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August 1998

# CHEMICAL AND BIOLOGICAL DEFENSE

## DOD's Evaluation of Improved Garment Materials



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**United States  
General Accounting Office  
Washington, D.C. 20548**

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**National Security and  
International Affairs Division**

B-279587

August 18, 1998

The Honorable Rick Santorum  
United States Senate

Dear Senator Santorum:

As you requested, we examined the Department of Defense's (DOD) research and development programs for improved chemical defense garment materials for U.S. armed forces to determine whether the programs were conducted fairly. A company that participated in the Marine Corps and Joint Service Lightweight Integrated Suit Technology (MCLIST and JSLIST) programs raised concerns about the evaluation, claiming that it did not have an opportunity to submit an improved material for evaluation and that requirements changed in the transition from MCLIST to JSLIST. To assess the fairness of DOD's evaluation process, we determined whether, in the research and development context, DOD (1) provided sufficient notice to industry of the government's interest in identifying improved chemical defense materials, (2) provided industry sufficient opportunity to participate in the programs, and (3) changed requirements in the transition of MCLIST to JSLIST. In addition, we are reporting on DOD's response to a recent congressional reporting requirement concerning sources of supply for the military's chemical defense materials.

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## Background

In the late 1980s, the Marine Corps began efforts to improve its chemical and biological protective suits because the ones used by U.S. armed forces at the time were bulky and heavy and could not be reused after laundering. Starting in 1989, the Marine Corps' exploratory development efforts and subsequent MCLIST Advanced Technology Transition Demonstration program identified, evaluated, and field tested a number of chemical defense materials. During the same time period, the Army began an exploratory development effort to evaluate materials that offered less weight and bulk and enhanced protection, and the Air Force and the Navy began pursuing improved materials for their chemical protective uniforms.

Separate from the MCLIST program, the Marine Corps fielded the Saratoga chemical and biological protective overgarment in 1991. The Saratoga garment, made from materials manufactured by Blucher, a German company, had an inner liner made with activated carbon spheres rather

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than the carbon-impregnated foam used by the military services at the time.

All of the military services eventually combined their chemical defense material improvement efforts. Marine Corps, Army, Air Force, and Navy officials signed a memorandum of agreement, effective in November 1993, that defined the new JSLIST program and set forth the services' respective responsibilities for the development, production, and deployment of the next-generation chemical and biological protective suits. The Marine Corps Nuclear, Biological, and Chemical Defense Office was designated as the lead agency for the JSLIST program.

The MCLIST and Army programs, which ultimately became JSLIST, were research and development activities. Research and development activities are generally conducted in a more flexible environment than acquisition programs and often involve informal communications with prospective participants. DOD used market research to seek out existing foreign and domestic technologies for testing. The minimum requirements that applied to DOD's efforts to identify improved chemical defense materials were published in a series of annual Broad Agency Announcements. These announcements described various areas of scientific or technical interest, provided specific points of contact, and included a statement that proposals would be evaluated based on merit and responsiveness to a government requirement.

According to Marine Corps officials, the JSLIST program evaluated 57 material combinations (including liners, outershells, and combinations of both). The program evaluation was conducted in two phases. At the completion of phase I, 5 of the 57 material combinations were qualified to enter phase II for developmental and operational testing. At the completion of phase II in April 1997, only one of the five material combinations tested was determined to be acceptable for use in protective suits—Blucher's Saratoga liner with a nylon and cotton outershell. (See app. I for further information on the JSLIST test program phases.) DOD is contracting for the suits through the National Industries for the Severely Handicapped and a company under section 8(a) of the Small Business Act. The contracts require that the suits be made from the Blucher material combination. Appendix II contains additional information on the JSLIST contracts.

The JSLIST acquisition strategy includes a pre-planned product improvement program. DOD announced this new competition in the

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Commerce Business Daily in June 1997. DOD is seeking additional materials to address JSLIST objectives that were not met in the initial evaluation, such as a chemical protective garment that lasts for 60 days and improved chemical protective gloves and socks. Production is scheduled to begin in fiscal year 2000. Appendix III shows a timeline of key events in the MCLIST and JSLIST programs.

Congress has raised concerns about the fact that the JSLIST material is produced by a sole-source company. The National Defense Authorization Act for Fiscal Year 1998 conference report noted that DOD should consider taking actions necessary to qualify additional sources of supply for chemical protective garment materials. Congress directed the Secretary of Defense to address this issue in DOD's next Nuclear, Biological, and Chemical Defense Annual Report to Congress.

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## Results in Brief

Because the MCLIST program and the Army's exploratory development efforts—which ultimately became the JSLIST program—were research and development activities, they were not subject to the same procedural requirements that apply to acquisition programs. In this research and development context, DOD provided sufficient notice to industry of its interest in improved chemical defense materials through market research, direct industry contacts, ongoing exploratory development projects, and Broad Agency Announcement notices published in the Commerce Business Daily.

DOD provided industry an adequate opportunity to participate in the research and development programs. On the basis of the notice DOD provided to industry, a total of 57 material combinations, submitted by 13 companies (including the complainant company), were evaluated in JSLIST after initial testing in MCLIST and the Army demonstration. However, reliance on informal communications—common in a research and development environment—resulted in companies receiving different information about submission deadlines to the MCLIST and the Army programs. Due in part to the lack of formal communications regarding deadlines of material submissions, the complainant company did not get an improved material into JSLIST for evaluation.

The complainant company, which already had one material in the MCLIST demonstration, submitted an unsolicited proposal to the Marine Corps for an improved chemical defense material after entry into MCLIST was closed. The Marine Corps rejected the proposal in accordance with the

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Federal Acquisition Regulation, which governs unsolicited proposals, because the material duplicated an existing Marine Corps effort. However, the Marine Corps missed an opportunity to refer the company to the Army's demonstration program, which might ultimately have allowed the improved material to enter the JSLIST program. We could not determine whether the outcome of JSLIST would have differed if this material had been assessed.

The basic requirements for a lightweight, launderable, chemical protective garment did not change in the transition from MCLIST to JSLIST. However, the individual military services added certain mission-specific requirements under JSLIST.

DOD overlooked the congressional reporting requirement in the National Defense Authorization Act for Fiscal Year 1998 conference report. A May 1998 addendum to DOD's February 1998 Nuclear, Biological, and Chemical Defense Annual Report to Congress stated that the pre-planned product improvement program might identify additional sources of supply to meet those requirements that were not achieved in the JSLIST program.

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## DOD Provided Adequate Notice to Industry

Because the MCLIST and Army demonstrations were research and development activities, they were not subject to the formal notification requirements that apply to acquisitions. However, DOD provided adequate notice of its interest in identifying improved chemical protective materials through three different mechanisms. First, DOD conducted informal market research efforts and contacted industry directly to identify materials to include in the research and development programs. These efforts involved foreign as well as domestic suppliers. Officials from the Army's Natick Research, Development, and Engineering Center, which managed MCLIST for the Marine Corps, told us that they traveled worldwide to locate promising technologies.

Second, ongoing exploratory development projects at Natick identified technologies that were subsequently included in the demonstration programs. Marine Corps officials told us that they directed certain new and promising materials from these projects into the MCLIST demonstration program.

Last, notice of three Broad Agency Announcements, published in the Commerce Business Daily, alerted industry of the government's interest in

developing new technologies for chemical defense materials.<sup>1</sup> The dates of the announcements are shown in table 1. Although these announcements did not specifically cite the MCLIST program or the Army's exploratory development effort, points of contact were named so that industry representatives could obtain further information concerning DOD's research and development efforts.

**Table 1: Broad Agency Announcement Solicitation Numbers and Dates**

Solicitation number	Opening date	Closing date
DAAK60-90-T-0001	September 1989	September 30, 1990
DAAK60-91-T-0001	February 1, 1991	September 30, 1991
DAAK60-92-T-0001	October 1, 1991	September 30, 1992

## DOD Provided Adequate Opportunity to Participate in the Research and Development Process but Did Not Evaluate a Company's Material

Participation in the JSLIST program was limited only to those materials submitted under the MCLIST or Army's demonstrations; new companies or materials were excluded from entering JSLIST. DOD tested 57 material combinations, submitted by 13 companies, in the JSLIST program. However, reliance on informal communications—common in a research and development environment—resulted in some companies getting different information about deadlines for material submissions.

Outside of the research and development programs, a company submitted an unsolicited proposal to the Marine Corps for an improved chemical defense material. The Marine Corps' subsequent rejection of the proposal was consistent with the Federal Acquisition Regulation. However, the Marine Corps could have referred the company to the Army's exploratory development program so that the material could have been considered for inclusion in JSLIST.

## Industry Learned of Opportunities Through Informal Communication With DOD

Industry learned of the opportunity to participate in the MCLIST and Army research and development programs through informal discussions with DOD officials or by calling the points of contact listed in the Broad Agency Announcements. Participation in these programs resulted in 57 material combinations, submitted by 13 companies, being tested in JSLIST. However, because the MCLIST and Army programs operated separately, each had different timeframes and cutoff dates for submitting materials. For

<sup>1</sup>Broad Agency Announcements may be used by agencies to fulfill their requirements for scientific study and experimentation directed toward advancing the state of the art or increasing knowledge or understanding rather than focusing on a specific system or hardware solution. These announcements are to be used only when meaningful proposals with varying technical and scientific approaches can reasonably be expected.

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example, materials for the MCLIST program had to be submitted to Natick in time to make garments before field testing, which took place from April to June 1992. According to Marine Corps officials, industry was required to submit garments by September 30, 1992, for participation in the Army's demonstration, which was held in March 1993. If industry was submitting materials rather than fully constructed garments, the deadline was June 1992. The Army's program was industry's final opportunity to have materials entered in JSLIST.

MCLIST participants were advised informally of the final date to submit materials to the Marine Corps program, but not all companies learned of the opportunity to submit materials to the Army program. For example, officials from the complainant company said that they were not told of the Army program's deadline for submission of materials until September 30, 1992, the last day submissions were allowed. Therefore, the company did not submit an improved material to Natick that could have been included in the Army's demonstration and JSLIST program. Officials from this company did not call the points of contact listed in the Broad Agency Announcement. Rather, they contacted a Natick official who had been involved with MCLIST but was not directly involved with JSLIST.

In contrast, a company that fared poorly in MCLIST was advised by a Natick official who was also not named in the Broad Agency Announcements of its opportunity to submit an improved material for evaluation in the upcoming Army program. Because contacts between DOD officials and industry were informal and largely undocumented, we could not determine whether all companies that contacted the Natick officials named in the Broad Agency Announcements were told of the opportunity to participate in the Army's demonstration program.

According to Marine Corps officials, the closing date of each Broad Agency Announcement represented the cutoff dates for material submissions to the demonstration programs. For example, the officials said that the closing date of the final announcement—September 30, 1992—was the deadline for entering materials in the Army's demonstration program. However, Natick officials told us that the Broad Agency Announcements were not connected to cutoff dates for material submissions to the demonstration programs. For example, the officials noted that the cutoff date for the MCLIST demonstration was simply tied to their need to receive materials and make garments in time for field testing.

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The three Broad Agency Announcements did not cite particular programs—such as MCLIST or JSLIST—or cutoff dates for material submissions and thus were not explicitly tied to the deadline for material submissions. Nothing in the third announcement sets it apart from the two previous announcements to indicate that September 30, 1992, was industry’s last opportunity to submit a material to JSLIST via the Army’s demonstration program. Furthermore, a fiscal year 1993 Broad Agency Announcement, issued a year after entry to JSLIST was closed, is nearly identical to the three previous announcements.

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## Marine Corps Rejected Unsolicited Proposal

In June 1992, 3 months before the closing date of the fiscal year 1992 Broad Agency Announcement, the complainant company submitted an unsolicited proposal to the Marine Corps for an improved chemical defense material. The company had developed this improved material after its initial submission to the MCLIST program. The proposal—submitted outside of the Advanced Technology Transition Demonstration process—was for a competitive alternative to the Saratoga suits that the Marine Corps had begun to field in 1991. The company offered to absorb a substantial share of the testing costs if its product did not meet the Marine Corps’ requirements.

In April 1993, more than 6 months after the deadline for submissions to the Army’s demonstration program, the Marine Corps rejected the unsolicited proposal, stating that it was duplicative in nature to an existing Marine Corps effort. The rejection letter noted that the Marine Corps had already initiated a research and development effort based on the carbon sphere technology identified in the proposal.

The Federal Acquisition Regulation provided that an unsolicited proposal be rejected when it resembled an ongoing acquisition or did not demonstrate an innovative and unique concept. The Marine Corps’ actions in rejecting the proposal were therefore consistent with the Federal Acquisition Regulation. However, we believe the Marine Corps missed an opportunity to refer the firm to the Army’s demonstration program, which ultimately became part of JSLIST, before it was too late for entry. Because a joint program was already planned at that time, the Marine Corps could have informed the company that the Broad Agency Announcement was still open, thus allowing the firm’s potential entry into the Army’s demonstration program. We could not determine whether the outcome of the JSLIST program would have differed if the firm’s material had been assessed.

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## Basic Requirements Did Not Significantly Change

The complainant company asserted that the transition to JSLIST had caused a significant change in requirements. The company was primarily concerned that the requirement for a single-use garment in MCLIST had changed to one that was launderable in JSLIST. Officials from the company stated that the changed requirements placed it at a disadvantage relative to the competition because it was not allowed to submit a different material under JSLIST. However, the basic requirements for a lightweight, launderable, chemical protective overgarment did not change during the transition.

The requirements for MCLIST and JSLIST were based on assessments of the services' missions and the threat. DOD's basic requirement for both programs was to develop a lightweight, launderable, durable material that protected against chemical agent penetration and reduced heat stress. These fundamental requirements were reflected in the three Broad Agency Announcements issued from fiscal years 1990 to 1992. The latter two announcements added a requirement for protection from toxic aerosols. MCLIST and JSLIST both sought improved materials that could be laundered multiple times and reused, unlike the single-use garment that the Army, Air Force, and Navy were using at the time, which could not be laundered.

Although the fundamental requirements did not change, each service added various service-unique requirements to the JSLIST program. For example, the Army required, in addition to the standard 30-day garment, a single-use, 7-day garment that would weigh less than the 30-day garment and provide the same level of chemical protection. In addition, the Air Force required chemical protection for liquid dispersed by air burst munitions or spray tanks. Although materials were tested that would accommodate these variations, the basic requirements for the overgarment did not change.<sup>2</sup>

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## Ongoing Program May Identify Additional Sources of Supply

The National Defense Authorization Act for Fiscal Year 1998 conference report urged DOD to consider taking actions necessary to qualify additional sources of supply for its chemical protective garment materials. The conferees directed the Secretary of the Army, as executive agent for the chemical-biological defense program, to report to the congressional defense committees on any plans to qualify such sources. The conferees also directed the Secretary of Defense to address the issue as a special area of interest in DOD's next annual report to Congress on the Nuclear,

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<sup>2</sup>The Army requirement was dropped during the JSLIST evaluation because testing revealed that the requirement could not be met.

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Biological, and Chemical Defense program. However, the subsequent annual report to Congress, issued in February 1998, did not address the issue of qualifying additional sources of supply. A DOD official told us that the reporting requirement had been overlooked.

In May 1998, DOD issued an addendum to its February 1998 report to address the congressional reporting requirement. The addendum cited DOD's ongoing pre-planned product improvement program as a potential mechanism for identifying additional sources of supply for the requirements that were not achieved in the JSLIST program. The report emphasizes, however, that DOD's primary goal remains to provide the U.S. armed forces with the best chemical protective ensemble available.

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## Conclusions

Because the MCLIST program and the Army's exploratory development efforts—which ultimately became the JSLIST program—were research and development activities, they were not subject to the same procedural requirements that apply to acquisition programs. In this context, we believe that the MCLIST and JSLIST programs were conducted fairly. DOD provided industry adequate notice of the government's interest in improved chemical defense garment materials and sufficient opportunity to participate in the programs. The basic requirement for a lightweight, less bulky overgarment that could be reused after laundering did not change in the transition from MCLIST to JSLIST, although each service added certain unique requirements. Although the informal nature of communications that characterizes the research and development environment may have contributed to a missed opportunity for DOD to evaluate the complainant's improved chemical defense garment material, the Marine Corps' rejection of the unsolicited proposal was consistent with the Federal Acquisition Regulation governing such proposals.

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## Agency Comments

DOD reviewed a draft of this report and fully concurred with the information as presented.

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## Scope and Methodology

To determine whether DOD provided sufficient notice to industry of its interest in new chemical defense materials and industry had sufficient opportunity to participate in the MCLIST demonstration, the Army's exploratory development effort, and the JSLIST program, we obtained and analyzed Broad Agency Announcements and information about DOD's formal and informal communications with industry regarding the

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programs. We gathered and analyzed information pertaining to the intent, timeframes, and participants in the MCLIST and Army's demonstration programs, which afforded industry entry to JSLIST. We discussed these programs with officials from the Office of the Secretary of Defense, Director of Defense Procurement; the Marine Corps Systems Command; the Army's Natick Research, Development, and Engineering Center; and selected contractor locations. We also reviewed the unsolicited proposal a company sent to the Marine Corps in June 1992 and the Marine Corps' response to the company. We determined whether the Marine Corps' rejection of the proposal was done in accordance with the Federal Acquisition Regulation.

To determine whether basic requirements that materially affected the competition changed in the transition from MCLIST to JSLIST, we obtained and analyzed requirements documents, such as the Marine Corps' 1986 Required Operational Capability statement and the 1995 Joint Operational Requirements Document for JSLIST, as well as test plans for JSLIST. We discussed MCLIST and JSLIST requirements with officials from the Marine Corps Systems Command and industry officials. We also analyzed the requirements as stated in the Broad Agency Announcements.

To report on DOD's response to the congressional reporting requirement in the Fiscal Year 1998 National Defense Authorization Act conference report, we interviewed officials at the Office of the Assistant to the Secretary of Defense for Nuclear, Chemical, and Biological Defense Programs and the Marine Corps Systems Command. We also reviewed DOD's February 1998 Nuclear, Chemical, and Biological Defense Annual Report to Congress and the May 1998 addendum to that report.

We did not attempt to assess the accuracy of the JSLIST test results or determine whether the outcome of the JSLIST program would have differed if additional chemical defense materials had been evaluated.

We conducted our review from February to June 1998 in accordance with generally accepted government auditing standards.

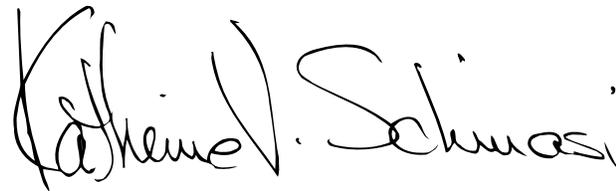
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We are sending copies of this report to appropriate congressional committees, the Secretary of Defense, and the Commandant of the Marine Corps. We will also provide copies to other interested parties on request.

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Please contact me at (202) 512-4841 if you or your staff have any questions concerning this report. Major contributors to this report are listed in appendix IV.

Sincerely yours,

A handwritten signature in black ink that reads "Katherine V. Schinasi". The signature is written in a cursive style with a large initial "K" and a distinct "V" before the last name.

Katherine V. Schinasi  
Associate Director  
Defense Acquisitions Issues

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Table 1: Broad Agency Announcement Solicitation Numbers and Dates

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## Abbreviations

DOD	Department of Defense
MCLIST	Marine Corps Lightweight Integrated Suit Technology
JSLIST	Joint Service Lightweight Integrated Suit Technology

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# JSLIST Test Phases

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Because the Joint Service Lightweight Integrated Suit Technology (JSLIST) program was a joint effort, standardized test methods and procedures had to be developed that would be acceptable to all the services and recognize service-unique requirements. Testing occurred during two phases. Phase I began in October 1993; phase II began in August 1995 and resulted in the selection of the only material combination that was determined to be acceptable for use in the Department of Defense's chemical defense garments.

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## Phase I

During phase I, 600 suits made from 57 candidate material combinations (outershells, liners, or both) were tested. Phase I testing involved chemical agent penetration, aerosol penetration, heat stress, laundry tests, wear tests, suit design evaluation, physical properties and flame resistance tests, and user size and fit tests. Wear tests were conducted over 14 days at Camp Pendleton, California, and Camp Lejeune, North Carolina. Suit design evaluations took place at Camp Pendleton, California; Camp Lejeune, North Carolina; Brooks Air Force Base, Texas; U.S. Army Natick Research, Development, and Engineering Center, Massachusetts; Fort Rucker, Alabama; Norfolk Naval Station, Virginia; and Fort Bragg, North Carolina. To pass the tests, candidate materials had to equal or exceed the performance of the Battledress Overgarment, which was the suit used by the Army at that time, or the Saratoga, which was replacing the Battledress Overgarment in the Marine Corps. Those materials that did not pass chemical agent penetration and laundry tests were disqualified. Test garments and individual swatch samples were coded to ensure unbiased testing.

Phase I culminated in a decision by the Marine Corps Systems Command to proceed to the engineering and manufacturing development phase, or phase II. Of the 57 material candidates, 5 were selected for phase II testing.

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## Phase II

During phase II, more than 3,000 suits (330 suits per candidate material plus the Battledress Overgarment and Saratoga control garments) were tested at 10 worldwide field locations using mission-oriented scenarios and individual user tasks. The purpose of these tests was to collect operational and technical data to assess the performance of each material configuration during mission-oriented activities and provide worn suits for follow-on laboratory tests. The coding procedure used in phase I was also used in phase II to continue unbiased testing. Arctic, tropic, and desert environmental conditions were represented during the tests. The wear

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**Appendix I**  
**JSLIST Test Phases**

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periods were 7, 15, 30, and 45 days, and suits were laundered up to 6 times. Laboratory tests included chemical agent, flame resistance, aerosol penetration, and heat stress. As with phase I, the Army's Battledress Overgarment and the Marine Corps' Saratoga garment were the established baselines. Only one material combination was found to meet all program requirements—the nylon/cotton outershell over the Blucher Saratoga liner.

# Contractual Mechanism for JSLIST Chemical Defense Garments

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Because Blucher's Saratoga liner with a nylon/cotton outer shell was the only material combination to pass the JSLIST phase II tests, the JSLIST production material is sole source. The Department of Defense is contracting for the JSLIST suits through the National Industries for the Severely Handicapped and another contractor under section 8(a) of the Small Business Act. Tex-Shield, Inc., Blucher's American distributor, is a directed sole source for the material from which the suits are to be fabricated. The contracts are not awarded competitively.

Suit fabrication services are on the procurement list developed under the provisions of the Javits-Wagner-O'Day Act. Under the act, once a commodity or service has been added to the list by the Committee for Purchase from the Blind and Other Severely Handicapped, contracting agencies are required to procure the commodity or service directly from the workshops for blind or other severely handicapped individuals affiliated with the National Industries for the Severely Handicapped. For the JSLIST suits, the Marine Corps offered the requirement to the National Industries for the Severely Handicapped, which accepted as much of the work as it could, and the Marine Corps contracted for the balance of work with another contractor under section 8(a) of the Small Business Act. Neither contracting through the National Industries for the Severely Handicapped nor the contract with the section 8(a) contractor required publication of a notice in the Commerce Business Daily or the use of competitive procedures.

# Timeline of Events

August 1989	■ MCLIST program began.
September 1989 to September 1990	■ First Broad Agency Announcement was released in <u>Commerce Business Daily</u> .
1991	■ Marine Corps fielded Saratoga suits.
February to September 1991	■ Second Broad Agency Announcement was released in <u>Commerce Business Daily</u> .
October 1991 to September 1992	■ Third Broad Agency Announcement was released in <u>Commerce Business Daily</u> .
April to May 1992	■ First MCLIST wear test was conducted at Camp Lejeune (hot/humid climate testing).
June 1992	■ A company submitted an unsolicited proposal to the Marine Corps.
June to July 1992	■ Second MCLIST wear test was conducted at Camp Pendleton (hot/dry climate testing).
September 1992	■ Deadline for submissions to Army demonstration program. According to Marine Corps, no additional materials were accepted after this time.
March 1993	■ Army wear test was conducted at Camp Pendleton.
April 1993	■ Marine Corps rejected the unsolicited proposal.
October 1993	■ JSLIST phase I testing began with 57 material combinations.
November 1993	■ JSLIST memorandum of agreement became effective.
August 1995	■ JSLIST phase II testing began.
April 1997	■ Phase II testing was completed, and Saratoga material was selected.
May 1997	■ JSLIST contracts were awarded.
June 1997	■ Preplanned Product Improvement Program was announced in <u>Commerce Business Daily</u> .

# Major Contributors to This Report

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