(NAVY) NAVAIR 17-15-50.1
(ARMY) TM 38-301-1
(AIR FORCE) T.O. 33-1-37-1
(COAST GUARD) CGTO 33-1-37-1

JOINT OIL ANALYSIS PROGRAM MANUAL

VOLUME I

INTRODUCTION, THEORY, BENEFITS, CUSTOMER SAMPLING PROCEDURES, PROGRAMS AND REPORTS

Published by direction of Commander, Naval Air Systems Command under the authority of the Joint Oil Analysis Program Regulation AFI 21-131 (I), AR 700-132 and OPNAVINST 4731.1B.

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0719405

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The following deficiency reports are incorporated as part of this change:

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SECTION I

INTRODUCTION

This volume was prepared under the technical cognizance of the Joint Oil Analysis Program Technical Support Center, Pensacola, Florida. Comments and recommendations pertaining to this volume should be submitted in accordance with instructions in paragraph 1-6.

1-1. Purpose. The Joint Oil Analysis Program (JOAP) was established by the Joint Army, Navy and Air Force regulation as a combined effort to establish and maintain a standard program that would consolidate and coordinate the three separate service oil analysis programs. The purpose of Volume I is to clarify the use of oil analysis as a diagnostic maintenance tool, to standardize JOAP operating procedures and to provide general guidance for JOAP managers and customers in accordance with the Tri-Service Regulation (AFI21-131(I)/AR700-132/OPNAVINST 4731.1B). Specific JOAP Laboratory operating procedures and guidance are contained in Volume II. The JOAP equipment wear-metal criteria listings which contain trend tables and decision making guidance for laboratory use in evaluating oil sample analysis results and determining actions required are contained in Volumes III and IV for aeronautical and non-aeronautical equipment, respectively.

1-2. Applicability. The provisions of this volume apply to all activities of the Departments of the Army, Navy, Air Force and the Coast Guard participating in the JOAP and to laboratories operating under contracts therewith. Laboratory services provided by JOAP laboratories to customer activities will be in accordance with instructions contained in this manual.

1-3. Program Guidance. Guidance for the JOAP and Departments of the Army, Navy, and Air Force Oil Analysis Programs is provided by the following references:

a. Joint Oil Analysis Program:

(1) Tri-Service: AFI-21-131(I)/AR700-132/OPNAVINST 4731.1B Joint Oil Analysis program (JOAP).

b. Military Departments:

(1) Army: AR 750-1 Army Material Maintenance Policy and Retail Maintenance Operations. This publication is contained in the Maintenance Management UPDATE.

(2) Navy: COMNAVAIRFOR 4790.2A Naval Aviation Maintenance Program (NAMP). NAVAIRINST 4731.1B Navy Oil Analysis Program for Aeronautical Equipment.

(3) Air Force: AFI 21-124 Air Force Oil Analysis Program and supplements thereto.

1-4. JOAP Goals. The goals of the Joint Oil Analysis Program are to:

a. Improve the operational readiness and economy of military equipment by the effective use of oil analysis.

b. Collect and analyze technical data in order to:

(1) Increase the effectiveness of oil analysis in diagnosing oil condition and potential equipment failures.

(2) Accumulate engineering data for each phase of a weapon system's or equipment's life.

c. Ensure all Army, Navy, and Air Force oil analysis plans and operations are integrated within the JOAP to provide;

(1) Standardization of analytical techniques, procedures, data collection, calibration standards, and instrumentation/equipment.

(2) Interservice oil analysis support to all military departments.

(3) The most cost-effective means of monitoring the condition of lubricating fluid and fluid lubricated mechanical systems.

1-5. Joint Oil Analysis Program Responsibilities. Responsibilities for each service are delineated in the Joint Oil Analysis Program Tri-service Instruction and the Memorandum of Understanding for Support of the Joint Oil Analysis Program.

a. JOAP Executive Committee - A chartered committee established to provide joint service decisions on the Joint Oil Analysis Program (JOAP). The JOAP-EC is responsible for:

(1) Approving policy and strategic planning for the JOAP.

(2) Providing oversight of the Joint Oil Analysis Program Technical Support Center (JOAP-TSC), including establishment of and provision for personnel staffing levels and funding requirements.

(3) Reviewing tasking provided to the JOAP-TSC by the JOAP Coordinating Group (JOAP-CG).

(4) Being the source of final resolution disagreements among services on oil analysis programmatic matters.

b. JOAP Coordinating Group (JOAP-CG) - A chartered committee established to provide the resolution of routine problems in the JOAP and provide an interface among the services for planning and administering the JOAP. It is composed of all service Oil Analysis Program Managers and the Director of the JOAP-TSC. The Marine Corps, Coast Guard or other participating agencies may be invited as non-voting members of the JOAP-CG to advise the committee on their agency's unique requirements. The JOAP-CG coordinates inter-service planning and procedures for the execution of the JOAP. The JOAP-CG is responsible for:

(1) Providing recommendations to the JOAP-EC on JOAP policy and strategic planning at the semi-annual meetings.

(2) Assuring open communications between the JOAP-TSC and the services' Program Managers to ensure continuity and standardization of policies and procedures within and among the services.

(3) Resolving routine problems occurring among the services and/or the JOAP-TSC.

(4) Assigning non-chartered tasks to the JOAP-TSC.

(5) Making recommendations to the JOAP-EC on joint service long range plans and interservice issues.

(6) Reviewing and recommending changes to the tri-service regulation.

MEMBERSHIP

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Director, Joint Oil Analysis Program Technical Support Center

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c. JOAP Technical Support Center (JOAP-TSC): A jointly staffed organization that is established to provide coordinated fluid analysis and technical support for the Army, Navy, and Air Force. The JOAP- TSC is responsible for:

(1) Producing reference/calibration fluid standards for the JOAP, including development and maintenance of the standard operating procedures for the manufacture and quality verification, ensure periodic validation of reference/calibration fluid standards, control and inventory of both reference and calibration standards, and perform quality assurance and/or acceptance testing on JOAP electrodes or fluids as required on a reimbursable basis.

(2) Conducting a laboratory certification program for the U.S. Armed Forces.

(3) Conducting a laboratory correlation program for the JOAP.

(4) Testing and evaluating non-development (off-the-shelf) equipment for joint applicability as directed by the JOAP Coordinating Group (CG).

(5) Preparing and maintaining technical oversight for the JOAP Manual (NAVAIR 17-15-50, TM 38-01, T.O. 33-1-37, Volumes I through IV) and other JOAP technical documents. Coordinating resolution of service differences and providing changes to the field.

(6) Operation of a JOAP certified laboratory.

(7) Serving as a clearinghouse for technological interchange among the services. This includes, but is not limited to, developing, maintaining, and distributing documents such as the JOAP Manual, oil analysis program directories, correlation reports, customer lists, newsletters, and other documents as needed. Conducting meetings, conferences, and symposiums for the purpose of technological exchange. Coordinating with other agencies, civilian companies, universities and other countries and reporting on emerging technologies. Providing statistical, analytical, management, technical, and other reports to equipment engineers, program managers, field activities, and other service offices.

(8) Providing technical assistance to all participating field activities for instrument operation and maintenance.

(9) Providing guidance and oversight for the curriculum presented in the JOAP operator/evaluator course and other JOAP training.

CONTACT POINT

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d. Laboratories:

(1) Process and evaluate customer samples as soon as possible during normal work hours. Processing and evaluation priority is as follows:

(a) Special aeronautical

(b) Routine aeronautical

(c) Special non-aeronautical

(d) Routine non-aeronautical

(2) Provide recommendations to customer activities based upon analytical results of customer samples.

(3) Participate in the JOAP Correlation Program.

(4) Ensure entry of all laboratory analytical data into the laboratory database, regardless of home service or home base/station for that equipment. In other words, results for oil samples from transient equipment include samples from equipment from the sister services as well as equipment from other bases/stations for the same service as the laboratory.

e. Customers: Customer responsibilities are included in Section III of this volume.

1-6. Manual Change Procedures.

a. General. JOAP manual users desiring technical and or procedural changes shall provide feedback via their appropriate oil analysis Program Manager to ensure coordinated directive updating. The Program Manager will screen proposed changes for validity and forward recommended changes to the JOAP-TSC for technical review and coordination with all service Program Managers and engine/equipment managers, as applicable. Procedural and technical changes are not authorized for program application until formally released.

b. JOAP Manual Update Methods. The Navy is the lead service for publication of this manual; therefore, the following Navy publication change procedures apply:

(1) Revision. A revision is a complete document reissue with all change information incorporated. With the current Internet hosting of the JOAP manuals, the goal is to use complete revisions to avoid the workload of inserting page changes (in addition to RAC'S and IRAC's).

(2) Routine changes. Technical manual changes are the official corrected pages to a portion of an existing document. They consist of replacement change pages for that area of the manual affected by the change action.

(3) Rapid action changes. Rapid action changes are issued in order to provide the operating forces and maintenance personnel with accurate and timely information necessary for mission performance.

(a) Rapid action changes shall be prepared and issued when any of the following conditions exist:

1. Hazards to safety of personnel.

2. Impairment of safety of flight.

3. Aircraft grounding.

4. Mission capabilities adversely affected.

5. Potential equipment damage.

(b) Rapid action changes may be issued as Interim Rapid Action Changes (IRAC) or as formal Rapid Action Changes (RAC). Interim Rapid Action Changes are issued as Naval messages to expedite the release of urgent and essential operational and maintenance change information. Army and Air Force Program Management offices are responsible for retransmission of IRAC's to appropriate service addresses.

(c) Formal Rapid Action Changes are issued as insert change pages prepared in the same style and format of the technical manual being changed and as a replacement for an IRAC. A Formal RAC or routine change containing IRAC change material must be issued within one year of the release of an IRAC.

NOTE

All four volumes of the JOAP Manual are on-line at: http://www.natec.navy.mil. Registration is required to use the site, including entering a user name and obtaining a password for access. Be prepared to enter a Distribution Account Code (DODAC). Each installation has a unique code. Check with the local supply representative for the correct DODAC number to use. Some users, depending on the laboratory status (contractor, allied, etc.) may have to submit special paperwork to NATEC to obtain access. Generally, if your e-mail address ends with ".mil", registration should be quick and easy. Contact the trouble desk (see information below) to get help with registering on-line or inquire about any special registration requirements. Ensure that Adobe Acrobat 5.0 or higher is used. If an upgrade is required, use the site link for downloading the latest Adobe Acrobat version. Without at least version 5.0, the manuals may not display correctly.

JOAP Manual Designations by Service:

US Army	TM 38-301-1/-2/-3/-4
US Navy	NA 17-15-50.1/.2/.3/.4
US Air Force	T.O. 33-1-37-1/-2/-3/-4
Coast Guard	TO 33-1-37-1/-2/-3/-4

Navigation at the NATEC site: Once at the site, click on "NATEC Login". Enter your user name and password. Then using the third entry box on the left, enter the technical order number for your service, such as 33-1-37 for US Air Force, 17-15-50 for US Navy, or 38-301 for US Army. Do not use the "T.O." ,"NA" and "TM" prefixes or no match will be made. Regardless of which of the three number series are used, the same manual links will be displayed. By leaving off the "-1" or ".1", links to all four volumes and IRAC's will be seen. Click on the link for the particular volume desired. The manuals can be saved to your computer if desired. With the mouse pointer on the manual link, click on the right mouse button. An option will be displayed to save the file. Just select where you want it saved on your computer. **All users of the JOAP Manuals are required to check the website at least every 30 days for possible changes**. Once a volume is opened, a useful tool when looking for a particular item is the use of "Ctrl/F". Enter the search word and all matches will be displayed.

Points of contact at NATEC:

Trouble Desk:	DSN: 735-2994 Comm: 619-545-2994
Compact Disk Copies	Mr. Douglas Harder DSN: 735-3088 Comm: 619-545-3088 e-mail: douglas.harder@navy.mil

1-7. Requirements for Procurement, Relocation and Repair of Oil Analysis Equipment. All requirements for procurement, relocation or repair of oil analysis spectrometers and ancillary equipment shall be submitted to the appropriate Service Program Managers in sufficient time to allow inter-service coordination of the action, if required. Detailed instructions for obtaining repair of spectrometers are contained in Volume II.

NOTE

During periods of shutdown such as shipyard repair or shop renovation, laboratory managers will ensure that JOAP laboratory personnel protect the spectrometer with a plastic covering. Seal off the spectrometer from possible contamination for dust and/or water by using tape to secure the plastic covering.

The AFOAP office advises labs request a waiver through owning MAJCOM to simulate movement of OAP assets during exercise/ORI. MAJCOMs will grant waivers on a case by case basis. Each MAJCOM will approve/disapprove simulations as they see fit with consideration given to number of units available for exercise, current wait time to repair, availability of funds if damage occurs, value-added training from movement of assets, current ops tempo, set-up/tear-down experience, etc.

1-8. Relocation of Oil Analysis Using Organizations/Customers. Any time that an oil analysis customer relocates, either deployed or permanently, and oil analysis services are required at the new location, the transfer of workload and provision of services shall be handled through the normal chain of command in order to ensure orderly transfer of support. Unusual problems encountered should be referred to the appropriate service oil analysis Program Management office for resolution.

a. When it is known that away from home base oil analysis support will be required on extended duration transit flights, transferring customers are responsible for obtaining complete oil analysis records for their equipment from the losing laboratory and for delivery of the records to the gaining laboratory at the new operating site. If sufficient time is not available to comply with these procedures prior to departure, the customer shall notify the losing laboratory concerning the relocation and the losing laboratory shall mail or electronically transfer all required oil analysis records to the gaining laboratory.

b. Deployment/Permanent Relocation. Transferring activity (Customer). The customer activity is responsible for notifying the home base supporting oil analysis laboratory concerning transfer/deployment schedules in advance of departure. Advance notice is required in order to provide the laboratory sufficient time for orderly processing of records for transfer to the new supporting laboratory to avoid disruption in equipment oil analysis monitoring schedules. The losing laboratory will forward equipment oil analysis records directly to the receiving laboratory unless directed otherwise by competent authority. The losing laboratory shall ensure that each equipment record transferred is complete, accurate and legible. When the customer returns to home base, records of analysis done at intermediate locations must be delivered to the regular supporting laboratory. If the customer departs prior to receipt of the completed record, the intermediate laboratory will forward the completed record to the regular supporting laboratory.

1-9. Requests from Foreign Countries. Requests from foreign agencies for JOAP technical information, assistance, equipment, spare parts, consumable supplies, etc. under Mutual Assistance Programs (MAP), Foreign Military Sales (FMS), Grant Aid Programs or other mutually beneficial programs should be addressed to the nearest United States Military Advisory Group for consideration and/or processing. Requests from foreign countries for participation in the JOAP Correlation Program are addressed in Section IV of this volume.

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SECTION II

OIL ANALYSIS THEORY AND BENEFITS

2-1. Spectrometric Oil Analysis. Spectrometric oil analysis is a diagnostic maintenance tool used to determine the type and amount of wearmetals in lubricating fluid samples. Engines, transmissions, gearboxes, and hydraulic systems are the types of equipment most frequently monitored. The presence of unusual concentrations of an element in the fluid sample can indicate abnormal wear of the equipment. Once abnormal wear is verified, the equipment may be repaired or removed from service before a major failure of a fluid wetted component occurs. Spectrometric oil analysis enhances personnel safety and material readiness at a minimum cost, and serves as a decisive, preventive maintenance tool.

2-2. Physical Property Testing. Lubricant physical property testing provides data on conditions that are standards of measurement for judgment of the quality of the oil. Physical property tests aid in determining degradation or contamination of the lubricant which occur from combustion blow-by, oxidation from overheating, moisture from coolant leaks, additive depletion, etc. Physical properties testing of used lubricants is primarily utilized in ground and ship equipment applications but may also have some beneficial application to aeronautical equipment as an adjunct to spectrometer testing.

2-3. Benefits of Oil Analysis. Data from spectrometric and/or physical property testing may be used as guidelines to assist in identifying incipient mechanical failures or in determining the quality and useful life of the oil. Thus, potential equipment component wear or failure and premature lubricant failure may be detected prior to a major equipment failure or an expensive repair/rebuild. Oil analysis may also be used to identify inadequate or improper maintenance procedures and unsatisfactory equipment parts/components/assemblies.

2-4. Wearmetals. Wearmetals are generated by friction between moving metallic surfaces in mechanical systems. Despite lubrication, wear-metal generation occurs in all oil wetted systems to some degree and the lubricant serves as a repository for the wearmetals. Wearmetals may also be generated from corrosive action resulting from moisture and electrolytic action within lubricated systems. Thus, information related directly to the condition of the assembly exists in the circulating lubricating fluid. This conclusion is developed as follows: first, the metal particles rubbed or gouged off the metal alloy surfaces will always have the same chemical compositions as the alloys from which they came; second, the normal level and rate of production of each kind of metal particle can be established for each type equipment through oil analysis over a period of time. Thus, when an abnormal level and/or rate of production of wearmetals is detected, the chemical identity of the abnormally produced particles will provide clues concerning the identity of the parts being worn. Some metallic elements will specifically identify an impending problem while others provide only general information that abnormal wear is occurring, For example, increased quantities of iron are quite common since iron is present in many component parts and the skill and knowledge of the evaluator is important in diagnosing equipment condition and the source of wearmetal. On the other hand, increased quantities of an uncommon element such as silver may pinpoint the trouble area directly to a single part. For a normally operating piece of equipment, wearmetals are produced at a constant rate. In some cases, the rate may be negligible, but this rate is similar for all normally operating equipment of the same model. The wear-metal concentration will also increase at a constant rate for a normally operating, completely enclosed system with no fluid consumption. A theoretical plot of wear-metal concentration in parts per million (PPM) vs operating hours is represented in figure 2-1. Any condition which alters the normal relationship or increases the normal friction between moving parts will generally accelerate the rate of wear and increase the quantity of wear-metal particles produced. An abnormal condition of this type will sharply increase the concentration and rate of buildup of wearmetals in stable fluid systems. If the condition is not discovered and corrected, the deterioration will continue to accelerate, usually with major secondary damage to other parts of the assembly, resulting in the eventual failure of the entire assembly. (Newly overhauled assemblies may tend to produce wearmetals in higher concentrations during the initial break-in period.)

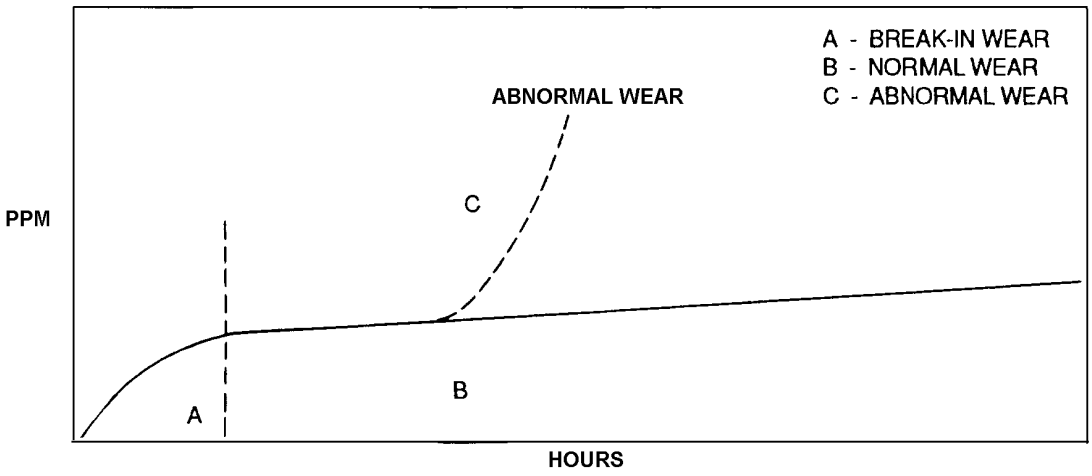

Figure 2-1. Wearmetal Concentration Vs. Operating Hours

2-5. Identification and Measurement of Wearmetals. Wearmetals produced in fluid lubricated mechanical assemblies can be measured in extremely low concentrations by spectrometric analysis of fluid samples taken from the assembly. The analytical instrument currently used for spectrometric oil analysis by the services are atomic emission rotrode instruments.

a. Atomic Emission Spectrometer. An emission spectrometer is an optical instrument used to determine the concentration of wearmetals in lubricating fluid. The analysis is accomplished by subjecting the sample to a high voltage spark or plasma which energizes the atomic structure of the metallic elements, causing the emission of light. There are two commonly used types of emission spectrometers, Atomic Emission Rotrode (AER), and Inductively Coupled Plasma (ICP). Laboratories certified under the Joint Oil Analysis Program utilize the AER spectrometer. The emitted light is subsequently focused into the optical path of the spectrometer and separated by wavelength, converted to electrical energy and measured. The intensity of the emitted light for any element is proportional to the concentration of wear metal suspended in the lubricating fluid.

b. Atomic Absorption Spectrophotometer. An atomic absorption spectrophotometer is an optical instrument used to determine the concentration of wearmetals in the lubricating fluid. The sample is aspirated into a flame and vaporized. The molecular structure of the wear-metal compounds is reduced to ground state atoms by the high temperature. Light energy having the same characteristic wavelength of the element being analyzed is radiated through the flame. The resultant light which is not absorbed is converted to electrical energy and measured electronically. The amount of light absorbed by the elements in the flame is proportional to the concentration of wearmetal suspended in the lubricating fluid.

2-6. Spectrometric Limitations. The spectrometric/spectrophotometric fluid analysis methods detect only small particles and are effective in detecting those failures characterized by an abnormal increase in the wear-metal content of the lubricating fluid. This is particularly true of failures that proceed at a rate slow enough to permit detection by the laboratory. Examples of both detectable and undetectable failures are listed below.

a. Detectable Failures.

(1) The following are good indicators of impending engine/component failure:

(a) A slow, progressive wear-metal concentration buildup above established abnormal criteria

(b) A series of rapid wear-metal concentration increases occurring below established abnormal criteria.

(2) Typical sources of wear found in detectable failures.

(a) Jet/Turbine Engines. Worn bearings (balls, cages, races), bearing seals and retainers, bearing housings, constant speed drives, oil pump gears, and gearbox castings.

(b) Reciprocating/Internal Combustion Engines. Worn bearings, crankshafts, cylinder walls, oil pump gears, piston pin bushings, piston rings, push rods, rocker arms, valve guides, and valve springs.

b. Undetectable Failures.

(1) Catastrophic failures. Sudden failures not preceded by characteristic wear-metal generation, such as fatigue failure, cannot be detected by spectrometric oil analysis techniques now in use.

(2) Failures with no wear-metal indications. Equipment failure may occur when metal particles too large to be detected by spectrometric methods are generated without the accompanying normal wear-metal generation pattern that oil analysis is designed to detect.

2-7. Practical Considerations.

a. Sample Integrity. The value of spectrometric analysis and the subsequent utilization of this analysis by the evaluator is based on the assumption that the oil sample is representative of the system from which it was taken. If the oil is not truly representative of the system, the analytical results are totally useless. Occasionally, samples from one component may be erroneously substituted for another, resulting in what may at first appear to be a developing wear condition for one of the components. Closer inspection of results will often reveal these discrepancies. Any sudden increase of wearmetal in one component and decrease in another, within the same weapon system/end item, should be viewed as a problem related to mislabeling of samples, i.e., misidentifying a sample as an engine sample when it was actually a transmission, or reversing left and right engine samples.

b. Contamination. Contamination is the problem that most frequently affects sample integrity. Sharp increases in the concentration of wearmetals, water, unusual color, and particulate matter may be indications of contamination, and additional samples may be required to establish the true wear-metal baseline. In some cases, systems may have to be flushed one or more times to remove contaminating substances. The most common contamination found in lubricant systems is dirt and sand which is detected by an increase in silicon. Silicon contamination is a common problem in dry, sandy, or dusty operational areas. Once in the component, dirt and sand are abrasive, and may accelerate wear.

c. Type of Spectrometer. The type of instrument being used to analyze fluid samples has a direct effect on the analytical result and must be considered. The analytical results from an inductively coupled plasma or atomic absorption spectrophotometer will generally be lower than the value that would be given by an atomic emission rotrode instrument for used oil analysis.

d. Calibration Standards. Calibration standards which are used to standardize the spectrometer have an assigned shelf life. Standards which have exceeded the allowable shelf life may introduce errors into the analytical process that may not be readily detected, particularly if all standards on hand have degraded over the entire standard range of PPM. Calibration standards should be checked for signs of precipitation as an indication of degradation. Refer to Volume II for detailed information concerning calibration standards.

e. Additives. New lubricating fluids normally do not contain any metallic compounds or constituents that would interfere with spectrometric identification and measurement of the wearmetals produced by operation of the major assembly. Occasionally, lubricant manufacturers will use a metallic compound as a fluid additive. Although such additive compounds may only contribute a small amount of metal/chemical to the lubricant, it is necessary for the laboratory to recognize this source of trace materials. An analysis of a sample of new fluid can be used to establish a baseline for determining actual concentration of wearmetals.

f. Corrosion. Internal equipment corrosion may become a factor in oil analysis when water is allowed to contaminate equipment lubricating fluid. Helicopter gearboxes are particularly susceptible to water-induced internal corrosion because of design features that frequently do not protect against water intrusion. Evaluators must be familiar with the corrosion mechanism because corrosion products may easily be mistaken for impending failure indications and the equipment may be unnecessarily removed from service.

g. Fuel Dilution. Engine oil-lubricated systems using leaded gasoline sometimes become contaminated through oil system fuel dilution. Analytical results indicating a high concentration of lead are a good indication that the system is fuel contaminated.

h. New/Rebuilt Engines/Components. New or recently overhauled equipment tends to produce wearmetals at an accelerated rate. During this break-in period, evaluation maybe difficult since wear-metal production maybe higher than normal. The break-in period is about 20 hours for jets, gearboxes and constant speed drives (CSD's) and about 100-200 hours (depending on RPM) for reciprocating engines. Curves A and B in figure 2-2 show typical plots of operating hours versus wear-metal concentration for most new/rebuilt equipment. After break-in is complete, an oil change may be necessary to reduce wear-metal concentration to normal levels so evaluation criteria can be effectively utilized.

i. Patterns of Wear. Note that in figure 2-1, the wear-metal concentration level continued to increase gradually as the equipment continued in operation. In actual practice, this may not happen because of the effect of fluid consumption and the replenishment of lost fluid by new fluid. Fluid replenishment usually causes the wear-metal concentration level in a normal engine to "level off" and remain steady. If fluid were replaced as it was lost (rather than at discrete intervals, as is the actual practice), the effect of this oil replenishment on the wear-metal concentration level would be as shown in figure 2-2. In this hypothetical example, the wear-metal concentration level reaches its steady state following the break-in period and then remains fairly constant. This steady state point is a function of two variables: (1) the rate of fluid consumption and replenishment, and (2) the rate of wearmetal production by internal friction within the equipment. Theoretically, a steady-state condition is never reached but is only approached as a limiting condition. In practice, the steady-state point varies due to changing rates of fluid consumption and wearmetal production.

j. Effects of Fluid Loss/Addition/Change. The smooth curve of figure 2-2 shows the hypothetical result if fluid was replaced as it was lost. This, of course, is impossible for most items of equipment. Figure 2-3 shows the effect of periodic fluid addition and a fluid change. In components such as some reciprocating engines, where oil depletion is rapid and replenishment is frequent, concentrations of wearmetals will change erratically. Under these conditions it is best for the oil sample to be taken for analysis just prior to the addition of new oil. An accurate record of time since last oil change or oil addition is a requisite for the evaluator, as he may be misled if this information is incorrectly reported. Eight parts per million iron at 50 hours since oil change may be normal for a turbine engine; however, eight parts per million at 2 hours since oil change may indicate impending failure.

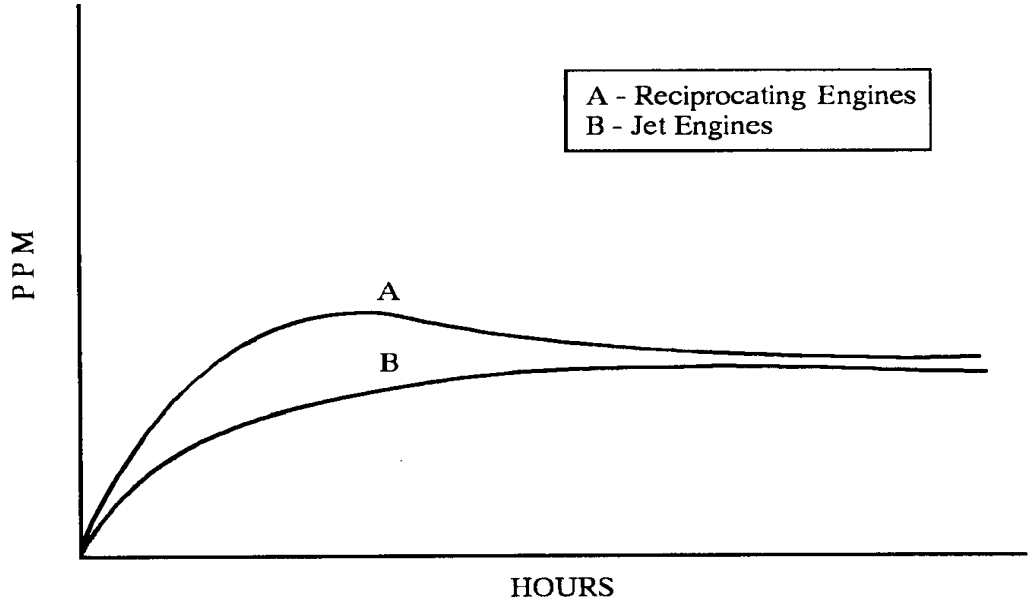

Figure 2-2. Wear-metal Concentration vs. Operating Hours

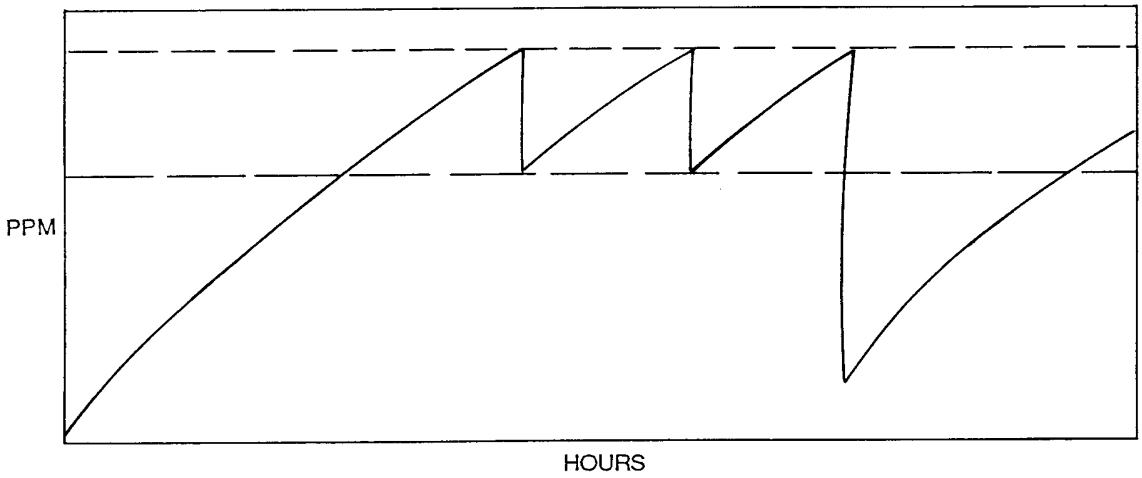

Figure 2-3. Effect of Periodic Fluid Addition and Fluid Change

k. Evaluation Information. Time since new or overhaul must be reported correctly, and the evaluator must remain alert to detect any inconsistencies in these data. When necessary, the customer must be contacted to check on the validity of any suspect values that affect the evaluation. The reporting of an incorrect time for the component may cause the evaluation to request a component removal rather than an oil change or reducing the sampling interval. It is also important that information on component maintenance be reported and considered in the evaluation process.

l. Filter/Screen Checks. Information regarding the examination of filters or screens during routine equipment servicing can often augment spectrometric analysis. Large particles accumulated on filter screens may or may not be accompanied by high spectrometric wear-metal indications. Normally, the wearmetals detected and measured by spectrometric analysis are too small to be trapped on a filter screen. Therefore, visible particles on the screen and high wear-metal content (spectrometric) may be detected independently. When large metal particles are detected in the oil system, either on filters or chip detectors, the source of the metal should be determined, if possible, or the equipment should be placed on shorter chip detector/filter inspection and/or oil sampling intervals.

m. Operating Conditions. The mission profile concerns the load factor and manner in which the equipment is operated. Generally speaking, equipment that operates at high percentages of maximum load at all times, will show a higher concentration of wearmetals. Extreme operating load factors invite engine and power train problems. Under normal loads and less demanding conditions, most equipment operates at lower, more stable wear-metal concentration levels. Equipment operated intermittently may exhibit symptoms associated with corrosion.

n. Feedback. Operating activity feedback containing maintenance or operating information that may affect the oil analysis results must be included in the evaluation process. For example, a sudden increase in wearmetals may indicate a severe wear condition, but may also indicate that maintenance was performed on the component since the last sample was taken. Overboosts, overspeeds, overtemps, cylinder or rings replaced, overtorque, vibration, corrosion found, repair or adjustments on components, color of oil, mission profile information, compressor stalls, unusual noises from the component and filter/screen and chip detector inspections are all bits

of information that will assist the evaluator in making a maintenance recommendation. Incorrect reporting or omission of even the most routine feedback information could adversely affect the evaluator's decision. Oil additions can distort developing wear trends and therefore affect evaluator decisions. The addition of oil between samples may result in abnormally low wear-metal results if the sample is taken immediately following an oil addition. This may be particularly misleading if it occurs when a sample has been requested to verify high results from a previous sample. **Tank/sump draining actions done by the customer to reduce or eliminate wear-metal levels will distort trends or mask actual conditions and are prohibited unless coordinated with the monitoring laboratory**. All of the above information may affect oil analysis results and should be promptly reported to the laboratory. Details concerning oil analysis feedback requirements and procedures are contained in Section III of this volume.

2-8. Physical Properties Identification and Measurement. The physical properties of lubricating fluids are altered as lubricants degrade and/or become contaminated through service time and temperature, operational conditions and faulty maintenance practices. Important physical properties of lubricants are viscosity, moisture content, flash point, particulate level (solids), acidity/alkalinity and additive content. Physical property tests measure contaminants such as water, atmospheric dirt, fuel, combustion blow-by products, and suspended particulate matter commonly found in used crankcase oils. A brief description of the physical test methods currently in use follows. The specific methods of analysis used to measure the various physical properties of used engine oils are included in Volume II. Physical properties tests on lubricants may be selectively applied to service equipment as determined by applicable service Program Managers.

a. Viscosity. Lubricating fluids are affected by high temperatures and aeration during service which promote oxidation. This oxidation, if allowed to continue indefinitely, leads to increased viscosity, varnish and sludge. Viscosity decreases are usually attributed to fuel dilution. The viscosity of used lubricating fluids is determined by a viscometer which provides results/data that are converted to absolute viscosity and density readings in centipoise x g/cm3. These readings may be compared to new oil viscosity specifications and provide an indication of used oil condition.

b. Blotter Spot Test. This test is used to determine the presence of sludge in crankcase oils. One or two drops when placed on a piece of blotter paper and allowed to spread will provide information on the presence of sludge, the depletion of oil additives and/or moisture. The test is a rough estimate of sludge quantity but not of its identity.

c. Moisture Testing. Moisture or free water in an oil causes sludge formation In the crankcase and prevents proper lubrication. Excess water causes flashing of metal surfaces under hot operating conditions, and can cause engine failure. Moisture or free water in a transmission causes sludge formation or corrosion. Heat transfer fluids and dielectric fluids require careful treatment due to their sensitivity to moisture, particulate and ion contamination which can adversely affect equipment operation and degrade the fluid Insulating properties. Water or moisture may be determined by either of the following methods:

(1) Crackle Test. The crackle test is a qualitative test used for screening oil samples for the presence of water contamination. After vigorous shaking, one or two drops of the used oil sample are dropped onto the surface of a laboratory hot plate which has been heated to 150-177 degrees C (300-350 degrees F). A positive test is indicated by an audible crackling and spattering of the oil. Use of this test in conjunction with other tests can be used to identify probable sources of water contamination.

(2) Karl-Fischer Method. The Karl-Fischer method utilizes an automatic coulometric titrator that determines the quantitive amount of water in various fluids (transmission, heat transfer, dielectric, etc.). This is an electrochemical technique. A measured amount of sample is added to a cell containing a sensing electrode in a chemical medium. If water is present, the sensing electrode causes the cell to generate iodine. When the sensing electrode indicates no water is present, iodine production stops. The electrical charge used to generate the iodine is proportional to the concentration of water. The test functions automatically and provides a readout of the electrical charge used which is converted electronically into an indication of water content of the sample in PPM or in percent by volume/weight.

d. Fuel Dilution (Flash Point). Fuel dilution may be determined by flash point or by measuring fuel vapor in the sample headspace. The flash point is a means of determining if used lubricants are contaminated with diesel or gasoline fuel. The flash point method measures the reduction of flashpoint in the oil. The headspace analysis uses surface wave acoustic measurement to determine the percentage of fuel vapor in the headspace.

e. Insoluble Debris Characterization (Microscopic Analysis). Insoluble debris, collected by filtration on a membrane filter, are examined microscopically to determine their significance with respect to wear and contamination. Some contaminants such as metal chips or dirt may provide Indications of the source of the contaminants. This may be of particular value in the quality control of high performance fluids or in early detection of imminent failures.

f. Particulate Contamination. Measuring particulate contamination provides the quantity and size of particles present. Large particles are generally ingested dirt while smaller particles are usually generated from the system itself in the form of wear debris.

g. Fourier Infrared Transform Spectrometer (FT-IR). The FT-IR spectrometer system quantitatively measures water, fuel, coolant, soot, and by-products in synthetic and petroleum based lubricants. It also monitors component's lubricant additive depletion, lubrication degradation, and incorrect oil contamination for predicting a variety of fluid conditions that lead to component failures.

h. Debris/Wear Particle Analysis (Ferrographic analysis). Ferrography is a means of microscopic examination of component wear particles suspended in fluids. The ferrographic analysis of wear particles begins with the magnetic separation of wear debris particles suspended from the lubrication fluids. The primary element evaluated is iron (Fe). There are two basic types of ferrographs to evaluate wear particles: The analytical ferrograph system and the Direct Read (DR) ferrograph. The analytical ferrograph allows visual analysis for wear particles to be identified by type and characteristics of the wear. The DR ferrograph is used to obtain numerical baseline values for normal and abnormal wear.

i. Filter Debris Analysis. Filter Debris Analysis consists of backwashing an oil system filter with solvent, capturing the debris or portion thereof, and analyzing the debris by Energy Dispersive X-Ray Analysis.

SECTION III

CUSTOMER RESPONSIBILITIES, REQUIREMENTS, AND PROCEDURES

3-1. Importance of Oil Analysis at Customer Level. The stated purpose of the oil analysis program is to detect changes in the condition of used oil and other fluids, to detect unusual wear and to predict impending equipment failures. At the customer level this can be translated into improved equipment operational safety and reliability and increased maintenance effectiveness through performance of the right maintenance, at the right time at the lowest maintenance level consistent with good maintenance practices. An effective oil analysis program can also enhance maintenance workload planning by early identification of unscheduled maintenance requirements, improve the quality of maintenance and equipment operating practices, and result in improved maintenance procedures and equipment design as a result of oil analysis feedback information. Feedback is an extremely important element of the oil analysis program. Feedback is that information passed between all activities involved in the oil analysis program concerning conditions that may affect or influence either the oil analysis sample evaluation process and/or the resulting recommendation for maintenance action. Feedback may result in engineering change decisions that affect the safety, reliability or maintainability of operating equipment. Feedback from the oil analysis process also provides the basis for improved troubleshooting assistance from the supporting laboratory as data are compiled relating sample results to a particular component that may be generating abnormal wear metals. The refinement of this process on some equipment has resulted in the ability to correct problems by component replacement at the organizational level rather than removal of the equipment for overhaul. Feedback concerning increasing contamination trends on a specific item of equipment has also assisted in improved operational planning, for example, restricting an aircraft from cross country flights to avoid the possibility of an engine change at a remote site, until the problem causing the increasing trend is identified and corrected. Feedback also creates a dynamic evolution of the criteria used to evaluate oil samples. This process ensures that the criteria applied to detected oil condition changes are more accurately related to actual equipment condition, thus reducing the possibility of premature, unwarranted equipment removals from service, while ensuring that criteria levels are low enough to ensure equipment operating safety. Probably the most important element of the feedback system to the customer is the laboratory recommendation for maintenance action following analysis of the customer's oil sample. Oil analysis laboratory recommendations are the result of careful trending and in-depth analysis of equipment history and should normally be followed. However, it is ultimately the customer's responsibility to decide what action to take in regard to any recommendation from the JOAP laboratory. A customer representative must work closely with the supporting oil analysis laboratory to ensure adequate maintenance procedures are implemented which will result in reduced maintenance costs and increased operational and personnel safety. See Appendix A for descriptions of all laboratory recommendation codes.

3-2. Customer's Responsibilities. Customer responsibilities are as follows:

a. Establish a system of internal accounting/record keeping to ensure that all samples for equipment entered in the oil analysis program are taken correctly and on time in accordance with applicable directives, to ensure that all samples are correctly identified, with accompanying paperwork correctly completed, and to ensure that all samples are expeditiously forwarded to the supporting oil analysis laboratory.

b. Ensure that all personnel involved with the oil analysis program are properly trained in their duties and thoroughly aware of the importance of, and the benefits to be obtained by, an effective oil analysis program.

c. Ensure that timely response is made to laboratory requests for samples or laboratory recommendations for maintenance actions and that prompt and complete feedback is provided to the laboratory concerning any condition or maintenance action that may affect the condition of the equipments' oil system. Customer feedback includes any internally generated maintenance action as well as those maintenance actions performed as a result of laboratory analysis reports or recommendations.

d. Designate a unit point of contact to monitor activity compliance with oil analysis requirements and to establish close liaison with the supporting oil analysis laboratory for all matters relating to activity support and equipment condition.

3-3. Laboratory Support of Customers. JOAP policy requires all JOAP laboratories to provide non-reimbursable routine support to all DOD and U.S. Coast Guard transient customers and permanent customers in each JOAP certified laboratory's assigned area of responsibility. . The JOAP laboratory listed in Appendix B closest to an activity's area of operation that is capable of providing the most responsive support will normally support operational activities. Activities experiencing any problems with laboratory support or anticipating changing supporting laboratories due to change of operating site should request guidance via the normal chain of command. The Major/Type Command, the laboratory's parent command and the appropriate service oil analysis Program Management office will coordinate assignment or transfers of customers between laboratories. Interservice laboratory support workload matters should be coordinated through the appropriate service chain of command directly to the service Program Management office. Customers desiring to obtain oil analysis support from an oil analysis laboratory not currently approved and qualified within the Joint Oil Analysis Program must submit a request through the chain of command to the appropriate service Program Manager. The following information will be provided:

Laboratory name/location and affiliation
Type spectrometer
Type standards
Laboratory operator qualifications
Description of support work to be performed
Details of proposed support agreement

Service Program Managers may approve such laboratories if they qualify for entry in the JOAP Correlation Program in accordance with paragraph 4-3. Laboratories may be approved for interim operational support by the appropriate service Program Manager(s) following successful completion of analysis of three special sets (six pairs) of correlation samples as specified in paragraph 4-3.e. Laboratories shall then be entered in the JOAP Correlation Program and receive final Program Manager approval or disapproval based on Correlation Program performance results.

a. All Navy laboratories, if equipped and capable to do so, shall process samples submitted to them by any DOD customer. Refusal to do so may be considered sufficient cause for laboratory to be decertified from the JOAP program.

3-4. Sampling Intervals. Sampling intervals have been established for specific equipment based upon engineering design, average wear rates, projected failure points, and the hazards related to potential system/equipment failures. Therefore, equipment sampling should be closely monitored for compliance with established intervals. The sampling interval should not vary more than plus or minus 10 percent of that specified for each Type/Model/Series of equipment except as modified by appropriate equipment managers.

NOTE

Samples may be taken earlier than the specified interval if adjustment to engine sampling time is required to permit simultaneous engine sampling on multi-engine aircraft. However, limits may not be exceeded to adjust sampling times.

Refer to the applicable scheduled maintenance or periodic inspection documents for the specific routine sampling interval and specific sampling instructions for each Type/Model/Series equipment being sampled.

3-5. Sampling Procedures. The success and effectiveness of the oil analysis program is dependent upon reliable samples. A reliable sample is one, which is truly representative of the circulating fluid in the equipment being evaluated.

a. When to Take Samples. Samples should be taken as soon as possible but within 30 minutes (Air Force Only) of engine/equipment shutdown and before any fluid is added to the system. An exception to this requirement is non-aeronautical equipment oil samples. If fluid was not added following shutdown, these samples may be taken without warming a component to operating temperature if the equipment has been operated within the last 30 days. If not operated within the last 30 days, the equipment must be brought to operating temperature

before sampling. (Army personnel sampling nonaeronautical equipment should refer to DA Pam 738-750 for additional oil analysis procedural information.) If a sample must be taken from a unit after new oil has been added, e.g., if oil level is too low to permit sampling or if laboratory requests a special sample following oil addition and prior to equipment operation, the old and new oils must be thoroughly mixed to obtain a homogeneous mixture by operating the unit to operating temperatures before taking the sample. In systems where system oil temperature is not an operating characteristic, a judgment of operating time required to obtain a homogeneous mixture must be made based upon system characteristics such as system capacity, pump volume output, reservoir capacity, etc. These procedures are necessary since any sample taken from a system in which the fluid is not a homogeneous mixture will not be representative of actual fluid condition and may distort the laboratory trend for the equipment and may result in a resample request from the laboratory.

(1) Routine Samples. Routine sampling intervals shall be as specified in appropriate service documentation governing operation and maintenance of each Type/Model/Series equipment. Cognizant Weapon System/Model Engineering activities establish and maintain sample interval documentation to provide effective oil analysis coverage.

(2) Special Samples. Special samples from equipment monitored by the service oil analysis programs will be taken in accordance with the following guidelines:

(a) Whenever requested by the laboratory.

(b) Whenever directed by the unit maintenance activity to investigate suspected deficiencies.

(c) Immediately following an operation in which any abnormal condition or incident occurred resulting from either malfunction of the oil lubricated system, or damage to the oil lubricated system from excessive loss of engine oil, or low/fluctuating or zero oil pressure.

(d) Immediately prior to and after maintenance is performed affecting the oil lubricated system, including the removal and replacement of an oil lubricated system component. Systems, which are sampled after each flight, do not require samples taken prior to maintenance, provided an analysis was accomplished after the last flight. The "after replacement" sample should be taken after ground/functional run-up or check flight.

NOTE

Special sampling is not required for maintenance performed on oil pressure or quantity indicating systems where it is determined that only the instrument system components are faulty and where repair, replacement and/or failure of these components will not cause damage to oil wetted components or cause wear-metal particles, foreign material and/or instrument system fluids to be introduced into the oil system.

(e) After flight test following installation of new, overhauled, or repaired aircraft engines.

(f) At completion of a test cell run. If unit is operated on oil previously used in the test cell system, a sample is required both prior to and at the completion of the test cell run.

(g) Whenever excessive vibration or a chip light indication is experienced on an aircraft engine or component during flight, ground or test run.

(h) Immediately following all aircraft incidents involving failure of internal enclosed lubricated parts or unplanned/unexpected shutdown affecting operation of internal enclosed lubricated parts.

(i) Immediately following all aircraft accidents regardless of cause and resulting damage. These samples will be taken by any means possible to obtain a representative sample.

(j) Prior to overseas deployment or redeployment of any equipment already being monitored by oil analysis. Samples should be taken far enough in advance to assure receipt of analysis prior to unit deployment

or redeployment. A sample prior to departure is not required if: (1) the aircraft is on routine sampling; and (2) oil analysis records will accompany the aircraft; and (3) the normal sampling interval can be maintained due to the availability of an oil analysis facility at the destination.

(3) Additional Special Samples. Special samples taken from equipment not enrolled in a service oil analysis program may be submitted to a JOAP laboratory. No advice is provided for samples that do not have limits provided to JOAP by the cognizant engineering activity.

b. How to Take Samples. There are three basic techniques for taking a sample; dip tube, drain/valve, and pump. Detailed sampling procedures for specific equipment are established in applicable service documentation governing the use and operation of such equipment.

(1) Dip Tube Sampling.

(a) Remove the filler cap/dip stick from the tank and open the sample bottle.

(b) Using a sampling tube of the correct length, grasp the tube at one end and lower it into the tank through the filler neck (see figure 3-3, Views A and B). For units using the new sampling kit with the plastic bottle, insert one end of the dip tube into the opening on the cap of the plastic bottle. Insert the other end into the oil reservoir. Squeeze and release the bottle. After the sample is obtained, remove the tube and close the lid.

WARNING

Do not use mouth suction to fill the sampling tube. Many fluids are highly toxic and may cause paralysis and/or death.

(c) Allow the lower end of the tube to fill with fluid, then close the upper end with a thumb or finger. Withdraw the tube and drain the trapped fluid into the sample bottle (see figure 3-3, Views C and D). Repeat this operation until the bottle has been filled to approximately 1/2 inch from the top.

NOTE

The plastic sampling tubes may be received curved and difficult to straighten; but a tube straightener can be fabricated and used for taking samples from many systems. An example of a tube straightener constructed with 3/32-inch diameter stainless steel rod is illustrated in figure 3-4.

(d) Replace the filler cap on the tank and dispose of the sampling tube in accordance with local base requirements.

CAUTION

If sampling materials are accidentally dropped into the system, do not operate the equipment until corrective action has been completed.

(2) Drain/Valve Sampling.

(a) Check appropriate service documentation for location of drain/valve. Equipment may have to be in operation for valve sampling.

(b) Open the sample bottle.

(c) See figure 3-5 for a locally manufactured drain kit.

(d) Hold the sample bottle under the drain/valve and fill to approximately 1/2 inch from the top as pictured in figure 3-5, views B and C. Close the drain/valve outlet.

(e) Replace the bottle cap and tighten it enough to prevent leakage from the bottle.

(3) Pump/Syringe Sampling.

(a) Determine the best source for obtaining the sample such as the dipstick hole or filler neck.

(b) Determine best length for sample tubing according to the equipment.

(c) Open the sample bottle. (Pumps are designed to attach the sample bottles to the pump assembly.)

(d) Use pump/syringe action to draw fluid from equipment.

(e) Deposit fluid into sampling bottle. Repeat steps (d) and (e) as necessary to fill sample bottle to approximately 1/2 inch from the top.

(f) Replace the filler cap or dipstick and discard the sampling tube. Replace the sample bottle cap and tighten enough to prevent leakage.

(4) Oil Servicing Cart Sampling.

(a) Remove supply tank fill cap and visually inspect tank for contamination. If contamination is found, refer to applicable tech orders and conduct an investigation.

(b) Ensure that the oil sample taken is representative of the oil in the cart reservoir and not the oil in the hose. Install the nozzle adapter onto the supply hose. Insert the nozzle end into the supply tank opening. Operate the pump handle a minimum of ten complete cycles circulating oil from the supply tank through the supply hose. Verify that there is a steady flow of fluid to ensure that the sample will be representative of the oil in the reservoir.

(c) Carefully pump a sufficient amount of oil into the sample bottle, filling the bottle to within one-half inch from the top of the bottle.

(5) Oil servicing cart sampling (Air Force only).

(a) Sampling of oil servicing carts is critical for maintaining the integrity of engine oils. Servicing carts are subject to contamination due to incorrect handling and storage, environmental factors, and filling of servicing tanks with contaminated oils or incorrect fluids. The most common contamination is water or sand/dirt. When passed to aircraft engines, these contaminants can increase engine wear patterns or accelerate engine oil breakdown, reducing the service life of the oil and its ability to properly lubricate internal components. For these reasons, sampling of oil servicing carts must be completed as part of the oil analysis process and is integral to engine health/component monitoring. The policy of sampling of oil servicing carts and oil containers is applicable only for those locations with aircraft engines and/or components that are enrolled and monitored as part of the Air Force oil analysis program. Oil carts and containers that are used to service engines/components that are not routinely sampled and monitored under the air force oil analysis program are exempt from these requirements.

(b) Each base/location that has engines and/or components enrolled and monitored and uses oil servicing carts as part of their engine maintenance and servicing schedules must establish a program to ensure the integrity of the oils within the servicing carts and containers. Each base/location that uses oil servicing carts as part of their engine maintenance and servicing schedules must establish a program to ensure the integrity of the oils within the servicing carts. Each base/location must develop procedures to ensure servicing carts are sampled on a routine basis. Oil servicing carts used to service aircraft engines must be sampled within the following guidelines:

(1). Must be sampled prior to the beginning of the routine flying week or at a minimum of every 15 days. (Note: to be based on mission and use of the carts)

(2). Whenever contamination to the cart is suspected.

(3). upon completion of maintenance on the oil servicing cart.

(4). Aircraft oils in bulk containers (55 gal drums or other) that are to be transferred to oil carts for the servicing of aircraft engines will be sampled at initial opening and results known prior to addition to the oil cart.

(5). Whenever contamination is suspected in an aircraft engine sample.

(c) Ensure that contaminated carts are handled according to local or MAJCOM policy. Refer to volume ii, section ix for guidance on contamination from automotive oil.

(d) Environmental conditions at some operating locations may drive a more frequent sampling interval to ensure the integrity of the oil. Desert, high moisture areas, exposure to salt air or extreme cold may all induce contamination into the oil reservoir and may require more stringent sampling intervals.

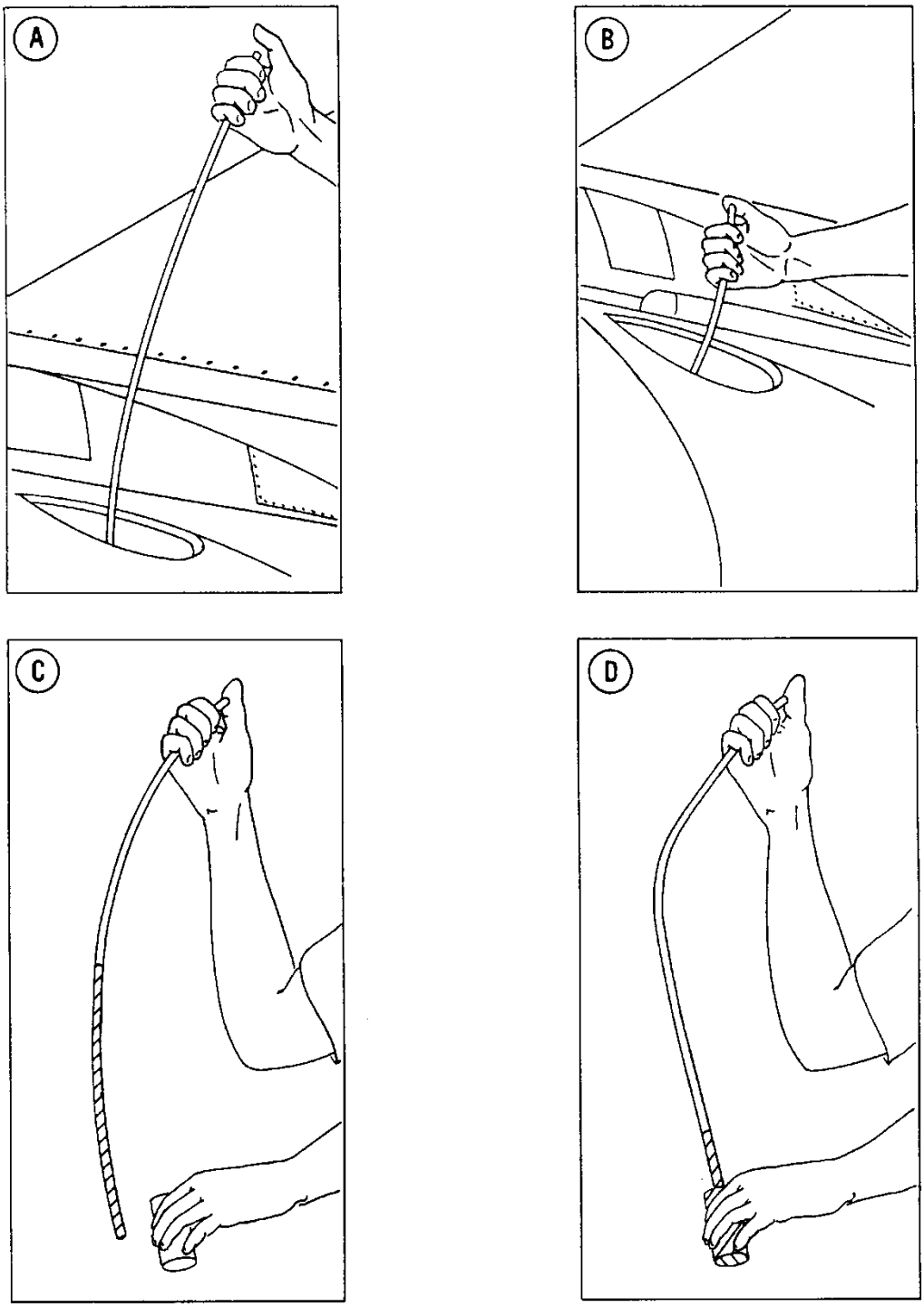

Figure 3-3. Dip Tube Sampling

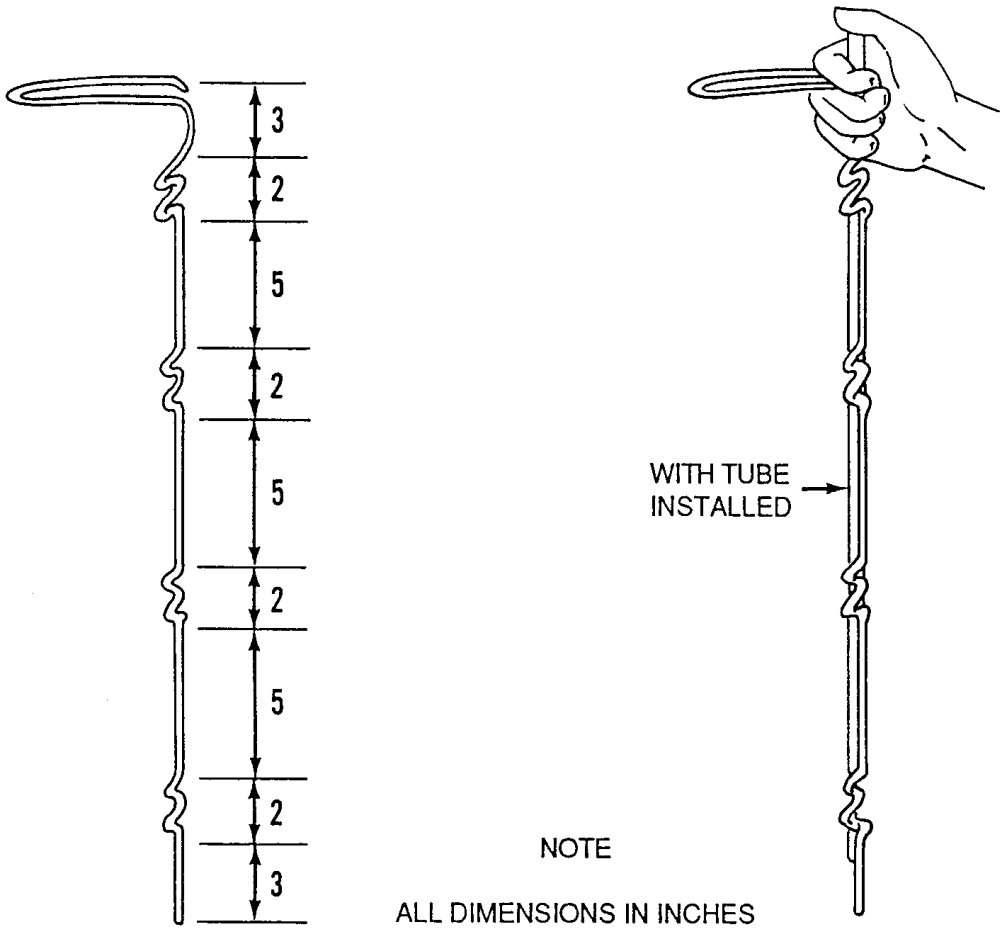

Figure 3-4. Sample Tube Straightener

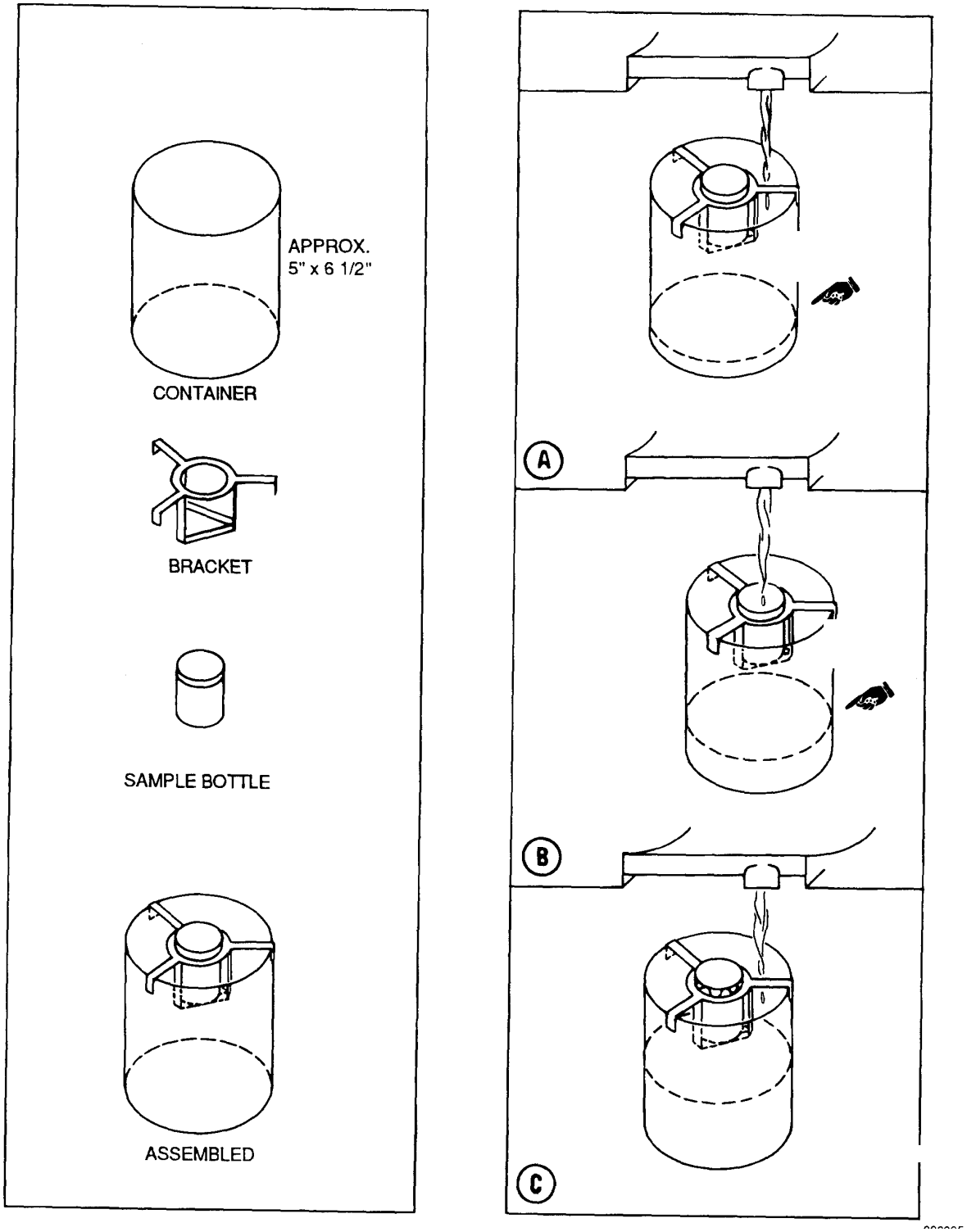

Figure 3-5. Locally Manufactured Drain Sample Kit

c. Special Precautions. The following precautions are provided to assist activities in ensuring reliable equipment fluid samples:

(1) Store unused sampling kits or materials in clean, closed containers, such as the packaging boxes in which received.

(2) Use the correct length of sampling tube for the particular equipment involved so that the tube cannot reach the bottom of the tank and pick up sludge contamination. In cases where the tubing must be cut to the proper length, the tubing should be cleanly cut at a 45-degree angle, exercising care not to leave rough edges that could introduce bits of plastic tubing into the system being sampled.

(3) Avoid contact of the sampling tube with the outside of equipment being sampled and all other surfaces which might contaminate it. Use a sampling tube to take one sample only and discard the tube after taking the sample.

(4) Open the sample bottle only when ready to take the sample and replace the bottle cap immediately after taking the sample.

(5) In cases where samples can be taken only by draining from a valve or the bottom of the tank, sump, or case, open the drain valve/outlet and allow enough fluid to flow through to wash out any accumulated sediment before filling the bottle. If it has been determined that a particular system does not normally have sediment at the point where the sample is drained, it is not necessary to perform the sediment removal procedure.

(6) Use lint-free-wiping cloths to avoid introducing lint into the system.

CAUTION

If sampling materials are accidentally dropped into the system, do not operate the equipment until corrective action has been completed.

(7) Exercise caution to avoid dropping sample bottle caps or other material into the system during sampling.

WARNING

Do not use mouth suction to fill the sampling tube. Many fluids are highly toxic and may cause paralysis and/or death.

(8) Exercise care during the sampling process to avoid burns from hot fluid. Do not leave plastic tubing in hot fluid for extended periods since the tubing may melt and contaminate the system.

(9) To reduce the possibility of sample misidentification, all sample bottles/bottle containers should be marked with equipment/system identification as soon as possible after drawing the sample.

3-6. DD Form 2026, Oil Analysis Request and DA Form 5991-E, Oil Analysis Request, Unit Level Logistics System (ULLS) (DD Form 5991-E is an automated form applicable to US Army Units only).

a. The Oil Analysis Request Form, DD Form 2026, is used for:

(1) Submission of routine or special oil samples.

(2) Reporting corrective maintenance actions, including engine/component removal, taken as a result of a laboratory recommendation.

(3) Reporting the initial entry (or re-entry) of equipment into the oil analysis program with a sample or the removal of equipment from the oil analysis program, with or without a sample.

(4) Reporting removal/replacement of an engine, gearbox or other oil analysis monitored accessory for reasons other than a laboratory recommendation.

(5) Reporting all maintenance actions, such as change of oil or an oil system component, which can affect the presence or level of wearmetals in the oil system.

(6) Reporting incidents, such as overspeed, overtemp, compressor stall, or abnormal oil pressure indications, that could adversely affect oil wetted parts subject to wear.

b. Filling out DD Form 2026. Proper completion of the Oil Analysis Request by the submitting activity is a vital step in the evaluation process upon which maintenance actions are based. When forms are incomplete or erroneously completed, all other efforts to produce a valid evaluation are degraded or impossible. Examples of DD Form 2026 usage are provided by figures 3-6 through 3-11. Customers shall use only plain language, unless otherwise directed. If extra space is required, attach additional sheets.

(1) Examples of routine and transit analysis, minor engine maintenance, and engine removal, side 1 of DD Form 2026, are provided by figures 3-6, 3-7, and 3-8. Instructions for DD Form 2026 completion are as follows:

(a) TO: Oil Analysis Laboratory. Enter the designated OAP laboratory, which will perform the sample analysis, e.g., Ft. Campbell, KY; Columbus AFB, MS; NADEP Jacksonville, FL; etc.

(b) FROM:

1. Major Command. Enter possessing Major Command, foreign government or contractors, e.g., TAC, FORSCOM, COMNAVSURFLANT, RAF UK, and General Dynamics.

2. Operating Activity. Enter the designation of the operating activity submitting the sample, e.g., 432BW, 337 Med Co A., VA 165. Air Force enter name of base; Army and Navy enter unit identification code.

(c) Equipment Model/Application. Enter type, model and series of engine being sampled, e.g., J57-21, J85-5, GTCP85-106, AVDS 1790, LM-2500. Accessory equipment being sampled will be identified by nomenclature such as CSD, main gearbox, fwd trans, hyd sys #1, etc.

(d) Equipment Serial No. Enter complete serial number of equipment being sampled.

(e) End Item Model/Hull No. Enter mission, design and series (type, model, series) of end item which contains system being sampled, e.g., F100D, M32A-60, A4A, M-60, DD 963, etc.

(f) End Item Ser No/EIC. Enter the complete end item serial number (bureau number).

(g) Date Sample Taken (Day, Mo, Yr). Enter the date in numeric - day, month and year on which the sample was taken, e.g., 03/12/04 for 3 Dec 2004.

(h) Local Time Sample Taken. Enter local time sample was taken using 24-hour clock, e.g., 0700, 1600, 2200, etc.

(i) Hours/Miles Since Overhaul. Enter the total hours/miles since overhaul of system being sampled to the nearest whole hour/mile (round up if 0.5 or above). If the equipment has never been overhauled, the total operating hours/miles since new are used. Air Force personnel will normally enter total flying hours. However, on equipment such as the F-100 and F-110 series engine, engine operating hours will be entered except when accuracy and availability of the engine operating hours are not practical.

(j) Hours/Miles Since Oil Change. Enter hours/miles since oil change on the system being sampled to the nearest whole hour/mile (round up if 0.5 or above).

NOTE

Accurate data on hours/miles since overhaul and hours/miles since oil change are extremely important for correct evaluation of the analysis results. Every effort possible must be made to ensure that these data are correct.

(k) Reason for Sample. Enter reason for taking sample. Place an "X" in applicable block; if "Other" block is marked, specify reason for sample, e.g., initial sample, warning light, etc.

NOTE

If the sample is a special sample, it must be prominently marked in red (such as red borders), both on the form and on the outside of the mailing container to alert the laboratory to the need for immediate processing.

(l) Oil Added Since Last Sample. Enter the quantity of oil added since the last sample to the nearest whole number and specify the measurement used.

CAUTION

Oil consumption information is essential to the evaluation process for trend analysis and to determine if a system is using excessive amounts of oil. Report suspected excessive oil usage to both the local system manager(s) and the local oil analysis laboratory.

(m) How Taken. Leave blank unless specifically directed otherwise.

(n) Sample Temperature. Leave blank unless specifically directed otherwise.

(o) Type Oil. Leave blank unless specifically directed otherwise.

(p) Engine position. Enter position number when applicable.

NOTE

The customer is responsible for completing all required information above "FOR LABORATORY USE ONLY" and their sample number. Sample numbers are normally assigned by both the customer and the laboratory to ensure that all of the samples taken were successfully processed.

(q) Name: The individual who took the sample will print his/her name.

(r) Employee number (Air Force and Navy only): The individual who took the sample will enter his/her employee number.

(s) Remarks/Miscellaneous: Enter any pertinent sample information. On initial samples, note any changes in equipment status, and provide the JOAP laboratory with the following information:

1. System oil capacity.
2. Oil change interval.
3. Sampling interval.
4. Minor maintenance actions within the oil system.

OIL ANALYSIS REQUEST

TO	OIL ANALYSIS LABORATORY: JOAP-TSC (TRANSIT)
FROM	MAJOR COMMAND: NAVAL AIR TRAINING
	OPERATING ACTIVITY (Include ZIP Code / APO/DODAAD): VT-86 TRARON EIGHT SIX PENS, FL. 32508
	EQUIPMENT MODEL/APPLICATION: J52-P6
	EQUIPMENT SERIAL NUMBER: 650116
	END ITEM MODEL/HULL NUMBER: TA-4F
	END ITEM SERIAL NUMBER/END ITEM CODE: 158725
	DATE SAMPLE TAKEN (Day, Mo., Yr.): 02 - 25 - 99
	LOCAL TIME SAMPLE TAKEN: 1300
	HOURS/MILES SINCE OVERHAUL: 480
	HOURS/MILES SINCE OIL CHANGE: 122
	REASON FOR SAMPLE: ☒ ROUTINE ☐ LAB REQUEST ☐ TEST CELL ☐ OTHER (Specify)
	OIL ADDED SINCE LAST SAMPLE (Pts, Qts, Gals): 1 PT
	ACTION TAKEN
	DISCREPANT ITEM
	HOW MALFUNCTIONED
	HOW FOUND: ☐ LAB REQUEST ☐ AIR OR GROUND CREW
	HOW TAKEN: ☐ DRAIN ☐ TUBE; SAMPLE TEMPERATURE: ☐ HOT ☐ COLD; TYPE OIL
	ENGINE POSITION: NAME: GEORGE SMITH EMP NO: S-0231; REMARKS/MISC: PHONE: 2-1642 SIGNATURE: George Smith

FOR LABORATORY USE ONLY

SAMPLE RESPONSE TIME

FE	AG	AL	CR	CU	MG	NA
NI	PB	SI	SN	TI	B	MO
ZN	LAB RECOMMENDATION					
SAMPLE NO. 2-234					FILE MAINT	DATA SEQ

Use Transit Only if Applicable)

Figure 3-6. Oil Analysis Request, DD Form 2026 Routine Sample

OIL ANALYSIS REQUEST

TO: OIL ANALYSIS LABORATORY: JOAP-TSC

FROM:
MAJOR COMMAND: NAVAL AIR TRAINING
OPERATING ACTIVITY (Include ZIP Code / APO/DODAAD): VT-86 TRARON EIGHT SIX PENS, FL. 32508

EQUIPMENT MODEL/APPLICATION: J52-P6
EQUIPMENT SERIAL NUMBER: 650116
END ITEM MODEL/HULL NUMBER: TA-4F
END ITEM SERIAL NUMBER/END ITEM CODE: 158725
DATE SAMPLE TAKEN (Day, Mo., Yr.): 10-03-99
LOCAL TIME SAMPLE TAKEN: 0930
HOURS/MILES SINCE OVERHAUL: 491
HOURS/MILES SINCE OIL CHANGE: 2
REASON FOR SAMPLE: [X] ROUTINE [ ] LAB REQUEST [ ] TEST CELL [ ] OTHER (Specify)
OIL ADDED SINCE LAST SAMPLE (Pts, Qts, Gals): ROUTINE OIL CHANGE
ACTION TAKEN:
DISCREPANT ITEM:
HOW MALFUNCTIONED:
HOW FOUND: [ ] LAB REQUEST [ ] AIR OR GROUND CREW
HOW TAKEN: [ ] DRAIN [ ] TUBE
SAMPLE TEMPERATURE: [ ] HOT [ ] COLD
TYPE OIL:
ENGINE POSITION :
NAME: GEORGE SMITH
EMP NO: S-0231
REMARKS/MISC: SERVICED WITH NEW OIL AT 489 HRS SINCE OVERHAUL
PHONE: 2-1642
SIGNATURE: George Smith

FOR LABORATORY USE ONLY

SAMPLE RESPONSE TIME

FE	AG	AL	CR	CU	MG	NA
NI	PB	SI	SN	TI	B	MO
ZN	LAB RECOMMENDATION					
SAMPLE NO. 3-485					FILE MAINT	DATA SEQ

DD Form 2026, MARCH 1999 (EG)

Figure 3-7. Oil Analysis Request, DD Form 2026 - Routine Sample Following Routine/Minor Maintenance (Oil Change)

OIL ANALYSIS REQUEST

TO: OIL ANALYSIS LABORATORY: JOAP-TSC

FROM:
MAJOR COMMAND: NAVAL AIR TRAINING
OPERATING ACTIVITY (Include ZIP Code / APO/DODAAD): VT-86 TRARON EIGHT SIX PENS, FL. 32508

EQUIPMENT MODEL/APPLICATION: J52-P6
EQUIPMENT SERIAL NUMBER: 650116
END ITEM MODEL/HULL NUMBER: TA-4F
END ITEM SERIAL NUMBER/END ITEM CODE: 158725
DATE SAMPLE TAKEN (Day, Mo., Yr.): 10-03-99
LOCAL TIME SAMPLE TAKEN:
HOURS/MILES SINCE OVERHAUL: 498
HOURS/MILES SINCE OIL CHANGE: 9
REASON FOR SAMPLE: ☐ ROUTINE ☐ LAB REQUEST ☐ TEST CELL ☐ OTHER (Specify)
OIL ADDED SINCE LAST SAMPLE (Pts, Qts, Gals):
ACTION TAKEN:
DISCREPANT ITEM:
HOW MALFUNCTIONED:
HOW FOUND: ☐ LAB REQUEST ☐ AIR OR GROUND CREW
HOW TAKEN: ☐ DRAIN ☐ TUBE
SAMPLE TEMPERATURE: ☐ HOT ☐ COLD
TYPE OIL:
ENGINE POSITION:
NAME: STAN CARLSON
EMP NO: C-3862
REMARKS/MISC: REMOVED AND REPLACED ENGINE AS RECOMMENDED BY THE LAB
PHONE: 2-1642
SIGNATURE: Stan Carlson

FOR LABORATORY USE ONLY

SAMPLE RESPONSE TIME

FE	AG	AL	CR	CU	MG	NA
NI	PB	SI	SN	TI	B	MO
ZN	LAB RECOMMENDATION					
SAMPLE NUMBER (S)					FILE MAINT	DATA SEQ

Figure 3-8. Oil Analysis Request, DD Form 2026 - Operating Activity Information Feedback for Engine Removal (Date Engine Removal is Entered in Date Sample Taken Block)

(t) Phone: The individual who took the sample will enter his/her phone number.

(u) Signature: The individual who took the sample will enter his/her signature.

(2) Examples of reporting feedback to JOAP laboratory of air/ground crew recommended maintenance and customer (repair activity) maintenance feedback to monitoring laboratory are provided by figures 3-9 and 3-10. Instructions for DD Form 2026 completion are as follows:

(a) Complete items (a), (b), (c), (d), (e), (f), (g), (l), and (r) as described for routine analysis/ minor engine maintenance in paragraph 3-6.b.(1). (Item (g) is the date maintenance feedback is submitted).

(b) Action Taken. Enter corrective maintenance accomplished to remedy a known or suspected discrepancy, e.g., equipment check-no repair required, removed and replaced, etc.

(c) Discrepant Item. Enter nomenclature of major component and subassembly, which has malfunctioned, e.g., engine No. 2 bearing, gearbox accessory drive bearing, etc., or system which is examined for discrepancy, e.g., basic engine, CSD, gearbox, etc. Only one major discrepancy will be reported per failure, e.g., an engine which has several discrepancies such as No. 1 bearing failure, No. 2 bearing scored, and loose tab washer, will be reported as engine No. 1 bearing failure, which in this case is the most severe discrepancy, No. 2 bearing scored and loose tab washer may be reported as additional discrepancies in Remarks block. When reporting discrepant items use only the proper nomenclature for the item as listed in the illustrated parts breakdown manual (IPB) for the equipment.

(d) How Malfunctioned. Enter description of defect related to item identified in Discrepant Item block, e.g., worn beyond limits, no defects, defects unknown, etc. The suspected cause of the discrepancy may be reflected in Remarks block.

(e) How Found. Enter an -X- in the appropriate block indicating how the necessity for maintenance action was determined. If other, specify.

(3) An example of a transit aircraft oil analysis record (Side 2 of DD Form 2026), is provided by figure 3-11.

(a) When equipment is scheduled for a mission away from the home installation/base, and oil samples will be due during the mission, the customer is responsible for coordinating oil analysis support at the mission site or at intermediate site(s) if applicable (refer to Appendix B for a complete listing of laboratories). The laboratory that usually supports the equipment will provide historical analytical data upon request. It is the customers' responsibility to provide the laboratory that supports the equipment at the mission or intermediate sites(s) with the historical data so they have a record of previous oil analysis results for the equipment prior to the samples they receive. Complete side one of the DD Form 2026 as described in paragraphs 3-6. b. (1) (a) through (r), adding the word "transit" after the name of the home base if the sample is to be processed at any lab other than the home base laboratory. Aircraft on rotational assignment will reflect the name of rotational base and will not be considered transient. Prior to aircraft departure from home installation/base, the servicing laboratory shall prepare a DD Form 2027 or provide an equivalent printed record of OAP results. The DD 2027 or equivalent historical record shall be included in the maintenance or service records that accompany the aircraft. The DD2027 shall be supplied to and used by all laboratories visited en route to provide effective oil analysis while the aircraft is in transit. Steps 1-7 are to be completed by the home laboratory with step 8 completed by each en route laboratory. The record must contain at least the following information:

1. Complete message and mailing address of assigned support OAP laboratory.

2. Home installation/base laboratory telephone number (DSN and commercial where applicable).

3. End item model and serial number.

4. Equipment model and serial number.

5. Contain the OAP results for at least the last 10 samples and all samples analyzed during at least the last 10 hours of operation.

6. Any pertinent remarks about the aircraft or results.

7. Date aircraft departed on transit mission.

8. The en route laboratory will complete the remainder of the transit record. Transient sample results may be documented either on the back of the DD Form 2026, by continuation on the DD Form 2027, or by providing a printed record of all results of any oil analysis performed. Regardless of what other forms the data are provided in, all data obtained by or in an en route laboratory must be entered into en route laboratory's electronic database— even if the aircraft and en route laboratory belong to different services.

(b) When the customer returns to home base, records of analysis done at intermediate locations must be delivered to the regular supporting laboratory. If the customer departs prior to receipt of the completed transit record, the intermediate laboratory will forward the completed transit record to the regular supporting laboratory.

3-7. Preparation for Delivery.

a. Attach the completed DD Form 2026 to the sample bottle or wrap the completed form around the sample bottle and insert both into the mailing envelope.

NOTE

If the sample is a special sample, it must be prominently marked in red (such as red borders), both on the form and on the outside of the mailing container to alert the laboratory to the need for immediate processing.

b. Forward the sample package to the supporting laboratory by established channels using the most expeditious means. Criticality of the sample should govern the delivery method, i.e., mail, hand delivery, etc. It should be noted that 4-ounce samples require additional packaging either individually or in groups to be forwarded by mail.

3-8. Sampling Supplies.

a. Kit, Spectrometric Oil Analysis (NSN 6695-01-045-9820). This is a general purpose sampling kit required by operating activities taking and submitting samples for spectrometric testing. This spectrometric oil analysis kit should only be used on equipment that requires the siphoning method for obtaining an oil sample. See paragraph 3-8.d. for individual supplies for equipment that requires the drain method of sampling. This kit consists of a 30-inch long 5/16-inch OD plastic tube, a 5-dram glass bottle with plastic screw cap, a shipping bag and one DD Form 2026 (Oil Analysis Request). Nomenclature is Sampling Kit, Spectrometric. Unit of issue: box, containing 144 kits.

b. Kit, Spectrometric and Physical Test (NSN 4920-01-003-0804). This sampling kit is required by Navy operating activities taking and submitting samples for physical tests only or spectrometric tests combined with

physical tests. Each kit contains a 4-ounce polyethylene bottle, a shipping bag, a plastic bag, a NOAP sample label and a DD Form 2026. Nomenclature is Sampling Kit, Oil. Unit of issue: each, material for 72 kits.

c. Kit, Mailer (NSN 8125-01-193-3440). For AOAP use, this kit is required by operating activities taking and submitting samples for physical tests only or spectrometric and physical tests. Each kit contains 24 each of 3-ounce plastic bottles, plastic bags and shipping sacks.

d. Individual Supplies.

(1) Bottle, Spectrometric (NSN 8125-01-378-9518). This bottle with cap can be individually ordered for equipment that uses the drain sampling method. This bottle and cap are the same as contained in the Spectrometric Oil Analysis Kit in paragraph 3-8.a. above. This sample bottle is a 5-dram (5/8 ounce) clear, glass bottle. Nomenclature is Bottle, Screw Cap. Unit of issue: gross (144 each). Use of a smaller bottle is authorized if cleanliness standards set for approved JOAP bottles are met and the bottle size permits at least two sample analyses.

(2) Bottle, Spectrometric and Physical Test (NSN 8125-01-082-9697). For AOAP use, this sample bottle is a 3-ounce plastic bottle. Nomenclature is Bottle, Oil Sample. Unit of issue: box (120 each).

(3) Shipping Bag Spectrometric (NSN 8105-00-498-6619). This bag measures 4 inches x 8 inches. Nomenclature is Shipping Bag, Spectrometric. Unit of issue: bundle (500 each).

OIL ANALYSIS REQUEST

TO	OIL ANALYSIS LABORATORY: JOAP-TSC
FROM	MAJOR COMMAND: NAVAL AIR TRAINING
	OPERATING ACTIVITY (Include ZIP Code / APO/DODAAD): VT-86 TRARON EIGHT SIX PENS, FL. 32508
	EQUIPMENT MODEL/APPLICATION: J52-P6
	EQUIPMENT SERIAL NUMBER: 650116
	END ITEM MODEL/HULL NUMBER: TA-4F
	END ITEM SERIAL NUMBER/END ITEM CODE: 158725
	DATE SAMPLE TAKEN (Day, Mo., Yr.): 14-06-96
	LOCAL TIME SAMPLE TAKEN: 1430
	HOURS/MILES SINCE OVERHAUL: 497
	HOURS/MILES SINCE OIL CHANGE: 8
	REASON FOR SAMPLE: ☐ ROUTINE ☐ LAB REQUEST ☐ TEST CELL ☒ OTHER (Specify) ENGINE MAINT.
	OIL ADDED SINCE LAST SAMPLE (Pts, Qts, Gals): 1 QT.
	ACTION TAKEN: REMOVED AND REPLACED
	DISCREPANT ITEM: OIL PUMP
	HOW MALFUNCTIONED: REMOVAL NOT ASSOCIATED WITH OAP
	HOW FOUND: ☐ LAB REQUEST ☒ AIR OR GROUND CREW
	HOW TAKEN: ☐ DRAIN ☐ TUBE; SAMPLE TEMPERATURE: ☐ HOT ☐ COLD; TYPE OIL:
	ENGINE POSITION; NAME: George Smith; EMP NO: 5-0231; REMARKS/MISC: LOW OIL PRESSURE - OIL PUMP CHANGE; PHONE: 2-1642; SIGNATURE: George Smith

FOR LABORATORY USE ONLY

SAMPLE RESPONSE TIME						
FE	AG	AL	CR	CU	MG	NA
NI	PB	SI	SN	TI	B	MO
ZN	LAB RECOMMENDATION					
SAMPLE NO. 3-508					FILE MAINT	DATA SEQ

DD FORM 2026, MARCH 1999 (EG)

Figure 3-9. Oil Analysis Request, DD Form 2026 - Maintenance Feedback Special Sample Following Unscheduled Maintenance Not Associated with the OAP

OIL ANALYSIS REQUEST

TO: OIL ANALYSIS LABORATORY: JOAP-TSC

FROM:
MAJOR COMMAND: NAVAL AIR TRAINING
OPERATING ACTIVITY (Include ZIP Code / APO / DODAAD): AIMD SHERMAN FIELD NAS PENS, 32508

EQUIPMENT MODEL/APPLICATION: J52-P6
EQUIPMENT SERIAL NUMBER: 650116
END ITEM MODEL/HULL NUMBER: TA-4F
END ITEM SERIAL NUMBER/END ITEM CODE: 158725
DATE SAMPLE TAKEN (Day, Mo., Yr.):
LOCAL TIME SAMPLE TAKEN:
HOURS/MILES SINCE OVERHAUL: 493
HOURS/MILES SINCE OIL CHANGE:
REASON FOR SAMPLE: ☐ ROUTINE ☐ LAB REQUEST ☐ TEST CELL ☐ OTHER (Specify)
OIL ADDED SINCE LAST SAMPLE (Pts, Qts, Gals):
ACTION TAKEN: REMOVED AND REPLACED
DISCREPANT ITEM: NO. 1 BEARING
HOW MALFUNCTIONED: WORN BEYOND LIMITS
HOW FOUND: ☒ LAB REQUEST ☐ AIR OR GROUND CREW
HOW TAKEN: ☐ DRAIN ☐ TUBE
SAMPLE TEMPERATURE: ☐ HOT ☐ COLD
TYPE OIL:
ENGINE POSITION:
NAME: JOHN SAMPLES
EMP NO: S-0427
REMARKS/MISC: YOUR TEARDOWN RECOMMENDATION RESULTED IN ABOVE FINDING
PHONE: 2-4167
SIGNATURE: John Samples

FOR LABORATORY USE ONLY

SAMPLE RESPONSE TIME

FE	AG	AL	CR	CU	MG	NA
NI	PB	SI	SN	TI	B	MO
ZN	LAB RECOMMENDATION					
SAMPLE NO.					FILE MAINT	DATA SEQ

DD FORM 2026, MARCH 1999 (EG)

Figure 3-10. Oil Analysis Request, DD Form 2026 - Customer Feedback Information (Intermediate and Depot Level)

TRANSIT AIRCRAFT OIL ANALYSIS RECORD

ASSIGNED OIL ANALYSIS LABORATORY: JOAP-TSC

LABORATORY TELEPHONE NO. (Autovon): 922-3191 (Commercial): 850-452-3191

END ITEM MODEL AND SERIAL NO.: A-4 158725

EQUIPMENT MODEL AND SERIAL NO.: J52-P6 650116

LAB CODE	DATE	TOTAL TIME SINCE OVERHAUL	TOTAL TIME SINCE OIL CHG	FE	AG	AL	CR	CU	MG	NI	PB	SI	SN	TI	MO	LAB REC
ANH	12-02-99	460	102	14	0	1	0	3	2	0		3				A
ANH	17-02 99	471	113	13	0	1	0	2	1	0		3				A
ANH	25-02 99	480	122	15	0	1	0	3	1	0		2				A

DATE DEPARTED *(Return this form with aircraft)*: 26 FEB 99

REMARKS

DD FORM 2026, MARCH 1999

Figure 3-11. Transit Aircraft Oil Analysis Record, DD Form 2026 (Side 2) DD Form 2026 or equivalent oil analysis history record must provide all results acquired during the past 10 hours of flight and all results for no fewer than the last 10 samples.

(4) Shipping Bag, Spectrometric and Physical Test (NSN 8105-00-290-0340). This bag measures 6 inches x 10 inches. Nomenclature is Sack, Shipping. Unit of issue: box (250 each).

(5) Plastic Tubing. Various diameters and lengths of plastic tubing are available.

Plastic Sample Tubing	NSN	Unit of Issue
15" long x 3/8" OD	4710-00-933-4415	Bag (100 each)
30" long x 3/8" OD	4710-01-087-1629	Bag (100 each)
20" long x 1/4" OD	4710-00-933-4417	Bag (100 each)
1000 long x 1/4" OD	4720-00-964-1433	Roll (1000 feet)
5/16" OD	4710-01-040-4175	Feet

Nomenclature is Tubing, Nonmetallic except for NSN 4710-01-087-1629 which is Tubing, Plastic.

(6) Oil Sampling Pump (NSN 4930-01-119-4030). This pump is used to extract fluid from nonaeronautical equipment and is used with bottle, NSN 8125-01-082-9697. Nomenclature is Pump, Oil Sampling. Unit of issue: each.

(7) DD Form 2026. Obtain locally through publication distribution channels.

3-9. Battle Group Ships/Squadrons NOAP Procedures.

NOTE

Battle Group Ships/Squadrons will utilize Battle Group Lab if available while deployed. The following procedures must be strictly adhered to, ensuring proper sampling/testing/evaluation and reporting of lubricating and hydraulic oil samples.

a. Prior to Deployment.

(1) Deploying Ships/Squadrons

(a) Notify shore based lab(s) (info Battle Group Lab) via message of upcoming deployment and request all histories be transferred to Battle Group Lab.

(b) Provide Battle Group Lab with NOAP point of contact. Request must be initiated at least 2 weeks prior to deployment to ensure delivery of histories prior to deployment.

(2) Shore Based Lab(s)

(a) Transfer histories of deployers to Battle Group Lab utilizing standard procedures listed in NAVAIR 17-15-50.

(b) Message deployers and Battle Group Lab of effective date of transfer and means of transfer (i.e. U.S. Mail, hand-deliver, etc).

(3) Battle Group Lab

(a) Message shore based lab(s) and ships/squadrons upon receipt of histories.

(b) Identify lab point of contact, message address, mail address and any particulars about sample transfer, etc.

(c) Ensure spectrometer is operating properly and correlation results meet established criteria.

(d) Ensure adequate PPT supplies are on hand for entire deployment.

b. During Deployment.

(1) Message battle group, NOAP-PM, TYCOM monthly of sample summary (see figure 3-12).

(2) Battle Group Ships/Squadrons

(a) Draw samples using normal periodicity and transfer to battle group lab (recommend use of log helo.).

(b) Ensure shipping procedures are followed as outlined.

1. Sample bottles are completely full.

2. Caps are tight and not leaking.

3. Sample ID is glued/taped to bottle.

4. DD Form 2026 is completed in accordance with this manual to include sample number and signature. The completed form shall be secured to the sample bottle with a rubber band.

5. Package sample to preclude damage that would cause leakage.

6. Mark package "NOAP SAMPLE. ATTN: AMID NOAP LAB"

7. Utilize NOAP Samples kits available through Naval Supply System (this kit includes 72 bottles, 72 labels, pad of DD Form 2026's and 72 padded mailing envelopes.

(3) Shore Based Lab(s)

(a) If samples received from battle group ships/squadrons after transfer, process as normal and inform battle group lab via message of the results for manual entry into database. This will ensure analysis continuity.

c. Post Deployment.

(1) Battle Group Lab

(a) Process all samples in-house.

(b) Force tape file dump and mail to NOAP-DAO.

(c) Transfer all histories back to originating lab.

(d) Provide end-of-cruise summary to appropriate type commanders, shore based lab(s), NOAP-PM and DIR JOAP-TSC.

(e) Message all ships/squadrons that histories have been transferred to home port lab and to commence sending samples to their home port lab.

(f) Continue NOAP support of own ship samples.

(2) Battle Groups Ships/Squadrons

(a) Send all samples to home port lab.

(b) Provide NOAP-PM procedure improvement recommendations.

(3) Shore Based Lab(s)

(a) Update database from battle group lab.

(b) Message battle group, ships and squadrons upon receipt of histories.

(c) Process all samples.

PRE-DEPLOYMENT MESSAGE EXAMPLE

FM USS UNDERWAY
TO ALL SHIPS/SQUADRONS OF THE BATTLE GROUP
INFO COMNAVAIRSYSCOM WASHINGTON DC//411//
NAVOAPROGMGR PENSACOLA FL//3.2//
COMNAVAIR PAC/LANT//N4//
COMNAVSURF PAC/LANT//N4//
NAVSURF PAC/LANT READSUPPGRU
UNCLAS//NO4731//
SUBJ: NAVY OIL ANALYSIS PROGRAM (NOAP)
REF/A/DOC/NAVAIR 17-15-50//
RMKS/1. FULL SERVICE NOAP LAB ESTABLISHED AND OPERATIONAL FOR BATTLE GROUP_____.
2. PROCEDURES OUTLINED REF A. WILL ENSURE TIMELY RESPONSE TO SAMPLES.
3. WEEKLY AND MONTHLY REPORT WILL BE SENT VIA LOG HELO. FAILED SAMPLE RESULTS WILL BE INCLUDED IN OPSUM OR VIA SEPCOR.
4. SUGGESTIONS TO IMPROVE SERVICE ARE WELCOMED.
5. POINT OF CONTACT IS_____.

Figure 3-12. Message Examples (Sheet 1 of 3)

MONTHLY OPSUM

FM USS UNDERWAY
TO ALL SHIPS/SQUADRONS OF THE BATTLE GROUP
INFO NAVOAPROGMGR PENSACOLA FL//3.2//
COMNAVAIRFOR SAN DIEGO CA
COMNAVSURF PAC/LANT//N4//
NAVSURF PAC/LANT READSUPPGRU
UNCLAS//N04731//
SUBJ: BATTLEGROUP NOAP SUMMARY FOR (MONTH/YEAR)_____.
RMKS/1. TOTAL SAMPLES PROCESSED_____, AERONAUTICAL_____.
NON-AERONAUTICAL_____. COOLANOL/PAO_____.

COMMAND	RCVD	PROCESSED	PASSED	FAILED	RMKS

(LIST ALL COMMANDS)

2. POINT OF CONTACT:_____.

Figure 3-12. Message Examples (Sheet 2 of 3)

MESSAGE FOR TRANSFERRING HISTORIES

FM USS UNDERWAY
TO ALL SHIPS/SQUADRONS OF THE BATTLE GROUP
INFO NAVOAPROGMGR PENSACOLA FL//3.2//
COMNAVAIRFOR SAN DIEGO CA
COMNAVSURF PAC/LANT//N4//
NAVSURF PAC/LANT READSUPPGRU
UNCLAS//N04731//
SUBJ: NAVY OIL ANALYSIS PROGRAM (NOAP) BATTLE GROUP HISTORY TRANSFER
RMKS/1. HISTORIES TRANSFERRED TO_____, ON_____
2. SHORE BASED LAB/BATTLE GROUP LAB REPLY VIA MESSAGE WHEN HISTORIES RECEIVED.
3. POINT OF CONTACT _____.

Figure 3-12. Message Examples (Sheet 3 of 3)

3-10. Air Force Spectrometer Deployment/TDY Procedures.

a. Prior to aircraft leaving home station.

(1) Send a request for deployment kits for pre and post deployment to AF Correlation Team (corr@navy.mil).

(2) Print out DD Form 2027 trend history to accompany aircraft(s) to deploy or TDY location.

(3) Inform AF OAP manager of deployed spectrometer include serial number, mailing address, and POC email and phone contact information (afoap@tinker.af.mil).

(4) Pack and inventory all equipment, spare parts, tools and consumables. Ensure adequate supplies are on-hand for entire deployment/TDY.

(5) Ensure spectrometer is operating properly and is certified in the correlation program.

b. During aircraft deployment/TDY.

(1) Input DD Form 2027 trend history data into deployed/TDY database since aircraft left home station.

(2) Identify lab point of contact, message address, mail address and any particulars about sample transfer, etc

(3) Send email to AF Correlation Team to put spectrometer on deployed status corr@navy.mil. Include serial number, mailing address, and POC email and phone contact

(4) Analyze deployment kit and complete test. Email test to AF Correlation Team (corr@navy.mil).

(5) Analyze monthly correlation samples that were due while instrument was in deployed/TDY location.

c. Post aircraft deployment/TDY.

(1) Input DD Form 2027 trend history data into home station database since aircraft left deployed TDY location.

(2) Analyze post deployment kit and complete test. Email test to AF Correlation Team (corr@navy.mil).

(3) Unpack and inventory all equipment, spare parts, tools and consumables.

SECTION IV

JOAP PROGRAMS AND REPORTS

4-1. General. This section provides general information concerning JOAP programs and reports.

4-2. Background. The JOAP certification and correlation programs are primary elements of the JOAP quality assurance effort to ensure standardization of operations and quality of oil analysis by the laboratories enrolled in these programs. Participation in these programs by both organic and contracted laboratories is mandatory for all laboratories equipped with atomic emission rotrode spectrometers.

4-3. JOAP Certification Program,

a. Purpose. To ensure that all participating laboratories meet specified criteria in order to maintain quality and uniformity of spectrometric oil analysis between laboratories.

b. Policy.

(1) All DOD oil analysis laboratories, (organic or under contract to a DOD agency or US military service for the purpose of analyzing samples from US government equipment or supplies) will participate in the JOAP Correlation Program. Laboratories with approved types of atomic emission rotrode spectrometers are certified by the Director, JOAP-TSC. Only certified laboratories may perform interservice oil analysis functions. Uncertified laboratories may perform intraservice or intraagency analysis functions only with the service Program Manager's written authorization.

(2) The JOAP Certification Program is currently standardized on the atomic emission rotrode spectrometer. Atomic absorption (AA) spectrophotometers and Inductively Coupled Plasma (ICP) spectrometers do not meet the certification criteria, and therefore will not be certified for interservice oil analysis. AA or ICP laboratories may be approved for independent operations by Program Managers for individual service oil analysis.

c. Certification Procedures. The JOAP-TSC certifies laboratories upon their initial establishment and relocation based on the Service Program Manager's attestation (see figure 4-1 AND 4-1A) that the laboratory/spectrometer meets specified criteria and the laboratory/spectrometer's satisfactory participation in the JOAP Correlation Program. The certification checklist enables the JOAP-TSC to ensure that laboratories meet minimum criteria required for an operating laboratory.

NOTE

An officer, senior non-commissioned officer*, or senior civilian manager who is responsible for laboratory operations must sign the certification checklist. For contractor operated laboratories, an Officer-in-charge is considered to be the lowest level of government supervision within the laboratory's chain of command authorized to sign correspondence leaving the installation. *Not applicable to AOAP laboratories.

d. Categories of Certification. Based upon qualifications and performance, the JOAP-TSC places eligible laboratories/spectrometers in the following certification categories:

(1) Certified - Correlation average for 3 months is 80 percent or above and all certification checklist requirements satisfied.

(2) Uncertified - Correlation average for 3 months falls below 80 percent and/or certification checklist requirement(s) not satisfied.

JOINT OIL ANALYSIS PROGRAM LABORATORY FACILITY

☐ Army ☐ Navy ☐ Air Force ☐ Other

OFFICIAL MAILING ADDRESS

Parent Command

Lab Activity

Com. Tel. No. | DSN No.

Form Use: ☐ CERTIFICATION VERIFICATION CHECKLIST (Orignal to JOAP-TSC, Copy to Program Manager) ☐ PROGRAM MANAGER'S ATTESTATION (Orignal to Program Manager, Copy to JOAP-TSC)

SPECTROMETRIC OIL ANALYSIS INSTRUMENT

Manufacturer and Type (AA, AE, or Other)

Model Number	Serial Number	Date Placed in Service	Type Data ☐ Automated ☐ Manual

Instrument Capability (Circle Elements)
Fe Ag Al B Cu Na Pb Ni Si Sn Ti Cr Mg Mo Zn Other (List)

WORK AREA AND STRUCTURE

Type (Frame, Masonry, Ship, etc.)	Work Area (Sq. Ft.)	Storage Area (Sq. Ft.)

Environmental Controls (Describe)	Comments

WORKLOAD

Samples Per Month	Spectrometric Only	Physicals Only	Spectrometric and Physicals

LABORATORY STAFFING AND MANHOURS

NAME (Last, First MI)	Grade/(MOS/NEC/AFSC)	Training School	Training OJT	Months of Lab Experience
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	

Total Manhours Available for Oil Analysis

Comments

Prepared By	Date
Approved By	Date
Program Manager	Date

Figure 4-1. Certification Verification Checklist or Program Manager's Attestation. NOT FOR AF USE—AF USE FIGURE 4-1A

AIR FORCE OIL ANALYSIS PROGRAM CERTIFICATION CHECKLIST			
Parent Command		Official Mailing Address:	
Lab Activity			
Group/Squadron:			
Com Tel No.	DSN No.	FAX No.	Backup Lab:
Lab Supervisor:		Email:	

Assigned Aircraft and Engines			
A/C 1:	Eng 1:	A/C 2:	Eng 2:
A/C 3:	Eng 3:	A/C 4:	Eng 4:
A/C 5:	Eng 5:	A/C 6:	Eng 6:
A/C 7:	Eng 7:	A/C 8:	Eng 8:
A/C 9:	Eng 9:	A/C 10:	Eng 10:

SPECTROMETRIC OIL ANALYSIS INSTRUMENTS			
Use Dropdown Model Nr.	Serial Nr.	Lab Code:	Date Placed in Service
Model Nr.	Serial Nr.	Lab Code:	Date Placed in Service
Model Nr.	Serial Nr.	Lab Code:	Date Placed in Service
Model Nr.	Serial Nr.	Lab Code:	Date Placed in Service
Model Nr.	Serial Nr.	Lab Code:	Date Placed in Service
Model Nr.	Serial Nr.	Lab Code:	Date Placed in Service
Model Nr.	Serial Nr.	Lab Code:	Date Placed in Service

SEM/EDX INSTRUMENTS		
Use Dropdown Manufacturer	Serial Nr.	Date Placed in Service
Manufacturer	Serial Nr.	Date Placed in Service
Manufacturer	Serial Nr.	Date Placed in Service
Manufacturer	Serial Nr.	Date Placed in Service

LABORATORY STAFFING AND MANHOURS			
NAME (Last, First MI)	Grade/AFSC	Use Dropdown Training	Use Dropdown Years of Lab Experience

Figure 4-1A. Certification-Verification Checklist Air Force ONLY

Comments:

Prepared By (Double Click to Digitally Sign, then Forward. No changes allowed once signed):

X _____

NDI/JOAP Lab Chief (Double Click to Digitally Sign, then Forward. No changes allowed once signed):

X _____

AF Program Manager Attestation(Digitally Sign):

X _____

Figure 4-2A Continuation. Page 2 of the Certification-Verification Checklist, Air Force ONLY

Engine Abnormal Oil Analysis Maintenance Action Report			
Base	Unit	Date	Code (H, R, or T)
A/C Type	Tail Number	Engine Serial Number	Engine Operating Hours
QDR Number			Date QDR Submitted to PIM
Explanation of OAP Lab Recommendation			
Printed Name/Grade of OAP Personnel:		OAP Personnel Signature:	
Maintenance Performed/Action Taken (Provide complete details)			
If engine is removed from aircraft, it is currently located at:		☐	Flight line
		☐	Engine Shop
		☐	Shipped to Depot
Printed Name/Grade (verifying above action taken/location):		Signature/Date (verifying above action taken/location):	

Figure 4-2. Example Air Force Feedback Form.

(3) If a laboratory/spectrometer certification is withdrawn, the laboratory/spectrometer is not approved for interservice work. However, the responsible Service Program Manager may elect to operate the laboratory/spectrometer to satisfy parent service requirements. In order to provide interservice support, the requesting Service Program Manager must authorize the utilization of the laboratory/spectrometer in writing to the laboratory and the JOAP-TSC.

NOTE

Under special conditions, the Service Program Manager or the Director, JOAP-TSC may waive certain checklist elements, in order to avoid interruption of essential laboratory operations.

e. Laboratory/Spectrometer Certification Procedure. A laboratory must complete the following steps to become certified:

(1) Complete three special certification sample sets (six pairs) with an average of 80 percent or above. The new JOAP, commercial, contract or previously stored instrument schedule is completed over three weeks as follows:

First Monday	A1/2
First Friday	A3/4
Second Monday	B1/2
Second Friday	B3/4
Third Monday	C1/2
Third Friday	C3/4

The JOAP de-certified instrument schedule is completed in six workdays as follows:

First work day	A1/2
Second work day	A3/4
Third work day	B1/2
Fourth work dayB3/4	
Fifth work day	C1/2
Sixth work day	C3/4

If approved by the applicable Service Program Manager, an accelerated three day schedule may be performed for JOAP instruments when a spectrometer must be used for critical JOAP support (i.e. as the only spectrometer available and is needed for deployment):

First work day AM	A1/2
First work day PM	A3/4
Second work day AM	B1/2
Second work day PM	B3/4
Third work day AM	C1/2
Third work day PM	C3/4

Deviations may occur due to the time samples are received or actual days worked. Regardless, the analysis schedule for each set of two samples must be completed following a new and complete standardization followed by a successful series of standards checks. Refer to the spectrometer manual for other possible requirements such as optical alignment or electrode offset procedures when changing rod or disk electrode lots. All JOAP laboratories must use standards manufactured by the JOAP TSC. Standards checks and standardizations must be performed only using aluminum boats. Correlation samples are analyzed using white caps (NSN 6640-01-042-6583); not the caps supplied with the correlation samples. Send completed sample pair results by email using the normal correlation report form to, OAPCORR@TINKER.AF.MIL and CORR@Navy.Mil. The overall average of scores must be 80 per cent or above.

(2) Forward the completed/signed Certification Verification Checklist to the Service Program Manager; who will forward to the JOAP TSC.

f. Existing Laboratory Procedure.

(1) Certified: Laboratory/spectrometer certification does not expire unless it is uncertified by an action listed in paragraph 4-3f. (2) below.

(2) Uncertified: Reasons for reduction to uncertified are as follows:

(a) Three month average falls below 80 percent.

(b) Failure to submit monthly correlation results prior to the next month's due date.

NOTE

Units with spectrometers in Reported Maintenance (RM) status will comply with procedures in paragraph 4-4. Units with deployed spectrometers will comply with procedures in paragraph 4-5.

(c) Failure to submit an annual approved verification checklist.

(d) Failure to meet full operating requirements (dependent upon nature of deficiency).

(e) Laboratory/spectrometer is physically relocated.

NOTE

Spectrometers that are geographically relocated (other than spectrometers that are relocated within the same operating base or vessel) shall be decertified and required to undergo the complete certification procedure as listed for new laboratories. Spectrometers that are physically relocated within the same operating base or vessel will be required to submit a new certification verification checklist and to perform a complete spectrometer standardization prior to commencing normal operational support. Any spectrometer, which has to be disassembled in any manner in order for it to be relocated, must undergo the complete certification procedure. Mobile emission spectrometers (Baird MOA's, Spectroil M's, etc.) will use the deployment kit available from the JOAP-TSC to ensure proper operation after movement of the spectrometer.

(f) Laboratory is deactivated.

(g) Upon direction of the Service Program Manager and/or the Director, JOAP-TSC.

g. Reinstatement To Certified. A laboratory/spectrometer that has been placed in the uncertified category must complete the certification requirements as outlined in paragraph 4-3e.

4-4. Laboratories with Equipment in Reported Maintenance "RM" Status.

a. Laboratories reporting RM status for a spectrometer will receive no calculated correlation score for that spectrometer if the RM period extends past the correlation sample analysis due date. During RM periods, spectrometers will be placed in an RM status, and will not be authorized to perform any operational oil analysis support functions.

b. Correlation score average will be frozen at pre-RM period recorded averages for the duration of the RM period.

c. Spectrometers in RM status for one or more element channels but not reporting total equipment failure will not be subject to the criteria listed above. Due to inherent differences in operating requirements, different weights placed on different elements, and the type of equipment being monitored, spectrometers will be placed in a status as determined by the appropriate Program Manager.

(1) RM status for one to two months - When the spectrometer has been repaired, up to two months of correlation samples that were on hold may be analyzed. If only one set of samples are overdue, analyze the correlation samples on hand immediately after repair. If two sets of samples are overdue, analyze one set on the first workday after repair, and the second set on the second workday after repair. This procedure is to ensure that a different standardization is accomplished for each set.

> Example 1 - one month R/M: The lab reports that their spectrometer is R/M on 17 October. On 4 November, it is repaired. Then October samples are submitted to the OAPCORR@TINKER.AF.MIL. The November sample results are due in by 21 November.
>
> Example 2 - two months R/M: The lab reports that there spectrometer in R/M on 17 October. On 5 December, it is repaired. Then October samples are submitted to the OAPCORR@TINKER.AF.MIL. After the October score is obtained, the November samples are analyzed on the next workday and submitted to the OAPCORR@TINKER.AF.MIL. After obtaining the November score, the December sample results are due in by 21 December.

(2) RM status for three months - Spectrometers will be decertified when the third correlation due date is missed. When the laboratory reports the spectrometer repaired, the laboratory will complete the certification procedures as outlined in paragraph 4-3e.

4-5. Deployed Spectrometers.

a. Deployable laboratory spectrometers must be approved for deployed operation through a special test procedure. Procedures outlined below must be performed when an organization deploys with a portable atomic emission rotrode instrument prior to supporting actual deployed operations. The test procedure is designed to quickly determine if the spectrometer has survived the transportation to the new site/original site, has adjusted to the environment, and is ready to provide accurate support for the sampling requirements.

NOTE

> If the spectrometer is deployed during an exercise and transported from the regular lab location, but will not be used for actual oil analysis support, the special test procedure is not required.

b. After the spectrometer has returned from the deployment, laboratory personnel must ensure that the spectrometer is again fully operational. If the spectrometer will be immediately re-deployed, or immediately used to support local oil analysis requirements, another kit must be successfully analyzed. However, if time permits prior to re-deployment or use within the laboratory, standardization, standardization checks, and participation in the JOAP Correlation Program will ensure that the spectrometer is fully operational.

c. Deployment kits are supplied to all laboratories by the JOAP-TSC upon request for projected deployments. Each kit includes complete instructions, two synthetic oil correlation samples, results forms including pass/fail criteria, an envelope for mailing, and message format examples. A package of three kits will be mailed for each request. Send requests to: OAPCORR@TINKER.AF.MIL.

d. Two tests are required. Test 1 is the analysis of two JOAP Correlation Program synthetic oil samples. Each sample is analyzed three times and averaged. The average value obtained for each of the required fifteen elements is compared to upper and lower limit values that are supplied with the kit. Test 2 involves ten analyses of D12-100 and D3-100 JOAP Calibration Standards that are not supplied with the kit, but are required for standardization of the instrument and must accompany the spectrometer when it is deployed/re-deployed. The test monitor must be an officer, senior NCO, or senior civilian manager with overall responsibility for laboratory management. The monitor must attest that the spectrometer passes or fails the overall testing based on criteria supplied with each kit. An overall average of 80 percent is required.

e. Test results must be reported by message, e-mail, or mail to the OAPCORR@TINKER.AF.MIL, applicable command, and the Service Program Office. No approval from any outside agency is required if the results meet the criteria that is supplied with each kit. The spectrometer is approved for deployed site use immediately after the successful completion of the kit. Regular monthly JOAP Correlation samples must still be

processed at the deployed location. If the correlation samples must be mailed to the deployed location, contact OAPCORR with new address information. If the deployed spectrometer fails the overall test requirements, contact the applicable Service Program Management office for further instructions.

4-6. Other Laboratories Requiring Recertification.

a. For laboratories requiring recertification, the officer-in-charge/senior civilian manager must verify in writing, using the checklist shown in Figure 4-1, Air Force labs use checklist shown in Figure 4-1A, that the laboratory meets all operating requirements listed below. The appropriate Service Program Manager depending upon the nature and severity of the operating deficiency may grant an operating waiver for certain operating requirements.

b. Operating requirements are as follows:

(1) Space requirement (as determined by Program Manager).

(2) Environmental control of equipment spaces.

(3) Staffing adequate for projected workload (as determined by Program Manager).

(4) Necessary operating supplies available.

(5) Required instrument and support equipment available.

(6) Full time qualified operator/evaluator assigned and present (Army evaluators must be certified, see Volume II, Appendix N).

4-7. Qualifications Required for Operators and Evaluators.

a. Qualifications Required for Operators and Evaluators for each branch of service are as follows:

(1) Air Force.

(a) Complete either Block 9 of the Air Force Nondestructive Inspection Course (J3ABP2A732-000) training school, or complete the DOD Operator/Evaluator Training Course (J3AZP2A752-000), and

(b) Perform 30 days on-the-job training in a JOAP certified laboratory, and

(c) Achieve five (5) additional months of operator/evaluator experience.

(2) Navy: Complete the DOD Operator/Evaluator Training Course that includes both spectrometric and physical property analysis (J3AZP2A752-003) resulting in the award of NEC 6403 for active duty personnel and appropriate certificate of completion for civilian personnel.

(3) Army: Meet all of the requirements of Volume II, Appendix, N.

b. In the case of some operators and evaluators, it may not be possible or appropriate to satisfy all of the above requirements. The responsible Service Program Manager may waive these requirements on an individual basis with the exception of Army laboratories. Specific instructions require the adherence of Army laboratories to the requirements outlined in TM 38-301-2, Appendix N.

c. The qualified operator and evaluator must be assigned to the laboratory to qualify the laboratory for JOAP certification and must be present for duty in the laboratory during all hours of laboratory operation. A supervisor, present on an intermittent basis, does not satisfy the operator/evaluator requirements.

4-8. JOAP Correlation Program.

a. Purpose. To ensure uniform and continuous high quality oil analysis results throughout the Joint Oil Analysis Program. The Correlation Program quickly identifies laboratories experiencing instrument and/or operator problems and provides managers and laboratory personnel a means to compare their performance with other laboratories having the same type of spectrometer.

b. Policy. AII DOD oil analysis laboratories, (organic or under contract to a DOD agency or US military service for the purpose of analyzing samples from US government equipment or supplies) will participate in the JOAP Correlation Program. The applicable Program Manager may grant a participation waiver for extenuating circumstances. The JOAP Correlation Program is also extended to the following categories of laboratories:

(1) Privately owned laboratories with oil analysis contracts with elements of the DOD.

(a) If the contract does not specify that the DOD will provide participation free of charge in the JOAP Correlation Program, the privately owned laboratory must pay an annual fee to participate in the program.

(b) Contact the JOAP-TSC for current fees and processing instructions. Cash or negotiable instruments cannot be accepted by the JOAP-TSC. Payment must be made through the local contracting office or the major command approving the contract. See Section 1, paragraph 1-5.b. for the JOAP-TSC address and telephone information.

(2) Federal Government owned laboratories other than DOD laboratories.

(3) Laboratories of an allied nation providing support to the military forces of that nation or to US military forces.

NOTE

Foreign or private laboratories under contract to provide oil analysis services to US military forces and desiring entry into the JOAP Correlation Program should submit letter requests to the appropriate JOAP Management Office via the service contracting office administering the contract.

Laboratories of an allied nation providing oil analysis support to the military forces of that nation and desiring entry in the JOAP Correlation Program should apply through the appropriate FMS case, or in the absence of an FMS case, submit letter requests to the nearest United States Military Advisory Group for consideration and/or processing.

c. Correlation Procedures. The Correlation Program for spectrometers is conducted monthly by the JOAP-TSC. Two sample pairs are mailed from the JOAP-TSC to each participating JOAP laboratory scheduled to arrive not later than the 5th working day of the month. The spectrometer is standardized and the same qualified operator analyzes the sample pairs. Results are submitted to the JOAP-TSC to arrive not later than the 21st of each month. Results may be submitted either by e-mail, mail, FAX, or by message using the message format contained in Volume II. E-mailing the correlation data to OAPCORR@TINKER.AF.MIL and CORR@Navy.Mil is the preferred method of transmittal as the data can then be directly downloaded into the database and a data receipt will be returned. If you receive a receipt, then no other method of transmittal is required. On the 25th of each month or the first workday immediately following the 25th, the JOAP-TSC computes the mean of all spectrometer results for each sample for all required elements for the two categories of spectrometers (JOAP Rotrode and other). Using standard statistical techniques, acceptable reproducibility 1 and reproducibility 2 criteria are calculated. These acceptable criteria are compared to each laboratory's results and points are assigned. From these points, an overall score is assigned for each spectrometer. These scores are used, in addition to facility and personnel requirements, to classify laboratories as JOAP certified or as uncertified. Laboratories with spectrometers in R/M status will report this status to the JOAP-TSC prior to 21st of the month. Correlation samples will be retained and analyzed when the spectrometer is repaired. Contact the JOAP-TSC for special instructions when the R/M period exceeds two correlation-reporting periods. A message or e-mail request for

maintenance help to the JOAP-TSC or some other agency with info copy to the TSC does not constitute requesting R/M status unless a specific request for R/M status is included in the message. Either call the TSC or send a message or e-mail specifically requesting R/M status and try to provide the TSC with a "get well" date.

NOTE

Correlation printouts, including all standardization data, shall be retained for three months. This information is vital for troubleshooting instruments that score low in the program. The JOAP-TSC may also request printouts as a quality assurance check.

4-9. JOAP Training.

a. Training Courses Available.

(1) Spectrometer operator/evaluator training courses available at NAS Pensacola, FL:
Website: http://www.cnet.navy.mil/cnet/nattc/361trs/ndi.htm
DSN 922-7488/7489

Title	Course No.
Defense Joint Oil Analysis Program (DoD JOAP) Atomic Emission Spectrometer. (12 days)	J3AZP2A752-000
Defense Joint Oil Analysis Program (DoD JOAP) Atomic Emission Spectrometer/Physical Properties Testing (18 days)	J3AZP2A752-003

NOTE

The Air Force Non-Destructive Inspection (NDI) course, J3ABP2A732-000 (or equivalent), includes evaluator training and operation/maintenance of the Spectro,Inc. Model M or M/N spectrometer, which is equivalent to training provided in course J3AZP2A752-000.

(2) Spectro, Inc. offers a spectrometer maintenance course. For additional information call 1-888-486-0123.

b. Training Requests.

(1) Army/Air Force-submit training requirement(s) in accordance with established service procedures.

(2) US Navy, US Marine, and US Coast Guard personnel will contact the following offices:

US Navy/US Marine personnel:
Ms. Sheila Nelson
Naval Station Norfolk
Naval Personnel Development command
DSN 564-2996 EXT 3223
COMM 757-444-2996 EXT 3223

US Coast Guard:
AETCM Dukes
Training Quota Management Center
Chesapeake Va
COMM 757-366-6582

4-10. JOAP-TSC Reports.

a. Correlation Program Report. The Correlation Program Report is published each month by the JOAP-TSC. This report contains the complete correlation results for the most recent month as well as a table showing reproducibility 1 and reproducibility 2 failures and scoring over the last 12 months for each enrolled

spectrometer. This report averages over 400 pages and is intended for JOAP management level use (i.e. JOAP Coordinating Group, Major Command Monitors).

b. Correlation Test Results. The JOAP-TSC sends each participating laboratory their individual correlation test results each month. This computer printout is simply the page(s) of the JOAP Laboratory Correlation Program Report which applies to each individual laboratory. See figure 4-2 for an example of a typical JOAP Atomic Emission Rotrode instrument report and figure 4-3 for a typical Non-JOAP instrument report.

c. JOAP Directory. The JOAP Directory is published by the JOAP-TSC and contains mailing addresses, message addresses and phone numbers of management, liaison offices and oil analysis laboratories. The directory also provides a listing of JOAP codes and backup laboratory data.

d. JOAP Newsletter. The JOAP-TSC publishes a JOAP Newsletter on a quarterly basis. The newsletter is sent to all JOAP managers and DOD connected oil analysis laboratories. Articles published in the newsletter keep managers and technicians informed concerning news and developments relating to oil analysis. OAP personnel are invited to submit articles of interest for publication.

4-11. JOAP Data Processing and Warehousing.

a. The US Army data is processed and warehoused by the US Army Program Management office at Redstone Arsenal, Huntsville, AL. The US Navy data is processed and warehoused by the US Navy Program Management office at Pensacola NAS, Pensacola, FL. The US Air Force data is processed and warehoused by the AF OAP PMO at Tinker AFB, Oklahoma City, OK.

b. Laboratories shall submit data to their respective service data base as directed by the Service Program Manager or as contained in this publication.

1. All Navy and USMC laboratories shall submit data at the end of each day that samples are processed. This requirement for data submission applies to spectrometric and physical property data and to filter debris analysis data. Laboratories needing assistance with the data submission may phone 850-452-3175 ext 203 for help
2. Laboratories that do not process any samples for seven continuous days shall send a negative sample report to the NOAP office by fax to 850-452-3760 or by email. If email reporting is desired, contact the NOAP office at 850-452-3175 for the address to use.
3. Shipboard laboratories undergoing extended yard period shall notify the NOAP Office that the laboratory is in stored status and provide the number of months that no data will be submitted.

c. Each Service Program Manager is responsible for routine data transfer to the other services. See Appendix D, OASIS Data Base Structure Summary.

Army only: The AOAP Program Manager will provide technical assistance and initiate corrective software program changes to the Oil Analysis Standard Interservice System (OASIS) laboratory operating system. If OASIS software support is required, contact the PD AOAP as follows:

ARMY OIL ANALYSIS PROGRAM OFFICE
USAMC LOGISTICS SUPPORT ACTIVITY
ATTN AMXLS-AO BUILDING 3661
REDSTONE ARSENAL AL 35898-7466
AOAP Hot Line DSN: 645-0869 / (256) 955-0869
Data Facsimile: 746-9344 / (256) 876-9344
DDN address: logsa.aoap@conus.army.mil

d. Data Reports: Routine reports are produced from laboratories and from the service data bases. Examples of some of the reports available are included in appendices C and D (D is Army only).

e. The US Air Force laboratories will use the following instructions for submitting data when using Windows. If using any other system software, contact the JOAP-TSC for instructions.

(1) After the diskette with the "keypunch.dat" file is created, start Windows. Any questions about creating this file using AETC software should be referred to the US Air Force Program Office.

(2) There are three ways to send the data. A file may be attached, "Notepad" may be used to import the information directly into the e-mail, or the information may be mailed on diskette if there is no e-mail capability.

(3) Using an attached file:

(a) Go to the e-mail function.

(b) Select "New Message"

(c) Ensure that correct AFCR address is used for submission of all data bank information: AFCR@TINKER.AF.MIL

(d) Ensure the correct subject is used exactly as shown with no additional characters (use capital letters and spaces as shown):

AETC ATTN JCL

(e) Click on the function to attach a file (usually represented as a paper clip).

(f) Type in the exact file name or find the file and click on it.

(g) Click on "attach".

(h) Select "Send".

(4) Using "Notepad":

(a) Start up "Notepad" as follows:

(1) Click on "Start".

(2) Go to "Programs".

(3) Go to "Accessories".

(4) Select "Notepad".

(b) From the "Notepad" menu, click on "File", and select "Open".

(c) Select the location of the data at "Look in", which is normally on diskette at the "A" or "B" drive locations.

(d) Select the file desired. If the desired file is not displayed, select "All files" for "Files of type".

(e) Double click on the data file open it.

(f) Click on "Edit" and "Select All". Then click "Edit" and select "Copy". All of the data is now in memory.

(g) Close "Notepad".

(h) Go to the e-mail function.

(i) Ensure that the e-mail is set to a width of 90 characters.

(j) Select "New Message".

(k) Ensure that correct AFCR address is used for submission of all data bank information: AFCR@TINKER.AF.MIL

(l) Ensure the correct subject is used exactly as shown with no additional characters (use capital letters and spaces as shown):

AETC ATTN JCL

(m) Click in the upper left-hand corner of the e-mail message area.

(n) Select "Edit" and then "Paste". This process will place all of the B003 information into the e-mail. Do not enter any additional information into the body of the e-mail. The laboratory location will be known from the coding in the data and the e-mail address.

(o) Select "Send".

Interlaboratory Correlation Test Results
May 2005
Air Force Laboratory
Spectroil M (E)
Sample Pair 1 & 2

Sample 1

	Fe	Ag	Al	Cr	Cu	Mg	Na	Ni	Pb	Si	Sn	Ti	B	Mo	Zn
Lab Results	7	26	7	7	7	8	67	7	7	6	7	23	6	6	7

Sample 2

	Fe	Ag	Al	Cr	CU	Mg	Na	Ni	Pb	Si	Sn	Ti	B	Mo	Zi
Lab Results	6	21	6	6	6	6	59	6	6	5	6	18	5	5	6
Reprod.(1)	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
Reprod.(2)	P	P	P	P	P	P	P	P	P	P	P	F	P	P	P
Points:	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1

Sample Pair 3 & 4

Sample 3

	Fe	Ag	Al	Cr	Cu	Mg	Na	Ni	Pb	Si	Sn	Ti	B	Mo	Zn
Lab Results	11	11	7	19	11	12	65	25	10	10	18	11	10	11	15

Sample 4

	Fe	Ag	Al	Cr	Cu	Mg	Na	Ni	Pb	Si	Sn	Ti	B	Mo	Zn
Lab Results	11	11	7	19	11	12	64	26	10	9	18	11	10	11	15
Reprod.(1)	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
Reprod.(2)	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
Points:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Note Failed Critical Wear Element(s): Ti

Twelve Month Summary

	Sample Pair 1 & 2															Sample Pair 3 & 4														Score	3 Mo. Ave.	Cert.
	Fe	Ag	Al	Cr	Cu	Mg	Na	Ni	Pb	Si	Sn	Ti	B	Mo	Zn	Fe	Ag	At	Cr	Cu	Mg	Na	Ni	Pb	Si	Sn	Ti	B	Mo	Zn			
																															97	94.7	Y
Apr								2																									
Mar			2													2															93	90.0	
Feb				1																				1							94 L	90.7	
Jan		2			2											2	2							2							83	92.7	
Dec																	1										1				95	97.0	
Nov																															100	97.3	
Oct																												1	1		96	97.3	
Sep								1																2							96	98.7	
Aug																															100	100.0	
Jul																															100	99.3	
Jun																															100	96.3	
May																								2							98	94.0	

1=Failed Reprod.(1) - Reproducibility among laboratories (Inter-Lab)
2= Failed Reprod.(2) - Reproducibility among samples 1 & 2 or 3 & 4 (Intra-Lab)
3=Failed both Reprod.(1) & Reprod.(2) (Inter-Lab & Intra-Lab)

m = Reported Maintenance
s = Not submitted
* No History Found

n = Not Required
z = Given zero
c = Not Computed

Y = Certified
N = Uncertified
A = Allied
- = Non-Certifiable
U = Unknown

Figure 4-3. Typical JOAP Atomic Emission Rotrode Instrument Report

Interlaboratory Correlation Test Results
May 2005
Allied Laboratory
Spectraspan (A)
Sample Pair 1 & 2

Sample 1

	Fe	Ag	Al	Cr	Cu	Mg	Na	Ni	Pb	Si	Sn	Ti	B	Mo	Zn
Lab Results	6	15	5	6	5	6	NR	6	NR	5	NR	18	NR	NR	NR

Sample 2

	Fe	Ag	Al	Cr	Cu	Mg	Na	Ni	Pb	Si	Sn	Ti	B	Mo	Zi
Lab Results	5	13	4	5	4	5	NR	5	NR	4	NR	15	NR	NR	NR
Reprod.(1)	P	P	P	P	P	P	-	P	-	P	-	P	-	-	-
Reprod.(2)	P	P	P	P	P	P	-	P	-	P	-	P	-	-	-
Points:	1	1	1	1	1	1	-	1	-	1	-	1	-	-	-

Sample Pair 3 & 4

Sample 3

	Fe	Ag	Al	Cr	Cu	Mg	Na	Ni	Pb	Si	Sn	Ti	B	Mo	Zn
Lab Results	5	4	5	12	5	5	NR	14	NR	5	NR	5	NR	NR	NR

Sample 4

	Fe	Ag	Al	Cr	Cu	Mg	Na	Ni	Pb	Si	Sn	Ti	B	Mo	Zn
Lab Results	5	4	5	12	5	5	NR	14	NR	5	NR	5	NR	NR	NR
Reprod.(1)	P	P	P	P	P	P	-	P	-	P	-	P	-	-	-
Reprod.(2)	P	P	P	P	P	P	-	P	-	P	-	P	-	-	-
Points:	1	1	1	1	1	1	-	1	-	1	-	1	-	-	-

AA Statistics Based On 10 Instruments Reporting

Twelve Month Summary

	Sample Pair 1 & 2															Sample Pair 3 & 4														Score	3 Mo. Ave.	Cert
	Fe	Ag	Al	Cr	Cu	Mg	Na	Ni	Pb	Si	Sn	Ti	B	Mo	Zn	Fe	Ag	Al	Cr	Cu	Mg	Na	Ni	Pb	Si	Sn	Ti	B	Mo	Zn			
Apr			1																												94	90.7	A
Mar	1																	1													89	87.0	
Feb																										1					89	87.0	
Jan		1				1												1													83	85.0	
Dec	1																								2						89	85.0	
Nov				1													1								1						83	83.0	
Oct		2					1																			1					83	86.7	
Sep				2		2																				2					83	88.7	
Aug	2																														94	90.7	
Jul	1																								1						89	87.0	
Jun										1											1										89	87.0	
May		2		1																					2						83	87.0	

1=Failed Reprod.(1) - Reproducibility among laboratories (Inter-Lab)
2= Failed Reprod.(2) - Reproducibility among samples 1 & 2 or 3 & 4 (Intra-Lab)
3=Failed both Reprod.(1) & Reprod.(2) (Inter-Lab & Intra-Lab)

m = Reported Maintenance
s = Not submitted
* No History Found

n = Not Required
z = Given zero
c = Not Computed

Y = Certified
N = Uncertified
A = Allied
- = Non-Certifiable
U = Unknown

Figure 4-4. Typical Non-JOAP Instrument Report

APPENDIX A - RECOMMENDATIONS

STANDARD LAB RECOMMENDATION CODES - AERONAUTICAL FOR SPECTROMETRIC ANALYSIS (NOT FOR ARMY USE)

CODE	GENERAL LAB RECOMMENDATIONS
A	Sample results normal; continue routine sampling.
X	Analysis results supplied to customer; no recommendation required.
Z	Previous recommendation still applies.

CODE	INSPECTION RECOMMENDATIONS (Requires Feedback)
H**	Inspect unit and advise lab of finding. Abnormal wear indicated by *** PPM (element).
R**	Do not fly or operate; inspect filters, screens, chip detector and sumps; advise laboratory of results.
T**	Do not fly or operate. Examine for discrepancy and advise laboratory of results and disposition. If discrepancy found and corrected, continue operation and submit resample after *** hours of operation. If discrepancy is not found, recommend remove component from service and send to maintenance.

CODE	OIL CHANGE RECOMMENDATIONS (Requires Resample)
J	Contamination confirmed. Change oil, sample after *** minute run-up and after *** operating hours. NOTE: Contamination is defined as water, coolant, silicon, etc. and not wear metals. Use the appropriate recommendation codes for increasing trends or elevated wear- metal conditions.
W	Contamination suspected. Change oil; run for *** additional hours, take samples hourly. (This code is for Air Force ALC Depot use only).

CODE	LAB REQUESTED RESAMPLES (Requires Resample)
B*	Resample as soon as possible; do not change oil.
C*	Resample after *** hours; do not change oil.
E*	Do not change oil. Restrict operations to local flights or reduced load operation, maintain close surveillance and submit check samples after each flight or *** operating hours until further notice.
F*	Do not change oil. Submit resample after ground or test run. Do not operate until after receipt of laboratory result or advice.
G*	Contamination suspected, Do not change oil, resample unit and submit sample from new oil servicing this unit.
P*	Do not fly or operate; do not change oil; resubmit resample as soon as possible.
Q*	Normal PPM reading was obtained from test cell run after complete P.E. where oil lubricated parts were changed/removed/replaced. Monitor engine closely after installation to ensure a normal trend before release to routine sampling.

NOTES:

*Resample (red cap) required
**Maintenance feedback required; advise laboratory of findings
***Laboratory will specify time limit

STANDARD LAB RECOMMENDATION CODES - NON AERONAUTICAL FOR SPECTROMETRIC ANALYSIS (NOT FOR AIR FORCE OR ARMY USE)

CODE	GENERAL LAB RECOMMENDATIONS
A	Sample results normal; continue routine sampling.
X	Analysis results supplied to customer; no recommendation required.
Z	Previous recommendation still applies.

CODE	INSPECTION RECOMMENDATIONS (Requires Feedback)
H**	Inspect unit and advise lab of finding. Abnormal wear indicated by (element) (PPM). Resample after (maintenance/***hours/etc.).
K**	Impending failure, critical wear indicated by (element). Inspect unit and advise lab of findings. Resample after (maintenance/***hours/etc.).
L**	Inspect brake and clutch plate adjustments, change oil service filters, resample after *** hours of operation.
M**	Perform engine coast-down check If engine fails test, examine for discrepancy and advise lab of results, else resample after *** hours of operation.
U**	Cooling system leak indicated by (Mg/Cr/Na/B). Inspect unit and advise lab of findings. Resample after (maintenance/***hours/etc.).

CODE	OIL CHANGE RECOMMENDATIONS (Requires Resample)
D	Change oil and service filters. Resample after *** hours of operation.

CODE	LAB REQUESTED RESAMPLES (Requires Resample)
B*	Resample as soon as possible; do NOT change oil.
C*	Resample after *** hours.
F*	Do not change oil; submit special sample after test run. Do not operate until after receipt of laboratory results or advice.
G*	Contamination suspected; resample unit and submit sample from new oil servicing this unit.
N*	Unit 'wear-in' indicated; resample in accordance with break-in schedule or after *** hours.
I*	Stop purification resample each engine after 4 hours of operation.
P*	Do not operate; do not change oil; submit resample as soon as possible.

NOTES:

*Resample (red cap) required
**Maintenance feedback required; advise laboratory of findings
***Laboratory will specify time limit

STANDARD LAB RECOMMENDATION CODES - PHYSICAL TEST RECOMMENDATIONS (NOT FOR AIR FORCE OR ARMY USE)

CODE	RECOMMENDATION
AA	Oil condition normal; continue routine sampling.
DN	Do not operate.
ER	Evaluate and repair component.
TS	Check oil type and source.
ZZ	Previous recommendation still applies.
XX	Analysis results supplied to customer; no recommendation required.

CODE	OIL CONDITION STATEMENTS
FD	Fuel dilution.
NN	Neutralization or acid number.
PC	Particle count excessive.
PN	Precipitation number.
SA	Solid or abrasive material.
VS	Viscosity (high/low/change).
WA	Water

CODE	OIL CHANGE RECOMMENDATIONS
CS	Change oil and service filter.
CP	Purify, renovate or change oil and service filters.

CODE	LAB REQUESTED SAMPLES (Requires Resample)
RB*	Resample as soon as possible.
RC*	Resample after *** hours.
RH*	Submit hot sample.
RI*	Resample; insufficient amount of sample received.
RS*	Submit sample of new oil servicing this unit.

CODE	INSPECTION RECOMMENDATIONS (Requires Feedback)
IA**	Inspect and repair air induction system.
IC**	Inspect and repair cooling system.
IF**	Inspect repair fuel system; change/service filters oil.
IW**	Inspect for source of water.

NOTES:

*Resample (red cap) required.
**Maintenance feedback required; advise laboratory of findings.
***Laboratory will specify time limit.

APPENDIX B

JOAP LABORATORY LISTING

JOINT DoD LABORATORIES

****JOAP Technical Support Center, Pensacola, FL

US ARMY LABORATORIES

CONUS:

Fort Bragg, NC
Fort Campbell, KY
Fort Carson, CO
Fort Hood, TX
Fort Irwin, CA
Fort Lewis,WA
Fort Rucker, AL
Redstone Arsenal, AL

OCONUS :

Bagram, Afghanistan
Kandahar, Afghanistan
Camp Anaconda, Iraq
Camp Arifjan, Kuwait
Camp Humphreys, Korea
Camp Marmal, Afghanistan
Mannheim (Coleman Barracks), Germany

US ARMY DEPOT LABORATORIES (QA ONLY)

CONUS:

*****Anniston Army Depot, AL
*****Corpus Christi Army Depot, TX
*****Red River Army Depot, TX

US NAVY LABORATORIES

Atsugi NAF, Japan
Cherry Point ISSC, NC
CNATRA Corpus Christi, TX
Fallon NAS, NV
Patuxent River NAWC AD Fuels and Lubricants Liaison, MD
PATUXENT RIVER NAS, MD
Iwakuni MCAS, japan
Jacksonville ISSC, FL
HMX-1, VA
Key West NAS, FL
Lemoore NAS, CA
Cherry Point, MALS 14, NC
Mayport, SERMC, FL
Norfolk MARMC, VA
Oceana NAS, VA
Pearl Harbor NSY and IMF, HI
San Diego SWRMC, CA
Sigonella NAS, Italy
Camp Pendleton, MALS-39, CA
Al Asad Air Base, MALS-16, Iraq
J52 ELU Bagram, Afghanistan
J52 ELU Whidbey Island, WA
Albany MCLB, GA
Bahrain NSA, Bahrain
USS ABRAHAM LINCOLN
USS BATAAN
USS BONHOMME RICHARD
USS BOXER
USS CARL VINSON
USS DWIGHT D EISENHOWER
USS ENTERPRISE
USS ESSEX
USSGEROGE WASHINGTON
USS HARRY S TRUMAN
USS JOHN C STENNIS
USS KEARSARGE
USS NASSAU
USS NIMITZ
USS PELELIU
USS RONAL REAGAN
USS THEODORE ROOSEVELT
VAQRON 129, WA
WHIDBEY ISLAND NAS, WA
USS WASP
USS IWO JIMA
YUMA MCAS, AZ
USS MAKIN ISLAND
USS GEORGE H BUSH

US AIR FORCE LABORATORIES

332ND AEW Iraq
Alpena CRTC, MI
Al Dhafra, UAE
Al Udeid AB, Qatar
Andersen AB, Guam
Andrews AFB, MD
Arnold AFB, TN
Atlantic City ANGB, NJ
Aviano AB, Italy
Bangor ANGB , ME
Barksdale AFB, LA (2nd)
Barksdale AFB, LA (917th)
Barnes ANGB, MA
Battle Creek ANGB, MI
Beale AFB, CA
Bradley ANGB, CT
Buckley ANGB, CO
Burlington IAP, VT
Cannon AFB, NM
Cape Canaveral Aerospace Fuels Lab, FL
Capital Airport, IL
Columbus AFB, MS
Dannelly Field, AL
Davis Monthan AFB, AZ
Des Moines IAP, IA
District of Columbia ANG, MD
Dover, DE
Duluth IAP MN
DynCorp NASA, TX
Edwards AFB, TX
Eglin AFB, FL (33rd)
Eglin AFB, FL (46th)
Eielson AFB, AK
Ellington ANGB, TX
Elmendorf AFB, AK
Fairchild AFB, WA (92nd)
Fairchild AFB, WA (141st)
Forbes Field, KS
Fort Smith ANGB, AR
Fort Wayne IAP, IN
Forth Worth NAS JRB, TX
Fresno ANGB, CA
Gowen Field, ID
Great Falls IAP, MT
Grissom ARB, IN
Gulfport ANG CRTC, MS
Hancock Field, NY
Hector Field, ND
Hickham AFB, HI
Hill AFB, UT (388th)
Hill AFB, UT (419th)
Holloman AFB, NM
Homestead ARS, FL
Hulman Field, IN
Hurlburt Field, FL
Incirlik AB, Turkey
Jacksonville ANGB, FL
Joe Foss Field, SD
Kadena AB, Japan
Keflavik AB, Iceland
Kingsley Field, OR
Kirtland AFB, NM (58th)
Kirtland AFB, NM (150th)
Kunsan AB, Korea
Lackland AFB,TX
Lajes Field, Azores
Lakenheath RAF, United Kingdom
Lambert IAP, MO
Langley AFB, VA
Laughlin AFB, TX
Lear Siegler Services, TX
Lockheed Martin Aeronautical Systems, GA
Lockheed Martin Kelly AVN CTR, TX
Lockheed Martin Skunkworks, CA
Louisiana ANG, LA (56th)
Luke AFB, AZ (58th)
Luke AFB, AZ (944th)
March ARB, CA
Martin State Airport, MD
McConnell AFB,KS
McEntire ANGS, SC
McGhee Tyson ANGB, TN
McGuire AFB, NJ (108th)
McGuire AFB, NJ (305th)
Mildenhall RAF, United Kingdom
Minot AFB, ND
Misawa AB, Japan
Moody AFB, GA
Moron AB, Spain
Mountain Home AFB, ID
Nellis AFB, NV
New Orleans NAS JRB, LA
Offutt AFB, NE
Ogden ALC,UT
Osan AB, Korea
Otis ANGB, MA
Paya Lebar AB, Singapore

AIR FORCE LABORATORIES (CONT)

Phoenix ANGB, AZ
Pope AFB, NC
Portland IAP, OR
Ramstein AB, Germany
Randolph AFB, TX
Richmond IAP, VA
Robins AFB, GA (9th)
Robins AFB, GA (116th)
Robins AFB, GA (WR-ALC)
Salt Lake City IAP, UT
Savannah IAP, GA
Scott AFB,IL
Selfridge ANGB, MI
Seymour Johnson AFB, SC
Shaw AFB, SC
Sheppard AFB, TX
Sioux City Gateway Airport, IA
Spandahlem AB, Germany
Springfield Beckley MAP, OH
Tinker AFB, OK (507th)
Tinker AFB (OC ALC)
Toledo Express Airport, OH
Travis AFB, CA
Truax Field, WI
Tucson IAP, AZ
Tulsa IAP, OK
Tyndall AFB, FL
USAF Thunderbirds, NV
Vance AFB, OK
Volk Field ANG CRTC, WI
Whiteman AFB, MO (442nd)
Whiteman AFB, MO (509th)
Willow Grove ARS, PA
Wright Patterson AFB, OH (88th)
Wright Patterson AFB, OH (445th)

* Laboratories having the following physical properties testing capabilities:

- Blotter
- Crackle
- Viscosity

**Laboratories having the following physical properties testing capabilities:

- Blotter
- Crackle
- Viscosity
- Ferrography
- Fourier Transform Infra Red Spectrometer

***Laboratories having the following physical properties testing capabilities:

- Acidity
- Fuel Dilution (Setaflash)
- Neutrality number
- pH
- Particle Count (HYAC)
- Precipitation number
- Water (Crackle)
- Water (Aquatest VIII)
- Viscosity

****Laboratories having the following physical properties testing capabilities:

Acidity
Fuel Dilution (Setaflash or Fuel Sniffer)
Neutrality number
pH
Particle Count (HIAC or PODS)
Precipitation number
Water (crackle)
Water (Aquatest 2010)
Viscosity
Fourier Transform Infrared Spectrometer (FT-IR)

*****Laboratories having the following physical properties testing capabilities:

Acidity
Base Number
Fuel Dilution (Setaflash or Fuel Sniffer)
Particle Count (LNF)
Water (Aquatest)
Viscosity (40 & 100 °C)
Fourier Transform Infrared Spectrometer (FT-IR)

APPENDIX C

OASIS Data Base Structure Summary

Structure for Database: TAPEFILE.DBF

Fld	Fld Name	Type	Width	Dec	Start	End	
1	TRANSCODE	C	1		1	1	Code for Transaction being recorded I - Initial Record for this Sample C - Change Record for Sample D - Sample Deleted Record F - Feedback Record U - Undelete Sample Record
2	DT_STAMP	C	14		2	15	Date and time record created Format = YYYYMMDDHHMMSS
3	TYPEQUIP	C	1		16	16	Type of Equipment (Air, Grd, Qa, etc)
4	TEC	C	4		17	20	Component TEC
5	ACCES	C	1		21	21	Currently Unused
6	COMPSN	C	15		22	36	Component Serial Number
7	DT_SAMPLE	C	8		37	44	Date Sample Taken
8	SAMPNO	C	5		45	49	Sample Number
9	COMPMOD	C	12		50	61	Component Model Number
10	EISN	C	12		62	73	End Item Serial Number at Time Component Sampled
11	EIMOD	C	11		74	84	End Item Model Number
12	UIC	C	6		85	90	UIC at time Component Sampled
13	MAJCOM	C	3		91	93	Major Command of UIC in Field 12
14	LABCODE	C	3		94	96	Testing Labs Lab Code
15	TRANSIT	C	2		97	98	Days from Sample Date to Received
16	REASSAMP	N	1		99	99	Reason for this sample
17	HRSCOMP	N	6		100	105	Hours since last complete overhaul
18	HRSOIL	N	4		106	109	Hours since last oil change
19	OIL	C	3		110	112	Amount of Oil Added
20	MEAS	C	1		113	113	Measurement unit of Oil Added
21	LABREC	C	1		114	114	Lab Rec for this sample
22	COMPREC	C	1		115	115	Calculated Computer Rec for Sample
23	SPEC_REDG	C	60		116	175	Spectrometer readings and Flags in Character format (15 elements)
24	MILEIND	C	1		176	176	Mileage Reading (M, K, or H)
25	MILEAGE	N	6		177	182	Mileage or Hours usage
26	REMARKS	C	30		183	212	1st 30 characters or remarks field Fields 27 thru 38 will be blank of 0's in cases where component does not require physical tests
27	CRACKLE	C	3		213	215	Crackle test results code
28	VISC	C	3		216	218	Viscosity test results code
29	FUELDIL	C	3		219	221	Fuel dilution percent
30	INSOL	C	3		222	224	Solubility test results code
31	PHYSREC1	C	2		225	226	Lab Physical Rec. Code 1
32	PHYSREC2	C	2		227	228	Lab Physical Rec. Code 2
33	PHYSREC3	C	2		229	230	Lab Physical Rec. Code 3
34	TEMP	C	3		231	233	Oil temp. for physical test
35	CONTAM	C	1		234	234	Contamination results code
36	COOL	C	1		235	235	Coolant test results code
37	ALKIN	C	1		236	236	Alkalinity test results code

APPENDIX C

OASIS Data Base Structure Summary

Structure for Database: TAPEFILE.DBF - continued

Fld	Fld Name	Type	Width	Dec	Start	End	
38	DISPERS	C	1		237	237	Dispersancy test results code Fields 39 thru 45 will be blank or 0's for all records which are not feedback records
39	DT_FB	C	8		238	245	Date feedback received
40	ACTION	C	1		246	246	Feedback action code
41	HOWFND	C	1		247	247	Feedback How found code
42	DISITEM	C	2		248	249	Feedback Discrepancy code
43	HOWMAL	C	1		250	250	Feedback How Malfunctioned code
44	ACTION2	C	1		251	251	2nd feedback Action code
45	FBRMKS	C	29		252	280	Remarks from feedback
46	DT_ANAL	C	8		281	288	Date Sample Analyzed
47	HOWTAKEN	C	1		289	289	How sample was taken
48	TYPEOIL	C	1		290	290	Type Oil used
49	SAMPTEMP	C	1		291	291	Temperature from physical test
50	DT_RECEIV	C	8		292	299	Date Sample received in lab
51	EVALSPEC	C	3		300	302	Initials of Spectro Evaluator
52	EVALPHYS	C	3		303	305	Initial of Physical Evaluator
53	CHGCOUNT	C	1		306	306	Number this change is if fld 1 = C
54	DT_XFER	D	8		307	314	Date record sent to Log SA
55	CHG_ID	C	1		315	315	Identifies change as Physical or Spectrometer Change
**	Total **		316				

Appendix C (continued)

US Army Oil Analysis Reports

1. (Monthly) Resample and Type Recommendation Report

   This report is a summary of the latest samples with a laboratory recommendation other than normal. A recommendation is considered abnormal if it is other than an "A" for spectrometric advices or other than "AA" for physical advices. In case of ground equipment with an advice code of "Z" (previous recommendation still applies), the number of Z advices is also counted and reported.

   The report shows the component serial number, end-item model, end-item serial number, component model, date sample analyzed, either the physical or spectrometric lab advice depending on the level of significance of the advice code, and a narrative interpretation of the advice code.

   The report items are grouped by UIC. The report may address only specific UIC's, Sort Codes, or all UIC's. See page D-5 for an example of this report.

2. (Monthly) Monthly Activity Report

   The Monthly Activity Report is grouped by UIC, and up to four copies may be requested. The report shows the component model, component serial number, end-item serial number, sample number, date sample analyzed, days in transit, hours since overhaul, hours since oil change, reason for sample and either the physical or spectrometric lab advice depending on the level of significance of the advice code.

   This information is shown for all samples for each piece of equipment. The report also includes totals for number of samples analyzed for the month, the average days in transit, and the n umber of samples processed with 'UNKNOWN" HSOH (hours since overhaul) and HSOC (hours since oil change). See page D-6 for an example of this report.

3. (Monthly) End Item Configuration Report

   The End Item Configuration Report shows the end-item model, end-item serial number, UIC, component model, component serial number, and dates of the last five samples taken. This report is sorted by end-item serial number, component model, and component serial number. See page D-7 for an example of this report.

4. (Monthly) Summary by Equipment Type Report

   The Summary by Equipment Type Report is a summary of laboratory recommendations given for samples processed for the previous month. See page D-8 for an example of this report.

5. (Monthly) Components Enrolled Report

   The Components Enrolled Report lists the history records that contain a sample processed in the lab during the reporting period. The report includes all components enrolled through the last day of the previous month.

   The top of the report shows the sort code, UIC, unit name and address, report date, and name of the laboratory.

   For ground equipment, the body of the reports shows bumper number, end-item model, end-item serial number, component model, component serial number, hours since overhaul, hours since oil change, sampling interval hours/days, date sample taken, reason sampled, and remarks. If the equipment is TDY, the word TDY will appear in the remarks column.

The report is sorted by sort code, UIC, end-item serial number, TEC, and the component serial number and bumper number for ground equipment. See pages D-9 and D-10 for an example of this report.

6. Laboratory Workload Summary Report

The Laboratory Workload Summary report is sorted by sort code, UIC, end-item serial number, component TEC, and component serial number. The report shows a breakdown of lab recommendations, reasons for sample, and feedback required for samples within a UIC. The report is a summary of samples analyzed during the previous month.

The "unit summary" part of the report shows the number of end-items enrolled, the number of components enrolled, and the number of feedback required within a UIC. In addition for ground equipment, the report shows the percentage of components that have no usage reported and the percentage of components that are delinquent. Delinquency occurs when an enrolled component is not sampled during the established sampling interval.

The "type sample" part of the reports shows a breakdown of the reason for sample codes given to the samples. Any samples with the reason "R" are classified as routine; any with an "L" are classified as lab requests, and all others are classified as "other".

The "lab recommendation" part of the report shows either the physical or spectrometric lab advice depending on the level of significance in the advice code file for the samples. The advices are grouped as normal, resample, purify oil, and inspect. See pages D-11 and D-12 for an example of this report.

7. (On Request) Laboratory Response Time Report

This report is automatically produced when the laboratory workload summary is selected. The Laboratory Response Time Report reflects the number of days between receiving and processing a sample. The report is a summary of the number of samples processed within 0-10 days, over 10 days, unknown days, total samples processed, and the average response time in days.

The grand totals produced by the report are saved in a disk file for transmission of FSA (PROV). See page D-13 for an example of the report.

8. (Monthly) Usage and Sample Status Report

The end-item usage and component status report is produced on a monthly basis by UIC for ground equipment only.

The report shows the bumper number, component model, end-item model, end-item serial number, end-item meter reading, component serial number, sample number, date sample taken, date sample next due, days delinquent, feedback required, sample number, date, and remarks. Totals are provided end-items enrolled, components enrolled, end-items with no usage, recommendations with no feedback, components delinquent, and percentage of end-items with no usage. See page D-14 for an example of this report.

NON-AERONAUTICAL

SORT CODE:

065

RESAMPLE AND TYPE RECOMMENDATION REPORT

BY FT. CAMPBELL

REPORT DATE: 19 APRIL 1994

UIC NO. :WABOTO

BY DATE SAMPLE RECEIVED

UNIT NAME: 1ST BN 5TH SPECIAL FORCES
ATTN: AOAP POC
FT CAMPBELL, KY 42223-5000

END-ITEM MODEL	END-ITEM SERIAL NO.	COMPONENT MODEL	COMPONENT SERIAL No.	DATE ANALYZED	RECOMMEND LAB CODE	NARRATIVE	CODE	PREVIOUS REQUESTS
M35A2	022515329	LDT-465-1C	3802058	11/06-92	B OIL	RESAMPLE ASAP DO NOT CHANGE		

SORT CODE: 212

NON-AERONAUTICAL

065 OIL ANALYSIS MONTHLY ACTIVITY REPORT

FOR SAMPLE AND ANALYZED DURING REPORT DATE: 11 APRIL 1994

UIC NO. :WOXY26 JANUARY, 1992 COMMAND : FORSCOM

UNIT NAME: MAINTENANCE DIV,
FT MCCOY, ATTN: AFZR-DLM-CV
FT MCCOY, SPARTA WI, 54656

COMPONENT MODEL	COMPONENT SERIAL #	END ITEM SERIAL #	SAMPLE NUMBER	DATE ANAL	DAYS TRANS	HRS OVH	HRS SINCE OIL CHANGE	REASON FOR SAMPLE	LAB ADVICE
NHC-250	750697	10377	2501	01/30/92	8	2270	1814	ROUTINE	NORMAL
5R82	1078	61G1060	1532	01/21/92	4	UNKNOWN	UNKNOWN	ROUTINE	RESAMPLE ASAP
DD6V92	N2956535	6JD032163	2499	01/30/92	3	UNKNOWN	UNKNOWN	ROUTINE	NORMAL
CAT D333	2S13372	75E1091	168	01/06/92	3	UNKNOWN	510	ROUTINE	NORMAL
3R2211	2368	75E1738	2511	01/30/92	3	UNKNOWN	53	ROUTINE	NORMAL
5R6192	IHC00725	7GB00662	2436	01/29/92	6	UNKNOWN	2705	ROUTINE	NORMAL
5R6192	IHC00726	7GB00664	2437	01/29/92	6	UNKNOWN	1720	ROUTINE	NORMAL
DD6V92	06VF163109	8JD032164	2532	01/31/92	2	UNKNOWN	UNKNOWN	ROUTINE	NORMAL
HT750DRD	2510124937	8JD032164	2531	01/31/92	2	UNKNOWN	UNKNOWN	ROUTINE	NORMAL
DD6V92	N2956544	8JD032164	2534	01/31/92	2	UNKNOWN	UNKNOWN	ROUTINE	NORMAL
CASE 504BD	10367709	9160408	2500	01/30/92	3	UNKNOWN	863	ROUTINE	NORMAL
CASE 504BD	10367789	9160413	185	01/06/92	3	UNKNOWN	19	LAB REQUEST	NORMAL
CASE 504BD	10367511	9160420	186	01/06/92	3	UNKNOWN	965	LAB REQUEST	CHANGE OIL & RESAMPLE AFTER
CASE 504BD	10367511	9160420	2199	01/28/92	4	UNKNOWN	UNKNOWN	LAB REQUEST	NORMAL
TT2421-1	5110142354	9160420	2438	01/29/92	6	UNKNOWN	UNKNOWN	ROUTINE	NORMAL
360311	130805	A177B26354K	2510	01/30/92	3	UNKNOWN	UNKNOWN	ROUTINE	NORMAL
ISUZU C240	709267	A177B26354K	2497	01/30/92	3	UNKNOWN	UNKNOWN	ROUTINE	NORMAL
NHC-250	10265252	C12610198	2498	01/30/92	3	UNKNOWN	UNKNOWN	ROUTINE	NORMAL
NHC-250	752034	C12610356	2435	01/29/92	6	UNKNOWN	UNKNOWN	ROUTINE	NORMAL
NHC-250	10287488	C14010023	2533	01/31/92	2	UNKNOWN	13	ROUTINE	NORMAL
HT750DRD	2510124974	JD032163	2512	01/30/92	3	UNKNOWN	UNKNOWN	ROUTINE	NORMAL
IHC S-700	1662	U002932	154	01/06/92	3	UNKNOWN	UNKNOWN	ROUTINE	NORMAL
IHC DT-466B	194904	U002932	169	01/06/92	3	UNKNOWN	133	ROUTINE	NORMAL

SUMMARY FOR UIC: WOXY26

TOTAL SAMPLES ANALYZED	AVERAGE DAYS IN TRANSIT	TOTAL UNKNOWN OVERHAUL	TOTAL UNKNOWN OIL CHANGE
23	3.7	22	13

SUMMARY FOR LAB: Ft. Campbell

TOTAL SAMPLES ANALYZED	AVERAGE DAYS IN TRANSIT	TOTAL UNKNOWN OVERHAUL	TOTAL UNKNOWN OIL CHANGE
23	3.7	22	13

END-ITEM	END-ITEM MODEL	CUSTOMER S/N	COMPONENT UIC	COMPONENT MODEL	DATES LAST FIVE (5) SAMPLES TAKEN S/N
130G	7GB00662	WOXY26	5R6192	IHC00725	04/23/91 07/23/91 10/23/91 01/23/92 04/22/92
130G	7GB00662	WOXY26	CAT 3304 DIT	07211276	10/01/91 12/24/91 03/25/92 06/25/92 07/23/92
130G	7GB00663	WOXY26	5R6192	IHC00740	05/21/91 08/20/91 11/20/91 02/21/92 04/22/92
130G	7GB00663	WOXY26	CAT 3304 DIT	07211284	12/24/91 03/25/92 04/21/92 05/06/92 06/02/92
130G	7GB00664	WOXY26	5R6192	IHC00726	04/23/91 07/23/91 10/22/91 01/23/92 04/22/92
130G	7GB00664	WOXY26	CAT3304 DIT	07211292	08/27/91 10/01/91 12/24/91 03/25/92 06/25/92
22BM	129937	WOXY26	JN6I	618434	05/21/91 08/20/91 11/19/91 02/19/92 05/20/92
2500L	6JD032163	WOXY26	DD6V92	06VF163043	05/07/91 07/31/91 08/27/91 11/26/91 02/28/92
2500L	6JD032163	WOXY26	DD6V92	N2956535	05/07/91 07/31/91 10/29/91 01/27/92 04/24/92
2500L	8JD032164	WOXY26	DD6V92	06VF163109	05/07/91 07/31/91 10/30/91 01/28/92 04/30/92
21500L	8JD032164	WOXY26	DD6V92	N2956544	07/31/91 10/30/91 11/26/91 01/28/92 04/30/92
2500L	8JD032164	WOXY26	HT750DRD	2510124937	05/07/91 07/31/91 10/30/91 01/28/92 04/30/92
2500L	JD032163	WOXY26	HT750DRD	2510124974	07/31/91 10/29/91 01/27/92 04/24/92 07/23/92
ARTFT6	4D80256	WOXY26	DD-453N	D1192	11/09/92
ARTFT6	D1192	WOXY26	ALS 3331-1	63853	11/09/92 11/24/92
ARTFT6	D1192	WOXY26	HYD SYS	D1192	11/09/92
ARTFT6	E1425	WOXY26	DD-453N	4D0093571	08/20/91 11/19/91 02/19/92 03/04/92 05/19/92
ARTFT6	F1494	WOXY26	ALS 3331-1	6777976	06/03/89 11/08/89 05/16/90 05/20/90 07/11/90
ARTFT6	F1494	WOXY26	DD-453N	4D106329	11/09/92
ARTFT6	F1494	WOXY26	HYD SYS	F1494	11/09/92
CAT D7E	75E1091	WOXY26	3R2211	1366	09/17/91 10/01/91 11/19/91 02/24/92 05/26/92
CAT D7E	75E1091	WOXY26	CAT D333	2S13372	10/04/91 01/03/92 04/03/92 06/25/92 07/28/92
CAT D7E	75E1091	WOXY26	HYD SYS	75E1091	11/25/92
CAT D7E	75E1738	WOXY26	3R2211	2368	01/27/92 04/24/92 07/23/92 08/12/92 08/31/92
CAT D7E	75E1738	WOXY26	CAT D333	75E1738	12/03/91 03/04/92 03/24/92 04/17/92 07/23/92
CAT D7F	61G1060	WOXY26	5R82	1078	07/17/91 10/16/91 01/17/92 02/11/92 05/12/92
CAT D7F	61G1060	WOXY26	CAT 3306	61G1060	05/07/91 08/05/91 11/14/91 02/11/92 05/12/92

SORT CODE: 212

NON-AERONAUTICAL
AOAP SUMMARY BY EQUIPMENT TYPE FOR SAMPLES RECEIVED
BY FT. CAMPBELL
1 OCT 1992 - 31 OCT 1992

UIC NO: WABOTO
UNIT NAME: MAINTENANCE DIV,
COMMANDER
FT MCCOY, ATTN: AFZR-DLM-CV
FT MCCOY, SPARTA, WI 54656

END ITEM MODEL	COMP MODEL	NORMAL	RESAMPLE	CHANGE OIL	INSPECT EXAMINE	TOTAL SAMPLES	PERCENT NORMAL
130G	5R6192	3	0	0	0	3	100.00
130G	CAT 3304 DIT	1	1	0	0	2	50.00
2500L	DD6V92	1	0	0	0	1	100.00
2500L	HT750DRD	1	0	0	0	1	100.00
CAT D7F	CAT 3306	1	0	0	0	1	100.00
D60	NHC-250	1	0	0	0	1	100.00
H40XL-MIL	360311	2	0	0	0	2	100.00
H40XL-MIL	ISUZU C240	1	1	0	0	2	50.00
M10A	IHC DT-466B	1	0	0	0	1	100.00
M10A	IHC S-700	1	0	0	0	1	100.00
M810	NHC-250	2	0	0	0	2	100.00
MW24C	TT2421-1	1	1	0	0	2	50.00
UIC TOTAL >>>>>>		16	3	0	0	19	84.21

SORT CODE: 065
UIC NO.: WABOTO ACTIVE
UNIT: 1ST BN 5TH SPECIAL FORCES
COMMANDER

NON-AERONAUTICAL
COMPONENTS ENROLLED IN AOAP
REPORT PERIOD ENDING 31 Mar 94
FOR FT. CAMPBELL
REPORT DATE: 19 APRIL 1994
BY DATE SAMPLE TAKEN

ATTN: AOAP POC
FT CAMPBELL, KY 42223-5000

BUMPER	END-ITEM NUMBER	END-ITEM MODEL	END-ITEM SERIAL NO.	COMPONENT MODEL	COMPONENT SERIAL NO.	COMP HSOH	COMP HSOC	SMP HRS/DAY	INTDATE SAMPLED	REMARKS REASON SAMPLED
1D50	M35A2	012523540	LTD-465-1D	3988131		806	806	100/ 90	6Oct92	Routine
1D48	M35A2	012528596	LTD-465-1D	3993317		123	123	100/ 90	6Oct92	Routine
1D23	M35A2	012530980	LTD-465-1D	18009		406	406	100/ 90	6Oct92	Routine
1B3	M35A2	012532392	LTD-465-1D	3887827		27	27	100/ 90	6Oct92	Routine
1C3	M35A2	012533151	LD-465-1C	3924499		1669	1669	100/ 90	6Oct92	Routine
1A3	M35A2	022512765	LDT-465-1C	3900220		0	0	100/ 90	8Aug92	Routine
1B2	M35A2	022515329	LDT-465-1C	3802058		1190	1190	100/ 90	5Nov92	Lab Request
1D44	M35A2	022520253	LDT-465-1C	3807737		2202	220	100/ 90	22Sep92	Routine
1A2	M35A2	022522251	LDT-465-1C	3900592		1360	1360	100/ 90	5Nov92	Lab Request
1D27	M35A2	052525362	LDT-465-1C	3936051		1868	1868	100/ 90	5Nov92	Lab Request
1C2	M35A2	052525533	LD-465-1C	3889076		1765	1765	100/ 90	5Nov92	Lab Request
1D22	M35A2	053914027	LD-465-1C	3870176				100/ 90	3Nov92	Routine
1D25	M35A2C	054010373	LD-465-1	3831769		2461	2461	100/ 90	3Nov92	Routine
1D52	M35A2C	054010675	LDT-465-1C	3901222		1111	1111	100/ 90	22Sep92	Routine
1D24	M35A2	054012745	LDT-465-1C	3900520		11	11	100/ 90	7Oct92	Routine
1D49	M35A2C	054013570	LDT-465-1C	3900417				100/ 90	6Oct92	Routine
1D45	M35A2	054065909	LDT-465-1C	4886547		1209	1209	100/ 90	22Sep92	Routine
1D70	M10A	1004	HYD SYS	1004		427	302	0/365	7Oct92	Routine
1D70	M10A	1004	IHC S-700	1124678		302	302	50/ 90	3Nov92	Routine
1D70	M10A	1004	IHC DT-466B	79941		302	302	50/ 90	22Sep92	Routine
1D69	M936A2	1032AA026	HYD SYS	1032AA026		326	326	0/365	4May92	Routine
1D69	M936A2	1032AA026	MT 654	2420116480		34	29	100/ 90	22Sep92	Routine
1D69	M936A2	1032AA026	6CTA-8.3	44310302		342	342	100/ 90	22Sep92	Routine
1D51	M35A2	13446	LDT-465-1C	3904243		10059	1005	100/ 90	22Sep92	Routine
1D68	M923A2	2303323	MT 654	2420131371		177	177	100/ 90	6Oct92	Routine
1D68	M923A2	2303323	6CTA-8.3	44495233		177	177	100/ 90	6Oct92	Routine
1D26	M35A2C	30887	LDT-465-1D	821274T		210	209	100/ 90	22Sep92	Routine
1D46	M923	C52303394	NHC-250	11148480		546	546	100/ 90	6Oct92	Routine
1D46	M923	C52303394	MT 654	2420022752		488	488	100/ 90	6Oct92	Routine
1D47	M923	C52305301	NHC-250	111848480		385	385	100/ 90	15Oct92	Routine
1D47	M923	C52305301	MT 654	2420030705		373	373	100/ 90	22Sep92	Routine
1D48G	MEP-005A	RZ53532	D298ERX37	3468285		1894	1894	50/ 90	6Oct92	Routine
1D50G	MEP-005A	RZ53750	D298ERX37	3452512		1055	1055	50/ 90	22Sep92	Routine
1D51G	MEP-005A	RZ53754	D298ERX37	3452855		395	395	50/ 90	22Sep92	Routine

TOTAL END ITEMS ENROLLED = 28
TOTAL COMPONENTS ENROLLED = 35

NON-AERONAUTICAL
COMPONENTS ENROLLED IN AOAP AT FT. CAMPBELL
REPORT PERIOD ENDING
19 Apr 94

GRAND TOTAL OF END ITEMS ENROLLED = 28
GRAND TOTAL OF COMPONENTS ENROLLED = 35

NONAREONAUTICAL LABORATORY WORKLOAD SUMMARY
REPORT DATE: 18 April 1994
AT FT. CAMPBELL
1 OCT 1992 - 31 OCT 1992

SORT CODE	UIC	UNIT NAME	--------UNIT SUMMARY-------- END ITEMS	EI % UNK	USG COMP.	% DEL.	----------FOR SAMPLES RECEIVED---------- FEEDBKS REQ'D	TOTAL	--------TYPE SAMPLE-------- ROUTINE	LAB REQ.	OTHER	--LAB RECOMMENDATION-- NORM.	RESAMP	OIL	CHG INSP
212		WABOTO MAINTENANCE DIV.	19	15.79	19	0.00	0	19	19	0	0	16	3	0	0
TOTALS FOR UIC'S SELECTEC FOR SORT CODE 212			19	15.79	19	0.00	0	19	19	0	0	16	3	0	0

NON-AERONAUTICAL LABORATORY WORKLOAD SUMMARY REPORT DATE: 18 April 1994
AT FT. CAMPBELL

CT 1992 - 31 OCT 1992

1

SORT CODE	UIC	UNIT NAME	END ITEMS	EI %	USG UNK	COMP. %	DEL	FEEDBKS REQ'D	TOTAL	ROUTINE	LAB REQ.	OTHER	NORM	RESAMP.	CHG OIL	INSP
			--------UNIT SUMMARY--------					------TYPE SAMPLE------					--LAB RECOMMENDATIONS--			
			----------FOR SAMPLES RECEIVED----------													
GRAND TOTALS FOR ALL SORT CODES			19	15.79	19	0.00	0	19	19	0	0	16	3	0	0	

NON-AERONAUTICAL

LABORATORY RESPONSE TIME FOR SAMPLES RECEIVED REPORT DATE: 18 April 1994

By Ft. Campbell

1 Oct 1992 - 31 Oct 1992

SORT CODE	UIC	UNIT	NAME	TOTAL SAMPLES	AVG TIME IN DAYS	0 DAYS	1 DAYS	2 DAYS	3 DAYS	4 DAYS	5 DAYS	6 DAYS	7 DAYS	8 DAYS	9 DAYS	10 DAYS	OVER 10 DAYS	UNKN DAYS
TOTAL ALL LAB DAYS >>>>>>>				19	0.16	16	3	0	0	0	0	0	0	0	0	0	0	0

SORT CODE: 065
UIC NO.: WABOTO ACTIVE
UNIT: 1ST BN 5TH SPECIAL FORCES
COMMANDER

NON-AERONAUTICAL
USAGE & SAMPLE STATUS REPORT
REPORT PERIOD ENDING 31 Mar 94 FOR FT. CAMPBELL
REPORT DATE: 18 APRIL 1994
BY DATE SAMPLE TAKEN

ATTN: AOAP POC
FT CAMPBELL, KY 42223-5000

BUMPER NUMBER	END ITEM MODEL	END-ITEM SERIAL NO.	E/I METER READING	COMPONENT MODEL		COMPONENT SERIAL NO.	SAMP NUM	SAMPLE TAKEN	NEXT DUE	DATE DAYS DELINQ	DATE FEEDBACK SAMP	REQUIRED NO.	REMARKS DATE
1D50	M35A2	012523540	81021 M	LDT-465-1D		3988131	934	06OCT92-04JAN93					
1D48	M35A2	012528596	6172 M	LDT-4651D		3993317	929	06OCT92-04JAN93					
1D23	M35A2	012530980	4286 M	LDT-465-1D		18009	933	06OCT92-04JAN93					
1B3	M35A2	012532392	5901 M	LDT-465-1D		3887827	935	06OCT92-04JAN93					
1C3	M35A2	012533151	12754 M	LD-465-1C	-ENG	3924499	932	06OCT92-04JAN93					
1A3	M35A2	022512765	27165 M	LDT-465-1C		3900220	174	08AUG92-06NOV92					
1B2	M35A2	022515329	24608 M	LDT-465-1C		3802058	648	05NOV92-03FEB93					
1D44	M35A2	022520253	1 M	LDT-465-1C		3807737	2644	22SEP92-21DEC92					
1A2	M35A2	022522251	55630 M	LDT-465-1C		3900592	649	05NOV92-03FEB93					
1D27	M35A2	052525362	11459 M	LDT-465-1C		3936051	647	05NOV92-03FEB93					
1C2	M35A2	052525533	313356 M	LD-465-1C	-ENG	3889076	646	05NOV92-03FEB93					
1D22	M35A2	053914027	12085 M	LD-465-1C	-ENG	3870176	434	03NOV92-01FEB93					
1D25	M35A2C	054010373	62486 M	LD-465-1	-ENG	3731769	431	03NOV92-01FEB93					
1D52	M35A2C	054010675	23731 M	LDT-465-1C		3901222	2643	22SEP92-21DEC92					
1D24	M35A2	054012745	229 M	LDT-465-1C		3900520	1299	07OCT92-07OCT93					
1D49	M35A2C	054013570	389579 M	LDT-465-1C		3900417	936	03NOV92-01FEB93					
1D45	M35A2	054065909	50010 M	LDT-465-1C		4886547	2640	22SEP92-21DEC92					
1D70	M10A	1004	31 M	HYD SYS	-HYD	1004	1213	07OCT92-07OCT93					
1D70	M10A	1004	325 M	IHC S-700	-XMSN	1124678	430	03NOV92-01FEB93					
1D70	M10A	1004	310 M	UGC DT-466B	-ENG	79941	2818	22SEP92-21DEC92					
1D69	M936A2	1032AA026	10770 M	HYD SYS	-HYD	1032AA026	385	04MAY92-04MAY93					
1D69	M936A2	1032AA026	10973 M	MT 654	-XMSN	2420116480	2637	22SEP92-21DEC92					
1D69	M936A2	1032AA026	10973 M	6CTA-8.3	-ENG	44310302	2642	22SEP92-21DEC92					
1D51	M35A2	13446	42112 M	LDT-465-1C		3904243	2639	22SEP92-21DEC92					
1D68	M923A2	2303323	7475 M	MT 654	-XMSN	2420131371	939	06OCT92-04JAN93					
1D68	M923A2	2303323	7475 M	6CTA-8.3	-ENG	44495233	937	06OCT92-04JAN93					
1D26	M35A2C	30887	6704 M	LDT-465-1D		821274T	2641	22SEP92-21DEC92					
1D46	M923	C52303394	14778 M	NHC-250	-ENG	11148480	931	06OCT92-04JAN93					
1D46	M923	C52303394	14778 M	MT 654	-XMSN	2420022752	938	06OCT92-04JAN93					
1D47	M923	C52305301	104797 M	NHC-250	-ENG	11184543	2308	15OCT92-13JAN93					
1D47	M923	C52305301	104797 M	MT-654	-XMSN	2420030705	2636	22SEP92-21DEC92					

TOTAL END ITEMS ENROLLED = 24
TOTAL COMPONENTS ENROLLED = 31
TOTAL END ITEMS WITH NO USAGE REPORTED = 0

TOTAL RECOMMENDATIONS WITH FEEDBACK = 0
TOTAL COMPONENTS DELIENQUENT = 0
PERCENTAGE OF END ITEMS WITH NO USAGE REPORTED = 0.00