



DEPARTMENT OF THE ARMY
US ARMY CHEMICAL SCHOOL
FORT MCCLELLAN, ALABAMA 36205-5020

REPLY TO
ATTENTION OF

Directorate of Combat
Developments

18 MAR 1985

*Chemical
School
FIST
NOT needed
influxum*

Mr. Wesley C. Schneider
Wesleyan Company, Incorporated
1030 North State Street
Chicago, Illinois 60610

Dear Mr. Schneider:

My staff has performed an evaluation of your Fluid Intake Suction Tubing (FIST) system and our analysis has been staffed internally within the US Army Chemical School. Our plan is to next staff this document with other TRADOC schools.

I am forwarding a copy of our analysis. We welcome any comments you may wish to make before we reach a final decision.

If you have any questions, please contact CPT Ishmael or MSG Terrell Williams, (205) 238-3877.

Sincerely,

Robert W. Riordan
Colonel, CmlC
Director of Combat Developments

7 Enclosures

*Wesleyan -
FIST
Needed -
As req'd
Pass out
To Gen.
Howe
FT Lee
B. Lee*

WESLEYAN COMPANY, INC. OFFICIAL RESPONSE TO
THE U.S. ARMY'S CHEMICAL SCHOOL'S FIST/FLEX
HYDRATION SYSTEM'S STAFF EVALUATION OF 18 MARCH 1985

I. POINT OF AGREEMENT

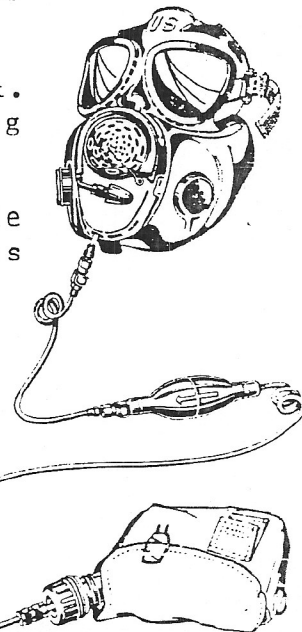
A. Ease of Use/Human Factors

We agree that the FIST/FLEX System is easier to use than the current issue (CI) drinking procedure.

II. POINT OF CONTENTION WITHIN THE CHEMICAL SCHOOL'S
EVALUATION - TAB B

Below find the Chemical Schools' stated Combat Support Nuclear, Biological and Chemical Mission Area Development Plan:

1. The Mission Area Analysis has not identified the rate of flow of water (drinking while masked) as a deficiency.
2. The deficiencies listed are:
 - a. All troops have not been issued a mask equipped with a drinking system.
 - b. There is no provision for eating in a contaminated area.
3. The listed solutions are:
 - a. Provide all troops with a mask equipped with a drinking system.
 - b. Continue development of the XM40 mask. Consider adding provisions for taking liquid rations.
 - c. Develop a MOPP drink that would provide minimum nutrients and electrolytes



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On page three under Essential Characteristics, letter J, Drinking; this requirements document states: The mask will provide the wearer with a drinking capability.

1. FIST SATISFIES THE REQUIREMENTS NEED FOR AN "IMPROVED OPERATIONAL CAPABILITY" FOR DRINKING.
2. FIST SATISFIES THE REQUIREMENTS CALL FOR "A MASK WITH APPROPRIATE COMPONENTS ... SUITABLE FOR WEAR UNDER A WIDE RANGE OF OPERATIONAL CONDITIONS."

FIST can be operated in enclosed spaces i.e., C³I areas, cockpits, tanks, etc, much more easily than the existing drinking procedure. FIST can be operated more safely in contaminated environments since the system is not breeched for every drink. FIST can be operated at night without vision requirements after its connected to the canteen. FIST will foster troop compliance to the proposed water intake doctrine especially during extreme heat conditions where 2.0qt/hr is required (code 4); FIST will reduce heat casualties from voluntary dehydration because FIST delivers water in small quantities at the soldier's command.

3. FIST SATISFIES THE REQUIREMENTS NEED FOR A DRINKING CAPABILITY OF "IMPROVED PERFORMANCE."

III. POINT OF CONTENTION WITHIN THE CHEMICAL SCHOOL'S EVALUATION - TAB D TIME SAVINGS TEST

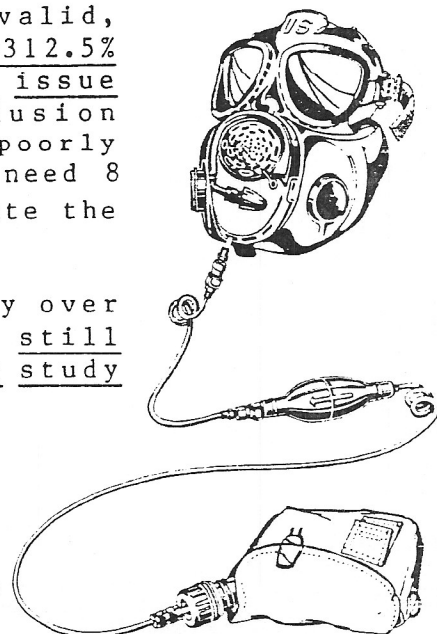
We conclude that the test findings are invalid, even though, the study found that FIST saves +312.5% more time per day compared to using the current issue (CI) drink system. This is a central conclusion omitted from your analysis. It is based upon poorly trained soldiers in +80 degrees Fahrenheit, that need 8 minutes to operate FIST vs 33 minutes to manipulate the CI.

Despite this impressive gain in efficiency over the CI the FIST's true quantitative value is still dramatically understated since the time saving study

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successfully operate it at night and once again this tests incomplete protocol and severely prejudices the true value of the FIST device.

The size of the test drink (i.e. 250 ml) is "estimated," based upon what the report calls "a satisfying drink when one is thirsty." This estimate is subjective. This drink size is too large, coming too late in the dehydration process. Yet, serves to distort the effectiveness of the FIST system since this determination increases the soldiers drink size, thereby reducing the total number of drinks within the test period and corresponding time needed to repeatedly connect and disconnect the current issue. The fact is, however, that thirst appears at 2 percent body fluid deficit and may not provide a good index of body water requirements. Pandolf, Usariem Effect of Hydration Levels 1984. Several investigators have reported that ad libitum water intake based on thirst results in incomplete fluid replacement or "voluntary dehydration." "During the 1967 Six Day War with Israel, the Egyptians suffered 20,000 deaths from heatstroke and/or dehydration. During this period, Israeli heat casualties were minimal because soldiers in the Israeli defense force drink often by command and in the absence of thirst. Strict procedures for preventing dehydration could in part explain observed differences in heat stroke symptomatology between the U.S. and Israel. For example, in Israel, heat stroke is often accompanied by profuse sweating, whereas in the U.S. it is uncommon. (Hubbard - Water/Salt Diet USARIEM 1982.) The FIST system provides smaller controlled drink quantities prior to the onset of thirst in less time reducing the risk of voluntary dehydration casualties.

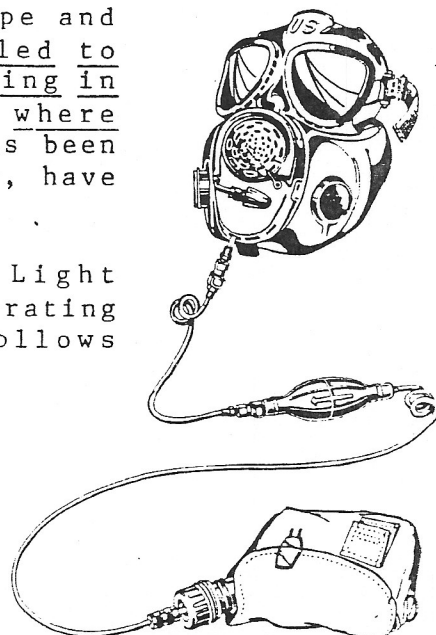
The test used water requirements for Europe and Korea only. The incomplete test protocol failed to include water requirements for soldiers operating in the tropic or the hot, arid areas of the world where U.S. Central Commands primary mission is. (It has been proven that Iraq and Iran, fighting in the desert, have unleashed chemical agents against each other).

Water requirements for a platoon in a Light Infantry Division dramatically increase when operating in tropic and desert areas as the chart that follows indicates (Source U.S. Army Water Office, 1985).

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By eliminating the soldiers water requirements in these climates, where the work load at MOPP will be heavy, the Chemical School's test results are incomplete. Had the study factored tropic and desert climates in its results more time would have been factored against the CI than the FIST. Moreover, in the desert, the CI's mating points would require cleaning each time it was used under blowing sand conditions. Again more time would be factored against the CI vs. the FIST device which remains continuously connected.

The time study performance graphs mathematically illustrate how inefficient and difficult it is for the soldier to obtain water from manipulating the CI. In graphs number #1 and #2, the CI's performance, indicated by the descending sloping line, shows how the soldier must work to obtain inconsistent fluid quantities by blowing into the canteen to offset the build up of internal negative pressure of the vacuum created inside the canteen. In contrast, the even straight line that runs consistently parallel to the graphs' horizontal axis indicates the FIST System performs reliability, in controlled measured drink quantities, without the need for the soldier to generate heat producing oral suction work. This is because the soldier using the FIST System operates in harmony with scientific principles of hydraulic and vacuum fluid mechanics, not against them, as the CI demands.

IV. POINT OF CONTENTION WITHIN THE CHEMICAL SCHOOL'S EVALUATION - TAB E

The Chemical Schools' evaluation concluded that, "Risk of Self Contamination is Minimal," when using the Current Issue (CI) mask drink apparatus. Wesleyan Company respectfully disagrees. With the four fundamental measures that form the basis for NBC Defense Doctrine, the first principle is contamination avoidance. However, by engineering design, the current drinking system invites contamination rather than avoids it.

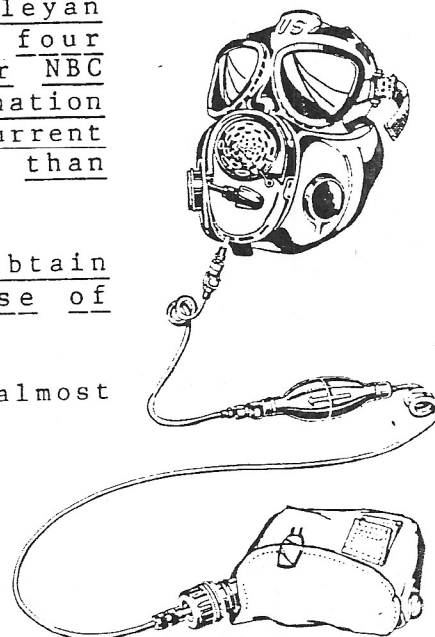
1. By design, the soldier must breach MOPP to obtain water. This contradicts the entire purpose of individual protection measures.

2. Operating the current issue drinking device almost

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However, in certain vehicles like the M1, MBT for example, there isn't enough head room to ingest fluids with the CI drink system. This insight comes from a mask technologist at CRDC and it is one reason why Wesleyan FIST technology is now being used in the M1 "Iron Man" tests at Aberdeen Proving Grounds. At Ft. Sill, FIST technology will be utilized in its P² NBC³ artillery test program slated for September, 1985.

Finally, in determining the requirements for a MBT for the 80's, the Army placed survivability and reliability and fire power on equal terms. To improve survivability, tank designers were forced to a reduced height, add new armour and improve the tanks agility.

But even though the tank is equipped with a faster power plant and night optical equipment, crew members in MOPP will be restricting the tanks survivability in both instances. If the crew does not drink water enough, they succumb to dehydration. If they drink, with the CI they can halt the action of the vehicle, making it more vulnerable to attack by opposing weapons. FIST, in contrast, permits concurrent water drinking without loss of efficiency.

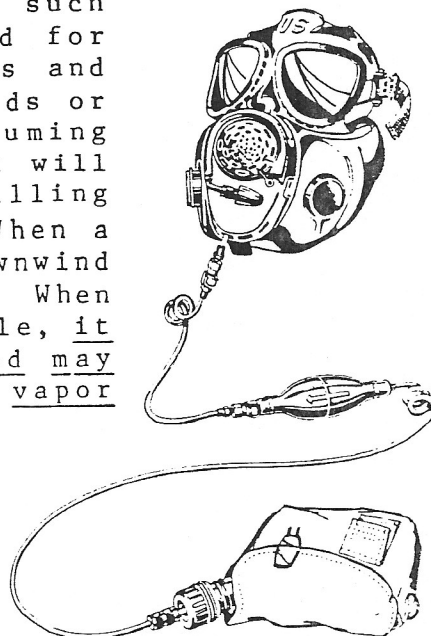
At MOPP, at night watch inside vehicles, water drinking is severely restricted. Unless the soldier is continuously hooked up to his water supply in a vehicle, he may not be capable of performing his assigned duties at protective posture. The FIST technology permits crews to drink safely and conveniently without loss of time or action or the requirement of vision.

CW threat applies to crew served vehicles. CW is more complicated than Nuclear or Biological protection since vehicle filters can generally exclude such particles. Whole body protection is required for personnel in vehicles against chemical agents and toxins which can be employed as solids, liquids or gases. For those crews, the effects of assuming defensive posture rather than the chemical agent will cause degradation in operational capability; killing the unprepared will be a secondary benefit. When a persistent agent like VR-55 or HD is used, the downwind vapor hazard can cause secondary contamination. When it contaminates the interior of a combat vehicle, it becomes entrapped in areas of low air flow and may persist for hours or even days, even though the vapor

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threat exterior to the vehicle is removed. Also, the liquid contamination on the exterior of the vehicle, with which is accumulated a vapor threat remains on a vehicle even though the vehicle may leave the contaminated area meaning the crew would remain masked until the vehicle could be decontaminated. No water can be consumed during this contamination period safely using the CI where a vapor hazard exists inside the vehicle. FIST permits drinking however since it is always connected to the water supply. Water drinking is mandatory while performing missions at protective posture, or the soldier will degrade the expensive performance values of the vehicle he operates.

TAB F - POINT 2:

The evaluation also concluded that, "it is believed that constant contact with the enemy will not last six consecutive hours and regardless of the mission or task being performed the soldier will have ample time to consume water."

This belief is best case only and inconsistent with anticipated battle condition.

The Chemical Schools' assumption is a contradiction to known Soviet Doctrine, force structure, and political motivations for waging war.

SOVIET DOCTRINE

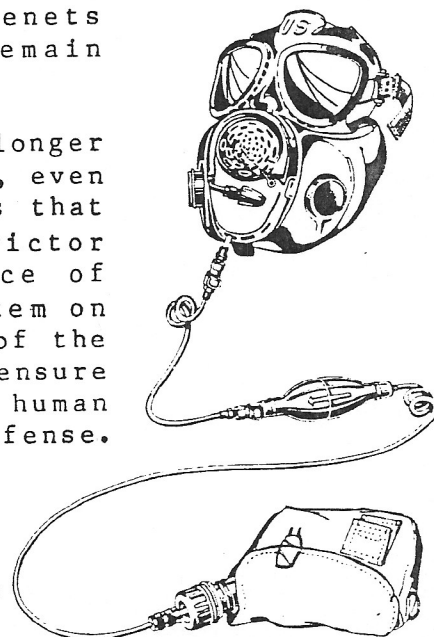
Doctrine, in the Soviet use of the term, is the identification by the political leadership of the character of future war, the strategic aims and the preparations to be undertaken. While doctrine necessarily evolves along with changing circumstances, especially the correlation of forces, certain tenets about the nature of the next war appear to remain constant.

War between capitalism and socialism may no longer be inevitable but it remains a strong possibility, even a probability. Marxist-Leninist ideology insists that defeat will be complete and irrevocable. The victor will not be interested in negotiating a peace of reconciliation, but will impose his social system on the vanquished. It is therefore the vital duty of the soviet government to do everything possible to ensure victory. The other myriad calls upon the state's human and material resources to take second place to defense.

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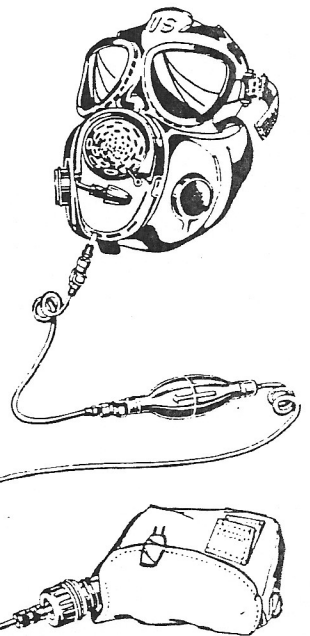


offensive action as the only decisive and therefore appropriate form of warfare. Eight main war principles follow:

1. Surprise. If nuclear weapons are used from the outset, surprise will enable the destruction of much of NATO's resources, especially nuclear, before NATO can take the field. If, as is currently more likely, a conventional offensive is launched, surprise will prevent NATO from preparing a well coordinated defense in depth to deny the Warsaw Pact as necessary, quick, and easy victory. NATO development will be pre-empted and disrupted. Instead of head-on assaults against prepared positions, there will be encounter battles (operational) and meeting engagements (tactical), improvised close quarter battles where the advantages to the defense of modern technology will be negated and superior numbers will tell.

2. Mobility and high rates of combat operations. Speed and flexibility (the Russian word mobilnost implies both characteristics) are crucial to success. A rapid advance will prevent NATO from recovering its balance after being surprised and after its defenses have been pierced. With Soviet armoured formations thrusting deep into the rear, the enemy will be stunned, his will paralyzed and his morale destroyed. Organized resistance becomes impossible. Instead, NATO will be forced into hasty, probably belated, improvisation -- at the very moment when it desperately needs time to respond. Indeed, the psychological effect could well be great enough to bring about not only a major surrender of troops but also a political collapse of the NATO alliance.

3. Concentration of main effort and the creation of superiority of forces. The Soviet implementation of this principle is interesting. There must be no massing of men and material on a breakthrough sector to "gnaw through" a prepared, alerted defense. If surprise is achieved, there will be no need to a breakthrough battle at all. The attack can be delivered on a number of axes across a broad front aiming at a vast encounter battle as was achieved in the Battle of Kursk 1943. This will greatly complicate NATO's use of scarce reserves by adding to surprise and concealing the attacker's main axis. Moreover, the early insertion of operational manoeuvre groups (OMGs) into the enemy rear will seek to crumble his defense from within to prevent



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The Wesleyan FIST/FLEX System is engineered to accomplish contamination avoidance. The drink pin is repositioned from its existing pocket down to where it hides beneath the hood. Therefore, it is not exposed to contaminants. One hookup is all that is required, per canteen. Compare this to the current drink system that is exposed for every drink. The Wesleyan Field Suspender Mount engineers contamination avoidance at the canteen neck so the mating points of the pin and M1 cap are always covered by fabric, avoiding contamination and reducing wear of the M1 caps plastic flip cap that tends to break at the hinge.

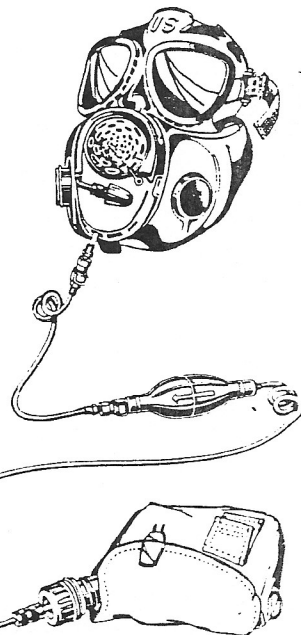
V. POINT OF CONTENTION WITHIN THE CHEMICAL SCHOOL'S EVALUATION - TAB F

POINT 1:

The Chemical Schools' evaluation concludes that, "based on a 6 hour period in combat it is not considered critical that the soldier be able to drink concurrently while conducting combat tasks."

A six hour combat period is a best case situation only and not likely. The six hour time is based upon the previously accepted standard of time that the current U.S. NBC overgarment (OG) could be safely worn in a contaminated environment without likely agent permeation. Today, however, the life of the OG is 14 days and can last as long as 24 hours in a contaminated environment without change, as is the case with the British MK4, O.G.

Moreover, this time assessment also presupposes that soldiers will be fully rotated in and out of battle in predetermined 6 hour periods for rest in collective shelters. However, there are three problems with making this assumption. First, there are not presently enough shelters for a full rotation. Secondly, no one can predetermine that battlefield conditions will permit rotation to be possible. Thirdly, collective protection shelters possess great tactical and logistical problems. The fluid battlefield movements anticipated by the Airland Battle Doctrine and Soviet Echelonment/OMG philosophy will make it difficult at best for collective protection to be utilized. According to former Director of NCC General G.G. Watson "the tactical situation may preclude their use for hours or even days if at all." (Source: 1983 DOD Appropriation Hearings).



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imaging; added radiant temperatures, multisorties, and high anxiety missions; pilots must operate at optimal performance. A pilot lost to voluntary dehydration magnifies into a problem to the ground operation he was intended to support.

In another Air Force study conducted by the Air Force Aerospace Medical Research Lab in January 1980, the Tactical Air Warfare Simulation Study concluded:

"The thermal burden imposed by wearing the chemical defense gear results in elevated core temperatures and heart rates that border on tolerance limits when subjects are exposed to these experimental conditions."

"...weight loss while wearing clothes effectively demonstrates the possibility of dehydration after multisorties."

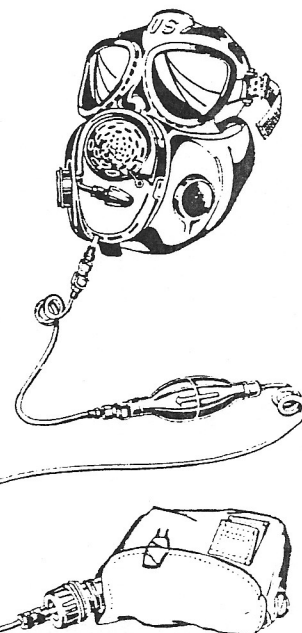
"The thermal conditions in this study were not unduly severe and the physiological response would worsen when combined with exercise and high anxiety states associated with operational situations."

"No radiant heat source was even involved to simulate the sun."

"Heat susceptible pilots at the Tactical Air Warfare Center (TAWC) test experienced errors in judgment and performance."

Example B: The evaluation concluded that, "vehicle drivers will not be in convoy for 6 continuous hours without a break. Break periods can be used to drink water."

Cpt. Ishmeal's response applies more satisfactorily to the scrapped Doctrine of Attrition, but not to realities of FM100-5, i.e. Maneuver. As previously mentioned the Airland Battle Doctrine envisages continuous operations and close logistical support to seize initiative on the battlefield. No "front" is established. M113 troop drivers will under various degrees of work loads depending upon their degree of proximity to the operation. Timely breaks can not be guaranteed before voluntary or involuntary dehydration incapacitates them. Moreover, at the outset of the



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operations, the primary missions of close combat forces are the rapid exploitation of nuclear or chemical strikes, the completion of the destruction of surviving enemy forces and the seizure of specific objectives. Under these conditions, the decisiveness and scope of the offensive are multiplied, the times for the attainment of goals are reduced, and the significance of surprise is increased. If attacking forces are required to traverse contaminated terrain, they do so in protected air and mobile land carriers, thus denying the enemy any economy-of-force benefit from such obstacles.

"Contaminated areas and water barriers are not viewed as serious obstacles to the conduct of combat operations. Combat vehicles with the means to cross water obstacles are capable of operating at full efficiency in chemical, biological and radiological environments. This is accomplished by installed radiation shields, chemical and biological protective and decontamination systems, or by a prophylaxis which protects the soldier against chemical and biological effects. Such systems permit the crossing of barriers in stride without reducing the momentum of attack. Organic close combat aviation assets and Air Force systems are fully integrated into the scheme of manoeuvre. These assets provide fires or insert dismounted forces to seize objectives on the far side of the obstacle."

For the Airland Battle to succeed, the first echelon battle will determine whether the "window of opportunity" is opened for a NATO combined arms offensive action including fixed wing assets, M1, Bradley, Blackhawk and apache helicopters. If the window is not opened much of the NATO offensive potential will be lost on purely defensive actions -- attempting to react to a numerically superior enemy who enjoys the freedom of action necessary for a successful conventional combined arms offensive.

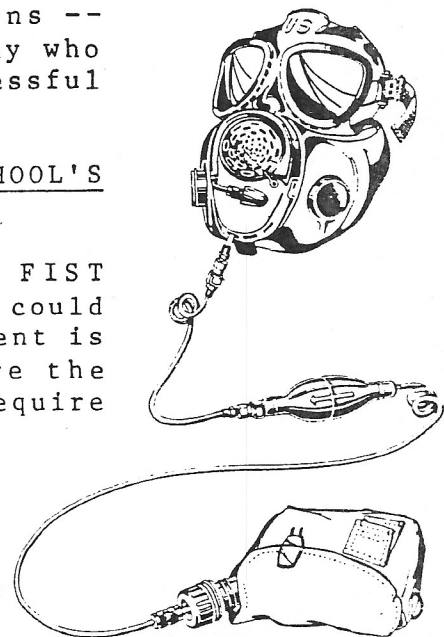
VIII. POINT OF CONTENTION WITHIN THE CHEMICAL SCHOOL'S EVALUATION - TAB G

- A. The evaluation concluded that the FIST System's "drawback is the tubing which could catch on underbrush unless the overgarment is modified to provide a channel to secure the tubing. Hence, the FIST system will require

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to the existing conditions. To bite off more than can be chewed is to invite disaster. At best, it leads to a dangerous loss of tempo while attempting risky improvisation to restore the situation. Almost as bad is to allot too large a premium on accurate and timely intelligence gathering -- before as well as during hostilities -- to ensure sound appreciations.

7. Coordination. In nuclear but even more in conventional conflict, the Soviets recognize that all-arms cooperation is essential to success. All branches have their vulnerabilities. Working as a team, their strengths are maximized and their weaknesses minimized. This simple military truth is often forgotten. The most recent example of this recurring error was in the October War in the Middle East in 1973. It is probable that this reminder of the fate of unsupported tank units had as much influence on the recent Soviet restructuring as did the shift in doctrine already mentioned.

8. Simultaneous action against the enemy to the entire depth of his employment. One of the problems in the Great Patriotic War was that the enemy, though surprised and defeated, could always, at the expense of ground, re-group, bring up reserves and establish a new line. It is obviously desirable to resolve operational and tactical tasks simultaneously, thus pre-empting any recovery. This is most easily accomplished by nuclear strikes. However, the Soviets have various "conventional" means of extending destruction, disruption and psychological paralysis into the enemy's rear. These vary from three to five-man diversionary sabotage or assassination patrols, through air attack and electronic warfare, to airborne assaults in as much as divisional strength coordinated with the thrusts and raids of OMGs in divisional/army strength.

THE ALLIED RESPONSE

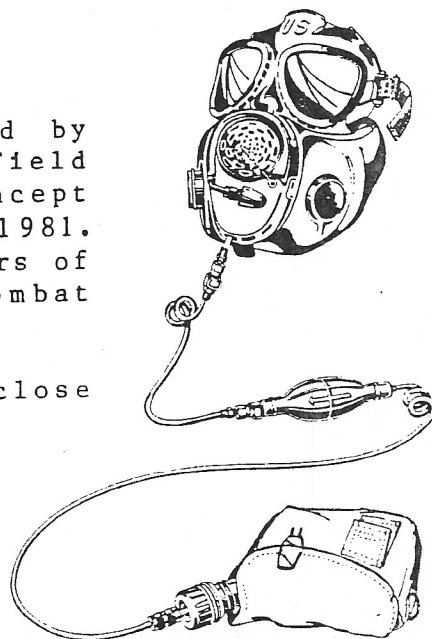
The Airland Battle concept as promulgated by TRADOC and the U.S. Army's latest version of Field Manual 100-5 Operations, is an operational concept first espoused in a document dated 4 September 1981. It advocates the aggressive use by corps commanders of deep strike combined arms formations in close combat situations.

According to the Airland Battle doctrine, close

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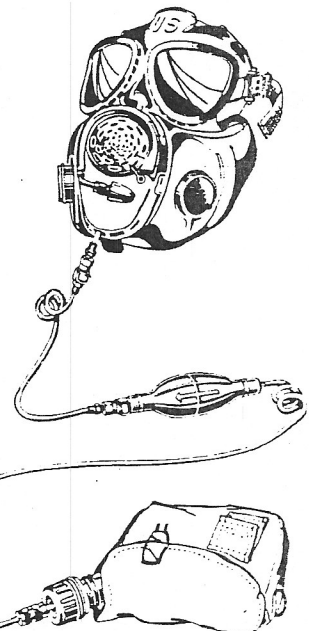
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folded and unattached to the mask and/or canteen when not in use.

DESIGN CONSIDERATIONS

1. Suspenders' canteen neck/cap cover is designed to completely encapsulate mating points of the water pin and M1 cap to insure contamination avoidance while the soldier is connected to the FIST #A1 system.
2. FIST #A1 bulb is repositioned to remove the bulbs' weight from the FIST's original mask position; below the mask snout. Neck movements remain unencumbered and helmet straps can be fitted thru a modified hood more easily if necessary. The modified hood will prevent the mask/pin mount push button connector from being exposed or tangled.
3. No time consuming entry/exit procedural changes are needed for personnel to remove themselves from the FIST/FLEX #A1 System since the assemblage rests on the suspenders. A simple push of a button is all that is needed for the soldier to disconnect himself from the mask/suspender mount connection point.
4. FIST #A1 Pump mechanism can be removed for sanitation at DECON Sites and Collective Protection Points. Dust covers can be fitted to mask/pin connector points for cleanliness at rest position.
5. The FIST #A1 Suspender Mount features a fluid tube inside the mount at the bulb's base connection point. This design feature is required for three reasons; 1) the curl creates a spring tension when it is extended and connected to the canteen neck; 2) the prefabricated curl prevents line kinks that might otherwise disrupt fluid flow while in use; and finally 3) the curl acts as a bounce back mechanism for the mounts' canteen neck/cap cover. This fluid line will be one piece construction in production eliminating the straight tube connection joints. When the soldier no longer needs to be connected to



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failing to completely decontaminate mating points of the existing drinking system. Psychological fear of breaching protective posture to drink water will incapacitate countless numbers of other fighters and support personnel. The result will mean a dangerous reduction in force strength. In total, the incapacitation of these men will severely weaken the Army's ability to:

1. Seize Initiative
2. Attack in Depth
3. Move with Agility
4. Effectively Utilize Time
5. Synchronize Effort

Eliminate this possibility, develop FIST now for immediate procurement.

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