

# Safety Investigation Report

Ref. AAIU-2015-11  
Issue date: 27 April 2016  
Status: Final

## SYNOPSIS

<b>Classification:</b>	Serious incident
<b>Level of investigation:</b>	Standard
<b>Date and time:</b>	31 July 2015 – 11:30 UTC
<b>Aircraft:</b>	Boeing B737-4Q8, msn 27628
<b>Operator:</b>	Tailwind Airlines
<b>Date of Manufacture:</b>	February 1997
<b>Type of engine:</b>	Two CFM-56-3
<b>Accident location:</b>	At the moment of the incident: Above St Georges sur Meuse, on approach to EBLG airport.
<b>Type of flight:</b>	Commercial
<b>Phase:</b>	Landing
<b>Injuries:</b>	None

## Abstract

An aircraft part was found in a privately owned garden located near to the airport of Liege, Belgium (EBLG).

The part fell down from a B737 airplane, on approach to EBLG.

## Occurrence type:

Other – Things Falling-Off Aircraft (TFOA)

## Cause:

The in-flight and undesired detachment of the LH inboard flap/inboard seal plate was due to the failure of the attachment bolts of the pno 67279-7 plate adaptor. This was caused by the use of NAS 517 bolts instead of the Boeing-prescribed BACB30NN5K23.

## FACTUAL INFORMATION

### Description of the event

A person living on the Boulevards des Combattants in Saint-Georges sur Meuse was walking in his garden when he noticed the presence of an object, thought to be an aircraft part. The discovery was made around 16.00 LT on the 31<sup>st</sup> July 2015.

The Boulevard des Combattants is located in the extension of runway 05R of EBLG airport.

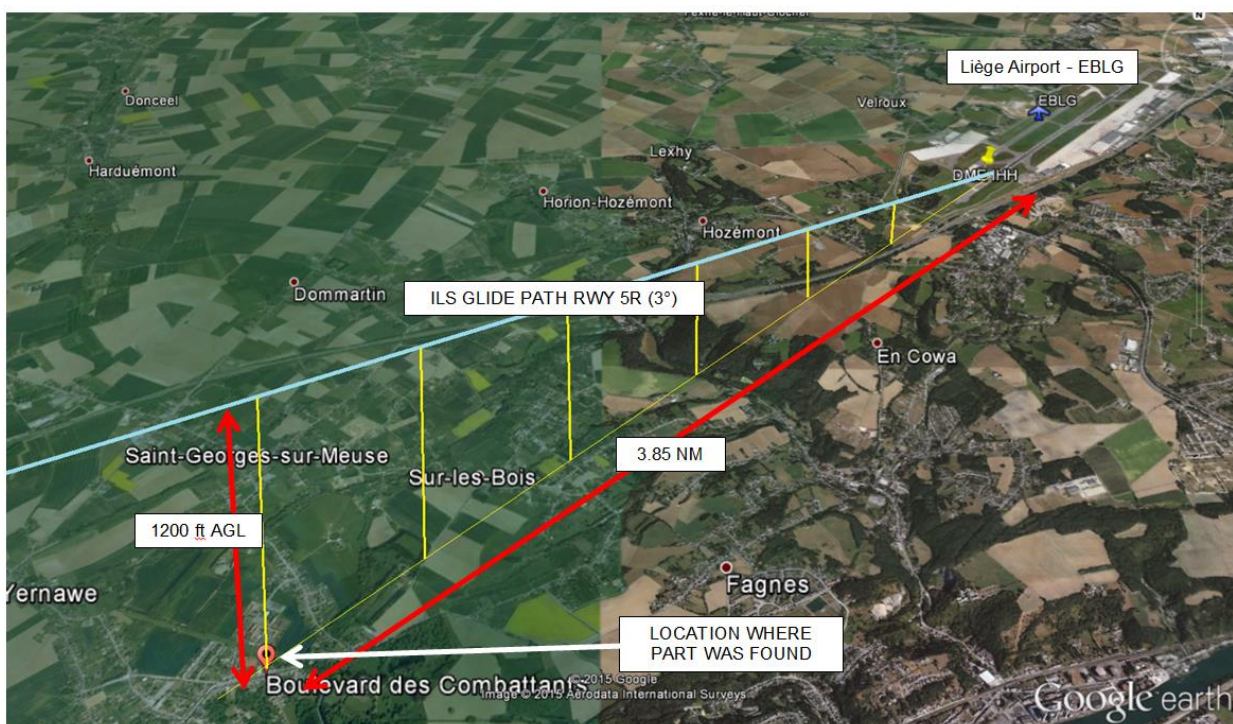


Figure 1: A scheme of the ILS approach glide path of runway 05R showing the location where the part was found

The person notified the police, that contacted the airport inspection services.

The airport inspection services determined, with the help of aircraft mechanics, that the part was indeed an aircraft part and most probably a B737 inboard flap/inboard seal plate. The airport inspection services reported the event to BCAA and AAIU(be) and included a list of the aircraft present at EBLG airport at the time of the event. Most airplanes on the list were checked, but all showed their inboard flap present, with inboard seal plate correctly attached.

Two Tailwind Airlines B737 were also in EBLG during the afore mentioned time span the incident was presumed to have happened, but had left EBLG again before the check was initiated.

Later that day, Brussels ATC reports problems with the wind direction, and this report indicates that during a preflight check a “fitting of flaps” was found missing on a Tailwind Airlines B737.

Related or not: 40 minutes after, landing TWI473 Pilot in command calling TWR (0475 775 839) to tell that, after inspection of the they saw it was damaged. A fitting of flaps was missing. Thorough RWY inspection 25R was required. A sudden RWY change ha place.





DEFERRED DEFECT	DEFECT DESCRIPTION	REASON FOR DEFERRAL	STAMP (OR APPR NO)	SIGN
4 APRIL 8 ITEM NO. E6734/2 DATE 01082015 STA BAU	LH INBOARD MIDFLAP SEAL PLATE MISSING.	PARTS ORDERED.		

Figure 2

After coordination with AAIU(be), a team of BCAA inspectors headed to Brussels Airport, and found confirmation that an airplane of Tailwind Airlines (msn 27628) was missing that part since 1/8/2015.

Records show that the airplane landed in EBLG on 31/7/2015 at 11:35UT, and took off from EBLG to LTFE at 13.20UT.

The recovered airplane part, was sent to the AAIU(Be) office for further investigation.

**Findings**

The part recovered is physically very similar to a B737 inboard flap inboard seal plate PNo 65C10543 – although no part number is visible. The part dimension are 79 cm x 40 cm.

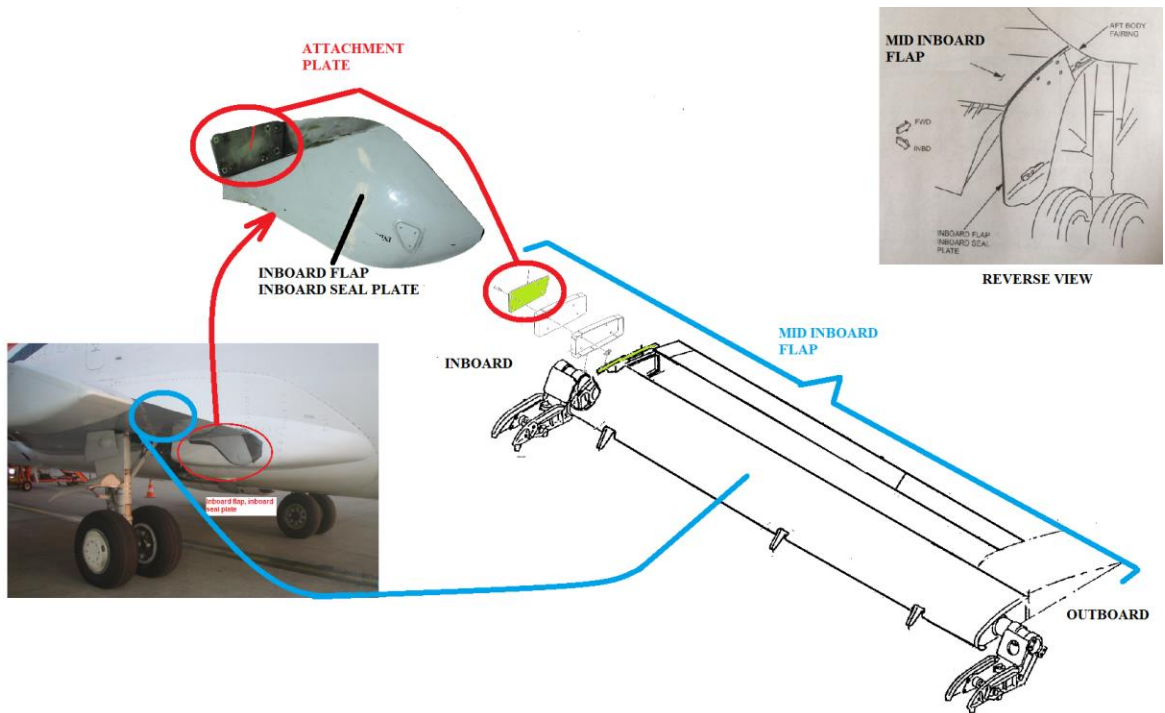


Figure 3

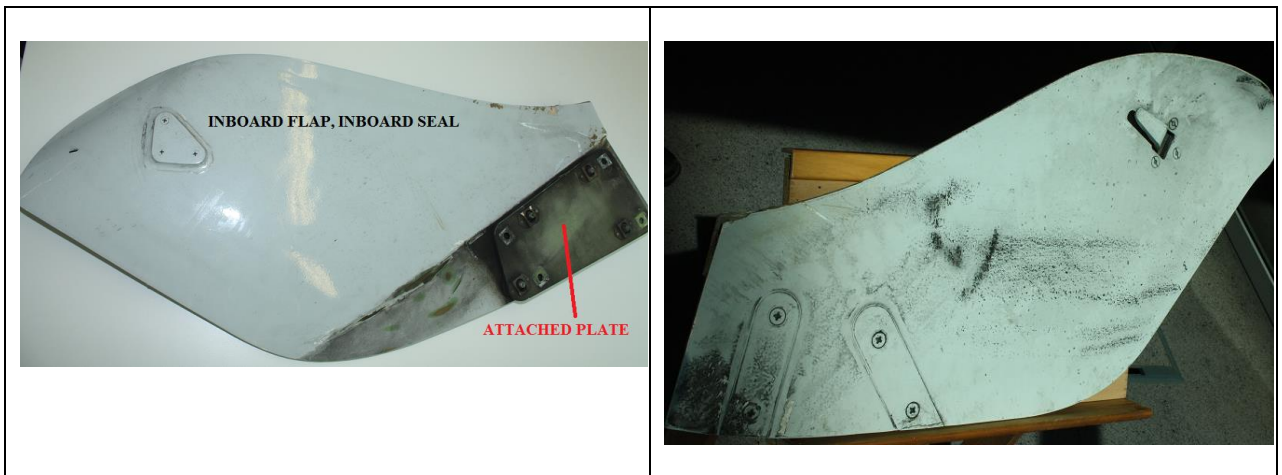


Figure 4

A plate is attached on one of the sides. After cleaning, a part number became visible – pn 69-67279-7. This part number matches the B737 Illustrated Parts Catalogue Chapter 27-51-04-02 fig 2, confirming the assembly is originating from a B737 aircraft.

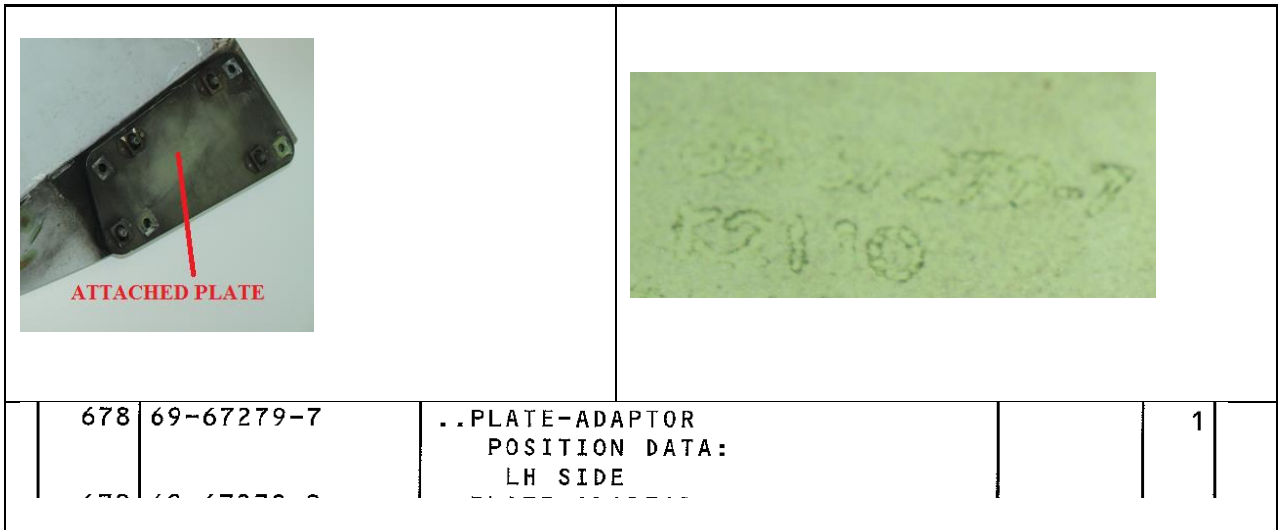


Figure 5

The fasteners are missing, although the remains of one is still lodged between the plate and the main body.

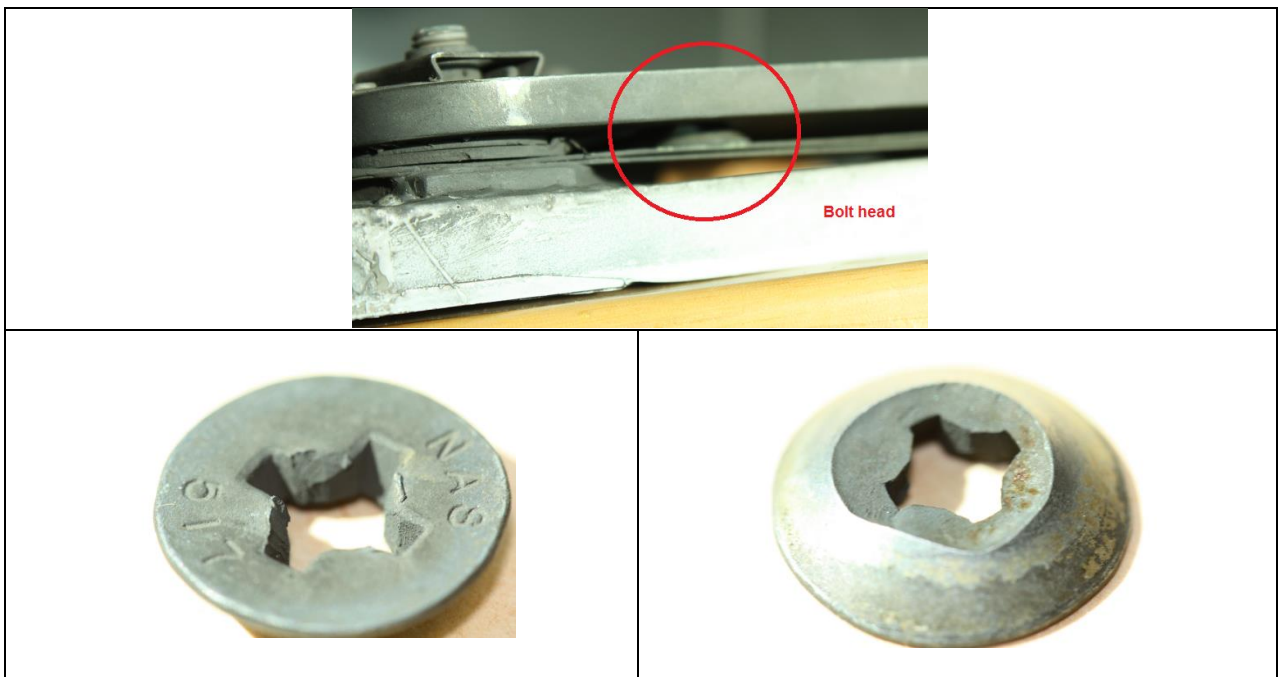


Figure 6

The bolt bears the identification of a NAS 517 bolt, is severed at the head, and shows some discoloration.

AMM 27-51-04-02 Fig 02 indicates that another type of bolt should be used.

680A	BACB30NN5K23	..BOLT	4
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## The airplane

The Boeing 737 is a short- to medium-range twin-engine narrow-body jet airliner. Originally developed as a shorter, lower-cost twin-engine airliner, compared to the Boeing's 707 and 727 models the 737 was derived from, the 737 has developed into a family of nine passenger models with a capacity of 85 to 215 passengers.

Originally envisioned in 1964, the initial 737-100 flew in 1967 and entered airline service in February 1968. Next the lengthened 737-200 entered service in April 1968. In the 1980s Boeing launched the -300, -400, and -500 models, subsequently referred to as the Boeing 737 Classic series. The 737 "Classic" came with additional capacity and incorporated CFM56 turbofan engines along with wing improvements.

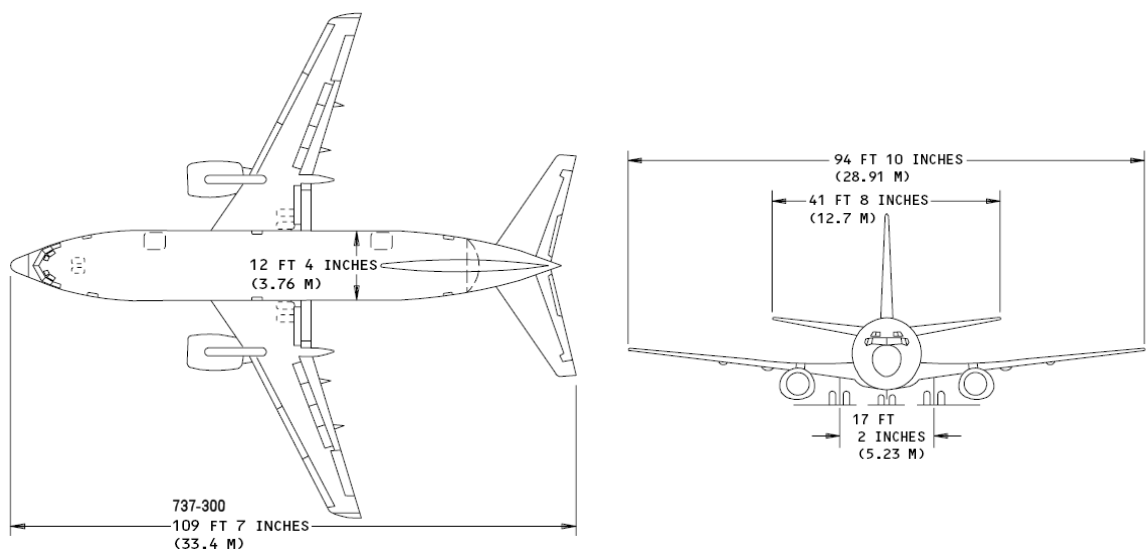


Figure 7

The 737 Dispatch Deviations Guide indicates (chapter 57-53-03) that the airplane may be flown with one or both inboard flap/inboard seal plates missing with reduced Performance limited weights (147kg in take-off and landings) and 204kg (en-route and climb).

### History of dislodged airplane parts falling from the skies

Boeing was notified of various similar events (loss of the inboard flap, inboard seal plate) in the past; there were a total of 10 events notified for the entire B737 fleet from 1993 to the present (B737 Classic: 1988 aircraft delivered).

The loss of aircraft parts in flight are rare events, but do occur from time to time; as examples:

On August 11, 2006, a cabin door fell off from a Fokker 100 from Sao Paulo to Rio de Janeiro. Nobody was injured.

A landing gear panel, weighing 60kg, of a Boeing B777 flight from Shanghai to Paris fell off after takeoff. Nobody was injured.

An Avro RJ85 wing leading edge panel separated in flight during climb out of Marseilles airport on 11 February 2011.

Several cases have been reported in which the potable water service panel access door of Airbus A330 aircraft was lost in flight.

### The company: Tailwind Airlines

Tailwind Hava yolları (Tailwind Airlines) is based in Istanbul, Turkey.

As of June 2015, Tailwind Airlines operates a fleet of 7 aircraft, including 5 B737-400.

Aircraft	msn	Delivery date	Manuf. Year	Previous operator
B737-4Q8	25107	20/2/2009	1993	Alaska airlines
B737-4Q8	25108	3/6/2009	1993	Alaska airlines
B737-4Q8	25112	1/8/2009	1994	Alaska airlines
B737-4Q8	27628	11/6/2010	1997	Alaska airlines
B737-4Q8	28199	7/2/2010	1996	Alaska airlines

### Inspection on aircraft

On msn 27628:

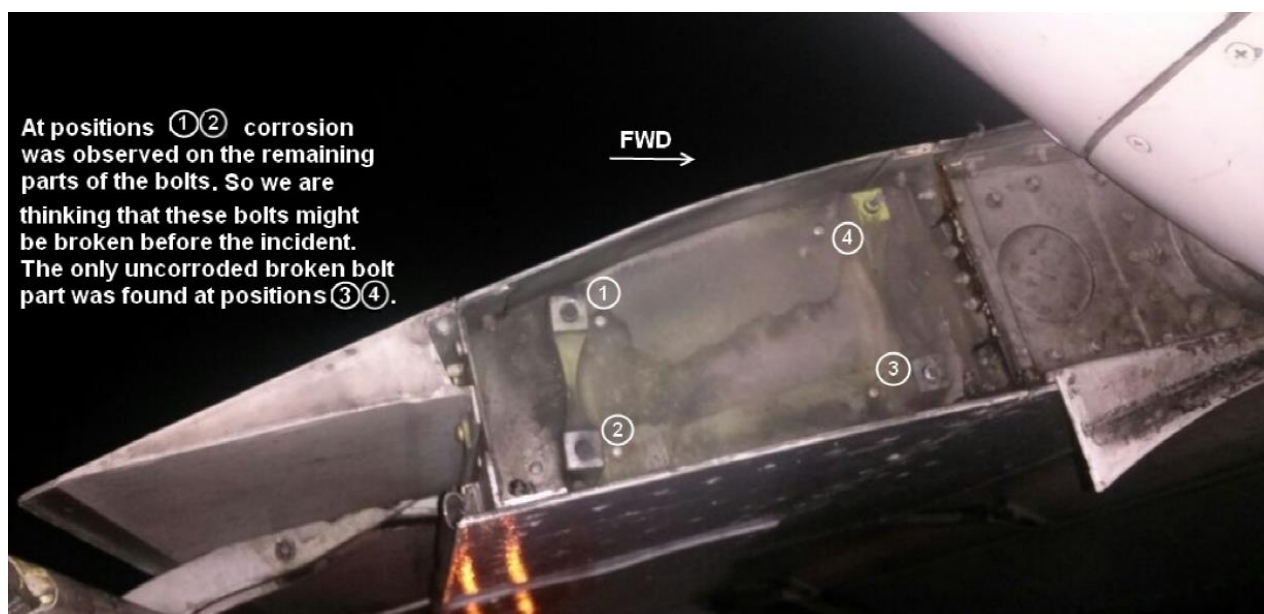


Figure 8

- All 4 fasteners holding the plate-adaptor were found broken at the base of the bolt head. Two of them were found corroded (dark aspect); two others were found not corroded (shiny appearance).
- The RH mid flap seal plate (in position) was found to be fastened with the correct bolts.

Tailwind Airlines performed a search of the maintenance records of the aircraft and found the following:

- The LH mid flap seal plate was never removed while the airplane was operated by Tailwind Airlines (from June 2010 to the present).
- The LH mid flap seal plate was removed for maintenance by the previous operator and maintenance organisations at various occasions in the past.
  - On 28/2/2009: the seal plate was removed, repaired and reinstalled.
  - On 30/8/2006: the seal plate was found to be not properly attached. It was removed, repaired and reinstalled.
  - On 16/4/2004: the seal plate was removed, repaired and reinstalled.
- There are no maintenance records indicating that any work has been performed on the subject parts during the period msn 27628 was operated by Tailwind airlines, nor on any of the other 4 B737-400 operated by Tailwind airlines.

Actions performed on the other aircraft:

msn 25107: Two fasteners were discovered that bore a part number, different from the one prescribed (BACB30LU5) for each side.

msn 25108: on the LH side, the part numbers of the bolts could not be determined (the original bolts were replaced); On the RH side, the fasteners bore the correct part number.

msn 25112: All fasteners were found in conformity to the IPC specifications

msn 28199: All fasteners were found in conformity to the IPC specifications

The previous operator, Alaska Airlines was contacted with the help of the US NTSB, and asked whether they had knowledge of the use of bolts different to the ones prescribed by the manufacturer for the fastening of the seal plate. They answered:

“The Maintenance and Engineering team found no evidence that we currently have this hardware (note: NAS517 bolts) on our fleet. Additionally, they found no evidence that we previously had this hardware on our fleet or specifically on this aircraft.”



## ANALYSIS

Boeing engineering stated that there was no documentation generated by Boeing supporting the use of NAS517 bolts instead of BACB30NN5K23 bolts.

Boeing have also reviewed the in-service communications and did not find any correspondence where Boeing allowed the use of NAS517 bolts instead of BACB30NN5K23 bolts in this installation.

Boeing has compared the NAS517 and BACB30NN5K23 bolts if used for the assembly of the 737 flap plate installation.

- These bolts are comparable in strength (160KSI-180KSI) and are similar in size.
- Boeing does not recommend using NAS517\* instead of BACB30NN\* bolts for exterior surface installations.
- BACB30NN\* is a titanium aluminum pigment coated fastener.
- NAS517 fastener is a Cadmium-plated alloy steel fastener. The Cadmium plating is a sacrificial coating (A corrosion prevention method in which a metal coating is subjected to preferential corrosion as a means of protecting the substrate metal).
- There is a potential for losing the Cadmium plating, which could result in corrosion and ultimately reducing bolt strength
- The specified torque for the BACB30NN5K23 bolts in the 737 Flap plate installation is 150 in/lbs
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The close examination of the remaining bolt head shows the presence of corrosion and fatigue beach marks.

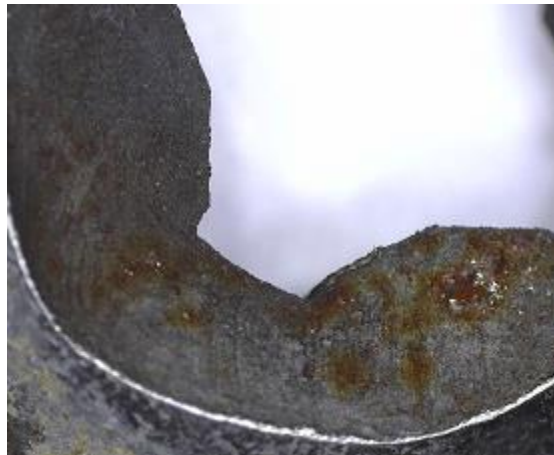


Figure 9

The maintenance program does not require a systematic removal of the plate adaptor pn 67279-7, and of the inboard flap, inboard seal plate. Therefore, these parts may remain installed for a very long period. Since the fasteners attaching the plate adaptor are hidden under the inboard flap, inboard seal plate, their deterioration can escape detection.

## CONCLUSIONS

### Cause of the accident

The in-flight and undesired detachment of the LH inboard flap/inboard seal plate was due to the failure of the attachment bolts of the pno 67279-7 plate adaptor. This was caused by the use of NAS 517 bolts instead of the Boeing-prescribed BACB30NN5K23.

## SAFETY ACTIONS AND RECOMMENDATIONS

### Safety message<sup>1</sup>

AAIU(Be) advises the Belgian Part-147 Maintenance Training Organisations to use the content of this report to highlight the importance of following the IPC prescriptions when selecting fasteners.

### About this report

*As per Annex 13 and EU regulation EU 996/2010, each safety investigation shall be concluded with a report in a form appropriate to the type and seriousness of the accident and serious incident. For this occurrence, a limited-scope, fact-gathering investigation and analysis was conducted in order to produce a short summary report.*

*It is not the purpose of the Air Accident Investigation Unit to apportion blame or liability. The sole objective of the investigation and the reports produced is the determination of the causes, and, where appropriate define recommendations in order to prevent future accidents and incidents.*

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<sup>1</sup> **Safety message:** An awareness which brings under attention the existence of a safety factor and the lessons learned. AAIU(Be) can disseminate a safety message to a community (of pilots, instructors, examiners, ATC officers), an organization or an industry sector for it to consider a safety factor and take action where it believes it appropriate. There is no requirement for a formal response to a safety message, although AAIU(Be) will publish any response it receives.