



## **NATIONAL TRANSPORTATION SAFETY BOARD**

Office of Aviation Safety  
Washington, D.C. 20594

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### **Attachment 24 – B747 Brake Temp Checklist**

# **OPERATIONAL FACTORS**

**DCA13MA081**

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### A. BRAKE TEMP CHECKLIST



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#### BRAKE TEMP

Condition: One or more brake temperatures are high.

Objective: To allow the brakes to cool.

1 Choose one:

◆ **In flight:**

**When** extending or retracting the landing gear, do not exceed the gear EXTEND limit speed (270K/.82M).

Landing gear lever . . . . . DN

This allows cooling air to flow around the brakes.

**When** the BRAKE TEMP message blanks:

**Wait** 8 minutes. This ensures sufficient cooling time.

Landing gear lever. . . . UP, then OFF



◆ **On the ground:**

Refer to the Brake Cooling Schedule in the Advisory Information section of the Performance Inflight chapter for the required cooling time.

Minimum cooling time is 70 minutes.



September 1, 2011

B747-400 QRH

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ADVISORY INFORMATION

**Recommended Brake Cooling Schedule**  
**Adjusted Brake Energy per Brake (Millions of Foot Pounds)**  
**No Reverse Thrust**

		REFERENCE BRAKE ENERGY PER BRAKE (MILLIONS OF FOOT POUNDS)								
EVENT		10	20	30	40	50	60	70	80	90
LANDING	RTO MAX MAN	10	20	30	40	50	60	70	80	90
	MAX MAN	4.2	12.9	21.9	30.8	39.8	48.8	58.0	67.4	77.0
	MAX AUTO	4.2	12.4	20.8	29.3	38.1	47.0	56.3	65.7	75.5
	AUTOBRAKE 4	3.6	11.7	19.5	27.4	35.4	43.6	52.4	61.7	71.8
	AUTOBRAKE 3	3.5	11.2	18.5	25.8	33.2	40.8	48.8	57.4	66.8
	AUTOBRAKE 2	3.5	10.6	17.4	24.1	30.9	37.8	45.1	52.9	61.4
	AUTOBRAKE 1	3.1	9.6	15.7	21.6	27.3	33.0	39.1	45.5	52.4

**Four Engine Reverse Thrust**

		REFERENCE BRAKE ENERGY PER BRAKE (MILLIONS OF FOOT POUNDS)								
EVENT		10	20	30	40	50	60	70	80	90
LANDING	RTO MAX MAN	10	20	30	40	50	60	70	80	90
	MAX MAN	2.7	11.2	19.5	27.6	35.7	43.7	51.9	60.1	68.6
	MAX AUTO	1.4	8.9	16.1	23.4	30.7	38.3	46.4	55.0	64.3
	AUTOBRAKE 4	0.0	6.5	12.6	18.7	24.9	31.5	38.8	47.0	56.5
	AUTOBRAKE 3		4.6	9.6	14.4	19.3	24.6	30.6	37.8	46.4
	AUTOBRAKE 2		3.0	7.0	10.6	14.1	18.0	22.5	28.2	35.3
	AUTOBRAKE 1		1.8	4.7	7.2	9.6	12.1	15.2	19.3	24.5

**Cooling Time (Minutes)**

		ADJUSTED BRAKE ENERGY PER BRAKE (MILLION OF FOOT POUNDS)								
		15 & BELOW	16	20	24	28	32	34	35 TO 45	45 & ABOVE
INFLIGHT	NO SPECIAL PROCEDURE		1	3	5	6	8	8	CAUTION	FUSE PLUG MELT ZONE
GROUND	REQUIRED	10	28	42	55	65	70			
BTMS	UP TO 2	2	2	3	4	4	4	4	5 TO 6	7 & ABOVE

Observe maximum quick turnaround limit.

Table shows energy per brake added by a single stop with all brakes operating. Energy is assumed to be equally distributed among the operating brakes. Total energy is the sum of residual energy plus energy added.

Add 1.0 million foot pounds for each taxi mile.

For one brake deactivated, increase brake energy by 7 percent.

For two brakes deactivated, increase brake energy by 15 percent.

When in caution zone, wheel fuse plugs may melt. Delay takeoff and inspect after one hour. If overheat occurs after takeoff, extend gear soon for at least 8 minutes.

When in fuse plug melt zone, clear runway immediately. Unless required, do not set parking brake. Do not attempt to taxi for one hour. Tire, wheel, and brake replacement may be required. If overheat occurs after takeoff, extend gear soon for at least 12 minutes.

Brake temperature monitor system (BTMS) indication on EICAS may be used 10 to 15 minutes after airplane has come to a complete stop, or in flight with gear retracted, to determine recommended cooling schedule.

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corrections for off-reference landing weight, altitude, wind, slope, temperature, approach speed, and the number of operative thrust reversers. Each correction is independently added to the reference landing distance. Landing distance includes the effect of maximum manual braking and reverse thrust.

### Recommended Brake Cooling Schedule

Advisory information is provided to assist in avoiding problems associated with hot brakes. For normal operation, most landings are at weights below the AFM quick turnaround limit weight.

Use of the recommended cooling schedule will help avoid brake overheat and fuse plug problems that could result from repeated landings at short time intervals or a rejected takeoff.

Enter the Recommended Brake Cooling Schedule table with the airplane weight and brakes on speed, adjusted for wind, at the appropriate temperature and altitude condition. Instructions for applying wind adjustments are included below the table. Linear interpolation may be used to obtain intermediate values. The resulting number is the reference brake energy per brake in millions of foot-pounds, and represents the amount of energy absorbed by each brake during a rejected takeoff.

To determine the energy per brake absorbed during landing, enter the table with the reference brake energy per brake and the type of braking used during landing (Max Manual or Max Auto). The resulting number is the adjusted brake energy per brake and represents the energy absorbed in each brake during the landing. The recommended cooling time is found in the final table by entering with the adjusted brake energy per brake. Times are provided for ground cooling and inflight gear down cooling.

Brake Temperature Monitor System (BTMS) indications are also shown. If brake cooling is determined from the BTMS, the hottest brake indication 10 to 15 minutes after the airplane has come to a complete stop, or inflight with gear retracted, may be used to determine recommended cooling schedule by entering at the bottom of the chart. An EICAS advisory message, BRAKE TEMP, will appear when any brake registers 5 on the GEAR synoptic display and disappears as the hottest brake cools to an indication of 4. Note that even without an EICAS advisory message, brake cooling is recommended.