

TM 55-1520-240-MTF

MAINTENANCE TEST
FLIGHT MANUAL

ARMY MODEL
CH-47D HELICOPTER

This copy is a reprint which includes current
pages from Changes 1 through 10.

HEADQUARTERS
DEPARTMENT OF THE ARMY

8 SEPTEMBER 1982

URGENT

TM 55-1520-240-MTF
C26

CHANGE HEADQUARTERS
DEPARTMENT OF THE ARMY
NO. 26 WASHINGTON, D.C., 29 DECEMBER 2000

MAINTENANCE TEST
FLIGHT MANUAL

ARMY MODEL CH-47D HELICOPTER

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Remove pages	Insert pages
2-42.1/(2-42.2 blank)	2-42.1/(2-42.2 blank)
2-43 and 2-44	2-43 and 2-44

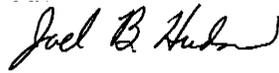
2. Retain this sheet in front of manual for reference purposes.

TM 55-1520-240-MTF
C26

By Order of the Secretary of the Army:

Official:

ERIC K. SHINSEKI
General, United States Army
Chief of Staff



JOEL B. HUDSON
Administrative Assistant to the
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TM 55-1520-240-MTF

C25

CHANGE
NO. 25

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DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 15 May 2000

MAINTENANCE TEST
FLIGHT MANUAL

ARMY MODEL CH-47D HELICOPTER

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TM 55-1520-240-MTF, 8 September 1982, is changed as follows:

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Remove pages	Insert pages
iii and iv	iii and iv
-----	v/(vi blank)
2-1 through 2-4	2-1 through 2-4
2-7 and 2-8	2-7 and 2-8
2-11 and 2-12	2-11 and 2-12
2-12.1/(2-12.2 blank)	2-12.1/(2-12.2 blank)
2-15 and 2-16	2-15 and 2-16
2-23 through 2-2-26	2-23 through 2-2-26
2-26.1/(2-26.2 blank)	2-26.1/(2-26.2 blank)
2-29 through 2-32	2-29 through 2-32
-----	2-32.1/(2-32.2 blank)
2-33 and 2-34	2-33 and 2-34
2-39 and 2-40	2-39 and 2-40
2-45 and 2-46	2-45 and 2-46
2-46.1/(2-46.2 blank)	2-46.1 and 2-46.2

TM 55-1520-240-MTF

C25

Remove pages

2-47 through 2-50

2-53 and 2-54

2-55 and 2-56
2-63 and 2-64

2-65 and 2-66
2-73 and 2-74
2-75 and 2-76

2-87 and 2-88
2-88.1/(2-88.2 blank)
2-89/(2-90 blank)
4-1 and 4-2
4-11 through 4-14

4-25 and 4-26
5-1 and 5-2
5-17/(5-18 blank)
5-23/(5-24 blank)
5-25/(5-26 blank)
5-26.1 and 5-26.2

5-29/(5-30 blank)
5-31/(5-32 blank)

Insert pages

2-46.3/(2-46.4 blank)
2-47 through 2-50
2-51.1 and 2-52.2
2-53 and 2-54
2-54.3/(2-54.4 blank)
2-55 and 2-56
2-63 and 2-64
2-64.1/(2-64.2 blank)
2-65 and 2-66
2-73 and 2-74
2-75 and 2-76
2-76.1/(7-76.2 blank)
2-87 and 2-88

2-89 and 2-90
4-1 and 4-2
4-11 through 4-14
4-14.1 through
14-14.7/(4-14.8 blank)
4-25 and 4-26
5-1 and 5-2
5-17/(5-18 blank)
5-23/(5-24 blank)
5-25/(5-26 blank)
5-26.1/(5-26.2 blank)
5-26.2.1/(5-26.2.2
blank) through
5-26.2.10/(5-26.2.20
blank)
5-29/(5-30 blank)
5-31/(5-32 blank)

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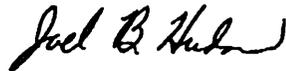
TM 55-1520-240-MTF

C25

By Order of the Secretary of the Army:

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General, United States Army
Chief of Staff



JOEL B. HUDSON
Administrative Assistant to the
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0013101

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TM 55-1520-240-MTF

C24

CHANGE HEADQUARTERS
NO. 24 DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 29 January 1999

MAINTENANCE TEST
FLIGHT MANUAL

ARMY MODEL CH-47D HELICOPTER

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Remove pages

2-5 and 2-6

2-84.11/(2-84.12 blank)

2-87 and 2-88

3-46.3 and 3-46.4

Insert pages

2-5 and 2-6
2-6.1 and 2-6.2
2-84.11 and 2-84.12
2-84.13/(2-84.14 blank)
2-87 and 2-88
2-88.1/(2-88.2 blank)
3-46.3 and 3-46.4
3-46.5 through 3-46.9/
(3-46.10 blank)

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TM 55-1520-240-MTF
C24

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Chief of Staff

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JOEL B. HUDSON

Administrative Assistant to the
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NO. 23 DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 16 October 1998

MAINTENANCE TEST
FLIGHT MANUAL

ARMY MODEL CH47D HELICOPTER

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Remove pages	Insert pages
2-9 and 2-10	2-9 and 2-10
-----	2-10.1/(2-10.2 blank)

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TM 55-1520-240-MTF

C23

By Order of the Secretary of the Army:

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Chief of Staff

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*Administrative Assistant to the
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**TM 55-1520-240-MTF
C22**

CHANGE HEADQUARTERS
NO. 22 DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 8 April 1998

MAINTENANCE TEST
FLIGHT MANUAL

ARMY MODEL CH-47D HELICOPTER

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1. Remove and insert pages as indicated below. New or changed text material is indicated by a vertical bar in the margin. An illustration change is indicated by a miniature pointing hand.

Remove pages	Insert pages
i through iii/(iv blank)	i through iv
2-29 and 2-30	2-29 and 2-30
2-33 and 2-34	2-33 and 2-34
2-38.1/(2-38.2 blank)	2-38.1/(2-38.2 blank)
3-17 and 3-18	3-17 and 3-18
-----	3-18.1/(3-18.2 blank)
3-35 and 3-36	3-35 and 3-36
4-1 and 4-2	4-1 and 4-2
4-31/(4-32 blank)	4-31 through 4-41/(4-42 blank)

2. Retain this sheet in front of manual for reference purposes.

TM 55-1520-240-4TF

C22

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CHANGE

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MAINTENANCE TEST
FLIGHT MANUAL

ARMY MODEL CH-47D HELICOPTER

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1. Remove and insert pages as indicated below. New or changed text material is indicated by a vertical bar in the margin. An illustration change is indicated by a miniature pointing hand.

Remove pages	Insert pages
i and ii	i and ii
2-37 and 2-38	2-37 and 2-38
2-55 and 2-56	2-55 and 2-56
2-65 and 2-66	2-65 and 2-66
2-84.7 and 2-84.8	2-84.7 and 2-84.8
_____	2-84.9 through 2-84.11/ (2-84.12 blank)
3-46.3/(3-46.4 blank)	3-46.3 and 3-46.4

2. Retain this sheet in front of manual for reference purposes.

TM 55-1520-240-MTF

C21

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**TM 55-1520-240-MTF
C 20**

CHANGE

NO. 20

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 27 FEBRUARY 1997

**MAINTENANCE TEST
FLIGHT MANUAL**

**ARMY MODEL
CH-47D HEUCOPTER**

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TM 55 -1520-240-MTF, 8 September 1982, is changed as follows:

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Remove pages

2-53 and 2-54

2-55 and 2-56

2-83 through 2-83 through 2-84.8

2-84.1/(2-84.2 blank)

3-45 and 3-46

Insert pages

2-53 and 2-54

2-54.1 and 2-54.2

2-55 and 2-56

2-56.1/(2-56.2 blank)

3-45 and 3-46

3-46.1 through

3-46.3/(3-46.4 blank)

URGENT

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DEPARTMENT OF THE ARMY
NO. 19 WASHINGTON, D. C., 30 November 1994

MAINTENANCE TEST FLIGHT MANUAL

ARMY MODEL CH-47D HELICOPTER

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TM 55-1520-240-MTF, 8 September 1982, is changed as follows:

1. Remove and insert pages as indicated below. New or changed text material is indicated by a vertical bar in the margin. An illustration change is indicated by a miniature pointing hand.

Remove pages

2-37 and 2-38
2-43 through 2-46
2-46.1/(2-46.2 blank)
2-65 and 2-66
2-77 and 2-78
3-37 and 3-38

Insert pages

2-37 and 2-38
2-43 through 2-46
2-46.1/(2-46.2 blank)
2-65 and 2-66
2-77 and 2-78
3-37 and 3-38

2. Retain this sheet in front of manual for reference purposes.

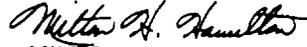
TM 55-1520-240-MTF

C19

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Chief of Staff

Official:



MILTON H. HAMILTON
Administrative Assistant to the
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07625

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CHANGE HEADQUARTERS
DEPARTMENT OF THE ARMY
NO. 18 WASHINGTON, D.C., 31 AUGUST 1994

MAINTENANCE TEST
FLIGHT MANUAL

ARMY MODEL
CH-47D HELICOPTER

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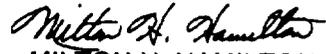
Remove pages	Insert pages
2-58.1/(2-58.2 blank)	2-58.1/(2-58.2 blank)
2-65 and 2-66	2-65 and 2-66
2-72.1/(2-72.2 blank)	2-72.1/(2-72.2 blank)
2-73 and 2-74	2-73 and 2-74

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By Order of the Secretary of the Army:

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CHANGE

HEADQUARTERS

DEPARTMENT OF THE ARMY

NO. 17

WASHINGTON, D.C., 18 January 1994

MAINTENANCE TEST
FLIGHT MANUAL

ARMY MODEL
CH-47D HELICOPTER

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Remove pages

Insert pages

i and ii	i and ii
1-3/(1-4 blank)	1-3/(1-4 blank)
2-7 and 2-8	2-7 and 2-8
2-11 and 2-12	2-11 and 2-12
-----	2-12.1/(2-12.2 blank)
2-13 through 2-16	2-13 through 2-16
-----	2-16.1/(2-16.2 blank)
-----	2-26.1/(2-26.2 blank)
2-27 through 2-30	2-27 through 2-30
2-37 and 2-38	2-37 and 2-38
2-38.1/(2-38.2 blank)	2-38.1/(2-38.2 blank)
2-45 and 2-46	2-45 and 2-46
-----	2-46.1/(2-46.2 blank)
2-49 and 2-50	2-49 and 2-50
2-87 and 2-88	2-87 and 2-88
3-17 and 3-18	3-17 and 3-18

TM 55-1520-240-MTF

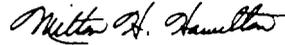
C 17

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CHANGE HEADQUARTERS
DEPARTMENT OF THE ARMY
NO. 16 WASHINGTON D.C., 30 SEPTEMBER 1992

MAINTENANCE TEST
FLIGHT MANUAL

ARMY MODEL
CH-47D HELICOPTER

TM 55-1520-240-MTF, 8 September 1982,
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1. Remove and insert pages as indicated below. New or changed text material is indicated by a vertical bar in the margin. An illustration change is indicated by a miniature pointing hand.

Remove pages	Insert pages
2-38.1/2-38.2	2-38.1/2-38.2
2-72.1/2-72.2	2-72.1/2-72.2
4-25 and 4-26	4-25 and 4-26
4-26.1 and 4-26.2	4-26.1/4-26.2
4-27 and 4-28	4-27 and 4-28
- - - -	4-28.1 and 4-28.2
4-29 and 4-30	4-29 and 4-30
5-25/5-26	5-25/5-26
5-26.1/5-26.2	5-26.1 and 5-26.2
5-26.3/5-26.4	5-26.3/5-26.4

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Chief of Staff

Official:



MILTON H. HAMILTON
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CHANGE HEADQUARTERS
 DEPARTMENT OF THE ARMY
 NO. 15 WASHINGTON, D.C., 30 April 1992

MAINTENANCE TEST
 FLIGHT MANUAL

ARMY MODEL
 CH-47D HELICOPTER

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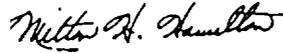
Remove pages	Insert pages
2-1 through 2-6	2-1 through 2-6
2-13 and 2-14	2-13 and 2-14
-----	2-14.1/2-14.2
2-15 through 2-18	2-15 through 2-18
2-31 through 2-36	2-31 through 2-36
-----	2-36.1/2-36.2
2-37 through 2-40	2-37 through 2-40
2-47 through 2-50	2-47 through 2-50
2-53 and 2-54	2-53 and 2-54
2-58.1/2-58.2	2-58.1/2-58.2
2-61 and 2-62	2-61 and 2-62
2-65 and 2-66	2-65 and 2-66
2-69 through 2-74	2-69 through 2-74
2-87 and 2-88	2-87 and 2-88
3-37 and 3-38	3-37 and 3-38
4-11 through 4-14	4-11 through 4-14
-----	4-14.1/4-14.2
4-15 and 4-16	4-15 and 4-16

2. Retain this sheet in front of manual for reference purposes.

By Order of the Secretary of the Army:

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Chief of Staff

Official:



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01434

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TM 55-1520-240-MTF
C 1 4

CHANGE HEADQUARTERS
DEPARTMENT OF THE ARMY
NO. 14 WASHINGTON, D.C., 28 August 1990

MAINTENANCE TEST
FLIGHT MANUAL

ARMY MODEL
CH-47D HELICOPTER

TM 55-1520-240-MTF, 8 September 1982,
is changed as follows:

1. Remove and insert pages as indicated below. New or changed text material is indicated by a vertical bar in the margin. An illustration change is indicated by a miniature pointing hand.

Remove pages	Insert pages
4-25 and 4-26	4-25 and 4-26
4-26.1 and 4-26.2	- - - - -
4-27	4-27 through 4-30

2. Retain this sheet in front of manual for reference purposes.

U R G E N T

TM 55-1520-240-MTF

C 14

By Order of the Secretary of the Army:

CARL E. VUONO
General, United States Army
Chief of Staff

Official:

THOMAS F. SIKORA
Brigadier General, United States Army
The Adjutant General

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To be distributed in accordance with DA
Form 12-31, MTF Maintenance requirements
for CH-47D Helicopter, Cargo Transport.

CHANGE HEADQUARTERS
DEPARTMENT OF THE ARMY
NO. 13 WASHINGTON, D.C., 18 OCTOBER 1990

MAINTENANCE TEST
FLIGHT MANUAL

ARMY MODEL
CH-47D HELICOPTER

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1982, is changed as follows:

1. Remove and insert pages as indicated below. New or changed text material is indicated by a vertical bar in the margin. An illustration change is indicated by a miniature pointing hand.

Remove pages	Insert pages
i and ii	i and ii
2-9 and 2-10	2-9 and 2-10
2-31 and 2-32	2-31 and 2-32
2-40.1/2-40.2	2-40.1/2-40.2
3-23 and 3-24	3-23 and 3-24
4-25 and 4-26	4-25 and 4-26

2. Retain this sheet in front of manual for reference purposes.

By Order of the Secretary of the Army:

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General, United States Army
Chief of Staff

Official:

THOMAS F. SIKORA
Brigadier General, United States Army
The Adjutant General

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ments for CH-47D Helicopter, Cargo
Transport.

CHANGE HEADQUARTERS
DEPARTMENT OF THE ARMY
NO. 12 WASHINGTON, D.C., 1 November 1989

MAINTENANCE TEST
FLIGHT MANUAL

ARMY MODEL
CH-47D HELICOPTER

TM 55-1520-240-MTF, 8 September 1982,
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1. Remove and insert pages as indicated below. New or changed text material is indicated by a vertical bar in the margin. An illustration change is indicated by a miniature pointing hand.

Remove pages	Insert pages
2-3 through 2-10	2-3 through 2-10
2-31 through 2-38	2-31 through 2-38
2-39 and 2-40	2-39 and 2-40
2-40.1/2-40.2	2-40.1/2-40.2
2-41 and 2-42	2-41 and 2-42
2-42.1/2-42.2	2-42.1/2-42.2
2-45 through 2-48	2-45 through 2-48
2-51 and 2-52	2-51 and 2-52
2-55 through 2-58	2-55 through 2-58
- - - -	2-58.1/2-58.2
2-61 and 2-62	2-61 and 2-62
2-62.1/2-62.2	2-62.1/2-62.2
2-63 through 2-70	2-63 through 2-70
2-71 and 2-72	2-71 and 2-72
2-73 and 2-74	2-73 and 2-74
2-83 and 2-84	2-83 and 2-84

TM 55-1520-240-MTF
C 12

Remove pages

- - -
3-27 and 3-28
3-33 and 3-34
3-37 and 3-38
- - -
4-5 and 4-6
- - -
4-23 and 4-24
4-26.1 and 4-26.2
5-29/5-30
5-31/5-32

Insert pages

2-84.1/2-84.2
3-27 and 3-28
3-33 and 3-34
3-37 and 3-38
4-4.1/4-4.2
4-5 and 4-6
4-22.1/4-22.2
4-23 and 4-24
4-26.1 and 4-26.2
5-29/5-30
5-31/5-32

2. Retain this sheet in front of manual for reference purposes.

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General, United States Army
Chief of Staff

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Brigadier General, United States Army
The Adjutant General

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TM 55-1520-240-MTF

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CHANGE HEADQUARTERS
DEPARTMENT OF THE ARMY
NO. 11 WASHINGTON, D.C., 14 October 1988

MAINTENANCE TEST
FLIGHT MANUAL

ARMY MODEL
CH-47D HELICOPTER

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This is a reprint of change 11.

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WASHINGTON, D. C., 14 March 1988

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4-31	4-31

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 FLIGHT MANUAL

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2-1 and 2-2	2-1 and 2-2
2-7 through 2-10	2-7 through 2-10
2-31 and 2-32	2-31 and 2-32
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TM 55-1520-240-MTF
C 9

Remove pages

Insert pages

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5-25/5-26	5-25/5-26
5-26.1/5-26.2	5-26.1/5-26.2
5-26.3/5-26.4	5-26.3/5-26.4

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FLIGHT MANUAL

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2-37 and 2-38

2-85 and 2-86

2-85 and 2-86

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FLIGHT MANUAL

ARMY MODEL
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4-27 and 4-28	4-27 and 4-28
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5-25 and 5-26	5-25 and 5-26
5-26.1/5-26.2	5-26.1/5-26.2
- - -	5-26.3/5-26.4

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Maintenance Test
 Flight Manual

ARMY MODEL
 CH-47D HELICOPTER

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TM 55-1520-240-MTF

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NO. 5 DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 15 April 1986

MAINTENANCE TEST
FLIGHT MANUAL

ARMY MODEL
CH-47D HELICOPTER

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TM 55-1520-240-MTF

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DEPARTMENT OF THE ARMY
NO. 4 WASHINGTON, D.C., 8 November 1985

MAINTENANCE TEST
FLIGHT MANUAL

ARMY MODEL
CH-47D HELICOPTER

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W A R N I N G

A maintenance test flight is an exceptionally demanding operation and requires a thorough flight readiness inspection (PREFLIGHT). The flight readiness inspection is prescribed in TM 55-1520-240-10 operators manual and must be completed prior to each maintenance test flight. Emergency procedures are found in the applicable -10 or checklist (CL) and are not duplicated in this publication. Prior to each maintenance test flight, the pilot will contact maintenance/quality control personnel to determine the maintenance that has been performed. This manual should be used only by qualified maintenance test flight pilots as required in AR95-1 and TM 55-1500-328-25.

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TM 55-1520-240-MTF
REPORTING ERRORS AND RECOMMENDING
IMPROVEMENTS

You can help improve this manual. If you find any mistakes or if you know of any way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in the back of the applicable operator's manual (when using the 2028-2 from the operator's manual. ensure the publication number and title reflect this MTF) direct to: Commander, U.S. Army Aviation and Missile Command, ATTN: AMSAM-MMC-LS-LP, Redstone Arsenal, AL 35898-5230. A reply will be furnished to you. You may also send in your comments electronically to our e-mail address: ls-lp@redstone.army.mil or by fax 205-842-6546/DSN 788-6546. Instructions for sending an electronic 2028 may be found at the back of the Aircraft Operator's manual.

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SECTION I — INTRODUCTION

1. PURPOSE. The purpose of this manual is to provide complete instructions for performing a maintenance test flight of CH-47D aircraft. For the specific conditions which require a general or limited maintenance test flight, refer to TM 55-1500-328-25 and TM 55-1520-240-23.

2. DEFINITIONS.

a. Maintenance Test Flight. A functional test flight for which the primary purpose is to determine whether the airframe, powerplant, accessories, and other equipment are functioning in accordance with predetermined requirements while subjected to the intended environment.

b. Warnings, Cautions, and Notes. Warnings, Cautions, and Notes are used to emphasize important and critical instructions and are used for the following conditions:

WARNING

An operating procedure, practice, etc., which, if not correctly followed, will result in personnel injury or loss of life.

CAUTION

An operating procedure, practice, etc., which, if not strictly observed, will result in damage or destruction of equipment.

NOTE

An operating procedure, condition, etc., which is essential to highlight.

3. GENERAL INFORMATION.

a . This manual covers only maintenance test flight of CH-47D aircraft and in no way supersedes any information contained in TM 55-1520240-10, or applicable CL, but is to be used in conjunction with the -10 or CL. For the purpose of maintenance test flights only, this manual satisfies all the requirements of the CL from Interior Check through Engine Shutdown.

b. Crew requirements will be as specified in TM 55-1500-326-25 and TM 55-1520-240-10.

c. The duration of a general or limited test flight will be in accordance with the requirements d TM 55-1500-328-25.

4. SPECIAL INSTRUCTIONS.

a. Cargo and Passengers. Cargo and passengers are prohibited on maintenance test flights.

b. Forms and Records. Forms and records will be checked prior to the maintenance test flight to determine what maintenance has been performed and the typed maintenance test flight required (i.e., general or limited).

c. Configuration. The configuration of the aircraft should be determined prior to each maintenance test flight in order to determine performance parameters.

d. Post Test Flight Inspection. A thorough visual inspection will be performed to the extent necessary to assure that deficiencies or shortcomings that may have developed as a result of the maintenance test flight are detected.

e . References. When a maintenance test flight is required to assure proper operation of a specific system(s), refer to the applicable maintenance manual for the limits of that system.

f. Asterisked Checks. An asterisk (*) prior to a check requires that the Test Flight Check Sheet be annotated with a specific reading. Also a check (✓) for satisfactory performance or an (X) for problem detected will be recorded and a short statement entered in the remarks block of the Check Sheet.

g. Maintenance Test Flight Check Sheet. The Check Sheet contained in Section V will be used for all test flights. When a test flight is performed to determine if specific equipment or systems are operating properly, completion of only that portion of the maintenance test flight Check Sheet applicable to the specific equipment or systems being tested is required. The aircraft test flight Check Sheets may be locally reproduced. Continuation sheets may be used when necessary. Items that prove to be unsatisfactory during the test flight and require corrective action shall be listed in the remarks block during flight and transferred to DA Form 2408-13 immediately after termination of the flight. The sheet will be attached to the DA Form 2408-13 upon completion. After accumulation of two or more sheets, the data should be reviewed to determine if trends are developing.

h. Symbolized Checks. The procedures include items that may be checked by the flight engineer and that may or may not be installed. These items are annotated immediately preceding the check to which they are pertinent: F for flight engineer, and O to indicate a requirement if the equipment is installed.

Symbols preceding Numbered Steps.

F - Indicates flight engineer function or response.

O - Indicates "If Installed".

SECTION II — MAINTENANCE TEST FLIGHT
CHECKLIST

General. This section contains the maintenance test flight requirements peculiar to Army Model CH-47D aircraft. Conditions requiring accomplishment of test flights shall be in accordance with TM 55-1500-328- 25. The requirements contained herein are established to assure a thorough inspection of the aircraft before flight, during flight and upon completion of the maintenance test flight. The right side of the checklist (Troubleshooting Reference) is cross indexed to the troubleshooting guides contained in Section III. A dash between references means "through"; a comma means "and".. The references list the possible abnormal conditions, indications or malfunctions which could be encountered while performing the procedure.

TM 55-1520-240-MTF

PROCEDURE **TROUBLESHOOTING**
REFERENCE

PRIOR TO MAINTENANCE TEST
FLIGHT

Before Interior Check

- *1. Publications - Check DA Forms 2408-12, -13, -14, -18, DD Form 365F, and DD Form 1896. locally required forms and publications, and availability of operators manual (-10), and maintenance test flight manual.
2. Ignition lock switch - ON.
3. BATT switch - OFF.
4. **712** Emergency power panel - Check trip indicators and timers.
5. **712** Topping stops - Check stowed (unless TEAC is to be performed).
6. Cockpit area - Check condition of bottom half inertia reel.
7. Deleted.
8. Fuel sample - Check before first flight of the day.
9. Deleted.
10. Rotor blade tracking targets installed if tracking (STROBEX) is required.
11. Accelerometers installed if rotor blade balance check (VIBREX) is required.
12. Tiedowns, locking devices, covers, and ground cables - Removed and secured.

PROCEDURE TROUBLESHOOTING
REFERENCE

PRIOR TO MAINTENANCE

TEST FLIGHT (Cont.)

Before Interior Check (Cont.).

NOTE

Do NOT turn the BATT switch OFF if the APU ON caution light does not come on, or if the start is automatically shutdown. Set the APU switch to OFF and check the bite indicators on the control unit for the cause of the shutdown.

f. APU ON caution light—
Check on (10-12 seconds after APU switch is released to RUN).

g. UTIL HYD SYS caution light—Check out (30 seconds maximum). G1

h. APU GEN switch—ON.
Check NO. 1 and NO. 2 RECT OFF caution lights out.

i. POWER XFR NO. 1 and POWER XFR NO. 2 switches—ON. Check NO. 1 and NO. 2 HYD FLT CONTR caution lights out. G2

WARNING

If either FLT CONTR caution lights do not go out in 30 seconds after POWER XFR switches are set to ON, set the POWER XFR switches to OFF. Do not fly the helicopter.

17. Neutral Rig Check — After Phase Maintenance inspection or flight control maintenance. Set DASH actuator to 36 inches for mechanical rig if required. Disconnect electrical connectors from DASH actuator.

TM 55-1520-240-MTF

PROCEDURE	TROUBLESHOOTING REFERENCE
------------------	--------------------------------------

**PRIOR TO MAINTENANCE
TEST FLIGHT (Cont.)**

Before Interior Check (Cont.).

18. Flight Controls - Neutral THRUST. ground detent. (If Neutral Rig Check not performed).

19. Flight control looseness - Check. See Section IV.

19.1. HF Radio Setup (AN/ARC-220) - Turn Radio Set function switch to STAY and allow system to go thru self tests. SYSTEM TESTING is displayed during test and "SYSTEM-GO" if system passes.	J41.42.43.44 45.46
--	-----------------------

19.2. Perform data and key fills and setup as necessary. "LOADING" is displayed during and "LOAD COMPLETE" after successful fill.	J47.48
---	--------

19.3. Turn HF radio OFF.

19.4. TSEC/KY- 100 Setup - Turn system ON, load keys and set up as necessary. A pass tone is heard in headset and "KEY N" (where 'N' is the key location) displayed on Z-AVH for a successful load.	J49.50.51
---	-----------

19.5. Turn OFF.

PROCEDURE	TROUBLESHOOTING REFERENCE
INTERIOR (Cont.)	

Forward Cabin (Cont.)

e. Flight controls - Check all push-pull tubes, actuators, magnetic brakes, and viscous dampers for condition and security. Rigging pins removed.

f. Fwd transmission temperature bulb and chip detector - Check for proper installation.

g. Fwd transmission - Check filter button in and oil cooler condition.

2. Troop commander's seat and belt - Check condition and security.

3. Cabin and ramp lights, fwd control switch 3 - Check operation.

4. Interior - Check for loose equipment and stowed.

5. Heater compartment - Check security of components, vibrator contact position, and ignition circuit fuse.

a. STVA test box - Check.

b. STVA switch-OFF.

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PROCEDURE	TROUBLESHOOTING
	REFERENCE
INTERIOR (Cont.)	

c. Winch and winch accessories -
Check security and
proper storage.

6. Cabin Door.

a. Condition - Check.

b. Upper section escape panel - Check
security and condition of seals.

TM 55-1520-240-MTF

PROCEDURE **TROUBLESHOOTING**
REFERENCE

INTERIOR (Cont.)

Forward Cabin (Cont.)

- c. Lower step - Check condition and static wire.
- d. Step lock - Check.
- 7. Emergency escape ax - Check condition and security.
- 8. Transformer rectifier air screens - Check clear behind and under seat (both sides).
- 9. Avionics equipment - Check security of components and connections.
- 10. AFCS computers electrical and pneumatic connections - Check for condition and security.
- 11. Troop alarm box - Check condition.
- 12. Hand fire extinguisher - Check seal, security, date and tagged.
- 13. **712** Engine N1 control boxes (overhead at station 200) - Check security.
- 14. Seats, litters, first aid kits, cargo and jettisonable cabin windows - Check condition and security.
- 15. Cabin lights - Check condition.
- 16. Emergency exit lights - Check secure and operation.
- 17. Utility hatch door - Check and position as necessary.

TM 55-1520-240-MTF

PROCEDURE **TROUBLESHOOTING**
REFERENCE

INTERIOR (Cont.)

Forward Cabin (Cont.)

18. Center cargo hook - Check and position as required. Check air charge. Check forward and aft hook manual release. Position lever in stowed position.
- O 18.1 Forward, center, and aft cargo hook manual release mechanism - Check for security, position lever in stowed position.
19. Lower rescue door - Check position as required and hand crank stowed.
20. Hoist control panel - Check switches and stow grip.
- 20.1 **714A** DECU (2) - Check condition and security.
- O 20.2 NO. 1 and NO. 2 EAPS control box - Check condition and security.
21. Loose equipment - Check stowed.
22. Static line - Check condition and security.
23. Crew safety harness - Rig and adjust as required.

Aft Cabin

1. Combining transmission area-Check mount bolt exposure by thread count 1 to 2 threads and slippage marks as required.
2. CABIN and RAMP LIGHT switches - As required.
3. Fire detect control unit - Check condition and security (No. 2 engine).

PROCEDURE

INTERIOR (Cont.)

Aft Cabin (Cont.)

4. Ramp - Check condition.
5. Ramp control lever - STOP
6. Power steering module - Check.
7. ENGINE NO. 2 FUEL VALVE - Check OPEN and electrical plug secure.
8. CROSSFEED FUEL VALVE - Check CLOSED and electrical plug secure.
9. Manual defueling valve - Check CLOSED and cap secure.
- IO. UTILITY hand pump - Check condition and leaks.
11. EMERG UTILITY PRESS controllable check valve - Check NORMAL.
12. HYD fill module - Check condition, fluid level, cover secure, and valve CLOSED.
13. Ramp area hydraulic lines - Check for leaks and filter button position.
14. Utility pressure and return modules - Check condition and pump filter buttons extended.
15. Maintenance panel - Check hydraulic reservoir levels and pressure and temperature range markings. Refer to table 1.
- 15.1 Fuzz burn-off module - Check for condition and security.

PROCEDURE **TROUBLESHOOTING**
REFERENCE**INTERIOR (Cont.)****Aft Cabin (Cont.)**

■ O 15.2 AFT POS LIGHT switch - Set as required.

16. AFT transmission - Check as follows:

- a. Check for oil level and condition. (Check filter contamination button in.)
- b. Aft transmission mount bolts - Check condition and security.
- c. Aft sync shaft, adapter assemblies, lord mounts, and support brackets - Check for condition, security, and foreign objects. connecting bolts for proper installation.
- d. Oil cooler - Check condition and security. Exhaust duct installed.
- e. Aft transmission oil pressure transducer - Check condition and security.
- f. Aft transmission drip pan for proper installation and security. Left and right access doors closed before flight.

17. Engine tire extinguisher bottles - Check squib installation dates and pressure (refer to Section V, engine fire extinguisher pressure).

18. Troop alarm box-Check condition.

19. Compass flux valve-Check security. Area clear of stored materials.

19.1 Fuel flow power supply - Check condition and security.

PROCEDURE

**TROUBLESHOOTING
REFERENCE**

INTERIOR (Cont.)

Aft Cabin (Cont.)

20. CROSSFEED FUEL VALVE -
Check CLOSED, electrical plug se-
cure.

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PROCEDURE **TROUBLESHOOTING**
REFERENCE

INTERIOR (Cont.)

Aft Cabin (Cont.)

21. ENGINE NO. 1 FUEL VALVE -
Check OPEN, electrical plug secure.
22. Ramp interphone control panel - As
required.
23. Fire detect control unit - Check con-
dition and security (No. 1 engine).
24. Hand fire extinguisher - Check seal,
security, date, and properly tagged.

EXTERIOR

Aft Cabin

1. Navigation light - Check condition.
2. Fluid vent and drain lines - Check
clear.
- 2.1 **714X** Engine wash system -Check
condition and security.
3. Right aft landing gear - Check as
follows:
 - a. Right aft landing gear support struc-
ture - Check for cracks or distor-
tion.
 - b. Tires for inflation and condition.
 - c. Shock strut for proper extension,
cleanliness, and static lock un-
locked.
 - d. Power steering actuator, wheel
brakes, and hoses for leakage, chaf-
ing, and security.

PROCEDURE

**TROUBLESHOOTING
REFERENCE**

EXTERIOR (Cont.)

Aft Cabin (Cont.)

- e. Electrical connections for condition and security.
- f. Landing gear proximity switch - Condition, linkage adjustment, and security.
- 4. Hydraulic system test panel - Check all caps secure.
- 5. Check No. 2 engine lower side.

NOTE

■ If TEAC/PAT is to be performed, all preflight inspection requirements/checks required prior to TEAC/PAT must be accomplished. In this case, EAPS must be moved forward of the engine to gain access for inspection. If TEAC/PAT is not required, EAPS will remain locked into position in front of the engine.

- a. Inlet for foreign objects and condition.
- O b. EAPS for general condition. Check vortex tubes for erosion and damage. Check seals for condition. Check rail and slide mechanisms. Inspect blower fan blades for damage and erosion. Check condition of electrical connectors, harness.
- c. Check fuel, oil, hydraulic, electrical and drain lines for connection and leaks.
- d. Check engine for chafing lines and condition and security of components.

PROCEDURE

TROUBLESHOOTING
REFERENCE

EXTERIOR (Cont.)

Top of Fuselage (Cont.)

f. Power turbine section - Check upper portion of engine for condition, security, and leaks.

g. Engine fairing condition and security.

h. If EAPS is installed. Check EAPS to fairing mating surface for evidence of wear or chafing.

2. Utility and flight control modules and cooler assemblies - Check for extended filter contamination indicators and leaks. Check that accumulators are precharged (Section V). Check PTU condition and security.

3. Aft rotor (right side) - Check as follows:

a. Check lag damper lockouts removed.

b. Check components for proper safety wiring and security.

c. Check blade lightning protection straps and cables installed on top and bottom of each blade and condition.

d. Check oil in rotor system reservoirs on right side.

e. Check droop stop weights and return mechanism and droop stops for condition and security.

EXTERIOR (Cont.)

Top of Fuselage (Cont.)

- f. Check droop stop shrouds for condition and security (if installed).
 - g. Check rain shield and stiffener for condition and security.
 - h. Check pitch change links, swash-plate, slider assembly, and drive arm for condition and security.
 - i. Check upper boost actuator and pilot valve for proper connection, condition, security, leakage, extended jam indicators.
4. Check thrust bearing and thrust bearing mount bolts, aft vertical shaft, and support structure for condition and security.
 5. Check top of aft transmission for condition and leakage.
 6. Check thrust deck air baffles for security.
 - 6.1 CGI signal processor—Check electrical connections and security.
 7. Anticollision and formation lights – Check condition.
 8. Aft pylon fairing – Check condition and security (right side).
 9. Right aft work platform and inspection panels – Check condition and security.
 10. Combining transmission area – Check as follows:
 - a. Chip detector - Check condition and security.

PROCEDURE

EXTERIOR (Cont.)

Top of Fuselage (Cont.)

- c. Push-pull tubes, bellcranks, and rod end bearing – Check condition and security.
 - d. Sync shaft and adapter – Check condition.
 - e. Engine to transmission drive shafting — For three piece driveshaft, check indexed properly, condition, and security. For one piece driveshaft, check for condition and security.
 - f. Oil level-Check engine and combining transmission sight gage.
 - g. Oil filters and contamination buttons - Check both engines and combining transmissions.
 - h. Oil pressure transducers and temp bulbs – Installed properly.
 - i. Transmission fan exhaust duct - Check for cooler fan and stator blades, retainer nut, obstructions and debris.
 - j. Oil coolers and lines – Condition, security, and FOD.
 - k. Check No. 2 and utility hydraulic exhaust coolers for condition, security, and FOD.
 - l. Combining transmission access doors – Check condition, seal around exhaust duct when doors are closed, and security.
11. Perform rotor phasing check (Section IV).



PROCEDURE

TROUBLESHOOTING
REFERENCE

EXTERIOR (Cont.)

Top of Fuselage (Cont.)

12. No. 1 engine - Check as follows:

NOTE

■ If TEAC/PAT is to be performed, all preflight inspection requirements/checks required prior to TEAC/PAT must be accomplished. In this case, EAPS must be moved forward of the engine to gain access for inspection. If TEAC/PAT is not required, EAPS will remain locked into position in front of the engine.

a. Inlet for foreign objects and condition. If FOD screens are installed, check security and condition.

O (1) EAPS for general condition. Check vortex tubes for erosion and damage. Check seals for condition. Check rail and slide mechanisms.

CAUTION

If engine is to be operated with the engine transmission fairing removed, be sure barrel nuts are secured or removed.

b. Oil level and cap secured.

c. Tailpipe and diffuser for cracks, hot spots, and security.

d. Power turbine section - Check upper portion of engine for condition, security, and leaks.

PROCEDURE

TROUBLESHOOTING
REFERENCE

EXTERIOR (Cont.)

Top of Fuselage (Cont.)

- e. Engine faking condition and security.
- f. If EAPS is installed, check EAPS to fairing mating surface for evidence of wear or chafing.

13. Aft rotor (left side) - Check as follows:

- a. Check lag damper lockouts removed.
- b. Check components for proper safety wiring and security.
- c. Check blade lightning protection straps and cables installed on top and bottom of each blade and condition.
- d. Check oil in rotor system reservoirs on left side.

EXTERIOR (Cont.)

Top of Fuselage (Cont.)

- e. Check droop stop weights and return mechanism and droop stops for condition and security.
 - f. Check droop stop shrouds for condition and security (if installed).
 - g. Check rain shield and stiffener for condition and security.
 - h. Check pitch change links, swashplate, slider assembly, and drive arm for condition and security.
 - i. Check upper boost actuator and pilot valve for proper connections, condition, security, leakage, and extended jam indicators.
 - j. Check aft longitudinal cyclic trim actuator for condition and security.
 - k. Cruise guide link and processor
 - Check for condition and security.
14. Check thrust bearing and thrust bearing mount bolts, aft vertical shaft, and support structure for condition and security.
15. Aft pylon fairing - Check condition and security (left side).
16. Left aft work platform and inspection panels – Check condition and security.

EXTERIOR (Cont.)

Top of Fuselage (Cont.)

17. Drive shafting, mounts, adapter assemblies and support brackets – Check for condition, security, and foreign objects. Connecting bolts for proper installation.
18. Formation lights – Check wiring clear of drive shaft and condition.
19. Push-pull tubes, bellcranks, hydraulic lines, and electrical wiring – Check condition and security.
- 19.1 Baffles – Check condition and security.
20. Drive shaft fairing – Check security and any looseness of fairings after being secured by fasteners.
21. Top of fuselage – Check skin condition, VHF antenna, and foreign objects removed.
22. Forward rotor (left side) – Check as follows:
 - a. Check lag damper lockouts removed.
 - b. Check components for proper safety wiring and security.
 - c. Check blade lightning protection straps and cables installed on top and bottom of each blade and condition.
 - d. Check oil in rotor system reservoirs on left side.
 - e. Check droop stops, rain shield and stiffener for condition and security,

PROCEDURE

EXTERIOR (Cont.)

Top of Fuselage (Cont.)

f. Check pitch change links, swashplate, slider assembly, and drive arm for condition and security.

g. Check upper boost actuators and pilot valve for proper connections, condition, security and leakage. Check for extended jam indicators.

h. Check longitudinal cyclic trim actuator for condition and security.

i. Cruise guide link and signal conditioners—Check for condition and security.

23. Forward transmission—Check mount bolts. Check oil cooler inlet for obstructions.

a. Forward transmission pressure transducer—Check for leaks and security.

b. Hydraulic cooling fan—Check for obstructions, condition, and security.

c. Forward transmission cooler shroud—Check security.

24. Brake accumulator—Check precharge (Section V) and security.

25. First and second stage mixing units—Check for rod end condition, security, and rigging pins removed.

26. Forward pylon fairing—Check condition and security (left and right sides).

26. Forward rotor (right side)—Check as follows:

PROCEDURE

TROUBLESHOOTING
REFERENCEEXTERIOR (Cont.)
Top of Fuselage (Cont.)

- a. Check lag damper lockouts removed.
 - b. Check components for proper safety wiring and security.
 - c. Check blade lightning protection straps and cables installed on top and bottom of each blade and condition.
 - d. Check droop stops, rain shield and stiffener for condition and security.
 - e. Check pitch change links, swashplate, slider assembly, and drive arm for condition and security.
 - f. Check upper boost actuator and pilot valve for proper connections, condition, security, leakage and extended jam indicators.
- 27.1 Forward transmission oil level—
Check.
28. Forward transmission—
Check mount bolts.
29. CC I signal conditioner—Check electrical connections and security.
30. Flight control hydraulic cooler and module—Check for extended filter contamination indicators, leaks and that accumulator is precharged (Section V).
Check PTU condition and security.
31. No. 1 Flight control hydraulic reservoir—Check level indicator.
Right Cabin.
1. Fuselage skitt—Check for dents, wrinkles, and loose or missing rivets.
 2. Aft aux fuel tank—Check as required and cap security.

PROCEDURE

TROUBLESHOOTING
REFERENCE

EXTERIOR (Cont.)

Right Cabin (Cont.)

3. Fuel vent—Check clear and fairing secure.
4. Windows—Check condition, seals and proper installation, cracks and cleanliness.
5. AFT cargo hooks (if installed)—Check the following:
 - a. Hook properly installed with hook opening pointing forward.
 - b. Electrical connector properly installed. Dust cap stowed.
 - c. Emergency release cable properly connected. Dust cap stowed.
 - d. Hook clean and load beam closed.
 - e. Latch roller moves freely.
6. Main fuel tank—Check as required and cap security.
7. Fuel vent—Check clear and fairing secure.
8. FWD cargo hook (if installed)—Check as in step 5 above.
9. Antennas—Check condition and security.
10. Fwd aux fuel tank—Check as required and security.
11. fuel vent—Check clear and fairing secure.

PROCEDURE

EXTERIOR (Cont.)
Right Cabin (Cont.)

12. Fwd l ux fuel tank electrical connections and fuel line—Check condition and security.

13. Pressure refueling station—
Check as follows:

a. PWR and LT switches—
OFF.

b. All TEST switches—PRI
OFF.

c. Refueling receptacle cover
installed, retainer wire condition,
and secure.

d. PRESS REFUELING
INSTRUCTIONS on panel—
Check condition.

e. Landing gear support structure—
Check for cracks and distortion.

f. Landing gear and pressure
refueling panel cover—Check posi-
tion light, closed and secure.

13.1. Static port—Check clear.

14. Forward landing gear—
Check as follows:

a. Tires for inflation and con-
dition.

b. Shock strut for extension
and cleanliness.

c. Hoses and wheel brakes for
leakage, chafing, and security.

15. Right lelectrical compart-
ment—Check as follows:

a. GEN/CT FAULT bite-
Check all black.

PROCEDURE **TROUBLESHOOTING**
REFERENCE

EXTERIOR (Cont.)

Right Cabin (Cont.)

- b. Transformer-rectifier - Check condition and security.
 - c. 712 No. 2 minimum beep resistor - Check condition and security.
 - d. Access door - Check condition and security.
16. Deleted.

Forward Cabin

- 1. Heater intake, exhaust and fuel drain outlets - Check clear.
- 2. Pilot's jettisonable door-Check condition and security.
- 3. Free air temperature gage - Check.
- 4. Pilot's hydraulic brake lines - Check for leakage.
- 5. Antennas (underside of helicopter) - Check security, condition, and free of dirt and oil.
- 6. Searchlights - Check condition.
- 7. Nose access panel - Check secure.
- 8. Windshield wipers - Check condition.
- 9. Windshields - Check for cracks and cleanliness.
- 10. Glide slope and IFF antennas - Check condition.

PROCEDURE **TROUBLESHOOTING**
REFERENCE

EXTERIOR (Cont.)

Forward Cabin (Cont.)

11. Pitot tubes - Check condition and security.
12. AFCS yaw ports - Check clear.
13. Copilot's hydraulic brake lines - Check for leakage.
14. Copilot's jettisonable door - Check condition and security.
15. HYD SYS TEST panel - Check capacities and fairing secure.
16. Emergency escape panel - Check condition and security.

Left Cabin

1. Left electrical compartment - Check as follows:
 - a. GEN/CT FAULT bite - Check all black.
 - b. Transformer-rectifier - Check condition and security.
 - c. **712** No. 1 minimum beep resistor - Check condition and security.
 - d. Battery for security, sump jar, and vent lines.
 - e. Battery CHARGING and CHARGED lights - Check.
 - f. BAIT CHG FAULT bite - Check all black.
 - g. Access door - Check condition and security.

PROCEDURE

EXTERIOR (Cont.)
Loft Cabin (Cont.)

2. GPU access panel and connections—Check condition.

3. Forward landing gear—
Check as follows:

a. Tires for inflation and condition.

b. Shock strut for extension and cleanliness.

c. Hoses and wheel brakes for leakage, chafing, and security.

4. Fwd aux fuel tank—Check as required and security.

5. Fuel vent—Check clear and fairing secure.

6. Forward landing gear support structure—Check as follows:

a. Fwd aux fuel tank electrical connections and fuel lines--Check condition and security.

b. Position light—Check wiring and condition.

c. Access panel—Check condition and security.

7. Static port—Check clear.

8. Anticollision light—Check condition.

9. HF antenna—Check antenna wire and standoffs condition and security.

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PROCEDURE	TROUBLESHOOTING REFERENCE
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EXTERIOR (Cont.)

Left Cabin (Cont.)

10. Main fuel tank - Check as required and security.
11. Fuel vent - Check clear and fairing secure.
12. Aft aux fuel tank - Check as required and security.
13. Fuel vent - Check clear and fairing security.
14. Fuselage skin - Check for dents, wrinkles, loose or missing rivets.
15. Windows - Check condition, seals, and proper installation, cracks, and cleanliness.
- 15.1 **714X** Engine wash system connectors - Check condition and security.
16. Left aft landing gear - Check as follows:
 - a. Landing gear support structure - Check for cracks or distortion.
 - b. Tires - Check for inflation and condition.
 - c. Static ground wire - Check wire secure and contacting the ground.
 - d. Shock strut - Check proper extension, cleanliness, and static lock unlocked.
 - e. Electrical connections - Check condition and security.
 - f. Landing gear proximity switch - Check condition, linkage adjustment, and security.

PROCEDURE

TROUBLESHOOTING
REFERENCE

EXTERIOR (Cont.)

Left Cabin (Cont.)

18. All access doors and covers - Check closed and secure.

19. If NO. 1 and NO. 2 EAPS are installed, check that they are aft and secured to engine inlets.

BEFORE STARTING ENGINES

1. Seat belts and shoulder harness - Check condition, fasten, and tighten.

NOTE

Seat belt locking device should be installed on the left side.

2. Shoulder harness locks - Check inertia reel functions properly (i.e., the shoulder harness should lock automatically when given a sharp pull).

PROCEDURE

BEFORE STARTING ENGINES
(Cont.)

3. Seats and pedals—Adjust.
 - a. Check seat fore-and-aft, vertical, and tilt adjustments lock in place.
4. Jettisonable door release bandies—Check that the top and bottom latches engage the door supports, locking devices removed.
5. Jettisonable door latches—Check through door latch plate inspection holes (upper and lower) that door latches are centered in the latch plate detents.
6. Fire extinguisher—Check seal, security, date, and properly tagged.
7. Pilot's and copilot's sliding windows—Check condition.
 - a. Open and close (50 lbs maximum force).
 - b. Slide operation (15 lbs maximum force).
8. NO. 1 and NO. 2 power distribution panels—Check all circuit breakers and gang bar up. Check for clearance between gang bar and cover.
9. Spare lamp box—Check.
10. Mirror—Adjust
11. FAT gage—Check FAT, condition, and security.

PROCEDURE

**TROUBLESHOOTING
REFERENCE**

BEFORE STARTING ENGINES (Cont.)

12. Overhead switches and control panels.
set as follows:

o a. EAPS ENG 1 and ENG 2 FAN
switches OFF. DOORS - CLOSE.

b. LIGHTING switches - As required

c. COMPASS switch - As required

d. TROOP WARN switches - OFF

e. HEATING switches - OFF.

f. WINDSHIELD WIPERS switch
OFF.

g. ELECT switches - Set as follows:

(1) BATT switch - OFF

(2) APU switch - OFF.

(3) NO. 1 and NO. 2 GEN switches -
OFF.

(4) APU GEN switch - OFF.

h. FUEL CONTROL switches - Set as
follows:

(1) CROSSFEED FUEL VALVES
switch - CLOSE.

PROCEDURE **TROUBLESHOOTING**
REFERENCE

BEFORE STARTING ENGINES (Cont.)

- (2) REFUEL STATION switch - OFF.
- (3) FUEL PUMPS switches - OFF.
- i. 712 START switches - OFF.
- j. ENG COND levers - STOP.
- j.1 714\ FADEC switches-Check or set as follows:
 - (1) NR% switch - 100%.
 - (2) PRI-REV switches - PRI.
 - (3) B/U PWR switch - OFF.
 - (4) LOAD SHARE switch - TQ.
 - (5) ECLs - STOP.
- k. LIGHTING switches - As required.
 - 1. ANTI-ICE switches - OFF.
- m. HOIST switches - OFF.
- n. CARGO HOOK switches - Set as follows:
 - (1) MASTER switch - OFF.
 - (2) SELECT switch -As required.
 - (3) EMERG REL ALL switch - OFF. Cover down.
- o. HYDRAULIC switches - Set as follows:
 - (1) POWER XFR switches -Off.
 - (2) FLT CONTR switch - BOTH.
 - (3) BRAKE STEER switch-ON. Cover down.
 - (4) RAMP PWR switch - ON.
 - (5) RAMP EMER switch - HOLD. Cover down.

PROCEDURE

BEFORE STARTING ENGINES
(Cont.)

13. Magnetic compass—Check full of fluid, no bubbles or discoloration, and compensated within last 12 months.
14. AGENT DISCH switch—
Check spring loaded to the neutral position.
15. FIRE PULL handles — In.
16. Systems instruments—Check engine, transmission, and rotor systems for static indications slip page marks, orientation, and operating range markings. Refer to Table 2-1.
17. XMSN OIL PRESS switch—SCAN.
18. XMSN OIL TEMP switch—SCAN.
19. VHF ANT SEL—As required.
20. Flight instruments—Check indications and set as follows:
 - a. Turn and slip indicators—Check race full of fluid, needle and ball centered. Alignment between indicators.
 - b. Airspeed indicators—Compare indicator readings.
 - c. Vertical velocity indicators—Check indicators at zero.
 - d. HSI—Check as required.

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Table 2-1. Instrument Range Markings

INDICATOR	RANGE MARKING
712 GAS PRODUCER TACHOMETER	YELLOW RADIAL 60% RED RADIAL 107%
712 POWER TURBINE INLET TEMPERATURE	GREEN ARC 400° TO 780°C YELLOW ARC 781° TO 940°C RED RADIAL 890°C BLUE RADIAL 810°C RED RADIAL 940°C
712 ENG OIL TEMPERATURE	RED RADIAL 140°C
712 ENGINE OIL PRESSURE	RED RADIAL 20 PSI RED RADIAL 35 PSI GREEN ARC 35 TO 90 PSI RED RADIAL 110 PSI RED DOT 150 PSI
714A GAS PRODUCER TACHOMETER	YELLOW RADIAL 50% RED RADIAL 110%
714A POWER TURBINE INLET TEMPERATURE	GREEN ARC 400° TO 815°C YELLOW ARC 815° TO 940°C BLUE RADIAL 855°C RED RADIAL 900°C RED RADIAL 940°C
714A ENG OIL TEMPERATURE	RED RADIAL 149°C
714A ENGINE OIL PRESSURE	RED/WHITE RADIAL 5 PSI GREEN ARC 5 TO 90 PSI YELLOW ARC 90 TO 110 PSI RED/WHITE RADIAL 110 PSI RED DOT 150 PSI
XMSN OIL PRESSURE	RED RADIAL 7 PSI RED RADIAL 20 PSI GREEN ARC 20 TO 90 PSI
XMSN OIL TEMPERATURE	RED RADIAL 140°C
712 TORQUEMETER	RED RADIALS 100% AND 123%
714A TORQUEMETER ROTOR TACHOMETER	RED RADIALS 101% AND 123% RED DOT 91% RED RADIAL 96% Disregard (Not applicable) GREEN ARC 97 TO 101% YELLOW ARC 102 TO 105% RED RADIAL 106% RED RADIAL 108% RED DOT 115%
AIRSPEED	RED RADIAL 170

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Table 2-1. Instrument Range Markings (Continued)

INDICATOR	RANGE MARKING
MAINTENANCE PANEL INDICATORS	
FLT CONTROL HYDRAULIC PRESSURE	RED RADIAL 2500 PSI GREEN ARC 2500 TO 3200 PSI RED RADIAL 3200 PSI
UTILITY HYDRAULIC PRESSURE	RED RADIAL 2500 GREEN ARC 2500 TO 3500 RED RADIAL 3500
HYDRAULIC TEMPERATURE	RED RADIAL 120°C YELLOW ARC 95" TO 120°C

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PROCEDURE **TROUBLESHOOTING**
REFERENCE

BEFORE STARTING ENGINES (Cont.)

21. Deleted.
22. VGI switches - NORM.
23. Deleted.
24. CYCLIC TRIM switch - AUTO.
25. AFCS SYSTEM SEL switch - OFF.
26. 712 EMERG ENG TRIM switches - AUTO; covers down.
27. Avionics equipment -Set as required.
28. SWIVEL switch - LOCK.
- *29. HEAD UP DISPLAY - Check operation as required. (Refer to Section IV.)

STARTING ENGINES

1. Personal equipment - Check. C1 ,D1
- *1.1 BATT switch - ON. Check BAT SYS MAL caution light out and the following caution panel lights on:
XMSN OIL PRESS, L. FUEL PRESS, R. FUEL PRESS, XMSN AUX OIL PRESS, NO. 1 RECT OFF, NO. 2 RECT OFF, NO. 1 GEN Off, NO. 2 GEN OFF, NO. 1 HYD FLT CONTR, NO. 2 HYD FLT CONTR, UTIL HYD SYS, NO. 1 AFCS OFF, NO. 2 AFCS Off, 714, FADEC 1, FADEC 2.
2. Interphone - Check all stations. C11,J1

PROCEDURE	TROUBLESHOOTING REFERENCE
<ul style="list-style-type: none"> b. DOME SELECT—NVG or RED, then WHITE. Check caution lights on bright. 	<p>C2, C4</p>
<ul style="list-style-type: none"> c. DOME LIGHTS rheostat — Check intensity varies DIM through BRT. (INTERIM NVG) 	<p>C3</p>
<ul style="list-style-type: none"> d. DOME SELECT-OFF. 	
<ul style="list-style-type: none"> * 6. Floodlights (NVG)-Check. 	
<ul style="list-style-type: none"> a. FLOOD LTS rotary control switches-ON. 	
<ul style="list-style-type: none"> b. FLOOD LTS selection switches on INST PNL/OVHD PNL—ON. 	
<ul style="list-style-type: none"> c. Check following lights on: <ul style="list-style-type: none"> (1) 6 under glareshield. (2) 2 on overhead bulkhead (sta 95). 	<p>C6</p>
<ul style="list-style-type: none"> d. FLOOD LTS rotary control switches-OFF. 	
<ul style="list-style-type: none"> e. FLOOD LTS selection switches-OFF. 	
<ul style="list-style-type: none"> 6.1. Emergency Floodlights— Check as follows: <ul style="list-style-type: none"> a. Pilot's FLT INST LTS rotary control switch—ON. b. Check (6) emergency lights under glareshield and (2) on overhead bulkhead are on. c. Pilot's FLT INST LTS rotary control switch—OFF. 	<p>C6, C23, C24</p>

STARTING ENGINES (Cont.)

- | | |
|--|----|
| *7. PILOT and COPILOT utility lights
– Check rheostat operation. | C5 |
| 8. Ground Power Unit – Connect GPU for ground start. Check EXT PWR caution light on. | |
| 9. Fire guard – Posted. | |

CAUTION

■ If a start results in a roar with flame in the exhaust (hot or torching start), shut down the APU by setting the APU switch to OFF.

NOTE

Allow one minute for cooling between APU shutdown and restart. Failure to do so may result in a premature shutdown on restart due to overtemperature.

- | | |
|--|------------|
| *10. APU switch – RUN for 3 to 5 seconds. Then START for 2 seconds. Then, release to RUN. | A1 |
| ■ 11. APU ON indicating light – Check on, after switch is released to RUN. When the APU is running properly, the APU ON light will come on. | A6 |
| 12. UTIL HYD SYS caution – Check out. If the light does not go out within 30 seconds of operation, shut down the APU. Have the utility hydraulic system checked. | B1, G1, G6 |

TROUBLESHOOTING

PROCEDURE

REFERENCE

STARTING ENGINES (Cont.)

14. GPU - Disconnect if used.
Check EXT PWR light out.

*15. POWER XFR NO. 1 and POWER XFR NO. 2 switches - ON. G2, G5

*16. HYD FLT CONTR caution lights - G2
Check out. If either HYD FLT CONTR caution light does not go out in 30 seconds after PWR XFR switches are set to ON, set switches to OFF. Do not fly the aircraft.

a. Check indicators on maintenance panel as follows (flight engineer response):

b. HYD FLT CONTR hydraulic PRESSURES stabilized at 2500 to 3200 psi. G4

c. UTILITY hydraulic PRESSURE stabilized at 2500 to 3500 psi. G7

d. Maximum fluctuation ± 50 G8

e. NO. 1, NO. 2, APU, and UTILITY PUMP FAULT lights - Out.

f. Maintenance panel - Check as follows (flight engineer response).

(1) GND TEST switch - TEST. Check all magnetic bite indicators are tripped (black and white indication). Check XMSN OIL HOT, NO. 1 ENG CHIP DET, XMSN CHIP DET, AND NO. 2 ENG CHIP DET caution panel lights on in cockpit.

(2) GND TEST switch - RESET. Check all bite indicators have reset (all black indications).

TROUBLESHOOTING

PROCEDURE

REFERENCE

STARTING ENGINES (Cont.)

(3) FILTER CHANGE and PUMP FAULT lights - PRESS TO TEST. Check all lights come on when pressed.

(4) MAIN OIL PRESS and AUX OIL PRESS lights - Check all on.

O (5) GROUND CONTACT lights - Check both on (Flight Engineer).

16.1 XMSN OIL PRESS gage - Check 0 ±5 psi all positions.

17. Avionics - ON (except transponder), ALQ-156 note status light on.

F O 17.1 EAPS Bypass Door Check.

a. NO. 1 and NO. 2 EAPS control boxes. C35
Press-to-test EAPS BYPASS DOORS OPEN light. (Flight Engineer).

b. EAPS ENG 1 DOORS switch - C36, C37
OPEN. Check both doors open and BYPASS DOORS OPEN light is on. (Flight Engineer).

c. EAPS ENG 1 DOORS switch - C37
CLOSE. Check both doors closed and BYPASS DOORS OPEN light is off. (Flight Engineer).

d. Repeat steps b and c for EAPS ENG 2.

TROUBLESHOOTING

PROCEDURE

REFERENCE

STARTING ENGINES (Cont.)

*18. CARGO HOOKS WINCH—
Check operation. Refer to Section IV.

18.1. CARGO RAMP AND DOOR— C35, C36, G22
Check operation. Refer to Section IV.

F *19. Lights (flight engineer).



NVG Helicopters have an infrared filter on co-pilot's searchlight. Check filament operation for presence of heat. Do not touch or look directly into light.

- a. SLT FIL switch — ON. C17
 - (1) Light, EXTEND, RETRACT, C18
and rotation from both THRUST CONT
positions.
 - (2) PLT and CO-PLT SLT CONT—
(AUTO) RETR. Check operation from both
switches.
 - (3) Searchlight — Set as desired and
OFF.
- b. ANTI-COLL LTS — TOP and C19
BOTTOM — ON.
- c. POSITION and FORMATION C20, C21
LTS — Check operation, then OFF. Operate
rheostat to vary FORMATION LT intensity
from DIM to BRT.
- d. Cockpit PRESS TO TEST lights —
Check (Table 2-2).

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**Table 2-2. Cockpit PRESS TO TEST
Caution Lights**

Overhead Panel

1. L and R AUX (FUEL) PRESS (2)
2. 712 ENG 1 and 2 STARTER ON (2)
3. Deleted
4. FWD and AFT HOOK LOADED (2)

Center Instrument Panel

1. IFF FAIL (1) (only if computer installed)
2. CIPHER ON (1)

Pilot/Copilot Instrument Panel

1. 712 EMERG PWR (2)
2. HSI MODE SELECT, BRG and MKR BCN lights (8)
on each pilot panel.

CANTED Console

1. HDG, BARO, and RAD hold
2. Deleted
3. ALQ-156 (if installed)
 - a. Press STATUS for STANDBY light.
 - b. Check CM JAM and CM INOP caution panel lights out.

PROCEDURE	TROUBLESHOOTING REFERENCE
STARTING ENGINES (Cont.)	
20. Parking Brakes/Swivel Locks.	
*a. Wheel parking brakes-Reset. Check PARK BRAKE ON and MASTER CAUTION light on.	D6, G10
b. MASTER CAUTION light—RESET.	D3
*C. SWIVEL switch-Check UNLOCK and LOCK (flight engineer response).	G11
20.1. Ramp Isolation—Check as follows:	
a. Place ramp control lever in the DOWN position until ramp rests on the ground, then STOP.	
b. RAMP isolation switch-OFF.	
c. RAMP control lever-UP. Check that ramp does not move, then STOP.	
d. RAMP isolation switch-ON.	
e. Adjust ramp as necessary.	
*21. Cruise Guide Indicator—Test FWD and AFT. Check pointer in white test band within 8 seconds	B9, B10
*22. Altimeters-Set local barometric pressure (tower setting) and compare with field elevation. If more than a 50 foot error is noted, corrective action should be initiated. Unreliable for flight if more than a 70 foot error exists.	J4
*23. RAD ALT-Set LO index to 100 feet. Set HI index to 800 feet and allow 1 minute for warmup.	J5

PROCEDURE	TROUBLESHOOTING REFERENCE
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STARTING ENGINES (Cont.)

*23.1. VGI Operation. Check both pilot's and co-pilot's.

a. Pitch/roll adjustment and travel—
Check 8° minimum roll left and right,
5° up, 10° down minimum, smooth
operation.

b. VGI switch—EMER. Check that OFF
flag stays hidden.

c. VGI switch—As required.

*24. FIRE DETR switch — TEST;
check FIRE PULL handle warning
lights on, release switch; and
check FIRE PULL handle warning
lights out.

C25

*25. FIRE PULL handle (flight
engineer response).

a. NO. 1 FIRE PULL
handle — Pull.

b. NO. 1 FUEL VALVE —
CLOSED. Check FUEL VALVE in-
dicating light cycles from off to on
then off as valve aligns with switch
position selected.

C26

c. NO. 1 FIRE PULL
handle — Push in.

d. NO. 1 FUEL VALVE in-
dication light on—then off. Check
FUEL VALVE—OPEN.

C26

e. Repeat check for NO. 2
FIRE PULL handle.

STARTING ENGINES (Cont.)

25.1 Crossfeed Fuel Valve Check—Check as follows (flight engineer response).

a. CROSSFEED FUEL VALVE switch—OPEN
Check that both crossfeed fuel valves open and indicating lights cycle on then off.

b. CROSSFEED FUEL VALVE switch—CLOSE.
Check that both crossfeed fuel valves close and indicating lights cycle on then off.

*26. FUEL QUANTITY Indicator—Check as follows:

a. Check individual tank indications coincide with known consents. B2, B3

b. Note digital readout remains constant during individual tank readings.

c. Select TOTAL. Check pointer rotates behind mask. Check total fuel indicated is within 420 pounds of known fuel on board. B4

27. CYCLIC TRIM Indicators—Check both in GND position. K3, B13

28. CYCLIC TRIM switch—MANUAL K14

a Check for proper operation and indicator movement by first retracting the FWD then AFT actuator into the RET position.

PROCEDURE

STARTING ENGINES (Cont.)

TROUBLESHOOTING
REFERENCE

b. Check actuators by fully extending the FWD then AFT actuator into the EXT range on the indicator. (Full RET to full EXT not to exceed 25 seconds).

c. CYCLIC TRIM switch — AUTO. Observe both indicators move from the full EXT position to the GND position.

29. Rotor Blades — Check position.

CAUTION

Prior to performing the static flight control check, be sure that an aft rotor blade is not within 30° of the centerline of the fuselage, since blade-fuselage interference may occur. In addition, the rotor blades may rotate due to wind or APU operation.

*29.1. AFCS Check. (Section IV).
Not required if mechanical rig check is to be performed.

30. Flight control travel and hydraulics — Check.

*a. Control Interference.

(1) Both sets of pedals (full aft) — Pilot and copilot pedal adjustment lever may contact the cockpit floor structure when pedals are in the rearmost adjustment position and full pedal travel is made in either left or right direction.

NOTE

This contact is permissible provided the yaw bellcrank in the first-stage mixing unit has already contacted its stop.

PROCEDURE

TROUBLESHOOTING
REFERENCE

STARTING ENGINES (Cont.)

(2) The cyclic stick contact with the pedal adjust lever is also possible and permissible with the above pedal conditions.

H1

(3) Reset pedals for flight.

b. Pedal adjustment-Matched.

c. Obtain neutral pedal measurement.

d. Set cyclic to placard measurement. Ensure position indicator is +1 in.

e. Control Breakout Forces-(See Section IV.)

H10

i. FLT CONTR HYDRAULIC switch-BOTH. With slow smooth flight control inputs, check each axis individually for smoothness of operation and full travel. While mixing pitch, roll, and yaw axis control inputs, check for smoothness of operation. Check for a minimum cyclic stick travel of 7 inches forward and 4 inches aft.

H3, H5

PROCEDURE	TROUBLESHOOTING REFERENCE
STARTING ENGINES (Cont.)	
(b) FLT CONTR NO. 1 PRES- SURE Indicator-Zero \pm 50 psi (flight en- gineer response).	G 3
(c) MASTER CAUTION light-Check on then RESET.	D3
(d) With slow smooth flight control inputs, check each axis individual- ly through full range of travel for smooth- ness of operation.	H3-5
(4) FLT CONTR HYDRAULIC switch-BOTH.	G4, G13
(a) NO. 1 HYD FLT CONTR caution light-Out.	D 8

NOTE

The flight engineer shall observe No. 2 system returns to normal operating pressure as No. 1 pressure drops below approximately 2000 psi. The same is true for No. 1 System when No. 2 drops below 2000 psi.

*g. Control interlock-Simulate failure of the NO. 1 and then NO. 2 hydraulic boost systems by the following:

(1) FLT CONTR HYDRAULIC switch-NO. 1 ON. G 13

(1.1) POWER XFR NO. 1-OFF.
Check NO. 1 HYD FLT CONTR caution light out, then on. NO. 2 HYD FLT CONTR caution light out. Flight engineer check pressure approximately 2000 psi.

(2) POWER XFR NO. 1-ON.
Check NO. 1 HYD FLT CONTR caution light out, NO. 2 HYD FLT CONTR caution light on.

(3) FLT CONTR HYDRAULIC switch-NO. 2 on.

STARTING ENGINES (Cont.)

(4) POWER XFR NO. 2 – OFF. Check NO. 2 HYD FLT CONTR caution light out, then on. NO. 1 HYD FLT CONTR caution light out. Flight engineer check pressure approximately 2,000 psi.

(5) POWER XFR NO. 2 – ON. Check NO. 2 HYD FLT CONTR caution light out. NO. 1 HYD FLT CONTR caution light on.

(6) FLT CONTR HYDRAULIC switch – BOTH.

G4, G13

*h. Control Centering – Control centering will hold cyclic and pedals within ½ inch from stops – heck ability to override control centering in all quadrants.

H6, H7

30.1 Pitot and Windshield Anti-ice System – Check as follows:

CAUTION

Do not leave the pitot heaters on for more than 5 minutes. Ground operation shortens service life.

*a. PITOT (and AFCS yaw ports heat) – Check, ON then OFF (flight engineer response).

CAUTION

Do not operate windshield anti-ice system above a free air temperature of +24°C.

*b. WINDSHIELD ANTI-ICE switches — ON. Check heating elements feel warm to the touch, then OFF.

31. HEATING VENT BLOWER Operation – Check (Section IV).

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PROCEDURE TROUBLESHOOTING
REFERENCE

STARTING ENGINES (Cont.)

32. **712** NO. 1 and NO. 2 ENGINE BEEP TRIM switch - DECREASE for 8 seconds. **C28**

33. Area - Clear for start.

NOTE

If the start is not normal, abort it. If a second start is to be attempted, wait at least 15 seconds after the N1 tachometer indicates zero before starting. This will allow sufficient time for fuel to drain out of the combustion chamber.

CAUTION

Sand and debris within the EAPS will be ejected when the EAPS fan is operating. Personnel shall stand clear of the exhaust when the fan is turned on.

NOTE

The EAPS fans have high start up electrical power requirements. To prevent an overload, the fans must be turned on one at a time. The first fan must be allowed to stabilize for 2-3 seconds before the second fan is turned on.

- O33.1 EAPS FAN NO. 1 and NO. 2 switches - ON, (one at a time). Allow first fan to stabilize for 2-3 seconds before the second fan is turned on.

CAUTION

With the DASH actuator set to 36 inches and electrically disconnected, neutral on the stick position is $3/4 \pm 1/4$ inch aft of neutral.

PROCEDURE	TROUBLESHOOTING REFERENCE
STARTING ENGINES (Cont.)	

- 33.2 **714A** DECU BIT and Abort System
 Check - Perform the following:
- a. Back-up power switch - ON.
 Check FADEC 1 & 2 capsules
 OUT. Check REV 1 & 2 and ENG
 FAIL 1 & 2 capsules - cycle ON
 then OUT.
 - b. ENG COND levers - GND.
 - F c. Check both DECU displays read
 88. If other than 88 on either DECU,
 then refer to, DECU Fault Codes in
 Section IV, for evaluation.
 - F d. Fire guard - Posted Rotor blades
 clear.
 - e. ENG START switch to 1 until N1
 reaches 10% and release.
 - f. Prior to completion of start se-
 quence (48% N1), place ENG 1
 ECL to STOP.
 - F g. Verify start was aborted and check
 for leaks.
 - h. Repeat for ENG 2.

NOTE

Abort start if not normal. Wait at least 15 seconds after N1 reaches zero before attempting another start. This will allow time for fuel to drain out of the combustion chamber.

- F i. DECU - Ensure reset to 88.
34. **712** Starting Engines **714A** Engine start - Primary Mode. See Section IV.
- a. Record ENG OIL PRESS and GND idle speed after 45 seconds for each engine.
 - b. Check XMSN AUX OIL PRESS light out.

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PROCEDURE TROUBLESHOOTING
REFERENCE

STARTING ENGINES (Cont.)

- e. ECL No. 1 - STOP.
 - f. Release OSPD switch.
 - g. Advance ENG No. 2 ENG COND lever from GND to 79±1%.
 - h. ENG No. 1 - Restart.
 - i. Repeat steps d thru f for ENG No. 2.
 - j. Normal shutdown.
- 34.2 **714A** Engine Start - Reversionary Mode. (See Section IV.)
- *35. XMSN OIL PRESS - Check for minimum 7 psi. F1, F2
- *36. **712** ENG COND levers - PLIGHT. Check for 92 to 96% rotor rpm. Engine acceleration should be smooth with no indication of roughness or surging. B5,B6,E8, E12
- *37. **712** ENGINE BEEP TRIM system operation (No. 1 and No. 2 switch).
- a. Check Pilot's NORMAL ENGINE BEEP TRIM operation. C28,C29
 - b. Check Copilot's NORMAL ENGINE BEEP TRIM operation. Establish 100% rotor rpm and match torque. C30
 - c. Pilot's and Copilot's rotor tachometer readings 2% split max. B7
- 2-46.3/(2-46.4 blank) C25

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PROCEDURE **TROUBLESHOOTING**
REFERENCE

STARTING ENGINES (Cont.)

- 38. Fluid drain lines - Check (flight engineer).
- 39. NO. 1 and NO. 2 GEN - ON. Check both GEN OFF caution lights out. C13
- 40. APU GEN - OFF.
- 41. POWER XFR NO. 1 and NO. 2 - OFF.
- 42. APU switch -OFF. APU ON caution light out.

- 42.1 **714A** DECU fault monitoring - Check as follows:
 - a. ECL of engine to be checked - Retard 5 degrees.
 - b. Check DECU display reads 88 (Flight Engineer).
 - c. ECL - FLT.

NOTE

If DECU display is not 88, shut down engine being checked and remove all power from the DECU by pulling the respective PRI CONT and REV CONT circuit breakers on the PDP. Repeat engine start sequence and DECU fault monitoring check. If DECU display is not 88, shut down helicopter and refer to maintenance.

- d. Repeat steps a, b, and c with other engine.
- 43. Systems - Check.
 - * a. ENG OIL PRESS - Check. Fluctuation ± 5 psi maximum. E9,E14
 - b. Maintenance Panel - Check as follows (flight engineer): G5,G7
 - (1) Hydraulic pressures and temperatures - Check. B2,G8,G21
 - (2) Bite indicators - Check all black and caution lights out.
- 44. **712** Minimum Beep Check:
 - a. NO. 1 & NO. 2 ENGINE BEEP TRIM switch - Full DECREASE. C28

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PROCEDURE **TROUBLESHOOTING**
REFERENCE

STARTING ENGINES (Cont.)

- b. NO. 2 ENGINE CONDITION lever - GROUND.
- * c. Check NO. 1 ENGINE for 91-94% rotor rpm. Record data. E12,E13

NOTE

Minimum rotor rpm is set during single engine operation only. Dual engine operating rpm will be somewhat higher. This increase in minimum rotor rpm should not be considered as a requirement for readjustment.

NOTE

NO. 1 & NO. 2 ENGINE BEEP TRIM switch - INCREASE then DECREASE if adjustments are made.

- d. NO. 2 ENGINE CONDITION lever - FLIGHT.
- * e. NO. 1 ENGINE CONDITION lever - GROUND. Check NO. 2 ENGINE for 91-94% rotor rpm and record data. E12,E13
- f. NO. 1 ENGINE CONDITION lever - FLIGHT.
- 45. NO. 1 & NO. 2 ENGINE BEEPTRIM switch - 100% rotor rpm.

- *46. **712** Bleed Band Check - See Section IV

ENGINE RUN UP

- * 1. VGI switches - As required.

PROCEDURE

TROUBLESHOOTING
REFERENCE

ENGINE RUN UP (Cont.)

CAUTION

If the heater is operating, set the HEATER switch to VENT BLOWER ONLY and allow two minutes for the heater to purge. This procedure will prevent a possible heater fire when generator power is lost in the following tests.

1.1 HEATER switch - Off. Allow 2 minutes with HEATER switch in VENT BLOWER ONLY if heater has been in operation.

2. Generators - Check operation.

*a. Generator-rectifier, crosstie operation - Check as follows:

(1) NO. 1 GEN switch - OFF.

Check the NO. 1 GEN OFF caution light comes on and the NO. 1 RECT OFF caution light remains off. NO. 1 GEN switch - TEST. Check that the NO. 1 GEN OFF caution light goes out. NO. 1 GEN switch - ON. Check that the NO. 1 GEN Off caution light is out.

(2) Repeat step (1) for NO. 2 GEN.

* b. Under-frequency cutoff - Check as follows:

O (1) EAPS ENG 1 and ENG 2 FAN switches - OFF.

(1.1) **712** ENG BEEPTRIM switch (No. 1 and 2) - Full decrease.

C13,D15

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PROCEDURE	TROUBLESHOOTING REFERENCE
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ENGINE RUN UP (Cont.)

- (2) ENGINE CONDITION lever of either engine - GROUND.
 - (3) Other ENGINE CONDITION lever - Slowly move toward GROUND until rotor rpm is 88%. Hold this rpm for 7 seconds. Ensure both GEN Off caution lights remain out. C31
 - (4) Continue reducing rpm with the ENGINE CONDITION lever until rpm is 82% and check that NO. 1 and NO. 2 GEN OFF and REC OFF caution lights are on.
 - (5) ENGINE CONDITION levers - FLIGHT.
 - (6) Check NO. 1 and NO. 2 GEN OFF and REC OFF caution lights out. C13
 - (7) **712** NO. 1 & NO. 2 ENGINE BEEP TRIM switch - set 100% rotor rpm.
 - O (8) EAPS ENG 1 and ENG 2 FAN switches - ON (one at a time).
 - c. Differential current protection circuit - Check as required. (Refer to Section IV.)
- 2.1 Transponder Master Switch - STBY.
Check TEST/MON NO GO light on within 30 seconds. Check PRESS TO TEST lights.

PROCEDURE	TROUBLESHOOTING REFERENCE
ENGINE RUN UP (Cont.)	I
*3. FUEL PUMPS and CROSSFEED VALVES Operation.	I
a. CROSSFEED FUEL VALVES switch—OPEN.	C27
b. FUEL PUMP switches— All OFF, both L and R FUEL PRESS caution lights should be on. Check fuel pumps one at a time as follows:	D16
c. LEFT AFT AUX TANK FUEL PUMP switch—ON. The left AUX PRESS caution light should come on momentarily, then go out. Then switch OFF.	D9, 10
d. LEFT AFT MAIN TANK FUEL PUMP switch—ON; the L and R FUEL PRESS caution light should go out. Then switch OFF. Check caution lights on.	D9
e. Remaining FUEL PUMPS switches—Check as in steps c. and d. above.	
f. CROSSFEED FUEL VALVES switch—CLOSED.	
g. Turn LEFT MAIN fuel pump ON. Check that the L FUEL PRESS caution light goes out. Ob- serve R. FUEL PRESS caution light stays on. There should be no bleed over to pressurize the opposite system. LEFT MAIN fuel pump OFF.	D9, D16

PROCEDURE	TROUBLESHOOTING REFERENCE
ENGINE RUN UP (Cont.)	
<p>h. Turn RIGHT MAIN fuel pump ON. Check that the R FUEL PRESS caution light goes out. Observe L FUEL PRESS caution light stays on. There should be no bleed over to pressurize the opposite system.</p>	
<p>4. All FUEL PUMP Switches—ON.</p>	
<p>*5. XMSN OIL PRESS and TEMP Indicator Operation.</p>	
<p>a. Check individual XMSN OIL PRESS readings. Allowable fluctuation of oil pressure readings shall not exceed ± 10% of actual readings.</p>	F1, F4, F7, F8
<p>b. XMSN OIL PRESS—SCAN. Reading ±3 psi of low transmission.</p>	F4
<p>c. XMSN OIL PRESS—TEST. Check to 0 psi or below.</p>	F5
<p>d. XMSN OIL PRESS switch—SCAN.</p>	
<p>e. Check all XMSN OIL TEMP readings.</p>	F3, F6, F8, F9, F10
<p>f. XMSN OIL TEMP—SCAN. Reading ±50 of high temperature xmsn.</p>	F11
<p>g. XMSN OIL TEMP—TEST. Check to -70°C or below.</p>	F8, F12

PROCEDURE **TROUBLESHOOTING
REFERENCE**

ENGINE RUN UP (Cont.)

- 6. Flight instruments - Check as follows:
 - *a. Horizontal Situation Indicator (HSI) - Check synchronized. Cross-check with magnetic compass. J13
 - b. Attitude indicators - Adjust as required. J3
- *7. **712** EMERG ENG TRIM System - Check operation. C12
 - a. NO. 1 EMERG ENG TRIM AUTO/MAN switch - MAN.
 - b. Note N1 reading.

CAUTION

Do not allow engine speed to go below minimum allowable N1 speed of 60%.

- c. NO. 1 EMERG ENG TRIM INC/DECR switch - Full DECR. Engine speed should decrease and stabilize at 60% N1 or above. Ensure engine remains running.
- d. NO. 1 EMERG ENG TRIM INC/DECR switch - INC to previously noted N1 speed.
- e. No. 1 ENG TRIM AUTO/MAN switch - AUTO.
- f. Repeat steps a. through e. for NO. 2 ENG.

PROCEDURE	TROUBLESHOOTING REFERENCE
ENGINE RUN UP (Cont.)	

7.1 **714A** FADEC system check:

* a. FADEC NR % check:

- (1) FADEC NR% switch - 97.
Check NR decreases to 97% $\pm 1\%$ with torques matched within $\pm 4\%$.
- (2) FADEC NR% switch - 103.
Check NR increases to 103% $\pm 1\%$ with torques matched within $\pm 4\%$.
- (3) FADEC NR% switch - 100.
Check NR returns to 100% with torques matched within $\pm 4\%$.

* b. FADEC Reversionary Mode Check:

- (1) ENG 2 ENG COND lever - GND.
- (2) FADEC 1 switch - REV.
- (3) THRUST CONT lever - Increase to obtain 90% N1.
- (4) FADEC 1 INC/DEC switch - DEC and hold. Check that NR stabilizes at 97% (+1%, -2%). If NR continues to decrease below 97%, return NR to 100% by holding the switch in the INC position and releasing it at 100% NR. Corrective maintenance action is required.
- (5) FADEC 1 INC/DEC switch - INC and hold. Check that NR stabilizes at 103% (+2%, -1%). If NR continues to increase above 103%, return NR to 100% by holding the switch in the DEC position and releasing it at 100% NR. Corrective maintenance action is required.

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PROCEDURE	TROUBLESHOOTING REFERENCE
ENGINE RUN UP (Cont.)	

- (6) FADEC 1 INC/DEC switch -
DEC as necessary to obtain
100% NR.
- (7) THRUST CONT lever - In-
crease to maximum possible
without lifting off the ground.
Check that NR stabilizes at
100% $\pm 2\%$.
- (8) FADEC 1 switch - PRI.
- (9) THRUST CONT lever -
Ground detent.
- (10) ENG 2 ENG COND lever -
FLT.
- (11) Repeat steps (1) through (10)
with the other engine.

PROCEDURE

ENGINE RUN UP
(Cont.)

8. Systems instruments-Check engine, transmission, rotor, and fuel systems indications. Master caution panel-Check.

*9. Altimeters -- Set/Test.

a. Barometric altimeter --
Recheck tower setting.

J4

*b. Radar Altimeters -- Check.

J5

(1) Dial pointers between 0 and 2 feet.

(2) Digital display indicates 0-2 feet.

(3) Set LO Set Index greater than 2 feet and HI Set Index 800 feet or less.

(4) LO caution light is on.

(5) HI caution light is off.

(6) OFF flags not in view.

○ (7) Pilot's Radar Altimeter Only - Periodic audio warning "ALTITUDE LOW, TOO LOW" heard in headsets (pilot, copilot, flight engineer/hoist operator).

J35

PROCEDURE

ENGINE RUN UP
(Cont.)

- (8) Momentarily depress PRESS-TO-TEST (pilot's).

J36

(a) 1 Time--Volume of the audio warning message decreases by one-half.

(b) 2 Times - Audio warning message is disabled and no longer heard in headsets.

- (9) PRESS-TO-TEST, hold and note.

NOTE

Dial pointer and digital display indications may deviate somewhat farther than 100 feet from the 1, 000 foot nominal.

- (a) OFF flags not in view.
- (b) Dial pointers 900-1, 100 feet.
- (c) Digital display 900-1, 100 feet.
- (d) LO caution light off.
- (e) HI caution light on.

2-54.1

C20

PROCEDURE

ENGINE RUN UP

(Cont.)

○ (f) Pilot's Radar Altimeter Only - Periodic audio warning "ALTITUDEHIGH,CHECK ALTITUDE" heard in headsets (pilot, copilot, flight engineer/hoist operator).

(g) Release PRESS-TO-TEST.

(10) Check dimming control for proper operation from DIM to BRT.

(a) Check digital display dims and goes out.

(b) Check LO caution lights dim but do not go out.

PROCEDURE **TROUBLESHOOTING**
REFERENCE

ENGINE RUN UP (Cont.)

10. **Blade Track - If not performed earlier, See Section IV.**

*11. **712** HIT Check - Complete, if TEAC is not required.

NOTE

Hit check may be deferred until arrival in test flight hover area if conditions in runup area preclude accurate or safe completion of check. Hit check must be completed before takeoff.

11.1 **714A** Power Assurance Check (PAC) (First flight of the day):

NOTE

If ambient conditions or aircraft weight precludes conducting this check on the ground, the check may be deferred and conducted at a hover. If conducted at a hover, the ECL of the engine not being checked can be reduced until the PAC Engine torque is between 60 to 80%.

- a. NR switch - 100%.
- b. ENG 1 ENG COND lever - Adjust.
- c. THRUST CONT lever - Raise until TRQ reads 60% to 80%. Stabilize for 30 seconds.
- d. TEST switch ENG 2 - PWR ASSURANCE. Check DECU display (Flight Engineer). An (A) means that the engine is operating at a cooler temperature than a baseline spec engine. Record results.

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PROCEDURE **TROUBLESHOOTING**
REFERENCE

ENGINE RUN UP (Cont.)

- e. THRUST CONT lever - Adjust.
 - f. ENG 1 ENG COND lever - PUT.
 - g. Repeat check with ENG 2 ENG COND lever at GND.
12. AN/ASN-128 Doppler - Program doppler with UTM (or latitude/longitude) coordinates for checkpoints in test course. Enter magnetic variation.
- O 12.1 AN/ASN-128B DGNS.
- a. Load several known local waypoints into DGNS either through CDU or through Data Loader Module.
 - b. Load SA/AS variables into DGNS through SA/AS port on SDC.
- * 13. AN/ASN-149(V) GPS with AN/ASN-128 Doppler.
- a. Power Up.
 - b. Perform Self-test.
 - c. Program waypoint coordinates for checkpoints in test course. (Enter magnetic variation and DTM if coordinate entry is manual.)

ENGINE RUN UP

(Cont.)

- d. Verify SA/AS entry.
- e. Verify present position
- f. Select destination way-point.

TAXI

* 1. SWIVEL switch- **G16**
UNLOCK then STEER.

2. AFCS SYSTEM SEL -
As required.

* 3. CYCLIC TRIM indicators - **K3**
GND position.

4. Chocks removed and secured.

5. Ramp and cabin door -
Secured.

6. FUEL VALVE and CROSSFEED
VALVES indicating lights - Out (flight
engineer response).

7. Crew -Check ready for taxi.

8. Taxi director and blade
watchers - Positioned as depicted
in TM 55-1520-240-10.

PROCEDURE	TROUBLESHOOTING REFERENCE
TAXI (Cont.)	
9. PARKING BRAKE -- Release.	
a. Check handle seated.	
b. PARK BRAKE ON caution light out.	G9
*10. Wheel brakes -- Check pilot's and copilot's right and left pedals for smooth operation and no fade upon application.	G14, 15
*11. Power steering -- Check.	
*a. Directional control -- SWIVEL switch - STEER.	G11
b. Left and right turns, 30 degree turns. Check HSI magnetic compass and turn needle for proper operation.	G16, G18
c. Check PWRSTEER caution light -- Out.	D17
(1) Check 10 degree deviation (maximum) in 100 feet.	G19
(2) SWIVEL switch -- LOCK. Check 5 degree deviation (maximum) in 100 feet	G20
12. Check power STEERING CONTROL inoperative with SWIVEL at LOCK.	G18
2-56.11(2-56.2 blank)	C20

PROCEDURE

BEFORE HOVER

1. Systems—Check indications of the following:

- a. Rotor.
- b. Torque
- c. Engine.
- d. Transmission.
- e. Fuel.
- f. Master caution panel.

2. PARKING BRAKE—As required.

3. AFCS SYSTEM SEL—
BOTH.

4. CYCLIC TRIM—AUTO

5. SWIVEL switch—LOCK.

G11

6. Crew and mission equip
mcac-Check.

CAUTION

Monitor all fuel tanks for overpressurization.

NOTE

During the fuel system check, observe the following:

1. No fuel will be pumped into any AUX tank.
2. At 1650 \pm 50 pounds, the main tank (with its pumps on) will start receiving fuel from its respective AUX tanks and stop when main tank capacity reaches 1800 \pm 50 pounds.

PROCEDURE	TROUBLESHOOTING
	REFERENCE

BEFORE HOVER (Cont.)

*7. RH Fuel System Check —
Start, note fuel quantity in all
tanks.

a. CROSSFEED FUEL
VALVE(S)—OPEN.

b. LH FUEL PUMPS — OFF.

c. Fuel selector — Monitor
RH tank fuel level.

*8. Ground Instability—Check.

a. Apply brakes and lift front
gear off the ground and check rear
brakes.

G14, G15

*b. Check flight control
response in all axes.

HOVER

NOTE

After work has been done on the flight control system, the dash actuators should be set to 36.0 inches and electrically disconnected. A mechanical rig check is not required if no adjustment has been made to the flight controls or the pitch links.

1. Mechanical Rig Check. (If no adjustments have been made to the flight controls or pitch change links, proceed to step 2).

a. DASH actuators — Set to 36.0 inches. Electrically disconnect.

NOTE

Even though the AFCS selector switch is in the BOTH ON position during the check, the AFCS OFF caution lights may stay on.

PROCEDURE	TROUBLESHOOTING REFERENCE
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HOVER (Cont.)

- b. Perform crosswind hover –
Check cyclic position of $\frac{3}{4}$ inch
aft $\pm\frac{1}{4}$ inch.
 - c. Check – Ground Contact An-
nunciator Maintenance Panel
light out.
 - d. Land helicopter.
 - e. AFCS selector switch – OFF.
Electrically reconnect DASH ac-
tuators.
2. AFCS function check. Conduct from
15 to 20 feet aft wheel height.

NOTE

All of the following tests must be started from a precisely trimmed condition. If this is not done, unsymmetrical or poor response will result, and the intent of this test will not be met. The performance criteria of this test are based on flight in smooth to light turbulent air.

PROCEDURE	TROUBLESHOOTING REFERENCE
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HOVER (Cont.)

a. CYCLIC TRIM check.
Note CYCLIC TRIM indicators move from the GND position to the 60 knot (RET) range on pick up to hover.

B11, K4

a.1. Engagement Error—Check as follows:

(1) AFCS SYSTEM SEL—NO. 1. Move switch from NO. 1 to OFF, then back to NO. 1. Check for engagement error.

(2) AFCS SYSTEM SEL—NO. 2. Move switch from NO. 2 to OFF, then back to NO. 2. Check for engagement error.

(3) AFCS SYSTEM SEL—BOTH.

b. Pitch axis test. AFCS SYSTEM SEL-BOTH. Check pitch axis response as follows:

K1, K2

NOTE

During AFCS function check, insure that both the pilot's and copilot's pitch and roll beep trim switches are operational.

(1) While trimmed for a stabilized hover, raise the nose of the helicopter 3° above hover attitude, and without retrimming longitudinal control or releasing the mag brake, return the stick to detent. The aircraft shall return to its approximate original pitch attitude, with no more than one and one-half residual oscillations, and hold attitude within $\pm 2^\circ$.

KS, K6

(2) Repeat test for a 3° nose-down trim displacement.

PROCEDURE	TROUBLESHOOTING REFERENCE
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HOVER (Cont.)

c. PITCH BEEP TRIM

Check. Check pitch beep trim as follows:

(1) While trimmed for hover, operate the four-way (conical) switch on the longitudinal stick grip to forward position. A small nose down pitch change shall be noted.	K7
---	----

(2) Operate the four-way switch to aft position. A small nose up change shall occur.

d. Roll axis test. Check roll axis response as follows

(1) Trim the aircraft to a level roll attitude. The aircraft shall hold this level attitude within $\pm 3^\circ$.	K8
--	----

(2) Operate the roll beep trim switch left and right. Roll attitude changes shall correspond to beep action.	K9
--	----

e. Yaw axis test. Check yaw axis response as follows:

(1) Apply a right pedal directional control input of $\frac{1}{2}$ inch. Do not operate the magnetic brake switch.

(2) Hold this input until a beading change of approximately 30° has occurred. Return the pedals to trim and do not apply any force to the pedals. The aircraft yaw rate shall diminish. When the rate has dropped to approximately 1° /second, a new heading shall be captured.	K10
---	-----

(3) Repeat steps (1) and (2), except apply left pedal.

PROCEDURE

TROUBLESHOOTING

REFERENCE

HOVER (Cont.)

NOTE

The AFCS yaw axis heading hold function is disabled when the SWIVEL switch is at UNLOCK or STEER.

(4) Set the SWIVEL switch to UNLOCK and repeat steps (1) thru (3). The aircraft should not lock on to any heading. The heading hold function will be inoperative.

f. Heading hold and bank angle hold check in sideward flight. Perform as follows:

(1) SWIVEL switch—
LOCK.

(2) Trim to a stable hover. Without operating the magnetic brake switch, apply a 5°-7° bank angle to produce a sideward velocity. Return longitudinal stick to the trim detent. The helicopter shall maintain the commanded bank angle and hold its original heading ($\pm 3^\circ$) during sideward flight.

K 10

(3) Repeat step (2), flying sideways in the opposite direction.

g. Hover check (NO. 1 AFCS). With the aircraft trimmed in pitch, roll, and yaw, AFCS SYSTEM SEL—NO. 1 and repeat the tests in steps b. thru f. Then set AFCS SYSTEM SEL switch to BOTH.

b. Hover check (NO. 2 AFCS). With the aircraft trimmed in pitch, roll, and yaw, AFCS SYSTEM SEL—NO. 2 and repeat the tests in steps b. thru f. Then set AFCS SYSTEM SEL switch to BOTH.

PROCEDURE

HOVER (Cont.)

CAUTION

Barometric altitude hold shall not be used in a hover. Rotor downwash and turbulence changes the reference pressure to the altitude hold transducer.

i. Radar altitude hold. RAD ALT—ENGAGED. Check segment lighted. Check radar altitude hold response while hovering at a known true altitude of at least 25-30 feet. Altitude shall be held within ± 5 feet.

K11

(1) Displace helicopter approximately 5 feet above known altitude by slipping THRUST CONT (do not use mag brake), and then release the THRUST CONT. Helicopter shall return to original altitude within ± 5 feet.

(2) Repeat test, slipping THRUST CONT 5 feet below known altitude and after releasing THRUST CONT note helicopter returns to original altitude within 5 feet.

(3) RAD ALT HOLD-OFF'.

3. Controls positions. (Refer to Section V).

H-12, K-12

a. Longitudinal

(1) Perform crosswind hover.

(2) Stick position
■ indicator-Check N $\pm \frac{1}{4}$ inch.

b. Lateral.

(1) Hover into the wind.

PROCEDURE	TROUBLESHOOTING REFERENCE
HOVER (Cont.)	
(2) Measure position from copilot's door post placard.	H-13
(3) 0 to ½ inch right of neutral position.	
c. Directional.	
(1) Hover into the wind.	
(2) Measure pedal separation.	H-14
(3) ½ inch maximum separation.	

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PROCEDURE **TROUBLESHOOTING**
REFERENCE

HOVER (Cont.)

4. Land helicopter, THRUST CONT in ground detent.
- *5. RH Fuel System check - Stop, note fuel quantity in all tanks.
- *6. LH Fuel System CHECK - START, note fuel quantity in all tanks.
 - a. LH FUEL PUMPS - ON.
 - b. CROSSFEED FUEL VALVES - Recheck OPEN (Flight Engineer Response).
 - c. RH FUEL PUMPS - OFF.
 - d. Fuel selector - Monitor LH fuel tank level.
- *7. **712** Torque Differential Check.
 - a. Recheck rotor rpm at 100%.

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PROCEDURE	TROUBLESHOOTING REFERENCE
HOVER (Cont.)	

- (1) Move NO. 2 ECL from FLIGHT to GROUND. 712 Using the No. 1 and No. 2 ENGINE BEEP TRIM switch, beep NO. 1 engine to 100% rotor rpm. Increase THRUST to point where aircraft is light on the gear, and a minimum of 60% SINGLE ENGINE TORQUE is indicated. Forward landing gear may be off the ground. 712 Maintain operating rpm with beep. After N1 has stabilized, record N1 and torque.
 - (2) Maintaining a constant THRUST, beep NO. 1 ENGINE to minimum beep, using the NO. 1 and NO. 2 ENGINE BEEPTRIM switch. Move NO. 2 ECL from GROUND to FLIGHT and allow NO. 2 engine to stabilize. Move NO. 1 ECL from FLIGHT to GROUND, beep NO. 2 ENG to 100% rotor rpm using the NO. 1 and NO. 2 ENGINE BEEP TRIM switch after N 1 has stabilized, record N1, and torque.
 - b. Beep NO. 2 ENG to minimum beep while placing THRUST in ground detent. Move NO. 1 ECL from GROUND to FLIGHT. After NO. 1 ENG has stabilized, match torques and beep both engines to 100% rpm.
 - c. Torque differential should not exceed 6%.
- 7.1 714A Torque Differential Check.
- a. Both FADEC PRI/REV SW - PRI.

B7,B8

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PROCEDURE

TROUBLESHOOTING
REFERENCE

HOVER (Cont.)

- b. ENG 2 ECL - GND.
- c. Incr thrust to 5 foot hover.
- d. Activate Power Assurance Test SW.
- e. Record TQ, DECU, value, and FAT.
- f. Without moving the thrust, advance ENG 2 ECL - FLT.
- g. ENG 1 ECL - GND.
- h. Activate Power Assurance Test SW.
- i. Record TQ, DECU value, and FAT.
- j. Advance ENG 1 ECL - FLT.
- k. Land helicopter.
- l. Difference will be no greater than 6% between ENG 1 and ENG 2TQ values.

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PROCEDURE	TROUBLESHOOTING REFERENCE
HOVER (Cont.)	

- *8. Droop Eliminator.
 - a. Establish 100 percent rotor rpm in the ground detent.
 - b. AFCS SYSTEM SEL - BOTH.
 - c. Lift off to stabilized hover, 15 to 20 feet aft wheel height.
 - d. Check 100% rotor rpm (+0 -1.0%). maximum stabilized droop. Maximum stabilized torque split 712 6%, 714A 4%. E11
- 9. Deleted.
- 9.1 714A FADEC REV CHECK:
 - a. THRUST CONT - At ground detent.
 - b. Both engines FADEC - REV.
 - c. NR% - 100%.
 - d. THRUST CONT lever - Increase to maximum attainable power without lifting off.
 - e. NR - Maximum transient change is +5% and -4%. Maximum sustained change is ±3%. (Colder OAT will result in higher NR during reversionary mode.)
 - f. THRUST CONT lever - Return to ground detent.
 - g. Both engines FADEC - PRI.
- 10. Deleted.
- * 11. Flight Instruments.
 - a. HSI compass card - 2° split between pilot and copilot indicators.
 - b. Magnetic compass ±5° of HSI indication. J9,J13
 - c. VGI alignment. J3
 - d. Turn and slip indicator. J8
 - e. Vertical velocity indicators. J6
 - f. Clocks.

HOVER (Cont.)

*12. LH Fuel System check -
Stop, note fuel quantity in all
tanks.

a. Land aircraft.

b. RH FUEL PUMPS - ON.

c. CROSSFEED FUEL
VALVES - CLOSE.

13. Cowling and Leak
Check - Performed.

BEFORE TAKEOFF

1. Systems - Check indications of
the following:

a. Rotor.

b. Torque.

c. Engine.

d. Transmissions.

e. Fuel

f. Master caution panel.

2. PARKING BRAKE - As required.

3. AFCS SYSTEM SEL - BOTH.

4. CYCLIC TRIM - AUTO.

5. SWIVEL switch - LOCK.

6. Transponder - NORMAL.

7. Crew and mission equipment - Check.

PROCEDURE
CRUISE

TROUBLESHOOTING
REFERENCE

- 1. Systems —Check normal.

NOTE

Operating the maintenance panel test switch in flight will cause the caution panel lights to go on. The flight engineer shall alert the pilot when the test switch is used in flight.

- 2. Ramp area and maintenance panel—Check every 30 minutes by flight engineer.

IN-FLIGHT

- *1. Fuel Consumption Check—Initiate.
- 2. Speed Sweep-Check.

CAUTION

With inoperative CGI, do not exceed airspeed limits (figure 5-2).

NOTE

FWD and AFT LCT schedules corrected for increases in pressure altitude are shown in Section V.

- a. Stabilize airspeed at 50 knots.

Observe both CYCLIC TRIM indicators are in the 60 knot (RET) range.

- b. Increase and stabilize airspeed at 60 knots.

* (1) Record longitudinal stick position. H12, K12

* (2) Record lateral stick position.

* (3) Record directional pedal separation. H14

PROCEDURE IN-FLIGHT (Cont.)	TROUBLESHOOTING REFERENCE
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<ul style="list-style-type: none"> * (4) Compare pilot and co-pilot airspeed indicators (7 knots maximum difference). 	J6, J7
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3. CYCLIC TRIM — Check.

<ul style="list-style-type: none"> * a. Record initial CYCLIC TRIM indicator lift off air-speed (Section V). 	B11, K13
---	----------

b. Increase and stabilize airspeed at 70 knots.

* c. Observe that both CYCLIC TRIM indicators have moved out of the RET position.

4. Speed Sweep-Check.

<ul style="list-style-type: none"> a. Increase and stabilize air-speed at 80 knots. 	H12, K12
--	----------

* b. Record longitudinal stick position.

5. Speed Sweep-Check.

a. Increase and stabilize air-speed at 100 knots.

<ul style="list-style-type: none"> * b. Record longitudinal stick position. 	H12, K12
--	----------

NOTE

Before selecting either AFCS, trim the helicopter to 110 knots with both AFCS operation.

6. AFCS Evaluation

a. Stabilize airspeed at 110 knots.

PROCEDURE TROUBLESHOOTING
REFERENCE

IN-FLIGHT (Cont.)

b. BARO ALT ENGAGED. K18
 Check that altitude hold maintains altitude ± 100 feet during steps c. through i.

*c. Directional pedal separation—Check as follows:

(1) Insure aircraft is in trim (ball centered).

(2) AFCS SYSTEM
 SEL—BOOTH.

(3) Switch from BOTH to H14
 NO. 1,—Measure pedal adjustment required to return aircraft to trim. Yaw correction should not exceed 0.5 inch.

(4) AFCS SYSTEM
 SEL—BOTH.

(5) Check NO. 2 the same as NO. 1,—Yaw correction should not exceed 0.5 inch per system or 1.0 inch total.

*d. Pitch axis—Check as follows: K-15

(1) Establish trimmed airspeed and attitude at 110 knots. Move the cyclic stick forward, without operating the centering device release button. Allow airspeed to increase to 120 knots. Return the stick to trim position. Airspeed should return to 110 knots and hold ± 5 knots.

(2) Repeat step (1) except move the stick aft to decrease airspeed to 100 knots.

PROCEDURE	TROUBLESHOOTING REFERENCE
IN-FLIGHT (Cont.)	
<p>(3) Pitch beep trim check. While trimmed level at 110 knots, operate the four way switch on the cyclic stick (without moving the stick) forward momentarily. The aircraft shall respond smoothly and increase airspeed. Do not allow airspeed to exceed 120 knots.</p>	K 7
<p>(4) Repeat (3) using aft beep trim to attain 110 knots.</p>	
<p>*e. Roll axis and coordinated turn. Check roll axis operation by trimming the helicopter to level roll attitude at 110 knots.</p>	K8
<p>(1) Trimmed attitude shall be maintained with $\pm 3^\circ$ roll and heading within $\pm 3^\circ$. The ball on the turn and slip indicator shall be centered within $\frac{1}{2}$ ball width.</p>	H6
<p>(2) Move the cyclic stick out of detent to the right (do not operate the centering device release button) to generate a 20° bank angle. Release stick back into detent. Hold turn for 60°. The newly acquired bank angle shall be held within $\pm 5^\circ$. During entry into the turn, the ball shall not be off-centered by more than one ball diameter. When stabilized in the turn, the ball in the turn and slip indicator shall be centered within $\frac{1}{2}$ ball width.</p>	H6, H7 H10, K8 K10, K16

PROCEDURE

TROUBLESHOOTING
REFERENCE

IN-FLIGHT (Cont.)

(3) Using cyclic stick, return aircraft to level attitude. Aircraft shall hold level roll attitude $\pm 3^\circ$ and heading within $\pm 3^\circ$ with controls free. Repeat steps (2) and (3) banking to the left.

H6, K8

f. Roll beep trim--Check as follows:

K9

(1) While trimmed level, operate the four-way (conical) switch on the control stick grip to the right to attain a 20° bank angle. The aircraft shall respond smoothly to beep inputs. The system shall hold the attitude acquired within $\pm 5^\circ$.

(2) Operate the four-way switch to the left to attain a 20° left bank angle. The system shall hold this angle within $\pm 5^\circ$.

(3) Return aircraft to level trimmed flight using the roll beep trim switch.

g. Repeat steps 2d through 2f first with NO. 1, then NO. 2 AFCS selected.

h. AFCS SYS SEL—BOTH.

*i. Heading select test.
Check as follows:

(1) Trim to level flight at 110 kts. Set the cursor on the Pilots HSI indicator 45° to the right. Engage pilot's CMD

PROCEDURE

IN-FLIGHT (Cont.)

SEL switch on the HSI mode select panel; press the AFCS HDG switch to engage. Helicopter shall enter into a standard rate turn and shall roll out smoothly onto the selected heading and maintain this heading within $\pm 5^\circ$.

(2) Depress centering release switch on pilot's cyclic. HDG switch shall release.

(3) Set the cursor on the pilot's HSI 45° to the left. Engage HDG switch. Helicopter shall enter into a standard rate turn to the left and shall roll out smoothly onto the selected heading. It shall maintain the new heading $\pm 5^\circ$.

(4) Select CMD SEL on co-pilot's mode select panel. HDG switch shall release.

(5) Repeat step (1) for co-pilot's HSI.

(6) Depress centering release switch on co-pilot's cyclic. HDG switch shall release.

(7) Repeat step (3) for co-pilot's HSI.

(8) Depress CMD SEL switch on pilot's mode select panel. HDG switch shall release.

(9) Engage HDG switch. Depress HDG switch to insure it will release.

*j. Barometric altitude hold test:

IN-FLIGHT (Cont.)

- (1) BARO-ALT – ENGAGED. K18
Note ENGAGED switch lighted. Trim to level flight at a selected altitude. Then, without pressing the THRUST CONT magnetic brake switch, increase altitude by 75 feet by pulling against the brake. Release THRUST CONT. The helicopter shall then return to the selected altitude within ± 25 feet, in not more than 30 seconds. Repeat this step, reducing altitude 75 feet below selected altitude. Release THRUST CONT. The helicopter shall return as above.
- (2) Press the BARO ALT ENGAGED switch to disengage altitude hold.

*k. DASH Actuator Low Rate Operation Check.

- (1) Trim helicopter at 110 knots.
- (2) Set the AFCS switch to either OFF position. Check that both MASTURE CAUTION and NO. 1 and NO. 2 AFCS OFF caution lights come on; then, reset MASTER CAUTION lights.
- (3) Slow to 90 knots and trim the helicopter.
- (4) Set the AFCS switch to BOTH and check that both AFCS OFF caution lights go out within 20 seconds.
- (5) Reset the AFCS switch to either OFF position; and check that both MASTER CAUTION and AFCS OFF caution lights come on.

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PROCEDURE TROUBLESHOOTING REFERENCE

IN-FLIGHT (Cont.)

- (6) Accelerate to 110 knots and trim the helicopter.
- (7) Set the AFCS switch to BOTH and check that both MASTER CAUTION and both AFCS OFF caution lights go out within 20 seconds. H16
- 7. Speed Sweep Check.
 - a. Increase and stabilize airspeed at 120 knots.
 - *(1) Record longitudinal stick position. H12,K12
 - *(2) Check jettisonable doors for security and vibration.
- 8. STVA evaluation.

CAUTION

Do not operate the self-tuning absorber test feature in flight.. In-flight operation may damage the absorber.

- a. Stabilize airspeed at 120 knots.
 - (1) Check rotor rpm at 100%.
 - *(2) 712 Increase rotor rpm to 102% and start clock. 714A FADEC NR% switch - Increase RRPM to 102% and start clock. Absorbers should retune within 60 seconds. H4
 - (3) Increase and stabilize airspeed at 140 knots.
 - *(4) 712 Decrease rotor rpm to 98%, and start clock. 714A FADEC NR% switch - Decrease RRPM to 98%, and start clock. Absorbers should retune within 60 seconds.

<p>PROCEDURE</p>	<p>TROUBLESHOOTING REFERENCE</p>
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IN-FLIGHT (Cont.)

*8.1 Rotor RPM Droop Check and Thrust Rod Slippage Check.

- a. Stabilize airspeed at 125 knots straight and level.
- b. Rotor rpm 100%.

- (1) Maintaining altitude and direction **712** without beeping rotor RPM, increase thrust as necessary to stabilize airspeed at 140 knots with thrust brake trigger depressed.

- (2) Maximum change in in rotor rpm shall be **712** ±2% or **71+A** ±1%.

- (3) Maximum thrust rod slippage with thrust brake applied shall be 2% dual engine torque.

9. Speed Sweep - Check.

- a. Stabilize airspeed at 140 knots.

- * (1) Record longitudinal stick position. H12,K12

- * (2) Record lateral stick position.

- * (3) Record directional pedal separation. H14

- (4) Compare pilot and copilot airspeed indicators (6 knots maximum difference). J6,J7

10. Speed Sweep - Check.

- a. Increase and stabilize airspeed at 150 knots.

- * (1) Record longitudinal stick position. H12,K12

PROCEDURE	TROUBLESHOOTING REFERENCE
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IN-FLIGHT (Cont.)

* (2) Evaluate 1/Rev and 3/Rev vibration.	11-4
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* (3) Coordinated turns.

11. CYCLIC TRIM—Check.

a. Observe both CYCLIC TRIM indicators have reached the leading edge of the EXT range 150 knots. FWD and AFT LCT schedules corrections for increases in pressure altitude are shown in Section V.	B12
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b. Decrease and stabilize airspeed below extended envelope corrected for altitude (section V).

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PROCEDURE

TROUBLESHOOTING
REFERENCE

IN-FLIGHT (Cont.)

- (1) CYCLIC TRIM indicators -
Check both out of EXT range.

CAUTION

Before entering autorotation, ensure outside area is clear, suitable forced landing area within range and crew notified.

12. m Autorotation RPM.

- a. Stabilize airspeed 70 to 100 knots.
- b. EMERG ENG TRIM AUTO MANUAL switches - MANUAL.
- c. THRUST CONT - Reduce.
- d. EMERG ENG TRIM INC/DECR switches - DECR while reducing THRUST CONT to ensure engines do not drive rotor system.
- * e. When in stabilized autorotation with full down THRUST CONT - Record following data. (Refer to Section V.)
 - (1) Rotor RPM. H15
 - (2) Pressure altitude.
 - (3) Free air temperature.
 - (4) Fuel quantity.
 - (5) Pedals - 2 inches maximum separation. H14

PROCEDURE	TROUBLESHOOTING REFERENCE
IN-FLIGHT (Cont.)	

- f. Note any abnormal vibrations. 11-6

NOTE

Autorotation at rotor rpm above 102% rotor rpm will be accompanied by an overall increase in vibration.

- g. Make power recovery.
 - (1) Load rotor.
 - (2) EMERG ENG TRIM AUTO MANUAL switches - AUTO (covers down, one at a time).
 - (3) Reestablish safe airspeed and altitude.

12.1 **71+X** Autorotation RRPM Check.

NOTE

Confirm that the aircraft gross weight and density altitude parameters are within the constraints of Figure 5-12.3, Autorotational RRPM chart.

- a. Stabilize airspeed at 75 ±5 kts.
- b. THRUST CONT lever - lower to ground detent.
- c. FADEC RRPM switch - 97%.
- d. THRUST CONT lever - full decr.
- e. When in stabilized autorotation with thrust full down, record the following data:

NOTE

Rotor RPM must be at 98% or higher. If it is not at or above 98% the pitch change links must be adjusted.

- *(1) RRPM.
- *(2) PA.

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PROCEDURE TROUBLESHOOTING
REFERENCE

IN-FLIGHT (Cont.)

- * (3) FAT.
- * (4) Fuel quantity.
- * (5) Pedals - 2 inches maximum separation.
- * f. Note any abnormal vibrations.

NOTE

Autorotation above 102% RRPM will be accompanied by an overall increase in vibration.

- g. Prior to reaching 1000 feet AGL make a power recovery.
- h. Reestablish 100% RRPM, safe air-speed, and altitude.
- i. FADEC RRPM Switch - 100%.
- j. Compare data to chart in Section V for proper RRPM.
- * 13. 712 Engine TEAC check, if required. (Section IV)
- 13.1 714 Power Assurance Test, if required. (Section IV)
- * 14. Fuel consumption check - STOP
- 15. Navigation and Communication.
 - * a. UHF.
 - (1) Transmit and receive. J2
 - (2) Preset and manual tune. J10
 - (3) Check both a high and low frequency, e.g., over 300 MHz and under 300 MHz.
 - b. VHF-AM/FM.
 - (1) Transmit and receive. J10

PROCEDURE	TROUBLESHOOTING REFERENCE
IN-FLIGHT (Cont.)	
(2) Check both AM and FM bands at high, medium, and low frequencies.	
(3) FM Homing.	J11
(a) MODE SEL-DF.	
(b) HSI MODE SELECT panel—FM SEL, check FM SEL lit.	
(c) Course deviation bar on HSI—Check response in turns.	
(d) TO-FROM arrows concealed on HSI.	
(e) GS and NAV OFF flags concealed on HSI.	
c. HSI and Magnetic Compass.	J12
(1) HSI synchronized.	
(2) Magnetic compass $\pm 5^\circ$ of HSI.	J9
(3) 2° maximum difference between pilot and copilot indicators.	
*d. VOR.	
(1) Tuning, reception, and volume.	J17
(2) HSI MODE SELECT panel—VOR SEL and CMD SEL engaged and lit.	
(3) HSI MODE SELECT panel—VOR ADF engaged and lit.	

IN-FLIGHT (Cont.)

(4) No. 2 pointer on HSI $\pm 3^\circ$ of correct magnetic course to station.

(5) Note course direction on HSI.

(a) Centered when on selected VOR course.

(b) 10° off-course gives full deviation bar displacement.

J13

(6) Station passage.

(7) Total No. 2 pointer fluctuation 5° .

(8) VOR frequency – Tune to 108.00 MHz.

(a) VOR/MB TEST switch – Press and hold.

(b) On both HSI, note TO arrow in view, the deviation bar deflects within the ± 2 dot deflection and NAV warning flags are concealed.

(c) Note all three marker beacon lights lit on HSI MODE SELECT panel.

(d) Release TEST switch and return VOR to operational frequency.

*e. ILS (if available).

(1) At a distance of at least 9 nautical miles, tune to the localizer frequency. Start on ILS approach.

PROCEDURE

TROUBLESHOOTING
REFERENCE

IN-FLIGHT (Cont.)

(2) Check that NAV and GS warning flags are concealed.

(3) Steer right and left. Check that the localizer pointer moves left and right, respectively.

(4) Climb and descend. Check that the glide slope pointer moves up and down, respectively.

(5) Check marker beacon lights anti audio during approach. Check high and low sensitivity.

(6) With pointers centered, continue approach to runway to ascertain that proper landing can be made.

*f. ADF.

J14

(1) Tuning, reception and volume.

(2) Check ADF, ANT and LOOP operation.

(3) ADF on HSI MODE SELECT panel—Engaged and lit.

(4) No. 2 pointer on HSI within $\pm 3^\circ$ of magnetic bearing to station.

(5) Total No. 2 pointer fluctuation $\pm 5^\circ$.

(6) Station passage.

g. Marker beacon.

J15

(1) Push to test any MKR BCN light. (One light tests all three.)

PROCEDURE

IN-FLIGHT (Cont.)

(2) Check audio high and low sensitivity over appropriate markers.

(3) Check light operation high and low sensitivity over appropriate markers.

*h. Transponder AN/APX-100 and Radar Signal Detecting Set AN/APR-39.

J17, J18

(1) Transponder master switch—STBY. Allow 2 minutes for warmup. Check CODE OFF flag on pilot's barometric altimeter out of sight.

(2) At a minimum altitude of 2,000 feet and distance of 30 miles, request a transponder check from an appropriate radar facility.

(3) Check all modes, including emergency. Check AIMS altimeter.

(4) Obtain operation information from radar facility.

(5) While checking transponder, check operation of radar signal detecting set. Check that detecting set displays bearing to all known radar facilities.

J18

*i. HF Radio (AN/ARC-102).

(1) Mode select switch—AM.

(2) Allow 5 minutes for warm up.

(3) Key transmitter and listen for 1000 Hz tone for no more than 30 seconds.

J19

PROCEDURE	TROUBLESHOOTING REFERENCE
IN-FLIGHT (Cont.)	
<p>(4) Transmit and receive on AM, USB and LSB.</p> <p>(5) Evaluate communications throughout a 360 degree turn.</p> <p>*j. Doppler Navigation Set (AN/ASN-128).</p>	<p>J20, 21</p>
<p>(1) Verify proper system operation with MODE switch at TEST and display indicates GO.</p> <p>(a) Fly helicopter over surveyed test course (figure 2-1) at cruise airspeeds. The altitude should be low enough to minimize error in establishing position over checkpoints.</p> <p>(b) Enter magnetic variations, lateral and longitudinal coordinates of the checkpoints.</p> <p>(c) With the MODE switch in UTM, the DISPLAY switch in GS/TK and the FLY-TO-DEST thumbwheel in position "0", take off and observe that the MEM and MAL lights are extinguished and ground-speed (GS) and track angle (TK) are reasonable.</p> <p>(d) Set the DISPLAY switch to DIST/BRG/TIME and the FLY-TO-DEST thumbwheel to position "1".</p>	<p>J22, 25</p>

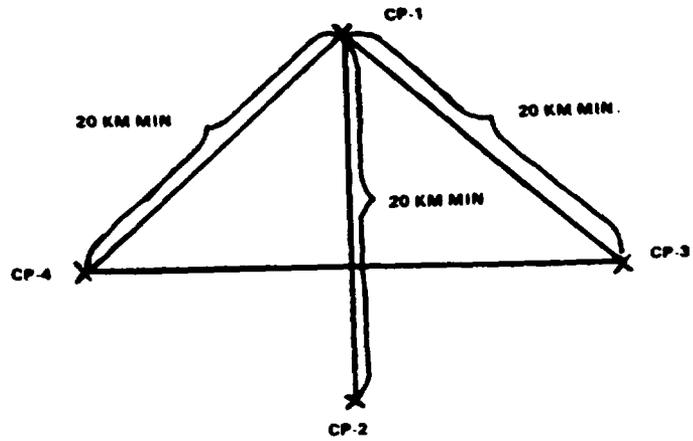


Figure 2-1. Test Course for Overhaul Accuracy Doppler

PROCEDURE	TROUBLESHOOTING REFERENCE
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IN-FLIGHT-(Cont.)

(e) Fly over the initial checkpoint (CP-1) on a heading for the first destination checkpoint (CP-3). As CP-1 is flown over, depress, first the KYBD key and then the ENTR key.

(f) Set the FLY-TO-DEST thumbwheel to position "3".

(g) Use the track angle error (TKE) display, DIST/BRG/TIME display, or an independent NAV aid, to steer the helicopter to the first (CP-3) destination.

(h) As the first (CP-3) checkpoint is located, change the helicopter heading as necessary to fly over the checkpoint. Set the DISPLAY switch to "PP" and depress KYBD as the checkpoint is overflown. Record the displayed present position coordinates or depress TGT STR.

(i) For leg number 2, steer the helicopter and fly over checkpoint CP-3 on a heading for destination checkpoint CP-4. Set the DISPLAY switch to DIST/BRG/TIME and as CP-3 is flown over, depress the KYBD key and then the ENTR key.

(j) Set the FLY-TO-DEST thumbwheel to position "4".

(k) Repeat step (g) for destination CP-4.

(1) Repeat step (h) for checkpoint CP-4.

PROCEDURE

IN-FLIGHT (Cont.)

(2) Navigation Accuracy Test Legs-The following navigation legs shall be flown in the indicated numerical sequence.

(a) Leg Number 1-Fly from CP-1 to CP-3 at normal cruising speed. Record the displayed present position coordinates at CP-3 flyover.

(b) Leg Number 2-Fly from CP-3 to CP-4 at the maximum helicopter speed. Record the displayed present position coordinates at CP-4 flyover.

(c) Leg Number 3-Fly from CP-4 to CP-1 at minimum safe speed (greater than 20 knots) of the helicopter. Record the displayed present position coordinates at CP-1.

(3) Maximum cross track error is $\pm 5\%$ of the distance of the leg. Maximum error along the track is 2% of the distance of the leg.

PROCEDURE

**TROUBLESHOOTING
REFERENCE**

INFLIGHT (Cont.)

*k. GPS/Doppler Flight Test Procedure.

(1) Verify proper system operation with MODE switch to TEST and display line 1 indicating **TEST COMPLETE** and line 2 **TEST OK**.

J26, J27

(2) Verify proper response of CDU panel lighting to aircraft dimmer control and Display lighting to CDU BRT control. Adjust to comfortable level.

J29, J30

(3) Perform GPS system Start-Up procedure. Ensure four (4) satellite measurements (SAT) are being used and estimated position error (EPE) is 50 (meters) or less with keys loaded or 200 (meters) or less with a cold start.

J28, J31, J33, J34

(4) Fly helicopter over surveyed test course consisting of two (2) waypoints used as checkpoints (CP) a minimum of 20KM apart.

(5) To minimize errors in establishing positions over the checkpoints (CP), the altitude shall be the lowest compatible with safety standards.

2-84.1

C20

PROCEDURE

IN-FLIGHT (Cont.)

(6) If checkpoint (CP) information was not entered through the data loader during Start-Up, with the Mode switch set to NAV enter checkpoints using the CDU.

(7) Set Mode switch to NAV.

(8) Depress GPS/DOP select button on HSI Mode Select Panel.

(9) Set Data switch to MSN. Depress waypoint key (WP) until > is displayed in upper left corner of display (meaning destination mode). On Page 1, ensure that an arrow (←) is in front of Doppler Only (DOP ONLY) and GPS Only (GPS ONLY), on lines 3 and 4 respectively.

(10) Set the Data switch to OPT.

(a) Select the Doppler backup mode on Page 1, Line 1 (* Back-Up displayed).

C20

2-84.2

PROCEDURE

INFLIGHT (Cont.)

(b) Slew (↕) down to Page 3.

(c) Verify an arrow (↔) is in front of STATIONARY on line one. (This means that Stationary operation is not selected. An asterisk (*) in front would mean that Stationary operation was selected).

(11) Set the Data switch to POS. Observe that the present position, displayed on lines two and three, is changing.

(12) Set the Data switch on the CDU to DIS-TG.

(a) Select waypoint examination mode by depressing WP key.

(b) Open line one of Page 1 and enter waypoint identifier by number, alphanumeric name or frequency of the destination CP (CP-1).

(c) Verify the values for the distance-to-go (DIS), displayed on line two, and bearing (BRG), displayed on line four are accurate.

PROCEDURE

IN-FLIGHT (Cont.)

(d) Depress WP key to select destination mode.

(13) Fly towards CP-1.

(14) When GPS set indicates arrival at CP-1, set Data switch to POS.

(15) While hovering over CP-1 depress the MARK key. Press line select key 3 to store coordinates and altitude. This will be Mark "A".

(16) Depress CLR key to exit Mark operation.

(17) Set Data switch to MSN. Open line three and enter an arrow (←) in front of Doppler Only (DOP ONLY). Ensure that an arrow is also in front of GPS ONLY on line four. GPS/DOP (GPS/Doppler) mode of operation is selected.

(18) Set Data switch to DIS-TG, WP mode. While still hovering over CP-1, open line 1 and select CP-2. Record distance and bearing to CP-2 (lines 2 and 4). Slew (3) down to Page 2 and record slant range to destination (line 2).

PROCEDURE

IN-FLIGHT (Cont.)

(19) With Data switch still set to DIS-TG, switch to destination mode and fly from CP-1 to CP-2. While hovering over CP-2, record displayed present position at CP-2 by performing the following: Depress the MARK key. Press line select key 3 to store coordinates and altitude. This will be Mark "B". Press the Clear key (CLR) to return to original screen.

(20) Set Data switch to POS and record the present position coordinates.

(21) Set Data switch to DIS-TG, WP mode. While still hovering over CP-2, open line 1 and select CP-1. Record distance and bearing to CP-1 (lines 2 and 4). Slew (↑) down to Page 2 and record slant range to destination (line 2).

PROCEDURE

IN-FLIGHT (Cont.)

(22) With Data switch still set to DIS-TG, switch to destination mode and fly from CP-2 back to CP-1. While hovering over CP-1, store displayed present position at CP-1 by performing the following: Depress the MARK key. Press line select key 3 to store coordinates and altitude. This will be Mark 'B". Press the Clear key (CLR) to return to original screen.

(23) Set Data switch to POS and manually record present position coordinates.

(24) Set Data switch to DIS-TG and manually record distance to CP-2 (line two).

(25) Return to ground station.

PROCEDURE

TROUBLESHOOTING
REFERENCE

IN-FLIGHT Cont.)

*1. GPS/Doppler Flight Test
Data Analysis.

Compare all MARK positions with the actual positions of the corresponding Check Point. Compare differences, if any, with Allowable Navigation Error Limits outlined in TM 11-5826-308-12. If errors exceed the Allowable Navigation Error Limits, use the self-test of the GPS system and fault isolation procedures to determine the failure mode.

*m. Zeroizing loaded keys from GPS memory.

NOTE

- Zeroize at termination of test flight or so dictated by operations.
- Aircraft power must be connected, or power applied to aircraft.

(1) Lift zeroize switch guard and toggle switch.

PROCEDURE

TROUBLESHOOTING
REFERENCE

(2) With the GPS receiver turned on, turn Data Switch to Stat. Observe message on Page 1. Line 2. The message **ZEROED** indicates all keys have been erased from memory and the unit is unclassified. J32

O AN/ASN-128B DOPPLER WITH EMBEDDED GPS

*n. DGNS Flight Test Procedure.

(1) Verify proper system operation with MODE switch to TEST. Left display GO and Right display ALL. MAL lamp is off. J37

(2) Verify proper response of CDU panel lighting to aircraft BRT and DIM controls. Adjust to comfortable level. J38

(3) Perform DGNS system Start-Up procedure. Ensure four (4) satellite measurements (SAT') are being used and estimated position error (EPE) is 50 (meters) or less with keys loaded or 200 (meters) or less with a cold start.

(4) Fly helicopter over surveyed test course consisting of two (2) waypoints used as checkpoints (CP) a minimum of 20KM apart.

(5) To minimize errors in establishing positions over the checkpoints (CP), the altitude shall be the lowest compatible with safety standards.

PROCEDURE

TROUBLESHOOTING
REFERENCE

(6) If checkpoint (CP) information was not entered through the data loader during Start-Up, enter checkpoints using the CDU.

(7) Set MODE switch to MGRS or LAT/LONG.

(8) Set DISPLAY switch to XTK/TKE. Observe standard Cross Track (XTK) and Track angle error (TKE) display.

(9) Depress GPS/DOP select button on HSI Mode Select Panel.

(10) To display Ply-To destination number depress the INC key or DEC key, or depress the first number key and the second number key.

(11) Ply shortest distance to first destination from present position, set DISPLAY switch to DIST/BRG/TIME position and steer helicopter to bearing displayed. As an aid to maintaining course, set DISPLAY switch to XTK/TKE position and steer the helicopter to keep track angle error (TKE) nominally zero. If the display indicates a L (left) TKE, the aircraft must be flown to the left to zero the error.

J39

PROCEDURE

TROUBLESHOOTING
REFERENCE

(12) At the first destination set DISPLAY switch to PP and KYBD key is depressed and released note the position, altitude and magnetic variation.

(13) Fly to the remaining destinations using the procedures described in (11) and (12) above.

(14) Return to ground station.

*o. DGNS Flight Test Data Analysis.

Compare all MARK positions with the actual positions of the corresponding Check Point. Compare differences, if any, with Allowable Navigation Error Limits outlined in TM 11-5841-305-12. If errors exceed the Allowable Navigation Error Limits, use the self-test of the GPS system and fault isolation procedures to determine the failure mode.

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PROCEDURE	TROUBLESHOOTING REFERENCE
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IN-FLIGHT (Cont)

* p. Zeroizing loaded keys from DGNS memory	J40
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NOTE

- . Zeroize at termination of test flight or so dictated by operations.
- . Aircraft power must be connected. or power applied to aircraft.

(1) Lift zeroize switch guard and toggle switch.

(2) Release toggle switch and close switch guard.

16. Miscellaneous.

a. Vertical velocity indicators.	J6
----------------------------------	----

b. Turn and slip indicators.	J8
------------------------------	----

c. Pressure altimeters.	J4
-------------------------	----

(1) Pilot and copilot difference:

100 @ 0-500 ft

150 @ 1000-2000 ft

200 @ 2000-4000 ft

300 @ 4000-8000 ft

350 @ 8000-10,000 ft

(2) No pointer sticking at any altitude.

Change 24 2-84.11

TM 55-1520-240-MTF

PROCEDURE	TROUBLESHOOTING REFERENCE
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IN-FLIGHT (Cont)

*q. HF Radio (AN/ARC-220)/COMSEC (KY- 100).

(1) AN/ARC-220 Function switch-T/R. Mode switch-PRE and Channel selector-Appropriate preset (1-20) containing a frequency to transmit/receive in USB.	J52, 53, 54, 55
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(2) KY-100-Mode switch-PT. Preset--Desired position for plaintext operation. Plaintext beeps are heard when system is idle or receiving.	J56
--	-----

(3) Transmit/Receive and evaluate communications throughout a 360 degree turn.	J57, 58
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(4) Repeat the process with ARC-220 operating on LSB, AME and CW.	
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(5) KY-100-Mode switch-CT. Preset-Desired position for ciphertext operation.	J59
--	-----

(6) Transmit/Receive with ARC-220 in USB, LSB, AME or CW.	J58
---	-----

(7) ARC-220-Mode switch-ALE. SQL switch--0 or 1.	160,61
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PROCEDURE	TROUBLESHOOTING REFERENCE
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IN-FLIGHT (Cont.)

(8) Push PTT.

(9) ARC-220 displays
“CALLING”.

(10) Wait for a short gong
tone and “LINKED” on display
before transmitting to a like con-
figured station.

(12) ARC-220-Mode
switch-ECCM. Channel switch-
Desired channel, SQL switch--O or
I.

(13) Transmit to a like
station by pressing PTT. wait for
preamble tones to cease and begin
transmission.

J69, 63

(14) While still in ECCM
mode, transmit a message from a like
configured ground/air station to
aircraft ARC-220 HF radio.
“RCVING PREAMBLE” and/or
“INCOMING CALL” is displayed
before incoming message is heard.

J58

PROCEDURE

IN-FLIGHT (Cont.)

*d. Establish cruise flight and record.

- (1) ENG OIL PRESS.
- (2) ENG OIL TEMP.
- (3) XMSN OIL PRESS.
- (4) XMSN OIL TEMP.
- (5) Hydraulic pressures (flight engineer response).
- (6) Hydraulic fluid temperatures.

BEFORE LANDING

1. Systems-Check indications of the following:
 - a. Rotor— 100%.
 - b. Torque.
 - c. Engine.
 - d. Transmission.
 - e. Fuel.
 - f. Master caution panel.
2. AFCS HDG and ALT switches-Disengaged.
3. CYCLIC TRIM switch—As required.
4. PARKING BRAKE—As required.

PROCEDURE TROUBLESHOOTING
REFERENCE

BEFORE LANDING (Cont.)

- 5. SWIVEL switch — LOCK.
- 6. Crew and mission equipment — Check.

AFTER LANDING

- 1. Flight Controls — Neutralize.
- 2. AFCS System Sel switch — As required.
- 3. Swivel switch — As required.
- 4. Searchlights — As required.
- 5. Transponder — As required.
- 6. GND contact annunciator lights — ON (Flight Engineer). (If installed.)
- 7. Cyclic Trim indicators — Check GND indication. K13

ENGINE SHUTDOWN

- 1. SWIVEL switch — LOCK.
- 2. PARKING BRAKE — Set. G10
 - a. Check PARK BRAKE ON — Caution Light ON.
- 3. HEATING switches — OFF.
- 4. ANTI-ICE switches — OFF.
- 5. EMERG EXIT LTS switch — DISARM.
- 6. Flight controls — Set. Position the pedals and cyclic at neutral (N on the stick position indicator) and the THRUST CONT at ground detent.
- 7. AFCS SYSTEM SEL switch — OFF.

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PROCEDURE **TROUBLESHOOTING**
REFERENCE

ENGINE SHUTDOWN (Cont.)

8. Ramp - As required.
9. Wheels - Choked.
10. Fire guard - Posted.
11. APU - Start. For apu starting procedures, refer to page 2-3.
12. APU GEN switch - ON.
13. NO. 1 and NO. 2 GEN switches - Off.
14. POWER XFR switches - NO. 1 and NO. 2 ON.
15. CYCLIC TRIM indicators - Check both in GND position, manually program if necessary.
16. ENGINE CONDITION levers - GROUND. Ensure 2 minutes cool-down is met.
17. FUEL CONTROL switches - SET.
- 17.1 ENGINE CONDITION levers - STOP. Check that engine coastdown time is 25 seconds minimum.

CAUTION

Check droop stops engaged.

- *17.2 **714A** DECU Check - Perform as follows:
- a. ENG COND levers - STOP.
 - F b. DECU display - Check for a 88 display.

PROCEDURE	TROUBLESHOOTING REFERENCE
ENGINE SHUTDOWN (Cont.)	

NOTE

If DECU display is other than 88, advance respective ENG COND lever to GND without starting engines. If 88 is displayed, then a nuisance fault has been verified. If other than 88 is displayed, refer to maintenance.

- 18. REFUEL STA switch - As required.
- 19. AVIONICS - Set as required then OFF. J64
 - a. HF Radio (AN/ARC-220) - ZEROIZE then OFF. "ZEROIZED" advisory is displayed. J65
 - b. TSEC/KY-100 - ZEROIZE. "ZEROED" advisory appears on display and a momentary tone is heard in headset.
- 20. Radar altimeters - OFF.

NOTE

Record any tripped indicators before setting GND TEST switch to TEST or RESET.

- 21. Maintenance Panel - Check for tripped indicators and lit PUMP FAULT or FILTER CHANGE lights. GND TEST switch - TEST, then RESET. Check indicators for proper operation. FILTER CHANGE and PUMP FAULT lights - PRESS TO TEST (Flight Engineer).

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PROCEDURE	TROUBLESHOOTING REFERENCE
ENGINE SHUTDOWN (Cont.)	

31. Check Sheet - Signed.
32. All entries from "Remarks" column of Check Sheet - Transcribed to DA Form 2428-13 and complete DA Form 2408-12.
33. Maintenance Personnel - Debriefed as necessary.

SECTION III — TROUBLESHOOTING

General. This section contains troubleshooting information that has been referenced in Section II checklists. This section shall list possible conditions, abnormal conditions and indications and probable causes. The information is to be used only as a quick reference and may not be all encompassing.

TROUBLESHOOTING GUIDE A—STARTING
(INCLUDES APU)

CONDITION

PROBABLE CAUSE

- A1. APU fails to start or fails during operation. Check bite indicators on APU control box. Note tripped bite sequence. Refer to label on APU control box for decoded bits information (figure 3-1).
- A2. Engine will not motor with START switch at MOTOR. DC power is available to panel if STARTER ON caution light is on.
 - a. Engine circuit breaker out.
 - b. Faulty start switch.
 - c. Faulty engine start solenoid valve.
 - d. Faulty start relay.
 - e. Faulty starter motor.
 - f. Faulty utility hydraulic system.
- A3. No engine combustion during START. Listen for "SNAP" sound of igniters during engine start.
 - a. Ignition key not on.
 - b. Ignition circuit breaker out.
 - c. Faulty ignition exciter.
 - d. Faulty ignition harness.
 - e. No starting fuel. Check FUEL PRESS caution lights are out.
- A4. Engine will not accelerate to 12% within 15 seconds during start cycle. Check utility hydraulic system pressure at 3350 psi (flight engineer response). Check for START caution light.
 - a. Faulty utility hydraulic start solenoid valve.

T-62T-2B

BITE *				DECODED BITE INFORMATION	
1	2	3	1		
● ○ ○ ○ ○ ○	● ● ○ ○ ○ ○	● ● ● ○ ○ ○	● ● ● ● ○ ○	RESET START FUEL VALVE & EXCITER SIGNAL OUT (5%) MAIN FUEL VALVE SIGNAL OUT (14%) START FUEL VALVE & EXCITER SIGNAL OFF (70%) 90% RPM SWITCH ON READY FOR SERVICE (90% + 1.5 SEC)	START SEQUENCE
○ ○ ○ ○ ○ ○ ○ ○ ○ ○	● ○ ○ ○ ○ ○ ○ ○ ○ ○	● ○ ○ ○ ○ ○ ○ ○ ○ ○	● ● ● ● ○ ○ ○ ○ ○ ○	PROCESSOR BOARD FAILURE SENSOR/DATA FAILURE OVERTEMPERATURE OVERSPEED UNDERSPEED FAILURE TO START LOSS OF SPEED DATA SHORTED THERMOCOUPLE PROBE (WARNING) OPEN THERMOCOUPLE PROCESSOR SEQUENCE FAIL NO TEMP DATA	OPERATION

D145-105-10MTF

Figure 3-1. Decoded APU Bite Information

CONDITION

PROBABLE CAUSE

- b. Faulty starter motor.
 - c. Faulty utility hydraulic system.
 - d. Compressor binding.
- A5. High PTIT during starting:
- a. Incorrect start procedures-Advancing ECL to GROUND before 10% N1 is indicated.
 - b. Air inlet obstructed/FOD.
 - c. Faulty indicating system.
 - d. Low starter motor speed.
 - e. Start fuel solenoid valve stuck open.
 - f. Excess fuel not purged following aborted start.
- A6. Engine will not accelerate to ground idle within 46 seconds:
- a. N1 actuator misrigged.
 - b. Ground idle screw out of adjustment.
 - c. P-3 air line clogged or disconnected.
- A7. Flameout. Engine starts, quits, and N1 falls: Check if fuel PRESS caution lights on.
- a. Main fuel valve closed.
 - b. Main fuel line quick disconnect not connected tightly.
 - c. Main fuel line restricted.
 - d. Faulty fuel control.

CONDITION

PROBABLE CAUSE

- A8. APU precharge pressure cannot be increased to 3,000 psi, when required, by ambient temperature charts in Section V.

Low air precharge in apu accumulator.

TROUBLESHOOTING GUIDE B—INSTRUMENTS

CONDITION

PROBABLE CAUSE

- B1. Maintenance panel hydraulic pressure indicators inoperative with generators on:
 - a. HYD PRESS IND circuit breaker out.
 - b. Faulty wiring.
- B2. No fuel quantity indication at all positions:
 - a. FUELING STATION PWR switch at ON.
 - b. FUEL QTY IND circuit breaker out.
 - c. Faulty indicator.
 - d. Faulty selector switch.
 - e. Faulty transmitter unit.
 - f. Faulty wiring.
- B3. Fuel quantity pointer erratic or static.
 - a. Faulty selector switch circuit or indicator not aligned with tank selected.
 - b. Faulty wiring.
- B4. Indicated total does not equal computed total by ± 420 pounds:
 - a. Fuel quantity system requires calibration.
 - b. Faulty selector switch.
 - c. Faulty tank unit.
- B5. Pilot's or copilot's rotor tachometer indicator inoperative:
 - a. ROTOR TACH circuit breakers out.

CONDITION

PROBABLE CAUSE

- b. Faulty indicator.
 - c. Faulty generator.
 - d. Faulty wiring.
- B6. Greater than 2% split between pilot's and copilot's rotor tachometer indicators:
- a. Faulty indicators.
- B7. No torque indication:
- a. Ac or dc circuit breakers out.
 - b. Faulty wiring.
 - c. Faulty indicator.
 - d. Engine failed.
 - e. Transmission clutch failed.
 - f. Faulty engine torque meter system.
 - g. Faulty power supply.
- B8. Torque indicator erratic. Not function of indicator pointer (i.e., sluggish response, pin wheels, remains above 10% with engines shut down, or fluctuates from high torque to 30%).
- a. Faulty power supply.
 - b. Faulty wiring.
 - c. Align zero adjustment resistor.
- B9. Cruise guide indicator will not move in TEST position.
- a. Circuit breaker out.
 - b. Faulty indicator.
 - c. Faulty wiring.

CONDITION

PROBABLE CAUSE

- B10. Cruise guide indicator moves upscale but not into white "TEST" band.
 - a. Faulty strain gage on flight control link.
 - b. Faulty switch.
 - c. Faulty wiring.
 - d. Faulty indicator.
 - e. Rotors engaged during test.

- B11. CYCLIC TRIM indicator(s) does not indicate lift-off at appropriate airspeed or reposition from GND to 0-60 KTS position on lift-off to hover.
 - a. CYCLIC TRIM switch in MANUAL position.
 - b. Ground proximity switch malfunction.
 - c. Faulty actuator(s).
 - d. Faulty indicator(s).
 - e. Faulty AFCS unit.
 - f. Faulty pitot-static system.
 - g. Pitot line not connected at AFCS unit.

- B12. CYCLIC TRIM indicator(s) does not indicate full EXT at appropriate airspeed or show full EXT early:
 - a. Actuator out of tolerance.
 - b. AFCS malfunction.

CONDITION

PROBABLE CAUSE

- B13. CYCLIC TRIM indicator(s) does not indicate RET at appropriate airspeed or does not RET or indicate GND position:
- a. Faulty speed trim actuator.
 - b. Faulty AFCS unit.
 - c. Faulty wiring.
 - d. AC electrical failure.

TROUBLESHOOTING GUIDE C—ELECTRICAL

CONDITION

PROBABLE CAUSE

- C1. No DC power supplied with BATT switch ON:
 - a. Battery disconnected.
 - b. Faulty battery.
 - c. Faulty battery relay.
 - d. Faulty battery switch.
- C2. Cockpit dome lights inoperative:
 - a. Circuit breaker out.
 - b. Faulty lamps.
 - c. Faulty switch.
 - d. Faulty wiring.
- C3. Cockpit dome lights will not dim:
 - a. Faulty rheostat.
 - b. Faulty wiring.
- C4. Cockpit white dome lights only inoperative:
 - a. Faulty lamps.
 - b. Faulty light selector switch.
 - c. Faulty wiring.
- C5. Utility lights inoperative:
 - a. Circuit breaker out.
 - b. Fault light assembly.
 - c. Faulty wiring.

CONDITION

PROBABLE CAUSE

C6. Instrument floodlights inoperative:

- a. Circuit breaker out.
- b. Faulty lamps.
- c. Faulty instrument floodlight switch.
- d. Faulty wiring.

C7. Jump lights and troop alarm inoperative:

- a. Circuit breaker(s) out.
- b. Faulty jump light relay.
- c. Faulty wiring.
- d. Jump light lamps burned out.

C8. Troop alarm bells inoperative:

- a. Circuit breaker out.
- b. Faulty alarm bell switch.
- c. Faulty wiring.
- d. Faulty alarm bell.

C9. Cabin and ramp lights inoperative:

- a. Circuit breaker out.
- b. Faulty cabin light relay.
- c. Faulty switch.
- d. Faulty wiring.
- e. No power to switched battery bus.

C10. Cabin and ramp lights inoperative in red:

- a. Faulty switch.

CONDITION

PROBABLE CAUSE

- b. Lamps burned out.
- c. Faulty relay.
- d. Faulty wiring.

C11. No power to essential bus:

- a. ESSEN BUS FEEDER circuit breaker out.
- b. Faulty battery switch.
- c. Faulty essential bus relay.
- d. Faulty wiring.

C12. Engine emergency beep inoperative:

- a. EMERG ENG TRIM circuit breaker out.
- b. Faulty actuator.
- c. Faulty emergency trim relay.
- d. Faulty switch.
- e. Faulty wiring.

C13. Generator will not come on line:

- a. Faulty control unit.
- b. Faulty generator.
- c. Faulty wiring.

C14. Windshield anti-ice system inoperative:

- a. Faulty control switch.
- b. Faulty control relay.
- c. Faulty anti-icing controller.
- d. Faulty sensing element.

CONDITION

PROBABLE CAUSE

- e. Faulty heating element.
 - f. Windshield anti-ice ac or dc circuit breaker out.
 - g. Faulty wiring.
- C15. Windshield anti-ice system continues to operate above 45°C:
- a. Faulty anti-icing relay.
 - b. Faulty anti-icing controller.
 - c. Faulty sensing element.
- C16. No pitot and/or sideslip port heat:
- a. Static port heater circuit breaker out.
 - b. Faulty switch.
 - c. Faulty heating elements.
 - d. Faulty wiring.
- C17. Pilot's and/or copilot's searchlight will not come on:
- a. Searchlight circuit breaker out.
 - b. Faulty lamp.
 - c. Faulty SLT-FIL switch.
 - d. Faulty searchlight unit.
 - e. Faulty wiring.
- C18. Pilot's and/or copilot's searchlight will not extend, retract, or rotate right or left:
- a. Searchlight circuit breaker out.
 - b. Faulty searchlight control switch.
 - c. Faulty pilot or copilot SLT cont switch.

CONDITION

PROBABLE CAUSE

- d. Faulty searchlight unit.
 - e. Faulty wiring.
- C19. Top and/or bottom anticollision lights will not come on.
- a. Circuit breaker out.
 - b. Faulty switch.
 - c. Faulty light assembly(s).
 - d. Faulty wiring.
- C20. Position and/or formation lights inoperative:
- a. Circuit breaker out.
 - b. Faulty switch.
 - c. Faulty wiring.
 - d. Lamps burned out.
- C21. Position and/or formation lights will not dim:
- a. Faulty switch.
 - b. Faulty dimming resistor.
 - c. Faulty wiring.
- C22. Instrument lights inoperative:
- a. Circuit breaker out.
 - b. Faulty rheostat.
 - c. Faulty dimming rheostat.
 - d. Faulty wiring.

CONDITION

PROBABLE CAUSE

- C23. Instrument lights will not brighten:
- a. Faulty rheostat.
 - b. Dimming rheostat out of adjustment.
- C24. No emergency floodlights when generator control and battery switches are off:
- a. Pilot's instrument light rheostat off.
 - b. Secondary cockpit lights circuit breaker out.
 - c. Faulty floodlight relay.
 - d. Faulty wiring.
- C25. Fire warning lights do not come on when tested:
- a. Burned out lamps.
 - b. Faulty press to test switch.
 - c. Circuit breaker(s) out.
 - d. Faulty control unit.
 - e. Faulty detection element.
 - f. Faulty wiring.
- C26. Main fuel valve does not close when FIRE CONTROL handle is pulled out:
- a. Faulty T-handle microswitch.
 - b. Faulty valve.
 - c. Faulty wiring.
- C27. Crossfeed valve does not open when switch is placed to on:
- a. Circuit breaker out.

CONDITION

PROBABLE CAUSE

- b. Faulty switch.
 - c. Faulty valve.
 - d. Faulty wiring.
- C28. Pilot's and/or copilot's normal or emergency engine beep trim switches inoperative:
- a. Circuit breaker out.
 - b. Faulty switch.
 - c. Faulty wiring.
 - d. Faulty remote positioning control box.
- C29. While beeping engines to match torque, No. 1 engine beeps up much faster than No. 2, causing an excessive torque split and No. 1 engine must be beeped in the opposite direction to match torques (engine stabilized, torques matched):
- a. Excessive difference in N2 actuator speeds between No. 1 and No. 2 engines.
 - b. Faulty N2 actuator.
 - c. Faulty remote positioning control box.
- C30. Excessive engine/torque split during power changes:
- a. Improperly rigged N2 system.
 - b. Faulty N2 actuator.
 - c. Faulty indicator.
 - d. Faulty fuel control.
 - e. Faulty torque transmitter.
- C31. Generators come off line earlier than predetermined time and/or prior to desired rotor rpm:
- Faulty generator control unit.

CONDITION

PROBABLE CAUSE

C32. Heater does not light off within 10 seconds:

- a. Igniter plug fouled.
- b. Igniter fuse blown.

Faulty igniter. (Vibrator contact failure -
Select RESERVE.)

- d. Faulty fuel system.

C33. Heater inoperative (blower operates):

- a. Circuit breaker out.
- b. Faulty air pressure switch.
- c. Faulty ignition system (igniters).
- d. Faulty fuel system.
- e. Faulty heater control switch.

C34. Blower stops when heater is turned off:

- a. Faulty blower overrun switch.
- b. No combustion in heater.

C35. PRESS-TO-TEST light inoperative.

- a. Circuit breaker out.
- b. Faulty bulb.
- c. Faulty wiring.

C36. Bypass door opens but light is off.

- a. Limit switch out of adjustment.
- b. Limit switch is defective.
- c. Faulty bulb.
- d. Faulty wiring.

C37. Bypass doors will not open.

- a. Faulty actuator.
- b. Limit switch shorted out.
- c. Faulty wiring.

CONDITION

PROBABLE CAUSE

C38. Ramp/ramp door does not open using RAMP EMER switch.

- a. Circuit breaker out.
- b. Faulty down solenoid on ramp control valve.
- c. Faulty wiring.
- d. Faulty RAMP EMER switch.

C39. Ramp/ramp door does not close using RAMP EMER switch.

- a. Circuit breaker out.
- b. Faulty up solenoid on ramp control valve.
- c. Faulty wiring.
- d. Faulty RAMP EMER switch.

TROUBLESHOOTING GUIDE D — CAUTION PANEL

CONDITION

PROBABLE CAUSE

- D1. **MASTER CAUTION panel lights inoperative:**
 - a. BATT switch OFF.
 - b. Caution lights circuit breaker out.
 - c. Faulty caution panel.
 - d. Faulty wiring.
- D2. **MASTER CAUTION lights do not come on when TEST switch is pressed:**
 - a. Faulty test switch.
 - b. Faulty caution panel.
 - c. Faulty wiring.
- D3. **MASTER CAUTION light will not cancel when RESET:**
 - a. Faulty master caution light.
 - b. Master caution light sticking in panel.
 - c. Faulty wiring.
- D4. **MASTER CAUTION lights do not dim:**
 - a. Faulty dim switch.
 - b. Faulty dimming relay.
 - c. Faulty caution panel.
 - d. Faulty wiring.
 - e. Dome light switch in white position.

CONDITION

PROBABLE CAUSE

- D5. When dome light switch is set to thie (caution lights dimmed), the caution lights do not go to bright:
 - a. Faulty dimming lockout relay.
 - b. Faulty wiring.
- D6. PARK BRAKE ON caution light does not come on when brakes a re set:
 - a. Rod incorrectly rigged.
 - b. Faulty microswitch.
- D7. Hydraulic boost off (HYD FLT CONTR NO. 1 or NO. 2) caution light does not come on with low pressure in the system:
 - a. Faulty pressure switch.
 - b. Faulty wiring.
 - c. Faulty caution panel.
- D8. Hydraulic boost off (HYD FLT CONTR NO. 1 or NO. 2) caution light on with system pressurized:
 - a. Faulty pressure switch.
 - b. Faulty wiring.
 - c. Faulty caution panel.
- D9. Left or right fuel pressure (L or R FUEL PRESS) caution light does not go out with fuel pumps on:
 - a. Circuit breaker out.
 - b. Faulty pressure switch.
 - c. Faulty fuel pump.
 - d. Faulty wiring.
 - e. Faulty caution panel.

CONDITION

PROBABLE CAUSE

- D10. With crossfeed switch open and left or right fuel pumps on, only the L or R FUEL PRESS caution light for the pumps turned on goes out:
 - a. Circuit breaker out.
 - b. Faulty crossfeed valve.
 - c. Faulty caution panel.
 - d. Faulty wiring.
 - e. Faulty pressure switch.

- D11. NO. 1 or NO. 2 ENG N1 CONT caution light does not come out when engine condition lever is moved out of detent.
 - a. Circuit breaker out.
 - b. Faulty caution panel.
 - c. Faulty control box.
 - d. Faulty actuator.
 - e. Faulty wiring.

- D12. NO. 1 or NO. 2 ENG N1 CONT caution light stays on when engine condition lever is in detent.
 - a. Faulty wiring.
 - b. Faulty actuator.
 - c. Faulty control box.

- D13. NO. 1 or NO. 2 ENG N1 CONT caution light flashes on and off as the engine condition lever is moved between detent positions.
 - a. Actuator mechanical linkage obstruction.
 - b. Gas producer control actuator faulty.

CONDITION

PROBABLE CAUSE

- D14. NO. 1 or NO. 2 GEN OFF, caution light on and NO. 1 or NO. 2 RECT OFF caution light on:
 - a. Circuit breaker out.
 - b. Faulty bus-tie relay.
 - c. Faulty reverse current relay.
 - d. Faulty wiring.
- D15. NO. 1 or NO. 2 RECT OFF caution light on.
 - a. Circuit breaker out.
 - b. Faulty reverse current relay.
 - c. Faulty transformer/rectifier.
 - d. Faulty wiring.
- D16. Fuel pressure (L or R FUEL PRESS) caution lights do not come on when all fuel pumps are turned off and engines are operating.
 - a. Circuit breaker out.
 - b. Lamps burned out.
 - c. Faulty caution panel.
 - d. Faulty pressure switches.
 - e. Faulty wiring.
- D17. PWR STEER caution light comes on when wheel is in normal travel range:
 - a. Faulty out-of-phase switch.
 - b. Faulty caution panel.
 - c. Failure in control system.

CONDITION

PROBABLE CAUSE

- D18. NO. 1 AFCS OFF and/or NO. 2 AFCS OFF caution lights do not go out with AFCS emgaged:
 - a. Circuit breaker out (AC/DC).
 - b. Faulty caution panel.
 - c. Faulty flight boost pressure switch.
 - d. Faulty AFCS computer.

- D19. NO. 1 AFCS OFF caution light does not come on when selector switch is set in NO 2 ON pision:
 - a. Faulty caution panel capsule.
 - b. Faulty selector switch.
 - c. AFCS unit disconnected or faulty.

- D20. NO. 1 AFCS OFF or NO. 2 AFCS OFF caution light on wish AFCS selector switch in BOTH:
 - a. Faulty flight boost system (below 2000 psi).
 - b. Faulty flight boost pressure switch.
 - c. Faulty AFCS computer.
 - d. Faulty caution panel.

- D21. NO. 2 AFCS OFF caution light does not come on when selector switch is set in NO. 1 ON position:
 - a. Faulty caution panel capsule.
 - b. Faulty selector switch.
 - c. AFCS computer disconnected or faulty.

TROUBLESHOOTING GUIDE E—POWERPLANT

CONDITION

PROBABLE CAUSE

- E1. No engine oil pressure.
 - a. Circuit breaker out.
 - b. Transmitter disconnected.
 - c. Faulty transmitter.
 - d. Faulty indicator.
 - e. Clogged pressure line or F fitting filter.
 - f. Faulty wiring.
- E2. Engine oil pressure gage reads in opposite direction:
 - a. Engine oil pressure gage line connected to vent port.
 - b. Faulty wiring.
- E3. During No. 1 start, No. 2 engine oil pressure indicator reads normal but No. 1 does not:
Indicator connectors reversed.
- E4. Engine oil pressure below 20 psi.
 - a. Faulty transmitter.
 - b. Faulty indicator.
 - c. Clogged oil filter (No. 2 bearing).
 - d. Incorrect oil pump relief valve pressure setting.
- E5. No engine oil temperature indication:
 - a. Circuit breaker out.
 - b. Faulty indicator.
 - c. Faulty temperature bulb.

CONDITION

PROBABLE CAUSE

- E6. Engine oil temperature indicator, pointer swings abruptly against upper stop:
 - a. Faulty or open temperature sensing bulb.
 - b. Faulty indicator.
- E7. Erratic engine oil temperature indications:
 - Intermittent short or open circuit in wiring, temperature bulb, or indicator.
- E8. Engine will not accelerate from ground idle to flight:
 - a. N1 actuator faulty.
 - b. Faulty control box.
 - c. Faulty P-3 air system.
 - d. Faulty fuel control.
 - e. Faulty wiring.
- E9. Engine oil pressure fluctuates in excess of ± 5 psi:
 - a. Faulty indicator.
 - b. Faulty pressure transmitter.
 - c. Main oil filter bypass button out.
 - d. Faulty oil pump.
- (0)E10. Engine anti-ice switch on, no decrease in N1 and no rise in ptit. Flight engineer check for valve activation by feel, etc.
 - a. Faulty switch.
 - b. Faulty valve(s).
 - c. System blocked.

CONDITION

PROBABLE CAUSE

- E11. Droop greater than $\pm 2\%$.
 - a. Droop potentiometers improperly adjusted.
 - b. Faulty droop potentiometers.
 - c. Engine N2 actuator improperly rigged.
- E12. Minimum beep does not reach required rpm:
 - a. Minimum beep trim resistor out of adjustment.
 - b. Engine N2 actuator improperly rigged.
- E13. Unable to adjust minimum beep:
 - a. N2 engine controls improperly rigged.
 - b. Minimum beep trim resistor faulty.
 - c. Fuel control minimum N2 stop set too high.
- E14. Low engine oil pressure (ECL's flight):
 - a. Faulty indicator.
 - b. Faulty transmitter.
 - c. Oil pump out of adjustment.
 - d. Clogged oil line(s).
 - e. Main oil filter bypass button out.
 - f. Internal oil leak in engine.

TROUBLESHOOTING GUIDE F—POWERTRAIN

CONDITION

PROBABLE CAUSE

- F1. Transmission oil pressure indicating system inoperative:
 - a. Circuit breaker out.
 - b. Faulty selector switch.
 - c. Faulty indicator.
 - d. Faulty pressure transmitter.
 - e. Faulty wiring.
- F2. Transmission oil pressure does not indicate above 7 psi during start.
 - a. Faulty pressure transducer.
 - b. Faulty indicator.
 - c. Faulty wiring.
 - d. Low service level.
- F3. Indicator goes to 0 when selecting one individual transmission:
 - a. SCAN selector switch set midway between selections.
 - b. Faulty transducer.
 - c. Faulty wiring.
- F4. Pressure on low individual indication exceeds the ± 3 psi of scan indication:
 - a. Faulty indicator.
 - b. Faulty selector switch.
 - c. Faulty pressure transmitter.

CONDITION

PROBABLE CAUSE

- F5. Indicator does not move when selecting the test position:
 - a. Faulty pressure transducer.
 - b. Faulty switch.
 - c. Faulty indicator.
- F6. Transmission oil pressure reading too high or too low:
 - a. Faulty pressure transducer.
 - b. Faulty selector switch.
 - c. Faulty wiring.
 - d. Faulty indicator.
- F7. Fluctuation is more than $\pm 10\%$ of actual reading
 - a. Faulty pressure transducer.
 - b. Faulty pressure relief valve.
 - c. Faulty wiring.
- F8. Transmission oil temperature indicating system inoperative:
 - a. Circuit breaker out.
 - b. Faulty indicator.
 - c. Faulty selector switch.
 - d. Faulty wiring.
- F9. Transmission oil temperature indication too high or too low :
 - a. Faulty temperature bulb.
 - b. Faulty selector switch.

CONDITION

PROBABLE CAUSE

- c. Faulty wiring.
 - d. Low service level.
 - e. Faulty oil cooler bypass valve.
 - f. Obstructed oil cooler (temperature too high).
- F10. One transmission oil temperature does not indicate when selected:
- a. Faulty indicator.
 - b. Faulty temperature bulb.
 - c. Faulty selector switch.
 - d. Faulty wiring.
- F11. Temperature indication of highest transmission selected exceeds $\pm 5^\circ$ of seen indication:
- a. Faulty indicator.
 - b. Faulty temperature bulb.
 - c. Faulty selector switch.
 - d. Faulty wiring.
- F12. With selector switch in the test position, the indicator moves toward but not below -70°C .
- Faulty selector switch.
- F13. Maintenance panel magnetic indicator does not trip when gnd test switch is set to TEST.
- a. Circuit breaker out.
 - b. Faulty indicator.

CONDITION

PROBABLE CAUSE

- c. Faulty test diode.
- d. Faulty test switch.
- e. Faulty wiring.

F14. Maintenance panel magnetic indicator(s) do not reset when gnd test switch is set to RESET.

- a. Indicated fault may be real — Check associated sensor.
- b. Circuit breaker out.
- c. Faulty indicator.
- d. Faulty test diode.
- e. Faulty test switch.
- f. Faulty wiring.

TROUBLESHOOTING GUIDE G—HYDRAULIC

CONDITION

PROBABLE CAUSE

GENERAL. Verify any MASTER CAUTION panel hydraulic faults with the maintenance panel for actual pressure indications. The panel can also be used to confirm proper system servicing and pump condition.

- G1. UTIL HYD SYS caution light does not go out and indicator does not increase to normal operating range within 30 seconds after apu start.
 - a. Faulty hydraulic pump motor.
 - b. Reservoir fluid level low.
 - c. Air in system.
 - d. Faulty or low precharged utility reservoir "boot strap" accumulator.

- G2. Both HYD FLT CONTR caution lights do not go out within 30 seconds after POWER XFR switches are set to ON.
 - a. Faulty APU hydraulic pump motor. (Check for proper 3,000 psi output.)
 - b. Faulty PTU valve.
 - c. Faulty solenoid valve.
 - d. Faulty utility hydraulic isolate relay.

- G3. NO. 1 or NO. 2 HYD FLT CONTR caution lights are on and maintenance panel indicators show normal pressure. Crosscheck evidence of pressure with corresponding AFCS OFF caution lights.
 - a. Faulty pressure switch.
 - b. Faulty wiring.

CONDITION

PROBABLE CAUSE

- G4. NO. 1 or NO. 2 FLIGHT BOOST caution light on and maintenance panel indicator confirms low pressure (rotors turning).
- Faulty flight control pump. Check maintenance panel pump and filter lights.
- G5. NO. 1 or NO. 2 FLIGHT BOOST pressure indicators show a high pressure indication.
- Faulty pressure transmitter.
 - Faulty flight control pump.
- G6. UTIL HYD SYS caution light on. (Check utility pressure gage on maintenance panel for pressure indication.)
- Faulty utility hydraulic motor pump (if both indicators have low pressure).
- G7. Utility hydraulic system indicator pressure high. (Check APU start accumulator gage.)
- Faulty utility hydraulic motor pump.
 - Faulty pressure transmitter.
- G8. Fluctuating hydraulic pressure indicator:
- Faulty indicator.
 - Faulty pressure transmitter.
 - Faulty wiring.
 - Trapped air in the system.
 - Faulty APU motor pump (with APU running).
 - Low service level (high fluid temperature).
 - Faulty utility pump. (If rotors are running.)

CONDITION

PROBABLE CAUSE

- G9. Parking brakes will not release: PARK BRAKE ON caution light remains on.
- Faulty parking brake valve or improperly adjusted.
- G10. Parking brake will not lock:
- Improperly adjusted rod.
 - Faulty parking brake valve.
 - Leak in system.
- G11. Swivel locks do not operate:
- Faulty swivel lock manifold solenoid valve.
 - Faulty swivel lock actuator assembly.
 - Low precharge pressure in swivel lock accumulator.
 - Faulty wiring.
- G12. HYD FLT CONT caution light for opposite system does not illuminate when NO. 1 or NO. 2 is selected. (Flight boost hydraulic indicator pressure remains at 2500 to 3200 psi when system is OFF.)
- Pressure in other system is low.
 - Faulty pressure switch.
 - Faulty solenoid valve or pressure operated valve in power control module.
 - Faulty wiring.
- G13. NO. 1 or NO. 2 HYD FLT CONT caution lights remain on 5 seconds after switch is turned on:
- Faulty switch.
 - Faulty module.

CONDITION

PROBABLE CAUSE

- c. Faulty wiring.
- d. Faulty pump.

G14. One or more wheel brakes will not engage, or brake pedal(s) spongy:

- a. Air in system.
- b. Faulty transfer valve.
- c. Faulty master cylinders.
- d. Fluid leakage.
- e. Faulty brakes.

G15. Excessive force needed to apply brakes:

- a. Faulty master cylinder.
- b. Faulty transfer valve.
- c. Faulty pressure reducer valve.
- d. Faulty parking brake valve.

G16. Power steering fails to operate:

- a. Faulty power steering module.
- b. Faulty wiring.
- c. Faulty steering actuator.
- d. Swivel lock switch in the lock or unlock position.
- e. Faulty power steering control box.

G17. Power steering system does not operate within normal limits:

- a. Trapped air in the system.
- b. Zero trimpot out of adjustment.

CONDITION

PROBABLE CAUSE

- c. Improper rigging.
 - d. Faulty power steering actuator assembly.
 - e. Faulty wiring.
 - f. Faulty power steering control box.
- G18. Wheels will not center with swivel locks locked:
- a. Faulty centering cam.
 - b. Faulty power steering module.
- G19. Aircraft deviation exceeds 10° with swivel locks released. (Check tolerance with swivels locked to eliminate steps a. and b. as probable factors.)
- a. Struts uneven.
 - b. Tire pressure uneven.
 - c. Power steering improperly adjusted.
 - d. Faulty power steering actuator.
 - e. Crosswind component.
- G20. Aircraft deviation exceeds 5° with swivel locks locked:
- a. Struts uneven.
 - b. Tire pressure uneven.
 - c. Swivel locks not locked.
 - d. Crosswind component.

CONDITION

PROBABLE CAUSE

G21. Utility and/or flight boost hydraulic system overheats.

- a. Hydraulic cooler air inlet or outlet obstructed.
- b. Hydraulic cooler fan inoperative.
- c. Faulty pump.
- d. Excessive internal leakage in system component.

G22. Ramp/ramp door will not open and/or close.

- a. Circuit breaker out.
- b. Faulty ramp control valve.
- c. Faulty wiring.
- d. Faulty RAMP PWR switch.

TROUBLESHOOTING GUIDE H—FLIGHT CONTROLS

CONDITION

PROBABLE CAUSE

- H1. Cockpit flight controls immovable:**
 - a. No pressure in either flight control hydraulic system.
 - b. Rigging pins installed.
 - c. Obstructions in the cockpit control linkage or the cockpit transfer bellcranks.
- H2. Thrust control requires excessive force to move:**
 - a. Faulty thrust brake trigger switch.
 - b. Faulty thrust cockpit controlled driver actuator.
- H3. Binding in-flight controls:**
 - a. Improper rigging.
 - b. Low hydraulic pressure.
 - c. Binding in controls below ILCA.
 - d. Faulty ilca.
 - e. Loose bolts.
- H4. Noise when moving controls:**
 - a. Faulty bearing(s).
 - b. Bent connecting link.
 - c. Distorted bellcrank.
 - d. Broken support.
- H5. Control movements are binding or jump:**
 - a. Fluctuating hydraulic pressure.

CONDITION

PROBABLE CAUSE

- b. Faulty actuating cylinder (high value friction).
 - c. Binding at rotary-wing head controls.
- H6. Control centering will not hold:
- a. Faulty magnetic brake or cockpit control driver actuator.
 - b. Circuit breaker out.
 - c. Faulty centering spring.
 - d. Control centering improperly rigged (extreme travel positions).
- H7. Control system will not stay displaced:
- a. Magnetic brakes inoperative.
 - b. Balance springs defective.
- H8. Control travel incorrect:
- a. Bent, distorted, or broken component.
 - b. Improperly adjusted stops.
- H9. Thrust detent improper position:
Thrust detent stop improperly rigged.
- H10. Improper breakout forces:
- a. Improperly set balance springs.
 - b. Binding in controls.
 - c. Improper spring installed.
- H11. Excessive control displacement:
- a. Aircraft incorrectly rigged.

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CONDITION

PROBABLE CAUSE

- b. AFCS engagement error. (Verify with AFCS OFF.)
- H12. Longitudinal stick position is out of tolerance:
- a. Aircraft improperly rigged.
 - b. DASH actuator not set at 36 inch.
 - c. Longitudinal control position transducer (cpt) improperly adjusted.
 - d. Proximity switch failure.
 - e. Pitch change links improperly adjusted.
- H13. Lateral stick position out of tolerance during into-the-wind hover:
Aircraft improperly rigged.
- H14. Excessive pedal split:
- a. Aircraft improperly rigged.
 - b. AFCS engagement error in yaw ILCA or AFCS malfunction. (Verify with AFCS OFF.)
 - c. Improperly positioned pedal adjustment.
- H15. Autorotation RPM high or low. (Refer to Section V.):
- a. Aircraft improperly rigged.
 - b. Pitch links improperly set.
 - c. Test conducted outside of gross weight tolerance band.
 - d. Test conducted outside of specified airspeed tolerance band.
- H16. Either AFCS OFF caution light does not go out within 20 seconds:
- a. Dash actuator failure.
 - b. Associated AFCS unit failure.
 - c. Proximity switch failure.

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TROUBLESHOOTING GUIDE I —VIBRATIONS

CONDITION

PROBABLE CAUSE

11. 1/Rev vertical vibration:
 - a. Blades out of track.
 - b. Pitch link bearing worn.
 - c. Loose or binding horizontal pin bearing.
 - d. Faulty blade.
12. 1/Rev lateral vibration:
 - a. Unbalanced condition caused by combination of new and eroded blades.
 - b. Blades out of track (aft).
 - c. Unbalanced condition in rotor system.
 - d. Vibrex weights incorrect.
13. 3/Rev vibration:
 - a. Feedback from upper boost actuators (only if bearings are loose).
 - b. Excessive looseness in rod end bearings.
 - c. Loose heavy dynamic component such as forward transmission, aft vertical shaft, combining transmission, or rotary-wing heads.
14. Excessive 3/rev vibrations:
 - a. STVA circuit breaker out.
 - b. Faulty STVA system.
15. High frequency vibration:
 - a. Faulty flight boost pump.
 - b. Faulty generator.

CONDITION

PROBABLE CAUSE

- c. Faulty transmission cooler fan.
 - d. Faulty sync shaft hanger bearings.
16. High frequency (engine drive shaft area) vibration:
- a. Engine drive shaft spline worn, frozen. or improperly lubricated.
 - b. Faulty engine mounts.
 - c. Combining transmission input bearing.

TROUBLESHOOTING GUIDE J—COMMUNICATIONS/NAVIGATION EQUIPMENT

CONDITION

PROBABLE CAUSE

- J1. No interphone:
 - a. Faulty interphone control box.
 - b. Faulty headset.
 - c. Control box switches off.
 - d. Circuit breaker out.
- J2. UHF radio inoperative:
 - a. Faulty radio set.
 - b. Faulty wiring.
 - c. UHF radio circuit breaker out.
- J3. VGI will not erect:
 - a. Circuit breaker out.
 - b. Faulty indicator.
 - c. Faulty gyro.
- J4. Altimeter error in excess of ± 70 feet:
 - a. Altimeter set wrong.
 - b. Static ports blocked.
 - c. Faulty altimeter.
- J5. Radar altimeter error in excess of ± 5 foot.
 - a. Faulty altimeter (pilot's).
 - b. Faulty antenna.
 - c. Slingload reflecting signal.

CONDITION

PROBABLE CAUSE

- J6. Pointer indicates incorrectly (airspeed and vertical velocity indicators and/or pressure altimeter):
 - a. Moisture in pitot-static lines.
 - b. Damaged pitot-static lines.
 - c. Obstructed pitot-static lines.
 - d. Indicator not properly connected to pitot-static system.
 - e. Faulty indicator.
- J7. Airspeed indicator fluctuates excessively or greater than 7 knot difference between pilot's and copilot's indicator:
 - a. Faulty indicator.
 - b. Leak in pitot-static lines.
- J8. Turn and slip indicator inoperative:
 - a. Circuit breaker out.
 - b. Faulty indicator.
- J9. Excessive error in gyro compass:
 - a. Improper compensation.
 - b. Abnormal magnetic influence.
 - c. Faulty flux valve.
 - d. Faulty gyro.
 - e. Faulty HSI.
- J10. VHF-AM/FM radio inoperative:
 - a. Circuit breaker out.

CONDITION

PROBABLE CAUSE

- b. Faulty radio set.
 - c. Faulty antenna.
- J11. FM homing will not center, always gives full right or left deflection:
- a. Faulty antenna.
 - b. Faulty signal comparator.
 - c. Faulty quadrature hybrid (homing module).
 - d. Faulty receiver.
- J12. HSI compass card will not hold sync:
- a. Faulty control.
 - b. Faulty gyro.
 - c. Faulty flux valve.
 - d. Faulty indicator.
- J13. VOR course deviation indicator does not give 10° sweep:
- a. Receiver requires adjustment.
 - b. Faulty indicator.
- J14. ADF will not home.
- a. Circuit breaker out.
 - b. Faulty receiver.
- J15. Marker beacon functions inoperative:
- a. VOR circuit breaker out.
 - b. Faulty MB SENS switch.

CONDITION

PROBABLE CAUSE

- c. Faulty AN/ARN-123 receiver.
- d. Faulty control panel.

J16. VOR inoperative:

- a. VOR circuit breaker(s) out.
- b. Faulty AN/ARN-123 receiver.
- c. Faulty antenna.
- d. Faulty control panel.

J17. Transponder inoperative:

- a. Circuit breaker out.
- b. Faulty fuse.
- c. Faulty transponder.

J18. Radar warning system inoperative:

- a. RADAR WARN circuit breaker out.
- b. Defective antenna(s).
- c. Defective indicator.
- d. Defective comparator.
- e. Defective control.
- f. Defective receiver.

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- J19. HF 1,000 cps tone is not heard when radio trigger switch is pressed:
- a. Microphone or trigger switch defective.
 - b. Receiver-transmitter improperly tuned.
 - c. Antenna coupler is defective.
- J20. No HF background noise heard in headset:
- a. RF SENS knob fails to control volume.
 - b. Communication panel controls are improperly set.
 - c. Power source or connections are defective.
 - d. Defective headset.
- J21. HF radio channel interference after desired frequency has been set:
- a. Interconnecting cabling or connector is defective.
 - b. Frequency set knobs are defective.
 - c. Tuning circuits in receiver-transmitter are defective.
- J22. Doppler left display does not indicate GO after 15 seconds with MODE select switch at TEST:
- a. Right display is P (pitch or roll data in error/or missing)—Check copilot attitude gyro warning flag and AFCS 1 caution light on.
 - b. Right display is MN or NG—Recycle MODE select switch to OFF then TEST and note nature of malfunction from display codes in Chapter 3 of TM 55-1520-240-10.
- J23. Doppler left display indicates EN during LAMP TEST following interruption of power to unit:
- a. Dry cell battery has insufficient voltage to retain previously entered data.
 - b. Re-enter present position, spheroid/variation and destination.

J24. Doppler MEM and/or MAL indicator lamps fail to light with MODE switch at LAMP TEST:

- a. Unit is powered and other displays are lighted.
- b. Defective indicator lamp.
- c. Faulty computer-display (CDU).

J25. Doppler MAL and MEM indicator lamps light in TEST MODE:

- a. Pitch, roll, or magnetic heading missing or in error.
- b. Signal converter faulty.

J26. GPS Control Display Unit (CDU) C-1 1702/UR, when in TEST mode, does not display TEST IN PROG on display line 1, after one (1) minute:

Replace CDU C-11702/UR.

J27. Display line 1 of GPS Control Display Unit (CDU) C-11702/UR displays anything but TEST COMPLETE, after four (4) minutes of turning MODE switch of CDU to TEST:

- a. Replace Receiver R-2400()/A - CDU display line 2 reads RCV.
- b. Replace Control Display Unit (CDU) C-11702/UR - CDU display line 2 reads CDU 1.
- c. Replace Antenna Amplifier AM-7314/URN - CDU display line 2 reads AE.
- d. Memory Batteries in Radio Receiver R-2400()/A are low - CDU display line 2 reads BT1.

J28. GPS system - Four (4) satellites (SAT) are not being tracked and estimated position error (EPE) less than 50 meters (MI with keys loaded or less than 200 meters (M) with a cold start cannot be attained after Start-Up:

- a. Replace Fixed Reception Pattern (FRPA-3) Antenna, AS-38221URN.
- b. Troubleshoot/repair aircraft antenna cables.

J29. Data Display lighting on GPS Control Display Unit (CDU) C-11702/UR does not vary with CDU BRT (Brightness) control rotation:

Replace CDU C-117021UR.

J30. Panel lighting on GPS CDU C-1 1702/UR does not vary with aircraft dimmer control:

- a. Replace CDU C-117021UR.
- b. Faulty aircraft wiring.

J31. GPS Alert light is always illuminated:

a. The Threshold value on the Mission (MSN) page may be set too low --
Check.

- b. Radio Receiver R-2400()/A is defective.
- c. The GPS Alert light is defective - Check for a short to ground.
- d. Faulty aircraft wiring.

J32. GPS system fails to zeroize loaded keys:

- a. Radio Receiver R-2400()/A is defective.
- b. GPS zeroize switch is defective.
- c. Faulty aircraft wiring.

J33. GPS system does not accept KYK-13 key load:

- a. Try a different KYK-13 key loader.
- b. Radio Receiver R-2400()/A is defective.
- c. Faulty aircraft wiring.
- d. Defective receptacle.

J34. GPS system does not accept Data Loader fill:

- a. Try a different Data Loader Module.
- b. Radio Receiver R-2400()/A is defective.
- c. Faulty aircraft wiring.
- d. Data Loader receptacle defective.

J35. No Audio Voice Warning Message heard in Pilot Copilot, or Flight Engineer/Hoist Operator's headset when altimeter pointer is below or above preset altitude limits (pilot's):

- a. Audio absent in all above mentioned headsets:
 - (1) Faulty altimeter (pilot's).
 - (2) Check Terminal Board TB4, Block 9.
 - (3) Check wire between Terminal Board TB4, Block 9 and 195P2 (pilot's radar altimeter connector).

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b. Audio Present in at least one of the headsets:

- (1) Faulty ICS panel(s).
- (2) Check wiring between Terminal Board TB4, Block 9, and affected ICS panel(s)/Interphone Stations.
- (3) Check Terminal Board TB4, Block 9.

J-36. Audio Voice Warning Message volume does not fluctuate when PRESS-TO-TEST knob is depressed on altimeter (pilot's):

Faulty altimeter (pilot's).

J37. DGNS Mode Switch to TEST GO ALL not Displayed:

a. If GO P:

- (1) Defective vertical gyro.
- (2) Faulty aircraft wiring.

b. If NG:

- (1) Defective CDU.
- (2) Defective SDC power supply.

c. If DN:

- (1) GPS failed, Doppler can be used for navigation.
- (2) Replace SDC.
- (3) Replace CDU.

d. If GN:

- (1) Doppler failed. GPS can be used for navigation.
- (2) Replace SDC.
- (3) Replace CDU.

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J38. DGNS data display lighting does not vary with BRT and DIM controls:

- a. Replace CDU.
- b. Faulty aircraft wiring.

J39. DGNS functions Inoperative:

- a. Replace CDU.
- b. Replace SDC.
- c. Faulty aircraft wiring.
- d. Replace Antenna.

J40. DGNS system fails to zeroize:

- a. Replace CDU.
- b. Replace SDC.
- c. Zeroize switch defective.
- d. Faulty aircraft wiring

J41. No characters displayed on HF Radio Display:

- a. Circuit breaker(s) out.
- b. Radio function switch is OFF.
- c. Faulty wiring.

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J42 HF Radio circuit breaker does not remain pressed:

- a. Faulty Power Amplifier Coupler.
- b. Faulty Control Display Unit.
- c. Faulty Receiver/Transmitter.
- d. Faulty wiring.

J53. “SYSTEM-NO GO RT-CDU COMM FAIL” displayed during Power-up Bit (P-Bit):

- a. Faulty wiring.

J44. “SYSTEM-NO GO” displayed upon completion of P-Bit.

- a. Keys or data not loaded for a particular mode of operation.
- b. Faulty HF Radio system component: Set function switch to STBY, press INOP line-select switch, and press LRU line-select switch to acquire failed component listing.

J46. Radio control displays ‘CDU FAIL’:

- a. Faulty control display unit.
- b. Faulty wiring.

J46. Radio control displays ‘RT FAIL’:

- a. Faulty receiver/transmitter.
- b. Faulty wiring.

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J47. “LOAD FAIL” displayed during Keyfill:

- a. Fill device improperly connected to key fill port.
- b. Fill &vice not enabled.
- c. HF Radio component failure. Perform BIT test to determine failed component.
- d. Fill connectors improperly connected between CDU and RT.
- e. Faulty wiring

J48. “COPY FAIL” displayed during Datafill:

- a. Fill device improperly connected to key fill port.
- b. Fill device not enabled.
- c. HF Radio component failure. Perform BIT test to determine failed component.

J49. KY-100 does not turn on.

- a. Circuit breaker out.
- b. Faulty Z-AVH control.
- c. Faulty main processor.
- d. Faulty wiring.

J50. “DEV ERR” displayed and a fail tone heard In headset when loading KY-100.

- a. Fill device not connected properly.
- b. Fill &vice not configured properly.

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J51. KY-100 key loading unsuccessful.

- a. Faulty Z-AVH control.
- b. Faulty main processor.

J52. HF radio displays a fault advisory during operation:

- a. Faulty HF radio set component. Perform BIT check to locate failed component.

J53. HF radio displays “INOP MODES EXST”:

- a. Keys or data for that mode not loaded.
- b. Faulty component. Press LRU line-select switch to locate failed component.

J54. HF radio displays “MAN - INOP”:

- a. Faulty HF radio set component. In STBY, press INOP line-select switch, then press LRU line-select switch to identify failed component.

J55. HF radio displays “PRE - NO DATA”:

- a. No preset data loaded.

J56. Plaintext communication not received/transmitted:

- a. CT ONLY mode selected.
- b. Faulty ARC-220 receiver/transmitter.
- c. Faulty KY-100 main processor.
- d. Faulty wiring.
- e. Faulty ARC-220 Power Amplifier Coupler.

J57. HF radio displays “CHANNEL INOP”:

- a. Propagation condition may not allow communications on channel selected.
- b. Faulty component. Perform BIT check to locate failed component.

J58. Excessive background noise in headset:

- a. Squelch not set properly
- b. Faulty antenna.
- c. Faulty ARC-220 Antenna Interface Adapter.
- d. Faulty ARC-220 Power Amplifier Coupler.
- e. Faulty HF receiver/transmitter.
- f. Faulty KY-100 main processor.
- g. Faulty wiring.

J59. Cipher-text messages not received/transmitted-plaintext is received/transmitted.

- a. Mode switch still in PT position
- b. KY-100 not configured properly.
- c. Faulty KY-100 main processor.
- d. Faulty wiring.

J60. HF radio displays “ALE - NO DATA”:

- a. No ALE data loaded.

J61. HF radio displays “ALE - NO KEYS”:

- a. No ALE keys loaded.

J62. HF radio displays “ECCM - NO DATA”:

- a. No ECCM data loaded.

J63. HF radio displays “ECCM - NO KEYS”:

- a. No ECCM keys loaded.

J64. “ZEROIZED” advisory not displayed.

- a. Faulty receiver/transmitter.
- b. Faulty control display unit.
- c. Faulty wiring.

**J65. “ZEROED” not displayed nor a tone heard.
(CAUTION: KY-100 encryption keys are still
loaded, handle as classified).**

- a. Faulty Z-AVH control.
- b. Faulty main processor.
- c. Faulty wiring.

TROUBLESHOOTING GUIDE K—AFCS AND CYCLIC TRIM

CONDITION

PROBABLE CAUSE

- K1. NO. 1 and/or NO. 2 AFCS OFF caution panel light on:
 - a. Circuit breaker(s) out.
 - b. Hydraulic pressure low.
 - c. Faulty AFCS solenoid valve.
 - d. Vertical gyro invalid.
 - e. Faulty AFCS unit or panel switch.
 - f. Vertical gyro interlock relay malfunction.
- K2. No. 1 AFCS or No. 2 AFCS system fails to respond normally, no AFCS OFF caution panel light on:
 - a. Faulty caution panel.
 - b. Faulty AFCS solenoid valve.
- K3. CYCLIC TRIM indicators not in GND position.
 - a. CYCLIC TRIM in MANUAL position.
 - b. Proximity switch activated by excessive nosedown attitude (light on aft gear).
 - c. Ground proximity switch malfunction.
 - d. AFCS malfunction.
- K4. CYCLIC TRIM indicators stay in GND position:
 - a. Ground proximity malfunction (both gear).
 - b. CYCLIC TRIM in MANUAL position.

- K5. Pitch attitude hold inoperative:
 - a. AFCS malfunction (DASH).
 - b. DASH actuator malfunction.
 - c. Hover longitudinal position out of tolerance.
 - d. Vertical gyro malfunction.

- K6. Pitch attitude return oscillatory (more than one and one-half residual oscillations):
 - a. Longitudinal ILCA malfunction.
 - b. Faulty AFCS unit.
 - c. Vertical gyro malfunction.
 - d. Ground proximity switch malfunction.

- K7. Pitch beep inoperative:
 - a. Defective beep switch.
 - b. Longitudinal CCDA malfunction.

- K8. Roll attitude hold inoperative:
 - a. Control centering not holding.
 - b. Vertical gyro malfunction.
 - c. AFCS malfunction.
 - d. Lateral ILCA malfunction.

- K9. Roll beep trim inoperative:
 - a. Defective beep switch.
 - b. Control centering not holding.
 - c. Control looseness.
 - d. AFCS malfunction.

CONDITION

PROBABLE CAUSE

K10. New heading not captured/heading hold inoperative:

- a. Swivel lock "Unlocked" or malfunctioning.
- b. Control looseness.
- c. Heading gyro malfunction.
- d. Yaw ILCA malfunction.

K11. Radar altitude hold inoperative:

- a. Pilot's radar altimeter inoperative.
- b. Collective CCDA malfunction.
- c. AFCS malfunction.
- d. Faulty AFCS panel switch.

K12. Longitudinal control position out of tolerance:

- a. AFCS malfunction — DASH.
- b. AFCS longitudinal control position tolerance CPT incorrectly pulled.
- c. DASH actuator malfunction.
- d. Squat switch malfunction.
- e. Airspeed signal inoperative (fwd fit) — Pitot system or AFCS airspeed transducer.

K13. CYCLIC TRIM inoperative in the AUTO position:

- a. Circuit breaker out.
- b. Faulty AFCS computer.
- c. Faulty LCT actuator(s).
- d. Faulty wiring.
- e. Faulty AFCS panel switch.

CONDITION

PROBABLE CAUSE

- K14. MANUAL CYCLIC TRIM inoperative:
- a. Circuit breaker out.
 - b. Faulty LCT actuator.
 - c. Faulty AFCS panel switch.
- K15. Airspeed does not return and hold:
- a. DASH actuator malfunction.
 - b. AFCS malfunction.
 - c. Airspeed system malfunction.
- K16. Lateral stick only turns not coordinated:
- a. AFCS malfunction (Sideslip stabilization).
 - b. Sideslip ports not open.
- K17. Heading selector inoperative:
- a. Aircraft not properly trimmed in level flight prior to engagement.
 - b. HSI malfunction.
 - c. AFCS panel switch malfunction.
 - d. AFCS malfunction.
- K18. Barometric attitude hold out of tolerance:
- a. Collective CCDA malfunction.
 - b. AFCS malfunction.
 - c. Faulty AFCS panel switch.

SECTION IV. SPECIAL PROCEDURES

SPECIAL PROCEDURES This section contains special procedures which were referenced in Section II.

LIST OF PROCEDURES

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A. AFCS BITE CHECKS.

Reference: TM 55-1520-240-23

This test should only be performed to verify a suspected AFCS discrepancy. The bite test is performed by pressing the BITE switch on the AFCS computer. The bite associated with systems No. 1 tests system No. 1 only and system No. 2 tests system No. 2 only. The engine condition levers provide a bite interlock which prevents inadvertent bite operation during flight. The bite test can be interrupted during operation by moving the engine condition level out of the STOP position and back again, or by switching the AFCS to OFF.

1. Prior to activating the bite test, perform the following:
 - a. Start apu and apply electrical and hydraulic power.
 - b. Claw all circuit breakers.
 - c. AFCS SYSTEM SEL-NO. 1 or NO. 2 (do not select BOTH).
 - d. CYCLIC TRIM-AUTO.
 - e. Cyclic stick and directional pedals—Center.
 - f. STEERING CONTROL panel—Knob centered.
 - g. SWIVEL switch—LOCK.
 - h. Radar altimeter—Set LO knob to 100 feet.
 - i. Heading bug to bending of helicopter, then 30° clockwise.
 - j. ENG CONDITION levers—STOP.
 - k. Ensure left and right aft landing gear is in ground contact. (Not on jacks.)

WARNING

**The bite check results in flight control motions.
Keep hands and body clear moving controls.
Severe injury can occur.**

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2. Press and release the bite switch on the AFCS computer for the system to be tested. A light in the push button switch will flash to show that the test is in progress. The digital-display will indicate the test number of the current circuit under test. Should a failure be present, the flashing light will turn to a steady glow 20 seconds after the failure is detected. Bite test numbers 0, 1, 2, and 3 are bite tests allocated to the self checking of reinterrogation circuits. When bite is initiated, it will run quickly thru these first tests and after approximately 20 seconds, the flashing light will become steady with 3 shown in the digital-display. Press and release the bite switch again to allow the test to proceed.

3. If a failure occurs, record the number on the digital display and press the bite switch to proceed with the test. When the test is completed, the bite will shut down. Refer to TM 55-1520-240-24 for the recommended maintenance actions for the failures detected. There are programmed failures at bite test numbers 6 and 18 of system No. 1. Results of bite test numbers 7 and 47 shall be disregarded.

4. BITE numerical test numbers correspond to the malfunctions as follows:

BITE TEST TABLE

TEST NO.	MALFUNCTION
0-69	AFCS UNIT
70-74	PITCH ILCA
75-79	YAW ILCA
80-84	ROLL ILCA
85-86	DASH ACTUATOR
87-88	CCDA ACTUATOR
89-90	LONG CPT
91-92	PEDAL CPT
93-94	LATERAL CPT
95-96	RADAR ALTIMETER
97	AUTOMATIC STOP

B. SELF-TUNING ABSORBER SYSTEMS CHECK.

NOTE

Perform this test on the ground with the rotors stopped. If the absorbers are tested with the rotors turning, the absorbers may be damaged.

1. APU—ON.
2. APU generator control switch—ON.
3. Vibration absorber circuit breakers (left, right and center)—Pushed in.
4. Selector swircb—Left.
5. Test switch—Retract.

NOTE

The meter pointer will move in direction selected. (Retractor extend). The pointer may initially deflect offscale then return to the required average meter deflection and fall to approximately zero in the required time interval for ambient temperature as shown below. Hold switch until the meter pointer indicates zero or stabilizes at approximately zero.

6. Test switch—Extend.
7. Test switch—Retract.

TEMPERATURE	AVG METER DEFLECTION	TIME INT SECONDS
10 C and above	.05 to .20	50 to 300
-20 C to 10 C	.04 to .20	50 to 360
-55 C to -20 C	.02 to .20	50 to 480

8. Selector switch—Center.
9. Repeat steps 5 thru 7.
10. Selector switch—Right.
11. Repeat steps 5 thru 7.
12. Selector switch-off.

C. CONTROL BREAKOUT FORCES.

Reference: TM 55-1520-240-23

The control breakout forces check is intended to detect improper installation of close tolerance bolts, overtorqued hardware, or dirty bearings.

NOTE

A push-pull type fish scale can be used to check these forces. All forces measured from zero stick position and magnetic brake on.

1. Longitudinal forward and aft 1.8 to 2.5 lb.
(Breakout force forward must be greater than breakout force aft.)
2. Lateral left and right 1.2 to 2 lb.
3. Directional left and right 7 to 12 lb.

4. THRUST CONTROL SYSTEM.

MEASURE- MENT	MAG BRAKE	DIRECTION	POUNDS REQUIRED
UP FROM ¹ DETENT	OFF	UP	<u>7.0 MAX.</u> 2.0 MIN.
DOWN FROM ¹ DETENT	OFF	DOWN	<u>15.0 MAX.</u> 5.0 MIN.
SLIP FORCE AT NEUTRAL.	ON AT 28 ± 2 VDC	UP AND DOWN	<u>23.0 MAX.</u> 7.0 MIN.
UP FROM ¹ NEUTRAL	OFF	UP	<u>4.0 MAX. *</u> 1.0 MIN.
DOWN FROM ¹ NEUTRAL	OFF	DOWN	<u>4.0 MAX. *</u> 1.0 MIN.

NOTE

Thrust breakout to be measured when output rod of lower boost actuator starts to move.

¹Switch depressed and taped down.

*Breakout forces, up and down, must be within 1.5 lbs of each other.

5. ENGINE CONDITION levers.

a. Move either lever to a position between GROUND and FLIGHT.

b. Position scale below lever knob. Force required to move lever 4 to 5 lb.

D. WINCH OPERATIONAL TEST.

Reference: TM 55- 1520-240-T

1. Perform an operational test of the cargo hoisting system as follows:

a. With the APU running, apply hydraulic pressure and electrical power to the helicopter.

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- b. Route the winch cable in the hoist configuration. (Refer to TM 55-1520-240-10.)
- c. Plug in the cable curter at sta 120 or 325.
- d. Check the HOIST CONT circuit breaker on the No. 1 pdp is closed. Set the HOIST MASTER switch to REMOTE.
- e. Set the shifting lever on the winch to RESCUE. (If the shift lever fails to operate properly, replace the winch.) Operate the winch from either of the auxiliary hoist operator's control panels. Connect the winch control grip to the panel using the extension cord.
- f. Press the WINCH ARMING TRIGGER and rotate the WINCH CABLE switch to OUT. Continue to operate the winch until it stops. Check that the out-limit switch stops the winch when 2 ½ wraps of the first layer of cable remain on the drum. If the winch does not stop within the specified limit, readjust the out-limit switch. (Refer to TM 55-1520-240-23, Ch. 14.) If the time required to reel the cable fully OUT is not about 90 seconds, replace the winch.

CAUTION

In case of an in-limit switch failure, do not allow the end of the cable to reel in and jam in a pulley. The winch, pulley, or airframe maybe damaged.

- g. Operate the WINCH CABLE control switch to IN. Continue to operate the winch to IN until the winch stops. Check that the rescue mode in-limit switch stops the winch when 28½ feet of cable remain extended. Measure the distance from the outer roller on the level wind mechanism to the ball end of the cable. If the winch does not stop automatically within the specified limit, readjust the rescue mode in-limit switch. (Refer to TM 55-1520-240-23, Ch. 14.) If the time required to reel the cable in to the limit switch is not about 90 seconds, or if there is binding or uneven spooling of the cable drum, replace the winch.
- h. Operate the winch to reel out the cable. Connect the cable hook to a 600-pound weight. Raise the weight with the winch and release the WINCH CABLE switch to OFF. Check that the hoist remains in the stopped position and the weight does not creep downward. If the weight creeps downward, replace the winch.

i. Lower the weight and remove it from the cable. Remove the winch cable from the pulleys. Remove the pulleys and return them to the stowage container. Unplug the cable cutter from the overhead connector. Connect it to the cable cutter stowage receptacle.

j. Set the shifting lever on the winch to CARGO.

CAUTION

In case of an in-limit switch failure, do not allow the end of the cable to reel in and jam in the reel assembly. The winch may be damaged.

k. Operate the winch to reel in the remaining length of cable. Check that the cargo mode in-limit switch stops the winch when 3 feet of cable remain extended. If the cargo mode in-limit switch does not stop the winch when the specified length of cable is extended, adjust the cargo mode in-limit switch or have it replaced. (Refer to TM 55-1520-240-23, Ch. 14.)

l. Place the shifting lever to RESCUE. Unplug the cable cutter from the stowage receptacle and connect it to the overhead receptacle above the rescue hatch

NOTE

RESCUE operation mode is used to reduce reelout time. Keep tension on the cable while it is reeling out.

m. Operate the winch to reel out the cable. Continue to operate the winch until the cable is fully extended.

n. Set the shifting lever to CARGO. Unplug the cable cutter from the overhead receptacle and connect it to the stowage receptacle.

o. Attach a 3,100 to 3,300-pound load to the winch cable.

p. Operate the winch to reel in the cable. Check that the overload-limit switch stops the winch when the second layer of cable wraps start on the cable drum. If the winch does not stop operating on the second layer of cable, adjust the overload-limit switch and repeat this step. (Refer to TM 55-1520-240-23, Ch. 14.)

q. Check the winch for leakage of hydraulic oil or lubricating grease from the housing. If other than minor seepage is noted, replace the winch.

r. Stow the winch cable and its related equipment. Set the HOIST MASTER switch in the cockpit to OFF. Shut down the apu. (Refer to TM 55-1520-240-23, Ch. 14.)

s. Troubleshooting. (Refer to TM 55-1520-240-23, Ch. 14.)

E. LOOSENESS CHECK.

Reference TM 55-1520-240-23

WARNING

Keep head, hands and other body parts clear of moving flight controls. Hydraulic forces are strong enough to cause severe injury.

NOTE

Impedance bolts have been installed in flight control connections. These bolts are self-retaining and require a special nut and torque. Refer to chapter 1 of reference for information on the bolts.

NOTE

To do a satisfactory looseness check, all binding conditions within control system must be corrected. Binding in some components will prevent detection of looseness in other components. Also, looseness (or wear) in some components can cause binding.

1. Check for binding in the tunnel controls as follows:

CAUTION

Dirt on bellcranks and idlers can sift into the bearings. Dirty bearings will bind and cause jerky control movements.

a. Open the forward fairing and work platforms. Open the six tunnel covers.

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b. Apply ac and hydraulic boost pressure to the flight control system.

c. Move the thrust control, control stick, and directional pedals to produce motion in the tunnel controls.

NOTE

Thrust or pitch control input will move the idlers
Roll or directional control input will move the walking beams.

(1) Observe the walking beams and idlers. Check for jerking movements. Observe component attaching bolts. Check for jerky rotation.

WARNING

Be careful when feeling bellcranks and idlers for vibration. Personnel can have fingers caught between bellcranks and idlers if care is not used.

(2) Listen for cracking or squeaking sounds. Carefully feel bellcranks and idlers for vibration.

d. Disconnect the links at the walking beams and idlers that may be binding. (Refer to TM 55-1520-240-23, Ch. 11.)

(1) Move the walking beam and idler by hand. Feel for binding and roughness.

NOTE

Disconnecting the links and moving the walking beam and idler by hand is the most accurate method of locating a binding component.

(2) If binding or roughness is found, have the walking beam or idler bearings cleaned and lubricated.

(3) If necessary, have the walking beam or idler replaced.

e. Attach the connecting links to the walking beams and idler. (Refer to TM 55-1520-240-23, Ch. 11.)

WARNING

Make sure area is clear of foreign objects before closing tunnel covers. If not, damage to components or systems could result in personal injury or death.

f. Shut down ac and hydraulic power. Pickup tools and clean area. Close tunnel covers.

2. Looseness Check Tolerances. The following tolerances apply to the looseness check.

a. Bearings with radial looseness in excess of 0.007 inch must be replaced.

b. If each bearing in a series of hearings, has less than 0.007 inch radial looseness, but overall system looseness is in excess of 3/8-inch, all or a portion of these bearings must be replaced to reduce looseness to within the 3/8-inch overall looseness tolerance.

3. Check for control system looseness at forward upper controls as follows:

a. Apply a manual force of about 10 pounds up and down to connecting link attaching points of right and left bellcranks. (Refer to TM 55-1520-240-23, Ch. 11.)

b. Measure distance that either bellcrank end moves. If a bellcrank moves more than 3/8 inch, there is excess looseness in this portion of the control system.

c. Isolate the cause of excess looseness. (Refer to TM 55-1520-240-23, Ch. 11.)

4. Check for control system looseness at the aft upper controls as follows:

a. Apply a force of about 10 pounds up and down to link attaching points of right and left pylon upper bellcranks. (Refer to TM 55-1520-240-23, Ch. 11.)

b. Measure distance that either bellcrank end moves. If a bellcrank moves more than 3/8 inch, there is excess looseness in this portion of control system.

c. Isolate cause of excess looseness. (Refer to TM 55-1520-240-23, Ch. 11.)

F. ROTOR PHASING.

Reference: TM 55-1520-240-23

WARNING

Improper phasing can result in injury to personnel and serious damage to the helicopter. Whenever the rotary-wing system has been dephased or components of the drive system (except the engine drive shafts or engine XMSN's) have been removed or disconnected, the system must be properly phased before the system is operated. The method of checking or obtaining proper phase relationship of the rotors is given in the above reference.

WARNING

phasing requires alignment of the swiveling actuators with the rotating swashplates. Do not perform any alignments using pivoting actuators. The swiveling actuator on the forward rotor is located on the left side of the swashplate and the swiveling actuator on the aft rotor is on the right side of the swashplate.

NOTE

Phasing the rotary-wing system shall be accomplished with a minimum crew of two; one crewman to install the phasing blocks and one to turn the forward rotor blades.

1. Rotor Phasing.
 - a. Obtain two phasing blocks. If necessary, locally manufacture them from aluminum alloy sheet, 3/8 inch thick.
 - b. Gain access to the right side of the aft swashplate. Rotate the rotor head to align a pitch link lug on the rotating swashplate with the upper flange of the swiveling actuator.
 - c. Install one phasing block over the lug and the flange. Leave it in place.

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- d. Gain access to the left side of the forward swashplate. If the rotor system is properly phased, a pitch lug on the rotating swashplate will align with the upper flange of the swiveling actuator. Install a phasing block over the lug and flange to verify alignment.
- e. If the lug and flange are not in alignment, the rotor system must be phased. Refer to TM 55-1520-240-23 for procedures.

G. 712 NO. 1 AND NO. 2 ENGINE START

Reference: TM 55-1520-240-10

PROCEDURE	TROUBLESHOOTING REFERENCE
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NOTE

Either engine may be started first.

- 1. First engine - Start as follows:
 - a. L FUEL PUMP MAIN switches -ON. Check L FUEL PRESS caution capsule out. D9
 - b. XFEED switch -OPEN. Check R FUEL PRESS caution capsule out. D10
 - c. ENG COND lever - STOP.
 - d. ENG START switch - MTR. A2

NOTE

Avoid motoring in excess of 15 seconds before moving the ENG COND lever to GND. These excess periods can have a detrimental effect on starter reliability.

- e. Motor engine to a minimum of 15% N 1. Set ENG COND lever - GND; ENG START switch to START immediately. Check STARTER ON light on.

PROCEDURE	TROUBLESHOOTING REFERENCE
*f. Release START switch to MTR prior to PTIT reaching 200°C. When N1 is 50%, set START switch to OFF. Check STARTER ON light out.	A4

CAUTION

If no oil pressure is indicated during the starting sequence, shut down engine and investigate.

- *g. ENGINE OIL PRESS – Check E1,E4,E14 and record (20 psi Minimum).
- h. Engine instruments – Check. B7,B8,E14

NOTE

Ground idle 60.0 to 63.0 percent N1 is the minimum speed at which the engine will operate satisfactorily for extended periods. If the engine speed stabilizes below ground idle, shut down the engine and investigate.

- *i. Ground idle speed after 45 seconds – Check and record. A6

NOTE

If the start is not normal, abort it. If a second start is to be attempted, wait at least 15 seconds after the tachometer indicates zero before starting. This will allow sufficient time for fuel to drain out of the combustion chamber.

<p>PROCEDURE</p>	<p>TROUBLESHOOTING REFERENCE</p>
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CAUTION

If no oil pressure is indicated during the starting sequence, shut down engine and investigate.

- | | |
|--|------------------------------------|
| <p>1. First engine - Start as follows:</p> <p>a. L FUEL PUMP MAIN switches - ON. Check L FUEL PRESS caution capsule out.</p> <p>b. XFEED switch - OPEN. Check R FUEL PRESS caution capsule out.</p> <p>c. ENG COND lever - GND.</p> <p>d. FADEC ENG 1 and FADEC ENG 2 switch - PRI.</p> <p>e. FADEC ENG START switch - Select first engine to be started and hold until N1 accelerates to 10%. Release switch.</p> <p>f. Check and record engine oil pressure (5 PSI minimum).</p> <p>g. Check and record engine acceleration speed to ground idle (50 to 59% within 45 sec).</p> <p>2. Second engine - Start by using the same method as the first.</p> | <p>D9</p> <p>D10</p> |
|--|------------------------------------|

G.2. 714A P3 BELLOWS CHECK

1. First engine.
 - a. Engine #1 FADEC PRI-REV switch (started engine) - REV,
 - b. FADEC Caution - ON.
 - c. N1 - Maximum change $\pm 3\%$.

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PROCEDURE **TROUBLESHOOTING**
REFERENCE

- d. FADEC PRI-REV switch (started engine) - PRI.
- e. FADEC FAIL caution - OUT.
- f. Repeat for Engine #2.

G.3. 714A NO. 1 AND NO. 2 ENGINE REVERSION-ARY START

Reference: TM 55-1520-240-23

NOTE

Either engine may be started first.

CAUTION

The flight controls must be manned anytime the helicopter is on the ground with the rotors turning.

- 1. First engine - Start as follows:
 - a. L FUEL PUMP MAIN switches - ON. Check L FUEL PRESS caution capsule out. D9
 - b. XFEED switch - OPEN. Check R FUEL PRESS caution capsule out. D10
 - c. ENG COND lever - GND.
 - d. FADEC ENG 1 and FADEC ENG 2 switch - REV
 - e. FADEC ENG START switch - Select first engine to be started and hold until NG accelerates to 10%. Release switch.
 - (1) Check and record engine oil pressure (5 PSI minimum).

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Reference: TM 55-1520-240-23 (Cont.)

PROCEDURE **TROUBLESHOOTING**
REFERENCE

- (2) Check and record engine acceleration speed to ground idle (50 to 59% within 45 sec).

CAUTION

If no oil pressure is indicated during the starting sequence, shut down engine and investigate.

2. FADEC switch of engine started - PRI.
3. Second engine - Start by using the same method as the first.

G.4. 714A POWER ASSURANCE TEST.

CAUTION

Do not exceed - 899°C. Time in exceedance of 899 degrees C will be recorded by the FADEC.

N1 - 111%

Vne - 149 kts

TQ - 123%

1. Maximum Continuous Power Test:
 - a. Stabilize airspeed at 120 kts. with RRPM 100%.
 - b. Pilot's altimeter set to 29.92.
 - c. Select an altitude/FAT combination from figure 5-12.4 (Refer to Section V) that provides the highest practical torque while observing the applicable transmission limits.
 - d. Determine required minimum TQ from figure 5-12.5. (Refer to Section V.)
 - e. ENG COND lever of engine not being checked - Slowly retard towards GND. Ensure that ENG PTIT for engine being checked does not exceed 806 degrees. If PTIT of 806 degrees is reached prior to required minimum TQ being attained, terminate the PA Test on this engine, and proceed to step j.

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- f. Raise THRUST CONT lever, if required, to obtain minimum TQ while ensuring the PAT N1 or PAT PTIT limits of figures 5-12.8 and 5-12.7 respectively (Refer to Section V) are not exceeded.
- g. Allow conditions to stabilize and record the following:
 - *(1) FAT.
 - *(2) PA.
 - *(3) NR 100%.
 - *(4) ENG PTIT.
 - *(5) N1.
 - *(6) TQ.
 - *(7) FF.
- h. Recover engine not being checked. Engine passes test if it meets or exceeds torque value from figure 5-12.5. (Refer to Section V.)
- i. Repeat steps a. through h. for engine not previously tested.
- j. If engine fails test use MAX power conditions in Section V charts and follow steps below:
 - (1) Select an altitude/FAT combination from figure 5-12.4 (Refer to Section V) that provides the highest practical torque while observing the applicable transmission limits.
 - (2) Determine required minimum TQ from figure 5-12.6. (Refer to Section V.)
 - (3) ENG COND lever of engine not being checked - Slowly retard towards GND. Ensure that ENG PTIT for engine being checked does not exceed 899 degrees. If PTIT of 899 degrees is reached prior to required minimum TQ being attained, engine has failed and the PA Test should be terminated.
 - (4) Raise THRUST CONT lever, if required, to obtain minimum TQ while ensuring MP N1 or MP PTIT limits of figures 5-12.8 and 5-12.7 respectively (Refer to Section V) are not exceeded.
- k. Allow conditions to stabilize and record the following:
 - *(1) FAT.
 - *(2) PA.

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*(3) NR 100%.

*(4) ENG PTIT.

*(5) N1.

*(6) TQ.

*(7) FF.

1. Recover the engine not being tested. Engine passes test if it meets or exceeds torque value from figure 5-12.6. (Refer to Section V.)
- m. Return to step i. if required.

G.5. 714A POWER ASSURANCE TEST (PAT) BASELINE AND TRIGGER VALUE.

After performing a Power Assurance Test at Maximum Continuous Power or Maximum Power, subtract the required torque from the measured torque to determine Torque Margin. Round off to the closest whole number.

NOTE

The PAT Baseline shall be used in conjunction with the Engine Power Check, Maximum/Maximum Continuous to determine the PAT pass/fail trigger value. Perform the PAT Baseline check as soon as possible after the Engine Power Check.

1. Power Assurance Test (PAT) Baseline and Trigger Value.
 - a. Stabilize flight with NR 100% on the ground.
 - b. Adjust ECLs as required to maintain 60 - 80% torque on engine being checked.
 - c. Stabilize for 15 seconds.
 - d. Activate Power Assurance Test Switch.
 - e. Record DECU Power Assurance Value.
 - f. Repeat for the other engine.
 - g. Enter the PAT Number vs Torque Margin Chart (Section V) with the torque margin determined from the Engine Performance Check to determine the PAT Number Margin.
 - h. Subtract PAT Number Margin from DECU Power Assurance value to obtain the PAT Trigger Value. Enter this value in the aircraft log book.

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- i. Minimum acceptable value for the Power Assurance Test is the PAT Trigger Value and represents a minimum specification engine. Compare the results of subsequent PATs to this Trigger Value and enter in the aircraft log book.

Example:

A Maximum Continuous Power Check was performed under Ambient Conditions of Altitude - Sea Level; Temperature - 12°C.

Results:

	ENGINE #1	ENGINE #2
TORQUE (%)	121	119
N1 (%)	104	103
PTIT (°C)	806	806

Following the Engine Power Check, a Power Assurance Test baseline was performed. The DECU values were; ENG #1,28; ENG #2,28.

Entry into the PAT N1 Limits Chart at 12° C indicates the maximum continuous N1 Limit is 103.9%.

Entry into the PAT ENG TEMP Limits Chart at the same temperature shows a PTIT limit of 806°C. Thus both engines are operating on the PTIT limit.

Entry into the PAT Maximum Continuous Power Chart at 12° C and Sea Level shows Maximum Continuous Torque to be 111%. The recorded datum shows Engine #1 providing 121% torque.

The Torque Margin is 121%. minus 111% = 10%.

Entry into the PAT Number vs. Torque Margin chart at 10% Torque Margin and Sea Level shows a PAT Number Margin of 7.

Subtracting the PAT Number Margin from the DECU Power Assurance Value yields the PAT Trigger Value: PAT Trigger Value = 28 minus 7 = 21. The PAT Trigger Value for ENG # 1 is **21**.

**H. 712 INTERSTAGE AIR-BLEED SPEED
ADJUSTMENT.**

Reference: TM 55-1520-240-23

NOTE

Unsatisfactory bleed band cycling or compressor stall may be encountered if bleed band closure is not within N1 speed range specified. If N1 speed for bleed band closure is above that specified, an increase in specified fuel consumption will result until bleed band closes. In an extreme case, where bleed band does not close at all, or may be open again at high power, engine will suffer loss of maximum power.

NOTE

This procedure requires two-way communications between the pilot and the mechanic. The pilot will run the engine and note the N1 readings. The mechanic will notify the pilot when the bleed band closes and adjust, if necessary.

1. Deleted.
2. NO. 1 & NO. 2 ENGINE BEEP TRIM-DECREASE for 8 seconds.
3. Deleted.
4. Note engine N1 readings.
5. Use the appropriate beep system (Normal or Emergency on the engine to be checked) to indicate an engine N1 less than the minimum specified for the applicable ambient temperature as indicated on figure 5-9.

NOTE



Bleed band must be open under this operating condition.

Do not allow engine speed to go below minimum N1 speed during this check.

6. Slowly increase appropriate beep trim while maintaining rotor rpm within limits and determine N1 when bleed band has just closed.

NOTE

Closure may be determined by inserting a 0.010 inch feeler gage under the bleed band.

7. The N1 at the bleed band closure point must be within the limits specified on the chart on figure 5-9.
8. If adjustment is necessary, turn adjusting screw on the fuel control in 1/8 turn increments. If the bleed band is closing too soon, turn the adjusting screw counterclockwise to increase the N1 speed at which the bleed band closes. If the bleed band closes too late, turn the adjusting screw clockwise to decrease the N1 at which the bleed band opens.

NOTE

The adjustment of the interstate air-bleed system shall be recorded in the fuel control service record. One full revolution of the adjustment screw equals approximately 5 percent N1.

9. EMERG ENG TRIM—AUTO, to restore normal operation if required.
10. Repeat steps 1 through 9 for second engine if required.
11. Regain 100% rpm upon completion of check.

I. AFCS CHECK.

Reference: TM 55-1520-240-10

PROCEDURE	TROUBLESHOOTING REFERENCE
1. AFCS SYSTEM SEL switch—OFF.	
a. NO. 1 & NO. 2 AFCS caution lights—ON.	K1
b. Controls centered, longitudinal—Neutral (N) on longitudinal stick position indicator.	H12
2. AFCS SYSTEM SEL—NO. 1.	K1
a. NO. 2 AFCS OFF caution light—ON.	D22
3. AFCS SYSTEM SEL—BOTH.	
a. NO. 1 & NO. 2 AFCS OFF caution lights off.	D19, D21
4. AFCS SYSTEM SEL—NO. 2.	K1
a. NO. 1 AFCS OFF caution light on.	D20

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PROCEDURE	TROUBLESHOOTING REFERENCE
5. AFCS SYSTEM SEL—OFF. a. NO. 1 & NO. 2 AFCS OFF caution lights on.	
6. MASTER CAUTION light— RESET.	D3

J. HEATING/VENT BLOWER OPERATION.

Reference: TM 55.1520-240-10

PROCEDURE	TROUBLESHOOTING REFERENCE
1. HEATER function switch— VENT BLOWER ONLY. AIR CONTROL knobs—PULL and check operation.	
2. COCKPIT AIR CONTROL knobs—Pilot and copilot, PULL.	
3. HEATER function switch— HEATER ON.	
4. HEATER START switch— Press. Check ignition (within 10 seconds).	C32
5. CABIN TEMP SELEC- TOR—Check heater operation and rheostat from COLDER to WARMER.	
6. HEATER function switch— OFF. Check that blower continues to run until combustion chamber cools.	C33

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K. CARGO HOOK OPERATIONAL CHECK.

Reference: TM 55-1520-240-23

1. CARGO HOOK PWR CONT NORM RELEASE circuit breakers on No. 2 power distribution panel—Check in.
2. CARGO HOOK EMER RELEASE PWR CONT EMER RELEASE and CAUTION PANEL circuit breakers on No. 1 power distribution panel—Check in.
3. Hoist operator cargo hook switch—REMOTE.
4. Apu—On.
5. Floor and rescue hatch doors-Open.
6. Mid-cargo hook released from stowed position.
7. Mid-hook air charge 2,100 psi.
8. Check that the forward and aft hooks are properly installed. Check that the electrical and mechanical cables are connected to the hooks.
9. Check the center hook by placing a length of wood approximately 2 by 4 inches on the tongue of the hook and pressing down. The hook shall not open.
10. Apply a test load force of 18 to 22 pounds on the forward and aft hooks.

NOTE

The forward and aft hooks will not open unless a load of 18 to 22 pounds is on the hook.

11. Check normal operation of the forward hook as follows:
 - a. CARGO HOOK MASTER switch—OFF.
 - b. CARGO HOOK EMERG REL ALL switch—OFF.
 - c. HOOK SELECT switch—FWD.
 - d. Press the CARGO HOOK RELEASE switch on the pilot's cyclic control stick. Check that the hooks remain closed.

e. Set the CARGO HOOK MASTER switch to ARM. Press the hook release switch on the pilot's control stick. Check that the forward hook opens and closes, and the FWD HOOK OPEN and MASTER CAUTION lights come on.

f. MASTER CAUTION LIGHT—PUSH TO RESET.

g. Set the CARGO HOOK MASTER switch to RESET. Check that the hooks remain closed and the FORWARD HOOK OPEN caution and the MASTER CAUTION lights are out.

h. Replace the load on the forward hook.

i. Set the CARGO HOOK MASTER switch to ARM. Press the CARGO HOOK RELEASE switch on the pilots control stick. Check that the forward hook opens and closes. Check that the FORWARD HOOK OPEN and the MASTER CAUTION lights come on.

j. MASTER CAUTION LIGHT—PUSH TO RESET

k. Momentarily set the CARGO HOOK switch on the hoist operators panel to RESET. Check that the hooks remain closed and the FORWARD HOOK OPEN and the MASTER CAUTION lights are out.

1. Repeat steps d. thru k. for the copilot's control stick CARGO HOOK RELEASE switch.

m. Set the CARGO HOOK MASTER switch to OFF

n. Place the load on the forward hook.

o. Press and hold the CARGO HOOK RELEASE switch on the hoist operators grip. Check that the forward hook remains closed. Release the switch.

p. Set the CARGO HOOK switch on the hoist operators panel to ARM. Press the CARGO HOOK RELEASE switch on the hoist operators grip. Check that the hook remains closed.

q. Set the CARGO HOOK MASTER switch on the overhead panel to ARM. Set the CARGO HOOK switch on the hoist operator's panel to RMTE. Press and hold the CARGO HOOK RELEASE switch on the hoist operators grip. Check that the forward hook remains closed. Release the CARGO HOOK RELEASE switch.

r. Set the CARGO HOOK switch on the hoist operator's panel to ARM. Press and release the CARGO HOOK RELEASE switch on the hoist operator's grip. Check that the forward hook opens and closes. Check that the FORWARD HOOK OPEN and the MASTER CAUTION lights are lit. Momentarily set the CARGO HOOK switch on the hoist operator's panel to RESET. Check that the FORWARD HOOK OPEN and the MASTER CAUTION lights go out.

12. Check normal operation of the mid hook and MID HOOK OPEN caution lights as follows:

a. Turn the HOOK SELECT switch on the CARGO HOOK control panel to MID.

b. Repeat steps 11.d. thru 11.r. for center hook operation.

13. Check normal operation of the aft hook and AFT HOOK caution lights as follows:

a. Turn the HOOK SELECT switch to AFT.

b. Repeat steps 11.d. thru 11.r. for aft hook operation.

14. Check normal operation of forward and aft hooks in tandem and the forward and aft hook caution lights as follows:

a. turn the HOOK SELECT switch to TANDEM.

b. Check DUAL HOOK FAULT caution light — OUT.

c. Repeat steps 11.d. thru 11.r. for forward and aft hook operation.

15. Check normal operation of all hooks and caution lights as follows:

a. Turn the HOOK SELECT switch to ALL.

b. Check DUAL HOOK FAULT caution light — OUT.

c. Repeat steps 11.d. thru 11.r. for operation of all hooks.

16. Check the cockpit cargo hook emergency release as follows:

- a. Check that the pressure gage on the center hook indicates 2,100 psi.
- b. Check DUAL HOOK FAULT caution light — OUT.
- c. Set the CARGO HOOK MASTER switch to OFF.
- c. Set the HOOK SELECT switch to ALL.
- d. Check DUAL HOOK FAULT caution light — OUT.
- e. Note the position of the second hand on the clock. Momentarily set the guarded EMERG REL ALL switch to REL ALL. Check for the following:
 - (1) All three hooks open.
 - (2) The forward and aft hooks make sounds like a machine gun for about 12 seconds.
 - (3) Check that all hooks are closed after approximately 12 seconds.
 - (4) Check that the three HOOK OPEN caution lights light and the MID HOOK OPEN light goes out after approx. 12 seconds.
 - (5) Check that the MASTER CAUTION lights are on.
 - (6) Release the EMERG REL ALL switch. Check all three hooks are closed and that FWD and AFT HOOK OPEN caution lights remain on.
 - (7) Place HOOK MASTER switch to RESET. Check all hooks closed.
 - (8) Recharge the center hook. Replace the loads on the forward and aft hooks.
 - (9) Check all caution lights are out.
- f. Set the HOOK MASTER switch to ARM.
- g. Set the EMERG REL ALL switch to REL ALL. Repeat step e.

17. Check the cargo hook cabin manual release as follows:

- a. Set the CARGO HOOK MASTER switch to ARM.

CAUTION

Do not operate the center hook from the cockpit during the following test. Damage to the hook can result.

- b. Apply 10 to 20 pounds of force to the hook tongue.
- c. Pull the center hook emergency release handle. Check that the force on the handle to open the hook is less than 20 pounds. Check that the MID HOOK OPEN and the MASTER CAUTION lights are on.

CAUTION

When the center cargo hook is opened using the manual emergency release handle, the hook must be closed manually. No attempt should be made to close the hook using the normal hydraulic or pneumatic method, since damage to the cargo hook can result.

- d. Reset the hook by hand. Apply a force to the tongue of the hook. Set CARGO HOOK MASTER to RESET. Check that the MID HOOK OPEN caution light is out.
- e. Rotate the hook to the right until the upper attachment fitting contacts the support beam. Be sure the hook does not open.
- f. Rotate the hook to the left until the upper attachment fitting contacts the support beam. Be sure the hook does not open.
- g. Pull the tandem hook release lever to the operating position. Check that the lever is approximately perpendicular to the floor.
- h. Pull the lever to the rear of the helicopter. Check that the forward and aft hooks open, then close. Check that the FORWARD and AFT HOOK OPEN and the MASTER CAUTION lights are on.

i. Return the lever to the operating position. Check that the forward and aft hooks remain closed. Check that the hooks are latched by applying a force to the load beam. It may be necessary to relatch the hooks by opening the load beam fully and releasing it.

17.1 Check the triple hook manual release as follows:

a. Set the CARGO HOOK MASTER switch to ARM.

CAUTION

Do not operate the center hook from the cockpit during the following test. Damage to the hook can result.

b. Apply 10 to 20 pounds of force to the hook tongue.

c. Pull the emergency cargo hook manual release handle aft. Check that the FWD, MID, AFT HOOK OPEN and MASTER caution lights are on. The fwd and aft hooks should open then close.

CAUTION

When the center cargo hook is opened using the manual emergency release handle, the hook must be closed manually. No attempt should be made to close the hook using the normal hydraulic or pneumatic method, since damage to the cargo hook can result.

d. Reset the center hook by hand. Apply a force to the tongue of the hook. Set CARGO HOOK MASTER to RESET. Check that the FWD, MID and AFT caution lights are out.

e. Repeat steps 17.e. and 17.f.

f. With the handle in the ready (vertical) position, check that all three hooks remain closed. Check that the fwd and aft hooks are latched by applying a force to the load beams. It may be necessary to relatch the hooks by opening the load beams fully and releasing it.

18. Check the FWD and AFT HOOK LOADED lights as follows:

a. On the overhead panel, check that the MASTER switch is OFF.

b. At the forward hook, rotate the release knob to its maximum clockwise position. Pull the hook open. The FWD HOOK OPEN caution light shall light.

c. While holding the hook open, release the release knob.

d. Allow the hook to close slowly. On the overhead panel, the FWD HOOK LOADED light shall momentarily come on before the hook is full closed.

e. Pull on the hook to check that it is latched closed. If it is not, pull the hook fully open and then release it. Place the test load on the hook. The hook remains closed. The FWD HOOK OPEN caution light shall remain on.

f. At the aft hook, rotate the release knob to its maximum clockwise position. Pull the hook open. The AFT HOOK OPEN caution light shall come on.

g. While holding the hook open, release the release knob.

h. Allow the hook to close slowly. On the overhead panel, the AFT HOOK LOADED light shall momentarily come on before the hook is fully closed.

i. Pull on the hook to check that it is latched closed. If it is not, pull the hook fully open and then release it. Place the test load on the hook. The hook remains closed. The AFT HOOK OPEN caution light shall remain on.

j. On the overhead panel, set the MASTER switch to RESET. The HOOK OPEN light shall go out. Set the MASTER switch to ARM.

k. At the forward hook, rotate the release knob to its maximum clockwise position. Pull the hook open. On the caution panel, the FWD HOOK OPEN light shall come on.

l. While holding the hook open, release the release knob.

m. Allow the hook to close slowly. On the overhead panel, the FWD HOOK LOADED light shall momentarily come on before the hook is fully closed.

n. Pull hook fully open. If necessary, rotate release knob. The FWD HOOK LOADED light shall remain out. The FWD HOOK OPEN light shall remain on.

o. Release the hook. Pull on the hook to check that it is latched closed. If it is not, pull the hook fully open and then release it. Place the test load on the hook. The hook remains closed. The FWD HOOK OPEN light shall remain on.

p. On the overhead panel, set the MASTER switch to RESET. The FWD HOOK OPEN light shall go out.

q. Set the MASTER switch to ARM.

r. At the aft hook, rotate the release knob to its maximum clockwise position. Pull the hook open. On the caution panel, the AFT HOOK OPEN light shall come on.

s. While holding the hook open, release the release knob.

t. Allow the hook to close slowly. On the overhead panel, the FWD HOOK LOADED light shall momentarily come on before the hook is fully closed.

u. Pull hook fully open. If necessary, rotate release knob. The AFT HOOK LOADED light shall remain out. The AFT HOOK OPEN light shall remain on.

v. Release the hook. Pull on the hook to check that it is latched closed. If it is not, pull the hook fully open and then release it. Place the test load on the hook. The hook remains closed. The AFT HOOK OPEN light shall remain on.

w. On the overhead panel, set the MASTER switch to RESET. The AFT HOOK OPEN light shall go out.

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L. STROBEX-VIBREX TRACKING PROCEDURE

Reference: TM 55-1520-240-23

(To be provided)

M. ENGINE VIBRATION CHECK

Reference: TM 55-1520-240-23

N. 712 ACCELERATION CHECK

1. With both Engine Condition Levers (ECL) in flight and the thrust rod in the ground detent position, take both engines to minimum beep using the No. 1 and No. 2 engine beep trim switch.

WARNING

Do not exceed any operation limits during the following steps.

2. Check the acceleration of the No. 1 engine as follows:
 - a. Place the No. 2 engine auto/manual switch to the manual position.
 - b. Using the No. 1 and No. 2 engine beep trim switch, set the RRPM to 100%.
 - c. Increase the thrust rod to set the No. 1 engine N1 speed to 92%.
 - d. Using the No. 1 ECL, retard the N1 speed to 70% while maintaining a constant thrust position.
 - e. Rapidly advance the No. 1 ECL to flight while timing the N1 speed acceleration to 90%.

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- f. Repeat the above two steps and numerically average the two times. The average time from ECL advance to 90 percent N1 shall NOT exceed the values given below.

OAT (Deg. Celsius)	Max Time From 70% N1 to 90% N1 (seconds)
-40	2.4
-30	2.6
-20	2.8
-10	3.0
0	3.2
10	3.4
20	3.8
30	4.3
40	4.7

- g. Place thrust in ground detent position and decrease the No. 1 and No. 2 engine beep trim switch for 8 seconds.
 - h. Place the No. 2 auto/manual switch to the auto position.
3. To check acceleration of the No. 2 engine, repeat the steps of paragraph 2 using the No. 1 auto/manual switch and the No. 2 ECL.
 4. Upon completion of the acceleration check return both ECLs to flight and RRPM to 100%.
 5. If the average time from ECL advance to 90 percent N1 exceeds the values given above, the fuel selector switch must be set to JP-4 or the acceleration schedule adjusted to decrease acceleration time to within limits.

O. 712 TURBINE ENGINE ANALYSIS CHECK
(TEAC)

Reference: TM 55-1520-240-23

NOTE

Insure that engine indicating systems are operating properly before performing TEAC.

1. Make sure the engine trim stops are installed on the N1 controls.

2. Set the copilot's altimeter at 29.92 barometric pressure to determine pressure altitude.

CAUTION

To prevent tripping the indicator and starting the timer, do not allow the EMERG PWR light to remain on longer than 5 seconds.

3. Climb to an altitude where topping can be accomplished at 120 KIAS to 140 KIAS (not to exceed Vne) at 98 percent rotor rpm.

NOTE

At cold ambient temperatures, it may be impractical to perform a TEAC due to high pressure altitudes. Under these conditions, enter a red dash in the aircraft forms and accomplish the TEAC when conditions permit.

- (O) 4. Be sure the ENG ANTI-ICE switch is OFF.
5. Using NO. 1 & NO. 2 ENGINE BEEP TRIM, set rotor speed to 100 percent.

CAUTION

If during the check it becomes necessary to reduce engine power, initially reduce power by operating the No. 1 & 2 ENGINE BEEP TRIM switch until rotor speed begins to decrease. Then lower thrust. Do not lower thrust until rotor rpm begins to decrease or an engine overspeed may occur. Also, to prevent tripping the indicator and starting the timer, do not allow the EMERG PWR light to remain on longer than 5 seconds.

6. Raise thrust lever slowly.

7. Set ENGINE CONDITION LEVER of the engine not being checked to GROUND. Maintain 100 percent rotor rpm using NO. 1 & NO. 2 ENGINE BEEP TRIM switch.

CAUTION

While performing this check, do not exceed the following limits:

- | | |
|-------------|----------|
| a. PTIT | 890°C |
| b. N1 | 105% |
| c. Airspeed | 140 KIAS |
| d. Torque | 123% |

8. Continue increasing thrust and increasing NO. 1 & NO. 2 ENGINE BEEP TRIM switch until gas producer (N1) speed for engine being TEACed stabilizes at maximum and rotor rpm falls to 98 percent. Maintain N 1 and 98 percent rotor rpm using thrust control and NO. 1 & NO. 2 ENGINE BEEP TRIM switch.

9. Stabilize the rotor speed at 98 percent, then record the following:

- a. N1.
- b. Deleted.
- c. Free air temperature (FAT).
- d. Power turbine inlet temperature (PITT).
- e. Torque.
- f. Pressure altitude.

10. Determine Engine Trim.

NOTE

Below 5°C FAT it may be impossible to perform a TEAC below 10,000 feet pressure altitude. Under these conditions, enter a red dash in the aircraft forms and accomplish the TEAC when conditions permit.

(O) 4. Be sure the ENG ANTI-ICE switch is OFF. █

5. Using NO. 1 & NO. 2 ENGINE BEEP TRIM, set rotor speed to 100 percent.



If during the check it becomes necessary to reduce engine power, initially reduce power by operating the No. 1 & 2 ENGINE BEEP TRIM switch until rotor speed begins to decrease. Then lower thrust. Do not lower thrust until rotor rpm begins to decrease or an engine over-speed may occur. Also, to prevent tripping the indicator and starting the timer, do not allow the EMERG PWR light to remain on longer than 5 seconds.

6. Raise thrust lever slowly.

7. Set ENGINE CONDITION LEVER of the engine not being checked to GROUND. Maintain 100 percent rotor rpm using NO. 1 & NO. 2 ENGINE BEEP TRIM switch.



While performing this check, do not exceed the following limits:

- a. Ptit 890°C
- b. N1 105%
- c. Airspeed 140 KIAS
- d. Torque 123%

8. Continue increasing thrust and increasing NO. 1 & NO. 2 ENGINE BEEP TRIM switch until gas producer (N1) speed for engine being TEACed stabilizes at maximum and rotor rpm falls to 98 percent. Maintain N1 and 98 percent rotor rpm using thrust control and NO. 1 & NO. 2 ENGINE BEEP TRIM switch.

9. Stabilize the rotor speed at 98 percent, then record the following:

- a. N1.
- b. Deleted.
- c. Free air temperature (FAT).
- d. Power turbine inlet temperature (PTIT).
- e. Torque.
- f. Pressure altitude.

10. Determine Engine Trim.

a. Enter figure 5-12 at the recorded FAT, proceed vertically to the curves which define the acceptable range of N1 values, then horizontally to the topping N1 (percent) scale.

b. Establish the PTIT band of figure 5-12.1 as follows:

Upper limit – the upper limit of the PTIT band is the top most line as marked on figure 5-12.1.

Lower limit – from the engine lower limit baseline.

Establish Engine Lower Limit

- (1) Engine that have previous acceptable TEAC checks within the upper PTIT band shall continue to have the band 1 lower limit.
- (2) Certain engines have performance improvements. These engines will be N1 limited and shall be trimmed to the acceptable N1 speed band limits. The thermocouple assemblies shall have a resistance check performed to assure serviceability prior to the initial TEAC baseline. Subsequent TEAC checks do not require resistance checks.
- (3) The TEAC performed following Step 2 shall determine the engine lower limit baseline. A tolerance of 20°C shall be subtracted from the recorded PTIT.
- (4) To determine the lower limit baseline enter figure 5-12.1 at the prevailing FAT, proceed vertically to a value 20°C less than the measured PTIT. The lower limit baseline is identified as the number of degrees above the applicable reference line 1, 2, 3 or 4 on figure 5-12.1, When the engine lower limit baseline has been determined, record the line number and the number of degrees above the line in the remarks section of the Historical Record For Aircraft (Form 2408-15 TEAC overprint).

Example

During the TEAC, PTIT was recorded at 800°C, N1 speed was 103%, FAT was -14°C.

PTIT = 800°C
Tolerance = -20°C
Engine Lower Limit Baseline = 780°C

The engine lower limit is 5°C above line 3 at all ambients. Record lower limit in the Historical Record For Aircraft as shown below.

NOTE

The purpose of the lower limit is to validate the accuracy of the PTIT temperature measurement system, as mentioned in the troubleshooting chart. A PTIT temperature below the established lower limit, with all other indications correct, is an indication of temperature system problems.

- c. Enter figure 5-12.2 at the recorded FAT, proceed vertically to the pressure altitude, then horizontally to the torque available scale.

11. The engine trim is acceptable if the following conditions are met:

- a. Recorded N1 is between the values from step 10a which define acceptability

and

Recorded PTIT is between the values from step 10b which define acceptability

and

Recorded torque exceeds the value from step 10c.

OR

b. Recorded PTIT is within band 1 of figure 5-12.1

a n d

Recorded torque exceeds the value from step 10c

a n d

Recorded N1 is within 5%, but does not exceed the Max N1 line of figure 5-12.

12. If the criteria of step 11 are not met, troubleshoot the engine indicating systems prior to trimming the engine to comply. Do not trim the engine to exceed PTIT limits. To increase N1 or PTIT, turn the N1 trim adjustment clockwise. To decrease N1 or PTIT, turn N1 trim adjustment counterclockwise. Trim sensitivity is, $\frac{1}{4}$ turn of screw changes N1 approximately 1% and PTIT approximately 25°C. If the recorded N1 is acceptable, but the recorded PTIT is lower than it should be according to 11a, a resistance check of the PTIT harness should be performed. If the PTIT indicating system is OK the engine is acceptable.

13. After completion of the check, reduce engine power initially by operating the No. 1 & 2 ENGINE BEEP TRIM switch to decrease rotor rpm, N1, and torque. Do not lower thrust until rotor rpm and N1 begins to decrease.

CAUTION

Do not move the ENGINE CONDITION lever of the other engine from GROUND to FLIGHT until N1 speed and torque of the engine being TEACed has been reduced.

14. Move the ENGINE CONDITION lever of the next engine to be TEACed from GROUND to FLIGHT.

15. Repeat steps 6 thru 15 for the other engine.



Failure to remove the topping stops following a topping check will prevent the engines from achieving emergency power on subsequent flights.

P. (Deleted).

**Q. DIFFERENTIAL CURRENT PROTECTION
CIRCUIT CHECK**

Reference: TM 55-1520-240-23.

Perform this check whenever maintenance has been performed on a generator, a generator control unit, a current transformer or the wiring between these units. Perform the check as follows:

1. Set the following switches to the specified positions:
 - a. HEATER — VENT BLOWER ONLY.
 - b. CPLT, CTR, and PLT WINDSHIELD ANTI-ICE — ON.
 - c. CPLT and PLT SLT-FIL — ON.
 - d. FUEL PUMPS — All ON.
2. GEN 1 switch — OFF. Check NO. 1 GEN OFF caution light is on and NO. 2 GEN OFF caution light is out.
3. GEN 1 switch — ON. GEN 2 switch - Off. Check NO. 1 GEN Off caution light is out and NO. 2 GEN OFF caution light is on.
4. GEN 2 switch — ON. Check both GEN OFF caution lights are out.
5. HEATER, WINDSHIELD ANTI-ICE, SLT-FIL, and FUEL PUMPS switch — Set as desired.

R. CARGO RAMP AND DOOR CHECK.

Reference: TM 55-1520-240-T.

1. Cargo ramp and door — Check fully closed.
2. Electrical and hydraulic power —Off.
3. APU START ACCUMULATOR guage — Check 2,500 psi minimum. If not, use hand pump to charge accumulator.
4. EMERG UTIL PRESS valve — OPEN.
5. RAMP CONTROL VALVE handle — DN and hold until ramp is level with cabin floor, then STOP. Check for the following sequence of actions:
 - a. Ramp and cargo door open and move downward about 10 inches, then stop.
 - b. Cargo door then retracts into ramp.
 - c. Ramp then continues to move downward, then stops when the RAMP CONTROL VALVE handle is moved to STOP
6. EMERG UTIL PRESS valve — NORMAL.
7. Apply electrical and hydraulic power.
8. UTIL SYS CONT circuit breaker — Check closed.
9. RAMP EMER CONT circuit breaker — Check closed.
10. RAMP PWR switch on overhead panel — ON.
11. RAMP CONTROL SEQUENCE VALVE — Turn pin to horizontal position.
12. RAMP CONTROL VALVE handle — DN. Check that ramp moves to full down position (resting on ground), and cargo door remains retracted.
13. RAMP CONTROL VALVE handle — UP. Check that ramp moves to the full up position and cargo door remains retracted.
14. RAMP CONTROL VALVE handle — DN and hold until ramp is at mid-position, then STOP. Check that ramp stops at mid-position with cargo door fully retracted.

CAUTION

Do not manually operate cargo door (ramp tongue) with ramp in full up position. Damage to door and fuselage will occur.

15. RAMP CONTROL SEQUENCE VALVE — Turn pin to vertical position.
16. RAMP CONTROL SEQUENCE VALVE MANUAL OPER knob — Pull up and hold. Check that cargo door extends fully.
17. RAMP CONTROL SEQUENCE VALVE MANUAL OPER knob — Release. Check that cargo door retracts fully into ramp.
18. RAMP PWR switch on overhead panel — OFF.
19. RAMP CONTROL VALVE handle — UP. Check that ramp does not move.
20. RAMP CONTROL VALVE handle — STOP
21. RAMP PWR switch on overhead panel — ON.
22. RAMP CONTROL VALVE handle — DN. Check that ramp moves to the full down position (resting on ground), and cargo door remains retracted.
23. RAMP CONTROL VALVE handle — UP. Check for the following sequence of actions:
 - a. Ramp moves upwards and stops approximately 8 inches from the fully closed position.
 - b. Cargo door then extends fully from ramp.
 - c. Ramp and door then move up into the fully closed position.
24. Press and hold knob on door override valve. Perform the next step while holding knob.
25. RAMP CONTROL VALVE handle — DN and hold till ramp is at mid-position, then STOP. Check that ramp moves to mid-position and stops with cargo door fully extended.

26. Release knob on door override valve. Check that cargo door retracts fully into ramp.

27. RAMP CONTROL VALVE handle — UP. Check that ramp and cargo door move to the fully closed position in the proper sequence described above.

28. RAMP CONTROL VALVE handle — STOP.

29. RAMP EMER switch on overhead panel — Lift guard and move switch to the DN position momentarily, then release switch. Check that switch returns to the HOLD position when released. Check that ramp does not move when switch is in the DN position.

30. RAMP PWR switch on overhead panel — EMERG. Check that RAMP CONTROL VALVE handle is resistant to manual movement, and returns to the STOP position if moved to either the UP or DN positions.

31. RAMP EMER switch on overhead panel — DN momentarily, then release. Check for the following:

a. RAMP CONTROL VALVE handle moves to the DN position.

b. Ramp and cargo door open and move downward in the proper sequence for approximately 5 seconds, then stop.

c. RAMP CONTROL VALVE handle returns to the STOP position.

32. RAMP EMER switch on overhead panel — DN momentarily, then immediately to UP momentarily, then release to HOLD. Check for the following:

a. RAMP CONTROL VALVE handle moves to DN, then UP, then STOP.

b. Ramp moves downward momentarily, then stops in less than 5 seconds.

33. RAMP EMER switch on overhead panel — DN and hold until ramp is fully open (resting on ground), then release to HOLD. Check that ramp remains fully open.

34. RAMP EMER switch on overhead panel — UP and hold until ramp is in level position, then release to HOLD. Check that ramp remains in level position.

35. RAMP EMER switch on overhead panel — UP and hold until ramp and cargo door are fully closed, then release to HOLD. Check that ramp and cargo door close in proper sequence, and remain fully closed.

36. Place the RAMP EMER switch guard in the closed (cover down) position.

37. RAMP PWR switch on overhead panel — OFF.

38. Remove hydraulic and electrical power.

39. UTILITY RESERVOIR DEPRESSURIZE valve — OPEN.

40. Press depressurization valve on apu start module. Check that utility system depressurizes.

41. UTILITY RESERVOIR DEPRESSURIZE valve — NORMAL.

42. RAMP CONTROL VALVE handle — DN. Check that ramp does not move.

43. RAMP CONTROL VALVE handle — STOP

S. HEADS UP DISPLAY CHECK. (HUD)

Reference: TM 55-1520-240-23

Perform this check on helicopters equipped with Heads Up Display, AN/AVS-7, System; to be used with the Aviator's Night Vision Imaging System (ANVIS). Flight test will consist of display comparison between panel displays and data displayed on the AN/AVS-7 HUD.

1. **Starting procedure.**
 - a. ADJ/ON/OFF switch - OFF.
 - b. Optical unit support clamps - Check.
 - c. Display unit lens - Check.

WARNING

Failure to remove the ANVIS neck cord prior to operation of the HUD may prevent egress from the aircraft in an emergency.

- d. ANVIS neck cord - Removed.
- e. Optical unit - Install on ANVIS. Lightly turn OU thumbscrew clockwise.
- f. EYE SELECT switch - L or R.

WARNING

CCU ADJ/ON/OFF switch must be OFF before connecting or disconnecting quick-release connector.

CAUTION

The AN/AVS-7 system should not be used if the quick-release connector is not in working order.

- g. PSCU - CONNECT. Connect PSCU to quick-release connector.
- h. PSCU - Disconnect.
- i. Pscu - Reconnect.



Keep the protective caps on the ANVIS whenever it is not in use. Operate the ANVIS only under darkened conditions.

NOTE

Ensure ANVIS operator procedures have been completed.

- j. P-PGM/OP/CP-PGM switch - OP.
- k. ADJ/ON/OFF switch - ON. SYS ON and FAIL lights illuminate and BIT will initiate automatically.
- l. FAIL light - Check. Out after ten seconds. BIT is complete. Allow 1 minute for warmup.
- m. BRT/DIM switch - as desired.
- n. DSPL POS control - as required.
- o. Display aligned to horizon - Check. Tighten thumbscrew.
- p. Master Mode Display - Check.

2. Symbol generator - Check as follows:

- a. BIT/ACK switch - Press BIT and hold. Display unit will show all master symbols, software version, date, and type aircraft.
- b. BIT/ACK switch - Release. Display returns to operating mode.

3. Ground Check — perform prior to flight.

a. Pilot DU — select a Master Mode Display. Verify that pilot DU is not changed as w-pilot toggles through all available symbology and declutter modes.

b. Repeat step a above for co-pilot DU as pilot toggles through available display modes.

4. In-flight Operation.

NOTE

Ensure that the AN/APN-209, AN/ASN-43, and AN/ASN-128 are ON and operational.

a. Heading.

(1) Ply the aircraft on a heading of 360° using the HSI.

(2) Verify that the compass heading scale on the DU displays a 000° heading.

(3) Repeat steps 1 and 2 for a heading of 045°, 090°, 135°, 180°, 225°, 270°, 315°.

b. Bearing and distance check.

(1) Verify that the bearing to waypoint-numeric on the DU matches the bearing to destination on the AN/ASN-128 display.

(2) Verify that the bearing to waypoint-pointer on the DU matches the bearing to waypoint-numeric or is displayed far right or far left if bearing is beyond displayed compass heading-scale.

(3) Maneuver the aircraft in the direction of the waypoint until the bearing to waypoint-pointer is centered. Verify that the bearing to waypoint-pointer matches the bearing to waypoint-numeric on the DU.

(4) Verify that the distance to target on the DU matches the distance to destination on the AN/ASN-128 display.

c. High altitude check.

(1) Verify that the radar altitude (AGL) numeric on the DU matches the radar altitude displayed on the AN/APN-209 (0-1000 feet).

(2) Fly aircraft at 2000 feet AGL. Verify that the barometric altitude (MSL) on the DU matches the barometric altitude displayed on the AIMS altimeter. (Various altitude levels may be chosen during flight and verify the DU barometric altitude matches what is displayed on the AIMS altimeter.)

d. Roll, pitch, and yaw check.

(1) Verify that the horizon line, angle of roll-scale, and angle of pitch-scale is present on the DU.

(2) Roll helicopter 20° to the left and verify the horizon line and the angle of roll - pointer on the DU indicate a 20° roll to the left. Roll the helicopter 35° to the left and verify the horizon line indicates a greater roll to the left than before and the angle of roll - pointer freezes at 30° and flashes. Repeat for roll angles of 20° and 35° to the right.

(3) Pitch helicopter 10° up and verify the horizon line on the DU indicates a 10° pitch up. Pitch helicopter 35° up. If a 35° pitch angle exceeds safe operating limits, pitch the aircraft to the maximum safe pitch limit instead. Verify the horizon line on the DU corresponds to the actual pitch angle of the helicopter and the bottom tic mark flashes if the pitch angle exceeds 30°. Repeat for similar downward pitch angles, noting the top tic mark will flash for downward pitch angles of greater than 30°.

(4) Verify the trim (slide ball) on the DU agrees with the turn and slip indicator.

e. Vertical speed, engine torque, and engine TGT check.

(1) Perform a 500 FPM climb. Verify the vertical speed pointer on the DU indicates a 500 FPM climb.

(2) Verify the torque-numeric and torque-analog bar on the DU displays the increased engine torque as displayed on the PDU.

(3) Repeat steps 1 and 2 for 2000 FPM.

(4) Repeat steps 1 through 3 for rate of decent noting decreased engine torque.

(5) Verify the No. 1 ENG PTIT and No. 2 ENG PTIT displayed on the DU matches the PTIT values displayed on the center instrument panel.

f. Airspeed, groundspeed, and drift angle.

(1) Increase airspeed to 120 KIAS and stabilize. Verify the IAS on the DU is 120 KIAS.

(2) Verify groundspeed on the DU matches groundspeed on the doppler.

(3) Repeat steps 1 and 2 for airspeeds of 80, 40, and 25 KIAS.

(4) Verify the velocity vector on the DU is identical to course deviation bar on HSI.

g. Low altitude check (done during approach to landing).

(1) Set LOW altitude warning marker on the AN/APN-209 to 200 feet. From an altitude of greater than 200 feet AGL, transition to a hover at approximately 100 feet AGL. Verify a box is displayed around the radar altitude numeric on the DU after passing through 200 feet AGL.

(2) Verify the radar altitude (AGL) analog bar is displayed on the DU as the aircraft descends below 200 feet AGL.

(3) Verify the radar altitude (AGL) analog bar on the DU matches the AN/APN-209.

h. Warnings and messages check.

(1) CARGO HOOK MSTR SWITCH - ARM.

(2) HOOK SEL switch - Rotate to hook to be released.

(3) CARGO HOOK RELEASE switch - Press and release.

(4) Verify DU hook message is on.

(5) CCU BIT/ACK switch - ACK. Verify DU hook message extinguishes.

(6) Land aircraft.

(7) Verify DU MEM message is on.

(8) APU CONTR switch - ON. Verify the DU MST message is on.

(9) APU CONTR switch - OFF. Verify DU MST message extinguishes.

(10) CCU BIT/ACK switch - ACK. Verify DU MEM message extinguishes.

(11) HUD - OFF.

SECTION V. CHARTS AND FORMS

1. GENERAL. This section contains the necessary charts and forms required to ascertain that the aircraft is performing to established standards and to record readings, pressures, rpm, etc., obtained during maintenance test flight.

2. LIST OF CHARTS.

FIGURE NUMBER	TITLE	PAGE
5-1	Temperature Conversion Chart	5-3
5-2	Airspeed Operating Limits with Inoperative CGI	5-5
5-3	Airspeed Operating Limits with Retracted LCT	5-7
5-4	APU Start Accumulator Precharge Limits	5-9
5-5	Flight/Utility/Power Steering Accu- mulator Precharge Limits	5-10
5-6	Brake Accumulator Precharge Lim- its	5-11
5-7	Engine Fire Extinguisher Pressures	5-12
5-8	CH-47D FWD and AFT LCT Indicator Schedule	5-13
5-9	712 Interstage Air-Bleed Closure Chart	5-17
5-10	CH-47D Cockpit Controls Position Envelope	5-19
5-11	712 Autorotational RPM Chart for CH-47D	5-23
5-12	712 Turbine Engine Analysis Check N1 Chart	5-25
5-12.1	712 Turbine Engine Analysis Check PTIT Chart	5-26.1
5-12.2	712 Turbine Engine Analysis Check Torque Chart	5-26.2.1
5-12.3	714A Autorotational RRPM Chart	5-26.2.3

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FIGURE NUMBER	TITLE	PAGE
5-12.4	714X Power Assurance Test Altitude Bands Chart	5-26.2.5
5-12.5	714X Power Assurance Test Maximum Continuous Power Chart	5-26.2.7
5-12.6	714X Power Assurance Test Maximum Power Chart	5-26.2.9
5-12.7	714X Power Assurance Test Engine Temperature Limits Chart	5-26.2.11
5-12.8	714X Power Assurance Test N1 Gas Generator Speed Chart	5-26.2.13
5-12.9	714X Power Assurance Test PAT Number Margin to Torque Margin Conversion Chart	5-26.2.15
5-12.10	714X N1 Idle Check Altitude Bands Chart	5-26.2.17
5-12.11	714X Engine Ground Starting Time vs. Ambient Air Temperature (Static, Sea Level)	5-26.2.19
5-13	Turbine Engine Analysis Check Troubleshooting Chart	5-26.3
5-14	Engine Vibration Test Data Sheet	5-27
5-15	Maintenance Test Flight Check Sheet	5-29

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Look up reading in middle column; if in degrees Centigrade, read Fahrenheit equivalent in right-hand column; if in degrees Fahrenheit, read Centigrade equivalent in left-hand column.

C	F	C	F	C	F	C	F				
-54	-65	-85	28.9	84	183.2	266	510	950	538	1000	1832
-51	-60	-76	30.0	86	186.8	271	520	968	543	1010	1850
-46	-50	-58	31.1	88	190.4	277	530	986	549	1021	1868
-40	-40	-40	32.2	90	194.0	282	540	1004	554	1031	1886
-34	-30	-22	33.3	92	197.6	288	550	1022	560	1040	1904
-29	-20	- 4	34.4	94	201.2	293	560	1040	566	1050	1922
-23	-10	14	35.6	96	204.8	299	570	1058	571	1060	1940
-17.8	0	32	36.7	98	208.4	304	580	1076	577	1070	1958
-16.7	2	35.6	37.8	100	212.0	310	590	1094	582	1080	1976
-15.6	4	39.2	43	110	230	316	600	1112	588	1090	1994
-14.4	6	42.8	49	120	248	321	610	1130	593	1100	2012
-13.3	8	46.4	54	130	266	327	620	1148	599	1110	2030
-12.2	10	50.0	60	140	284	332	630	1166	604	1120	2048
-11.1	12	53.6	66	150	302	338	640	1184	610	1130	2066
-10.0	14	57.2	71	160	320	343	650	1202	616	1140	2084
- 8.9	16	60.8	77	170	338	349	660	1220	621	1150	2102
- 7.8	18	64.4	82	180	356	354	670	1238	627	1160	2120
- 6.7	20	68.0	88	190	374	360	680	1256	632	1170	2138
- 5.6	22	71.6	93	200	392	366	690	1274	638	1180	2156
- 4.4	24	75.2	99	210	410	371	700	1292	643	1190	2174
- 3.3	26	78.8	104	220	428	377	710	1310	649	1200	2192
- 2.3	28	82.4	110	230	446	382	720	1328	654	1210	2210
- 1.1	30	86.0	116	240	464	388	730	1346	660	1220	2228
0.0	32	89.6	121	250	482	393	740	1364	666	1230	2246
1.1	34	93.2	127	260	500	399	750	1382	671	1240	2264
2.2	36	96.8	132	270	518	404	760	1400	677	1250	2282
3.3	38	100.4	138	280	536	410	770	1418	682	1260	2300
4.4	40	104.0	143	290	554	416	780	1436	688	1270	2318
5.6	42	107.6	149	300	572	421	790	1454	693	1280	2336
6.7	44	111.2	154	310	590	427	800	1472	699	1290	2354
7.8	46	114.8	160	320	608	432	810	1490	704	1300	2372
8.9	48	118.4	166	330	626	438	820	1508	710	1310	2390
10.0	50	122.0	171	340	644	443	830	1526	716	1320	2408
11.1	52	125.6	177	350	662	449	840	1544	721	1330	2426
12.2	54	129.2	182	360	680	454	850	1562	727	1340	2444
13.3	56	132.8	188	370	698	460	860	1580	732	1350	2462
14.4	58	136.4	193	380	716	466	870	1598	738	1360	2480
15.6	60	140.0	199	390	734	471	880	1616	743	1370	2498
16.7	62	143.6	204	400	752	477	890	1634	749	1380	2516
17.8	64	147.2	210	410	770	482	900	1652	754	1390	2534
18.9	66	150.8	216	420	788	488	910	1670	760	1400	2552
20.0	68	154.4	221	430	806	493	920	1688	766	1410	2570
21.1	70	158.0	227	440	824	499	930	1706	771	1420	2588
22.2	72	161.6	232	450	842	504	940	1724	777	1430	2606
23.3	74	165.2	238	460	860	510	950	1742	782	1440	2624
24.4	76	168.8	243	470	878	516	960	1760	788	1450	2642
25.6	78	172.4	249	480	896	521	970	1778	793	1460	2660
26.7	80	176.0	254	490	914	527	980	1796			
27.8	82	179.6	260	500	932	532	990	1814			

Figure 5-1. Temperature Conversion Chart

**AIRSPED OPERATING LIMITS
WITH INOPERATIVE CRUISE GUIDE INDICATOR**
PROGRAMMED LONGITUDINAL CYCLIC TIME 100% ROTER RPM

**AIRSPED
OPERATING
LIMITS
CH-47D**

EXAMPLE

WANTED

MAX INDICATED AIRSPEED FOR GIVEN
TEMP PRESS ALTITUDE, AND GROSS WEIGHT

KNOWN

FAT = -30°C
PRESS ALTITUDE = 8800 FT
GROSS WEIGHT = 38,000 LB

METHOD

ENTER FAT AT -30°C. MOVE RIGHT TO
PRESS ALTITUDE = 8800 FT

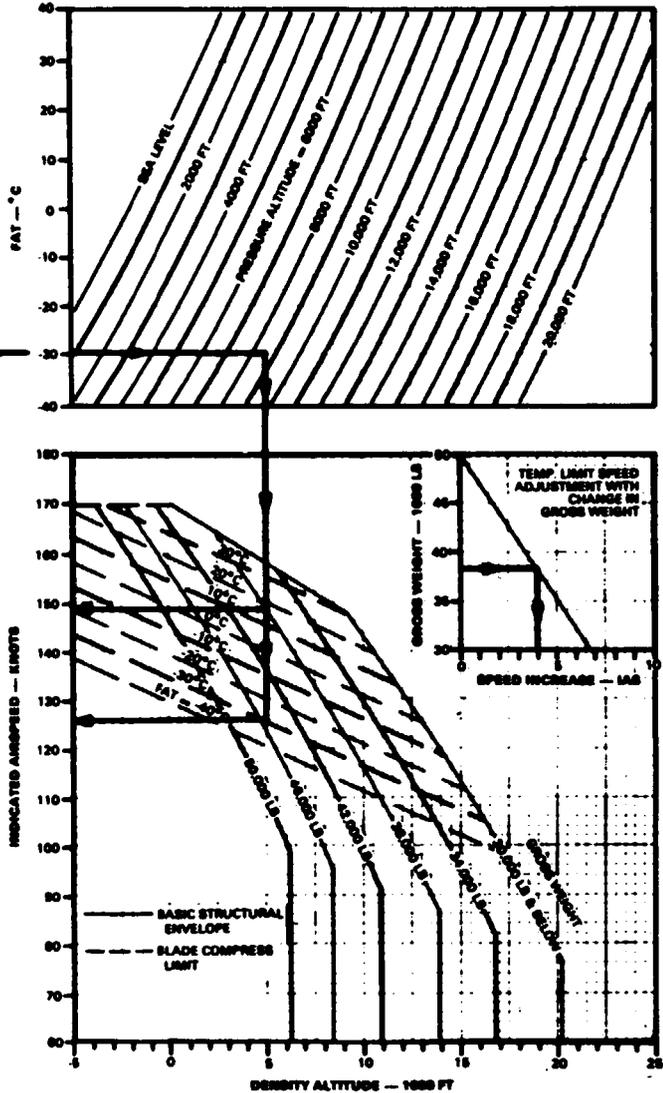
● MOVE DOWN TO GROSS WEIGHT LINE
(38,000 LB). MOVE LEFT AND
READ IAS = 148 KT

● MOVE DOWN TO TEMP LINE (-30°C).
MOVE LEFT AND READ IAS = 128 KT
USE INSERT GRAPH TO ADJUST TEMP
LIMIT SPEED FOR CHANGE IN GROSS
WEIGHT

ENTER AT GW = 38,000 LB MOVE RIGHT,
THEN DOWN TO READ INCREMENTAL
SPEED INCREASE = 4 KT (IAS)
NOW, IAS = 128 + 4 = 129 KT AT
GROSS WEIGHT = 38,000 LB

USE LOWER VALUE AS MAXIMUM IAS.

MAX IAS = 129 KT



0148-270-10

Figure 5-2. Airspeed Operating Limits With Inoperative Cruise Guide Indicator

**AIRSPPEED OPERATING LIMITS
WITH RETRACTED LONGITUDINAL CYCLIC TRIM**

AIRSPPEED
OPERATING
LIMITS
CH-47D

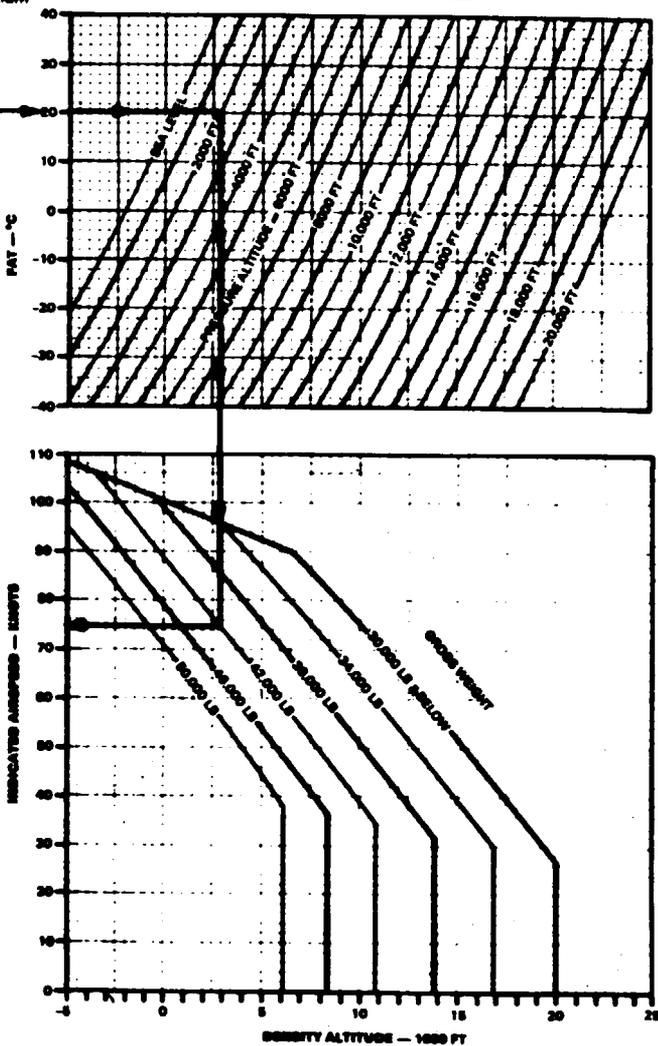
EXAMPLE

WANTED
MAX. INDICATED AIRSPEED FOR GIVEN
TEMP., PRESS. ALTITUDE, AND GROSS WEIGHT

KNOWN
FAT = 20°C
PRESS. ALTITUDE = 2000 FT
GROSS WEIGHT = 42,000 LB

METHOD
ENTER FAT AT 20°C. MOVE RIGHT TO
PRESS. ALTITUDE = 2000 FT
MOVE DOWN TO GROSS WEIGHT LINE
42,000 LB. MOVE LEFT AND
READ IAS = 74 KT

**NOTE: USE OF THE CURVE GUIDE INDICATOR TO EXCEED
THESE LIMITATIONS IS PROHIBITED**



0148-273-10

Figure 5-3. Airspeed Operating Limits With Retracted Longitudinal Cyclic Trim

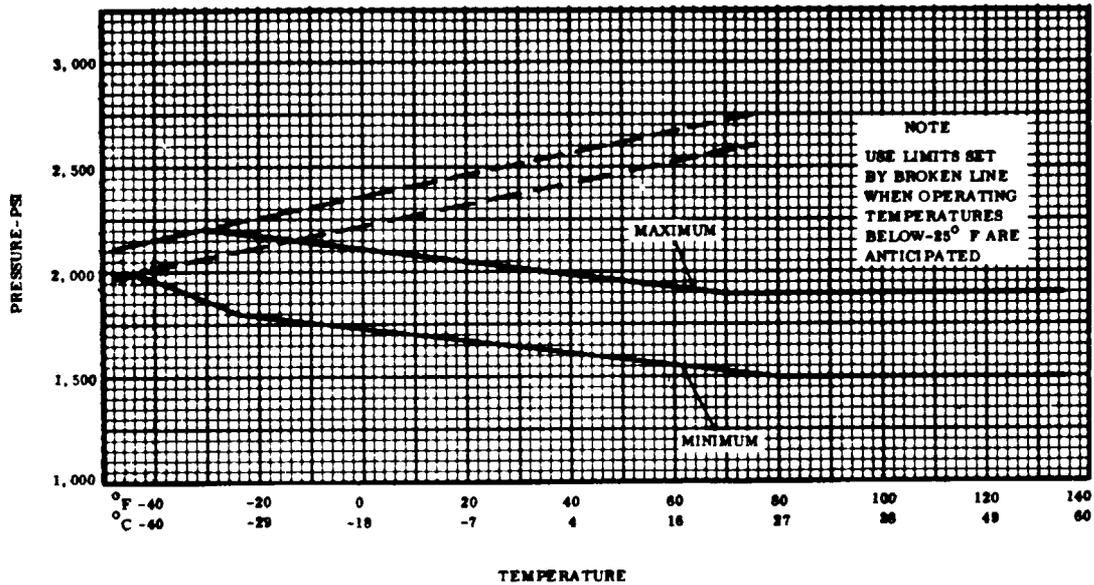
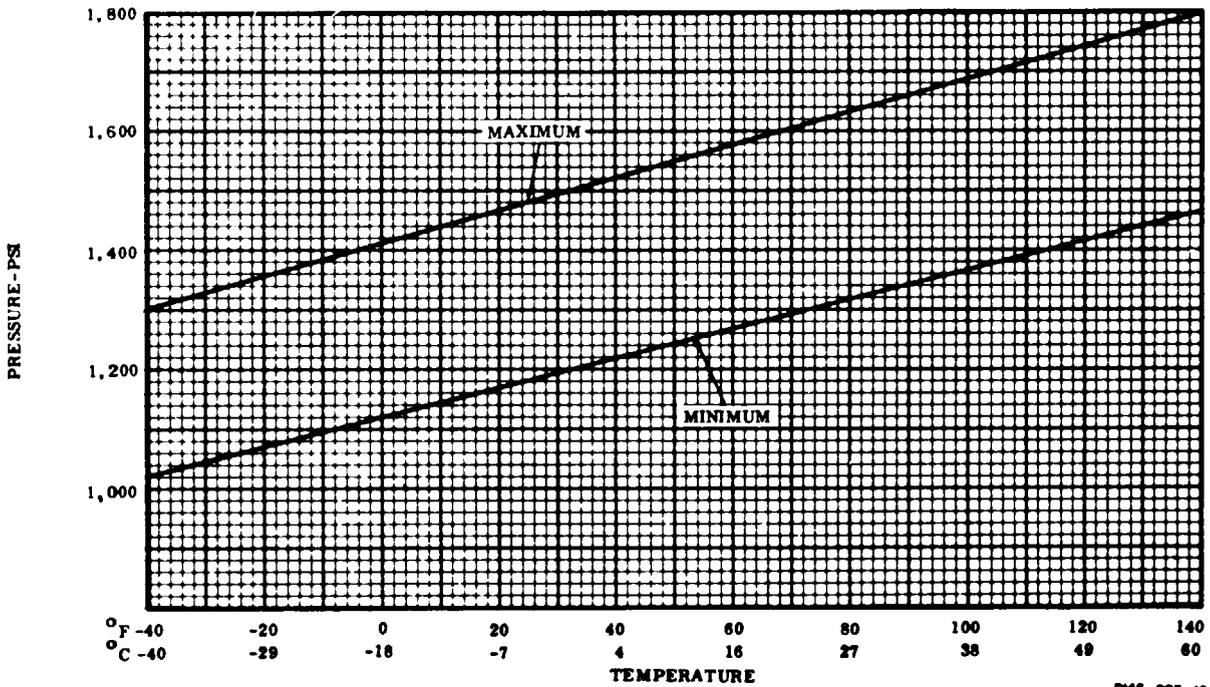
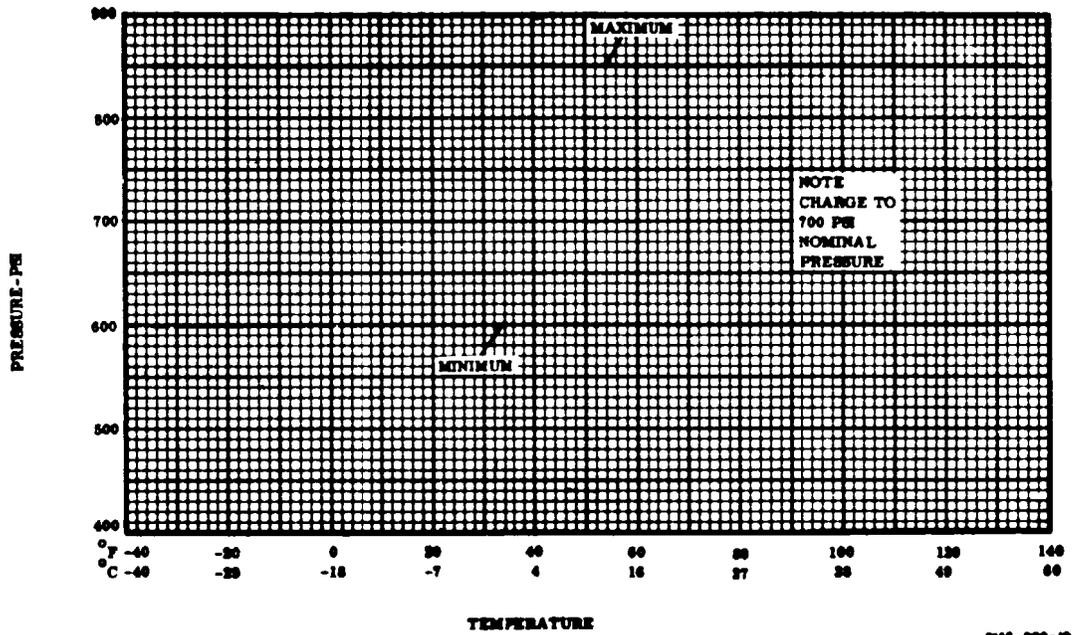


Figure 5-4. Apu Start Accumulator Precharge Limits



046-203-10

Figure 5-5. Flight/Utility/Power Steering
Accumulator Precharge Limits
5-10



000-000-10

Figure 5-6. Brake Accumulator Precharge Limits

Ambient Temperature (Fahrenheit)	(Centigrade)	Minimum Indication (Psi)	Maximum Indication (Psi)
-65°	-54°	271	344
-60°	-51°	275	350
-40°	-40°	292	370
-20°	-29°	320	400
0°	-18°	355	437
20°	- 7°	396	486
40°	4°	449	540
60°	15°	518	618
80°	27°	593	702
100°	38°	691	784
125°	52°	785	902

Figure 5-7. Engine Fire Extinguisher
Pressure

CH-47D FORWARD LCT INDICATOR SCHEDULE (SHEET 1 OF 2)

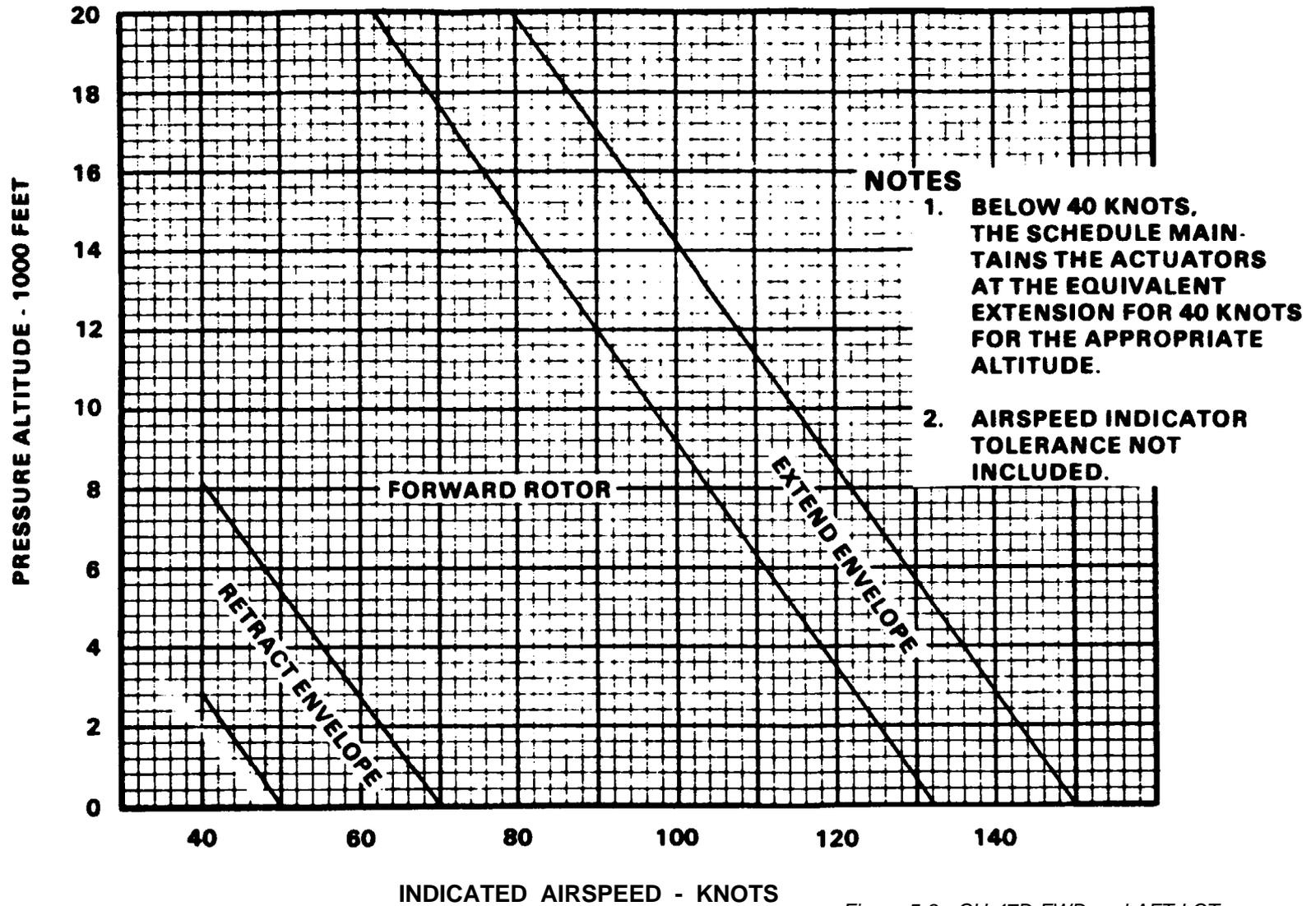


Figure 5-8. CH-47D FWD and AFT LCT Indicator Schedule (Sheet 1 of 2)

CH-47D AFT LCT INDICATOR SCHEDULE (SHEET 2 OF 2)

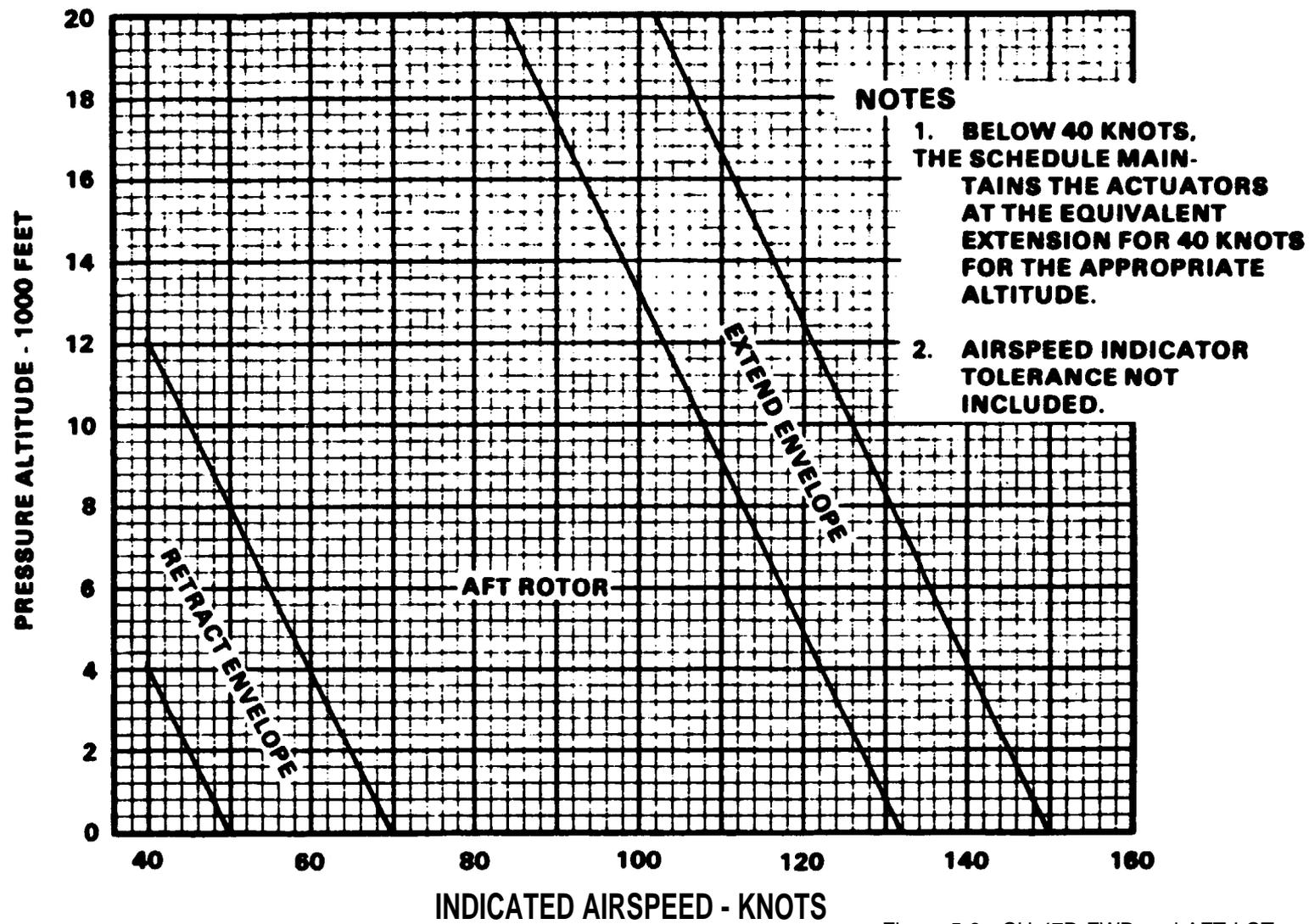


Figure 5-8. CH-47D FWD and AFT LCT Indicator Schedule (Sheet 2 of 2)

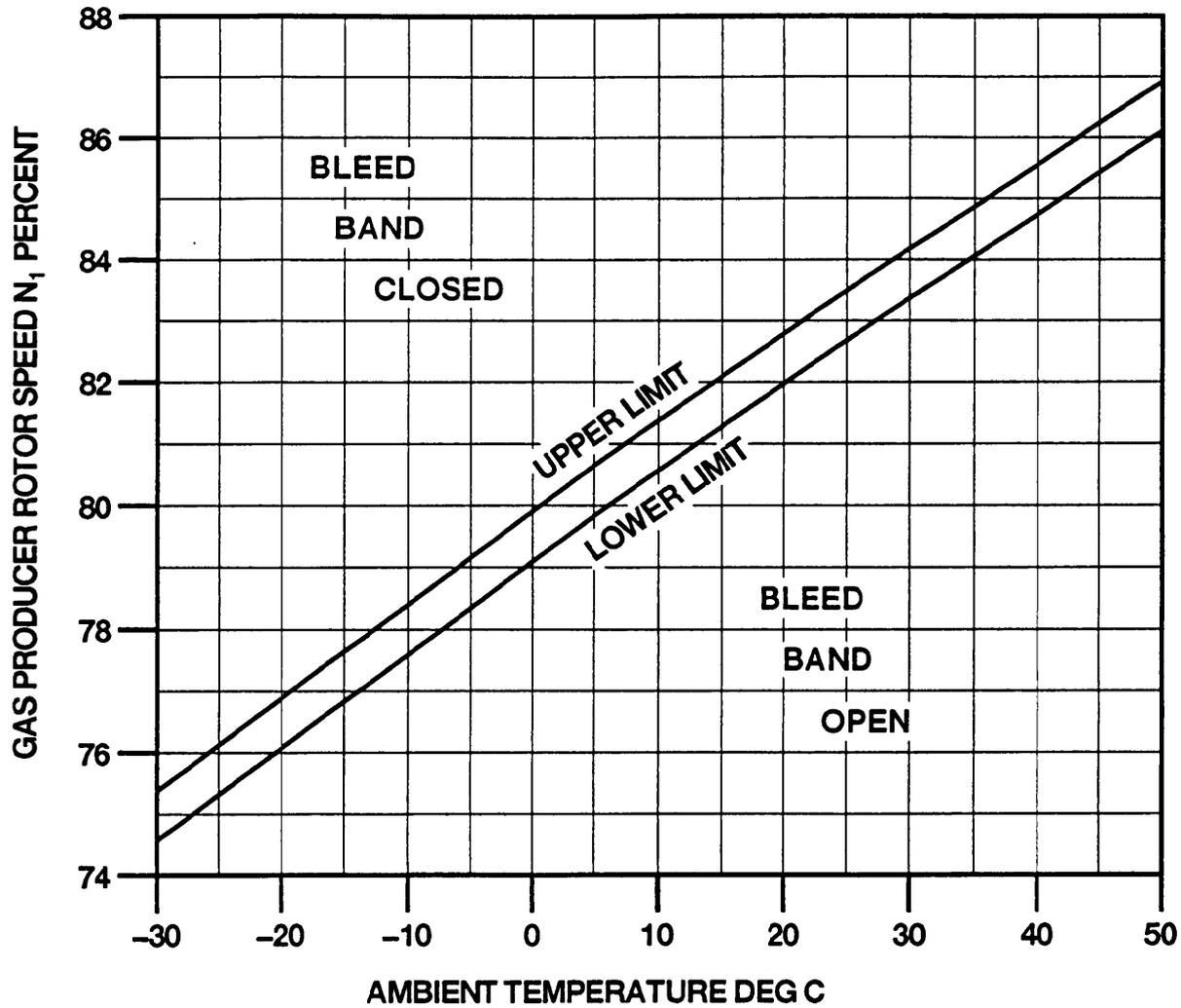


Figure 5-9. **712** Interstage Air-Bleed Closure Chart

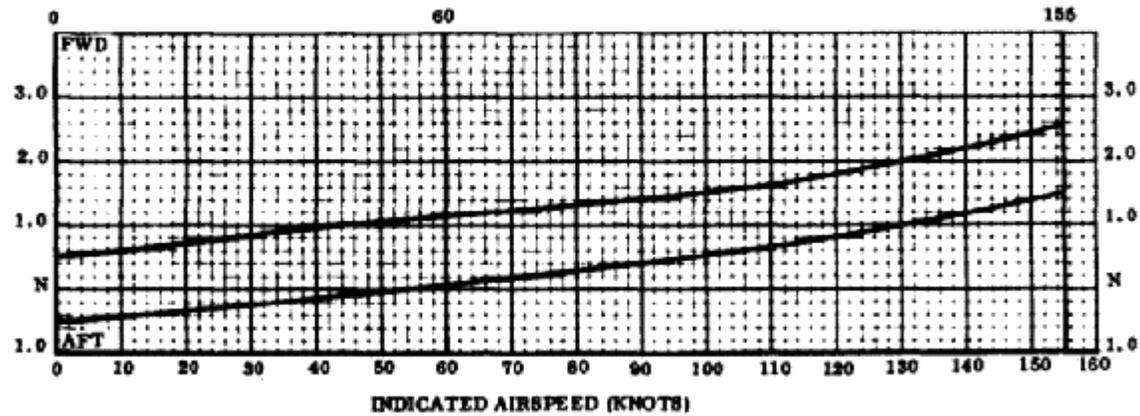
5-17/(5-18 blank)

C25

INTERSTAGE AIR-BLEED CLOSURE CHART T55-L-712

GROSS WEIGHT: STANDARD
UNBALLASTED CONFIGURATION

ROTOR RPM: 100%
RATE OF CLIMB: ZERO
CYCLIC TRIM: AUTO



LONGITUDINAL STICK POSITION ENVELOPE

Figure 5-10. CH-47D Cockpit Controls Position Envelope (Sheet 1 of 2)
5-19/(5-20 blank)

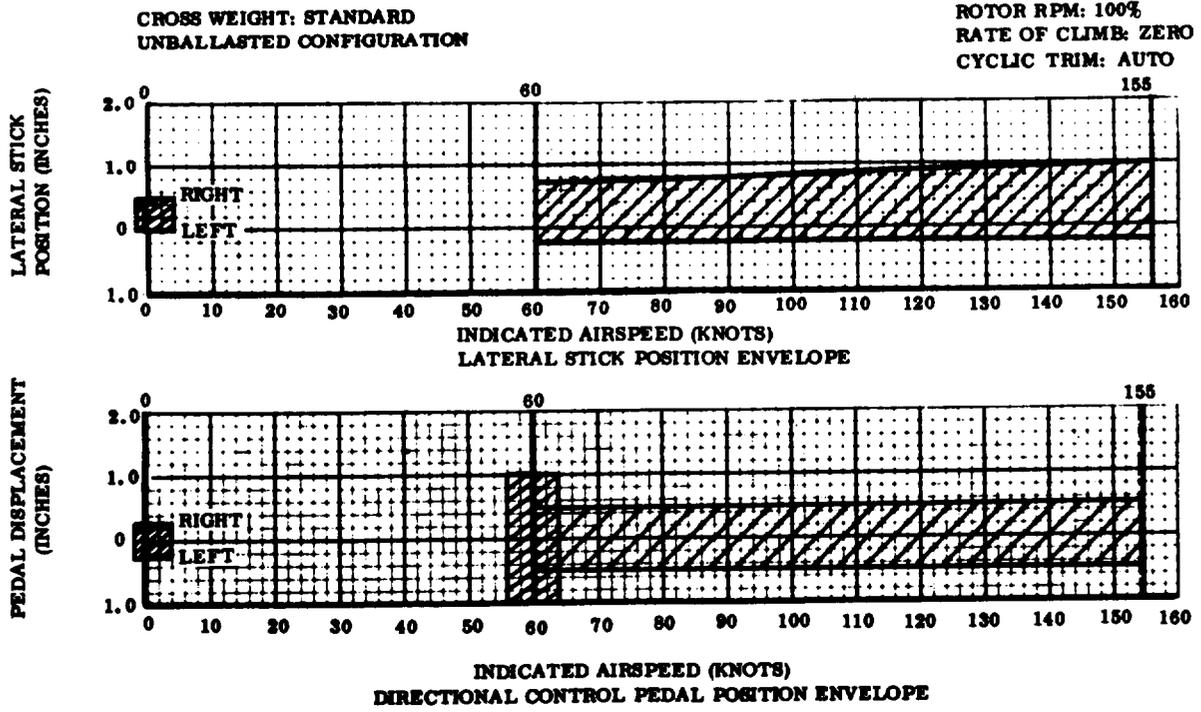


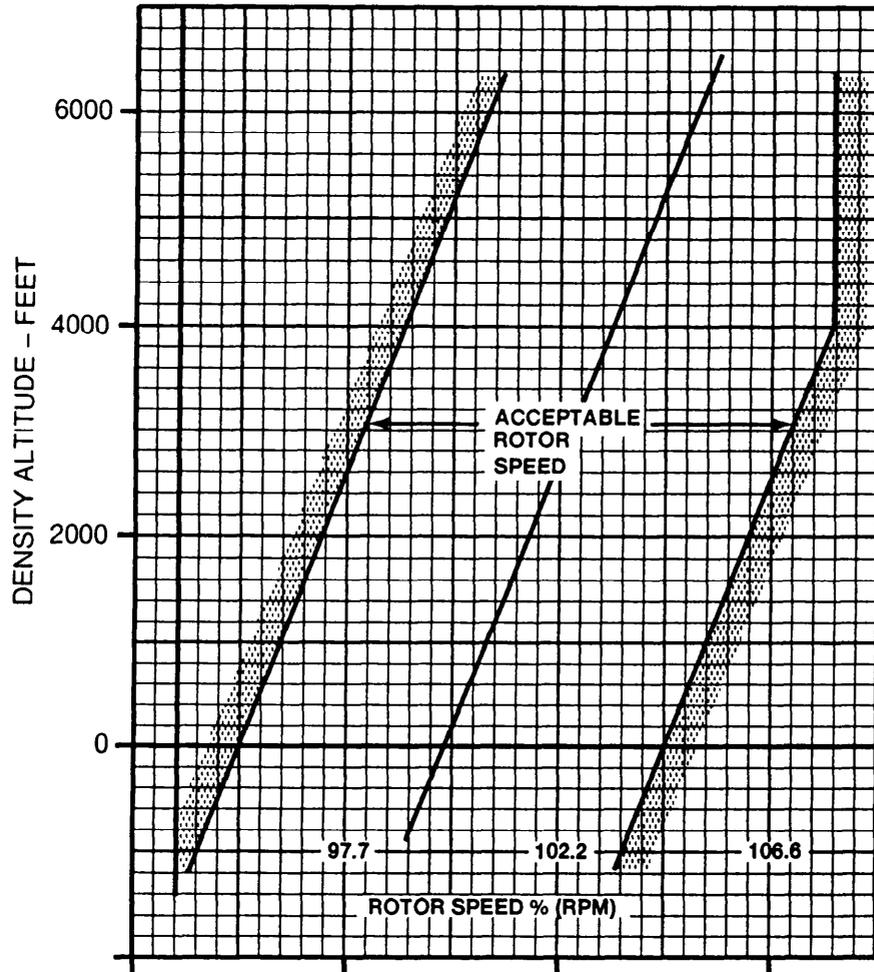
Figure 5-10. CH-47D Cockpit Controls Position Envelope (Sheet 2 of 2)

TM 55-1520-240-MTF

TRIM HELICOPTER IN STABILIZED AUTOROTATION
WITH FULL DOWN THRUST CONTROL.

GROSS WEIGHT = 28000 LB (± 1000 LB)

INDICATED AIRSPEED = 70 KTS TO 100 KTS



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Figure 5-11. **712** Autorotational RPM Chart
for CH-47D

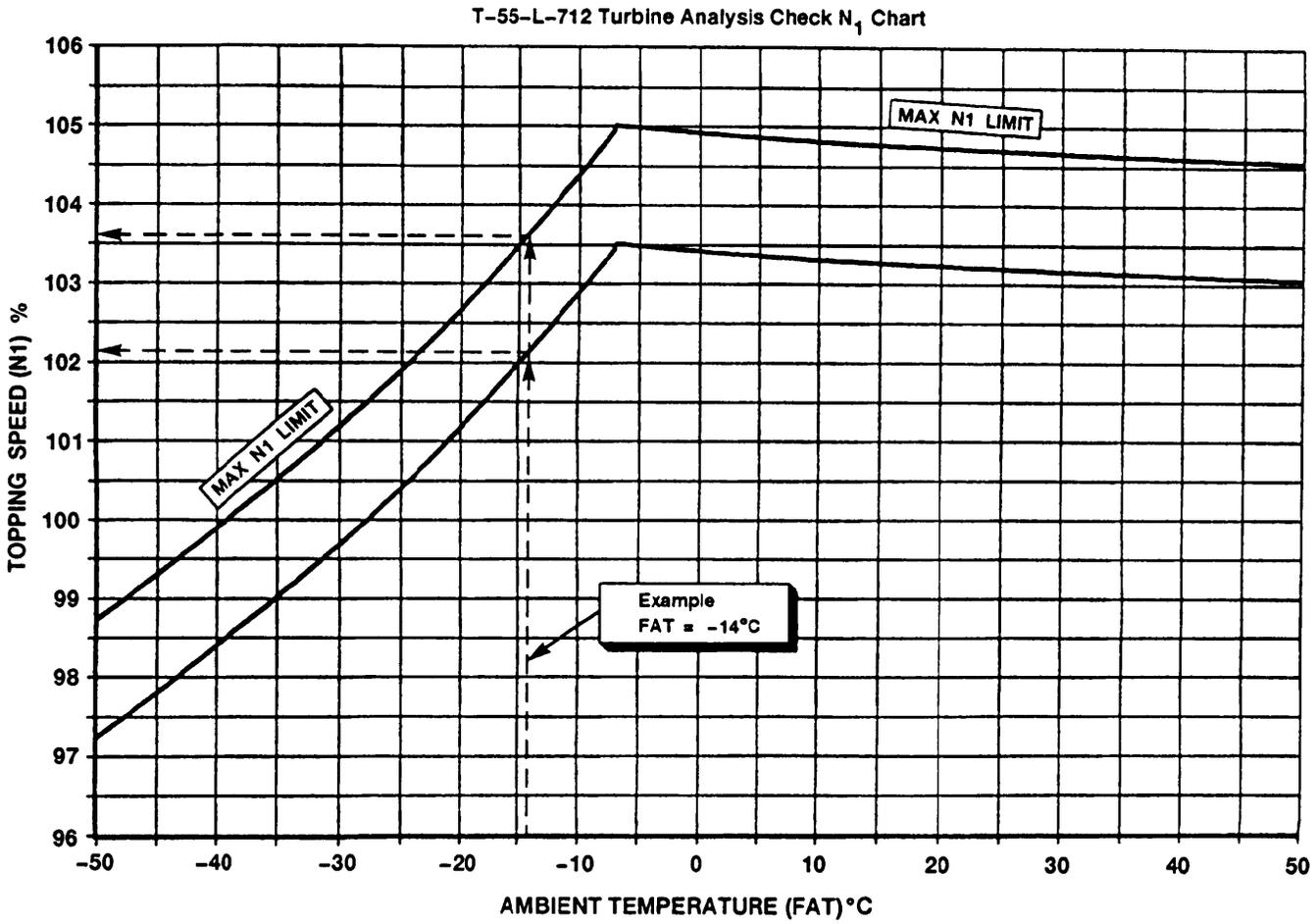


Figure 5-12. **712** Turbine Engine Analysis
Check N₁ Chart

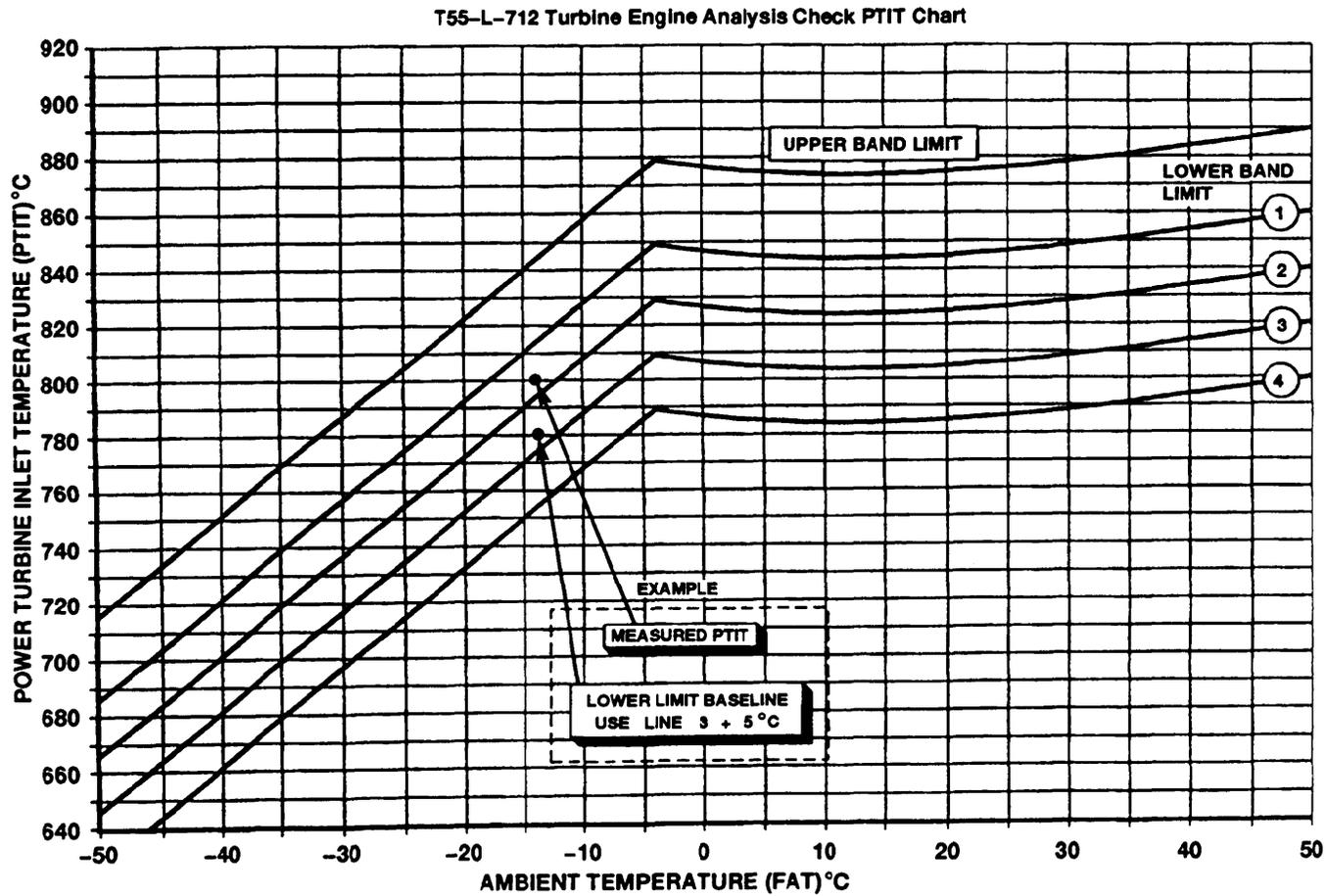


Figure 5-12.1. **712** Turbine Engine Analysis Check PTIT Chart

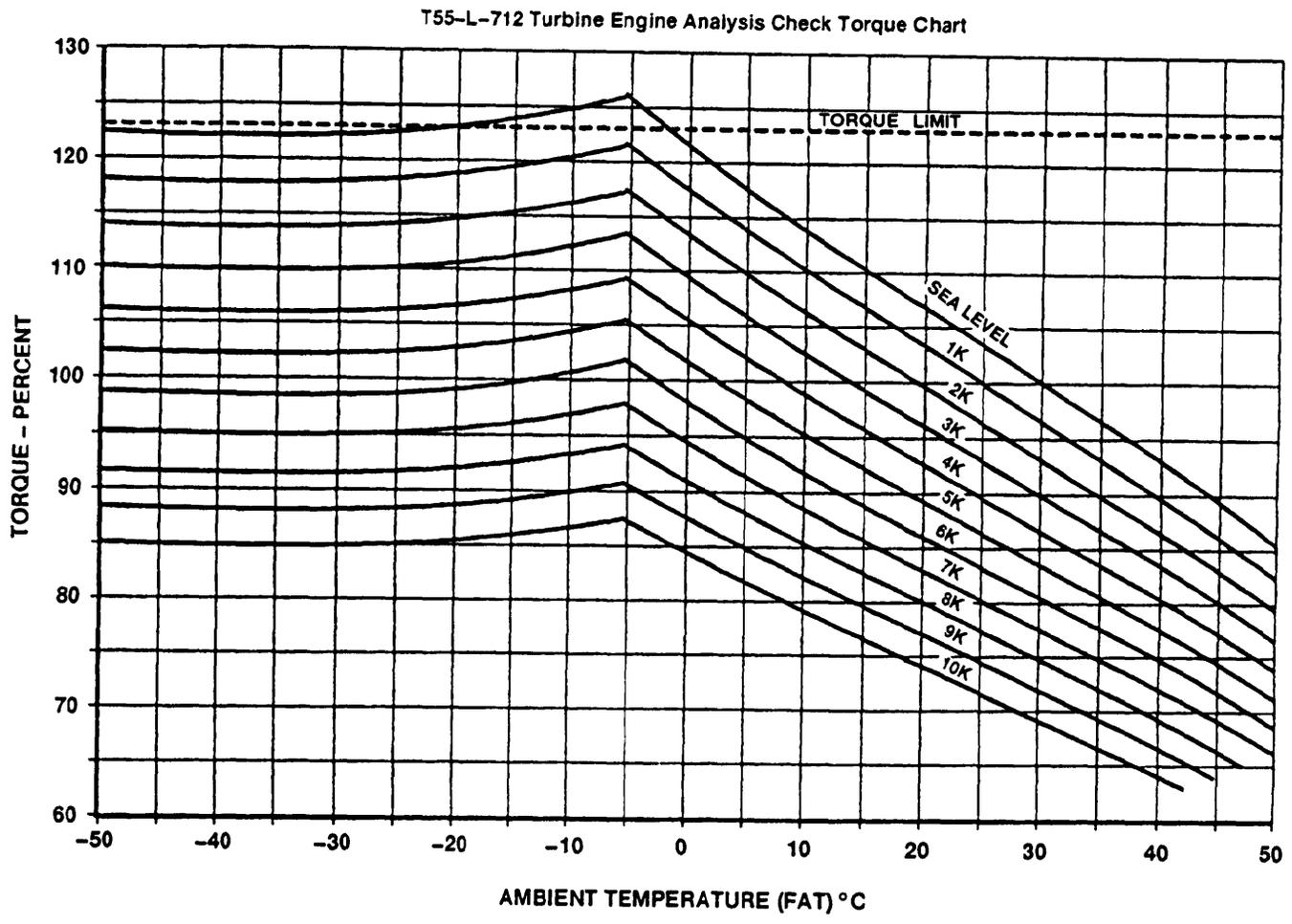


Figure 5-12.2. **712** Turbine Engine Analysis Check Torque Chart

AUTOROTATIONAL ROTOR SPEED CHECK

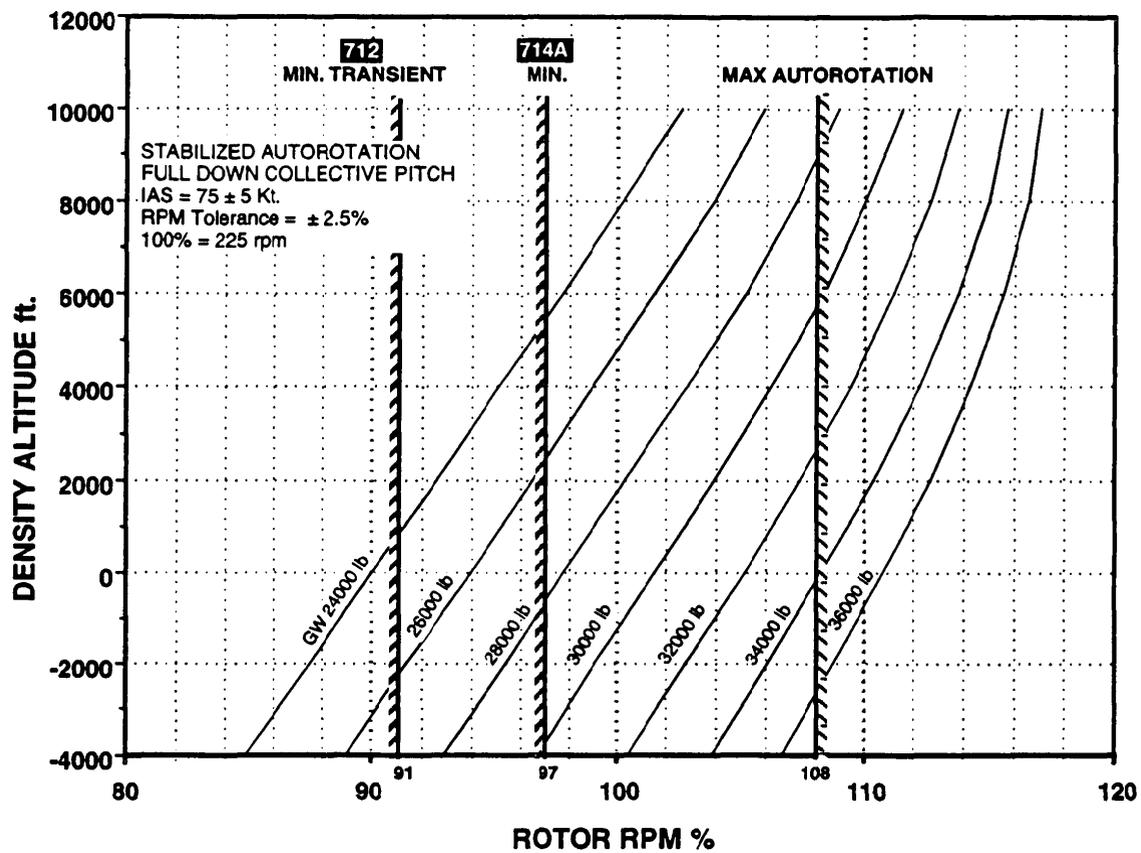


Figure 5-12.3, **714A** Autorotational RPPM Chart

5-26.2.3/(5-26.2.4 blank)

C25

TM 55-1520-240-MTF

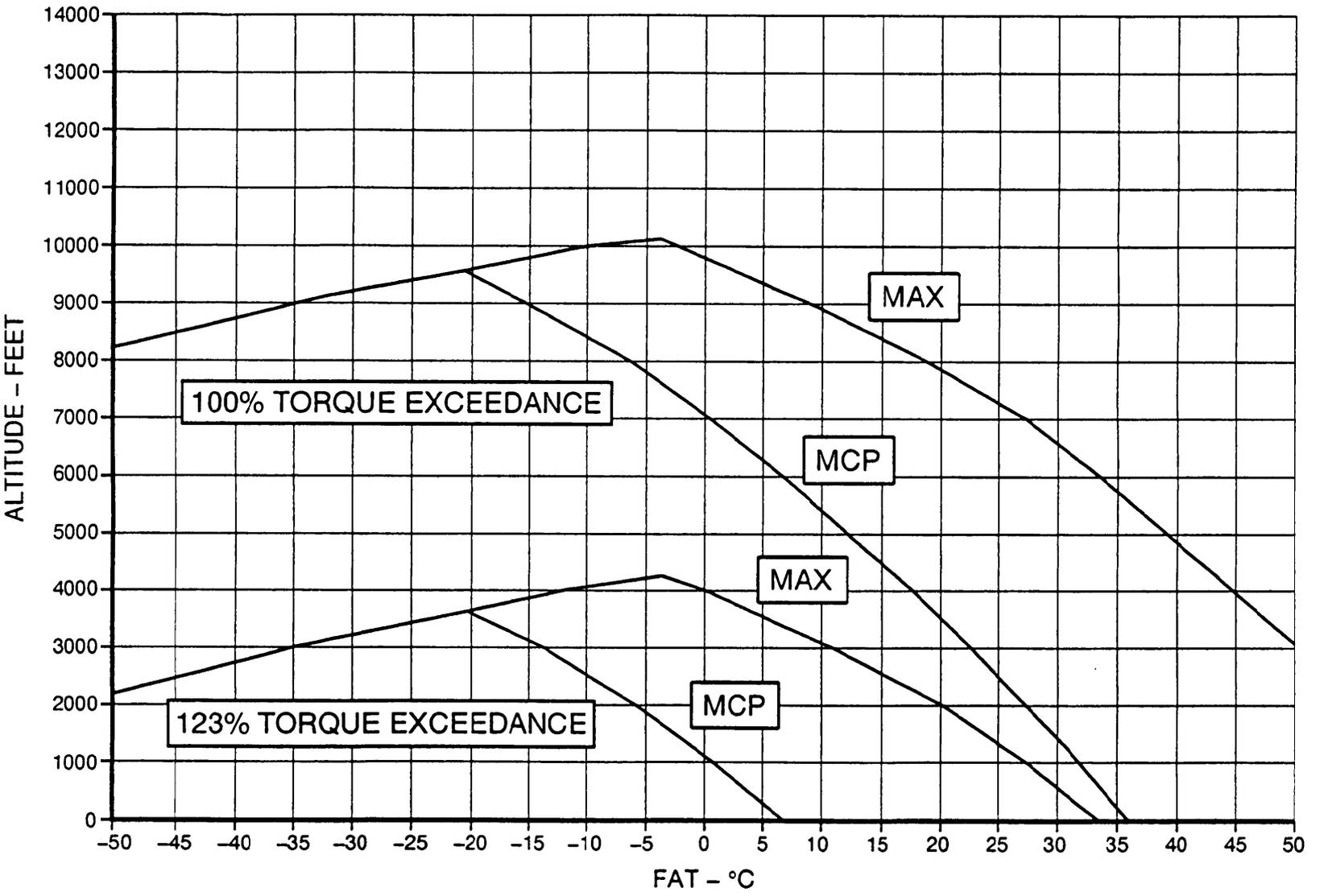


Figure 5-12.4. 714A Power Assurance Test Altitude Bands Chart

5-26.2.5/(5-26.2.6 blank)

C25

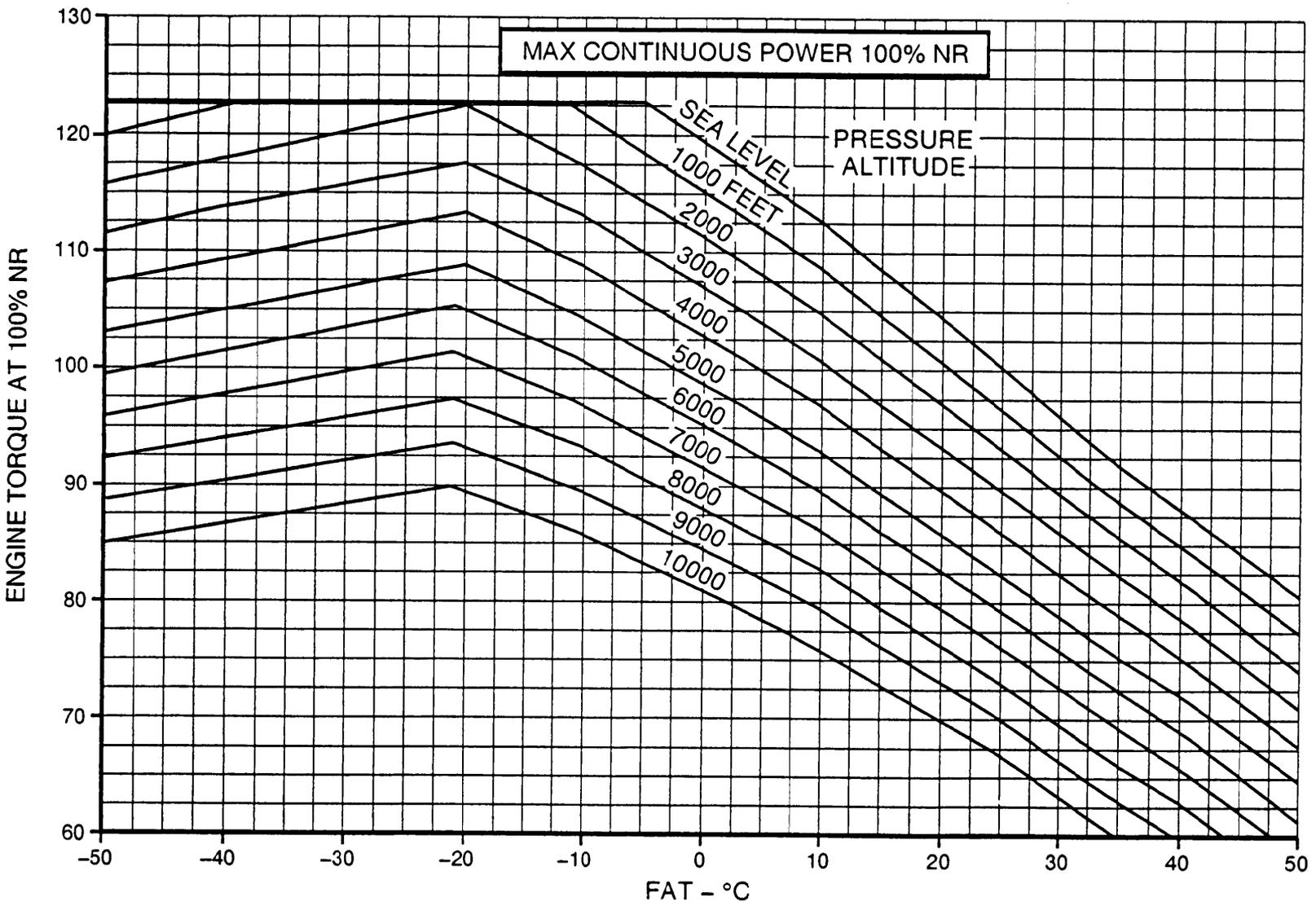


Figure 5-12.5. 7144 Power Assurance Test
Maximum Continuous Power Chart

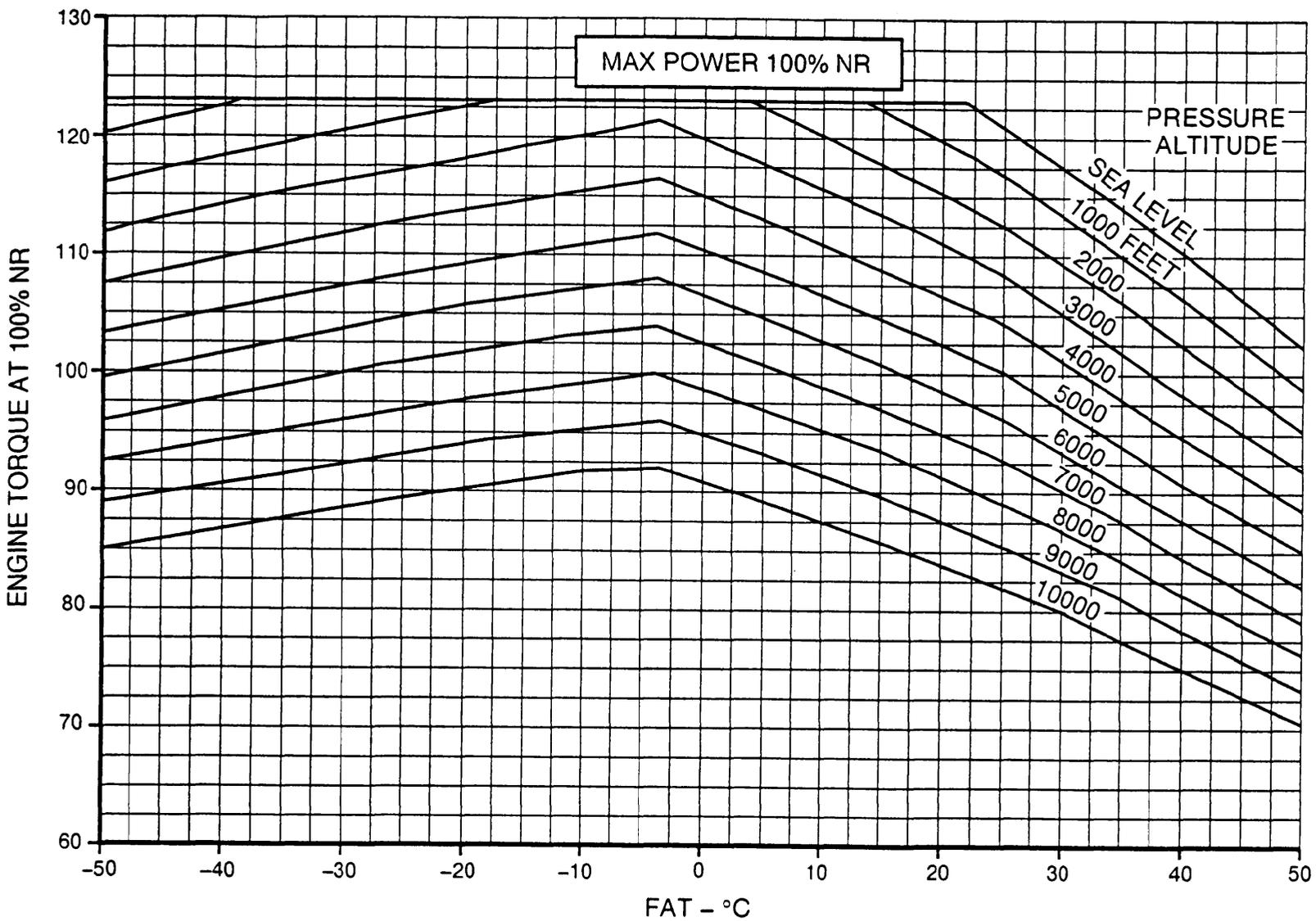


Figure 5-12.6. **714A** Power Assurance Test
Maximum Power Chart

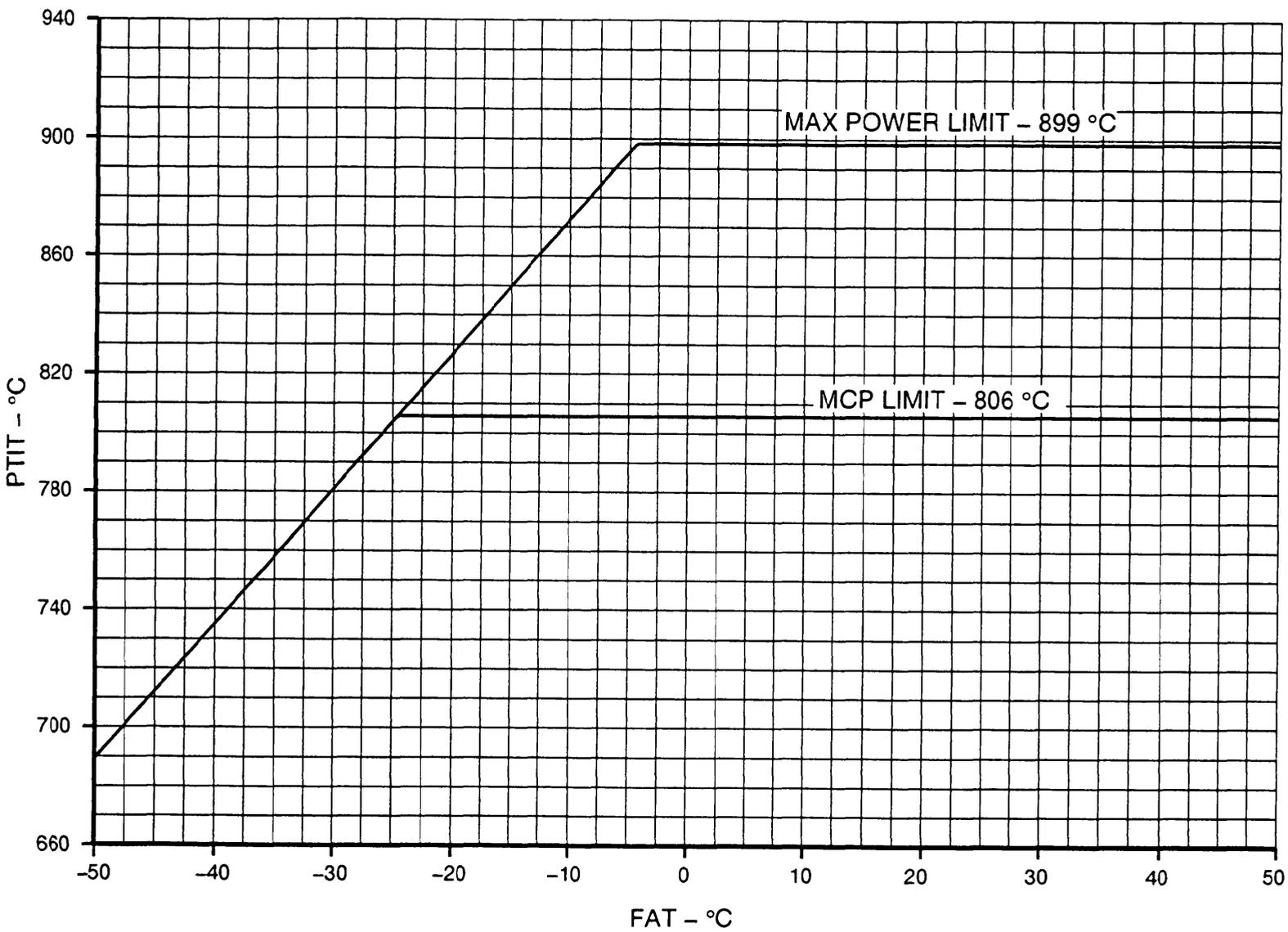


Figure 5-12.7. **714A** Power Assurance Test Engine Temperature Limits Chart

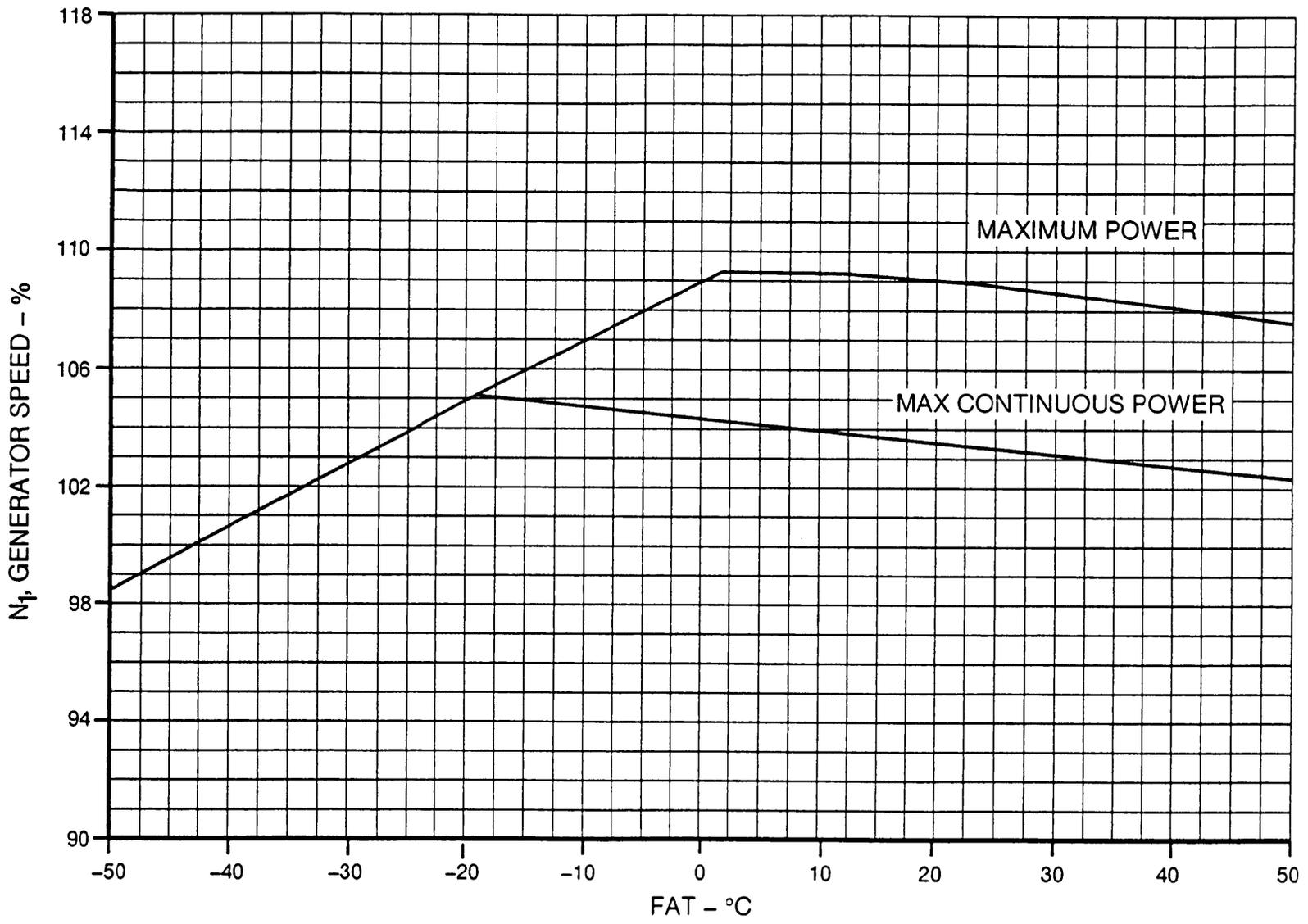


Figure 5-12.8. 714A Power Assurance Test
NI Gas Generator Speed Chart

CH-47D / T55-GA-714A Engine
 Engine Power Check / Max Continuous Power Check - All Weather Screen

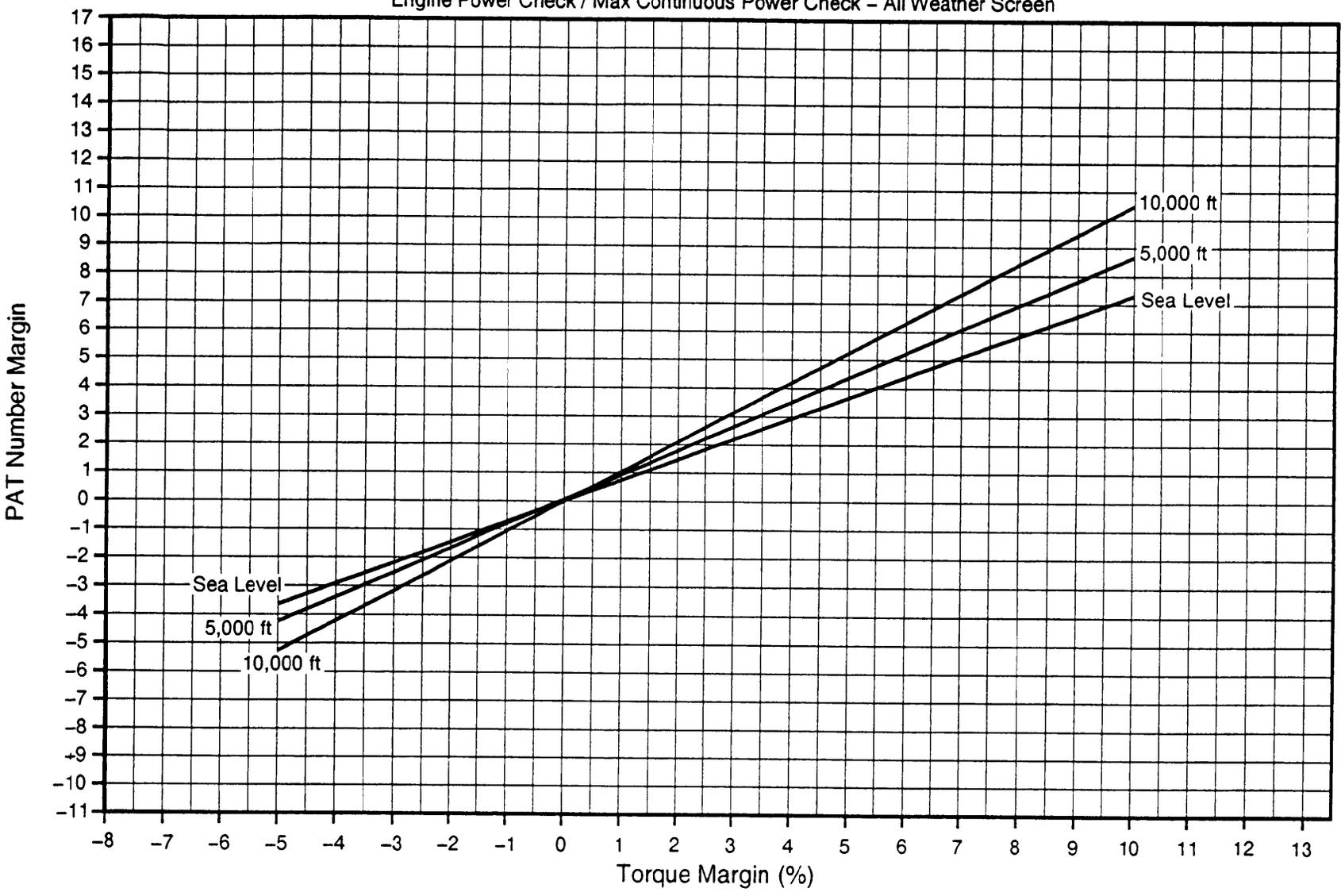
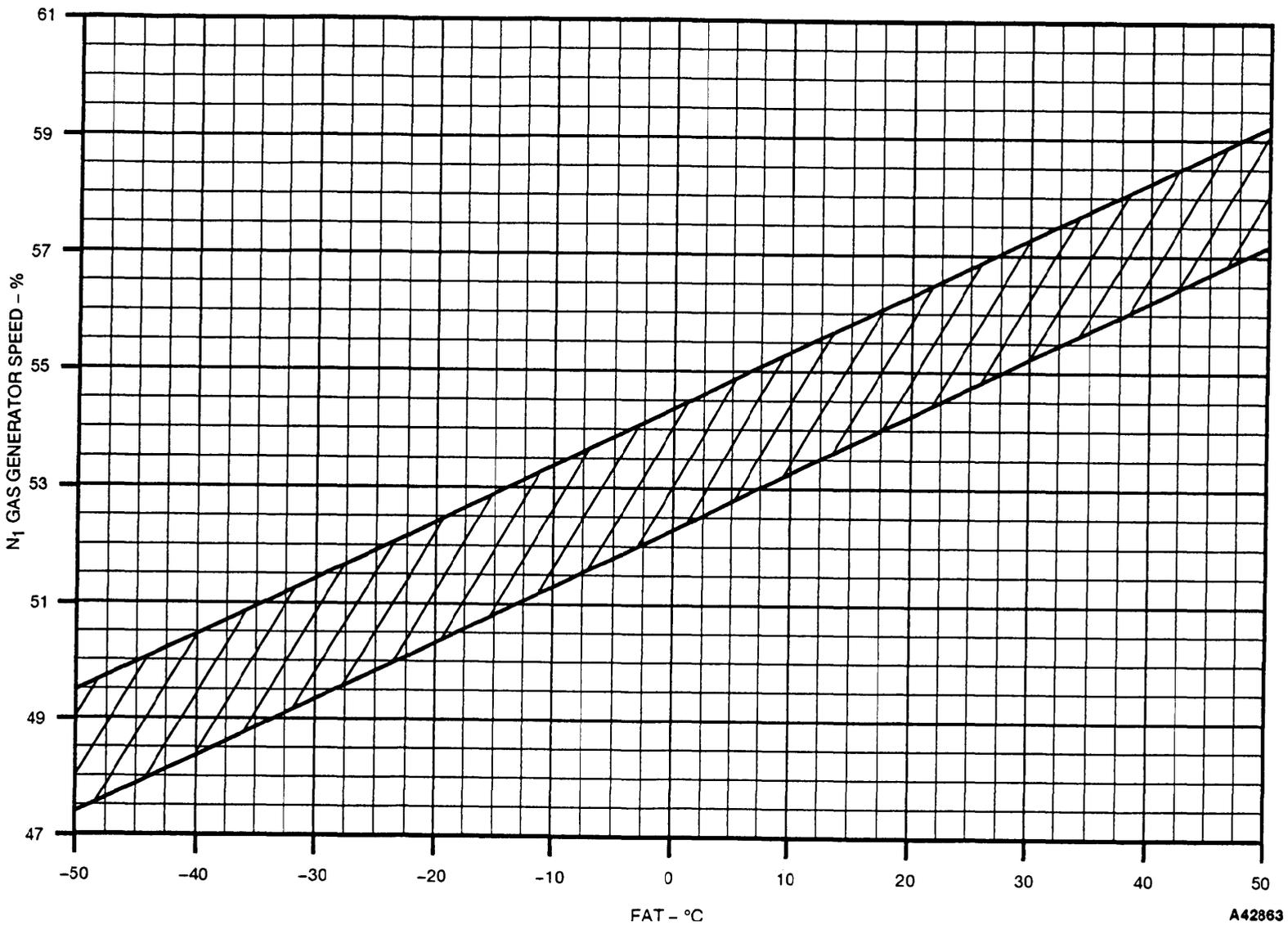


Figure 5-12.9. **714A** Power Assurance Test
 PAT Number Margin to Torque Margin Conversion
 Chart



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Figure 5-12.10. 714A NI Idle Check Altitude Bands Chart

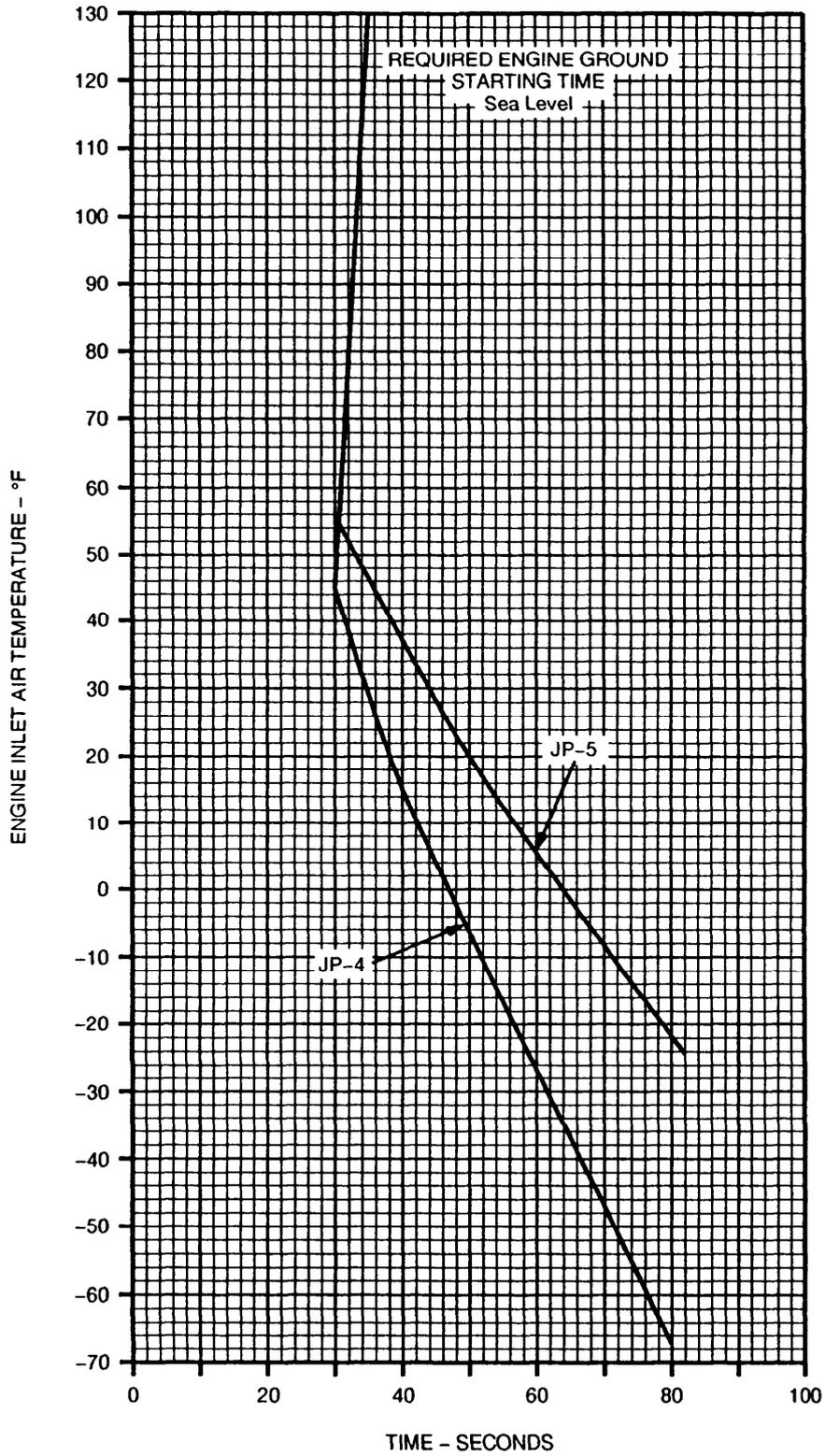


Figure 5-12.11. **714A** Engine Ground Starting Time vs. Ambient Air Temperature (Static, Sea Level)

N1	Torque	Engine Temperature	Probable	Cause
Correct	Low	High		Dirty inlet and/or compressor Bleed bend leaking Leaks in anti-icing
			FOD	Erosion Damaged combustor section PTIT indicating system Combustion chamber drain valve open
Low	Low	Low		Calculation error Engine not properly topped Fuel control adjustment
High	Correct	High		Calculation error Fuel control adjustment
Correct	Correct	High		N1 indicating system error
Correct	Low	Correct		Torque indicating system Torque transmitter malfunctioning
Correct	Correct	Low		PTIT indicating system

Figure 5-13. Turbine Engine Analysis Check Troubleshooting Chart

*U.S. GOVERNMENT PRINTING OFFICE:1992-654-12260030

T55-L-712 SERIES ENGINE VIBRATION TEST DATA SHEET

Engine Serial No. _____ TSN _____
 Lead Division Location _____ TLD: _____
 Aircraft Serial No. _____ A/C Type _____
 Test Location _____ Date _____
 Tested by _____ Observer _____
 Engine Passed Test - Accepted Engine Failed Test

Test #	Air RPM	N2	INDICATED ROTOR RPM %	No. 1 Transducer S/N _____				No. 2 Transducer S/N _____			
				70 CPS Freq		200 CPS Freq		70 CPS Freq		200 CPS Freq	
				Actual	Max. Amp. Allowed	Actual	Max. Amp. Allowed	Actual	Max. Amp. Allowed	Actual	Max. Amp. Allowed
20	1470	94.0	96.5		3.1		2.1		3.1		2.1
25	1500	94.0	96.5		2.9		1.9		2.9		1.9
30	1480	95.0	91.4		2.7		1.7		2.7		1.7
35	1490	94.0	96.5		2.7		1.7		2.7		1.7
40	1490	95.1	100.9		2.7		1.7		2.7		1.7
45	1770	94.0	96.5		2.6		1.6		2.6		1.6

100% N1 = 18,720 RPM
100% N2 = 15,334 RPM (Engine)
100% ROTOR RPM = 15,066 N2 RPM
 * = Maximum allowable engine vibration (double amplitude)
 Maximum N1 & N2 = Maximum RPM per engine/aircraft specification

DISPOSITION

Exceeded 70 CPS Max. Amp. Allowed	Exceeded 200 CPS Max. Amp. Allowed	Remarks
No	No	None
No	Yes	Exceeded Engine
No	Yes	Exceeded Engine
No	No	Exceeded Engine

D-49 - 898 - 1

Figure 5-14. Engine Vibration Test Date Sheet

5-27/(5-28 blank)

ACFT MODEL & SERIAL NUMBER		DATE	PURPOSE OF TEST FLIGHT
PILOTS NAME & UNIT			
OPERATING WEIGHT:		DENSITY LBS.	ALTITUDE: FT.
SYMBOLS: √ = SATISFACTORY, X = DEFICIENCY			18. FLT cont hyd
PRIOR TO MTF		19. Control Interlock	
1. Forms and records		20. Control Centering	
2. Weight and balance		21. Windshield Anti-Ice,	
3. Emergency Beep - Check		Pitot and AFCS Yaw ports	
STARTING ENGINES		22. Control Breakout	
1. BATT and Essen busses		23. 714A DECU BIT & Abort Start Check'	
2. 712 Caution lights		24. No.1 ENG Start	
714A Caution / Advisory		a. Eng oil press psi	
3. Cockpit lighting		b. GND Idle 45 sec. %	
4. APU start		c. Bellows Check	
5. PWR XFER switches		25. No.2 ENG Start	
6. Cargo hooks / winch		a. Eng oil press psi	
7. External lights		b. GND idle %	
8. Parking brakes/swivel locks		c. Bellows Check	
9. CGI		26. 714A Reversionary Start Check	
10. Altimeters		27. XMSN OIL PRESS check 7 psi min.	
11. VGI NORM - EMERG		28. ECL FLIGHT	
12. Fire Detector lights		29. 712 Beep operation (P + CP)	
13. FIRE PULL handles		30. Eng oil press fluct	
14. Fuel Quantity		a. No.1 psi	
15. AFCS		b. No.2 psi	
16. Control Interlock		31. Minimum beep	
17. Neutral pedal measurement		a. Both	
18. FLT cont hyd		b. No. 1	
REMARKS:			

c. No. 2	HOVER CHECKS
32. 712 Bleed band check	1. Mechanical Rig Checks
a. No.1	Long Measure in.
b. No.2	2. AFCS
ENG GROUND OPER	3. Control Position Check
1. Generator / X-TIE	a. Long measure in.
a. underfrequency	b. Lateral in.
2. FUEL Pump and XFEED CK	c. Pedals split in.
3. XMSN OIL PRESS Ind.	4. LH Fuel System Check
4. XMSN OIL TEMP Ind.	5. Torque Differential
5. HSI	No.1 No.2
6. 712 Emerg. Eng. Trim	a. Torque
714A FADEC Disc	b. N1
7. 714A FADEC sys check:	6. Droop Eliminator
a. FADEC NR % Check	a. RRPM
b. REV Min/Max Check	b. Torque No. 1 No. 2
c. REV Check	7. 714A REV Droop Check
d. OVERSPEED Check	8. Engine Anti-Ice
8. Altimeters	9. Flight Instruments
9. 712 HIT check	
10. 714A PAT - ENG 1 ENG 2	
TAXI CHECK	
1. Brakes check	
2. Power steering	
3. Swivel locks check	
BEFORE HOVER CHECKS	
1. RH Fuel system check	
2. Ground instability	
REMARKS:	

A63093

Figure 5-15. Maintenance Test Flight Check Sheet (1 of 2)

ACFT MODEL & SERIAL NUMBER		DATE	PURPOSE OF TEST FLIGHT
PILOTS NAME & UNIT			
OPERATING WEIGHT:		LBS.	DENSITY ALTITUDE: FT.
SYMBOLS: √ = SATISFACTORY, X = DEFICIENCY			
IN-FLIGHT CHECKS		5. Speed Sweep Check - 120K	
1. Fuel consumption		a. Long measure in.	
2. Speed sweep ck 50 K		b. Emerg exit doors (P&C/P)	
a. CYCLIC TRIM-CK RET		6. STVA evaluation 120 K	
b. 60 K		6.1. Rotor Droop / Thrust Slippage Check	
(1) Long measure in.		7. Speed Sweep Check - 140K	
(2) Lat measure in.		a. Long measure in.	
(3) Pedal separation in.		b. Lateral measure in.	
(4) A/S indicators		c. Pedal separation in.	
3. CYCLIC TRIM-CK 70K		d. Airspeed indicators	
a. LCT Liftoff Speed FWD AFT		8. 150 K	
b. PA		a. Long measure in.	
c. 80K		b. 1/Rev, 3/Rev Vib CK	
(1) Long measure in.		c. Coordinated turns	
d. 100 K		d. CYCLIC TRIM - EXT	
(1) Long measure in.		9. Autorotation	
4. AFCS check - 110 K		a. P.A. ft.	
a. Pedal separation		b. FAT °C	
b. Pitch axis		c. Fuel Quantity lbs.	
c. Roll axis		d. RRPM flat pitch %	
d. Heading select		e. Pedal separation in.	
e. BARO ALT HOLD		f. Vibration level	
f. DASH Low rate check			
REMARKS:			

10. 712 Engine TEAC entry TQ		13. Record Instrument Indications	
a. Engine Topping No. 1 No. 2		FAT °C	
NI		Pressure altitude ft.	
PTIT		RRPM	
TORQUE		Torque No. 1 No. 2	
FAT		NI	
PRES. ALT.		PTIT	
11. 714A Power Assurance Test		Engine oil temp	
a. FAT °C		Engine oil press	
b. PA ft.			
c. NR 100%		XMSN OIL PRESS / TEMP	
d.		PTIT	NN TQ FF
REQUIRED			
MCP ENG 1 (806)			
MCP ENG 2 (806)			
MP ENGINE 1			
MP ENGINE 2			
12. NAV & Comm		NO. 1 psi °C	
a. UHF		NO. 2 psi °C	
b. VHF - AM/FM		Utility psi °C	
c. HSI and Mag Compass		BEFORE LANDING	
d. VOR		AFTER LANDING	
e. ILS		ENGINE SHUTDOWN	
f. ADF-ANT, LOOP		1. Coastdown time	
g. Marker Beacon, HIGH & LOW		a. No. 1	
h. Transponder		b. No. 2	
i. Missile Alert		2. 714A DECU CHECK	
j. HF		BEFORE LEAVING CHECKS	
k. Doppler		COMPLETE / UPDATE FORMS	
REMARKS:			

A63094

Figure 5-15. Maintenance Test Flight Check Sheet (2 of 2)

TM 55-1520-240-MTF

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D. C., 8 September 1982

By Order of the Secretary of the Army:

Official: E. C. MEYER
General, United States Army
Chief of Staff

ROBERT M. JOYCE
Major General, United States Army
The Adjutant General

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To be distributed in accordance with DA Form 12-31, five copies to each account, operator Requirements for CH-47B/C, & D aircraft.

The Metric System and Equivalents

Linear Measure

1 centimeter = 10 millimeters = .39 inch
1 decimeter = 10 centimeters = 3.94 inches
1 meter = 10 decimeters = 39.37 inches
1 dekameter = 10 meters = 32.8 feet
1 hectometer = 10 dekameters = 328.08 feet
1 kilometer = 10 hectometers = 3,280.8 feet

Weights

1 centigram = 10 milligrams = .15 grain
1 decigram = 10 centigrams = 1.54 grains
1 gram = 10 decigrams = .035 ounce
1 dekagram = 10 grams = .35 ounce
1 hectogram = 10 dekagrams = 3.52 ounces
1 kilogram = 10 hectograms = 2.2 pounds
1 quintal = 100 kilograms = 220.46 pounds
1 metric ton = 10 quintals = 1.1 short tons

Liquid Measure

1 centiliter = 10 milliliters = .34 fl. ounce
1 deciliter = 10 centiliters = 3.38 fl. ounces
1 liter = 10 deciliters = 33.81 fl. ounces
1 dekaliter = 10 liters = 2.64 gallons
1 hectoliter = 10 dekaliters = 26.42 gallons
1 kiloliter = 10 hectoliters = 264.18 gallons

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