

MPR / 1



A. V. ROE CANADA LIMITED
MALTON - ONTARIO

TECHNICAL DEPARTMENT (Aircraft)

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AIRCRAFT CF-105

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CF-105 MONTHLY PERFORMANCE REPORT

(Issued Mid-Monthly)

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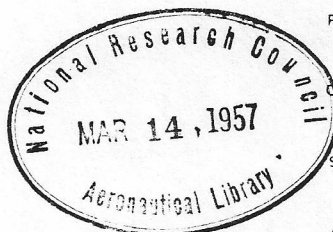
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CF-105 MONTHLY PERFORMANCE REPORT

(Issued Mid-Monthly)

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INTRODUCTION

This is the first of a series of monthly performance reports for internal usage, to be issued from the Aerodynamics Department. Successive reports will present the latest data, with the alterations from the previous report noted. The report is divided into three major sections:-

1. CF-105 Performance
2. CF-105 Drag
3. Engine Data

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1. CF-105 PERFORMANCE

The performance in this issue is sub-divided into two parts:

- 1A. CF-105 Performance with Pratt and Whitney JT4A-25 Engines
- 1B. CF-105 Performance with Orenda PS 13 Engines

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1A. CF-105 PERFORMANCE WITH PRATT AND WHITTNEY JT4A-25 ENGINES

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(C.G. = 29% M.A.C.)

The following CF-105 - JT4A-25 performance estimate is based on the wind tunnel configuration designated B2V1W1E1ON5D8-4. The particular feature of this configuration is the extended, notched, and cambered leading edge of the wing. The drag of this configuration is summarized (Extract P/Aero Data/58) and is presented in section 2 of this report.

The installed engine data is summarized (Extract P/Power/51) and is presented in section 3 of this report. Of particular interest, is the use of an ejector for improved performance.

SECRET

LOADING AND PERFORMANCEPerformance Under N.A.C.A. Standard Atmospheric Conditions**SECRET**To R.C.A.F. Specification AIR 7-4(With Two J75 Engines)**WEIGHT:**

Take-Off Weight with 15,298 Lb. Fuel (77.1% Max.)	Lb.	58,982
Operational Weight Empty	Lb.	43,684
Combat Weight (1/2 Fuel)	Lb.	51,333
Landing Weight (With Reserve Fuel + Missiles)	Lb.	44,200
Wing Loading at Normal Take-Off Weight	Lb. /Sq.Ft.	47.0
Power Loading at Normal Take-Off Weight	Lb. /Lb. Thrust	1.61

SPEED

True Air Speed In Level Flight		
At Sea Level at Combat Weight		
Maximum Thrust	Kts.	★ 755
Military Thrust	Kts.	640
True Air Speed in Level Flight		
At 50,000 Ft. at Combat Weight		
Maximum Thrust	Kts.	1,147

CEILING

Combat Ceiling at Combat Weight, Rate of Climb = 500 F.P.M.	
Maximum Thrust at 1.5 M.N.	Ft. 57,200

RATE OF CLIMB

Steady Rate of Climb at Sea Level, Combat Weight	
Maximum Thrust at M.N. = .92	F.P.M. 51,400
Military Thrust at 530 Kts.	F.P.M. 15,800
Steady Rate of Climb at 50,000 Ft., Combat Weight	
Maximum Thrust at M.N. = 1.5	F.P.M. 7,700

TIME TO HEIGHT

Time to 50,000 Ft. M.N. = 1.5 from Engine Start at Take-Off	
Weight = 58,982	
Maximum Thrust	Mins. 4.4

MANOEUVRABILITY

Combat Load Factor at Combat Weight	
Maximum Thrust at M.N. = 1.50 at 50,000 Ft.	1.50

Combat Load Factor at Combat Weight	
Maximum Thrust at M.N. = 1.70 at 50,000 Ft.	1.65

★ Placard Speed = 720 Kts.

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TAKE-OFF DISTANCE

Take-Off Distance over 50 Ft. Obstacle at Sea Level
Take-Off Weight = 58,982 Lb.

SECRET

Maximum Thrust	Ft.	3,400
Military Thrust	Ft.	6,700
Maximum Thrust, Hot Day	Ft.	4,600

LANDING DISTANCE

Landing Distance over 50 Ft. Obstacle at Sea Level at Combat Weight Ft. 5,300

STALLING SPEED

True Stalling Speed in Landing Configuration at Combat Weight
at Sea LevelKts. 110

RANGE

Combat Radius of Action at 50,000 Ft., Climb at M.N. = .92, Cruise out
at M.N. = 1.5, Combat for 5 Mins. at M.N. = 1.50, Cruise Back at M.N. = .92,
15 Min. Stack at 40,000 Ft., 5 Min. Fuel Reserve on Landing

High Speed Mission with 15,298 Lb. Fuel	N.M.	200
High Speed Mission with Full Internal Fuel	N.M.	309

Combat Radius of Action at 50,000 Ft., Mission as above except climb
at 530 Kts. and cruise out at M.N. = .92

Maximum Range Mission with 15,298 Lb. Fuel	N.M.	406
Maximum Range Mission with Full Internal Fuel	N.M.	605

Combat Radius of Action at Sea Level, Cruise out at .6 M.N. and
Combat at M.N. = .92 at Sea Level, Cruise Back at .92 M.N. at
40,000 Ft., 15 Min. Stack, 5 Min. Fuel Reserve on Landing

Sea Level Mission with 15,298 Lb. of Fuel	N.M.	325
Sea Level Mission with Full Internal Fuel	N.M.	470

Ferry Range Mission at Economical Cruise Speed (M = .92 and Height,
including 15 Mins. Stacking at 40,000 Ft., 5 Min. Fuel Reserve on
Landing

Range with Full Internal Fuel and 500 Gal. - External Tank .	N.M.	1,859
Range with full internal fuel	N.M.	1,609

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1B. CF-105 PERFORMANCE WITH ORENDA PS 13 ENGINES

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(C.G. = 29% M.A.C.)

The following CF-105 - PS 13 performance estimate is based on the wind tunnel configuration designated $B_2V_1W_1E_{10}N_5D_8-4$ over the subsonic portion, and configuration $W_9, NA_5, B_4, C_3, V_2, R_8$, over the supersonic range. The particular feature of the former configuration is the extended, notched, and cambered leading edge of the wing. The drag of this configuration is summarized, (Extract P/Aero Data/58), and is presented in section 2 of this report. The latter configuration differs chiefly by not having a cambered leading edge. This drag data is given in P/Aero Data/48 but has not been summarized for this report. This constitutes little change under supersonic cruise conditions, and only decreases the supersonic drag by about 4% at maximum 'g' due to less elevator angle for trim. Thus, the performance does reasonably represent that for the one configuration, $B_2V_1W_1E_{10}N_5D_8 - 4$.

The PS 13 engine data is in a more incomplete state. The engine data above the tropopause was taken from the Dec. '54 Memo, (Ref. Orenda P11-1-1) on the PS 13, with the exception of the cruise operation at .92 M.N. and 40,000 Ft., where insufficient data was available from the Memo, and we were forced to use the original PS 13 Brochure (EMS 8) April '54. The memo of Dec. '54 assumes a 6.5 Sq. Ft. intake, and pressure recovery curve from P/Power/23 APP/A/10. It also considers the effect of a 39" ejector, as well as a bypass which opens to 118 sq. Inches. For engine performance below the tropopause the original PS 13 Brochure was used. The above mentioned pressure recovery correction were applied to this data, but no account was taken of the bypass effect. It should be noted that revised thrust estimates now being prepared indicate an increase in maximum thrust at 1.5 M.N. of approximately 4%. This offsets the slightly optimistic supersonic drags used in this report for the performance of the PS 13 engines version.

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Performance Under N.A.C.A. Standard Atmospheric Conditions**SECRET**To R.C.A.F. Specification AIR 7-4With Two PS 13 Engines**WEIGHT:**

Take-Off Weight with 15,510 Lb. Fuel (78.2% Max.)	Lb.	55,889
Operational Weight Empty	Lb.	40,379
Combat Weight (1/2 Fuel)	Lb.	48,130
Landing Weight (With Reserve Fuel + Missiles)	Lb.	42,200
Wing Loading at Normal Take-Off Weight	Lb./Sq.Ft.	44.5
Power Loading at Normal Take-Off Weight	Lb./Lb. Thrust	1.19

SPEED

True Air Speed in Level Flight		
At Sea Level at Combat Weight		
Maximum Thrust	Kts.	★ 720
Military Thrust	Kts.	650
True Air Speed in Level Flight		
At 50,000 Ft. at Combat Weight		
Maximum Thrust	Kts.	1,110

CEILING

Combat Ceiling at Combat Weight, Rate of Climb = 500 F.P.M.		
Maximum Thrust at 1.5 M.N.	Ft.	62,200

RATE OF CLIMB

Steady Rate of Climb at Sea Level, Combat Weight		
Maximum Thrust at M.N. = .92	F.P.M.	50,000
Military Thrust at 530 Kts.	F.P.M.	25,200
Steady Rate of Climb at 50,000 Ft., Combat Weight		
Maximum Thrust at M.N. = 1.5	F.P.M.	11,500

TIME TO HEIGHT

Time to 50,000 Ft. M.N. = 1.5 from Engine Start at Take-Off		
Weight = 55,889 Lb.		
Maximum Thrust	Mins.	4.1

MANOEUVRABILITY

Combat Load Factor at Combat Weight		
Maximum Thrust at M.N. = 1.50 at 50,000 Ft.		1.84

★ Placard Speed = 720 Kts.

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TAKE-OFF DISTANCE

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Take-Off Distance over 50 Ft. Obstacle at Sea Level

Take-Off Weight = 55,889 Lb.

Maximum Thrust Ft. 2,500

Military Thrust Ft. 3,800

Maximum Thrust Hot Day Ft. 3,300

LANDING DISTANCE

Landing Distance over 50 Ft. Obstacle at Sea Level at Combat Weight Ft. 5,000

STALLING SPEED

True Stalling Speed in Landing Configuration at Combat Weight

at Sea Level Kts. 105

RANGE

Combat Radius of Action at 50,000 Ft., Climb at M.N. = .92, Cruise out at M.N. = 1.5, Combat for 5 mins. at M.N. = 1.50, Cruise Back at M.N. = .92, 15 Min. Stack at 40,000 Ft., 5Min. Fuel Reserve on Landing

High Speed Mission with 15,510 Lb. Fuel N.M. 200

High Speed Mission with Full Internal Fuel N.M. 318

Combat Radius of Action at 50,000 Ft., Mission as above except Cruise Out at M.N. = .92

Maximum Range Mission with 15,510 Lb. Fuel N.M. 315

Maximum Range Mission with Full Internal Fuel N.M. 491

Combat Radius of Action at Sea Level, Cruise Out at .6 M.N. and Combat at M.N. = .92 at Sea Level, Cruise Back at .92 M.N. at 40,000 Ft., 15 Min. Stack, 5 Min. Fuel Reserve on Landing

Sea Level Mission with 15,510 Lb. of Fuel N.M. 217

Sea Level Mission with Full Internal Fuel N.M. 318

Ferry Range Mission at Economical Cruise Speed (M = .92 and Height, including 15 Mins. Stacking at 40,000 Ft., 5 Min. Fuel Reserve on Landing

Range with Full Internal Fuel and 500 Gal. - External Tank . N.M. 1,675

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MPR / 2

SECRET

Introduction

This is the second of a series of monthly performance reports for internal usage, to be issued from the Aerodynamics Department. Only a minor change has occurred since the first report, and applies only to the CF-105 Performance with Pratt and Whitney JT 4A-25 Engines. This alteration is due to a reduction in the ejector performance estimate for the JT 4A-25. The pertinent changes are noted in their appropriate sections.

Successive reports will present the latest data, with the alterations from the previous report noted. The report is divided into three major sections:-

1. CF-105 Performance
2. CF-105 Drag
3. Engine Data

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A. V. ROE CANADA, LIMITED
MALTON - ONTARIO

TECHNICAL DEPARTMENT (Aircraft)

AIRCRAFT: CF-105

REPORT NO. Monthly Report No. 2

FILE NO:

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CF-105 MONTHLY PERFORMANCE REPORT

(Issued Mid-Monthly)

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SECRET

1A CF-105 PERFORMANCE WITH PRATT AND WHITNEY (J-75) JT 4A-25 ENGINES

(C.G. = 29% MAC)

SECRET

The following CF-105 - (J-75) JT 4A-25 performance estimate is based on the Wind Tunnel configuration designated B₂ V₁ W₁ E₁₀ N₅ D_{a-4}. The particular feature of this configuration is the extended, notched, and cambered leading edge of the wing. The drag of this configuration is summarized (extract P/Aero Data/58) and is presented in section 2 of the CF-105 Monthly Performance Report No. 1 issued October 1955.

The considerations for the installed engine data is summarized (Extract P/Power/51) and is presented in section 3 of the CF-105 Monthly Report No. 1. However an error has been made in the ejector calculations, and the revision of the thrust with full afterburning is given in Section 3 of this report. Only this alteration has been allowed for as changes to fuel consumption, and non afterburning engine performance would not be significant.

The pertinent CF-105 performance changes are listed below.

Δ Combat 'g' at 1.50 M.N. at 50000 feet	=	- .03g
Δ Maximum speed at 50,000 feet	=	- 37 kts.
Δ Combat ceiling at 1.50 M.N.	=	- 1000 ft.

also

Δ Steady rate of climb at 50000' & MN=1.5 ----- - 1000 fpm
Δ Time to 50000' at MN 1.5 ----- + 0.2 min.

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LOADING AND PERFORMANCEPerformance Under N.A.C.A. Standard Atmospheric ConditionsTo R.C.A.F. Specification AIR 7-4(With Two J-75 Engines)SECRET
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WEIGHT:

Take-Off Weight with 15,298 Lb. Fuel (77.1% Max.)	Lb.	58,982
Operational Weight Empty	Lb.	43,684
Combat Weight (1/2 Fuel)	Lb.	51,333
Landing Weight (With Reserve Fuel + Missiles)	Lb.	44,200
Wing Loading at Normal Take-Off Weight	Lb. /Sq.Ft.	47.0
Power Loading at Normal Take-Off Weight	Lb. /Lb. Thrust	1.61

SPEED

True Air Speed in Level Flight		
At Sea Level at Combat Weight		
Maximum Thrust	Kts.	★ 755
Military Thrust	Kts.	640
True Air Speed in Level Flight		
At 50,000 Ft. at Combat Weight		
Maximum Thrust	Kts.	1,110

CEILING

Combat Ceiling at Combat Weight, Rate of Climb = 500 F.P.M.		
Maximum Thrust at 1.5 M.N.	Ft.	56,200

RATE OF CLIMB

Steady Rate of Climb at Sea Level, Combat Weight		
Maximum Thrust at M.N. = .92	F.P.M.	51,400
Military Thrust at 530 Kts.	F.P.M.	15,800
Steady Rate of Climb at 50,000 Ft., Combat Weight		
Maximum Thrust at M.N. = 1.5	F.P.M.	6,700

TIME TO HEIGHT

Time to 50,000 Ft. M.N. = 1.5 from Engine Start at Take-off		
Weight = 58,982		
Maximum Thrust	Mins.	4.6

MANOEUVRABILITY

Combat Load Factor at Combat Weight		
Maximum Thrust at M.N. = 1.50 at 50,000 Ft.		1.47
Combat Load Factor at Combat Weight		
Maximum Thrust at M.N. = 1.70 at 50,000 Ft.		1.52

★ Placard Speed = 720 Kts.

SECRET

TAKE-OFF DISTANCE

Take-Off Distance over 50 Ft. Obstacle at Sea Level
Take-Off Weight = 58,982 Lb.

SECRET

Maximum Thrust	3,400 Ft.	3,400
Military Thrust	6,700 Ft.	6,700
Maximum Thrust, Hot Day	4,600 Ft.	4,600

LANDING DISTANCE

Landing Distance over 50 Ft. Obstacle at Sea Level at Combat Weight Ft. 5,300

STALLING SPEED

True Stalling Speed in Landing Configuration at Combat Weight
at Sea Level Kts. 110

RANGE

Combat Radius of Action at 50,000 Ft., Climb at M.N. = .92, Cruise out
at M.N. = 1.5, Combat for 5 Mins. at M.N. = 1.50, Cruise Back at M.N. = .92,
15 Min. Stack at 40,000 Ft., 5 Min. Fuel Reserve on Landing

High Speed Mission with 15,298 Lb. Fuel	N.M.	200
High Speed Mission with Full Internal Fuel	N.M.	309

Combat Radius of Action at 50,000 Ft., Mission as above except climb
at 530 Kts. and cruise out at M.N. = .92

Maximum Range Mission with 15,298 Lb. Fuel	N.M.	406
Maximum Range Mission with Full Internal Fuel	N.M.	605

Combat Radius of Action at Sea Level, Cruise out at .6 M.N. and
Combat at M.N. = .92 at Sea Level, Cruise Back at .92 M.N. at
40,000 Ft., 15 Min. Stack, 5 Min. Fuel Reserve on Landing

Sea Level Mission with 15,298 Lb. of Fuel	N.M.	325
Sea Level Mission with Full Internal Fuel	N.M.	470

Ferry Range Mission at Economical Cruise Speed (M = .92 and Height,
including 15 Mins. Stacking at 40,000 Ft., 5 Min. Fuel Reserve on
Landing

Range with Full Internal Fuel and 500 Gal. - External Tank .	N.M.	1,859
Range with full internal fuel	N.M.	1,609

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1B. CF-105 PERFORMANCE WITH OREDA PS 13 ENGINES

(C.G. = 29% M.A.C.)

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The following CF-105 - PS 13 performance estimate is based on the wind tunnel configuration designated B₂V₁W₁E₁₀N₅D₈-4 over the subsonic portion, and configuration W₉, NA₅, B₄, C₃, V₂, R₈, over the supersonic range. The particular feature of the former configuration is the extended, notched, and cambered leading edge of the wing. The drag of this configuration is summarized, (Extract P/Aero Data/58), and is presented in section 2 of this report. The latter configuration differs chiefly by not having a cambered leading edge. This drag data is given in P/Aero Data/48 but has not been summarized for this report. This constitutes little change under supersonic cruise conditions, and only decreases the supersonic drag by about 4% at maximum 'g' due to less elevator angle for trim. Thus, the performance does reasonably represent that for the one configuration, B₂V₁W₁E₁₀N₅D₈ - 4.

The PS 13 engine data is in a more incomplete state. The engine data above the tropopause was taken from the Dec. '54 Memo, (Ref. Orenda P11-1-1) on the PS 13, with the exception of the cruise operation at .92 M.N. and 40,000 Ft., where insufficient data was available from the Memo, and we were forced to use the original PS 13 Brochure (EMS 8) April '54. The memo of Dec. '54 assumes a 6.5 Sq. Ft. intake, and pressure recovery curve from P/Power/23 APP/A/10. It also considers the effect of a 39" ejector, as well as a bypass which opens to 118 sq. inches. For engine performance below the tropopause the original PS 13 Brochure was used. The above mentioned pressure recovery correction were applied to this data, but no account was taken of the bypass effect. It should be noted that revised thrust estimates now being prepared indicate an increase in maximum thrust at 1.5 M.N. of approximately 4%. This offsets the slightly optimistic supersonic drags used in this report for the performance of the PS 13 engines version.

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Performance Under N.A.C.A. Standard Atmospheric ConditionsTo R.C.A.F. Specification AIR 7-4With Two PS 13 Engines

SECRET

WEIGHT:

Take-Off Weight with 15,510 Lb. Fuel (78.2% Max.)	Lb.	55,889
Operational Weight Empty	Lb.	40,170
Combat Weight (1/2 Fuel)	Lb.	48,130
Landing Weight (With Reserve Fuel + Missiles)	Lb.	42,200
Wing Loading at Normal Take-Off Weight	Lb./Sq.Ft.	44.5
Power Loading at Normal Take-Off Weight	Lb./Lb. Thrust	1.19

SPEED

True Air Speed in Level Flight		
At Sea Level at Combat Weight		
Maximum Thrust	Kts.	* 720
Military Thrust	Kts.	650
True Air Speed in Level Flight		
At 50,000 Ft. at Combat Weight		
Maximum Thrust	Kts.	1,110

CEILING

Combat Ceiling at Combat Weight, Rate of Climb = 500 F.P.M.	
Maximum Thrust at 1.5 M.N.	Ft. 62,200

RATE OF CLIMB

Steady Rate of Climb at Sea Level, Combat Weight		
Maximum Thrust at M.N. = .92	F.P.M.	50,000
Military Thrust at 530 Kts.	F.P.M.	25,200
Steady Rate of Climb at 50,000 Ft., Combat Weight		
Maximum Thrust at M.N. = 1.5	F.P.M.	11,500

TIME TO HEIGHT

Time to 50,000 Ft. M.N. = 1.5 from Engine Start at Take-Off		
Weight = 55,889 Lb.		
Maximum Thrust	Mins.	4.1

MANOEUVRABILITY

Combat Load Factor at Combat Weight	
Maximum Thrust at M.N. = 1.50 at 50,000 Ft.	1.84

* Placard Speed = 720 Kts.

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TAKE-OFF DISTANCE

Take-Off Distance over 50 Ft. Obstacle at Sea Level **SECRET**
 Take-Off Weight = 55,889 Lb.
 Maximum Thrust Ft. 2,500
 Military Thrust Ft. 3,800
 Maximum Thrust Hot Day Ft. 3,300

LANDING DISTANCE

Landing Distance over 50 Ft. Obstacle at Sea Level at Combat Weight Ft. 5,000

STALLING SPEED

True Stalling Speed in Landing Configuration at Combat Weight
 at Sea Level Kts. 105

RANGE

Combat Radius of Action at 50,000 Ft., Climb at M.N. = .92, Cruise out
 at M.N. = 1.5, Combat for 5 mins. at M.N. = 1.50, Cruise Back at M.N. = .92,
 15 Min. Stack at 40,000 Ft., 5Min. Fuel Reserve on Landing
 High Speed Mission with 15,510 Lb. Fuel N.M. 200
 High Speed Mission with Full Internal Fuel N.M. 318

Combat Radius of Action at 50,000 Ft., Mission as above except Cruise
 Out at M.N. = .92

Maximum Range Mission with 15,510 Lb. Fuel N.M. 315
 Maximum Range Mission with Full Internal Fuel N.M. 491

Combat Radius of Action at Sea Level, Cruise Out at .6 M.N. and
 Combat at M.N. = .92 at Sea Level, Cruise Back at .92 M.N. at 40,000 Ft.,
 15 Min. Stack, 5 Min. Fuel Reserve on Landing

Sea Level Mission with 15,510 Lb. of Fuel N.M. 217
 Sea Level Mission with Full Internal Fuel N.M. 318

Ferry Range Mission at Economical Cruise Speed (M = .92 and Height,
 including 15 Mins. Stacking at 40,000 Ft., 5 Min. Fuel Reserve on
 Landing

Range with Full Internal Fuel and 500 Gal. - External Tank . N.M. 1,675

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MPR / 3



A. V. ROE CANADA LIMITED
MALTON - ONTARIO

TECHNICAL DEPARTMENT (Aircraft)

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AIRCRAFT: CF-105

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CF-105 MONTHLY PERFORMANCE REPORT

(Issued Mid-Monthly)

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INTRODUCTION

This is the third of a series of monthly performance reports for internal usage, to be issued from the Aerodynamics Department. Only a minor change has occurred since the second report, and applies only to the CF-105 Performance with Pratt & Whitney JT 4A-25 (J 75) Engines. This alteration is due to a reduction in the ejector performance estimate for the JT 4A-25; and to an increase in spillage drag. The pertinent changes are noted in their appropriate sections.

Successive reports will present the latest data, with the alterations from the previous report noted. The report is divided into three major sections:-

1. CF-105 Performance
2. CF-105 Drag
3. Engine Data

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1. CF-105 PERFORMANCE

The performance in this issue is sub-divided into two parts:

- 1A. CF-105 Performance with Pratt and Whitney JT4A-25 Engines
- 1B. CF-105 Performance with Orenda PS 13 Engines

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1A CF-105 PERFORMANCE WITH PRATT AND WHITNEY (J-75) JT 4A-25 ENGINES

(C.G. = 29% MAC)

SECRET
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The following CF-105 - (J-75) JT 4A-25 performance estimate is based on the Wind Tunnel configuration designated B₂ V₁ W₁ E₁₀ N₅ D₈₋₄. The particular feature of this configuration is the extended, notched, and cambered leading edge of the wing. The drag of this configuration is summarized (extract P/Aero Data/58) and is presented in Section 2 of the CF-105 Monthly Report No. 1 issued October 1955.

The considerations for the installed engine data is summarized (extract P/Power/51) and is presented in Section 3 of the CF-105 Monthly Report No. 1. An error was made in the ejector calculations and was noted in CF-105 Monthly Report No. 2. However, a further revision has been made to the thrust with full afterburning, and is given in Section 3 of this report. Only this alteration has been allowed for as changes to fuel consumption, and non-afterburning engine performance would not be significant.

A slight increase in operational weight empty has also been allowed for.

The pertinent CF-105 performance changes are listed below.

- Δ Combat 'g' at 1.50 M.N. at 50,000 feet = - .08g
- Δ Maximum speed at 50,000 feet = - 40 kts.
- Δ Combat ceiling at 1.5 M.N. = - 700 ft.

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December 1955

LOADING AND PERFORMANCEPerformance Under N.A.C.A. Standard Atmospheric ConditionsTo R.C.A.F. Specification AIR 7-4

(With 2 J-75 Engines)

SECRET
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Take-Off Weight with 15,356 Lb. Fuel (77.1% Max.)	Lb.	59,228
Operational Weight Empty	Lb.	43,872
Combat Weight (1/2 Fuel)	Lb.	51,550
Landing Weight (With Reserve Fuel + Missiles)	Lb.	44,390
Wing Loading at Normal Take-Off Weight	Lb./Sq.Ft.	47.2
Power Loading at Normal Take-Off Weight	Lb./Lb. Thrust	1.60

SPEED

True Air Speed in Level Flight At Sea Level at Combat Weight		
Maximum Thrust	Kts.	★ 755
Military Thrust	Kts.	640

True Air Speed in Level Flight
At 50,000 Ft. at Combat Weight

Maximum Thrust	Kts.	1,070
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CEILING

Combat Ceiling at Combat Weight, Rate of Climb = 500 F.P.M. Maximum Thrust at 1.5 M.N.	Ft.	55,500
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RATE OF CLIMB

Steady Rate of Climb at Sea Level, Combat Weight		
Maximum Thrust at M.N. = .92	F.P.M.	51,400
Military Thrust at 530 Kts.	F.P.M.	15,800
Steady Rate of Climb at 50,000 Ft., Combat Weight		
Maximum Thrust at M.N. = 1.5	F.P.M.	5,700

TIME TO HEIGHT

Time to 50,000 Ft. M.N. = 1.5 from Engine Start at Take-Off
Weight = 59,228

Maximum Thrust	Mins.	4.9
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MANOEUVRABILITY

Combat Load Factor at Combat Weight
Maximum Thrust at M.N. = 1.50 at 50,000 Ft.

★ Placard Speed = 720 Kts.

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TAKE-OFF DISTANCE

Take-Off Distance over 50 Ft. Obstacle at Sea Level
Take-Off Weight = 59,228 Lb.

SECRET

Maximum Thrust	Ft.	3,400
Military Thrust	Ft.	6,700
Maximum Thrust, Hot Day	Ft.	4,600

LANDING DISTANCE

Landing Distance over 50 Ft. Obstacle at Sea Level at Combat Wt. Ft. 5,300

STALLING SEPPED

True Stalling Speed in Landing Configuration at Combat Weight
at Sea Level Kts. 110

RANGE

Combat Radius of Action at 50,000 Ft., Climb at M.N. = .92, Cruise out
at M.N. = 1.5, Combat for 5 Mins. at M.N. = 1.50, Cruise Back at M.N. = .92,
15 Min. Stack at 40,000 Ft., 5 Min. Fuel Reserve on Landing

High Speed Mission with 15,356 Lb. Fuel	N.M.	200
High Speed Mission with Full Internal Fuel	N.M.	309

Combat Radius of Action at 50,000 Ft., Mission as above except climb
at 530 Kts. and cruise out at M.N. = .92

Maximum Range Mission with 15,298 Lb. Fuel	N.M.	406
Maximum Range Mission with Full Internal Fuel	N.M.	605

Combat Radius of Action at Sea Level, Cruise out at .6 M.N. and
Combat at M.N. = .92 at Sea Level, Cruise Back at .92 M.N. at
40,000 Ft., 15 Min. Stack, 5 Min. Fuel Reserve on Landing

Sea Level Mission with 15,356 Lb. of Fuel	N.M.	325
Sea Level Mission with Full Internal Fuel	N.M.	470

Ferry Range Mission at Economical Cruise Speed (M = .92 and Height,
including 15 Mins. Stacking at 40,000 Ft., 5 Min. Fuel Reserve on
Landing

Range with Full Internal Fuel and 500 Gal. - External Tank .	N.M.	1,859
Range with Full Internal Fuel	N.M.	1,609

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1B. CF-105 PERFORMANCE WITH ORENDA PS 13 ENGINES

(C.G. = 29% M.A.C.)

The following CF-105 - PS 13 performance estimate is based on the wind tunnel configuration designated B₂V₁W₁E₁₀N₅D₈-4 over the subsonic portion, and configuration W₉, NA₅, B₄, C₃, V₂, R_s, over the supersonic range. The particular feature of the former configuration is the extended, notched, and cambered leading edge of the wing. The drag of this configuration is summarized, (Extract P/Aero Data/58), and is presented in section 2 of this report. The latter configuration differs chiefly by not having a cambered leading edge. This drag data is given in P/Aero Data/48 but has not been summarized for this report. This constitutes little change under supersonic cruise conditions, and only decreases the supersonic drag by about 4% at maximum 'g' due to less elevator angle for trim. Thus, the performance does reasonably represent that for the one configuration, B₂V₁W₁E₁₀N₅D₈ - 4.

The PS 13 engine data is in a more incomplete state. The engine data above the tropopause was taken from the Dec. '54 Memo, (Ref. Orenda P11-1-1) on the PS 13, with the exception of the cruise operation at .92 M.N. and 40,000 Ft., where insufficient data was available from the Memo, and we were forced to use the original PS 13 Brochure (EMS 8) April '54. The memo of Dec. '54 assumes a 6.5 Sq. Ft. intake, and pressure recovery curve from P/Power/23 APP/A/10. It also considers the effect of a 39" ejector, as well as a bypass which opens to 118 sq. inches. For engine performance below the tropopause the original PS 13 Brochure was used. The above mentioned pressure recovery correction were applied to this data, but no account was taken of the bypass effect. It should be noted that revised thrust estimates now being prepared indicate an increase in maximum thrust at 1.5 M.N. of approximately 4%. This offsets the slightly optimistic supersonic drags used in this report for the performance of the PS 13 engines version.

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LOADING AND PERFORMANCE

P/Perf/102

Performance Under N.A.C.A. Standard Atmospheric Conditions**UNCLASSIFIED**
SECRETTo R.C.A.F. Specification AIR 7-4With Two PS 13 Engines**WEIGHT:**

Take-Off Weight with 15,510 Lb. Fuel (78.2% Max.)	Lb.	55,889
Operational Weight Empty	Lb.	40,379
Combat Weight (1/2 Fuel)	Lb.	48,130
Landing Weight (With Reserve Fuel + Missiles)	Lb.	42,200
Wing Loading at Normal Take-Off Weight	Lb./Sq.Ft.	44.5
Power Loading at Normal Take-Off Weight	Lb./Lb. Thrust	1.19

SPEED

True Air Speed in Level Flight		
At Sea Level at Combat Weight		
Maximum Thrust	Kts.	★ 720
Military Thrust	Kts.	650
True Air Speed in Level Flight		
At 50,000 Ft. at Combat Weight		
Maximum Thrust	Kts.	1,110

CEILING

Combat Ceiling at Combat Weight, Rate of Climb = 500 F.P.M.		
Maximum Thrust at 1.5 M.N.	Ft.	62,200

RATE OF CLIMB

Steady Rate of Climb at Sea Level, Combat Weight		
Maximum Thrust at M.N. = .92	F.P.M.	50,000
Military Thrust at 530 Kts.	F.P.M.	25,200
Steady Rate of Climb at 50,000 Ft., Combat Weight		
Maximum Thrust at M.N. = 1.5	F.P.M.	11,500

TIME TO HEIGHT

Time to 50,000 Ft. M.N. = 1.5 from Engine Start at Take-Off		
Weight = 55,889 Lb.		
Maximum Thrust	Mins.	4.1

MANOEUVRABILITY

Combat Load Factor at Combat Weight		
Maximum Thrust at M.N. = 1.50 at 50,000 Ft.		1.84

★ Placard Speed = 720 Kts.

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TAKE-OFF DISTANCE

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Take-Off Distance over 50 Ft. Obstacle at Sea Level

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Take-Off Weight = 55,889 Lb.

Maximum Thrust	Ft.	2,500
Military Thrust	Ft.	3,800
Maximum Thrust Hot Day	Ft.	3,300

LANDING DISTANCE

Landing Distance over 50 Ft. Obstacle at Sea Level at Combat Weight Ft. 5,000

STALLING SPEED

True Stalling Speed in Landing Configuration at Combat Weight

at Sea Level Kts. 105

RANGE

Combat Radius of Action at 50,000 Ft., Climb at M.N. = .92, Cruise out at M.N. = 1.5, Combat for 5 mins. at M.N. = 1.50, Cruise Back at M.N. = .92, 15 Min. Stack at 40,000 Ft., 5Min. Fuel Reserve on Landing

High Speed Mission with 15,510 Lb. Fuel	N.M.	200
High Speed Mission with Full Internal Fuel	N.M.	318

Combat Radius of Action at 50,000 Ft., Mission as above except Cruise Out at M.N. = .92

Maximum Range Mission with 15,510 Lb. Fuel	N.M.	315
Maximum Range Mission with Full Internal Fuel	N.M.	491

Combat Radius of Action at Sea Level, Cruise Out at .6 M.N. and Combat at M.N. = .92 at Sea Level, Cruise Back at .92 M.N. at 40,000 Ft., 15 Min. Stack, 5 Min. Fuel Reserve on Landing

Sea Level Mission with 15,510 Lb. of Fuel	N.M.	217
Sea Level Mission with Full Internal Fuel	N.M.	318

Ferry Range Mission at Economical Cruise Speed (M = .92 and Height, including 15 Mins. Stacking at 40,000 Ft., 5 Min. Fuel Reserve on Landing

Range with Full Internal Fuel and 500 Gal. - External Tank . N.M. 1,675

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MPR / 4



A. V. ROE CANADA LIMITED
MALTON - ONTARIO

TECHNICAL DEPARTMENT (Aircraft)

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AIRCRAFT: CF-105

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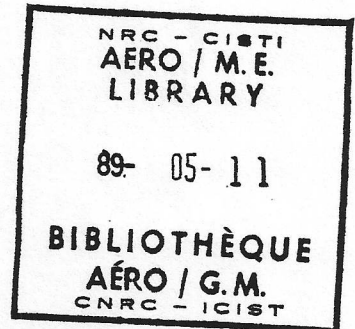
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CF-105 MONTHLY PERFORMANCE REPORT

(Issued Mid-Monthly)



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Issued toR.CAF.....

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ISSUE NO.	REVISION NO.	REVISED BY	APPROVED BY	DATE	REMARKS

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INTRODUCTION

This is the fourth of a series of monthly performance reports for internal usage, to be issued from the Aerodynamics Department.

Only the maximum performance in the stratosphere has been revised since the third report. The alterations are due to

- Revision of the trim drag estimate
- Revision of Orenda PS 13 maximum thrust estimate

The pertinent changes are noted in their appropriate sections.

A note on the effect of installing Sparrow II Missiles in place of Falcon missiles has been included as subsequent performance reports are to be based on the CF-105 with a sparrow missile pack.

Successive reports will present the latest data, with the alterations from the previous report noted. The report is divided into three major sections

1. CF-105 Performance
2. CF-105 Drag
3. Engine Data

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January 1956.

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PERFORMANCE NOTE ON THE

EFFECT OF INSTALLING SPARROW II MISSILES IN PLACE OF FALCONS

The latest weight and c.g. estimate (by no means finalized) for the CF-105 with 4 Sparrow II missiles submerged in the armament bay shows the following changes over that of the CF-105 carrying 3 fully submerged Falcons.

	<u>Weight Increase</u>	<u>Fwd. Shift in C.G.</u>
CF-105 - P.S. 13	1243 Lb.	1.09% M.A.C.
CF-105 - J-75	1243 Lb.	1.04% M.A.C.

The performance in this and previous Monthly Reports have been based on Falcon missile armament.

Based on the above data then, the CF-105 will suffer a 6% reduction in 'g' at 1.5 M.N. at 50,000 ft. on installing Sparrow Missiles. Subsequent Monthly Performance Reports will be based on Sparrow missile armament.

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1. CF-105 PERFORMANCE

The performance in this issue is sub-divided into two parts:

- 1A. CF-105 Performance with Pratt and Whitney JT4A-25 Engines
- 1B. CF-105 Performance with Orenda PS 13 Engines

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January 1956.

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1A: CF-105 PERFORMANCE WITH PRATT AND WHITNEY (J-75) JT 4A-25 ENGINES

(C.G. = 29% M.A.C.)

The following CF-105 - (J-75) JT 4A-25 performance estimate is based on the Wind Tunnel configuration designated B₂V₁W₁E₁₀N₅D₃-4 (except that the nose cone angle has been reduced to 30°). The particular feature of this configuration is the extended, notched and cambered leading edge of the wing.

The drag of this configuration is summarized (Extract P/Perf/112) and is presented in section 2 of this report. A more direct approach of estimating supersonic trim drag has been employed, resulting in reduced drag.

No revision has been made to the installed engine data.

Corrections for the above alteration has been applied directly to the maximum performance data in the stratosphere only. No revision has been made to the mission profiles.

The pertinent CF-105 Performance Changes are listed below:

Δ Combat 'g' at 1.50 M.N. at 50,000 feet	= + .09
Δ Maximum Speed at 50,000 feet	= + 3 knots
Δ Combat Ceiling at 1.50 M.N.	= + 1100 feet

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January 1956

LOADING AND PERFORMANCE - 4Performance Under N.A.C.A. Standard Atmospheric ConditionsTo R.C.A.F. Specification AIR 7-4

(With 2 J-75 Engines)

SECRET
UNCLASSIFIED**WEIGHT:**

Take-Off Weight with 15,356 Lb. Fuel (77.1% Max.)	Lb.	59,228
Operational Weight Empty	Lb.	43,872
Combat Weight (1/2 Fuel)	Lb.	51,550
Landing Weight (With Reserve Fuel + Missiles)	Lb.	44,390
Wing Loading at Normal Take-Off Weight	Lb./sq/Ft.	47.2
Power Loading at Normal Take-Off Weight	Lb./Lb. Thrust	1.60

SPEED

True Air Speed in Level Flight		
At Sea Level at Combat Weight		
Maximum Thrust	Kts.	* 755
Military Thrust	Kts.	640
True Air Speed in Level Flight		
At 50,000 Ft. at Combat Weight		
Maximum Thrust	Kts.	1,073

CEILING

Combat Ceiling at Combat Weight, Rate of Climb = 500 F.P.M.		
Maximum Thrust at 1.5 M.N.	Ft.	56,600

RATE OF CLIMB

Steady Rate of Climb at Sea Level, Combat Weight		
Maximum Thrust at M.N. = .92	F.P.M.	51,400
Military Thrust at 530 Kts.	F.P.M.	15,800
Steady Rate of Climb at 50,000 Ft., Combat Weight		
Maximum Thrust at M.N. = 1.5	F.P.M.	6,100

TIME TO HEIGHT

Time to 50,000 Ft. M.N. = 1.5 from Engine Start at Take-Off		
Weight = 59,228		
Maximum Thrust	Mins.	4.9

MANOEUVRABILITY

Combat Load Factor at Combat Weight		
Maximum Thrust at M.N. = 1.50 at 50,000 Ft.		1.48

* Placard Speed = 720 Kts.

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TAKE-OFF DISTANCE

Take-Off Distance over 50 Ft. Obstacle at Sea Level
Take-Off Weight = 59,228 Lb.

Maximum Thrust	Ft.	3,400
Military Thrust	Ft.	6,700
Maximum Thrust, Hot Day	Ft.	4,600

LANDING DISTANCE

Landing Distance over 50 Ft. Obstacle at Sea Level at Combat Wt.	Ft.	5,300
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STALLING SEPPED

True Stalling Speed in Landing Configuration at Combat Weight at Sea Level	Kts.	110
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RANGE

Combat Radius of Action at 50,000 Ft., Climb at M.N. = .92, Cruise out
at M.N. = 1.5, Combat for 5 Mins. at M.N. = 1.50, Cruise Back at M.N. = .92,
15 Min. Stack at 40,000 Ft., 5 Min. Fuel Reserve on Landing

High Speed Mission with 15,356 Lb. Fuel	N.M.	200
High Speed Mission with Full Internal Fuel	N.M.	309

Combat Radius of Action at 50,000 Ft., Mission as above except climb
at 530 Kts. and cruise out at M.N. = .92

Maximum Range Mission with 15,298 Lb. Fuel	N.M.	406
Maximum Range Mission with Full Internal Fuel	N.M.	605

Combat Radius of Action at Sea Level, Cruise out at .6 M.N. and
Combat at M.N. = .92 at Sea Level, Cruise Back at .92 M.N. at
40,000 Ft., 15 Min. Stack, 5 Min. Fuel Reserve on Landing

Sea Level Mission with 15,356 Lb. of Fuel	N.M.	325
Sea Level Mission with Full Internal Fuel	N.M.	470

Ferry Range Mission at Economical Cruise Speed (M = .92 and Height,
including 15 Mins. Stacking at 40,000 Ft., 5 Min. Fuel Reserve on
Landing

Range with Full Internal Fuel and 500 Gal. - External Tank .	N.M.	1,859
Range with Full Internal Fuel	N.M.	1,609

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January 1956.

1B: CF-105 PERFORMANCE WITH ORENDA PS 13 ENGINES

(C.G. = 29% M.A.C.)

The following CF-105 - PS 13 performance estimate is based on the Wind Tunnel configuration designated B₂V₁W₁E₁O₅D₈-4 (except that the nose cone angle has been reduced to 30°). The particular feature of this configuration is the extended, notched and cambered leading edge of the wing.

The drag of this configuration is summarized (Extract P/Perf/112) and is presented in section 2 of this report. A more direct approach of estimating supersonic trim drag has been employed, resulting in reduced drag.

The installed stratosphere thrust of the PS 13 with maximum afterburning has been re-estimated using the latest non-dimensional curves.

Corrections for the above alterations have been applied directly to the maximum performance data in the stratosphere only. No revision has been made to the mission profiles.

The pertinent CF-105 performance changes are listed below:

Δ Combat 'g' at 1.5 M.N. at 50,000 feet	= + .15
Δ Maximum Speed at 50,000 feet	= + 30 knots
Δ Combat Ceiling at 1.5 M.N.	= + 1800 feet

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Performance Under N.A.C.A. Standard Atmospheric Conditions January 1956.To R.C.A.F. Specification AIR 7-4With Two PS 13 Engines

UNCLASSIFIED SECRET

WEIGHT:

Take-Off Weight with 15,510 Lb. Fuel (78.2% Max)	Lb.	55,889
Operational Weight Empty	Lb.	40,379
Combat Weight (1/2 Fuel)	Lb.	48,130
Landing Weight (With Reserve Fuel + Missile)	Lb.	42,200
Wing Loading at Normal Take-off Weight	Lb./Sq.Ft.	44.6
Power Loading at Normal Take-off Weight	Lb./Lb. Thrust.	1.19

SPEED

True Air Speed in Level Flight		
At Sea Level at Combat Weight	Kts.	* 720
Maximum Thrust	Kts.	650
Military Thrust		
True Air Speed in Level Flight		
At 50,000 Ft. at Combat Weight	Kts.	1,140
Maximum Thrust		

CEILING

Combat Ceiling at Combat Weight, Rate of Climb = 500 F.P.M.	Ft.	64,000
Maximum Thrust at 1.5 M.N.		

RATE OF CLIMB

Steady Rate of Climb at Sea Level, Combat Weight	F.P.M.	50,000
Maximum Thrust at M.N. = .92	F.P.M.	25,200
Military Thrust at 530 Kts.		
Steady Rate of Climb at 50,000 Ft., Combat Weight	F.P.M.	15,000
Maximum Thrust at M.N. = 1.5		

TIME TO HEIGHT

Time to 50,000 Ft. M.N. = 1.5 from Engine Start at Take-Off		
Weight = 55,889 Lb.	Mins.	4.0
Maximum Thrust		

MANOEUVRABILITY

Combat Load Factor at Combat Weight		1.99
Maximum Thrust at M.N. = 1.50 at 50,000 Ft.		

* Placard Speed = 720 Kts.

UNCLASSIFIED SECRET

P/Perf 112

TAKE-OFF DISTANCE

Take-Off Distance over 50 Ft. Obstacle at Sea Level
 Take-Off Weight = 55,889 Lb.
 Maximum Thrust Ft. 2,500
 Military Thrust Ft. 3,800
 Maximum Thrust Hot Day Ft. 3,300

LANDING DISTANCE

Landing Distance over 50 Ft. Obstacle at Sea Level at Combat Weight Ft. 5,000

STALLING SPEED

True Stalling Speed in Landing Configuration at Combat Weight
 at Sea Level Kts. 105

RANGE

Combat Radius of Action at 50,000 Ft., Climb at M.N. = .92, Cruise Out
 at M.N. = 1.5, Combat for 5 mins. at M.N. = 1.50, Cruise Back at M.N. = .92,
 15 Min. Stack at 40,000 Ft., 5 Min. Fuel Reserve on Landing
 High Speed Mission with 15,510 Lb. Fuel N.M. 200
 High Speed Mission with Full Internal Fuel N.M. 318

Combat Radius of Action at 50,000 Ft. Mission as above except Cruise
 Out at M.N. = .92

Maximum Range Mission with 15,510 Lb. Fuel N.M. 315
 Maximum Range Mission with Full Internal Fuel N.M. 491

Combat Radius of Action at Sea Level, Cruise Out at .6 M.N. and
 Combat at M.N. = .92 at Sea Level, Cruise Back at .92 M.N. at 40,000 Ft.,
 15 Min. Stack, 5 Min. Fuel Reserve on Landing

Sea Level Mission with 15,510 Lb. of Fuel N.M. 217
 Sea Level Mission with Full Internal Fuel N.M. 318

Ferry Range Mission at Economical Cruise Speed (M = .92 and Height,
 including 15 Mins. Stacking at 40,000 Ft., 5 Min. Fuel Reserve on
 Landing

Range with Full Internal Fuel and 500 Gal. - External Tank. N.M. 1,675

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A. V. ROE CANADA LIMITED

MALTON - ONTARIO

TECHNICAL DEPARTMENT (Aircraft)

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AIRCRAFT: CF-105

REPORT NO. Monthly Report No.

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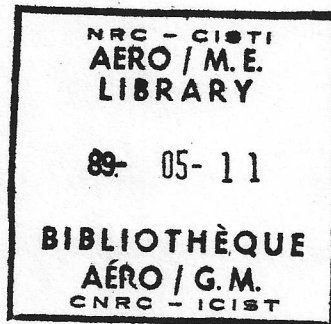
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CF-105 MONTHLY PERFORMANCE REPORT

(Issued Mid-Monthly)



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ISSUE NO.	REVISION NO.	REVISED BY	APPROVED BY	DATE	REMARKS

May 1956

CF-105 MONTHLY PERFORMANCE REPORT - 8

UNCLASSIFIED

Introduction:

This is the eighth of a series of monthly performance reports for internal usage, to be issued from the Aerodynamics Department.

Only the performance with Orenda P.S. 13 engines has been revised, based on new engine data. The performance with Pratt and Whitney J-75 engines, given in monthly report 6 is included again in this report for completeness.

The pertinent changes are noted in their appropriate sections.

Successive reports will present the latest data, with the alterations from the previous report noted. The report is divided into three major sections.

1. CF-105 Performance
2. CF-105 Drag
3. Propulsion.

SECRET

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1. CF-105 PERFORMANCE

The performance in this issue is sub-divided into two parts:

- 1A. CF-105 Performance with Pratt and Whittney JT4A-25 Engines
- 1B. CF-105 Performance with Orenda PS 13 Engines

March, 1956.

1A: CF-105 PERFORMANCE WITH PRATT AND WHITNEY (J.75) JT4A-25 ENGINES
(C.G. = 29.5% M.A.C.)

The following CF-105 - (J-75) JT4A-25 performance estimate is based on the wind tunnel configuration designated B₂ V₁ W₁ E₁₀ N₅ D₈-4 (except that the nose cone angle has been reduced to 30°). The particular feature of this configuration is the extended, notched and cambered leading edge of the wing.

The drag of this configuration has been summarized (extract P/Perf/112) and is presented in Section 2 of the previous monthly report. However, this has been revised slightly because of shifting the c.g. from 29% MAC to 29.5% MAC. This is in accordance with the planned fuel sequencing to give a c.g. position of 31% MAC on firing the Sparrow II missiles.

The CF-105 operational weight empty has increased approximately 1,400 lbs. since the previous report due to Sparrow II missile installation in place of Falcons.

No revision has been made to the installed engine data other than the extension required to revise the mission profiles.

The overall effect is one of only slightly degraded performance.

LOADING AND PERFORMANCE - 6

March 1956.

Performance Under N.A.C.A. Standard Atmospheric ConditionsTo R.C.A.F. Specification AIR 7-4

(With 2 J-75 Engines)

UNCLASSIFIED**WEIGHT:**

Take-Off Weight with 15,673 Lb. Fuel (78.9% Max.)	Lb.	60,927
Operational Weight Empty	Lb.	45,254
Combat Weight (1/2 Fuel)	Lb.	53,090
Landing Weight (With Reserve Fuel + Missiles)	Lb.	45,224
Wing Loading at Normal Take-Off Weight	Lb./sq /Ft.	48.5
Power Loading at Normal Take-Off Weight	Lb./Lb. Thrust	1.64

SPEED

True Air Speed in Level Flight		
At Sea Level at Combat Weight		
Maximum Thrust	Kts.	V 800
Military Thrust	Kts.	640
True Air Speed in Level Flight		
At 50,000 Ft. at Combat Weight		
Maximum Thrust	Kts.	1,075

CEILING

Combat Ceiling at Combat Weight, Rate of Climb = 500 F.P.M.		
Maximum Thrust at 1.5 M.N.	Ft.	56,400

RATE OF CLIMB

Steady Rate of Climb at Sea Level, Combat Weight		
Maximum Thrust at M.N. = .92	F.P.M.	46,500
Military Thrust at 530 Kts.	F.P.M.	15,500
Steady Rate of Climb at 50,000 Ft., Combat Weight		
Maximum Thrust at M.N. = 1.5	F.P.M.	5,900

TIME TO HEIGHT

Time to 50,000 Ft. M.N. = 1.5 from Engine Start at Take-Off Weight		
Maximum Thrust	Mins.	5.1

MANOEUVRABILITY

Combat Load Factor at Combat Weight		
Maximum Thrust at M.N. = 1.50 at 50,000 Ft.		1.46

V Placard Speed = 720 Kts. E.A.S.

UNCLASSIFIED

TAKE-OFF DISTANCE

Take-Off Distance over 50 Ft. Obstacle at Sea Level
Take-Off Weight

Maximum Thrust	Ft.	3,500
Military Thrust	Ft.	6,400
Maximum Thrust, Hot Day	Ft.	4,900

LANDING DISTANCE

Landing Distance over 50 Ft. Obstacle at Sea Level at Combat Wt.	Ft.	5,400
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STALLING SPEED

True Stalling Speed in Landing Configuration at Combat Weight at Sea Level	Kts.	112
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RANGE

Combat Radius of Action at 50,000 Ft., Climb at M.N. = .92, Cruise
out at M.N. = 1.5, Combat for 5 Mins. at M.N. = 1.50, Cruise back
at M.N. = .92, 15 Min. Stack at 40,000 Ft., 5 Min. Fuel Reserve
on Landing

High Speed Mission with 15,673 Lb. Fuel	N.M.	200
High Speed Mission with Full Internal Fuel	N.M.	295

Combat Radius of Action at 50,000 Ft., Mission as above except
climb at 530 Kts. and cruise out at M.N. = .92

Maximum Range Mission with 15,673 Lb. Fuel	N.M.	380
Maximum Range Mission with Full Internal Fuel	N.M.	545

Ferry Range Mission at Economical Cruise Speed (M = .92 and
Height, including 15 Mins. Stacking at 40,000 Ft., 5 Min. Fuel
Reserve on Landing

Range with Full Internal Fuel and 500 Gal. - External Tank	N.M.	1,678
Range with Full Internal Fuel	N.M.	1,444

May, 1956.

1B: CF-105 PERFORMANCE WITH ORENDA PS 13 ENGINES

(C.G. * 29.5% M.A.C.)

UNCLASSIFIED

The following CF-105 - Orenda F.S. 13 performance estimate is based on the wind tunnel configuration designated B₂V, W, E₁₀ NS D₈₋₄ (except that the nose angle has been reduced to 30°) The particular feature of this configuration is the extended, notched and cambered leading edge of the wing.

The drag of this configuration has been summarized in previous monthly reports. The drag used is that given in monthly report 6 with the C.G. at 29.5% M.A.C. in accordance with the planned fuel sequencing to give a C.G. position of 31% M.A.C. on firing the Sparrow II missiles.

The increased weight of the Sparrow II pack over that of the Falcon pack is largely responsible for the 1187 lb. increment in operational weight empty since the 4th monthly report (the last CF-105 Orenda PS 13 performance issue)

The Orenda PS 13 engine data has been completely revised. See Section 3. The most significant change has been the slightly decreased thrust in altitude below 1.5 M.N. and a considerable increase in thrust at the higher Mach numbers. The specific fuel consumptions are improved approximately 10%.

The pertinent CF-105 - Orenda PS 13 performance changes are listed below:

△ Combat 'g' at 1.5 M.N. at 50,000 ft.	= -.11
△ Maximum speed at 50,000 ft.	= + 120 Kts.
△ Combat ceiling at 1.5 M.N.	= - 1500 ft.
△ Combat mission fuel (200 NM radius)	= - 957 lb.

LOADING AND PERFORMANCE - 8

Extract P/Perf/102 Vol II

Performance Under I.C.A.O. Standard Atmospheric Conditions

May, 1956.

To R.C.A.F. Specification AIR 7-4With Two PS 13 Engines

WEIGHT:

Take-Off Weight with 14,553 Lb. Fuel (73.3% Max)	Lb.	56,119
Operational Weight Empty	Lb.	41,566
Combat Weight (1/2 Fuel)	Lb.	48,843
Landing Weight (With Reserve Fuel + Missiles)	Lb.	43,356
Wing Loading at Normal Take-off Weight	Lb/Sq.Ft.	44.7
Power Loading at Normal Take-off Weight	Lb/Lb. Thrust	1.25

SPEED

True Air Speed in Level Flight		
At Sea Level at Combat Weight		
Maximum Thrust A/B Lit	Kts.	* 720
Maximum Thrust A/B Not Lit	Kts.	670
True Air Speed in Level Flight		
at 50,000 Ft. at Combat Weight		
Maximum Thrust A/B Lit	Kts.	1,260

CEILING

Combat Ceiling at Combat Weight, Rate of Climb = 500 F.P.M.	
Maximum Thrust at 1.5 MN. A/B Lit	Ft. 62,500

RATE OF CLIMB

Steady Rate of Climb at Sea Level, Combat Weight	
Maximum Thrust at M.N. = .92 A/B Lit	F.P.M. 61,500
Maximum Thrust at 530 Kts. A/B Not Lit	F.P.M. 23,800
Steady Rate of Climb at 50,000 Ft., Combat Weight	
Maximum Thrust at M.N. = 1.5 A/B Lit	F.P.M. 12,400

TIME TO HEIGHT

Time to 50,000 Ft. M.N. = 1.5 from Engine Start at Take-Off Weight	
Maximum Thrust A/B Lit	Mins. 3.9

MANOEUVRABILITY

Combat Load Factor at Combat Weight	
Maximum Thrust at M.N. = 1.50 at 50,000 Ft. A/B Lit	1.88

* Placard Speed = 720 Kts.

TAKE-OFF DISTANCE

Take-Off Distance over 50 Ft. Obstacle at Sea Level at
 Take-Off Weight = 56,119 Lb
 Maximum Thrust A/B Lit Ft. 2,420
 Maximum Thrust A/B Not Lit Ft. 3,640
 Maximum Thrust Hot Day A/B Lit Ft. 3,000

LANDING DISTANCE

Landing Distance over 50 ft. Obstacle at Sea Level at Combat Weight Ft. 5,060

STALLING SPEED

True Stalling Speed in Landing Configuration at Combat Weight
 at Sea Level Kts. 105.5

RANGE

Combat Radius of Action at 50,000 Ft., Climb at M.N. = .92, Cruise out
 at M.N. = 1.5, Combat for 5 mins. at M.N. = 1.50, Cruise Back at M.N. = .92,
 15 Min. Stack at 40,000 Ft., 5 Min. Fuel Reserve on Landing

 High Speed Mission with 14,553 Lb. Fuel N.M. 200
 High Speed Mission with Full Internal Fuel N.M. 381

Combat Radius of Action at 50,000 Ft. Mission as above except Cruise
 Out at M.N. = .92

 Maximum Range Mission with 15,396 Lb. Fuel N.M. 300
 Maximum Range Mission with Full Internal Fuel N.M. 510

Ferry Range Mission at Economical Cruise Speed (M = .92 and Height,
 including 15 Mins. Stacking at 40,000 Ft., 5 Min. Fuel Reserve on
 Landing

 Range with Full Internal Fuel and 500 Gal. - External Tank. N.M. 1,738

MPR / 9



A. V. ROE CANADA LIMITED
MALTON - ONTARIO

TECHNICAL DEPARTMENT (Aircraft)

AIRCRAFT: CF-105

SECRET
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REPORT NO: 9

FILE NO:

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CF-105 PERIODIC PERFORMANCE REPORT

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November 1956.

CF-105 PERIODIC PERFORMANCE REPORT - 9Introduction

This is the ninth of a series of periodic performance reports for internal usage, to be issued from the Aerodynamics Department.

The pertinent changes are noted in the appropriate sections. For more detailed discussion of the drag changes see "Effect of N.A.C.A. Wind Tunnel and Free Flight Tests on the Estimated Performance of the CF-105".

As in the past, successive reports will present the latest data, with the alterations from the previous report noted. The report is divided into three major sections:

- 1) CF-105 Performance
- 2) CF-105 Drag
- 3) Propulsion

UNCLASSIFIED**SECRET**

1: CF-105 PERFORMANCE WITH ORENDA IROQUOIS ENGINES

(C.G. at 29.5% M.A.C.)

The following CF-105 performance estimate is based on supersonic wind tunnel and free flight tests which were conducted at the Langley Laboratories of the N.A.C.A. The transonic and high subsonic regions are based on C.A.L. wind tunnel tests, whilst the low speed data is from N.A.E. tunnel tests.

The drag has been completely revised resulting in minor changes subsonically, but with larger changes in the supersonic region compared to Monthly Report Number 6, see Section 2.

The Orenda Iroquois engine data has also been completely revised, see Section 3.

The pertinent performance changes are listed below,

Combat 'g' at 1.5 M.N. at 50,000 feet -----	-.25
Combat ceiling at 1.5 M.N. -----	-2900 Ft.
Combat mission fuel (200 N.M. radius) -----	+1119 Lb.

LOADING AND PERFORMANCE - 9

December, 1956.

Performance Under I.C.A.O. Standard Atmospheric ConditionsTo R.C.n.F. Specification AIR 7-4with Two Iroquois Engines

WEIGHT:

Take-Off Weight with 15,672 Lbs. Fuel (78.9% Max)	Lb.	59,336
Operation Weight Empty	Lb.	43,664
Combat Weight	Lb.	51,500
Normal design landing gross weight AIR 7-4 - MIL-S-5701	Lb.	45,854
Wing Loading at Normal Take-Off Weight	Lb/Sq.Ft.	48.4
Power Loading at Normal Take-Off Weight	Lb/Lb. Thrust	1.34

SPEED:

True Airspeed in Level Flight at Sea Level at Combat weight		
Maximum Thrust A/B Lit	Kts.	700 *
Maximum Thrust A/B not Lit	Kts.	671
True Airspeed in Level Flight at 50,000 Ft. at Combat weight		
Maximum Thrust A/B Lit	Kts.	1147 *

CEILING:

Combat Ceiling at Combat Weight, Rate of Climb = 500 F.P.M.	
Maximum Thrust at 1.65 M.N. A/B Lit	Ft. 60,000

RATE OF CLIMB:

Steady Rate of Climb at Sea Level, Combat Weight	
Maximum Thrust at M.N. = .92 A/B Lit	F.P.M. 60,600
Maximum Thrust at 527 Kts. A/B not Lit	F.P.M. 27,200
Steady Rate of Climb at 50,000 Ft., Combat weight	
Maximum Thrust at M.N. = 1.5 A/B Lit	F.P.M. 8,600

TIME TO HEIGHT:

Time to 50,000 Ft. M.N. = 1.5 from Engine Start at Take-Off Weight	
Maximum Thrust A/B Lit	Mins. 4.33

MANOEUVRABILITY:

Combat Load Factor at Combat Weight	
Maximum Thrust at M.N. = 1.50 at 50,000 Ft. A/B Lit	1.63

* AIR 7-4 Placard Speed

-2-

TAKE-OFF DISTANCE:

Take-Off Distance over 50 Ft. Obstacle at Sea Level at
Take-Off Weight = 59,336 Lbs.

Maximum Thrust A/B Lit	Ft.	2,850
Maximum Thrust A/B not Lit	Ft.	4,430
Maximum Thrust Hot Day A/B Lit	Ft.	3,460

LANDING DISTANCE:

Landing Distance over 50 Ft. Obstacle at Sea Level at

Normal Design Landing Gross Weight	Ft.	4,810
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STALLING SPEED:

True Stalling Speed in Landing Configuration at Combat Weight

at Sea Level	Kts.	111.5
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RANGE:

Combat Radius of Action at 50,000 Ft. Climb at 527 Kts. T.A.S.,

Accel. to M = 1.5 @ 30,000', Climb @ M = 1.5 to 50,000', Cruise-out

at M.N. = 1.5, Combat for 5 Mins. at M.N. = 1.50, Cruise-back

at M.N. = .92, 15 Min. Stack at 40,000 Ft., 5 Min. Fuel Reserve on Landing

High Speed Mission with 15,672 Lbs. Fuel.....	N.M.	200.0
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High Speed Mission with Full Internal Fuel (SG = 0.78).....	N.M.	302.0
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Combat Radius of Action at 50,000' Mission as above except

Cruise-out at M.N. = .92

Maximum Range Mission with 15,744 Lbs. Fuel	N.M.	300.0
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Maximum Range Mission with Full Internal Fuel (SG = 0.78).....	N.M.	450.0
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Ferry Range Mission at Economical Cruise Speed (Cruise climb from

36,500' to 41,500' at M = .92) including 15 Mins. Stacking at 40,000

Ft., 5 Min. Fuel Reserve on Landing

Range with Full Internal Fuel and 500 Gal. - External Tank

(SG = 0.78)	N.M.	1460.0
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MPR / 10



A. V. ROE CANADA LIMITED

MALTON - ONTARIO

TECHNICAL DEPARTMENT (Aircraft)

AIRCRAFT: CF-105

REPORT No: 10

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December 1956.

CF-105 PERIODIC PERFORMANCE REPORT - 10

Introduction

This is the tenth of a series of periodic performance reports for internal usage to be issued from the Aerodynamics Department, and is also the first performance report detailing predicted performance with the Iroquois engine with re-matched compressors (no model number has yet been furnished) and with the appropriate changes to the nozzle configuration.

The pertinent changes are noted in their appropriate sections. For more detailed discussion of the engine changes, see "Effect of N.A.C.A. Wind Tunnel and Free Flight Tests on the Estimated Performance of the CF-105".

As in the past, successive reports will present the latest data, with the alterations from the previous report noted. The report is divided into three major sections:

- 1) CF-105 Performance
- 2) CF-105 Drag
- 3) Propulsion

~~SECRET~~

1: CF-105 PERFORMANCE WITH OMENDA IROQUOIS ENGINES

(C.G. at 29.5% M.A.C.)

This estimate is the first to be prepared for the CF-105 Mk. 2 with the Iroquois engines with re-matched compressors (model number not available) and with the appropriate airframe nozzle changes.

As will be seen no significant change in performance at speeds up to $M = 1.5$ is predicted, but at speeds between $M = 1.5$ and $M = 2.0$ appreciable gains are made.

December, 1956.

Performance Under I.C.A.O. Standard Atmospheric ConditionsTo R.C.A.F. Specification AIR 7-4With Two Iroquois Engines

WEIGHT:

Take-Off Weight with 15,672 Lbs. Fuel (78.9% Max).....	Lb.	59,336
Operation Weight Empty	Lb.	43,664
Combat Weight	Lb.	51,500
Normal Design Landing Gross Weight AIR 7-4 - MIL-S-5701	Lb.	45,854
Wing Loading at Normal Take-Off Weight	Lb/Sq.Ft.	48.4
Power Loading at Normal Take-Off Weight	Lb/Lb. Thrust	1.34

SPEED:

True Airspeed in Level Flight at Sea Level at Combat Weight		
Maximum Thrust A/B Lit	Kts.	700 *
Maximum Thrust A/B not Lit	Kts.	671
True Airspeed in Level Flight at 50,000 Ft. at Combat Weight		
Maximum Thrust A/B Lit	Kts.	1147 *

CEILING:

Combat Ceiling at Combat Weight, Rate of Climb = 500 F.P.M.	
Maximum Thrust at 2.0 M.N. A/B Lit	Ft. 63,300

RATE OF CLIMB:

Steady Rate of Climb at Sea Level, Combat Weight	
Maximum Thrust at M.N. = .92 A/B Lit	F.P.M. 60,600
Maximum Thrust at 527 Kts. A/B not Lit	F.P.M. 27,200
Steady Rate of Climb at 50,000 Ft., Combat Weight	
Maximum Thrust at M.N. = 2.0 A/B Lit	F.P.M. 14,500

TIME TO HEIGHT:

Time to 50,000 Ft. M.N. = 1.5 from Engine Start at Take-Off Weight	
Maximum Thrust A/B Lit	Mins. 4.33

MANOEUVRABILITY:

Combat Load Factor at Combat Weight	
Maximum Thrust at M.N. = 1.50 at 50,000 Ft. A/B Lit	1.63
Maximum Thrust at M.N. = 2.00 at 50,000 Ft. A/B Lit	1.96

* AIR 7-4 Placard Speed

-2-

TAKE-OFF DISTANCE:

Take-Off Distance over 50 Ft. Obstacle at Sea Level at

Take-Off Weight = 59,336 Lbs.

Maximum Thrust A/B Lit	Ft.	2,850
Maximum Thrust A/B not Lit	Ft.	4,430
Maximum Thrust Hot Day A/B Lit	Ft.	3,460

LANDING DISTANCE:

Landing Distance over 50 Ft. Obstacle at Sea Level at

Normal Design Landing Gross Weight	Ft.	4,810
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STALLING SPEED:

True Stalling Speed in Landing Configuration at Combat Weight

at Sea Level	Kts.	111.5
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RANGE:

Combat Radius of Action at 50,000 Ft. Climb at 527 Kts. T.A.S.,

Accel. to M = 1.5 @ 30,000', Climb @ M = 1.5 to 50,000', Cruise-out

at M.N. = 1.5, Combat for 5 Mins. at M.N. = 1.50, Cruise-back

at M.N. = .92, 15 Min. Stack at 40,000 Ft., 5 Min. Fuel Reserve on Landing

High Speed Mission with 15,672 Lbs. Fuel.....	N.M.	200.0
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High Speed Mission with Full Internal Fuel (SG = 0.78).....	N.M.	302.0
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Combat Radius of Action at 50,000' Mission as above except

Cruise-out at M.N. = .92

Maximum Range Mission with 15,744 Lbs. Fuel	N.M.	300.0
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Maximum Range Mission with Full Internal Fuel (SG = 0.78).....	N.M.	450.0
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Ferry Range Mission at Economical Cruise Speed (Cruise climb from
36,500' to 41,500' at M = .92) including 15 Mins. Stacking at 40,000
Ft., 5 Min. Fuel Reserve on Landing

Range with Full Internal Fuel and 500 Gal. - External Tank

(SG = 0.78)	N.M.	1460.0
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