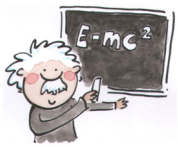
TRAILING EDGE FLAP ASYMMETRY



Ludo's Brief

- **What is a trailing edge flap asymmetry?**
  Condition: an uncommanded roll occurs when a new flap selection is made and/or difference between the left and right flap indication is observed.

- Flap malfunction is most of the time a tricky problem for many B737 pilots. It could cause quickly headache if you go too fast: big chance to go in the wrong direction! Bear in mind, that B737 NG NNC dealing with Flap problems are undoubtedly the longest one presented in the QRH!

  Identification of the problem is the key to entering the correct checklist. Ask yourself the following two questions:

❶ Is the problem concerning Trailing edge or Leading Edge devices?

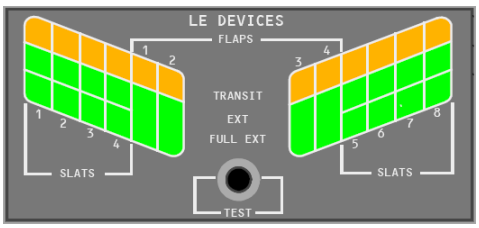
To answer this first question, check Center Forward Panel for any illuminated Leading Edge Flaps Transit amber light.

Leading Edge Flaps Transit (LE FLAPS TRANSIT) Light
Illuminated (amber)
- any LE device in transit
- any LE device not in programmed position with respect to TE flaps
- a LE slat skew condition exists (slats 2 through 7 only)
- during alternate flap extension until LE devices are fully extended and TE flaps reach flaps 10.

Note: Light is inhibited during autoslat operation in flight.

Illuminated (green)
- all LE flaps extended and all LE slats in extended (intermediate) position (TE flap positions 1, 2 and 5)
- all LE devices fully extended (TE flap positions 10 through 40).

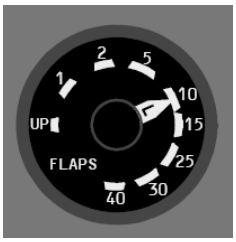
Also check Flaps Gauge (of course!) and Leading Edge Devices Annunciator Panel (Aft Overhead Panel) for any visible anomaly.



Leading Edge Devices Transit (TRANSIT) Lights
Illuminated (amber)
Related LE device in transit.

Leading Edge Devices Extended (EXT) Lights
Illuminated (green)
Related LE slat in extended (intermediate) position.

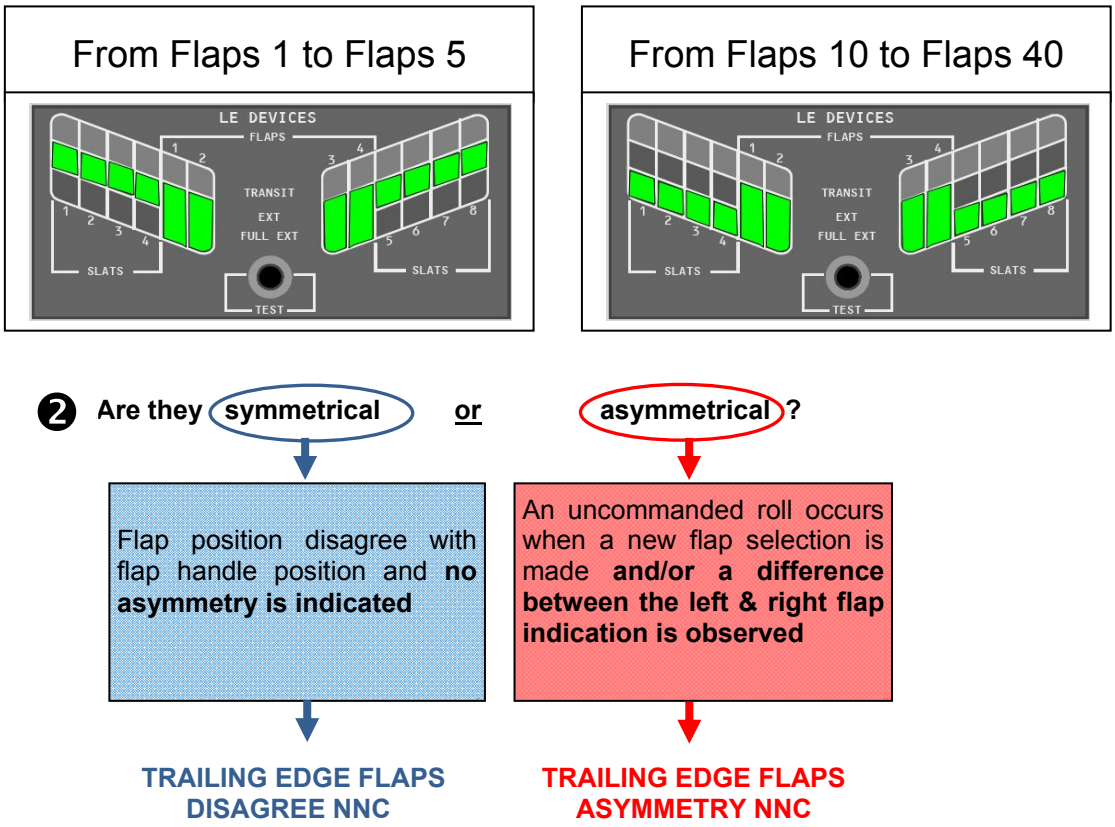
Leading Edge Devices Full Extended (FULL EXT) Lights
Illuminated (green)
Related LE device fully extended.



Flap Position Indicator
- indicates position of left and right TE flaps
- provides TE flaps asymmetry and skew indication
- a comparator will close the bypass valve if the flap position needles become split

[See next page: What is the purpose of the Flap / Slat Electronics Unit (FSEU)?]

Some details to remember:



- The flaps asymmetry can be caused by a mechanical failure in the flaps drive mechanism or a faulty signal in the flaps indicator. If a flaps asymmetry occurs by a mechanical fault, a roll will be indicated on the EADI. This can only be corrected by using aileron trim. The centering mechanism will be displaced and a new control wheel neutral position will be obtained (Grasp the lower part of the stick to fly the aircraft).

- **What is the purpose of the Flap / Slat Electronics Unit (FSEU)?**
  The FSEU monitors the TE flaps for flap asymmetry and flap skew. During an asymmetry the needles on the flap indicator show actual position, in a skew condition one pointer will be 15° apart.

  The FSEU sends analog discrete data to the Stall Management Yaw Damper System (SMYD) for leading edge device asymmetry and uncommanded motion. This data enables the SMYD to bias the stall warnings so that the warnings occur earlier if there is asymmetry or uncommanded motion of these devices. *[The FSEU sends other analog discrete signals to the FDAU for the Digital Flight Data Recorder and also to the PSEU for takeoff warning].*

  The FSEU receives inputs from the TE flap skew sensors and position transmitters to monitor the alignment of the TE flaps. If the TE flaps do not stay in alignment, the FSEU operates the bypass valve. This stops the hydraulic operation of the TE flaps. In the mean time, the FSEU sends an input to the Flaps Position Indication control to set the pointers 15° apart.

What the QRH says...

< TRAILING EDGE FLAP ASYMMETRY >

Condition: An uncommanded roll occurs when a new flap selection is made and/or a difference between the left and right flap indication is observed.

Flaps ..... Set

Move flap lever to the detent nearest the smallest indicated flap position.

CAUTION: Do not attempt to move the trailing edge flaps with the alternate flaps switch as there is no asymmetry protection.

If flaps are 15 or more:

Set VREF for smallest flap position.

If using VREF 15 and any of the following conditions apply, set VREF ICE = VREF 15 + 10.
- engine anti–ice will be used during landing
- wing anti–ice has been used any time during the flight
- icing conditions were encountered during the flight and the landing temperature is below 10° C.

Note: When VREF ICE is needed, the wind additive should not exceed 10 knots.

Note: VREF + wind additive, or VREF ICE + wind additive if needed, must not exceed the flap placard speed for the next larger flap setting.

Continue checklist at DEFERRED ITEMS, DESCENT.

If flaps are 1 or greater and less than 15:

Set VREF 40 + 30 knots.

Check the appropriate Non–Normal Configuration Landing Distance table in the ADVISORY INFORMATION section of the Performance–Inflight chapter.

Continue checklist at DEFERRED ITEMS, DESCENT.

If flaps are less than 1:

Accomplish the TRAILING EDGE FLAPS UP LANDING checklist.

Note: Do not use FMC fuel predictions with flaps extended.

---------- DEFERRED ITEMS ----------

==> DESCENT

Recall ..... Checked

AUTO BRAKE ..... ___

Approach aids ..... Checked & set

Approach brief & fuel ..... Discussed

GROUND PROXIMITY FLAP INHIBIT switch ..... FLAP INHIBIT

Landing data ..... VREF ___, Minimums ___

Approach briefing ..... Completed

---------- DEFERRED ITEMS ----------

==> APPROACH

Altimeters ..... ___

---------- DEFERRED ITEMS ----------

==> LANDING

ENGINE START switches ..... CONT

SPEED BRAKE ..... ARMED

Landing gear ..... DOWN

AUTO BRAKE ..... ___ Set

Flaps ..... ____, Green/amber light

[The light may be green or amber depending on the cause of the failure.]

1

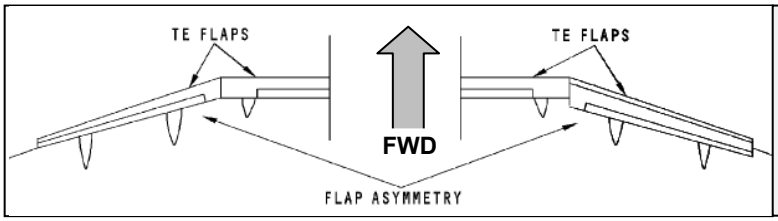
2

3

Three possibilities

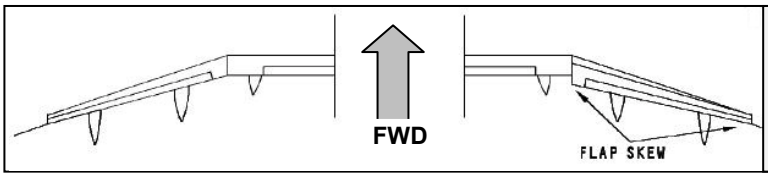
- Always check Flap Position Indicator circuit breaker.

- Think slowly and twice to the problem



Condition for flap asymmetry:

if a flap on one wing does not align with the symmetrical flap on the other wing.



Condition for flap skew:

If the inboard end of a flap does not align with the outboard end.

- **Trailing Edge Flap Asymmetry – Landing [FCTM]**
  - If a trailing edge flap up asymmetry occurs, full maneuvering capability exists even if the asymmetry occurred at flaps just out of the full up position.
  - Burn off fuel to reduce landing weight and lower approach speed.
  - Fly accurate airspeeds in the landing pattern. At lesser flap settings, excess airspeed is difficult to dissipate, especially when descending on final approach.
  - Pitch attitude and rate of descent on final is higher than for a normal landing: thrust should be retarded late in the flare to avoid excessive sink rate.
  - During flare, airspeed does not bleed off as rapidly as normal.
  - Fly the airplane onto the runway at the recommended touchdown point.
  - Flare only enough to achieve an acceptable reduction in the rate of descent.
  - Floating just above the runway surface to deplete additional speed wastes available runway and increases the possibility of a tail strike.

    Note: If the gear is retracted during a go-around and flap position is greater than 25, a landing gear configuration warning occurs.

- Consider CAT 1 landing only.

- Avoid Wet/Contaminated runways and crosswind if possible

- In case of go-around, respect placard speed limits for highest flap setting. Go-around with actual flap setting. Remember you will have to add an extra 10% to your fuel burn with the LE devices in Full Extend: do not rely on your FMC calculations!

- Check landing distances [QRH Performance Inflight Advisory Information].

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JAA/JAROPS
Category C Brakes

BOEING 737 Flight Crew Operations Manual

Performance Inflight Advisory Information

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance
Dry Runway

		LANDING DISTANCE AND ADJUSTMENT (M)							
		REFERENCE DISTANCE FOR 60000 KG LANDING WEIGHT	WT ADJ PER 5000 KG ABOVE/ BELOW 60000 KG	ALT ADJ PER 1000 FT STD/HIGH*	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		APPROACH SPEED
LANDING CONFIGURATION	VREF				HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	PER 10 KTS ABOVE VREF
TRAILING EDGE FLAP ASYMMETRY (30 ≤ FLAPS < 40)	VREF30	900	60/-50	20/25	-35	110	10	-10	65
TRAILING EDGE FLAP ASYMMETRY (15 ≤ FLAPS < 30)	VREF15	945	70/-55	20/25	-35	120	10	-10	65
TRAILING EDGE FLAP ASYMMETRY (1 ≤ FLAPS < 15)	VREF40+30	1050	85/-60	25/30	-35	130	10	-10	70
TRAILING EDGE FLAP DISAGREE (30 ≤ FLAPS < 40)	VREF30	900	60/-50	20/25	-35	110	10	-10	65
TRAILING EDGE FLAP DISAGREE (15 ≤ FLAPS < 30)	VREF15	945	70/-55	20/25	-35	120	10	-10	65
TRAILING EDGE FLAP DISAGREE (FLAPS < 15)	VREF15	945	70/-55	20/25	-35	120	10	-10	65
TRAILING EDGE FLAPS UP	VREF40+40	1110	110/-65	30/30	-40	165	15	-10	70

Reference distance assumes sea level, standard day, with no wind or slope.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above runway threshold (305 m of air distance).
Assumes maximum manual braking and maximum reverse thrust when available on operating engine(s).
Altitude adjustment for STD altitudes valid up to 8000 ft pressure altitude.
Altitude adjustment for HIGH altitudes valid for altitudes above 8000 ft up to 14000 ft.

*For landing distance above 8000 ft pressure altitude, first apply the STD altitude adjustment to derive new reference landing distance for 8000 ft, then apply applicable HIGH altitude adjustment between 8000 ft and 14000 ft to this new reference distance.

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ADVISORY INFORMATION

Non-Normal Configuration Landing Distance
Good Reported Braking Action

		LANDING DISTANCE AND ADJUSTMENT (M)							
		REFERENCE DISTANCE FOR 60000 KG LANDING WEIGHT	WT ADJ PER 5000 KG ABOVE/ BELOW 60000 KG	ALT ADJ PER 1000 FT STD/HIGH*	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		APPROACH SPEED
LANDING CONFIGURATION	VREF				HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	PER 10 KTS ABOVE VREF
TRAILING EDGE FLAP ASYMMETRY (30 ≤ FLAPS < 40)	VREF30	1250	80/-75	30/40	-55	195	30	-25	95
TRAILING EDGE FLAP ASYMMETRY (15 ≤ FLAPS < 30)	VREF15	1295	80/-80	35/45	-55	200	30	-25	90
TRAILING EDGE FLAP ASYMMETRY (1 ≤ FLAPS < 15)	VREF40+30	1435	80/-85	40/50	-60	210	30	-25	90
TRAILING EDGE FLAP DISAGREE (30 ≤ FLAPS < 40)	VREF30	1250	80/-75	30/40	-55	195	30	-25	95
TRAILING EDGE FLAP DISAGREE (15 ≤ FLAPS < 30)	VREF15	1295	80/-80	35/45	-55	200	30	-25	90
TRAILING EDGE FLAP DISAGREE (FLAPS < 15)	VREF15	1295	80/-80	35/45	-55	200	30	-25	90
TRAILING EDGE FLAPS UP	VREF40+40	1510	80/-85	40/55	-60	215	30	-30	85

Reference distance assumes sea level, standard day, with no wind or slope.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above runway threshold (305 m of air distance).
Assumes maximum manual braking and maximum reverse thrust when available on operating engine(s).
Altitude adjustment for STD altitudes valid up to 8000 ft pressure altitude.
Altitude adjustment for HIGH altitudes valid for altitudes above 8000 ft up to 14000 ft.

*For landing distance above 8000 ft pressure altitude, first apply the STD altitude adjustment to derive new reference landing distance for 8000 ft, then apply applicable HIGH altitude adjustment between 8000 ft and 14000 ft to this new reference distance.

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Performance Inflight Advisory Information

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance
Medium Reported Braking Action

		LANDING DISTANCE AND ADJUSTMENT (M)							
		REFERENCE DISTANCE FOR 60000 KG LANDING WEIGHT	WT ADJ PER 5000 KG ABOVE/ BELOW 60000 KG	ALT ADJ PER 1000 FT STD/HIGH*	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		APPROACH SPEED
LANDING CONFIGURATION	VREF				HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	PER 10 KTS ABOVE VREF
TRAILING EDGE FLAP ASYMMETRY (30 ≤ FLAPS < 40)	VREF30	1695	120/-120	50/65	-90	320	75	-60	120
TRAILING EDGE FLAP ASYMMETRY (15 ≤ FLAPS < 30)	VREF15	1770	125/-125	50/75	-90	330	70	-60	120
TRAILING EDGE FLAP ASYMMETRY (1 ≤ FLAPS < 15)	VREF40+30	1985	130/-135	60/80	-95	350	80	-65	120
TRAILING EDGE FLAP DISAGREE (30 ≤ FLAPS < 40)	VREF30	1695	120/-120	50/65	-90	320	75	-60	120
TRAILING EDGE FLAP DISAGREE (15 ≤ FLAPS < 30)	VREF15	1770	125/-125	50/75	-90	330	70	-60	120
TRAILING EDGE FLAP DISAGREE (FLAPS < 15)	VREF15	1770	125/-125	50/75	-90	330	70	-60	120
TRAILING EDGE FLAPS UP	VREF40+40	2110	135/-140	65/85	-100	360	80	-70	115

Reference distance assumes sea level, standard day, with no wind or slope.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above runway threshold (305 m of air distance).
Assumes maximum manual braking and maximum reverse thrust when available on operating engine(s).
Altitude adjustment for STD altitudes valid up to 8000 ft pressure altitude.
Altitude adjustment for HIGH altitudes valid for altitudes above 8000 ft up to 14000 ft.

*For landing distance above 8000 ft pressure altitude, first apply the STD altitude adjustment to derive new reference landing distance for 8000 ft, then apply applicable HIGH altitude adjustment between 8000 ft and 14000 ft to this new reference distance.

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ADVISORY INFORMATION

Non-Normal Configuration Landing Distance
Poor Reported Braking Action

		LANDING DISTANCE AND ADJUSTMENT (M)							
		REFERENCE DISTANCE FOR 60000 KG LANDING WEIGHT	WT ADJ PER 5000 KG ABOVE/ BELOW 60000 KG	ALT ADJ PER 1000 FT STD/HIGH*	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		APPROACH SPEED
LANDING CONFIGURATION	VREF				HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	PER 10 KTS ABOVE VREF
TRAILING EDGE FLAP ASYMMETRY (30 ≤ FLAPS < 40)	VREF30	2195	175/-165	70/95	-130	505	180	-115	140
TRAILING EDGE FLAP ASYMMETRY (15 ≤ FLAPS < 30)	VREF15	2295	180/-175	75/105	-135	525	160	-120	140
TRAILING EDGE FLAP ASYMMETRY (1 ≤ FLAPS < 15)	VREF40+30	2595	190/-190	85/120	-140	555	175	-130	145
TRAILING EDGE FLAP DISAGREE (30 ≤ FLAPS < 40)	VREF30	2195	175/-165	70/95	-130	505	180	-115	140
TRAILING EDGE FLAP DISAGREE (15 ≤ FLAPS < 30)	VREF15	2295	180/-175	75/105	-135	525	160	-120	140
TRAILING EDGE FLAP DISAGREE (FLAPS < 15)	VREF15	2295	180/-175	75/105	-135	525	160	-120	140
TRAILING EDGE FLAPS UP	VREF40+40	2780	200/-200	95/130	-145	565	185	-140	145

Reference distance assumes sea level, standard day, with no wind or slope.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above runway threshold (305 m of air distance).
Assumes maximum manual braking and maximum reverse thrust when available on operating engine(s).
Altitude adjustment for STD altitudes valid up to 8000 ft pressure altitude.
Altitude adjustment for HIGH altitudes valid for altitudes above 8000 ft up to 14000 ft.

*For landing distance above 8000 ft pressure altitude, first apply the STD altitude adjustment to derive new reference landing distance for 8000 ft, then apply applicable HIGH altitude adjustment between 8000 ft and 14000 ft to this new reference distance.

- **Trailing Edge Flap Asymmetry – Landing [FCTM]**
  - Do not allow the airplane to float.
  - Do not risk touchdown beyond the normal touchdown zone in an effort to achieve a smooth landing.

- Do not plan an overweight landing.

- Do not forget the PAN-PAN message to the ATC.

- Do not forget that the combination of a go-around with Flaps 25 to 40 or Flaps 15 with Thrust Levers Angle (TLA) < 30° and a gear retraction will activate the Landing Gear Configuration Warning Horn.
  To silence the horn, extend the gear when the go-around segment is completed.