



Ensuring the Proper Use of Particle Counters



*Equipment is Essential For Determining
the Condition of Hydraulic Fluid*



The correct use of particle counters can make the difference for meeting the requirements of the Aviation Hydraulics Contamination Control Program.

Background

Proper testing to determine hydraulic fluid conditions is central to the Aviation Hydraulics Contamination Control Program. Although two techniques, particle counters and patch test kits, are currently available, the particle counter is the superior choice. Proper use is also critical

to testing success. Several studies conducted by Fleet activities, notably the U.S.S. Theodore Roosevelt Pollution Prevention Cookbook, have shown that the proper use of particle counters can significantly reduce the amount of time required to monitor the cleanliness of the Navy's aviation hydraulic fluid when compared to the patch test kit. Particle counters can also reduce the amount of hazardous waste associated with the change-out of hydraulic fluid. Continuing environmental regulations on the use of solvents will make the use of patch test kit more problematic in the future.

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The new unit will have an accessory storage case for easy transport



Contaminant controls ensure hydraulic system readiness

The Requirements of the Aviation Hydraulics Contamination Control Program

The requirements of the Aviation Hydraulics Contamination Control Program are outlined in the following instructions:

**Office of the Chief of Naval Operations
Instruction 4790.2H, Volume V Chapter 6
paragraph 6.2 (dated 1 June 2001)**

- c. Stringent contamination control is required at all levels of maintenance to ensure flight safety and the highest degree of hydraulic system readiness. An aggressive hydraulic fluid surveillance program, with sampling/testing accomplished (as required), will ensure hydraulic fluids are maintained within acceptable contamination limits. Maximum acceptable hydraulic fluid particulate contamination levels are Navy Standard Class 5 for aircraft and Navy Standard Class 3 for Support Equipment (SE).

- d. An electronic particle counter is the preferred hydraulic fluid contamination analysis equipment and shall be used when available. The Hydraulic Fluid Contamination Analysis Kit, Part Number 57L414 (or authorized equivalent), may be used when a particle counter is not readily available at the Operational (O) -level or supporting Intermediate (I) -level maintenance activity.

Naval Air Systems Command (NAVAIR) 01-1A-17 Aviation Hydraulics Manual with Rapid Action Change 8 (dated 15 August 1997)

Section 2-23. Electronic Particle Counting. Electronic Particle Counting is the preferred method for measuring particle contamination to be utilized at all levels of maintenance. Electronic Particle Counters such as the HIAC Model or equivalent are the only automated equipment approved for particle counting. Particle counters located in an intermediate-level activity or Navy Oil Analysis Program (NOAP) Laboratory shall be used for testing all hydraulic fluid samples required by the Organizational-level units that the I-level activity or NOAP Laboratory support, unless time of transporting samples or other constraints make this not feasible. Operation of electronic particle counters shall be in accordance with applicable manufacturer's manuals.

Section 2-24. Patch Testing. Activities that do not have access to a particle counter either in their own area or through a supporting I-level unit or NOAP Laboratory shall continue to measure hydraulic fluid contamination by patch testing with the contamination analysis kit 57L414 (08071). Operation of the contamination analysis kit is described in detail in NAVAIR 17-15E-52.





The new particle counter unit being evaluated has a bottle shaker and ultrasonic bath



Particle Counter reduces the volume of waste hydraulic fluids

Current Assets and Logistics Support

Two different particle counters are currently available for use at Fleet activities—the Particle Counting System (part number 8011-3 from HIAC/Royco Pacific Scientific) and the Contamination Monitor (part number CM20.9090USN from UCC, Inc.).

The following table provides the details on the equipment and logistics elements of these two particle counters:

Part Number	Particle Counting System (8011-3)	Contamination Monitor (CM20.9090USN)
Manufacturer	HIAC/Royco Pacific Scientific	UCC, Inc.
National Item Identification Number (NIIN)	00-038-4323	01-433-4830
Typical Application	NOAP Laboratory / I-level Hydraulic	I- and O-levels
In Service (approximate quantity)	60 units	200 units
Technical Manual	NAVAIR 17-15-521	NAVAIR 17-15BF-99
User's Logistics Support Summary (ULSS)	U70097028 (December 1999)	U70094025 (June 1999)
Repair Contract	Yes, for the entire unit.	Yes, for the cradle assembly only.
Provisioning	Yes	Yes
Training	Available via NATEC	Available via NATEC
Calibration Manual	NAVAIR 17-20SX-146	NAVAIR 17- 20SX-151
Calibration Fluid	P/N 0-640-0041 NIIN: 01-452-8967	P/N B82.CAL NIIN: 01-437-5294
Miscellaneous	Includes the 8000A counter, ABS2 bottle sampler and HRDL 400 sensor.	



Eliminates the need for solvent dilution of hydraulic fluids



The new particle counter will require less sampling time than the current units.

Common Problems Associated With Particle Counters

The most common problems identified by Fleet activities that use particle counters have been obtaining consistent results, calibration of the unit and repairing broken equipment. The first two problems can be addressed through proper training. Operators and calibration personnel must have training to insure the successful operation and maintenance of any particle counter. Personnel from the Naval Air Technical Data and

Engineering Service Command (NATEC) have been fully trained and in turn can train fleet personnel upon request. The Support Equipment Program Manager has established repair contracts with the equipment manufacturers. Refer to the User's Logistics Support Summary (ULSS) for logistics support elements and procedures to access them. A copy may be obtained by contacting any of the points of contact listed in this fact sheet.

Implementation Data

The following data summarize the requirements and constraints associated with the use of particle counters.

General	Operators should obtain training prior to performance of any testing. Technique is critical to the successful performance of the test.
Supply System Considerations	Parts provisioning and repair contracts have been established with both vendors. Instructions for the repair contracts are included in the ULSS, which can be obtained from any of the points of contact provided.
Facilities	Both counters require 110V electrical power to operate. Existing facilities (hydraulic shops and/or NOAP laboratories) are usually adequate for use of a particle counter. The sampling should be done in a clean environment to minimize outside contaminants. The footprint for the equipment is small so it will fit in most industrial spaces
Training	Training is required for those personnel who intend to use particle counters. This training may be obtained from NATEC representatives.
Maintenance Planning/Scheduling	Beyond calibration the HIAC unit does not have any scheduled maintenance requirements. The UCC unit's schedule maintenance requirements are defined in Periodic Maintenance Requirements Manual for Electronic Particle Counters (NAVAIR 17-600-206-6-2).
Environmental, Safety and Health Issues	Aviation hydraulic fluid (MIL-PRF-83282) is a hazardous material and should be treated in accordance appropriate procedures.



Future Availability of Particle Counters

In concert with NAVAIR's goal to "providing the right products and removing barriers for getting the job done with greater efficiencies", coupled with increasing environmental regulations restricting the use of solvents has prompted the Support Equipment Program Manager with input from the Type Commanders to initiate a new acquisition for over 700 particle counters. The contract for these units was awarded in May 2003.

Units for Fleet evaluations began in March 2004, and anticipate unit induction to the Fleet to occur in October 2004 to January 2005. The new units will incorporate the lessons learned from the Fleet experience with existing units and will provide the Fleet with a reliable quality instrument for years to come. Below is the list of characteristics of a new particle counter as well as the plan to acquire them.

Characteristics of the New Particle Counter

Sampling

- On-line pressures up to 250 pounds per square inch
- No external air source necessary (new power supplies will be delivered with all necessary connections)
- Bottle sampling requires air source (shop air, air compressor, or CO2 cylinder)
- Sampling time is less than or equal to 15 minutes, including set-up and flushing

Integral Printer/ Unit Display

- Contamination Level displayed in either Navy Standard Class, ISO 4406, NAS 1638, and SAE AS 4059
- Header information includes free areas to record sample specification information
- Unit can store up to 250 sample runs, downloadable via RS232 port, if desired

Portable

- Uses rechargeable batteries (provided) when 115V is not available
- Weighs less than 30 pounds
- Size is less than or equal to 20"W x 14"L x 8"H
- Transportation/accessory storage case is available

Calibration

- Provided by manufacturer

Acquisition Plan

Year	Quantity	Delivery Date	Delivery Rate
FY 2003	13	Pre-production and technical evaluation units only.	
FY 2004	434	October 2004	15/month
FY 2005	309	September 2006	15/month

For more information about the NAVAIR environmental program, visit www.enviro-navair.navy.mil.



www.enviro-navair.navy.mil

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