Catapult Water Brake Tank and Post Launch Retraction Exhaust Discharge Summary

Description of Discharge

How is this discharge generated? This intermittent discharge is the oily water skimmed from the catapult water brake tank, and the condensed steam discharged when the catapult is retracted. Catapult water brakes are used to stop the forward movement of the steam-propelled catapults used to launch aircraft from Navy aircraft carriers. The catapult water brake system includes water brake cylinders and a water brake tank that contains freshwater. During flight operations, water from the catapult water brake tank is continuously injected into the catapult water brake cylinders. At the end of a launch stroke, spears located on the front of the catapult pistons enter the water brake cylinders. The water in the cylinders builds pressure ahead of the spears, cushioning the catapult pistons to a stop. The catapult brake water is continuously circulated between the catapult water brake tank and the catapult water brake cylinders.

Prior to the launch stroke, lubricating oil is applied to the catapult cylinder through which the catapult piston and piston spear are driven. As the catapult piston is driven forward during the launch stroke, the catapult piston and spear carries lubricating oil from the catapult cylinder into the water brake cylinder at the end of the stroke. Over the course of multiple launchings, the oil and water circulating through the water brake cylinder and tank leads to the formation of an oil layer in the water brake tank. The oil layer can adversely affect water brake operation by interfering with the cooling of water in the water brake tank. To prevent excessive heat buildup in the tank, the oil is periodically skimmed off and discharged overboard. Additionally, as the catapult piston is retracted following the launch, expended steam from the catapult launch stroke and some residual lubricating oil from the catapult cylinder walls are discharged below the waterline through a separate exhaust pipe.

Which vessels generate this discharge? Only aircraft carriers generate this discharge. Catapult operations during normal flight operations generate both the water brake tank discharge and the post-launch retraction exhaust; however, flight operations take place beyond 12 n.m. from shore. Catapult testing which occurs within 12 n.m. always discharges the post-launch retraction exhaust, but usually does not add sufficient quantities of oil to the water brake tank to require skimming.

How often and where is this discharge generated? The water brake tank is used within 12 n.m. for dead-load catapult shots when testing catapults on new aircraft carriers, and following major drydock overhauls or major catapult modifications. This testing requires a minimum of 60 dead-load shots each and may occur over a period of several days within 12 n.m. from shore. New carrier testing occurs only once, and major overhauls generally occur on 5- to 7-year cycles in conjunction with drydocking. Major modifications to catapults may occur during an overhaul or pierside and are also infrequent events. Carriers also routinely perform no-load shots when leaving port. The number of no-load shots conducted when leaving port, however, usually do not add enough lubricating oil to the water brake tank to require skimming the oil while the ship is within 12 n.m. from shore.

Analysis

Nature of Discharge: The Water Brake Tank and Post-Launch Retraction exhaust discharge includes lubricating oil, a limited thermal load associated with the heated oil and water (or condensed steam, in the case of the post-launch retraction exhaust), nitrogen (in the form of ammonia, nitrates and nitrites, and total Kjeldahl nitrogen), and metals such as copper and nickel from the piping systems. EPA and DoD analyzed the thermal effects of this discharge and concluded they were unlikely to exceed thermal mixing zone criteria in the States where aircraft carriers most frequently operate. The post-launch retraction exhaust discharge can contain oil, copper, nickel, ammonia, bis(2-ethylhexyl)phthalate, phosphorus, and benzidine in concentrations exceeding State acute water quality criteria. The post-launch retraction exhaust discharge can also contain nitrogen in concentrations exceeding the most stringent State water quality criteria.

Catapult Water Brake Tank and Post Launch Retraction Exhaust Discharge Summary (continued)

Analysis (continued)

The following table lists the concentration of the constituents that exceeded State water quality criteria and the resulting annual fleet-wide mass loadings.

Constituent	Concentration (μg/L)	Annual Mass Loading (lbs)
Benzidine	BDL - 73.5	2.7×10^{-2}
Bis(2-ethylhexyl) Phthalate	BDL - 112.0	1.6×10^{-2}
Copper[*]		
Dissolved	BDL - 49.0	1.1×10^{-2}
Total	BDL - 91.0	1.6×10^{-2}
Lead[*]		
Dissolved	BDL - 12.7	2.9×10^{-3}
Total	BDL - 18.9	3.5×10^{-3}
Nickel		
Dissolved	BDL - 22.0	8.3×10^{-3}
Total	BDL - 34.7	9.4×10^{-3}
Ammonia as Nitrogen	120 - 370	1.4×10^{-1}
Nitrate/Nitrite	300 - 810	3.1×10^{-1}
Total Nitrogen[A]	- -	1.3
Oil	1560000	1275
Phosphorus	BDL - 270	7.1×10^{-2}

[A] *Total nitrogen is the sum of nitrate/nitrite and total Kjeldahl nitrogen.*

BDL = below detection limit

[*] *Assumes the constituents and their concentrations in this discharge are similar in concentration to the constituents found in steam condensate that originates from shore facilities.*

Discussion and Discharge Determination

Discussion: The Navy has imposed operational controls limiting the amount of oil applied to the catapult cylinder during the launch stroke, which directly affects the amount of oil that is subsequently discharged from the water brake tank or during the post-launch retraction exhaust. The Navy has also established requirements prescribing when catapult testing is required within 12 n.m. from shore. These operational constraints minimize discharges of oil from the water brake tank and post-launch retraction exhaust in coastal waters. These existing management practices demonstrate the availability of controls for this discharge. Therefore, EPA and DOD have determined that it is reasonable and practicable to require use of a MPCD to mitigate potential adverse environmental impacts from this discharge.

Determination: A marine pollution control device is required.