

GAO

Report to the Ranking Minority Member,
Committee on Governmental Affairs,
U.S. Senate

September 1994

ARMY ACQUISITION

Commercial Components Used Extensively in Tactical Trucks



**National Security and
International Affairs Division**

B-257903

September 26, 1994

The Honorable William V. Roth, Jr.
Ranking Minority Member
Committee on Governmental Affairs
United States Senate

Dear Senator Roth:

In response to your request, we reviewed the Army's use of commercial technology in tactical trucks. Specifically, we reviewed the commercial technology used in the production of the Army's Family of Medium Tactical Vehicles (FMTV), the Heavy Equipment Transporter System (HETS), and the line haul and the Light Equipment Transporter (LET) tractor trucks. Our objectives were to determine (1) whether the Army could meet its tactical truck requirements through purchasing purely commercial or "off-the-shelf" trucks; (2) if this was not feasible, what modifications contractors had to make to existing commercial trucks or what actions contractors had to take to meet the Army's requirements; and (3) the Army's requirements that limit the use of off-the-shelf commercial trucks.

Results in Brief

Key operational requirements prevent the Army from buying pure commercial or off-the-shelf trucks to meet its tactical truck needs. However, the Army is making extensive use of commercial technology and commercial components in the tactical trucks it buys. For the four tactical truck systems we reviewed, we found that the manufacturers of these systems used commercial trucks as baselines for their systems and generally used commercial manufacturing practices and components to produce tactical trucks. In addition to such operational requirements as tactical mobility, deployability and transportability, and survivability, Department of Defense (DOD) standards and Army policies place demands upon contractors beyond what are found in the commercial marketplace. For example, contractors must undergo rigorous testing procedures, develop more detailed technical manuals, use standard parts already in the Army's inventory system, and adopt military quality standards.

Background

Reduced defense budgets are forcing DOD to develop new strategies to use more commercial technology in order to reduce acquisition costs and maintain a viable industrial base. Advocates of increasing the use of

commercial technology believe that it will reduce the cost of military systems and improve DOD's access to new technologies.

Tactical trucks are the backbone of the Army's warfighting support and sustainment structure. They are used to transport personnel, munitions, combat vehicles, petroleum products, critical supply items, and combat casualties. They also serve as platforms for command, control, communications, computers, and intelligence systems and selected weapon systems. To meet the Army's warfighting requirements, tactical trucks must be deployable and mobile on any battlefield in all climate conditions.

The Army acquires its tactical trucks using a nondevelopmental item (NDI) approach. Depending on the amount of modification required to make the item meet the Army's needs, NDI acquisitions can vary.

- Items in production and available on the public market at established prices are classified as basic or pure NDI acquisitions.
- Items requiring minor development or modification of hardware or operational software to meet the Army's needs are classified as modified NDI acquisitions.
- Items requiring major development or modification of hardware or operational software are classified as integrated NDI acquisitions. Because of the amount of research and development normally required for system integration, this acquisition is closest to a developmental-type item.

The FMTV program is one of the Army's largest acquisition programs. At a projected cost of \$15.9 billion, the Army plans to purchase 87,598 2.5-ton and 5-ton trucks over 30 years to replace its aging medium truck fleet. On October 11, 1991, the Army awarded a \$1.2-billion, 5-year contract to Stewart and Stevenson Services, Inc., of Houston, Texas, for the production of the first 10,843 FMTV trucks. For HETS, the Army contracted with Oshkosh Truck Corporation of Oshkosh, Wisconsin, for 1,354 tractors at a cost of \$275.3 million and Southwest Mobile Systems of St. Louis, Missouri, for 1,376 semitrailers at a cost of \$158.6 million. Under its 1988 contract with the Freightliner Corporation of Portland, Oregon, the Army has purchased 849 line haul tractors and 929 LET tractors at a cost of \$219.6 million.

Key Operational Requirements Prevent Procurement of Commercial Trucks

The contractors for the tactical truck systems we reviewed made extensive use of commercial manufacturing practices and commercial components in developing and producing the trucks. Although the Army and the contractors do not keep records of the amount of commercial components used in their trucks, the acquisition plans for all four trucks stated that each would primarily use commercial components. The major components—the engines, transmissions, axles, and tires—on all the trucks we reviewed were commercial components. Also, as shown in table 1, all the contractors started with a commercial vehicle as a baseline and either used an integrated or minor modification NDI approach to develop their tactical truck.

Table 1: Commercial Basis and NDI Approach for Tactical Trucks

System	Mission	Manufacturer	NDI approach	Commercial truck used as baseline
FMTV	Wide range of combat, combat support, and combat service support missions requiring extensive off-road mobility and deployability.	Stewart & Stevenson Services, Inc.	Integrated	Steyr-Daimler-Puch AG 12M18
HETS	Transportation and evacuation of 70-ton Abrams tank and other heavy tracked and wheeled vehicles. Mission requires HETS to traverse cross-country terrain with a heavy payload.	Oshkosh Truck Corporation (M1070 tractor)	Integrated	Oshkosh F2365
		Southwest Mobile Systems Corporation (M1000 semitrailer)	Integrated	Southwest XM1000 prototype ^a
Line haul and Light Equipment Transporter tractors	The line haul tractor (M915A2) is used to transport bulk cargo, cargo containers, and fuel using primary and secondary roads. The Light Equipment Transporter (M916A1) is used to transport engineer equipment to and from work sites and other line haul transportation missions. Limited cross-country capability is required.	Freightliner Corporation	Minor modification	Freightliner FLD 120 conventional

^aSouthwest Mobile developed the military XM1000 prototype based on a commercial semitrailer produced by Scheuerle, a German company.

The Army's FMTV and HETS requirements could not be met by making minor modifications to a commercial truck. To meet the requirements, the contractors had to integrate commercial and military components into their baseline vehicles and develop new systems to meet the Army's requirements. In contrast, the contractor could meet the Army's requirements for the line haul tractor and LET by making minor modifications to its existing line haul tractor. Army and contractor officials identified tactical mobility, deployability and transportability, survivability, and other unique military needs as the key operational requirements that prevented the Army from using the baseline commercial trucks.

Tactical Mobility

The Army's tactical trucks must demonstrate a level of mobility that varies depending on each truck's wartime mission. The Army's medium trucks are the workhorses of the battlefield, serving as the primary movers of unit equipment and personnel. The mobility requirement calls for the FMTV trucks to be able to operate on the front lines, often off road and alongside the Army's tracked vehicles. The HETS mission scenario requires it to traverse cross-country terrain carrying the Army's 70-ton Abrams tank and other heavy tracked and wheeled vehicles as far forward on the battlefield as possible. The line haul tractor is designed to perform high-speed resupply operations over extended distances on primary and secondary roads. LET is primarily used to transport heavy engineer equipment, such as bulldozers, to and from work sites. To perform this mission, LET must have a limited off-road capability.

To meet the Army's FMTV mobility requirements, Stewart & Stevenson Services, Inc., made numerous modifications to an Austrian army medium truck manufactured by the Austrian firm of Steyr-Daimler-Puch AG. For example, the company added a more powerful engine to allow FMTV to climb steep grades when operating off road and a central tire inflation system to allow tire pressure to be varied from within the cab, increasing off-road mobility.

The Oshkosh Truck Corporation made numerous modifications to its commercial tractor to allow the HETS tractor to pull the required 70-tons of payload off highway. For example, the company modified its baseline tractor's axles to improve mobility in soft soil. The Southwest Mobile Systems Corporation was able to develop a semitrailer able to survive the abuses of driving off highway with a 70-ton payload, meet the Army's intersection turning requirements, and comply with bridge load limits for

HETS by adopting and modifying a European semitrailer design with steerable axles.

The Freightliner Corporation did not have to modify its commercial line haul tractor to meet the Army's line haul primary and secondary road requirements. However, it added an extra driving axle and strengthened the suspension system of its commercial line haul tractor to meet LET's limited off-road requirements.

Deployability and Transportability

The Army's operational doctrine envisions contingency forces based in the United States that will respond quickly to crises worldwide by airlift and sealift. To meet this doctrine, the Army's tactical trucks must be easily transportable and deployable by a variety of means.

Of the systems we reviewed, FMTV has the most stringent air transportability requirement. The trucks must be transportable by C-130, C-141, C-5, and C-17 aircraft without altering the vehicle or removing vehicle components. Stewart & Stevenson modified the Steyr design to allow the FMTV trucks to fit into the required aircraft. In addition, Stewart & Stevenson developed and is producing a limited number of airdrop versions to be used by the Army's airborne divisions. The airdrop versions feature windshields and windows that fold down, reducing the height of the vehicles so that they can be ejected out of the back of the aircraft.

In addition, all four of the systems we reviewed must be equipped with adequate lifting and tiedown points to allow the trucks to be lifted and secured for sea and rail transport. According to U.S. Army Transportation School and Military Traffic Management Command officials, the ability to lift vehicles onto ships is critical to the fast deployment of the vehicles, given the military's limited number of roll-on and roll-off ships. Freightliner Corporation officials said that the modifications necessary to meet the Army's lifting and rail transportation requirements for the line haul and LET tractors was one of the most costly and difficult modifications they had to make to their commercial tractor. Freightliner's modifications included the addition of shackles and hardpoints for tiedown and lifting, strengthening of its commercial tractor's frame and mounting component in such a way as to prevent failure during rail shipment.

Survivability

To survive on the modern battlefield, the Army's tactical trucks must survive a high altitude electro-magnetic pulse or limit their susceptibility to and emission of electro-magnetic interference. The truck manufacturers hardened and insulated their trucks' electronic components and, in some cases, used components specifically designed for military application to limit their truck's susceptibility to these electro-magnetic forces. The FMTV's alternator is an example of an item specially designed for military use. It provides the needed amperage and protective shielding.

Also, to survive in a chemical weapons environment, the Army requires that a special paint be used to facilitate the decontamination of the vehicle. This paint will not melt when harsh cleansing agents are used to remove chemical contamination. Contractors said that the paint is very difficult and time-consuming to apply. They must take special care in cleaning and priming the vehicle prior to applying the paint. The paint takes much longer to cure than ordinary paint.

Other Unique Military Needs

Each of the trucks we reviewed had to meet a number of other requirements not found in the commercial world. For example, they must be equipped with dual 12-volt and 24-volt electrical systems. The 12-volt capability is used to power vehicle lights, while the 24-volt capability is needed to start the trucks during cold weather as low as -50 degrees Fahrenheit and to power Army radios. Also, to ensure interoperability to the extent possible, newly fielded trucks must maintain compatibility with previously fielded equipment, such as trailers and standardized test equipment.

Other Demands on Manufacturers Not Found in Commercial Marketplace

Tactical truck manufacturers we spoke with identified four other areas that place demands upon them not found in the commercial marketplace. These areas are vehicle testing, technical manuals development, standard parts usage, and military quality standards compliance.

Testing

The Army tests its vehicles to help ensure the timely development, production, and fielding of systems that meet the user's requirements and are operationally effective and suitable. This differs from the commercial market where buyers do not subject vehicles they have already purchased to extensive tests. There are two main types of Army system tests: technical and operational. The Army conducts technical testing to

demonstrate that the design risks have been minimized, the engineering development process is complete, and the vehicle meets system specifications. The Army conducts operational testing in a field environment under realistic combat conditions to determine that the vehicle is operationally effective and suitable for use in combat by typical military users.

Two of the four contractors disagreed with the Army about the rigorousness of the tests needed to demonstrate that their vehicles met the requirements. They said that their trucks were being over tested. Army officials, on the other hand, said that they were simply testing the trucks to the Army's requirements. The Army requires that its trucks be deployable, mobile on any battlefield in any and all climate conditions, and require minimum maintenance. In addition, the Army retains its trucks for significantly more years than do commercial users. Army officials said that without extensive testing, the Army would not be able to ensure that the trucks it is buying will meet its operational requirements, be easily maintainable, and survive many years of rugged use.

Technical Manuals

The Army requires that its vehicles be fielded with detailed technical manuals and other documentation covering the operation and maintenance of the vehicle. The Army requires specialized manuals because (1) Army drivers and mechanics generally are not as well trained as commercial drivers and mechanics, (2) frequent reassignment and personnel changes limit the experience soldiers are able to gain with a given system, and (3) the soldiers themselves are responsible for some maintenance and repairs of their systems.

Contractors said that technical manual development is a difficult, time-consuming, and costly process. Oshkosh officials stated that manual development becomes the critical path, determining the time it will take to develop and field a system. Freightliner officials noted that for systems requiring only minor modifications, manuals can take longer to develop than the trucks themselves. Officials from the U.S. Army Tank-Automotive Command, U.S. Army Ordnance Center and School, and U.S. Army Transportation School agreed that the Army's requirement for technical manuals is a burden not found in the commercial marketplace; however, they believe that properly developed manuals are essential given the Army's unique warfighting requirements.

Also, contractors and the Army disagree regarding the adequacy and consistency of Army guidance on manual preparation and the feasibility of verifying the accuracy of manuals during operational testing. Contractors said that the Army does not provide up-front direction on the requirements, which are often subjective, open to interpretation, and subject to change. Creating a further burden for contractors is the need to have draft manuals available for operational testing. For example, Oshkosh officials believed that evaluating the manuals during operational testing was an unrealistic demand. They said they had to limit design changes, even though changes may have resulted in a better truck, to allow time to develop manuals in time for operational testing.

Standard Parts

DOD requires all agencies and departments to establish, conduct, and maintain a parts control program, maximizing the use of standard parts. Standard parts can be military standard or, more commonly, commercial standard parts. Use of standard parts reduces both the Army's inventory carrying costs and the number of different parts units must carry when they deploy.

Although using standard parts is clearly a logistics benefit for the Army, identifying standard parts can be a time-consuming, labor-intensive process for contractors. Early in a vehicle's development, contractors must carefully screen databases of standard part numbers to identify and catalog standard parts on their systems. When a standard part cannot be identified or used, the contractor must submit a technical justification to the Army explaining why a nonstandard part is necessary. In most cases, the Army will accept the contractor's rationale and add the new part to the standard parts database. In cases where the Army does not accept the justification, the contractor must use a previously listed standard part.

Three of the four contractors accepted the parts control process as a burden of doing business with the government. Officials of the remaining contractor—Stewart & Stevenson—expressed a great deal of frustration with the requirement. They said that the use of standard parts was an enormous paperwork burden.

Military Quality Standards

Each of the contractors had to comply with DOD's military quality standards for inspection and production. These standards differ from commercial standards in that the emphasis is on consistency of product versus continuous improvement. That is, to ensure commonality and

fitness for a particular purpose, the Army does not want its systems to change at the manufacturers discretion once the configuration of the vehicle has been successfully set and tested. This differs from the commercial marketplace where manufacturers make routine changes to improve performance, reduce cost, or both.

To ensure consistency, DOD inspectors conduct daily inspections of work processes and completed work at each manufacturer's plant. In addition, contractors must maintain detailed records. For example, Southwest Mobile officials stated that they have to maintain information on sources of supply, decisions on scraping or reworking materials, and consistency of subcontractor items that they would not have to maintain if producing for the commercial marketplace. Contractors generally viewed the military quality standards and inspection procedures as a cost of doing business with the government.

Role of Commercial Trucks for Nontactical Needs

While the Army cannot meet its tactical truck needs using pure or off-the-shelf commercial trucks, the use of pure commercial vehicles for nontactical purposes could be increased. In and around its bases, the Army needs vehicles to perform nontactical transportation, such as personnel transportation and general cargo hauling. The Army has a fleet of commercial vehicles—pickup trucks, vans, busses, etc.—to perform nontactical base transportation. However, many of the units located on the bases also use their tactical trucks for these purposes.

Army Transportation School officials said that using commercial vehicles instead of the units' tactical trucks for base transportation could result in operation and maintenance savings because tactical trucks have significantly greater operation and maintenance costs than commercial vehicles. However, an official from the Tank-Automotive Command's Fleet Planning Office did not believe that the savings would outweigh the cost of purchasing or leasing commercial vehicles. His conclusion was based on the assumption that the increased use of commercial vehicles would not lead to a decrease in the number of tactical trucks because tactical truck requirements are based on warfighting needs, not peacetime use requirements. As a result, the Army would have to purchase or lease commercial vehicles in addition to the tactical trucks it requires.

Neither the Transportation School nor the Tank-Automotive Command has performed an analysis to support their position. Also, we did not

perform a cost-benefit analysis of the use of commercial vehicles for these purposes.

Agency Comments

DOD concurred with our report. Its comments are reprinted in appendix I.

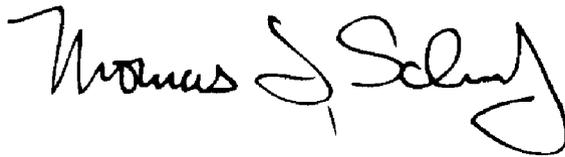
Scope and Methodology

We interviewed and obtained program documents from officials at the U.S. Army Program Executive Office for Combat Support, Warren, Michigan; U.S. Army Tank-Automotive Command, Warren, Michigan; U.S. Army Transportation School, Fort Eustis, Virginia; U.S. Army Test and Evaluation Command, Aberdeen Proving Ground, Maryland; U.S. Army Ordnance Center and School, Aberdeen Proving Ground, Maryland; the Military Traffic Management Command, Transportation Engineering Agency, Newport News, Virginia; and the U.S. General Services Administration, Washington, D.C. In addition, we interviewed officials of the Freightliner Corporation, Portland Oregon; Oshkosh Truck Corporation, Oshkosh, Wisconsin; Southwest Mobile Systems Corporation, St. Louis Missouri; and Stewart and Stevenson Services, Inc., Houston, Texas. We conducted our review from September 1993 to July 1994 in accordance with generally accepted government auditing standards.

We are sending copies of this report to the Chairmen and Ranking Minority Members of the Senate and House Committees on Armed Services and on Appropriations and the House Committee on Government Operations; the Chairman, Senate Committee on Governmental Affairs; the Director of the Office of Management and Budget; and the Secretaries of Defense and the Army. We will also provide copies to others upon request.

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

Sincerely yours,

A handwritten signature in black ink that reads "Thomas J. Schulz". The signature is written in a cursive style with a large, stylized 'S' at the end.

Thomas J. Schulz
Associate Director, Systems Development
and Production Issues

Comments From the Department of Defense



ACQUISITION AND
TECHNOLOGY

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23 AUG 1994



Mr. Frank C. Conahan
Assistant Comptroller General
National Security and International Affairs Division
U.S. General Accounting Office
Washington, D.C. 20548

Dear Mr. Conahan:

This is the Department of Defense (DoD) response to the General Accounting Office (GAO) draft report GAO/NSIAD-93-232, "ARMY ACQUISITION: Commercial Components Used Extensively in Tactical Trucks," dated August 2, 1994 (GAO Code 707040/OSD Case 9751).

The DoD has reviewed the draft report and concurs without further comment. The department appreciates the opportunity to review the report in draft form.

Sincerely,

George R. Schneider
Acting Director
(Tactical Warfare Programs)



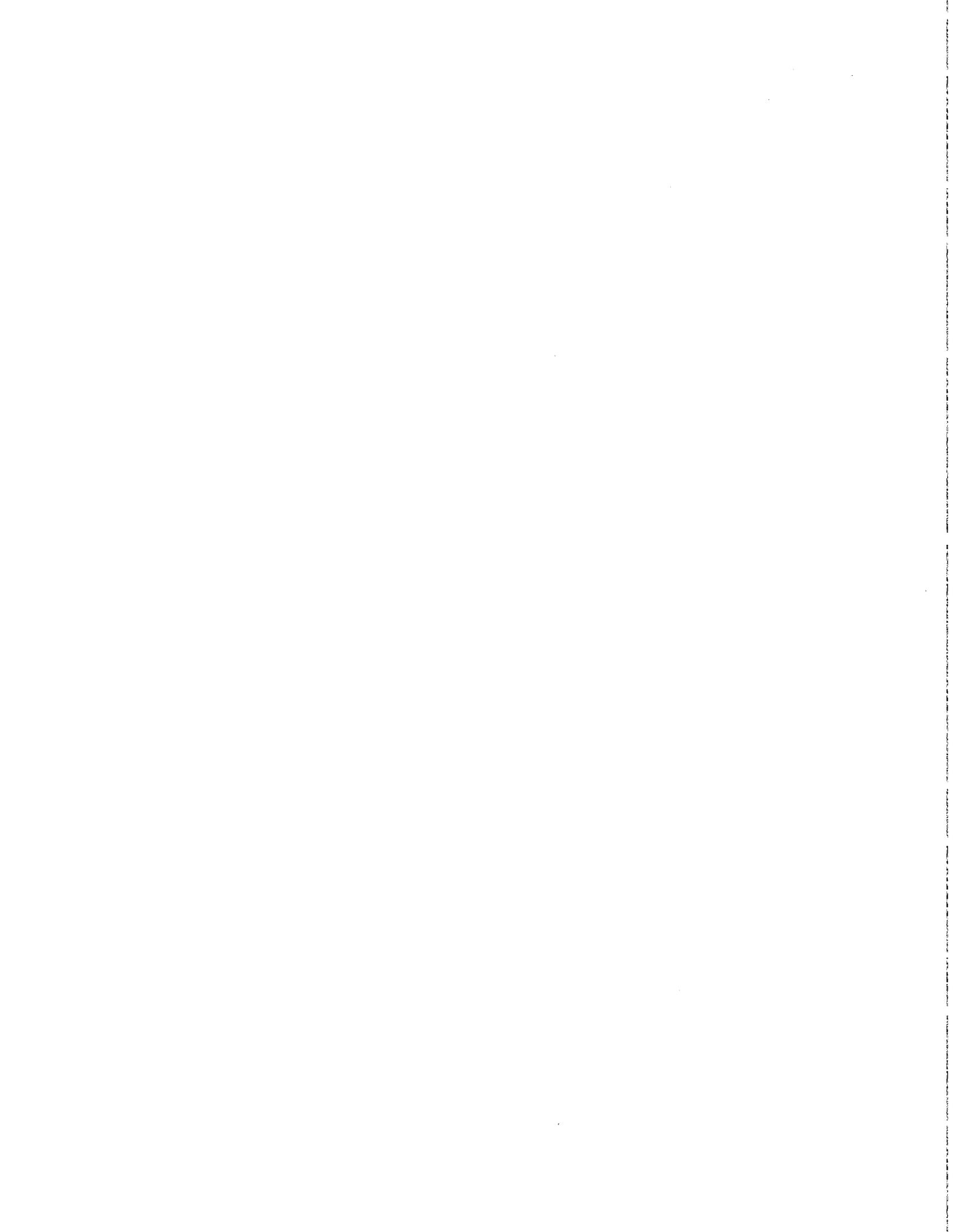
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