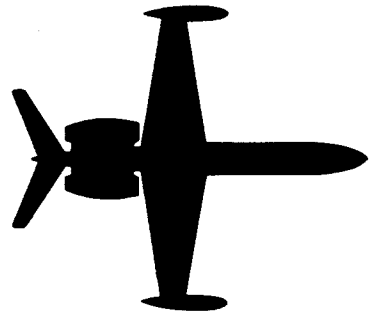
1124-WESTWIND



SERVICE INFORMATION LETTER

SERVICE INFORMATION LETTER NO. 1124-24-091 July 17, 1991

SUBJECT: ELECTRICAL - LUCAS AEROSPACE (LEAR SIEGLER) STARTER GENERATOR BEARING REPLACEMENT

Hold for scheduled maint

EFFECTIVITY: MODEL 1124/1124A WESTWIND equipped with Lucas Aerospace (Lear Siegler) Starter-Generator.

A. REASON

To extend starter generator service life by replacement of original P/N 03-6010-08 armature bearings with new P/N 03-6010-15.

B. REFERENCE

Lucas Aerospace Service Bulletin 23065-0XX-24-01, dated 2 October 90, titled "Conversion of Model 23065-0XX to 23065-0XX Mod A."

C. PUBLICATIONS AFFECTED

None.

D. DESCRIPTION

Referenced service bulletin recommends compliance within 500 hours TSN or TSO. Modifications should be accomplished to all units by an approved agency at time of overhaul or repair, if not previously in compliance.

Modified units should be identified by the letter "A" stamped on the "MOD" block of the starter generator plate.

SIL

Allied-Signal Aerospace Company

Allied Signal

SERVICE INFORMATION LETTER **TFE 731**

FOR ALL AIRFRAME MANUFACTURERS USING TFE731 TURBOFAN, OWNER/ OPERATORS, DISTRIBUTORS, SALES AND SERVICE ORGANIZATIONS AND FIELD SERVICE REPRESENTATIVES.

R APPLICABLE: [X] MAINTENANCE & ENGINEERING [ ] FLIGHT OPERATIONS

SIL: F731-34
REV: 17
DATE: February 12, 1993

Subject: THE GARRETT SPECTROMETRIC OIL AND FILTER ANALYSIS PROGRAM FOR TFE731 ENGINES

1. GENERAL

The Garrett Spectrometric Oil and Filter Analysis Program consists of a two part analysis. First, the spectrometric analysis determines, in parts per million, the suspended metal particle content in an engine's lubrication system. Secondly, the filter analysis has developed over the past several years to the point where it is the most effective means of the two part analysis of determining impending problems in the engine lubricating system. The filter analysis reveals the coarser or more rapid wear of internal engine parts which results in the production of larger metallic particles which become trapped in the oil filter.

From the amount and type of metal found by filter analysis, the condition of engine parts contacted by the engine lubricating oil can be monitored and impending failures of specific parts are predictable with a high degree of certainty. It should be noted, however, that this analysis involves subjective interpretation of the oil filter analysis data compared to historical analysis data for that particular engine. Mechanical failures cannot always be foreseen from analysis results nor is the program able to predict the possibility of sudden mechanical failures due to oil starvation, part failures or foreign particle introduction into the oil system.

For the convenience of all TFE731 operators who are participating in the oil and filter analysis program, Garrett has a fully staffed laboratory in Phoenix and has geographically located Garrett authorized independent laboratories around the world. The addresses for these laboratories are listed on Pages 20-21.

Soap kits should be returned to the laboratory from which they were purchased as the analysis fee is included in the kit price. Exceptions to this policy are made for customers outside the continental United States, where special provisions are in place allowing Garrett kits to be analyzed by independent laboratories.

2. ADVANTAGES OF ANALYSIS

The advantage for the participants of oil and filter analysis are many and significant. Foremost is the continual monitoring of the health of the engine's oil wetted components. This analysis will give the operator additional protection beyond normal external service inspections, greatly reduce the possibility of premature mechanical failures and allow advancement of the progressive maintenance concept. It will also greatly increase the participant's confidence in the safe operation of the engine.

3. PROCESSING OIL AND FILTER SAMPLES

All samples are analyzed within 24 hours after being received by the laboratory and a complete record of the analysis is sent to the owner/operator. The laboratory will catalog all sample data, engine serial numbers, and operating hours. Suspect samples or any that show a higher than normal count will be reported to the operator with further recommendations by telegram and/or telephone.

To be most effective, oil samples and filters should be submitted on a regular basis. This action may be accomplished concurrently with a routine maintenance inspection.

4. EVALUATING OIL SAMPLE

As stated previously, analysis of the filter contents is a more effective indicator of premature wear, however, the Garrett program continues to utilize both oil and filter analysis.

Three oil analysis tables are provided on Page 8 which present guidelines for determining the following:

1. Normal engine wear trend.

2. Above normal engine wear trend for which it is recommended that the filter content be checked for recommendation or contact the SOAP Administrator at Phoenix or Garrett Field Service Engineer.

For new engines, an initial oil sample should be analyzed in order to establish a norm or baseline. Therefore, a new engine should be sampled at 25 hours total time. The trends from this sample should be compared to Table A on Page 8. Once the baseline is established the engine should be sampled at time intervals specified in the engine Light Maintenance Manual.

To determine the type of wear present and its trend in the oil sample, first determine the amount of engine time on the oil sample. This can be determined by checking the TIME SINCE LAST SAMPLE on the most recent form. If this is not available, it must be determined by subtracting the engine time of the previous sample from the engine time at the most recent sample.

Next determine the wear trend by comparing each element wear level to the element wear level in the previous sample. Note the following example:

Engine Time	Time Since Last Sample	Parts Per Million Fe	Cu	Ni	Cr	Ag	Mg
300 hours	150 hours	5.0	1.2	1.0	1.0	1.0	.5
450 hours	150 hours	9.0	1.5	1.0	1.0	1.0	3.5
	Wear Trend	4.0	.3	0	0	0	3.0

After comparing actual wear trend values with values in Table C, all trends appear normal. Keep in mind that these tables are based on trends, not absolute levels.

5. EVALUATING FILTER CONTENTS

To determine the wear trends indicated by the engine oil filter analysis, it is first necessary to determine the weight of constituents flushed from the filter. Enter the appropriate filter flowchart observing the following.

NOTE: The following Filter Contents (milligram values) are based on a normal sample interval identified in the appropriate Light Maintenance Manual. When selecting the appropriate flowchart for commercial applications, the Filter Content (milligram value) should be adjusted per the following formula. Military applications should utilize the total filter weight to select the appropriate flowchart.

Reduced Interval Sample Formula

Total Filter Weight X .4 X (150/Actual Filter Hours)

Example: Resample Filter Weight of 25 mg's in 25 Hours
25 X .4 X (150/25) = 60 mg's

R

Filter Content	(-2/-3/-4 Engines) Flowchart	(-5 Engines) Flowchart
25 milligrams or less	#1 - Page 9	#6 - Page 14
26 mg's to 50 mg's	#2 - Page 10	#7 - Page 15
51 mg's to 75 mg's	#3 - Page 11	#8 - Page 16
76 mg's to 100 mg's	#4 - Page 12	#9 - Page 17
101 mg's to 150 mg's	#5 - Page 13	-
101 mg's to 125 mg's	-	#10 - Page 18
126 mg's to 150 mg's	-	#11 - Page 19

After the appropriate flowchart has been selected, proceed through the flowchart to the box which indicates the major constituent of the filter and read the recommendation written in bottom half of the box. Next, continue through the flowchart to the box which indicates the minor constituent and read the recommendation. If the flowchart does not permit further movement, consider that recommendation final. The following example represents a typical situation.

Filter time:	150 hours
Filter weight:	49 mg's
Major constituent:	Alloy Steel
Minor Constituent:	Grit, Carbon and Fiber

R Since the filter weight is 49 mg's, enter Flowchart No. 2 (TFE731-2/-3/-4) or No. 7 (TFE731-5). Major constituent is alloy steel which according to the flowchart would require a resample in 25 hours. If the results of the resample indicate another resample or an inspection, the results must be coordinated with the SOAP Administrator, Garrett General Aviation Services Division in Phoenix or a Garrett Field Service Engineer for locations outside the continental U.S.

6. FILTER WEIGHT DEFINITIONS

Major = 40% or more of total filter weight.
Minor = 10-40% of total filter weight.
Trace = 0-10% of total filter weight.

Trace constituents are not included in the filter flowcharts. However, they are sometimes valuable in determining location of abnormal wear.

7. GUIDELINES FOR DETERMINING RECOMMENDATIONS FOR ANALYSIS RESULTS

The following guidelines are provided as an aid in interpreting analysis results. Special circumstances such as possible residual contamination from a previous known failure, or engine repair procedure, should be considered when results seem abnormal.

A. If platelets are found, the engine may be inspected. (Refer to paragraph E on Page 6.)

B. If M-50 appears to be present with no known failure on the subject engine, be sure that dry lube ("Liquid Moly" molybdenum base grease) is not causing false moly indications. "Liquid Moly" is often used as an assembly compound during a major periodic inspection on the engine.

R

7. C. Resamples should be checked for the continuation of the abnormal wear trend. If-

The trend is still present, follow procedure outlined in Evaluating Filter Contents.

NOTE: The Filter Contents (milligram values) are based on a normal sample interval identified in the appropriate Light Maintenance Manual. When selecting the appropriate flowchart for commercial applications, the Filter Content (milligram value) should be adjusted per the following formula. Military applications should utilize the total filter weight to select the appropriate flowchart.

Reduced Interval Sample Formula

Total Filter Weight X .4 X (150/Actual Filter Hours)

Example: Resample Filter Weight of 25 mg's in 25 Hours
25 X .4 X (150/25) = 60 mg's

Results appear normal - no corrective action is required, resample at the usual interval.

Results indicate a resample, a second resample is required within the time interval recommended by a Garrett Customer Service Engineer in Phoenix or a Garrett Field Service Engineer.

Results indicate an engine inspection, the customer should contact a Garrett authorized service center capable of accomplishing major inspections.

NOTE: If sample indicates inspection, hold filter debris until source of material is verified. More detailed inspection of filter debris may be required if source cannot be confirmed at time of engine disassembly. (For example: EDX analysis.)

D. A higher than expected filter weight is not uncommon on the first filter analysis of new engines, or following major or heavy maintenance. It may be the result of inadequate purging or cleaning of the engine oil system following a failure within the engine. Careful consideration should be given in these cases to the history preceding the discovery of the heavier than normal filter weight including the replacement of the contaminated components such as the engine's oil cooler or oil tank. Once it has been established that any such residual contamination source has been eliminated it may be expected that the next filter weight will be greatly reduced or normal provided no new problem is developing in the engine.

7. E. Very small quantities of metal particles may be released into the oil system as a result of attrition due to some of the heavier loaded components in the gearbox. These indications do not necessarily indicate an impending failure.

Failing roller or ball bearings typically release particles of unique shape and composition. These particles frequently take on the shape of very tiny "platelets" when viewed under magnification. When filter contents indicate the presence of particles of this type it may be necessary to disassemble and inspect the gearboxes and/or bearing cavities of the engine in order to locate and correct the source of such material. Special attention should be given to close examination of bearings and oil pumps.

There have been cases where oxidized M50 tool steel platelets were detected and no bearing abnormalities were found. Oxidized or discolored platelets can usually be traced to components such as oil tanks and fuel/oil heat exchangers that were contaminated from a previous failure.

8. TYPICAL WEAR METALS AND THEIR LOCATION FOR GARRETT TFE731 ENGINES

The following information is provided to assist the maintenance technician in locating the component(s) responsible for the metal(s) in the oil and/or filter.

Aluminum (Al)	-	horizontal drive lip seal oil baffles in fan housing and planetary gearbox oil pump baffles, accessory gearbox lip seal housing intermediate housing (aluminum flakes or chunks only) unpainted oil pump housing
Copper (Cu)	-	oil pump bushings secondary or accessory bearing separators copper anti-seize compound used in hot section (C-5A)
Magnesium (Mg)	-	accessory gearbox housing painted oil pump housing
Silver (Ag)	-	plating on gears and bearing separators, sun gear (Part No. 3072463-3 only) damper ring, Bellville washers (planetary)
*M-50 Steel (Fe)	-	transfer gearbox bearings, tower shaft bearings, sun gear bearings, No. 1, 2, 3, 4, 5, and 6 bearings, planetary bearings NOTE: Molybdenum based grease (Liquid Moly or drylube) will cause false moly indication.
Alloy Steel (Fe)	-	gears and shafts, main bearing separators oil pump gerotors and shaft

Stainless Steel 17-4 (Fe)	-	planetary gear housing, bellville washers (17-7 (Fe)), No. 3 bearing housing, fan support housing, No. 5 oil slinger, tower shaft bearing housing
300 Series (Fe)	-	nuts, bolts, washers, anti-ice seal bellows, No. 3 bearing oil jet, horizontal shaft thrust washer, carbon seal housing, oil tank
400 Series (Fe)	-	carbon seal rotors
*Carbon Steel (Fe)	-	accessory gearbox bearings, sungear damper ring, carbon seal rotors, nuts, bolts and washers, fan shaft ring gear retainer

*Platelets may indicate bearing material.

TFE OIL ANALYSIS TABLES

TABLE A

10-25 HRS SINCE LAST SAMPLE TAKEN

TABLE B

26-100 HRS SINCE LAST SAMPLE TAKEN

TABLE C

101-150 HRS SINCE LAST SAMPLE TAKEN

ELEMENT	WEAR TREND		WEAR TREND		WEAR TREND	
	NORMAL	SEE FILTER	NORMAL	SEE FILTER	NORMAL	SEE FILTER
IRON	0 - < 4 PPM	≥ 4 PPM	0 - < 7 PPM	≥ 7 PPM	0 - < 10 PPM	≥ 10 PPM
COPPER	0 - < 4 PPM	≥ 4 PPM	0 - < 7 PPM	≥ 7 PPM	0 - < 9 PPM	≥ 9 PPM
NICKEL	0 - < 4 PPM	≥ 4 PPM	0 - < 7 PPM	≥ 7 PPM	0 - < 8 PPM	≥ 8 PPM
CHROME	0 - < 4 PPM	≥ 4 PPM	0 - < 7 PPM	≥ 7 PPM	0 - < 8 PPM	≥ 8 PPM
SILVER	0 - < 4 PPM	≥ 4 PPM	0 - < 7 PPM	≥ 7 PPM	0 - < 8 PPM	≥ 8 PPM
MAGNESIUM	0 - < 4 PPM	≥ 4 PPM	0 - < 7 PPM	≥ 7 PPM	0 - < 8 PPM	≥ 8 PPM

DEFINITIONS:

< - LESS THAN

≥ - GREATER THAN OR EQUAL TO

PPM - PARTS PER MILLION

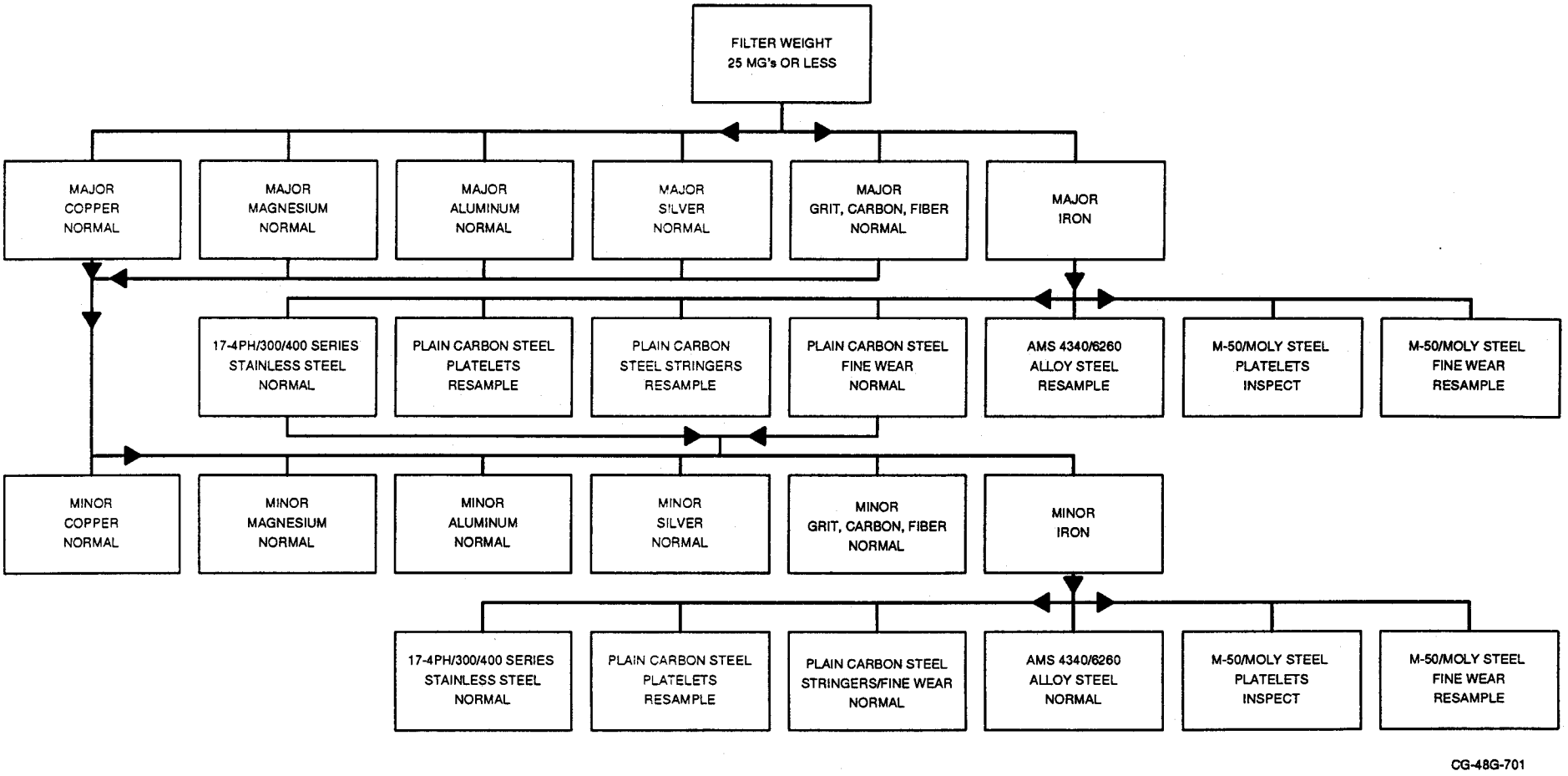
NOTES:

1. SEE FILTER - CHECK FILTER CONTENT FOR RECOMMENDATION OR CONTACT SOAP ADMINISTRATOR AT PHOENIX OR GARRETT FIELD SERVICE ENGINEER.
2. THE OIL ANALYSIS TABLES ARE BASED ON THE ATOMIC ABSORPTION METHOD.

G-48G-455

FILTER FLOWCHART NO. 1
(TFE731-2/-3/-4 ENGINES)

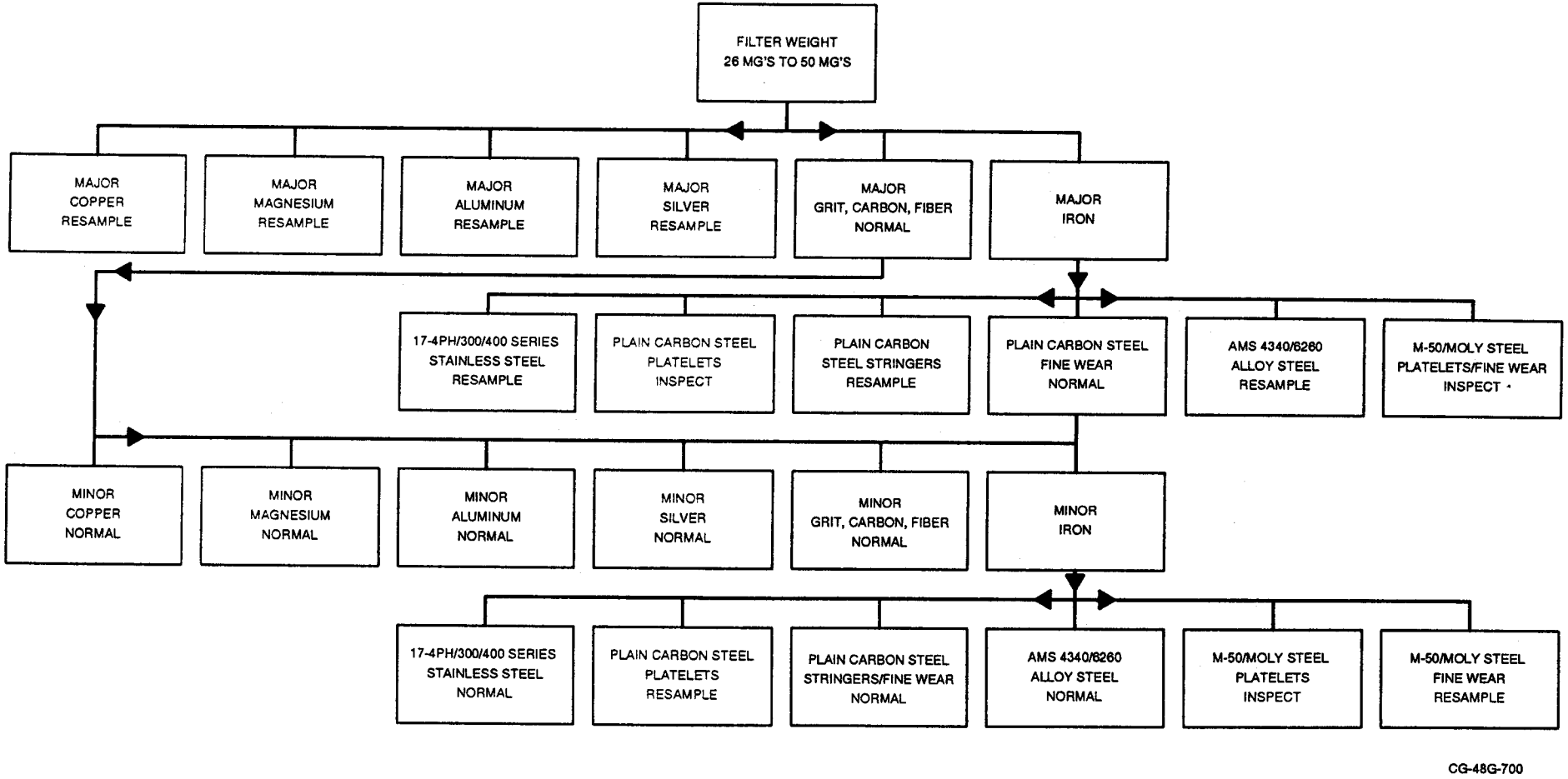
R



NOTE: The Filter Weight is based on a normal sample interval. Refer to the NOTE under paragraph 7 on Page 5 for procedure for determining appropriate flowchart for reduced interval samples.

R

FILTER FLOWCHART NO. 2
(TFE731-2/-3/-4 ENGINES)

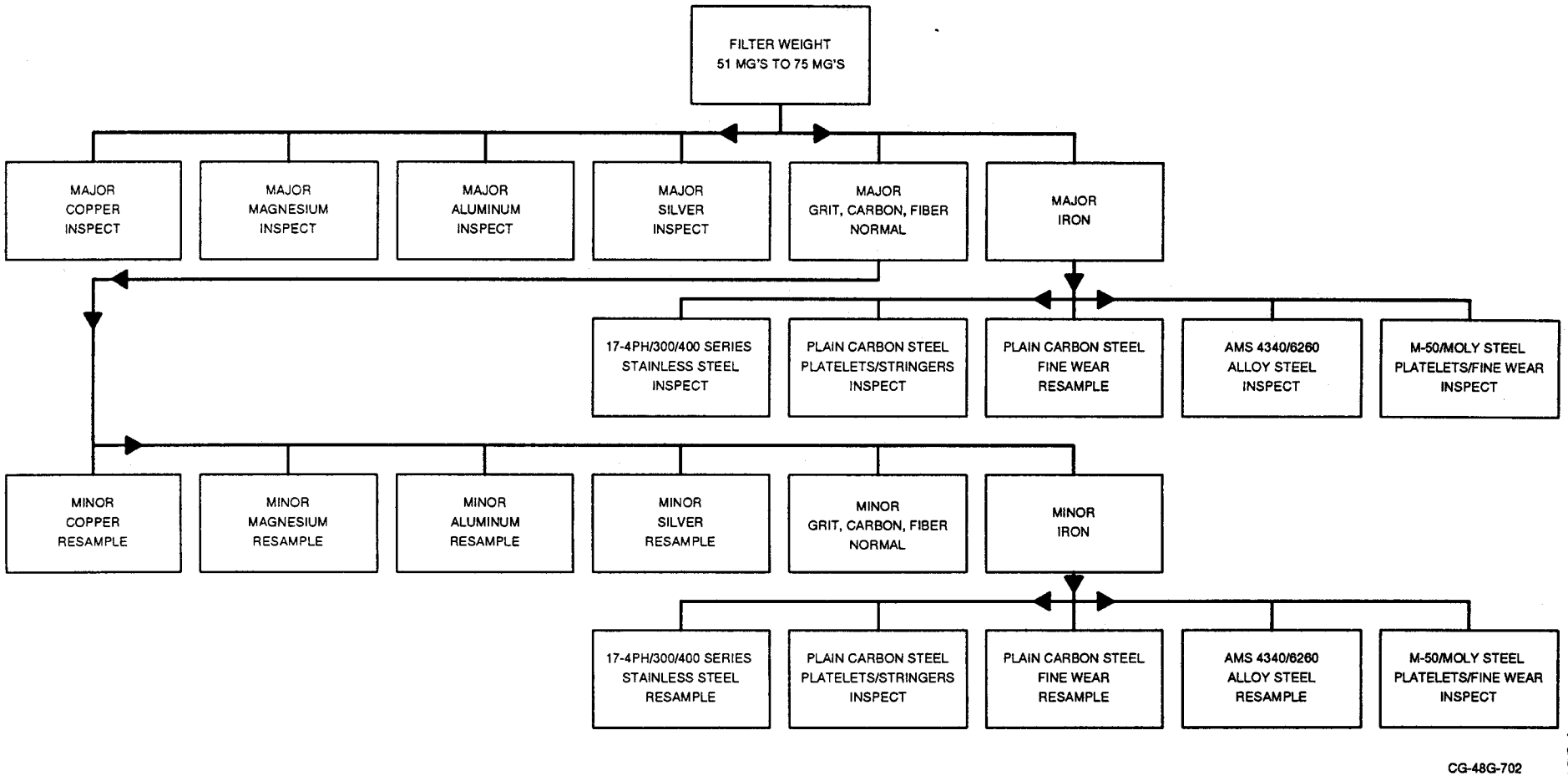


CG-48G-700

NOTE: The Filter Weight is based on a normal sample interval. Refer to the NOTE under paragraph 7 on Page 5 for procedure for determining appropriate flowchart for reduced interval samples.

R

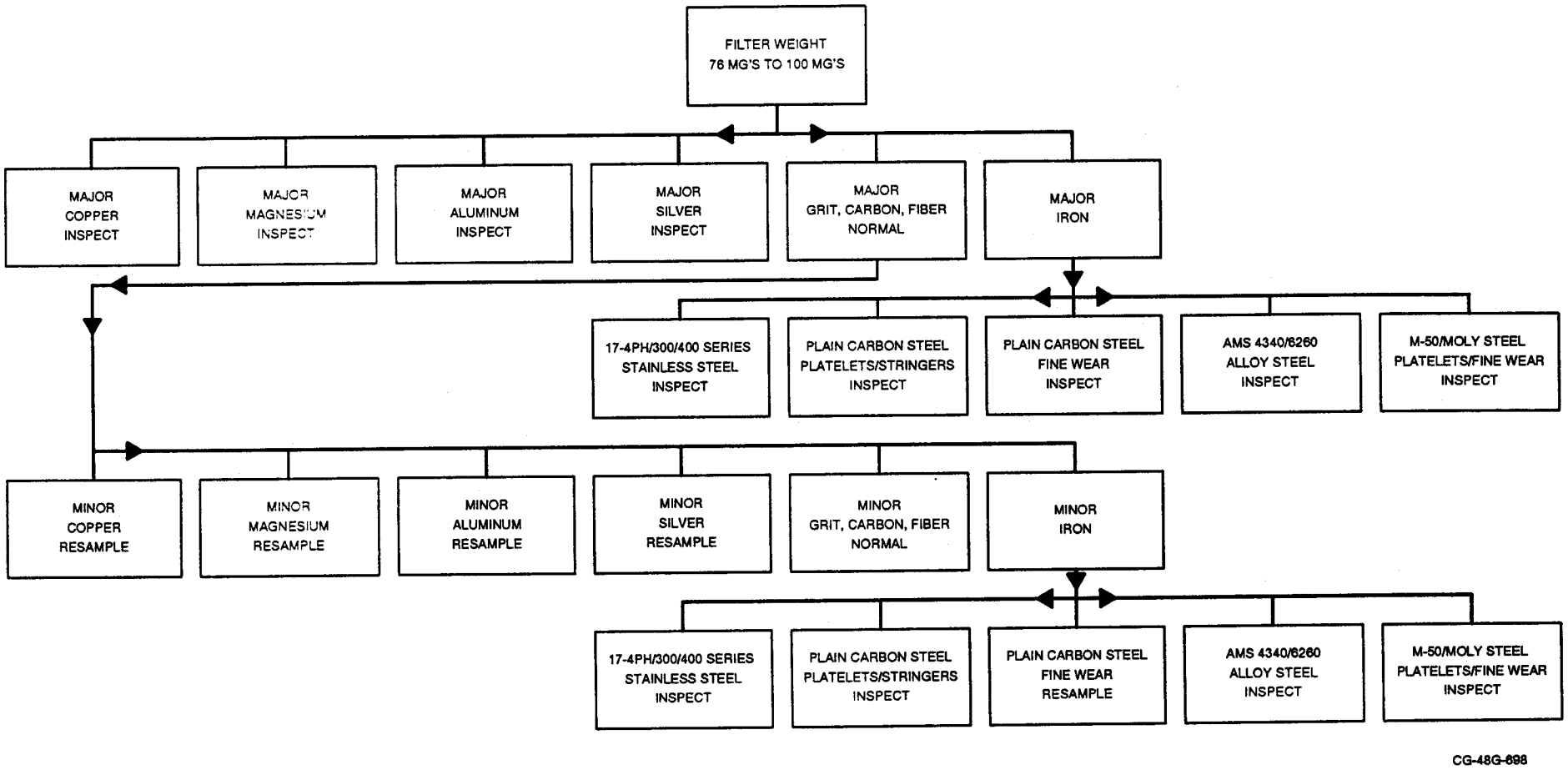
FILTER FLOWCHART NO. 3
(TFE731-2/-3/-4 ENGINES)



NOTE: The Filter Weight is based on a normal sample interval. Refer to the NOTE under paragraph 7 on Page 5 for procedure for determining appropriate flowchart for reduced interval samples.

R

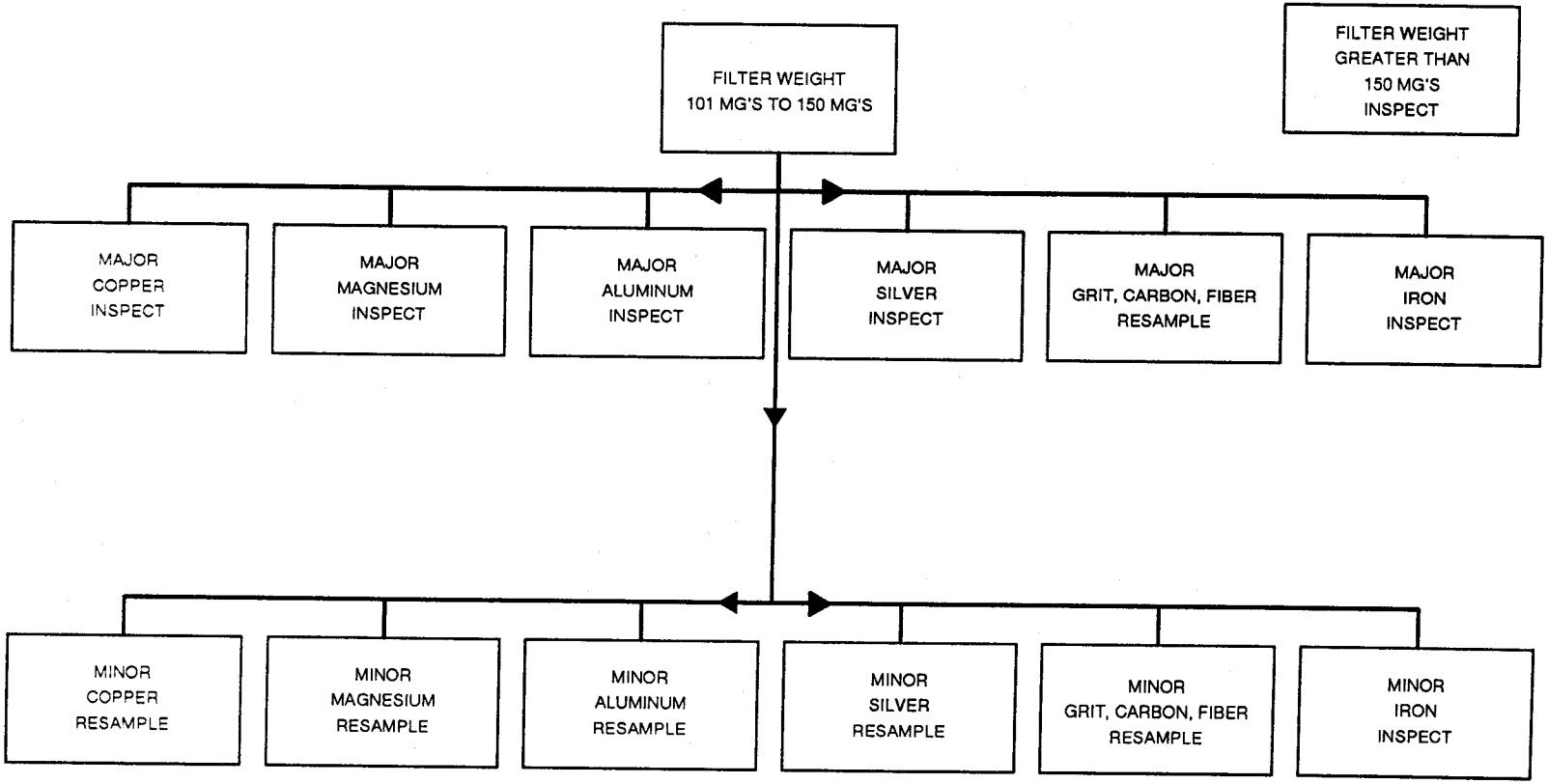
FILTER FLOWCHART NO. 4
(TFE731-2/-3/-4 ENGINES)



NOTE: The Filter Weight is based on a normal sample interval. Refer to the NOTE under paragraph 7 on Page 5 for procedure for determining appropriate flowchart for reduced interval samples.

R

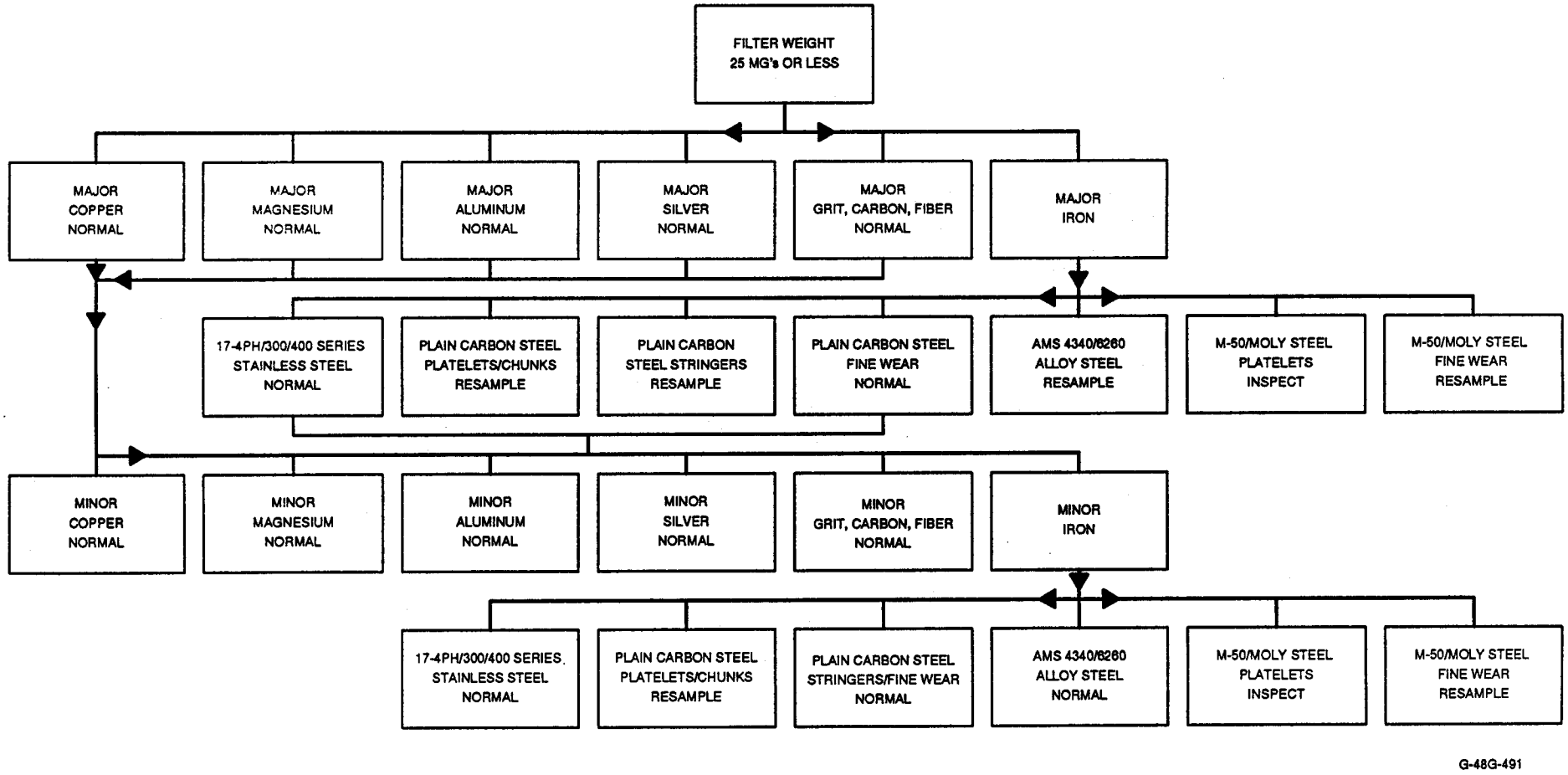
FILTER FLOWCHART NO. 5
(TFE731-2/-3/-4 ENGINES)



CG-48G-697

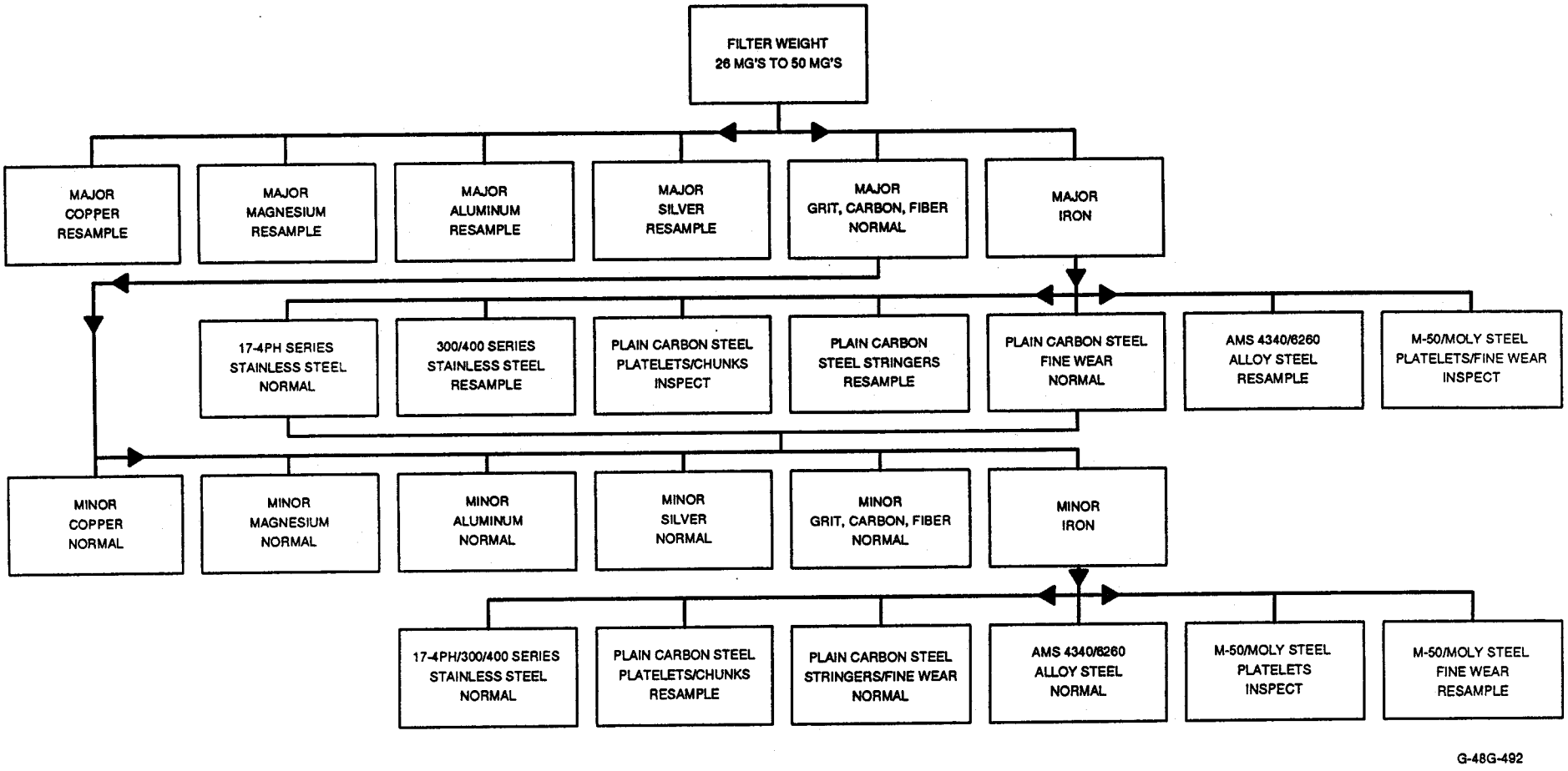
NOTE: The Filter Weight is based on a normal sample interval. Refer to the NOTE under paragraph 7 on Page 5 for procedure for determining appropriate flowchart for reduced interval samples.

FILTER FLOWCHART NO. 6
(TFE731-5 ENGINES)



NOTE: The Filter Weight is based on a normal sample interval. Refer to the NOTE under paragraph 7 on Page 5 for procedure for determining appropriate flowchart for reduced interval samples.

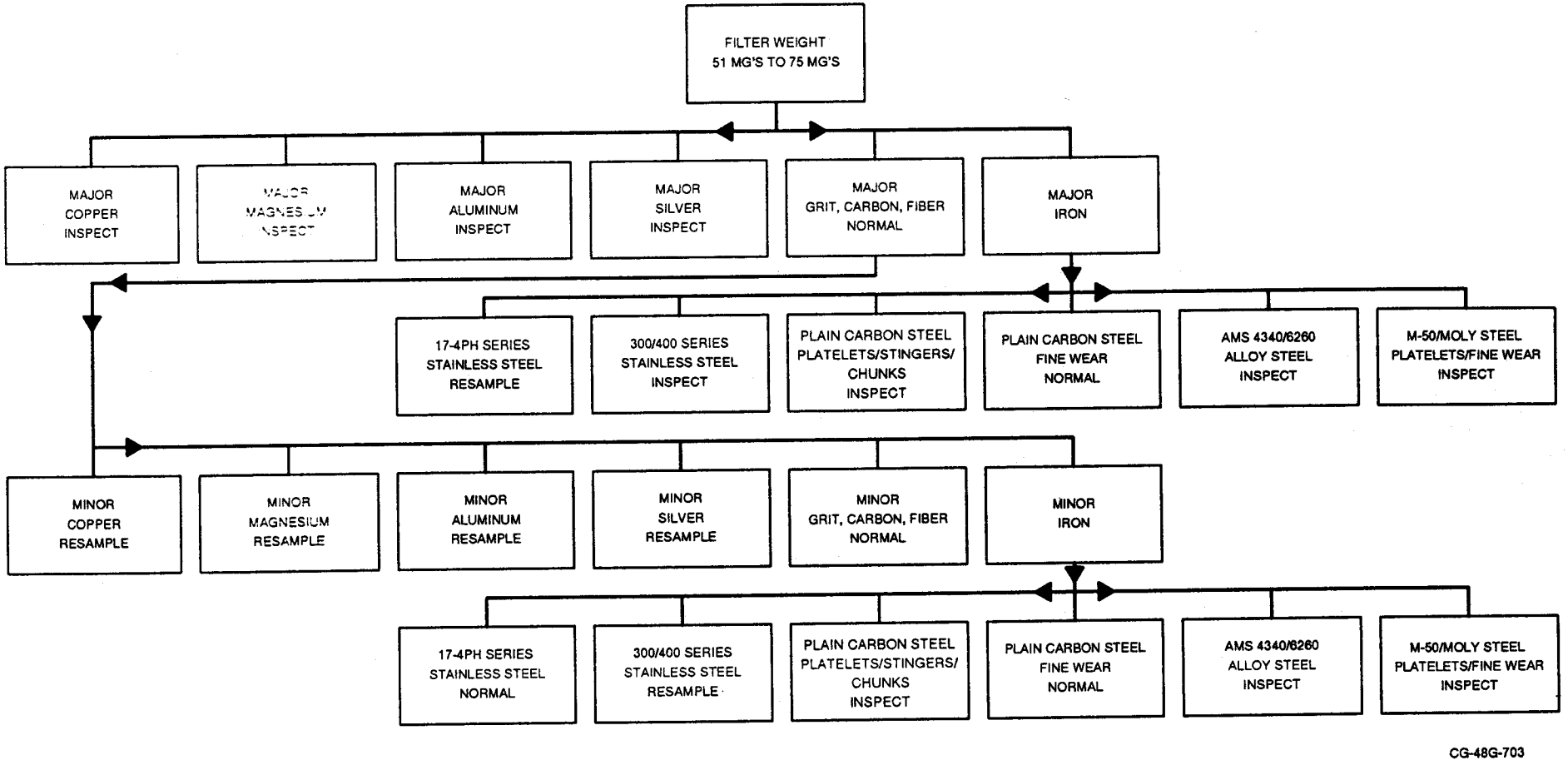
FILTER FLOWCHART NO. 7
(TFE731-5 ENGINES)



NOTE: The Filter Weight is based on a normal sample interval. Refer to the NOTE under paragraph 7 on Page 5 for procedure for determining appropriate flowchart for reduced interval samples.

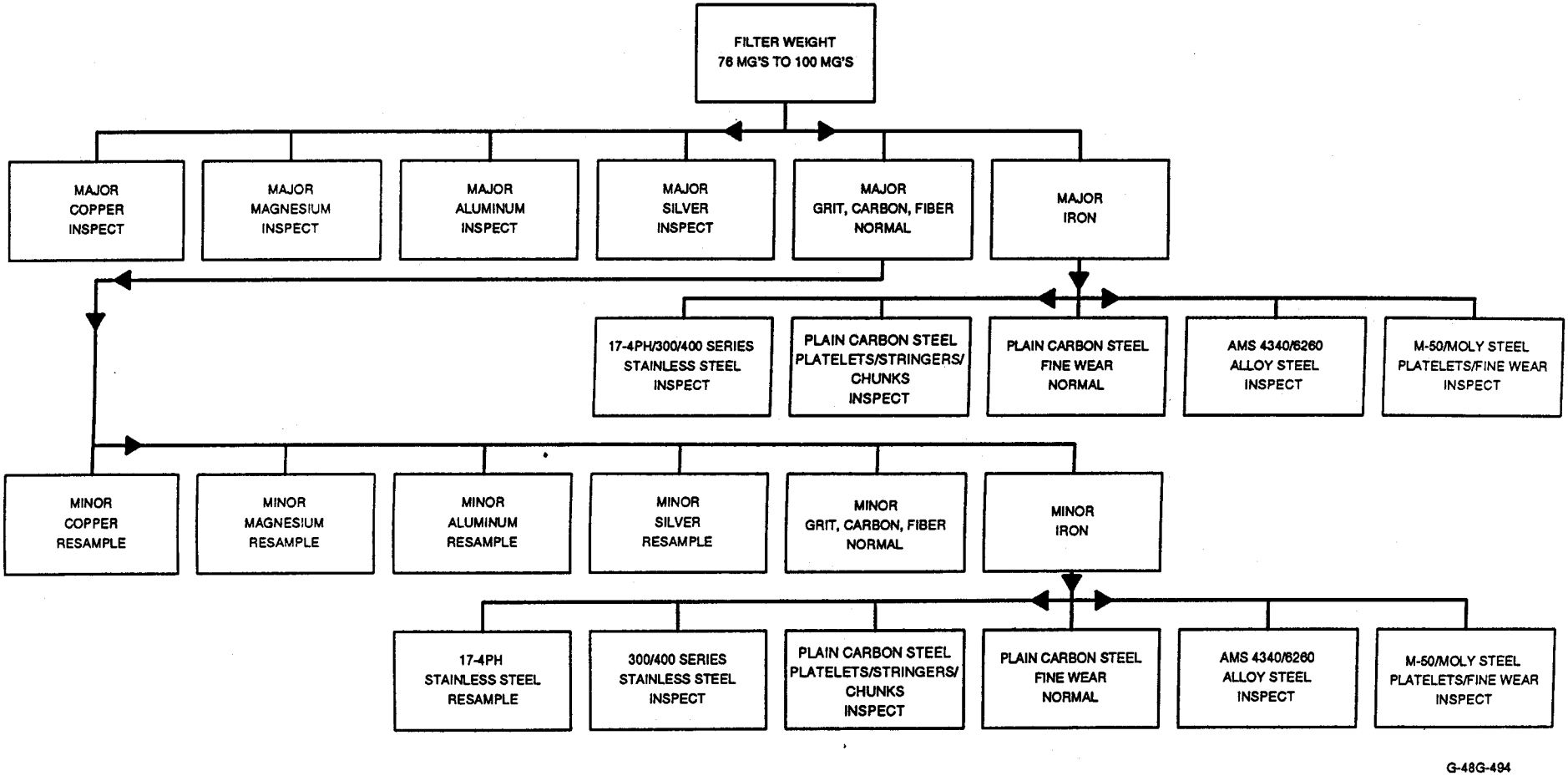
R

FILTER FLOWCHART NO. 8
(TFE731-5 ENGINES)



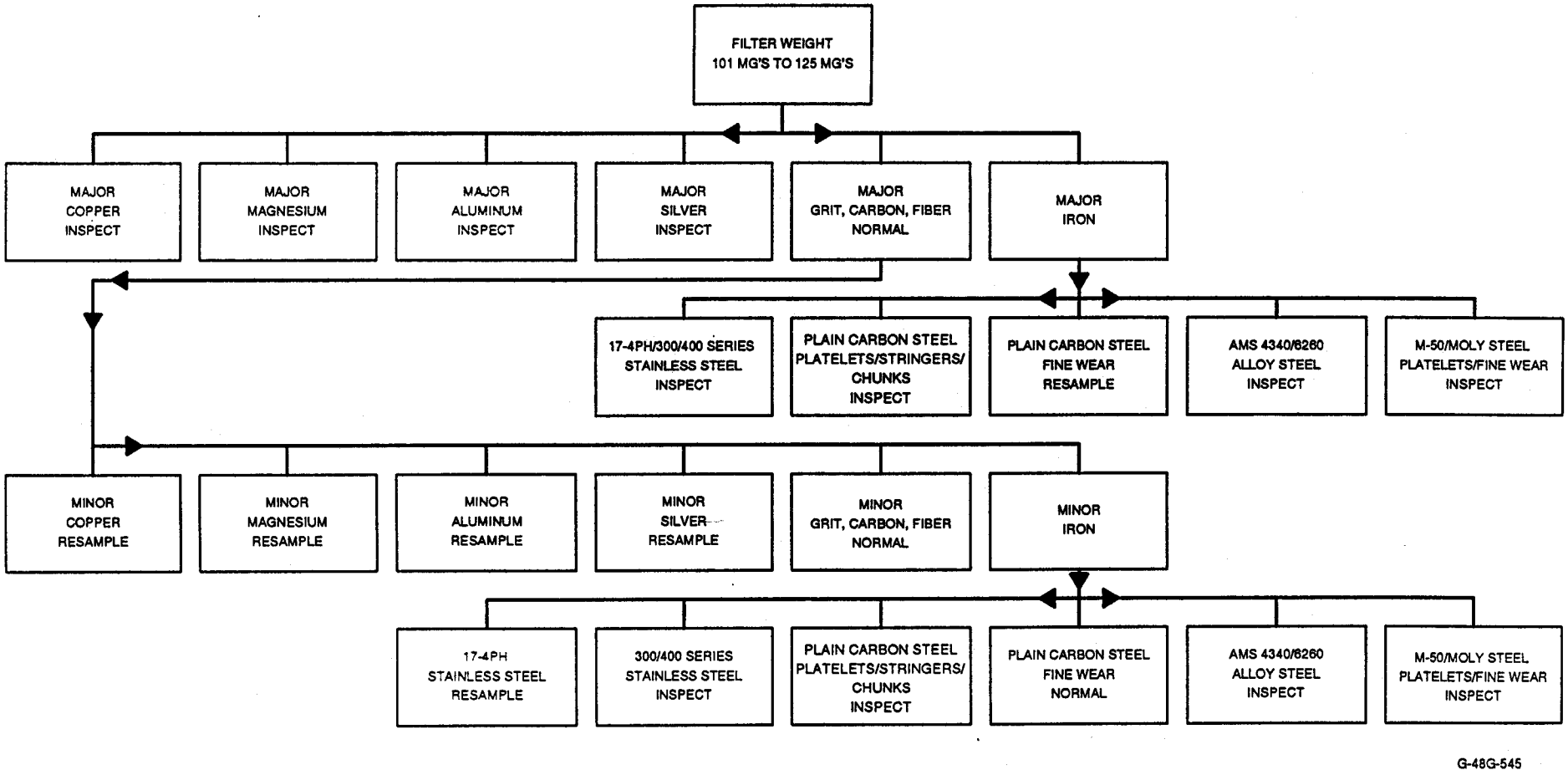
NOTE: The Filter Weight is based on a normal sample interval. Refer to the NOTE under paragraph 7 on Page 5 for procedure for determining appropriate flowchart for reduced interval samples.

FILTER FLOWCHART NO. 9
(TFE731-5 ENGINES)



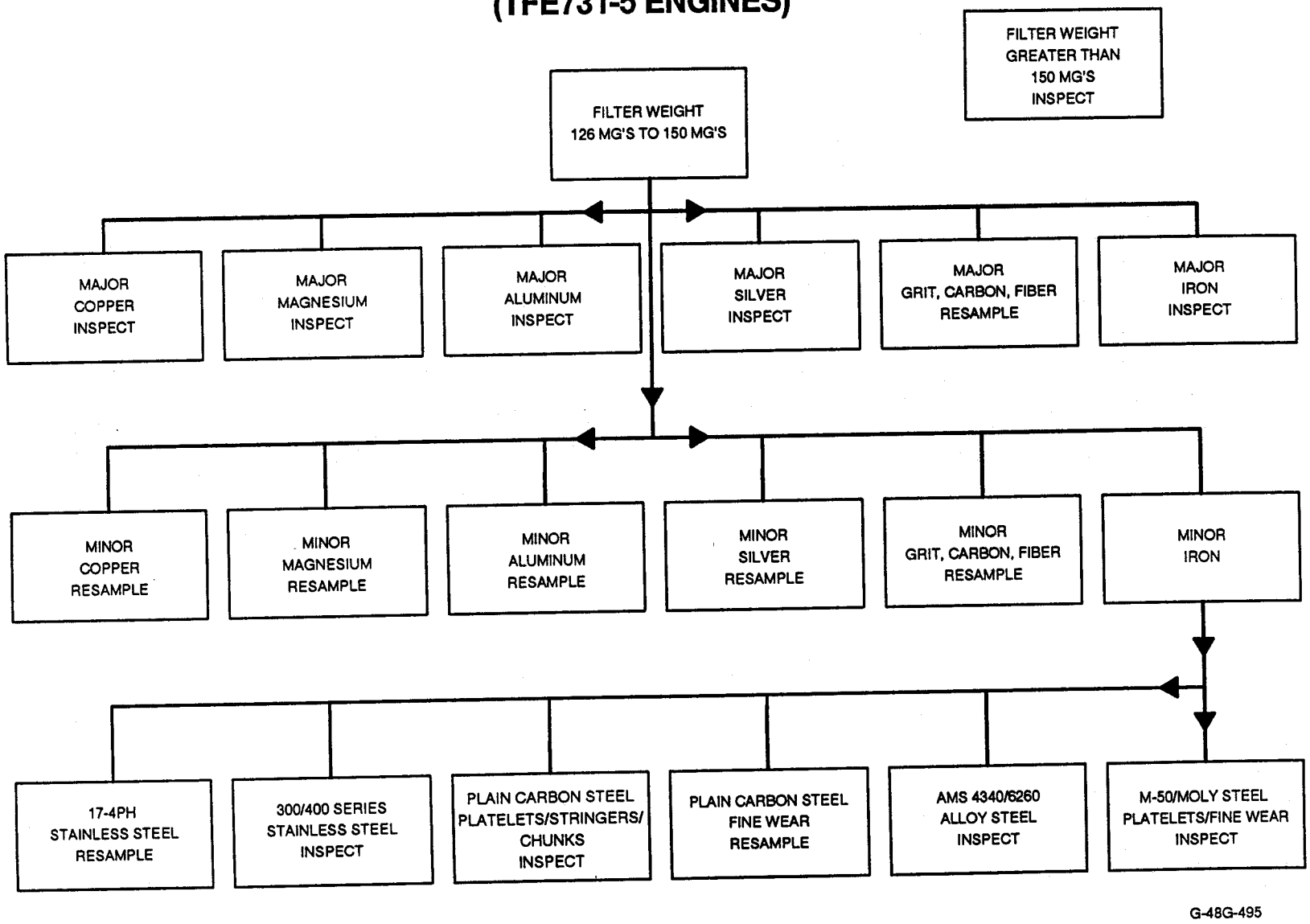
NOTE: The Filter Weight is based on a normal sample interval. Refer to the NOTE under paragraph 7 on Page 5 for procedure for determining appropriate flowchart for reduced interval samples.

FILTER FLOWCHART NO. 10
(TFE731-5 ENGINES)



NOTE: The Filter Weight is based on a normal sample interval. Refer to the NOTE under paragraph 7 on Page 5 for procedure for determining appropriate flowchart for reduced interval samples.

FILTER FLOWCHART NO. 11
(TFE731-5 ENGINES)



NOTE: The Filter Weight is based on a normal sample interval. Refer to the NOTE under paragraph 7 on Page 5 for procedure for determining appropriate flowchart for reduced interval samples.

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R CEP 31510
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R
R

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ENGINE DIVISION
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R CANADA T2E 7G9
R ATTN: BILL TANGUAY
R FAX: 403-295-3848
R PHONE: 403-295-8803
R
R MOBIL OIL LABORATORIES
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R YARRAVILLE, VICTORIA
R AUSTRALIA 3013
R ATTN: OWEN CAHILL
R PAUL ROGERS
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PHONE: 61-3-688-3310

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FAX: 509-535-1537
PHONE: 1-800-366-8596 OR
R 509-535-9791

R

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CILANDAK COMMERCIAL ESTATE
JAKARTA 12560, INDONESIA
ATTN: GORDON D'SILVA
MR. KORRYANTO
TLX: 00109 CORLAB IA
FAX: 62-21-780-2042
PHONE: 62-21-780-1533 &
62-21-780-2316

SPECTRO OIL ANALYSIS CO. LTD.
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SURREY, ENGLAND GUZ48HU
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PHONE: 44-276-857511

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35 KALLANG PUDDING ROAD
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AGNES ENG HWEE HONG
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PHONE: 65-7434311
65-7434308

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COMMERCIAL OVERHAUL
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FAX: 46-520-81992
PHONE: 46-520-94000

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