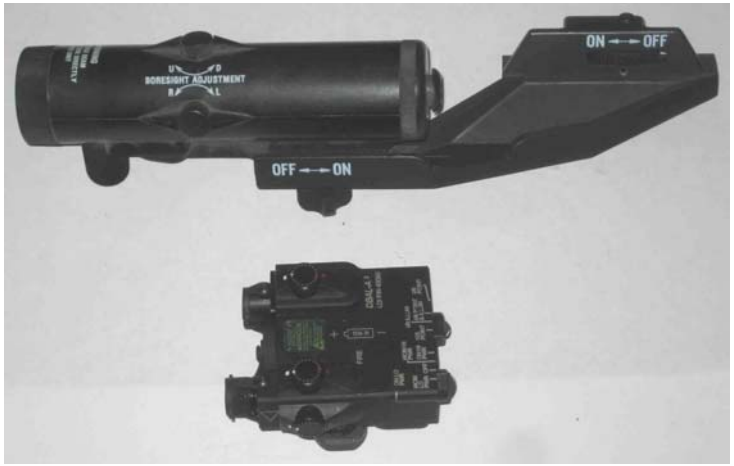
**A.R.M.S. mounting experiments included converting M16A1 receivers to a flat top configuration. A day vision and N.V. throw lever attachment and throw lever QD rear sight.**

**A.R.M.S. receiver experiments included electronic integration, with different goals in mind.**

**Two Thermal housings before being converted from a channel carry handle mount to dimensions better suited for rail interface needs.**

**Highly advanced weapon and aiming systems became more easily accomplished with the new rails and throw levers, such as this 1991 photo shows with the A.R.M.S. Rigid Frame.**

**Lasers working from a carry handle mount, compared to modern day mounting of much more capable laser devices.**



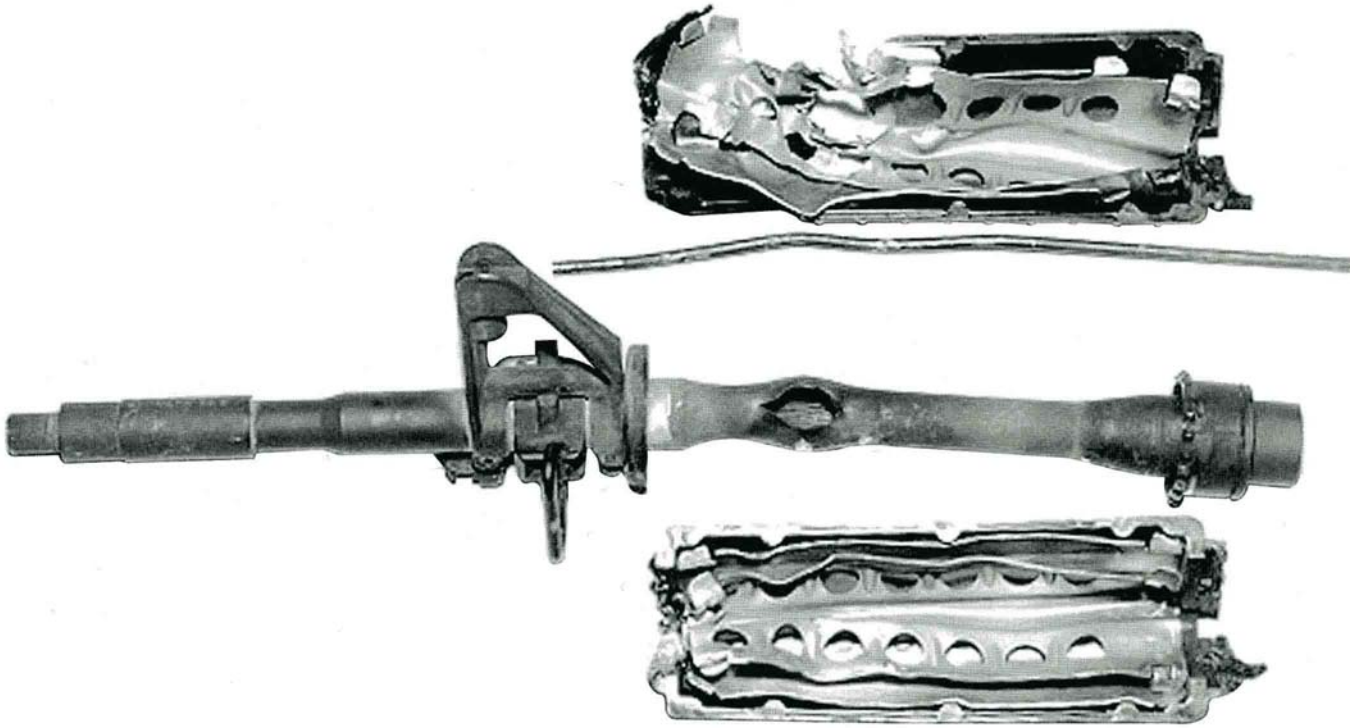

**Lasers keep on getting smaller, more capable, and headed to a common interface.**

**A.R.M.S. experimental carry handle and flat top receiver mounting for lasers, etc. that are only powered via an auxiliary box to the left of the receiver, that can also accommodate a miniature dynamo power up.**

## FREE FLOAT !

**The heat transfer of up to 900° hot gun barrels, is best avoided by not attaching (anything) to the barrel. Allowing good venting and not trapping heat from radiating away, will allow a weapon to survive longer.**

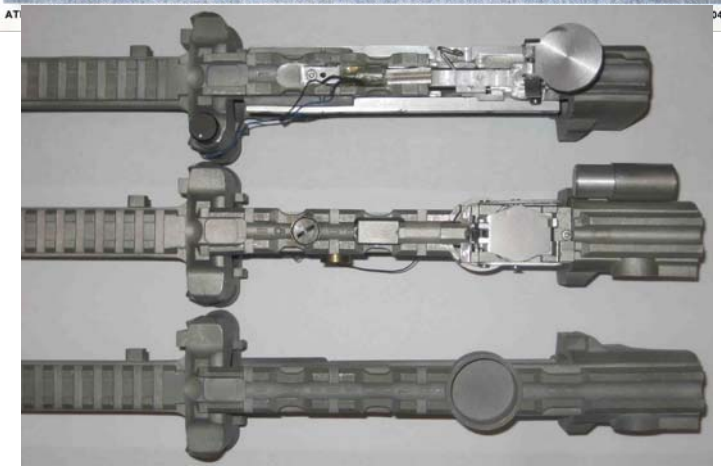




115. Another example of a barrel failure due to the barrel reaching its transformation temperature, which softens the metal.
courtesy United States Special Operations Command

**In the early 1990's A.R.M.S. designed a free float barrel and rail system. Some of the features included a Q.D. laser ability built in flip up optics, and integral electronics power supply.**



**A young me experimenting with reasons why the carry handle had to go, and some of the ways it was accomplished. The Canadian military were the 1st to adopt the A.R.M.S. established dovetail dimensions for their receiver; followed by Colt and Picatinny. The channel in the center was eliminated on the receiver as it was determined it looked too much like a pineapple grenade, next to a shooters head. All of the notches on top of the current receiver were added as a temporary accommodation for the various optics being evaluated, and having different eye relief's and crossbar requirements.**

National Defence / Défense nationale

10055-83-020 (DLAEEM 4-6)

6 March 1989

Distribution List

WEAVER RAIL
WEAPON INTERFACE

References: A. A.R.M.S. Inc FAX dated 03 Mar 89
B. ARDEC FAX dated 07 Mar 89

1. Thank you for your drawings with regard to the subject matter.

2. The Canadian Forces Land Element intends to use this basic Swan/Weaver configuration, currently in use with various small arm weapons in Europe and the U.S.A., on our small arms and short range Anti-Armour Weapons for mounting day and night vision scopes. A copy of the rail pattern is enclosed.

3. The Canadian Forces will also be using the "Swan Throw Lever" mounting system developed by A.R.M.S. Inc for mounting all our Night Vision Sights to this rail. It is currently being introduced with our AN/PVS 4 systems and will be used on our new light weight night sight planned for fielding in 1990/91.

4. Any comments from the Joint Services Small Arms Program (JSSAP) and the Canadian Defence Liason Office and other interested parties would be appreciated as early as possible due to planned production of our new small arms.

for L.A. LeFlar
Colonel
Director Land Armament and Electronics
Engineering and Maintenance

ENCLOSURE: 1

Canada

A.R.M.S., INC.

Specialists in Design and Manufacture of Military Mounting Brackets, Controls and Interfaces for Sighting Systems

Weapon System Consultants Servicing The Free World

A Subsidiary of Swan Industries
Atlantic Research Marketing Systems, Inc.

Offices: 375 West Street
West Bridgewater, MA 02379 USA
(508) 584-7816 Telex 948 205
Fax 508-588-8045

NON-DISCLOSURE AGREEMENT

This agreement is made and entered into this 8th day of August, 1990 by and between Colt Manufacturing Company, Inc., 150 Huyshope Avenue, Hartford, Ct. 06106, and Atlantic Research Marketing Systems, Inc., having an office located at 375 West Street, West Bridgewater, MA. 02379.

Whereas, both parties, for their mutual benefit, desire to disclose certain proprietary information related to the A.R.M.S. modified M16 ACR receiver with modular sleeving system, designed by and the sole property of A.R.M.S., Inc.

Now therefore, in consideration of receipt of such information, the parties mutually agree as follows:

1. All written information designated as proprietary, herein called "Proprietary information," disclosed by one party to the other shall be and remain the property of the originating party. The receiving party shall use the proprietary information for the purpose of the Agreement only and shall not disclose the proprietary information or any part thereof to any other person, firm or corporation without prope written consent of the disclosing party, and shall restrict to the same extent necessary to fulfill the purposes of this Agreement.

2. Notwithstanding any other provisions hereof, neither party shall be liable for release or disclosure of any proprietary information that (a) is required by an order from a court of competent jurisdiction, (b) is or becomes part of the public domain, other than through breach of this Agreement, (c) is known to the receiving party prior to the disclosure by the other, (d) is subsequently rightfully obtained by the receiving party from a third party, or (e) is disclosed inadvertently, despite the exercise by the receiving party of the same degree of care which it normally uses to prevent unauthorized disclosure and use of its own proprietary information.

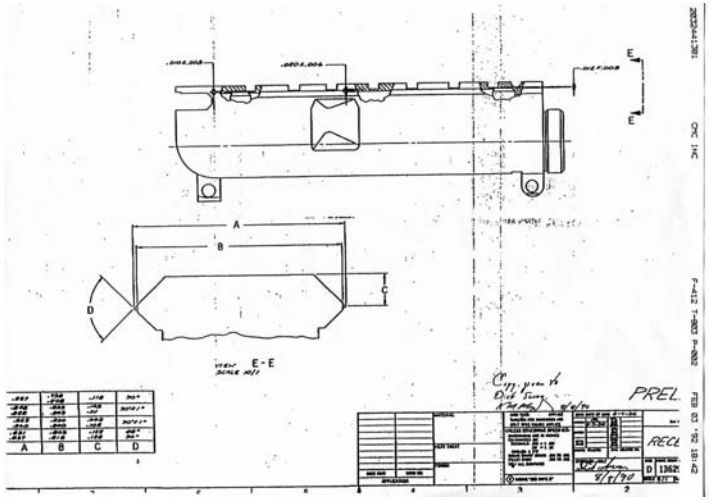
3. Any written proprietary information must be identified as proprietary by an appropriate stamp or legend at the time of disclosure to the receiving party. Any proprietary information which is disclosed orally shall be concurrently identified as proprietary and such claim shall be confirmed in written form to the receiving party within twenty (20) calendar days.

4. The proprietary information exchanged under this Agreement shall be returned to the originating party thereof promptly at its request, or in any event upon the termination or completion of this Agreement, together with all copies and/or negatives made thereof.

5. The disclosure of proprietary information shall not constitute any grant, license, or option under any patent or other right now or hereafter held by the disclosing party.

6. This agreement shall remain in force and effect for 36 months from the date set forth above.

| COLT MANUFACTURING CO., INC. | ATLANTIC RESEARCH MARKETING SYSTEMS, INC. (A.R.M.S., Inc.) |
|---|---|
| By: | By: |
| Title: VP Engrg | Title: President |
| Date: 8-8-90 | Date: 8/8/90 |

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Specialists in Design and Manufacture of Military Mounting Brackets, Controls and Interfaces for Sighting Systems

Weapon System Consultants Servicing The Free World

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Offices: 375 West Street
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(508) 584-7816 Telex 948 205
Fax 508-588-8045

March 8, 1989

NDHQ/DLAEEM 4-6
Major George R Pearkes Bldg
Ottawa Canada K1A 0K2

Attention: Capt PM Soulliere

Dear Sir:

A.R.M.S.,INC. hereby authorizes the Canadian Military forces to utilize A.R.M.S. drawings for their military requirements. Said drawings are of the Swan/Weaver STANAG universal interface.

We also authorize the use of A.R.M.S. Swan Throw Lever drawings on a proprietary basis.

It is also agreed that A.R.M.S. will be provided copies of the Canadian version of the A.R.M.S. drawings to ensure compatability of interfacing of weapon sighting devices.

Yours sincerely,

R. C. Swan
President
A.R.M.S.,Inc.

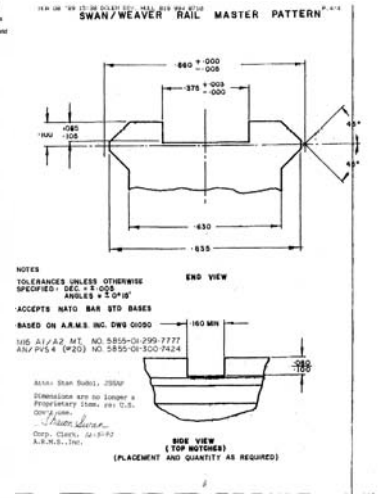


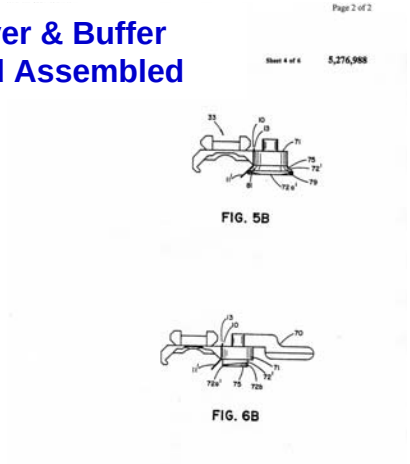
**Photo on the left demonstrates that we will try mounting any device to help our soldiers.**

**Photo on the right shows just some of the ancillary equipment the military currently make available to attach to the M16/M4 as needed by the warfighter.**

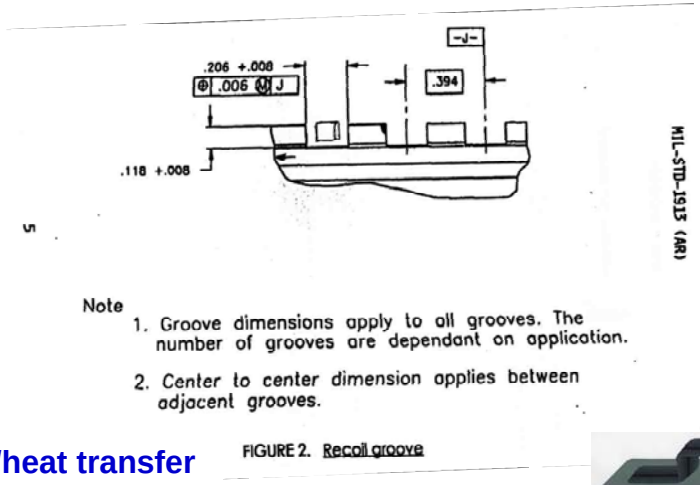
**Hard Mounting vs. Soft Mounting.**

**A.R.M.S. developed the throw lever concept in the late 1980's to provide a mount attachment that would provide a real repeat on/off zero. All other mounts used a side to side direction of force, that disrupted windage when a knob or nut was used for attachment, because of the varying degrees of force that hand tightening could not judge. The A.R.M.S. throw lever is a soft mounting system that helps eliminate shock waves to sensitive electro-optic devices, much like shock absorption springs for vehicles, and even tanks. A.R.M.S. experimented and determined that a non-adjustable pre-selected tension would eliminate any chance of over tightening or damage to rails, and for the same reasons that the M16/M4 does not provide an adjustable gas or buffer system, as experience shows, young soldiers may likely adjust it wrong. A.R.M.S. also provided a buffer system to further protect the precision rails. The notch in the 1913 rail is designed to leave clearance so that any debris in the notch does not disrupt placement of a cross bar in the field. Once attached in the forward position of the notch, the predetermined spring loaded tension built into the throw lever will provide extended longevity to sensitive devices.**

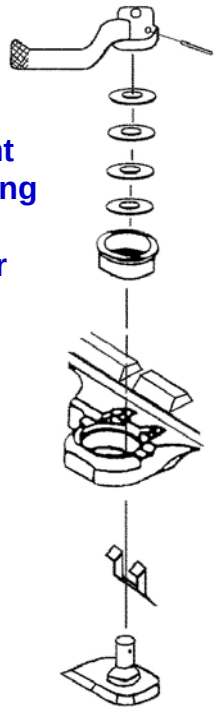
**Lever & Buffer Pad Assembled**




**1913 cross bar placement**




**Component view drawing – A.R.M.S. throw lever assembly.**



**Thermal coupling instrumentation/heat transfer**

**Typical Oscilloscope instrumentation for measuring shock values.**

**Soft mounting of devices provides an accurate QD advantage over thumbnuts and/or wrench tightened attachment. The cam surface on the A.R.M.S. throw lever assembly will not shake or vibrate loose and has proven to be snag free. A.R.M.S. has provided a lever lock ability, but to us its more like wearing suspenders with the belt. In the last 18 years, A.R.M.S. has supplied many hundreds of thousands of throw lever attachments to the electro-optical community for N.V., thermal, laser, and continue with some of the newest Government selected day optics, and many other devices not shown.**

**There are many good rail systems in service, the newest ones are free float. The A.R.M.S. S.I.R. System, Selective Integrated Rail, is unique that it allows rails to be added or replaced as required by technology changes and/or field repairs. The polymer lower is also unique since it does not require covers to protect against over-heated aluminum.**

**This 1995 A.R.M.S. poster demonstrates our continued vision of the future that will provide high tech integrated abilities to our warfighters with advanced man portable weapon systems of all kinds, and synchronized to communicate with larger support systems.**