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COMPTROLLER GENERAL OF THE UNITED STATES
WASHINGTON, D.C. 20548

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DEC 10 1975

The Honorable Ralph H. Metcalfe
House of Representatives



Dear Mr. Metcalfe:

As requested in your April 8, 1975, letter, we reviewed the Navy's practices of discharging fuel at sea. We expanded our coverage, as you later requested, to include all types of fuel which could have been reclaimed if brought to port. Several other congressmen requested similar information after the widespread publicity of the U.S.S. Independence's dumping 8,900 gallons of aviation gasoline in March 1975 off the South Carolina coast.

We developed information on the Atlantic and Pacific fleets for the period July 1, 1973, through June 30, 1975. We examined Navy instructions, Navy records, a Navy Audit Service Report issued in February 1975, and Exxon Research and Engineering Corporation studies; visited several vessels; and interviewed numerous Navy officials.

We found that:

- A common practice for Navy vessels has been to discharge fuel into the sea. We did not identify specific locations of discharges, because they occurred while the vessels were underway, and records were not adequate to readily identify locations.
- The Navy's records were neither adequate to calculate exact quantities of fuel discharged from oilers and carriers nor were they adequate to estimate quantities of fuel discharged from other vessels.
- Navy records available showed that, during fiscal years 1974 and 1975, oilers and carriers discharged from fuel tanks at least 13 million gallons of a water and fuel mixture. We determined, on the basis of Navy estimates of fuel content in the mixture, the fuel in this mixture was worth about \$500,000 (1.9 million gallons). Also, oil products in extremely low concentrations are discharged annually along with bilge and ballast water.

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--The Navy has developed procedures to stop dumping aviation gasoline and has set a goal of ceasing all oily discharges from all ships through ship alterations.

In summary, total fuel discharges cannot be accounted for by Navy ships because the Navy system for recording fuels discharged is insufficient and does not account for fuel discharges by all ships. Monitoring fuel discharges properly requires improvements in the Navy's reporting system.

The Navy's planned ship alterations and construction program, when completed, should reduce fuel discharges in the future.

WHY FUEL IS DISCHARGED

The primary petroleum-based fuels aboard Navy vessels are aviation gasoline, jet propulsion fuel (JP-5), Navy distillate, Navy special fuel oil, and diesel fuel marine. These fuels are transported to Navy vessels by Navy oilers. The primary propulsion fuel for large vessels is Navy distillate; however, some use special fuel oil, and smaller vessels use diesel fuel marine. Large aircraft carriers store JP-5, which is used on jet aircraft and aviation gasoline, which is used in reciprocating aircraft engines.

We were told that, except for accidents and emergencies, fuels are discharged into the sea when (1) water is removed from fuel tanks, pumps, and hoses, (2) tanks are flushed and cleaned in preparation for overhaul and repair, and (3) residue is pumped from the bilge and ballast tanks.

Removing water

Water is present in most fuels and settles in tank bottoms. Condensation also occurs in tanks, pumps, hoses, and valves, thus increasing the quantity of water present in fuel. This water has to be removed from aircraft fuels periodically to make the fuel safe to use in aircraft; when the water is removed, a certain amount of fuel goes with it. This process of removing water from fuel is called stripping.

Water droplets are carried over into JP-5 fuel during the refining process. The water separates and settles in

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the carriers' tank bottoms and, as a result, JP-5 storage tanks on the carrier must be stripped daily if a carrier is conducting flight operations. Otherwise they are stripped weekly. Aviation gasoline has almost no water carried over from the refining process; but after fuel is issued from tanks, the pumps and hoses are backpressured with inert gas to avoid fumes. The condensation which forms in pumps and hoses has to be flushed with aviation gasoline before the next issue.

The amounts of fuel discharged in stripping operations vary depending on the type of fuel and the crew's ability to measure or otherwise detect when the discharge becomes clean fuel.

Some ships contain tanks designated as contaminated fuel tanks to hold strippings until the water settles. Once the water settles, the tank is stripped of the water and the fuel is pumped back into the fuel tank. For ships not having contaminated tanks, the strippings are discharged overboard.

Flushing tanks at sea for shipyard work

Except for aviation gasoline, most fuels aboard ships can be carried into shipyards and unloaded. Fumes from aviation gasoline spread quickly and can be ignited in storage with a spark. On the other hand, JP-5 will ignite in storage only through a "wick" process, such as a burning rag. Therefore, the Navy requires that, before a ship undergoes overhaul or repair, all tanks carrying aviation gasoline be emptied. This emptying process further requires that the tanks be flushed three times with water and be completely filled with water to avoid explosive fumes. Even while being discharged at sea, the ship must be underway into the wind, and there must be no smoking.

The amount of aviation gasoline to be disposed of by unloading or dumping before entering a shipyard depends on the crew's ability to predict aviation gasoline requirements for aircraft operations. Navy instructions state that whenever practicable, all excess aviation gasoline should be unloaded to an oiler or supply activity. For example, Navy officials said that the U.S.S. Independence had unloaded 40,000 gallons of aviation gasoline to an oiler in the Mediterranean and retained approximately 10,000 gallons of aviation gasoline for predicted requirements. About 8,900 gallons were later dumped off the South Carolina coast.

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Bilge and ballast discharges

From a variety of sources, water and oily products drain into ships' bilges. Oil products range from machinery drippings to small oil spills. Presently most ships have little recourse except to pump bilges overboard.

Ships also take on large amounts of sea water as ballast, often into empty fuel tanks, to maintain stability. The water is eventually discharged, such as when taking on fuel, and residual fuels in the tanks go overboard with the ballast water.

A Navy study estimated that only about 0.1 percent of bilge and ballast discharges is petroleum.

ACCOUNTING FOR FUEL DISCHARGES

The Navy's system for recording fuels discharged into the sea is the Survey Request, Report, and Expenditure form which is required monthly. This document reports strippings and fuel dumps of stock fuels carried on board such ships as carriers and oilers.

These reports are not used by all vessels for all fuels. For example, there is no requirement for any vessel other than carriers and oilers to report fuel that is dumped. In the case of carriers and oilers propulsion fuels are also not required to be reported.

In addition, even though survey forms are required, they are not always submitted. For instance, we could locate only 83 percent of the required reports from Pacific carriers; the Navy Audit Service reported that from July 1973 through May 1974, 27 percent of the oilers' survey reports were not on file at the Navy Petroleum Office; and the petroleum office told us the June 1974 reports were apparently lost. The Fleet Aviation Accounting Office in the Atlantic Fleet acknowledged that it had not enforced the monthly submission of the report.

Navy officials said the form contained many inaccuracies. The present measuring system can result in inaccurate quantities of up to thousands of gallons because of the pitching and rolling motion of the ships during the measuring process. These quantities are sometimes reported as a loss of inventory rather than as a fuel discharge.

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Also, the survey form does not always show whether the discharge went overboard or into a contaminated tank or other vessel. Nor does the form indicate the amount of water and fuel in the fuel.

We visited several vessels and found no more detailed records with which we could reconstruct actual fuel discharges.

AMOUNTS OF FUEL DISCHARGED

Records from fiscal years 1974 and 1975 show oilers and carriers discharged from fuel tanks, by stripping and flushing, 13.1 million gallons of fuel mixed with water valued at \$3.5 million by the Navy. ^{1/} (See enc. I.) However, on the basis of Navy estimates of water content percentages in various fuels, the following is more representative of the reclaimable fuels discharged by stripping and flushing tanks.

	<u>Gallons</u>	Estimated value (note a)
Navy distillate	273,780	\$ 39,486
Navy special fuel oil	35,860	3,781
JP-5	1,172,782	315,527
Aviation gasoline	<u>434,379</u>	<u>149,580</u>
	<u>1,916,801</u>	<u>\$508,374</u>

a/Value at time of discharge.

There were no records showing that diesel fuel marine was discharged. A more detailed table of these estimates is included as enclosure II.

In addition, a large amount of oily waste is discharged in the sea from bilges and ballast tanks. Exxon studies done for the Navy estimated that 5.7 billion gallons of bilge and ballast were discharged annually by Navy vessels operating in 11 major port cities. They further estimate that by 1980, 6 million gallons of fuel (primarily diesel fuel marine)

^{1/}As discussed earlier, some water is entrained in fuel. For reimbursement purposes among commands, the discharged water is priced as fuel.

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could be reclaimed annually from Navy vessel bilge and ballast discharges if the Navy constructs in-port facilities to handle these discharges.

PLANS TO LIMIT DISCHARGES

In an April 1973 instruction, the Chief of Naval Operations stated that the Navy's major goal by 1975 and not later than the end of this decade, is the complete halt of all oil and oily discharges into streams, harbors, and oceans. Navy officials emphasized that the instruction was not a mandate and that a complete halt applied to discharges which contain enough petroleum to be detectable, such as those which produce a sheen.

The Navy has made some ship alterations to limit fuel discharges and plans further alterations; however, some Navy officials doubt whether a complete halt is technically feasible. Examples of the types of actions and plans follows:

- Procedures have been developed to unload aviation gasoline in port using fresh water to flush and fill tanks. In April 1975 this procedure was successfully used to unload 1,350 gallons of aviation gasoline to trucks in Norfolk, Virginia, and 24,000 gallons to a barge in Mayport, Florida. The Navy had no data available to show the cost of these unloadings.
- Alterations are planned for carriers to purify contaminated JP-5 from hose flushings and stripping operations which is presently discharged overboard.
- Two alterations dealing with oil-water separators and aviation gasoline hose flushings are being developed.
- Alterations are planned for carriers providing for ship changes necessary to pump bilges into other containers while in port.
- Some of the Exxon studies recommended military construction of in-port projects to handle bilge and ballast discharges of Navy vessels.

CONCLUSIONS AND RECOMMENDATIONS

We have no basis for determining the magnitude of total fuel discharges, and the Navy is also unable to develop information on total fuel discharges.

The Navy's current procedures and practices are inadequate to show total fuel discharges, because:

- The existing reporting system exempts all Navy vessels except carriers and oilers and the report does not require any information on dumping fuel used for propulsion of these vessels.
- Required reports are not submitted.
- In general, the reporting systems are inaccurate and do not explain the circumstances and fuel content of discharges.

The Navy acknowledged the need to control the discharges and has taken certain steps that will improve the situation.

We believe the Navy's action plan to avoid unnecessary discharges, primarily through planned ship alterations and changes in construction, should reduce fuel discharges into the sea.

Although the Navy has outlined an action plan aimed at reducing fuel discharges into the sea, we believe the Navy must improve its current procedures, practices, and reporting system to properly monitor its fuel dumpings and to adequately explain the circumstances and fuel content of its discharges.

We believe these improvements are needed so the Navy will have the necessary data to determine the magnitude of this problem and also to be able to monitor the effect of their corrective actions. We recommend that the Secretary of the Navy implement the following actions to improve fuel management and better control over stripping, flushing, and other types of discharging fuel into the sea.

- The required survey reports should be submitted.
- The Navy should expand current reporting systems to (1) show discharges from all vessels, (2) require more details, such as why discharges were made, where they were made, whether they were to another vessel or into the sea, and (3) show estimated volumes of fuel against water discharged.

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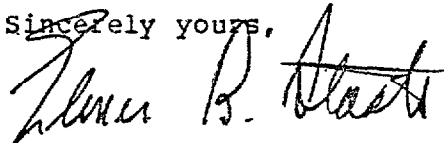
Navy comments

We discussed our observations with personnel of the Atlantic and Pacific fleets, and these officials agreed that better recordkeeping was needed. The Naval Air Forces Pacific agreed to better monitoring of the reports, to perhaps assign a fuel expert to review the reports, to recommend procedures and equipment changes to control losses, and to issue supplemental instructions so that fuel loss reports would have more precise information. Atlantic fleet personnel questioned whether the costs of expanding the reporting would be worth the benefits.

Personnel from the Navy Petroleum Office, Office of the Chief of Naval Operations, and Navy Supply Systems Command agreed with our observations and stated that the quality of reporting from oilers had already improved. They further said that reporting for bilge and ballast discharges might not be warranted, but they would consider it and would explore whether existing systems could be improved for better reporting of discharges and whether more oversight should be assigned to higher levels.

As agreed with a representative of your office, we are sending this report to the Director, Office of Management and Budget; the Secretary of the Navy; the House and Senate Committees on Government Operations and Appropriations; and to congressmen who requested us to review this matter.

Sincerely yours,



Comptroller General
of the United States

Enclosures 2

REPORTED WATER AND FUEL DISCHARGES (note a)

Fuel	Gallons				Total (note b)	Value (note c)
	Oilers		Carriers			
	Atlantic	Pacific	Atlantic	Pacific		
<u>FY 1974</u>						
Non Dis- tillate	1,879,206	1,580,124	-	-	3,459,330	\$ 789,711
Navy Special Fuel Oil	450,828	94,584	-	-	545,412	75,638
JP-5	871,385	963,834	647,481	1,022,734	3,505,434	748,524
Aviation Gasoline	<u>230,710</u>	<u>83,704</u>	<u>25,582</u>	<u>190,291</u>	<u>530,287</u>	<u>143,461</u>
	<u>3,432,129</u>	<u>2,722,246</u>	<u>673,063</u>	<u>1,213,025</u>	<u>8,040,463</u>	<u>\$1,757,316</u>
<u>FY 1975</u>						
Navy Dis- tillate	659,904	1,356,726	-	-	2,016,630	696,123
Navy Special Fuel Oil	40,698	131,082	-	-	171,780	55,742
JP-5	264,435	415,285	926,492	752,264	2,359,476	829,111
Aviation Gasoline	<u>89,433</u>	<u>193,978</u>	<u>114,928</u>	<u>77,773</u>	<u>476,112</u>	<u>202,785</u>
	<u>1,054,470</u>	<u>2,097,071</u>	<u>1,041,420</u>	<u>830,037</u>	<u>5,022,998</u>	<u>\$1,733,766</u>
	<u>4,486,599</u>	<u>4,819,317</u>	<u>1,714,483</u>	<u>2,043,062</u>	<u>13,063,461</u>	<u>\$3,541,092</u>

a/As discussed on pp. 4 to 6, many discharges were not reported. This table is based only on records available.

b/Included are 95,000 gallons of aviation gasoline dumped in six incidents before shipyard work. (Two dumpings accounted for about 75,000 gallons.) Also, the totals include about 100,000 gallons of JP-5 which were dumped in three incidents for the same reason.

c/Navy's stated value at time of discharge.

BEST DOCUMENT AVAILABLE

ENCLOSURE II

ENCLOSURE II

ESTIMATED RECLAIMABLE FUEL
CONTAINED IN GALLONS OF DISCHARGE
FISCAL YEARS 1974 AND 1975

<u>Fuel</u>	<u>Gallons</u>		<u>Percent of fuel content (note a)</u>	<u>Estimated reclaimable fuel</u>	
	<u>Oiler</u>	<u>Carrier</u>		<u>Gallons</u>	<u>Value (note b)</u>
Navy Distillate	5,475,960	-	5	273,780	\$ 39,486
Navy Special Fuel Oil	717,192	-	5	35,860	3,781
JP-5	2,514,939	3,348,971	20	c/1,172,782	315,527
Aviation Gasoline	597,825	-	5	29,891	10,279
Aviation Gasoline	-	408,574	99	404,488	139,301
	<u>9,305,916</u>	<u>3,757,545</u>		<u>1,916,801</u>	<u>\$508,374</u>

a/Based on estimates from fuel management and ship personnel.

b/Based on Navy's stated value of the fuel at the time of discharge.

c/As described in enclosure I, about 100,000 gallons of JP-5 were dumped. However, we did not separately recalculate the water content because it would not significantly affect totals.