# ARMY R,D&A

- RESEARCH
- DEVELOPMENT
- ACQUISITION

MARCH-APRIL 1979

## NATO's 30th Anniversary


NATO's 30th Anniversary

# ARMY R,D&A

**Vol. 20 No. 2** **March-April 1979**

## ABOUT THE COVER:

The cover photographs were taken by Mr. P. J. Pfeiffer, a member of the DARCOM Office of International R&D, during a recent visit to NATO HQ in Brussels. Mr. Pfeiffer, an amateur photographer, captured this fine view of all 15-member nation flags on their masts in front of the NATO HQ building. The magazine extends its thanks to Mr. Pfeiffer for permission to use the photographs. The flags are purchased by NATO HQ, are of a uniform size appropriate to the length of the staff, and are flown daily from sunup to sunset. Individual flags are lowered to half mast at the request of individual nations. Rarely, but occasionally, the Secretary General will direct all flags to half mast, as was done with the death of the Pope. The U.S. flag was lowered recently in honor of former VP Rockefeller.

Editor . . . . . L. VanLoan Naisawald
Associate Editor George J. Makuta
Assistant Editor . . Harvey Bleicher
Staff Assistant Mrs. Thelma Heisler

Published bimonthly by the Development and Engineering Directorate (DRCDE), HQ U.S. Army Materiel Development and Readiness Command, Alexandria, VA, in coordination with the DARCOM Public Affairs Office, the Office of the Chief of Engineers, the Office of the Surgeon General's Medical R&D Command, and the Office of the Deputy Chief of Staff for Research, Development, and Acquisition, HQ Department of the Army, to serve all elements of the U.S. Army Research and Development and Acquisition community.

Grateful acknowledgement is made for the valuable assistance of Public Affairs Offices within the Army Materiel Development and Readiness Command, Office of the Surgeon General, Office of the Chief of Engineers, Army Health Services Command, Army Training and Doctrine Command, Army Forces Command, and related activities. Use of funds for printing of this publication has been approved by Department of Army, 23 Dec. 1975.

*Purpose:* To improve informal communication among all segments of the Army scientific community and other Government R,D&A agencies; to further understanding of Army R,D&A progress, problem areas and program planning; to stimulate more closely integrated and coordinated effort among Army R,D&A activities; to express views of leaders, as pertinent to their responsibilities, and to keep personnel informed on matters germane to their welfare and pride of service.

*Picture Credits:* Unless otherwise indicated, all photographs are from U.S. Army sources.

*Submission of Material:* All articles submitted for publication must be channeled through the technical liaison or Public Affairs Officer at installation or command level.

*Bylined Articles:* Primary responsibility for opinions of bylined authors rests with them; their views do not necessarily reflect official policy or position of Department of the Army.

## FEATURES



## DEPARTMENTS



**POSTMASTERS: Controlled circulation postage paid at Mechanicsburg, PA. This publication contains no advertisement.**

DISTRIBUTION is based on requirements submitted on DA Form 12-5. Army agency requirements must be mailed to the U.S. Army AG Publications Center, 2800 Eastern Boulevard, Baltimore, MD 21220.

Distribution on an individual name basis is restricted to members of the U.S. Army Atomic Energy, R&D, and Procurement OPMS programs and to USAR Mobilization Designees in these fields. Otherwise, distribution is made only to the Army installation, office or organizational element to which the requester is assigned.

CHANGE OF ADDRESS for R&D and AE Officer Program enrollees should be addressed to U.S. Army Materiel Development and Readiness Command, ATTN: DRCDE-LN, 5001 Eisenhower Ave., Alexandria, VA 22333. Telephone: AUTOVON 284-9587; commercial-AC 202 274-9587. Mobilization Designees should report changes of address to Commander, USARCPAC, ATTN: AGUZ-CMD-M, P.O. Box 12167, Olivette Branch, St. Louis, MO 63132.

OTHER GOVERNMENT AGENCIES' requirements should be submitted directly to U.S. Army Materiel Development and Readiness Command, ATTN: DRCDE-LN, 5001 Eisenhower Ave., Alexandria, VA 22333.

ALL NON-U.S. GOVERNMENT agencies, firms and organizations must obtain this publication through the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402. Single copies: domestic—$1.25, foreign—$1.60. Subscription rates (6 issues annually): domestic, APO and FPO addresses—$7.50; foreign mailing—$9.40.

# *An Analysis of:*
# The Importance of RSI

**By Dr. W. B. LaBerge**

*Under Secretary of the Army*

This article discusses an analytical process through which the Army scientific and technological communities may better understand the importance of Rationalization, Standardization, and Interoperability (RSI) to the European theater. Those temporarily frightened by integral calculus should read on—the arithmetic ratios are explained in layman's language.

The United States Army is preeminent among the members of the Department of Defense in the implementation of Rationalization, Standardization and Interoperability with our NATO allies. This issue of the *Army RDA Magazine* will demonstrate to all who read it the very dramatic progress made in recent times toward effective total use of NATO Alliance resources which is the underlying reason for RSI.

The remarkable accomplishments already attained are joined by several other equally prominent Army initiatives to ensure that the U.S. and its Allies will continue to work closely together. Forces in the field have greatly increased their joint training, both in command post exercises and full deployment. As a result, they have had the chance to improve substantially their procedures and techniques for conduct of a coalition war.

Similarly, the individual Army staffs of the Alliances have initiated extensive soldier to soldier talks. These talks have resulted in codifying many important doctrines of how to fight together.

This leading of DOD by the Army is entirely appropriate, not only because it is an Army tradition to lead in all the tough and important tasks, but also because it is the Army which has more of its people inexorably committed to the success of its Allies in any engagement in Europe. These actions are truly important and I wish to express my personal thanks for them and to relay the appreciation of the senior members of DOD who share the recognition of this job well done.

However, because of the very great operational implications of RSI it does seem appropriate for the Army to continue to try to improve the effectiveness of its cooperation without Allies. The area of improvement which seems of most potential utility to the Army is that of better early interchange of technology and better planning together of experiments and preliminary designs by the Army with its Allies. Personally, I do not believe we do well enough in this front end technology cooperation and hence I have chosen to discuss that aspect of RSI in this article.

Because of the belief by many technologists that no article is worth reading unless it contains some integrals, exponents and vectors, I have elected to formulate, arithmetically, the importance of early participation by technologists to the successful implementation of RSI. In order to not wholly turn off the non-technologist reading public, I will offer subsequent to the presentation of the integral relationship, a layman's explanation of the arithmetic.

It is the contention of this article that the Second Law of Thermodynamics, as applied to warfare, RSI, and international cooperation, can be approximated as follows:

For programs whose dollar value is large, the rate of change of the amount of RSI in any one program is:

$$\dot{A}_{RSI}(t,l) = \frac{d}{dt} A_{RSI}(t,l) = \frac{k_s\, 10^{-N_{DSARC}}}{S_R/S_C}\, \dot{i}_{RSI} \int_0^{+} \frac{e^{K} \cdot \vec{p}(t)}{V_{ai}}\, dt$$

when $l \neq l_{HASC}$, and

$$\dot{A}_{RSI} = A_{RSI} = 0$$

When $l = l_{HASC}$

Where:

| | | |
|---|---|---|
| $\dot{A}_{RSI}$ | = | Rate of change of international cooperation |
| $A_{RSI}$ | = | Amount of RSI in a program |
| $k_s$ | = | A Service-determined interest measure: $k_{Army} = +1$ $k_{Air\ Force} = 0$ $k_{Navy} = -1$ |
| $N_{DSARC}$ | = | Defense Systems Acquisition Review Council milestone number |
| $i_{RSI}$ | = | Intrinsic military importance of RSI |
| $S_R$ | = | Proximity to the Russians in miles |
| $S_C$ | = | Proximity to the Congress in miles |
| K | = | Ambassador Komer interest variable—always a very big number when non-zero |
| $\vec{p}(t)$ | = | Dr Perry's interest vector<br>$\vec{p}(t) = 0$ when $t <$ time when USDRE finds out about program<br>$\vec{p}(t) = 10^3$ when $t \geq$ time USDRE finds out about program |
| $V_{ai}$ | = | Dollar value of the program (in units of $\$10^{+6}$) |
| l | = | Location of the program prime contractor facility |
| $l_{HASC}$ | = | Location of districts of House Armed Services Subcommittee members |

To better understand the importance of this relationship, one may make some first-order observations. Before beginning this analysis, though, it is important to note that the expressed RSI relationship is complicated and frequently analytically intractable. It should not be used unsupported in discussions with the Office of Manpower and Budget or either House of Congress.

Nonetheless, it should be obvious to any engineer within the Army R&D organization that the following gross conclusions can be drawn from the preceding formulations:

a. That for the case where $l \neq l_{HASC}$, e.g., when the program does not lie in the district of any HASC member, the time rate of change in the amount of RSI ($\dot{A}_{RSI}$) is—

(1) Proportional to the first power of $i_{RSI}$, the military importance of RSI, showing that the importance of RSI does increase with time. However, one can also see that the military importance of RSI is only linear, whole other factors in RSI implementation are expressed exponentially and exercise far greater impact.

(2) Uniquely dominated by $k_s$, the attitude of the Service involved. Service attitudes have been determined to be constant, and not affected by time, the program under consideration, or the level of OSD exhortation.

(3) Inversely dependent (exponentially) on the stage of commitment, as measured by its numerical progress through the DSARC process. Because of the negative exponential relationship, almost no increase in RSI can be expected after DSARC 0 (Program Initiation), where $N_{DSARC} = 0$.

(4) Inversely proportional to the ratio $S_R/S_C$, the decision maker's distance from the Russians divided by his distance from the Congress. This impression clearly relates the construed source of program jeopardy, i.e., the closer to the Russians the more RSI, the closer to the Congress the less RSI. This expression explains why commanders in Europe accomplish much more in RSI than those in the Pentagon.

(5) Proportional to the time integral of interest of the OSD RSI principle. This OSD interest is expressed as to the product of

$e^{Kt}$, where K is the Komer variable (always a very big number, the closest approximation being $K = \infty - \frac{t}{\infty}$ ), multiplied by a binary function representing the state of Dr. Perry's interest. Experimentally, the Perry interest vector has been found to be 0 when Dr. Garber has not told him of an explicit program opportunity, and $10^3$ when it has been divulged.

(6) Inversely proportional to the number of dollars which might be contracted to American industry. This shows the empirically derived reluctance of American industry to forego profits.

The above conclusions are valid only for the case $l \neq l_{HASC}$, the case where the location of the program is not within the locus of points defined by the geographical limits of the congressional district for any member of the HASC.

For the case where $l = l_{HASC}$, a much simpler formulation exists. For this case, where the corporation executing the program under consideration lies within the district of a HASC member, the time rate of change in the amount of

RSI ($\dot{A}_{RSI}$) is—

$$\dot{A}_{RSI} = \frac{d}{dt}A_{RSI} = 0$$

Or, more simply put, RSI has no chance to succeed for political reasons after it has been assigned by DOD to an industrial contractor in the district of a member of the HASC.

To members of the Army scientific and advanced technology communities, as the Under Secretary of the Army, I present the above RSI formulations for your consideration.

What this formulation says is perhaps what we already know, namely, that the greatest chance to ensure the best use of alliance resources comes by working toward that end from the earliest moments of program inception.

If the formulation is accurate, then we all have an obligation to ensure that this early work gets great emphasis. However, to my mind it is in the early stages that RSI emphasis is least not greatest.

To many of you who are the scientists and preliminary designers of the Army RDA community, the reading of this article will be the longest protracted period in your careers devoted to consideration of the importance of RSI,

If that is the case for you who read this article, this analytical treatment may well be of some use to you. It will be useful, not because the preceding analytical hocus-pocus makes any sense in itself, but rather because it may force you to admit that you have not given RSI the attention it warrants.

If nothing else, I hope this discussion makes you, the advanced technologist, seriously consider to what degree the project on which you are now working really does have important NATO-wide RSI implications.

That commitment to try and understand RSI, if made, is the most crucial thing this article can achieve for the Army RDA community. If each of us comes to an informed opinion on what is militarily important and necessary in RSI, we in the Army will have made great progress in our military capability.

In a sense, the formula I make in jest is not too far wrong. The Army advanced technology community is a long way from the Hundsfeld Gap. That is where the fighting Army now faces a Soviet force which can attack at any time with local force ratios of perhaps 6:1. Neither does the front-end technology community get frequent chance to see at the political border the barbed wire and electrified wall—so stark and foreboding.

That wall between East and West Germany, to us who have seen it, is completely incomprehensible. It is not within our culture to restrict our people as do our adversaries.

The wall separating east and west shows how little we really understand the value system of our adversaries. It also shows how little we can gauge the possibilities of peace and war, and therefore how NATO has little option but to be a strong alliance and a credible deterrent.

The Army advanced technology community lives almost entirely inside the U.S., far away from Europe. It is also part of a closely-knit green suit community whose very closeness tends to lessen dependence on allies who exist only far outside that community.

Because of these local pressures we tend, as described by my formula, to accede to what is easiest to sell to Congress rather than fighting for the interdependence which might be the greatest help in deterring war. Because Europe is so far away, we have a tendency to think of our potential war as "across the river" rather than across the ocean. This is really not the case.

Those of you in the research and preliminary design parts of our Army R&D organization have very little opportunity to realize the extent of our commitment to Western Europe. You also may not be aware that one out of every 200 American citizens is living somewhere in Europe.

We fail to realize that because of our "people investment" in Europe, not to be able to successfully deter or win a European war is a concept incredible in our time. It is hard for the Army laboratory community to feel the urgency of commitment to this place so far away.

Nor do we in the stateside RDA Army always realize that today the U.S. provides only 25 percent of the soldiers, 25 percent of the aircraft, and 20 percent of the airmen in Central Europe. Our U.S. forces protect only 170 miles of a 600 mile Central European front.

We provide only two corps of the nine corps allied force distributed from Bremen to the Austrian border. Nor do we seem to admit in our hearts the consequences of the knowledge that, despite what reinforcements we bring, we are as inexorably committed to the capabilities as our allies as they are committed to ours.

If we do put our attention to these thoughts, it is inevitable, I think, that we concede we can only act as an alliance. For any of us in that alliance to succeed we all must succeed. In my view, the Army R&D technology and preliminary design community at the working level has not faced up to these issues of cooperative warfare RSI.

It is regrettable that I conclude that a great many of the scientists and preliminary design engineers who read this article have yet to put in as much time in the formulation of their views on RSI as I have done in fabricating the nonsense which introduced this article.

To me, the manifestation of the lack of awareness of the importance of RSI, at the very early stages of concept development, is that none of the seemingly obvious things that encourage RSI get done automatically. The STOG and Future Systems Planning List do not treat satisfactorily the importance of RSI or demand its consideration in system formulation.

Additionally, the Army ROCs and MENS do not yet speak adequately to RSI. Concept development RFPs put out by the Army still frequently do not oblige RSI understanding.

DSARC Os do not yet examine, thoroughly, programs for RSI, although this is now coming about. And lastly, operational tests and evaluations of new concepts do not yet test for acceptable interface with our allies.

We, the Army—on our Hellfire or TOW developments, for example—did not automatically, diligently inquire as to what our allies' requirements might be so that they might commit to use our designs. We do not have a program addressing form, fit, and function with our allies so as to make interoperability come about automatically.

We do not use the same electrical connectors or even have adaptors to mate different connectors, nor the same launching

*(Continued on page 29)*

*An Analysis of:*

# The Importance of RSI

*(Continued from page 3)*

lugs, nor the same firing voltages for our munitions. If we in the advanced development business were thoroughly committed to RSI, these things would happen automatically.

Although RSI is now thoroughly and thoughtfully implanted in our Army program offices, it is a learning process just barely started with our technologists. It is not made easier by being separated from our allies by distance, culture, and bureaucracy, and by lack of easy contact, sameness of language or travel funds.

If RSI is to happen early in design, it will take an active effort on the part of each technologist of the R&D community. It is that extra special effort that I hope to encourage.

This imputed lack of interest in RSI does not exist in the project offices of DARCOM and TRADOC. Presumably, this is because they are one step closer to the troops in the field who clearly know the reality of interdependence on their NATO allies.

An absolutely fabulous job is being done by most, if not all, of the program managers to ensure that our European allies are offered the technical and economic opportunity to use our developments. XMI, IFV, Roland, Stinger, GSRS, AAH, all are great examples of the RSI problem being effectively worked.

However, these programs themselves suffer because the interest of our allies was not dominant in the early stages of these developments.

In the presumption that many readers are or will be interested, let me take a moment to describe the principal mechanisms through which RSI opportunities in advanced technology can be developed.

The organization for armaments cooperation within the NATO alliance is substantial in size and breadth of scope. To describe in detail the totality of the NATO cooperative armaments structure would require more space than afforded by this article, and its reading more patience than expected of any reader. However, here are the main elements.

The *Conference of National Armaments Directors (CNAD)* is the senior civil body under the North Atlantic Council concerned with making best use of Alliance resources in development of defense equipment.

The CNAD has three single Service oriented groups under it. These are the NATO Naval Armaments Group, the NATO Army Armaments Group, and the NATO Air Force Armaments Group. There are also three multi-service groups—the Defense Research Group, and the Tri-Service Groups on Air Defense and Communications and Electronic Equipment.

These groups have in turn panels beneath them. They exist in such numbers that almost every conceivable area in which an Army technologist might work has an international Alliance forum.

These panels publish their findings, and these publications are easily available. The panels also support symposia and other forms of informative exchange. So there is an opportunity to interchange ideas with our allies if we try.

In addition to the foregoing main governmental groups, the *NATO Industrial Advisory Group (NIAG)* has been constituted under CNAD from representative industrial leaders of the Alliance both on business topics within the field of armaments cooperation.

The concept of CNAD is strongly backed by the U.S. and our allies. Meetings by the CNAD main groups and subsidiary bodies represent approximately 8,000 total man-days per year.

Because of the great dimensions of this interchange, it is primarily through these CNAD bodies that U.S. and Canadian information becomes available to a wide range of European countries. Knowledge of the military technology of our allies also becomes available to us.

However, there is another body within NATO, this time on the military side. It also facilitates technical information interchange among alliance nations. It is the *Advisory Group for Aerospace Research and Development (AGARD)*. Its principal mission is to provide scientific and technical advice to the Military Committee. It also promotes interchange of information in science and technology relating to military aerospace.

AGARD provides, through its panels, a means of integrating the aerospace technology of member nations for common utilization. It is a forum of uncommon competence representing the foremost experts of each member nation.

AGARD's proceedings are internationally accepted as state-of-the-art documents of high merit. These volumes are easily available to the Army technologist, our preliminary designer. Their reading cannot only be professionally enhancing, but can also acquaint one with the Allied technical peers who can join with their American counterparts to make a sensible application of RSI.

Under the aegis of the Military Committee is the *Military Agency for Standardization (MAS)*. There is yet one more body which for years has worked for common use of alliance technical response. MAS has promulgated Standardization Agreements (STANAGs) on procedures, doctrine, and equipment characteristics aimed at providing various levels of standardization, interoperability, or compatibility.

Most of the STANAGs are established through MAS bodies, but some of the work on equipment STANAGs is undertaken by bodies under the CNAD. These STANAGs can, in many cases, provide a point of departure for the development of future armaments to be produced by European nations.

Although they apply only to developed items, STANAGs and STANAG procedures must be understood by the technologist who has as his objective the putting of hardware into the field.

These preceding paragraphs have been a short introduction to the technologist of the mechanics of NATO RSI. There is much, much more to learn if one chooses to do so. This article cannot, nor can DARCOM or the DA Staff, make the technologist and preliminary designer think and act seriously with respect to RSI.

The desire to design for cooperative warfare, or what we today call by the "buzzword" RSI, can only come if there is a belief in its importance. This can come only if you have an ingrained interest in understanding whether you are working the "right" problem or not.

So what I ask by this article is for you to consider how you can best help the Army fulfill its difficult commitments to participation in the NATO Alliance. Given this consideration, I am confident that the proper balance can be worked out. Such a proper balance in RSI has already been successfully worked out in the program offices so there is no reason that it cannot be done for early technical work.

To conclude, my challenge to you is to think seriously about the RSI issue. If you think that

$$\dot{A}_{RSI}(t,l) = \frac{d}{dt} A_{RSI}(t,l) = \frac{k_s 10^{-N_{DSARC}}}{S_R/S_C}\, i_{RSI} \int_0^{+} \frac{e^{K_t \vec{p}(t)}}{V_{ai}}\, dt$$

when $l \neq l_{HASC}$, and

$$\dot{A}_{RSI} = A_{RSI} = 0$$

When $l = l_{HASC}$

is nonsense, find in your mind a more responsible position on RSI, and then go do something about it.

*DR. WALTER B. LABERGE has served as Under Secretary of the Army since July 1977, following a prior assignment as Assistant Secretary General for Defense Support at NATO. He has also been a member of the U.S. Air Force Scientific Advisory Board, and the Chief of Naval Operations Industry Advisory Committee. His academic credentials include a BS degree in naval science and BS and PhD degrees in physics, all from the University of Notre Dame.*