

TECHNICAL BULLETIN
Bell Helicopter **TEXTRON**

A Subsidiary of Textron Inc.

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DATE
REV

MODEL AFFECTED: 407

SUBJECT: NEW MAIN ROTOR BLADES 407-015-001-127, / -129, PRODUCT BALANCE ADJUSTMENT CAPABILITY - INTRODUCTION OF

HELICOPTERS AFFECTED: Model 407 helicopters serial number 53001 through 53564.

[Model 407 helicopters serial number 53565 and subsequent will have the intent of this bulletin accomplished prior to delivery]

COMPLIANCE: At Customer's Option

DESCRIPTION:

This Technical Bulletin introduces new main rotor blades 407-015-001-127 (standard) and 407-015-001-129 (high visibility) that feature field product balance adjustments capability. These new main rotor blades can be mixed and matched with all main rotor blade dash numbers.

This additional adjustment capability will, in most cases, eliminate the requirement to return the blades to BHT for product balance adjustment.

Main rotor blades 407-015-001-107, /-109, /-111, /-117 can be modified to allow field product balance adjustments.

PART I of this bulletin is an introduction to product balance adjustments on the M407 main rotor blades. It also gives instruction for modification of -107, /-109, /-111, /-117 blades and indicates the blades mixing restrictions resulting of the modification.

PART II of this bulletin describes the product balance adjustment procedure. It explains how to perform product balance change recommended by the RADS-AT with the use of examples.

PART III of this bulletin gives the instructions to perform main rotor 1/rev smoothing with product balance adjustments.

PART IV of this bulletin explains the principle of weight shift and indicates when and how to perform a weight shift to the other blades when it is determined that a RADS-AT recommended product balance adjustment is not possible on a given blade.

APPROVAL:

The engineering design aspects of this bulletin are Transport Canada / CD approved.

MANPOWER:

No extra man-hours are needed to perform installation and normal track and balance of the new 407-015-001-127, /-129 main rotor blades. However, initial installation of modified main rotor blades will require a one-time product balance adjustment. Subsequent product balance adjustments are required only after a major repair or if one or more blades within a blade set are changed.

MATERIALS:

Required Material:

The following material is required for the accomplishment of this bulletin and may be obtained through your Bell Helicopter Textron Supply Center.

<u>Part Number</u>	<u>Nomenclature</u>	<u>Quantity</u>
CT-407-04-55	Weight kit (note 1)	1

Consisting of (note 1):

NOMENCLATURE	PART NUMBER	Quantity (note 2)
Weight	406-015-022-103	18
Weight	406-015-022-107	18
Weight	406-015-022-109	18
Weight	406-015-022-111	18
Retainer	406-015-038-113	3
Retainer	406-015-038-115	3
Retainer	406-015-040-105	3
Cover	406-015-043-105	3
Cover	406-015-043-107	3
Shim	407-015-025-101 (note 3)	24
Washer	NAS1149D0316K (note 4)	12
Bolt	NAS7503L2 (note 5)	14

Notes:

1. Weight kit CT-407-04-54 contains the parts listed above. The quantity of parts contained in a kit should be sufficient to perform the required product balance adjustments. These parts may be individually ordered if necessary.
2. The quantities indicated do not represent the maximum amount of weights allowed for a blade set. This is an estimated quantity of weights required to perform smoothing of the main rotor. For detailed information on the components required to perform product balance adjustments refer to Table 6 in PART III.
3. Peel shims 407-015-025-101 are made of Fiberglass and are 0.053 inch thick. Each laminate is approximately 0.0038 inch thick. They are used to shim the weights and prevent their looseness in the pocket. When no 406-015-022 weights are used, the 407-015-025-101 shims can be used as weight.
4. Washers NAS1149D016K are used to shim the forward pocket cover 406-015-106-103 to match with the blade contour. These washers should not be needed but are provided in case a washer is lost.
5. Bolts NAS7503L2 attaching the weights and the covers should be replaced with new bolts after final weight adjustment.

Consumable Material:

The following material is required to accomplish this bulletin, however this material is considered consumable (bench stock) material and may not require ordering depending on the operators consumable material stock levels. This material may be obtained through your Bell Helicopter Textron Supply Center.

<u>Part Number</u>	<u>Nomenclature</u>	<u>Reference</u>
AMS-S-8802 6OZ	Sealant	C-308

SPECIAL TOOLS:

There is no special tool required to perform main rotor blades product balance adjustments. However, the RADS-AT setup file 7.30 or later version will be required. This setup file can be downloaded from the Bell Helicopter web site (<http://www.bellhelicopter.com>)

WEIGHT AND BALANCE:

Not affected

ELECTRICAL LOAD DATA:

Not affected

REFERENCES:

BHT-407-MM Maintenance Manual

PUBLICATIONS AFFECTED:

BHT-407-IPB Illustrated Parts Breakdown
BHT-407-MM Maintenance Manual

ACCOMPLISHMENT INSTRUCTIONS:

PART I. Introduction to product balance adjustments on the M407 main rotor blades.

1. Main rotor blade balance pockets description
 - a. The 407-015-001-107, /-109, /-111, /-117 main rotor blades have two weight pockets for manufacturing balance adjustments located at the blade tip. The upper forward pocket is used for spanwise balance adjustments while the lower aft pocket is used for product balance adjustments.
 - b. The absence of accessibility to the balance pockets to perform field product balance adjustments requires the blade to be statically and dynamically rebalanced in the whirl tower to maintain the balance and the aerodynamic characteristics of the blade.
 - c. The field adjustable balance pockets introduced on the new 407-015-001-127, /-129 blades eliminates the need for rebalance in the whirl tower after a major repair.
 - d. The new -127, /-129 blades feature also new vented balance pocket covers to eliminate condensation and corrosion of the weights in the balance pockets.
2. Theory of product balance adjustments
 - a. The need for product balance adjustments is defined by the behavior of the blades relative to each other between ground (100% NR at 35% torque) and hover. If a blade track change of 3 mm or more is observed the blade is considered dynamically different from the other blades and requires product balance adjustments. Excessive track changes resulting in vibration increase with changes in helicopter gross weight or vibration increase in steep turns are also indications of the need for product balance adjustments.
 - b. The desired behavior of the blade between ground and hover is obtained by changing the weight in the aft balance pocket. In order to maintain the blade balance characteristics, changes in the aft pocket are done simultaneously with changes in the forward pocket. Whenever weight is added to the aft pocket, an equivalent amount of weight will have to be removed from the forward pocket.
 - c. In order to make the blade climb, weight is added to the aft pocket. To make it dive, weight will be removed from the aft pocket.

- d. Tables 1,2 and 3 illustrate and explain basic examples of RADS-AT data with its associated recommendation.

-NOTE-

For better accuracy it is recommended that millimeters (mm) unit be used to measure blade track. In this Technical Bulletin measurements are only given in millimeters.

-NOTE-

The maximum RADS-AT track split between low and high blade target at Idle, 100% NR 35% torque and hover is 4 mm. The maximum relative track change between 100 % NR with 35% torque and Hover is 3 mm.

Table 1. Example of a single blade needing pocket weight adjustment.

(- Indicates blade dive and + indicates blade climb)					
TEST CONDITION	RELATIVE TRACK (mm)				REMARKS
	BLU	ORG	RED	GRN	
100% Nr with 35% Torque	-0.8	-1.6	1.9	0.5	Track split between low and high blade < 4 mm
Hover	0.8	-0.1	-2.2	1.5	Track split between low and high blade < 4 mm
Analysis of individual blade relative track change between ground (100% Nr at 35% Torque) and hover	+1.6	+1.5	-4.1	+1.0	The individual blade track change target of 3 mm between ground and hover is exceeded on the RED blade. Adjustment on the RED blade would be required.
Analysis of blade pair relative track change	<p>The BLUE blade is at +1.6 mm while the RED blade is at -4.1 mm. This gives a total track change within this blade pair of 5.7 mm.</p> <p>The ORANGE blade is at +1.5 while the GREEN blade is at +1.0. This gives a total track change within the blade pair of 0.5 mm.</p>				<p>Track change within the blade pair exceeds the 3 mm target. Adjustment would be needed on the RED blade to correct this track change. Since the BLUE blade behaves like the ORANGE and the GREEN blade no adjustment to the BLUE blade would be required</p> <p>Track change within the blade pair does not exceed the 3 mm target. No adjustment would be recommended.</p>

Table 2. Example of a blade pair needing pocket weight adjustments

(- Indicates blade dive and + indicates blade climb)					
TEST CONDITION	RELATIVE TRACK (mm)				REMARKS
	BLU	ORG	RED	GRN	
100% Nr with 35% Torque	-0.8	-1.6	1.9	0.5	Track split between low and high blade < 4 mm
Hover	0.3	-1.0	-1.0	1.7	Track split between low and high blade < 4 mm
Analysis of individual blade relative track change between ground (100% Nr at 35% Torque) and hover	+1.1	+0.6	-2.9	+1.2	Individual blade relative track change between ground and hover is less than 3 mm. No adjustment would be required when considering the blades individually.
Analysis of blade pair relative track change	<p>The BLUE blade is at +1.1 mm while the RED blade is at - 2.9 mm. This gives a total track change within this blade pair of 4.0 mm.</p> <p>The ORANGE goes up 0.6 mm while GREEN blade goes up 1.2 mm. This gives a total track change of only 0.6 mm within the ORANGE-GREEN blade pair.</p>				<p>More than 3 mm of track change within the BLUE-RED blade pair is observed. Weight adjustment is recommended for a blade pair with more than 3 mm of track change between ground and hover. In this case, only the RED blade should be adjusted as the BLUE blade behaves well when compared with the ORANGE and the GREEN blades (the maximum difference is 0.5 mm of track change between BLUE and ORANGE).</p> <p>Less than 3 mm of track change within the ORANGE-GREEN blade pair is observed. In this case, no adjustment would be necessary.</p>

Table 3. Example of a blade pair needing weight pocket adjustments on the two blades.

(- Indicates blade dive and + indicates blade climb)					
TEST CONDITION	RELATIVE TRACK (mm)				REMARKS
	BLU	ORG	RED	GRN	
100% Nr with 35% Torque	-0.8	-1.6	1.9	0.5	Track split between low and high blade < 4 mm
Hover	1.8	-2.0	-0.7	0.9	Track split between low and high blade < 4 mm
Analysis of individual blade relative track change between ground (100% Nr at 35% Torque) and hover	+2.6	-0.4	-2.6	+0.4	Individual blade track change between ground and hover is less than 3 mm. No adjustment would be required when considering the blades individually.
Analysis of blade pair relative track change	<p>The BLUE blade goes up 2.6 mm while the RED blade goes down 2.6 mm. This gives a total track change of 5.2 mm within the BLUE-RED blade pair.</p> <p>The ORANGE blade goes down 0.4 mm while the GREEN blade goes up 0.4 mm. This gives a total track change of only 0.8 mm within the ORANGE-GREEN blade pair.</p>				<p>More than 3 mm track change within the BLUE-RED blade pair is observed. Weight adjustment would be recommended since this blade pair has more than 3 mm of track change between ground and hover. In this case, it would be advantageous to adjust both the BLUE and the RED blades since they both contribute more or less equally to the relative track change within the blade pair.</p> <p>Less than 3 mm track change within the ORANGE-GREEN blade pair. In this case, no adjustment would be necessary.</p>

3. Instructions for modification of main rotor blades 407-015-001-107, /-109, /-111 and /-117.

-NOTE-

Rotor Blades Inc. is the only blade repair facility approved by Bell Helicopter to perform the balance pockets modification.

- a. All blades 407-015-001-107, /-109, /-111 and /-117 can be modified to the latest configuration that will allow product balance adjustments in the field. Contact Rotor Blades Inc. at:

Rotor Blades Inc.
113 Ida Road
Broussard, Louisiana 70518
Office: 337-839-2119
Fax: 337-839-2122
E-mail: sales@rotor-blades.com

- b. All 407-015-001-107 and /-109 will be identified with the suffix FM1 (Field Modification No.1). For example a modified /-107 blade will be identified as 407-015-001-107FM1 after modification.
 - c. Blades 407-015-001-111 and /-117 can either be identified with the suffix FM1, or upgraded to the latest dash number depending on the initial balance weight configuration, before modification
4. Mixing restrictions for modified blades.
 - a. Due to significant differences in mass distribution, modified main rotor blades 407-015-001-107FM1, /-109FM1, /-111FM1 and /-117FM1 must be installed in opposite pair with another modified blade or with a later configuration /-127 or /-129 blade. Due to this mixing restriction, a minimum of two, or all four blades need to be modified at the same time.

-NOTE-

Non-modified 407-015-001-107, /-109, /-111 and /-117 can be mixed and matched with each other or with later configuration /-127 or /-129 blades.

- b. The new 407-015-001-127 and /-129 main rotor blades can be mixed and matched with all dash numbers.

PART II. Product balance adjustment requirements

1. Product balance adjustments will be initially required after modification of blades -107, /-109, /-111, /-117 and after major repairs or when one or more blades of a blade set are changed. New blades -127 and -129 are balanced at the factory and will typically not require product balance adjustment unless a major repair is done.
2. The weight kit CT-407-04-54 is required to perform product balance adjustments. Other components required and information to perform normal main rotor track and balance are given in the BHT-407-MM chapter 18.
3. To perform product balance adjustments the RADS-AT with setup file version 7.30 or later is required. The setup file 7.30 includes a Flight plan "INT_PB" for INITIAL Product Balance. When the flight plan "INT_PB" is selected to perform the initial phase of main rotor track and balance, the RADS-AT will provide product balance and other usual blade track adjustment recommendations. The new Flight Plan "INT_PB" will still target for a track split at ground idle and 100% NR 35% TQ to be within 4 mm between all four blades. The maximum targeted track change for individual blade or blade pair between 100% NR 35% TQ and Hover is 3 mm.
4. Main rotor blade sets that have been already smoothed for 1/rev or non-modified blades can continue to use the normal "INITIAL" flight plan for the initial phase of rotor track and balance.
5. The "FLIGHT" flight plan to perform the in flight phase of rotor track and balance is unchanged from the previous version and will not provide product balance adjustment recommendation.
6. Table 4 indicates the test conditions and the flight plans that are used to smooth the main rotor for the Model 407. The vibration amplitudes and the blade track heights given in this table are targets that the RADS-AT uses for reference. These numbers should not be considered as "limits" to achieve. They should not be used to determine the helicopter serviceability or to determine the ride acceptability.

Table 4. Test conditions and flight plans targets

AIRCRAFT TEST CONDITION	FLIGHT PLAN	RADS-AT TEST CONDITION	F/A 1/REV VIBRATION TARGET (IPS)	VERTICAL 1/REV VIBRATION TARGET (IPS)	TRACK SPLIT TARGET (low to high) (mm)
Flat Pitch at Ground Idle (63% Ng)	INITIAL	Idle	0.5	---	4
	INT_PB	Idle			4
	FLIGHT	Idle			8
100% Nr at 35% Torque	INITIAL	35%Tq	0.25	0.25	4
	INT_PB	35%Tq			4
	FLIGHT	35%Tq			10
Hover	INT_PB	Hover	0.10	0.15	4
	FLIGHT	Hover			10
60 knots level flight	FLIGHT	60K	---	0.15	---
100 knots level flight	FLIGHT	100K	---	0.15	15
120 knots level flight	FLIGHT	120K	---	0.15	---
130 knots level flight	FLIGHT	130K	---	0.15	---
140 knots level flight	FLIGHT	140K	---	0.20	---
60 knots descent at 1000 fpm	FLIGHT	L/DOWN	---	0.15	15

The track split targets are lower for the “INITIAL” and “INT_PB” flight plans than for the “FLIGHT” flight plan. When using the “INITIAL” or the “INT_PB” flight plans, the objective is to bring the blades in good track on the ground prior to flight. When using the “FLIGHT” flight plan, the objective is to reduce the 1/rev vibration, so the vibration data and targets are more important than the track data and targets in the determination of the requirements for rotor adjustments.

Part III. Main rotor smoothing procedure with product balance adjustments.

1. Using the RADS-AT set-up file 7.30 or later version select the flight plan "INT_PB".

-NOTE-

Do not take RADS-AT data in hover until the targets for the test conditions below are achieved. Refer to Table 4.

2. Run helicopter and acquire data for following test conditions:
 - a. Ground idle (63%Ng).
 - b. 100% Nr with 35% Tq.

-NOTE-

For rotor track and balance adjustment instructions other than product balance adjustments refer to BHT-407-MM Chapter 18.

3. Perform adjustments recommended by the RADS-AT until targets for the test conditions above are achieved. Refer to Table 4.
4. Once the targets for the test conditions given in step 2 are achieved, acquire data for the following test condition:
 - a. Ground idle (63%Ng).
 - b. 100% Nr with 35% Tq.
 - c. Hover.
5. With the data acquired for all test conditions in step 4 select "DIAGNOSTICS" from the menu on the CADU.
6. The "CORRECTIVE ACTIONS" display will provide the adjustment recommendations.
7. If some blades in the blade set do not have the field adjustable product balance pockets go to the "EDIT ADJUSTABLE" display and turn off the "Product Balance" for these blades. Once the "Product Balance" has been turned off for the selected blades press "DO" to obtain a new set of recommended adjustments.
8. Perform the recommended adjustments for the pitch links, the tabs and the hub weights. Refer to BHT-407-MM Chapter 18.
9. Perform recommended product balance adjustments as follow:

-NOTE-

Product balance weight change of 10 grams or less is considered minor and does not need to be done.

-NOTE-

Washers (3, Figure 1) are used to match cover (2) to the blade contour. If installed, note their location for reinstallation at same location. The cover is to be installed flush with blade contour within +0.004 to -0.008 inch up to 1 inch at the leading edge. Up to 1 inch at the trailing edge side, the cover is to be installed flush with blade contour within +0.008 to -0.004 inch.

-NOTE-

The shims (5 and 9, Figure 1) are used to ensure that the weights in the aft and the forward pockets are not loose. If a rattling noise is heard from the pockets when the blade tip is tapped by hand, the weights are loose and the shims should be readjusted to avoid fretting and chafing of the pocket components.

-NOTE-

After final weight adjustment, all bolts NAS7503L2 (1 and 7 Figure 1) should be replaced with new bolts.

- a. Remove the 8 bolts (1, Figure 1) that attach the forward cover (2) with the weights on the blade.
- b. Remove the 3 bolts (1) that attach the weights (4), shims (5) if installed and retainer (6) to the cover (2).
- c. Weigh the weights (4), the shims (5) and the retainer (6). Record in the table of Annex A.
- d. Remove the 3 bolts (7), cover (10), shims (9) if installed and the weights (8) from the aft pocket.
- e. Weigh the weights (8), the shims (9) if installed, and the cover (10). Record in the table of APPENDIX A.
- f. Record the RADS-AT recommended adjustments in the table of APPENDIX A.

-NOTE-

It is possible that due to the current pockets setting, the RADS-AT recommended adjustments cannot or can only be partially made. In this case a weight shift has to be done. PART IV explains the principle of weight shift and when it should be done.

-NOTE-

Table 5 gives information on the components required to perform product balance adjustments.

-NOTE-

Since they are always used, the weight of the 406-015-106-101 forward pocket cover and attaching bolts NAS7503L2 is not considered during product balance weight adjustments.

Table 5. Product balance components detailed Information

Item	Part Number	Applicable Location And Maximum Allowable Quantity per pocket		Description	
		Forward Pocket	Aft Pocket	Weight (grams)	Material
Weight	406-015-022-109	3	3	9	Al, 0.050" thick
	406-015-022-107	3	3	27	Cres, 0.050" thick
	406-015-022-111	4	4	18	Cres, 0.032" thick
	406-015-022-103	3	3	59	Tungsten
Retainer	406-015-038-113	1	0	43	Al
	406-015-038-115	1	0	124	Cres
	406-015-040-105	1	0	285	Tungsten
Cover	406-015-043-105	0	1	44	Al
	406-015-043-107	0	1	127	Cres

- g. Using the table of APPENDIX C select a new combination of components to achieve the desired weight change as recommended by the RADS-AT for the forward pocket.
- h. Using the table of APPENDIX D select a new combination of components to achieve the desired weight change as recommended by the RADS-AT for the aft pocket.

- i. Calculate and verify that the total weight of the aft and the forward pockets is within 6 grams with the total pockets weight marked at the blade root end on the trailing edge side.
- j. Apply a bead of sealant (C-308) under the head of 3 bolts (1) and attach the new combination of retainer (6), shims (5), if required, and weights (4) to the cover (2).

-NOTE-

The forward and the aft pockets should have a bead of sealant (C-308) applied in manufacture or at the blade modification to prevent water contamination. Replace damaged sealant (C-308). To prevent bonding of the cover to the blade when new sealant is applied, use a small amount of petroleum jelly on the cover during the sealant curing cycle. After the sealant has cured, remove the cover and wipe the petroleum jelly.

- k. Apply a bead of sealant (C-308) under the head of the bolts (1) attaching the cover to the blade.
- l. Make sure the washers (3) are installed at the correct location and install the forward cover (2) with the bolts (1). Tighten the bolts (1) to 30 to 40 in-lbs.
- m. Apply a bead of sealant (C-308) under the head of the bolts (7).
- n. Install the new combination of cover (10), shims (9) if required and weights (8) on the aft pocket with bolts (7). Tighten bolts (7) to 30 to 40 in-lbs.

PART IV. Product balance weight shift

1. Principle of weight shift.
 - a. Due to the current product balance pockets setting it is possible that the RADS-AT recommended adjustments could not be done to a given blade. In this case weight adjustment may need to be completely or partially shifted to the three other blades. Since the RADS-AT does not know the blade basic weight settings the weight shift has to be manually calculated. Tables 6 and 7 give examples of weight shift to the three other blades considering the blades individually and explain how it is done.

- b. It is also possible in some cases that a weight shift will be needed considering the blades as a pair rather than individually due to mixing restrictions. In these cases the weight shift will be done to the opposite blade only. When the weight shift is done considering the blades as a pair, the track change target of 4 mm in hover (track from the lowest to the highest blade) may be exceeded and this is acceptable.
- c. Tables 8 and 9 give examples of weight shift to the opposite blade considering the blades as a pair and explain how it is done.

-NOTE-

The RADS-AT recommended adjustments or calculated weight shifts are always called for the aft pocket.

Table 6. Shifting part of the weight adjustment from one blade to the other three blades.

SIGN CONVENTION FOR BLADE POCKET WEIGHT ADJUSTMENTS					
A positive weight adjustment (for example: + 55 grams) will make the blade climb. Weight is moved from the forward pocket to the aft pocket.					
A negative weight adjustment (for example: -22 grams) will make the blade dive. Weight is moved from the aft pocket to the forward pocket.					
Current Pocket Weight Settings	Pocket Weight (grams)				REMARKS
	BLU	ORG	RED	GRN	
Forward pocket	301	244	201	254	
Aft Pocket	84	125	139	66	
Weight Adjustment (grams)					
	BLU	ORG	RED	GRN	
RADS-AT recommended aft pocket weight adjustments.	+23	0	-24	-54	The GREEN blade aft pocket contains 66 grams and the minimum possible weight setting is 44 grams. Consequently the recommended adjustment cannot be completely made. Only 22 grams can be moved from the aft pocket to the forward pocket. This leaves 32 grams of adjustment that have to be shifted to the other three blades.
Adjustment shift	+32	+32	+32	+32	The 32 grams that cannot be made to the GREEN blade has to be shifted to all four blades.
Equivalent aft pocket weight adjustments	+55	+32	+8	-22	To have the same result as the original RADS-AT recommended adjustments these changes have to be done. Adjustments of less than 10 grams do not need to be made. Carry out only the adjustments to the BLUE, the RED and the GREEN blades.
New Pocket Weight Settings	Pocket Weight (grams)				
	BLU	ORG	RED	GRN	
Forward Pocket	246	212	201	276	
Aft Pocket	139	157	139	44	GREEN blade aft pocket now set at the minimum possible weight setting.

Table 7. Shifting all of the weight adjustment from one blade to the other three blades.

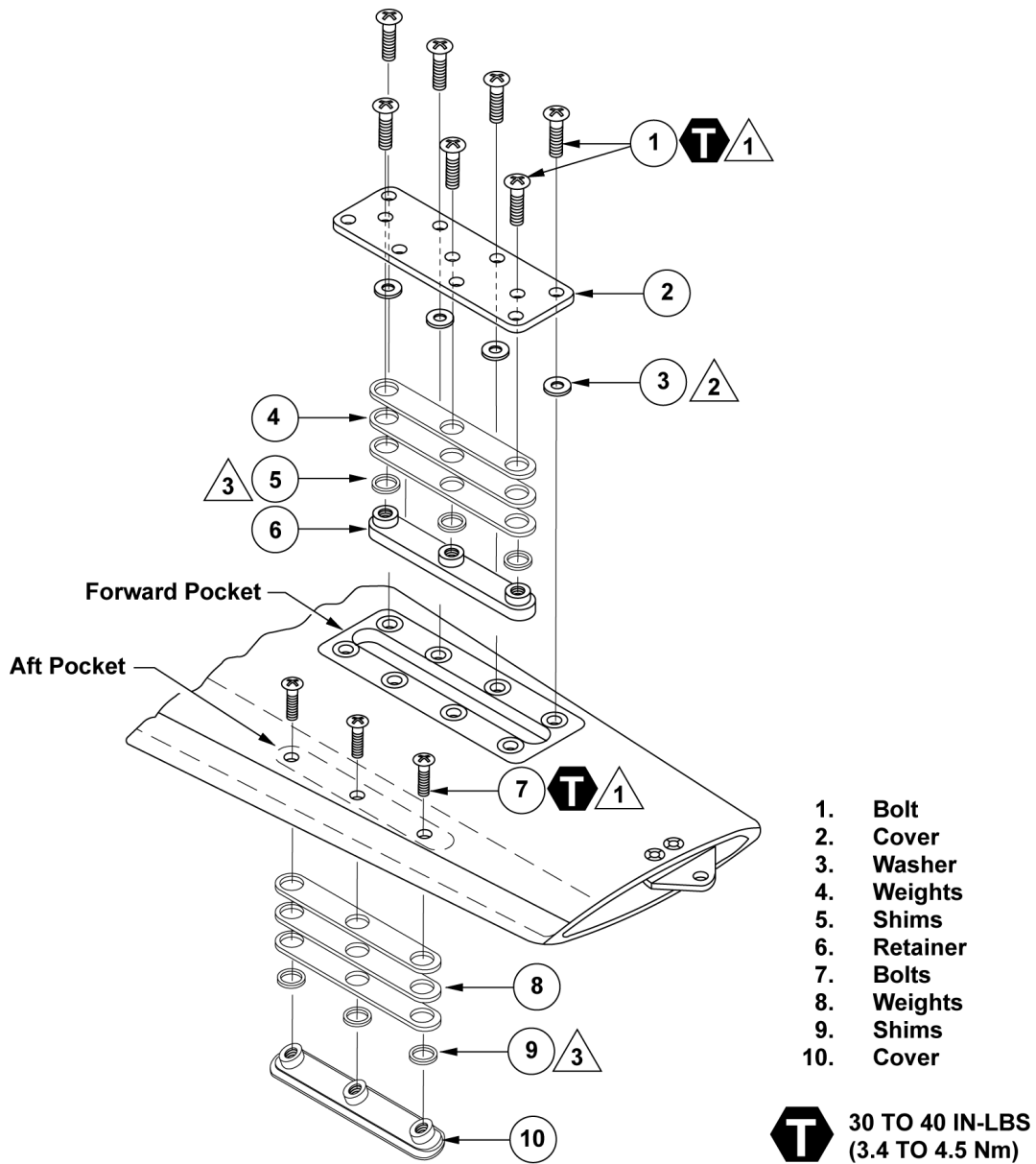
SIGN CONVENTION FOR BLADE POCKET WEIGHT ADJUSTMENTS						
A positive weight adjustment (for example: + 55 grams) will make the blade climb. Weight is moved from the forward pocket to the aft pocket.						
A negative weight adjustment (for example: -22 grams) will make the blade dive. Weight is moved from the aft pocket to the forward pocket.						
Current Pocket Weight Settings		Pocket Weight (grams)				REMARKS
		BLU	ORG	RED	GRN	
Forward Pocket		301	244	201	276	
Aft Pocket		84	125	139	44	
		Weight Adjustment (grams)				
		BLU	ORG	RED	GRN	
RADS-AT recommended aft pocket weight adjustments		+23	0	-24	-54	Since the GREEN blade aft pocket contains 44 grams and therefore is at the minimum possible weight setting the recommended adjustment cannot be made. The recommended 54 grams of adjustment to the GREEN blade have to be completely shifted to the other three blades.
Adjustment shift		+54	+54	+54	+54	Since the complete 54 grams of recommended adjustment cannot be made to the GREEN blade it has to be shifted equally to the other three blades.
Equivalent aft pocket weight adjustments		+77	+54	+30	0	To have the same result as the original RADS-AT recommended adjustments these changes have to be done. Adjustments of less than 10 grams do not need to be made. Carry out the adjustments to the BLUE, the Orange and the RED blades.
		Pocket Weight (grams)				
New Pocket Weight Settings		BLU	ORG	RED	GRN	
Forward Pocket		224	190	171	276	
Aft Pocket		161	71	169	44	The GREEN blade is not adjusted and the aft pocket remains at the minimum weight setting.

Table 8. Shifting part of the weight adjustment from one blade to the opposite blade only.

SIGN CONVENTION FOR BLADE POCKET WEIGHT ADJUSTMENTS					
A positive weight adjustment (for example: + 55 grams) will make the blade climb. Weight is moved from the forward pocket to the aft pocket.					
A negative weight adjustment (for example: -22 grams) will make the blade dive. Weight is moved from the aft pocket to the forward pocket.					
MEASURED BLADE TRACK	RELATIVE TRACK (mm)				REMARKS
	BLU	ORG	RED	GRN	
Blade Dash Number	107FM1	107	107FM1	107	Mix of modified and unmodified blades.
100% Nr with 35% Torque	-0.8	-1.6	1.9	0.5	
Hover	1.8	-2.0	-0.7	0.9	
Relative Track Change between ground (100% Nr at 35% Torque) and hover	+2.6	-0.4	-2.6	+0.4	
Current Pocket Weight Settings	Pocket Weight (grams)				
	BLU	ORG	RED	GRN	
Blade Dash Number	107FM1	107	107FM1	107	The ORANGE and the GREEN blades are not adjustable blades. The BLUE blade aft pocket is set near to the minimum weight setting.
Forward Pocket	301	---	201	---	
Aft Pocket	66	---	139	---	
	Weight Adjustment (grams)				
	BLU	ORG	RED	GRN	
RADS-AT recommended aft pocket weight adjustments	-46	N/A	+46	N/A	The BLUE blade aft pocket contains 66 grams and the minimum possible weight setting is 44 grams. Consequently the recommended adjustment cannot be completely made. Only 22 grams can be moved from the aft pocket to the forward pocket. This leaves 24 grams of adjustment that cannot be done.
Shift weight adjustment to opposite blade	+24	---	+24	---	The 24 grams that cannot be made to the BLUE blade has to be shifted to the opposite blade (RED).
Equivalent aft pocket weight adjustment	-22	---	+70	---	To have the same result as the original RADS-AT recommended adjustments these changes have to be done.
New Pocket Weight Settings	Pocket Weight (grams)				
	BLU	ORG	RED	GRN	
Blade Dash Number	107FM1	107	107FM1	107	
Forward Pocket	323	---	131	---	
Aft Pocket	44	---	209	---	The BLUE blade aft pocket will be at the minimum possible setting.

Table 9. Shifting all of the weight adjustment from one blade to the opposite blade only.

SIGN CONVENTION FOR BLADE POCKET WEIGHT ADJUSTMENTS					
A positive weight adjustment (for example: + 55 grams) will make the blade climb. Weight is moved from the forward pocket to the aft pocket.					
A negative weight adjustment (for example: -22 grams) will make the blade dive. Weight is moved from the aft pocket to the forward pocket.					
MEASURED BLADE TRACK	RELATIVE TRACK (mm)				REMARKS
	BLU	ORG	RED	GRN	
Blade Dash Number	107FM1	107	107FM1	107	Mix of modified and unmodified blades.
100% Nr with 35% Torque	-0.8	-1.6	1.9	0.5	
Hover	1.8	-2.0	-0.7	0.9	
Relative Track Change between ground (100% Nr at 35% Torque) and hover	+2.6	-0.4	-2.6	+0.4	
Current Pocket Weight Settings					
	BLU	ORG	RED	GRN	
Blade Dash Number	107FM1	107	107FM1	107	The ORANGE and the GREEN blades are not adjustable blades. The BLUE blade aft pocket is at the minimum possible weight setting.
Forward Pocket	301	---	201	---	
Aft Pocket	44	---	139	---	
Weight Adjustment (grams)					
	BLU	ORG	RED	GRN	
RADS-AT recommended aft pocket weight adjustments	-46	N/A	+46	N/A	The BLUE blade aft pocket is at the minimum possible weight setting. Consequently, the RADS-AT recommended weight adjustment cannot be made to the BLUE blade. The complete weight adjustment will have to be shifted.
Shift weight adjustment to opposite blade	+46	---	+46	---	Since the recommended adjustment is not possible the 46 grams will be shifted to the opposite blade (RED).
Equivalent weight adjustment	0	---	+92	---	To have the same result as the original RADS-AT recommended adjustments these changes have to be done.
New Pocket Weight Settings					
	BLU	ORG	RED	GRN	
Blade Dash Number	107FM1	107	107FM1	107	
Forward Pocket	301	---	109	---	
Aft Pocket	44	---	231	---	The Blue blade is not adjusted and the aft pocket remains at the minimum weight setting.



NOTES

- 1. Apply sealant AMS-S-8802 (C-308) under the bolt head.
- 2. Washers NAS1149D0316K are used to shim the 406-015-106-103 cover flush with the blade contour.
- 3. Shims 407-015-025-101 are used to shim the weights and prevent looseness.

IM03600001

Figure 1. Main rotor blade balance pockets

APPENDIX A

WORK SHEET - PRODUCT BALANCE ADJUSTMENTS

Current Pocket Weight Settings	Pocket Weight (grams)				REMARKS
	BLU	ORG	RED	GRN	
Forward Pocket					
Aft Pocket					
Weight Adjustment (grams)					
	BLU	ORG	RED	GRN	
RADS-AT recommended pocket weight adjustments					Changes of 10 grams and less do not need to be made. (+) mean remove weight from forward pocket and add to aft pocket. (-) mean remove from aft pocket and add to forward pocket.
Adjustment shift If required					Needed only if recommended adjustment can not be made
Equivalent set of pocket weight adjustments					Result of weight shift if required
Pocket Weight (grams)					
New Pocket Weight Settings	BLU	ORG	RED	GRN	
Forward Pocket					
Aft Pocket					

APPENDIX B

MODEL 407 MAIN ROTOR TRACK AND BALANCE ADJUSTMENT LOG

AIRCRAFT S/N: _____

Page ____ of ____

BLUE BLADE P/N : _____ S/N : _____

ORANGE BLADE P/N : _____ S/N : _____

RED BLADE P/N : _____ S/N : _____

GRN BLADE P/N : _____ S/N : _____

RADS-AT FLIGHT ID		ADJUSTMENTS				
(INITIAL or, INT_PB or FLIGHT) (Date / Time)		TYPE	BLUE	ORANGE	RED	GREEN
Remarks:		Hub Weight				
		Pitch Link				
		Tab				
		Pocket Weights				

RADS-AT FLIGHT ID		ADJUSTMENTS				
(INITIAL or, INT_PB or FLIGHT) (Date / Time)		TYPE	BLUE	ORANGE	RED	GREEN
Remarks:		Hub Weight				
		Pitch Link				
		Tab				
		Pocket Weights				

RADS-AT FLIGHT ID		ADJUSTMENTS				
(INITIAL or, INT_PB or FLIGHT) (Date / Time)		TYPE	BLUE	ORANGE	RED	GREEN
Remarks:		Hub Weight				
		Pitch Link				
		Tab				
		Pocket Weights				

RADS-AT FLIGHT ID		ADJUSTMENTS				
(INITIAL or, INT_PB or FLIGHT) (Date / Time)		TYPE	BLUE	ORANGE	RED	GREEN
Remarks:		Hub Weight				
		Pitch Link				
		Tab				
		Pocket Weights				

RADS-AT FLIGHT ID		ADJUSTMENTS				
(INITIAL or, INT_PB or FLIGHT) (Date / Time)		TYPE	BLUE	ORANGE	RED	GREEN
Remarks:		Hub Weight				
		Pitch Link				
		Tab				
		Pocket Weights				

RADS-AT FLIGHT ID		ADJUSTMENTS				
(INITIAL or, INT_PB or FLIGHT) (Date / Time)		TYPE	BLUE	ORANGE	RED	GREEN
Remarks:		Hub Weight				
		Pitch Link				
		Tab				
		Pocket Weights				

FINAL SETTINGS				
TYPE	BLUE	ORANGE	RED	GREEN
Hub Weight (grams)				
Tab (degrees)				
Fwd Pocket Weight (grams)				
Aft Pocket Weight (grams)				

APPENDIX C

**GUIDE TO ALLOWABLE FORWARD POCKET COMPONENT COMBINATIONS
AND THEIR ESTIMATED TOTAL WEIGHT**

The total weight of each component combination was estimated on the basis of the nominal weight of each component (Refer to Table 6-1 for the nominal weight of each components).

Some shims are peeled to a lower thickness when 406-015-022-111 (0.032 inch CRES; "Thin CRES") weights are used. Shims are used to ensure that the 406-015-022-107, -109, and -111 weights from being loosely held in the blade pocket. Shims used as weights must be used in sets of 3 shims at a given bolt location.

RETAINER DASH NO. (material)	WEIGHT DASH NO. (material)	WEIGHT DASH NO. (material)	WEIGHT DASH NO. (material)	SHIMS	TOTAL WEIGHT (grams)
-113 (AL)	---	---	---	---	43
-113 (AL)	---	---	---	3	45
-113 (AL)	---	---	---	6	46
-113 (AL)	---	---	---	9	48
-113 (AL)	-109 (AL)	---	---	6	55
-113 (AL)	-109 (AL)	-109 (AL)	---	3	63
-113 (AL)	-111 (Thin CRES)	---	---	9	65
-113 (AL)	-109 (AL)	-109 (AL)	-109 (AL)	---	70
-113 (AL)	-111 (Thin CRES)	-109 (AL)	---	6	72
-113 (AL)	-107 (CRES)	---	---	6	73
-113 (AL)	-111 (Thin CRES)	-109 (AL)	-109 (AL)	3	80
-113 (AL)	-107 (CRES)	-109 (AL)	---	3	81
-113 (AL)	-107 (CRES)	-109 (AL)	-109 (AL)	---	88
-113 (AL)	-111 (Thin CRES)	-111 (Thin CRES)	-109 (AL)	3	89
-113 (AL)	-107 (CRES)	-111 (Thin CRES)	---	6	90
-113 (AL)	-107 (CRES)	-111 (Thin CRES)	-109 (AL)	3	98
-113 (AL)	-111 (Thin CRES)	-111 (Thin CRES)	-111 (Thin CRES)	3	99
-113 (AL)	-107 (CRES)	-107 (CRES)	---	3	99
-113 (AL)	-103 (Tungsten)	---	---	6	105
-113 (AL)	-107 (CRES)	-107 (CRES)	-109 (AL)	---	106
-113 (AL)	-107 (CRES)	-111 (Thin CRES)	-111 (Thin CRES)	3	107
-113 (AL)	-103 (Tungsten)	-109 (AL)	---	3	113
-113 (AL)	-107 (CRES)	-107 (CRES)	-111 (Thin CRES)	3	116
-113 (AL)	-103 (Tungsten)	-109 (AL)	-109 (AL)	---	120
-113 (AL)	-103 (Tungsten)	-111 (Thin CRES)	---	6	122
-113 (AL)	-107 (CRES)	-107 (CRES)	-107 (CRES)	---	124
-115 (CRES)	---	---	---	---	124
-115 (CRES)	---	---	---	3	126
-115 (CRES)	---	---	---	6	127
-115 (CRES)	---	---	---	9	129
-113 (AL)	-103 (Tungsten)	-111 (Thin CRES)	-109 (AL)	3	130
-113 (AL)	-103 (Tungsten)	-107 (CRES)	---	3	131
-115 (CRES)	-109 (AL)	---	---	6	136
-113 (AL)	-103 (Tungsten)	-107 (CRES)	-109 (AL)	---	138
-113 (AL)	-103 (Tungsten)	-111 (Thin CRES)	-111 (Thin CRES)	6	139
-115 (CRES)	-109 (AL)	-109 (AL)	---	3	144
-115 (CRES)	-111 (Thin CRES)	---	---	9	146
-113 (AL)	-103 (Tungsten)	-107 (CRES)	-111 (Thin CRES)	3	148

APPENDIX C

**GUIDE TO ALLOWABLE FORWARD POCKET COMPONENT COMBINATIONS
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RETAINER DASH NO. (material)	WEIGHT DASH NO. (material)	WEIGHT DASH NO. (material)	WEIGHT DASH NO. (material)	SHIMS	TOTAL WEIGHT (grams)
-115 (CRES)	-109 (AL)	-109 (AL)	-109 (AL)	---	151
-115 (CRES)	-111 (Thin CRES)	-109 (AL)	---	6	153
-115 (CRES)	-107 (CRES)	---	---	6	154
-113 (AL)	-103 (Tungsten)	-107 (CRES)	-107 (CRES)	---	156
-115 (CRES)	-111 (Thin CRES)	-109 (AL)	-109 (AL)	3	161
-115 (CRES)	-107 (CRES)	-109 (AL)	---	3	162
-113 (AL)	-103 (Tungsten)	-103 (Tungsten)	---	3	163
-115 (CRES)	-107 (CRES)	-109 (AL)	-109 (AL)	---	169
-113 (AL)	-103 (Tungsten)	-103 (Tungsten)	-109 (AL)	---	170
-115 (CRES)	-111 (Thin CRES)	-111 (Thin CRES)	-109 (AL)	3	170
-115 (CRES)	-107 (CRES)	-111 (Thin CRES)	---	6	171
-115 (CRES)	-107 (CRES)	-111 (Thin CRES)	-109 (AL)	3	179
-113 (AL)	-103 (Tungsten)	-103 (Tungsten)	-111 (Thin Steel)	3	180
-115 (CRES)	-111 (Thin CRES)	-111 (Thin CRES)	-111 (Thin CRES)	3	180
-115 (CRES)	-107 (CRES)	-107 (CRES)	---	3	180
-115 (CRES)	-103 (Tungsten)	---	---	6	186
-115 (CRES)	-107 (CRES)	-107 (CRES)	-109 (AL)	---	187
-113 (AL)	-103 (Tungsten)	-103 (Tungsten)	-107 (CRES)	---	188
-115 (CRES)	-107 (CRES)	-111 (Thin CRES)	-111 (Thin CRES)	3	188
-115 (CRES)	-103 (Tungsten)	-109 (AL)	---	3	194
-115 (CRES)	-107 (CRES)	-107 (CRES)	-111 (Thin CRES)	3	197
-115 (CRES)	-103 (Tungsten)	-109 (AL)	-109 (AL)	---	201
-115 (CRES)	-103 (Tungsten)	-111 (Thin CRES)	---	6	203
-115 (CRES)	-107 (CRES)	-107 (CRES)	-107 (CRES)	---	205
-115 (CRES)	-103 (Tungsten)	-111 (Thin CRES)	-109 (AL)	3	211
-115 (CRES)	-103 (Tungsten)	-107 (CRES)	---	3	212
-115 (CRES)	-103 (Tungsten)	-107 (CRES)	-109 (AL)	---	219
-113 (AL)	-103 (Tungsten)	-103 (Tungsten)	-103 (Tungsten)	---	220
-115 (CRES)	-103 (Tungsten)	-111 (Thin CRES)	-111 (Thin CRES)	3	220
-115 (CRES)	-103 (Tungsten)	-107 (CRES)	-111 (Thin CRES)	3	229
-115 (CRES)	-103 (Tungsten)	-107 (CRES)	-107 (CRES)	---	237
-115 (CRES)	-103 (Tungsten)	-103 (Tungsten)	---	3	244
-115 (CRES)	-103 (Tungsten)	-103 (Tungsten)	-109 (AL)	---	251
-115 (CRES)	-103 (Tungsten)	-103 (Tungsten)	-111 (Thin CRES)	3	261
-115 (CRES)	-103 (Tungsten)	-103 (Tungsten)	-107 (CRES)	---	269
-105 (Tungsten)	---	---	---	---	285
-105 (Tungsten)	---	---	---	3	287
-105 (Tungsten)	---	---	---	6	288

APPENDIX C

**GUIDE TO ALLOWABLE FORWARD POCKET COMPONENT COMBINATIONS
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RETAINER DASH NO. (material)	WEIGHT DASH NO. (material)	WEIGHT DASH NO. (material)	WEIGHT DASH NO. (material)	SHIMS	TOTAL WEIGHT (grams)
-105 (Tungsten)	---	---	---	9	290
-105 (Tungsten)	-109 (AL)	---	---	6	297
-115 (CRES)	-103 (Tungsten)	-103 (Tungsten)	-103 (Tungsten)	---	301
-105 (Tungsten)	-109 (AL)	-109 (AL)	---	3	305
-105 (Tungsten)	-111 (Thin CRES)	---	---	9	307
-105 (Tungsten)	-109 (AL)	-109 (AL)	-109 (AL)	---	312
-105 (Tungsten)	-111 (Thin CRES)	-109 (AL)	---	6	314
-105 (Tungsten)	-107 (CRES)	---	---	6	315
-105 (Tungsten)	-111 (Thin CRES)	-109 (AL)	-109 (AL)	3	322
-105 (Tungsten)	-107 (CRES)	-109 (AL)	---	3	323
-105 (Tungsten)	-107 (CRES)	-109 (AL)	-109 (AL)	---	330
-105 (Tungsten)	-111 (Thin CRES)	-111 (Thin CRES)	-109 (AL)	3	331
-105 (Tungsten)	-107 (CRES)	-111 (Thin CRES)	---	6	332
-105 (Tungsten)	-107 (CRES)	-111 (Thin CRES)	-109 (AL)	3	340
-105 (Tungsten)	-111 (Thin CRES)	-111 (Thin CRES)	-111 (Thin CRES)	3	341
-105 (Tungsten)	-107 (CRES)	-107 (CRES)	---	3	341
-105 (Tungsten)	-103 (Tungsten)	---	---	6	347
-105 (Tungsten)	-107 (CRES)	-107 (CRES)	-109 (AL)	---	348
-105 (Tungsten)	-107 (CRES)	-111 (Thin CRES)	-111 (Thin CRES)	3	349
-105 (Tungsten)	-103 (Tungsten)	-109 (AL)	---	3	355
-105 (Tungsten)	-107 (CRES)	-107 (CRES)	-111 (Thin CRES)	3	358
-105 (Tungsten)	-103 (Tungsten)	-109 (AL)	-109 (AL)	---	362
-105 (Tungsten)	-103 (Tungsten)	-111 (Thin CRES)	---	6	364
-105 (Tungsten)	-107 (CRES)	-107 (CRES)	-107 (CRES)	---	366
-105 (Tungsten)	-103 (Tungsten)	-111 (Thin CRES)	-109 (AL)	3	372
-105 (Tungsten)	-103 (Tungsten)	-107 (CRES)	---	3	373
-105 (Tungsten)	-103 (Tungsten)	-107 (CRES)	-109 (AL)	---	380
-105 (Tungsten)	-103 (Tungsten)	-111 (Thin CRES)	-111 (Thin CRES)	3	381
-105 (Tungsten)	-103 (Tungsten)	-107 (CRES)	-111 (Thin CRES)	3	390
-105 (Tungsten)	-103 (Tungsten)	-107 (CRES)	-107 (CRES)	---	398
-105 (Tungsten)	-103 (Tungsten)	-103 (Tungsten)	---	3	405
-105 (Tungsten)	-103 (Tungsten)	-103 (Tungsten)	-109 (AL)	---	412
-105 (Tungsten)	-103 (Tungsten)	-103 (Tungsten)	-111 (Thin CRES)	3	422
-105 (Tungsten)	-103 (Tungsten)	-103 (Tungsten)	-107 (CRES)	---	430
-105 (Tungsten)	-103 (Tungsten)	-103 (Tungsten)	-103 (Tungsten)	---	462

APPENDIX D

**GUIDE TO ALLOWABLE AFT POCKET COMPONENT COMBINATIONS
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COVER DASH NO. (material)	WEIGHT DASH NO. (material)	WEIGHT DASH NO. (material)	WEIGHT DASH NO. (material)	SHIMS	TOTAL WEIGHT (grams)
-105 (AL)	---	---	---	---	44
-105 (AL)	---	---	---	3	46
-105 (AL)	---	---	---	6	47
-105 (AL)	---	---	---	9	49
-105 (AL)	-109 (AL)	---	---	6	56
-105 (AL)	-109 (AL)	-109 (AL)	---	3	64
-105 (AL)	-111 (Thin CRES)	---	---	9	66
-105 (AL)	-109 (AL)	-109 (AL)	-109 (AL)	---	71
-105 (AL)	-111 (Thin CRES)	-109 (AL)	---	6	73
-105 (AL)	-107 (CRES)	---	---	6	74
-105 (AL)	-111 (Thin CRES)	-109 (AL)	-109 (AL)	3	81
-105 (AL)	-107 (CRES)	-109 (AL)	---	3	82
-105 (AL)	-107 (CRES)	-109 (AL)	-109 (AL)	---	89
-105 (AL)	-111 (Thin CRES)	-111 (Thin CRES)	-109 (AL)	3	90
-105 (AL)	-107 (CRES)	-111 (Thin CRES)	---	6	91
-105 (AL)	-107 (CRES)	-111 (Thin CRES)	-109 (AL)	3	99
-105 (AL)	-111 (Thin CRES)	-111 (Thin CRES)	-111 (Thin CRES)	3	100
-105 (AL)	-107 (CRES)	-107 (CRES)	---	3	100
-105 (AL)	-103 (Tungsten)	---	---	6	106
-105 (AL)	-107 (CRES)	-107 (CRES)	-109 (AL)	---	107
-105 (AL)	-107 (CRES)	-111 (Thin CRES)	-111 (Thin CRES)	3	108
-105 (AL)	-103 (Tungsten)	-109 (AL)	---	3	114
-105 (AL)	-107 (CRES)	-107 (CRES)	-111 (Thin CRES)	3	117
-105 (AL)	-103 (Tungsten)	-109 (AL)	-109 (AL)	---	121
-105 (AL)	-103 (Tungsten)	-111 (Thin CRES)	---	6	123
-105 (AL)	-107 (CRES)	-107 (CRES)	-107 (CRES)	---	124
-107 (CRES)	---	---	---	---	127
-107 (CRES)	---	---	---	3	129
-107 (CRES)	---	---	---	6	130
-105 (AL)	-103 (Tungsten)	-111 (Thin CRES)	-109 (AL)	3	131
-105 (AL)	-103 (Tungsten)	-107 (CRES)	---	3	132
-107 (CRES)	---	---	---	9	132
-105 (AL)	-103 (Tungsten)	-107 (CRES)	-109 (AL)	---	139
-107 (CRES)	-109 (AL)	---	---	6	139
-105 (AL)	-103 (Tungsten)	-111 (Thin CRES)	-111 (Thin CRES)	6	140
-107 (CRES)	-109 (AL)	-109 (AL)	---	3	147
-105 (AL)	-103 (Tungsten)	-107 (CRES)	-111 (Thin CRES)	3	149
-107 (CRES)	-111 (Thin CRES)	---	---	9	149

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COVER DASH NO. (material)	WEIGHT DASH NO. (material)	WEIGHT DASH NO. (material)	WEIGHT DASH NO. (material)	SHIMS	TOTAL WEIGHT (grams)
-107 (CRES)	-109 (AL)	-109 (AL)	-109 (AL)	---	154
-107 (CRES)	-111 (Thin CRES)	-109 (AL)	---	6	156
-105 (AL)	-103 (Tungsten)	-107 (CRES)	-107 (CRES)	---	157
-107 (CRES)	-107 (CRES)	---	---	6	157
-107 (CRES)	-111 (Thin CRES)	-109 (AL)	-109 (AL)	3	164
-105 (AL)	-103 (Tungsten)	-103 (Tungsten)	---	3	164
-107 (CRES)	-107 (CRES)	-109 (AL)	---	3	165
-105 (AL)	-103 (Tungsten)	-103 (Tungsten)	-109 (AL)	---	171
-107 (CRES)	-107 (CRES)	-109 (AL)	-109 (AL)	---	172
-107 (CRES)	-111 (Thin CRES)	-111 (Thin CRES)	-109 (AL)	3	173
-107 (CRES)	-107 (CRES)	-111 (Thin CRES)	---	6	174
-105 (AL)	-103 (Tungsten)	-103 (Tungsten)	-111 (Thin Steel)	3	181
-107 (CRES)	-107 (CRES)	-111 (Thin CRES)	-109 (AL)	3	182
-107 (CRES)	-111 (Thin CRES)	-111 (Thin CRES)	-111 (Thin CRES)	3	183
-107 (CRES)	-107 (CRES)	-107 (CRES)	---	3	183
-105 (AL)	-103 (Tungsten)	-103 (Tungsten)	-107 (CRES)	---	189
-107 (CRES)	-103 (Tungsten)	---	---	6	189
-107 (CRES)	-107 (CRES)	-107 (CRES)	-109 (AL)	---	190
-107 (CRES)	-107 (CRES)	-111 (Thin CRES)	-111 (Thin CRES)	3	191
-107 (CRES)	-103 (Tungsten)	-109 (AL)	---	3	197
-107 (CRES)	-107 (CRES)	-107 (CRES)	-111 (Thin CRES)	3	200
-107 (CRES)	-103 (Tungsten)	-109 (AL)	-109 (AL)	---	204
-107 (CRES)	-103 (Tungsten)	-111 (Thin CRES)	---	6	206
-107 (CRES)	-107 (CRES)	-107 (CRES)	-107 (CRES)	---	208
-107 (CRES)	-103 (Tungsten)	-111 (Thin CRES)	-109 (AL)	3	214
-107 (CRES)	-103 (Tungsten)	-107 (CRES)	---	3	215
-105 (AL)	-103 (Tungsten)	-103 (Tungsten)	-103 (Tungsten)	---	221
-107 (CRES)	-103 (Tungsten)	-107 (CRES)	-109 (AL)	---	222
-107 (CRES)	-103 (Tungsten)	-111 (Thin CRES)	-111 (Thin CRES)	3	223
-107 (CRES)	-103 (Tungsten)	-107 (CRES)	-111 (Thin CRES)	3	232
-107 (CRES)	-103 (Tungsten)	-107 (CRES)	-107 (CRES)	---	240
-107 (CRES)	-103 (Tungsten)	-103 (Tungsten)	---	3	247
-107 (CRES)	-103 (Tungsten)	-103 (Tungsten)	-109 (AL)	---	254
-107 (CRES)	-103 (Tungsten)	-103 (Tungsten)	-111 (Thin CRES)	3	264
-107 (CRES)	-103 (Tungsten)	-103 (Tungsten)	-107 (CRES)	---	272
-107 (CRES)	-103 (Tungsten)	-103 (Tungsten)	-103 (Tungsten)	---	304