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Defense Policies and Plans for Implementing Ada

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The Honorable John P. Murtha
Chairman, Subcommittee on Defense
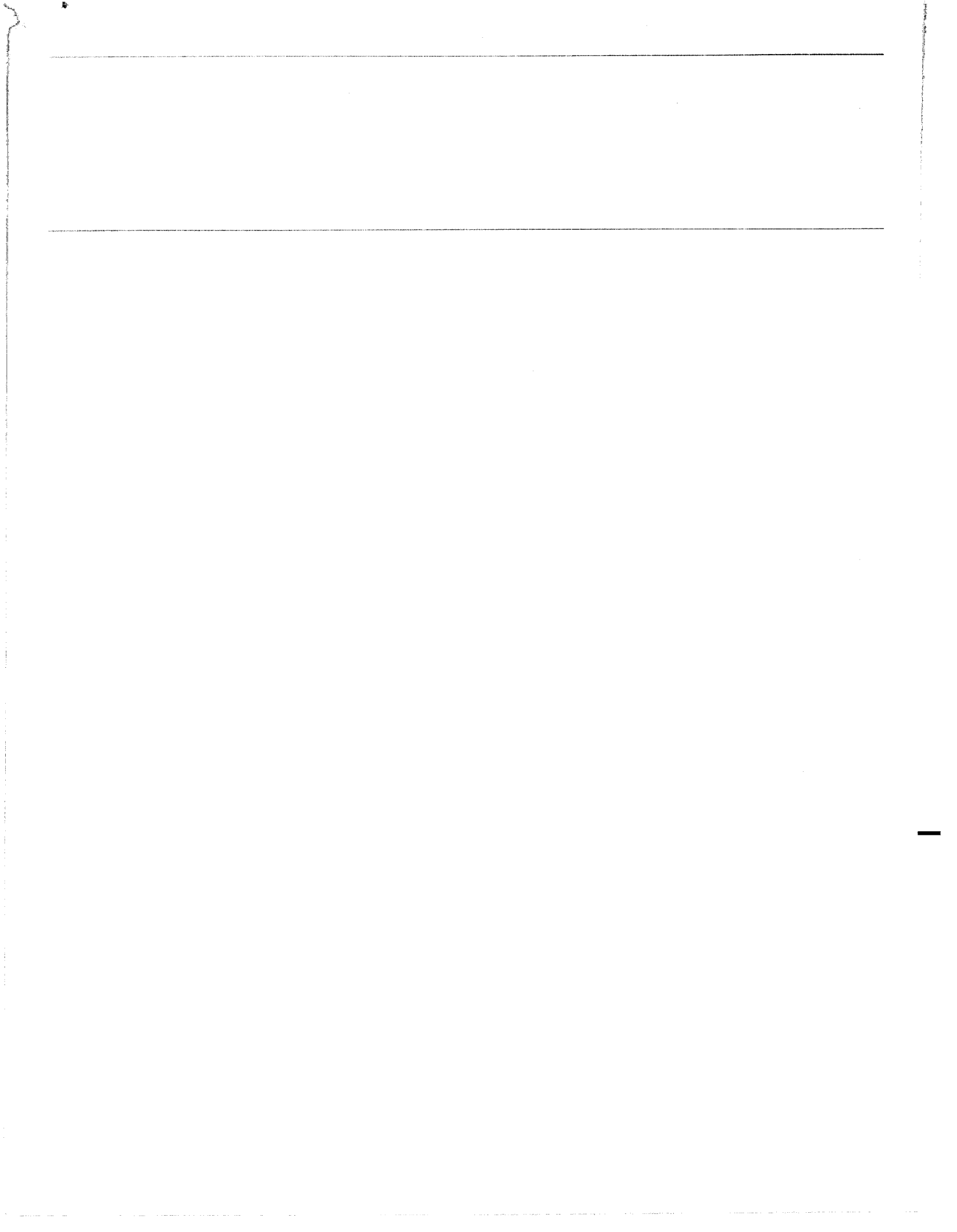Committee on Appropriations
House of Representatives

Dear Mr. Chairman:

In response to your March 5, 1991, request, we obtained information on the Department of Defense's implementation of Public Law 101-511, section 8092, which mandated using the Ada programming language for all software development, where cost effective. Although Defense mandated Ada use in 1987, congressional committees believed that the cost benefits of Ada were being substantially delayed because too many Defense systems were still using other programming languages. The Congress included a general provision in the 1991 Appropriations Act (P.L. 101-511) to enforce Defense's Ada policy and remove any doubt of a full transition to Ada, particularly in applications other than weapon systems.

As agreed with your office, we reviewed Defense's policies and plans to determine how it plans to implement the Ada law. We provided the results of our review in a formal briefing to your office in July 1991. At that time, we agreed to prepare this report containing the charts used in the briefing (see app. I).

Results in Brief

Defense and the services' current policies support the intent of the law to use Ada for all software development, which includes information systems and automated weapon systems. However, the section of the policy covering waivers is not consistently interpreted and uniformly applied among Defense components. The Office of the Secretary of Defense (OSD) plans to clarify its policy on waivers when it updates Defense software policies by the end of 1991.

Background

The Department of Defense developed Ada in the 1970s to stem the proliferation of programming languages in the Defense Department and help promote the software engineering principles of reusability, portability, maintainability, and reliability. Defense approved Ada as a military standard programming language in 1980. The Ada language was

subsequently approved by the American National Standards Institute in 1983 and by the International Standards Organization in 1987.

In 1987, Defense directives declared Ada the single, common computer language for use in its automated weapon systems, and information systems except where another language could be demonstrated to be more cost effective. However, in their individual policies, the services interpreted the scope of the Ada policy differently. The Air Force and Army required Ada for all automated weapon and information systems, whereas the Navy required Ada only in weapon systems. The Navy allowed Ada or any other approved high-order language for its information systems.

Defense Response to the Ada Law

More recently, Public Law 101-511, section 8092, went into effect, stating:

> Notwithstanding any other provision of law, after June 1, 1991, where cost effective, all Department of Defense software shall be written in the programming language Ada, in the absence of special exemption by an official designated by the Secretary of Defense.

In response to the law, the Office of the Secretary of Defense issued a memorandum on June 24, 1991, stating that the Ada law reinforces existing Defense policy and that further implementation guidance would be issued shortly. Also on June 24, 1991, the Navy issued policy guidance which required Ada in information systems as well as automated weapon systems. Army and Air Force officials felt that their current policies already implement the intent of the law; therefore, they did not issue additional policy guidance. The Air Force did, however, further clarify what is meant by cost effectiveness.

Services' Ada Waiver Policies Vary

While the services' interpretation of the scope of the Defense Ada policy is now consistent, the policies for allowing programs to waive the Ada requirement still vary. For example, the services' policies range from requiring a waiver to develop any non-Ada code, to requiring a waiver if the non-Ada code to be developed is more than 15 percent of the total code. As a result, Defense policy is not being uniformly applied.

Because the services agreed that current Defense waiver policy was subject to interpretation, the Ada Joint Program Office[1] and the Ada Executive Officials[2] formed a working group to define a consistent waiver policy. At the time of our review, the working group had agreed on a consistent approach to Ada waivers, and developed a draft policy. OSD officials plan to consider this draft waiver policy as they update Defense software policies, including the waiver policy, by the end of 1991. Interim guidance on waivers may be issued sooner. Also, OSD officials intend to ensure that Defense policies are consistently interpreted and uniformly applied by reviewing the services' Ada policies.

Officials of the Department of Defense provided comments on a draft of this report. These comments have been incorporated where appropriate.

We performed our work in accordance with generally accepted government auditing standards, from June to August 1991. We interviewed Defense officials responsible for issuing or implementing Ada policy at the OSD level, in the Air Force, Army, and Navy. We analyzed their policies on Ada in regard to information systems, automated weapon systems, and waivers. In addition, we met with individuals at the AJPO to discuss the merits and progress made on a consistent waiver policy among services.

We are providing copies of this report to the Secretary of Defense; the Secretaries of the Air Force, Army, and Navy; and other interested parties. We will also make copies available to others upon request.

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[1]The Ada Joint Program Office (AJPO) is the Defense organization that manages the effort to implement, introduce, and provide life-cycle support for the Ada programming language.

[2]Ada Executive Officials were high-level representatives in each Defense service and component, designated by Defense Directive 3405.2, Use of Ada in Weapon Systems, to monitor and support Ada use. When Defense Instruction 5000.2, Defense Acquisition Management Policies and Procedures, superceded Defense Directive 3405.2 in February 1991, the Ada Executive Official in each service was replaced by a senior-level Software Executive Official who is the focal point for Ada usage and sound software engineering policy and practice.

Should you have any questions about this report, please contact me at (202) 275-4649. Other major contributors are listed in appendix II.

Sincerely yours,

Samuel W. Bowlin
Director, Defense and Security
  Information Systems

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Abbreviations

AEO	Ada Executive Official
AJPO	Ada Joint Program Office
DOD	Department of Defense
GAO	General Accounting Office
HOL	high-order language
IMTEC	Information Management and Technology Division
OSD	Office of the Secretary of Defense

Briefing Charts

GAO Information Management and Technology Division

Survey of the Ada Programming Language

Presented to:
Subcommittee on Defense,
Committee on Appropriations,
House of Representatives

GAO   Points for Discussion

- Ada policies prior to the law

- Interpretation of DOD
  policies varied

- P.L. 101-511 requires Ada use

- Policy responses to the law

- Waiver clarification activities

- Observations

GAO   Ada Policies Prior to the Law

**DOD Directive 3405.1,2 (1987)
DOD Instruction 5000.1,2 (1991)**

- Ada required for weapons, intelligence, and command and control systems

- Ada required for all other applications except when another approved HOL is more cost effective

GAO   Interpretation of DOD
Policies Varied

Services apply policy differently

• Army and Air Force required
Ada in automated weapon and
information systems

• Navy required Ada for weapon
systems; Ada or approved HOL
for information systems

Services have different waiver
policies

GAO   Public Law 101-511,
Section 8092

- All software shall be written in Ada

- Where cost effective

- In the absence of special exemption

GAO   Policy Responses to the Law

- OSD issued a memo stating that the Ada law reinforces existing DOD policy

- Navy extended its Ada policy to include information systems

- Air Force and Army had policies in place that supported the law

GAO   Waiver Clarification Activities

- •AJPO/AEO Working Group drafted a consistent waiver policy

- •OSD plans to consider this draft policy as it updates DOD software policies

- •OSD plans to review service policies to ensure consistency

GAO   Observations

- •DOD policies support the intent of the Ada law for use in information and automated weapon systems

- •DOD waiver policy is not consistently interpreted and uniformly applied among Defense components

- •OSD plans to clarify waiver policies when it updates Defense software policies by the end of 1991

Major Contributors to This Report

Information Management and Technology Division, Washington, D.C.

Leonard J. Latham, Assistant Director
Colleen M. Phillips, Evaluator-in-Charge
Paula F. Bridickas, Computer Scientist

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