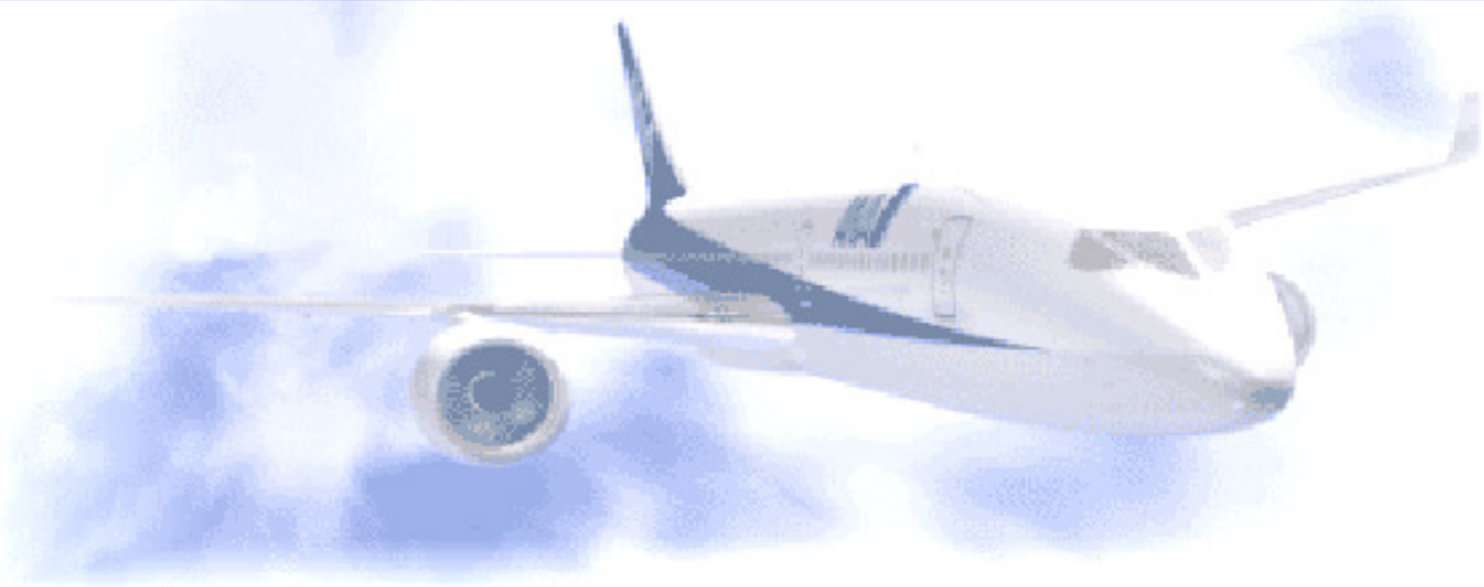
ANA | A STAR ALLIANCE MEMBER

Field Experience – Lightning Strike Damage of ANA B767

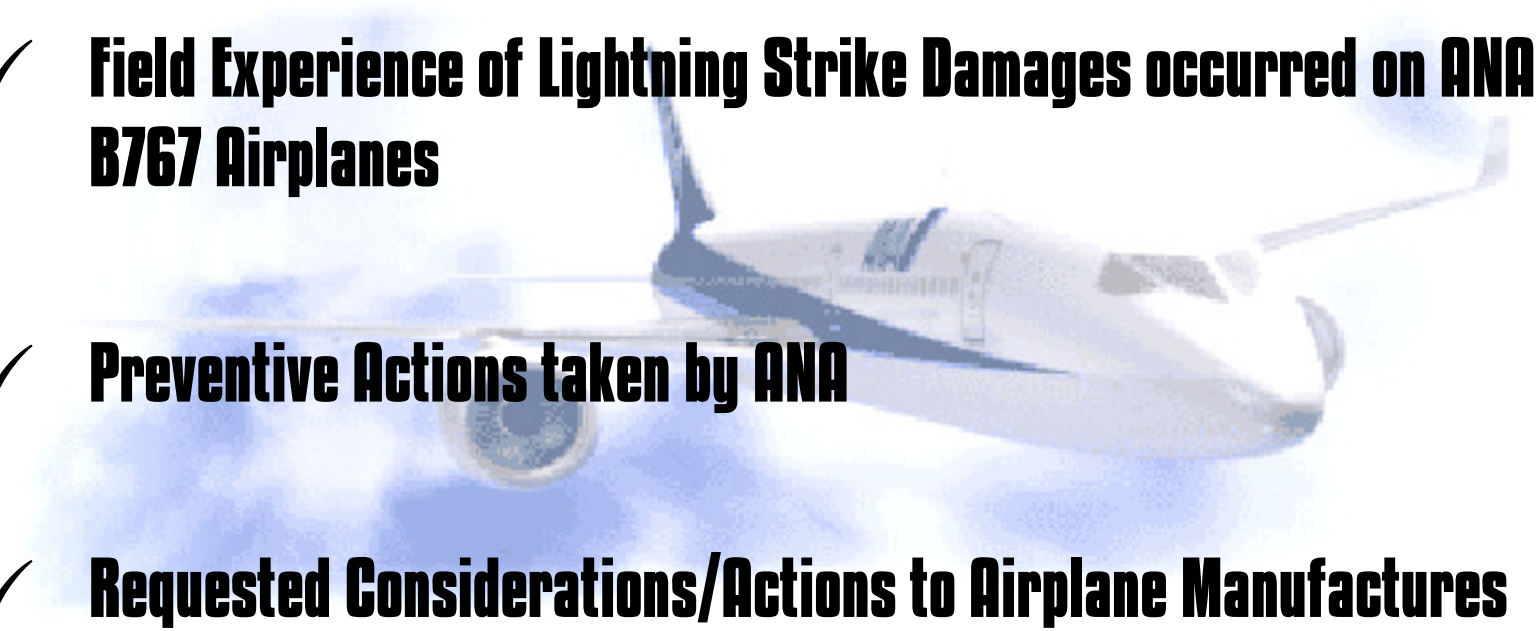


June 4, 2009

Nobuyuki Nakayama

ANA

Contents :



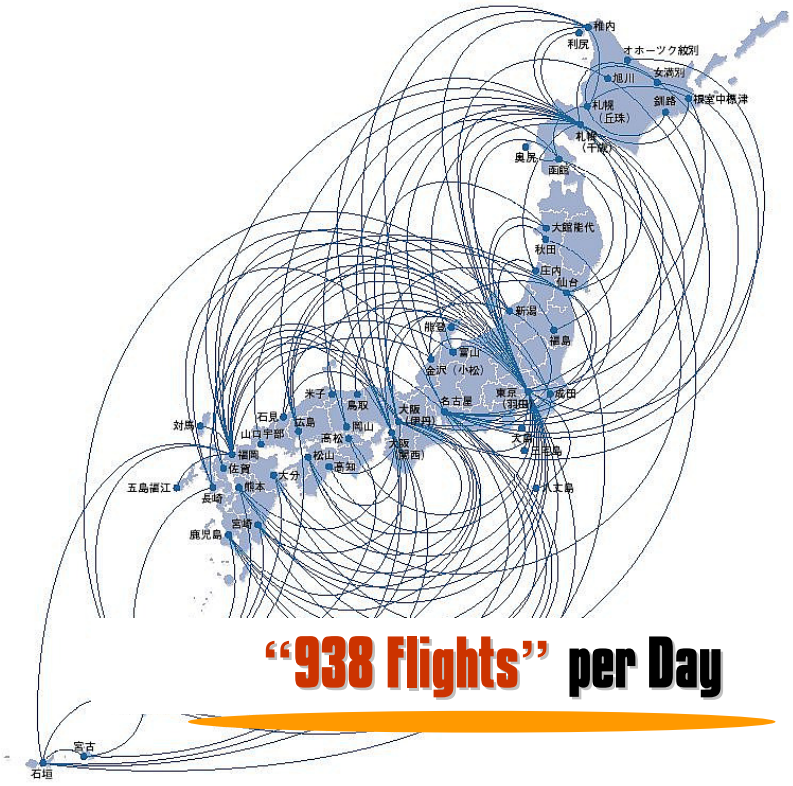
- ✓ Field Experience of Lightning Strike Damages occurred on ANA B767 Airplanes
- ✓ Preventive Actions taken by ANA
- ✓ Requested Considerations/Actions to Airplane Manufactures

ANA Overview

➢Domestic Operation□
50 cities/130 Routes

➢International Operation□
24cities/36 Routes

Number of Airplanes: 214 Airplanes



“938 Flights” per Day

“596 Flights” per Week

Lightning Strike Data:

Period- from 01/01/2005 to 12/31/2006 (2 years)

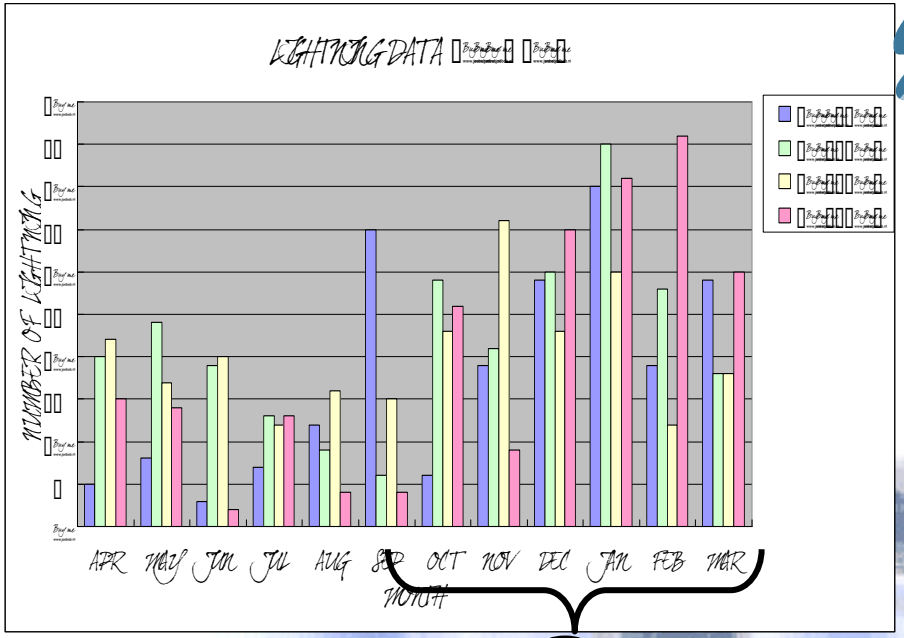
Fleet- ANA's all 767 (56 airplanes)

Damage: Lightning Strike

Resource: ANA's maintenance control system (SAP)

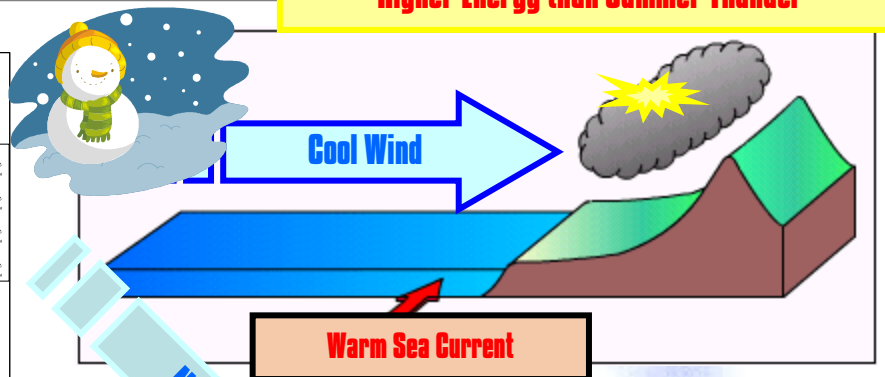
Results:

✓ **Total 333 Lightning damages reported**



Majority of Lightning Strike occurs in Winter Season in this region

Higher Energy than Summer Thunder



Northern Cool Wind

Lightning Prone Region

JAPAN SEA

Warm Sea Current

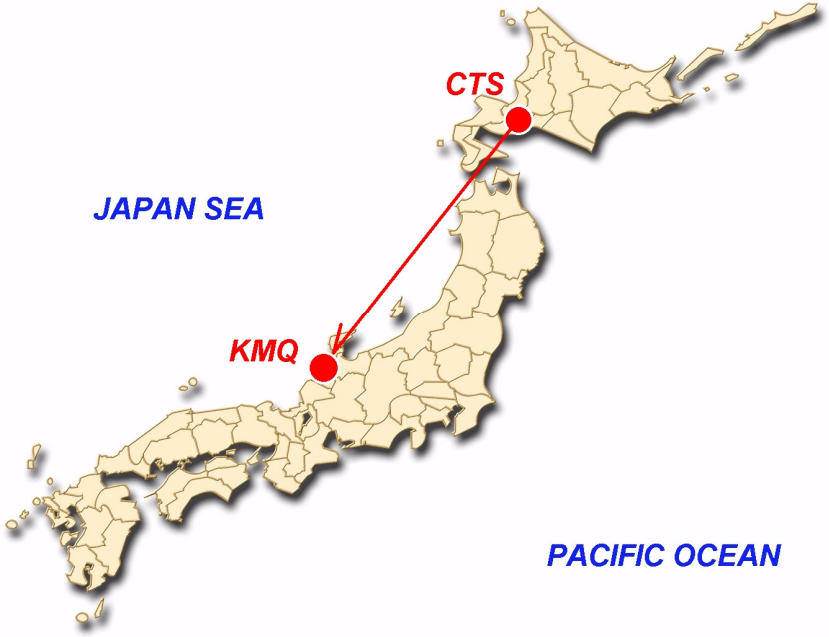
PACIFIC OCEAN

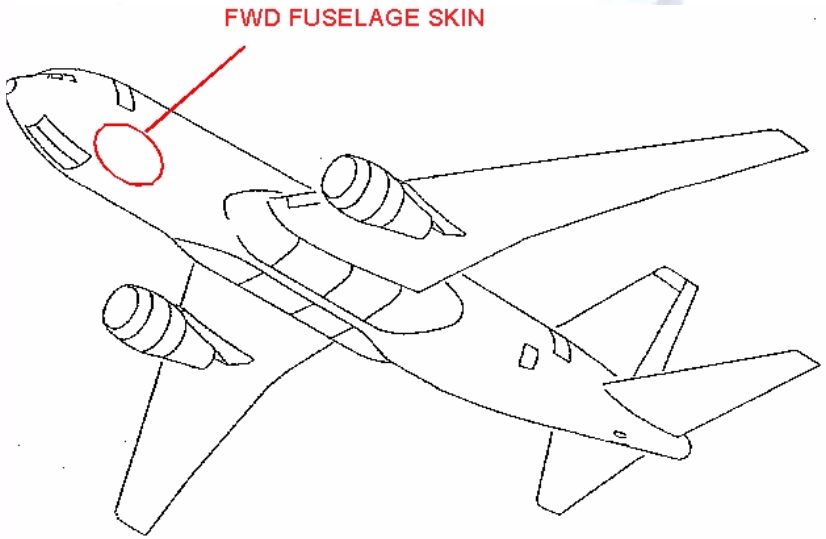
3 Major Regions – Winter Thunder:

- West Coast of Norway
- Great Lakes
- Japan Sea Coast

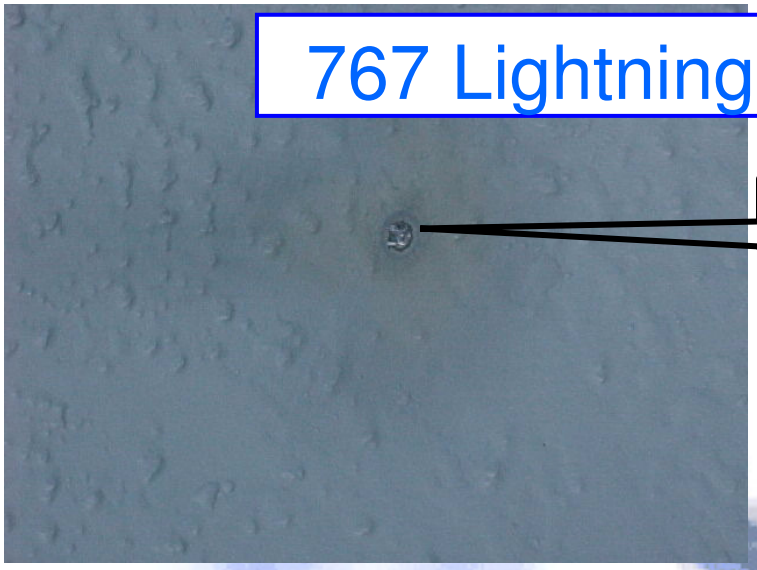
767 Lightning Strike Experience

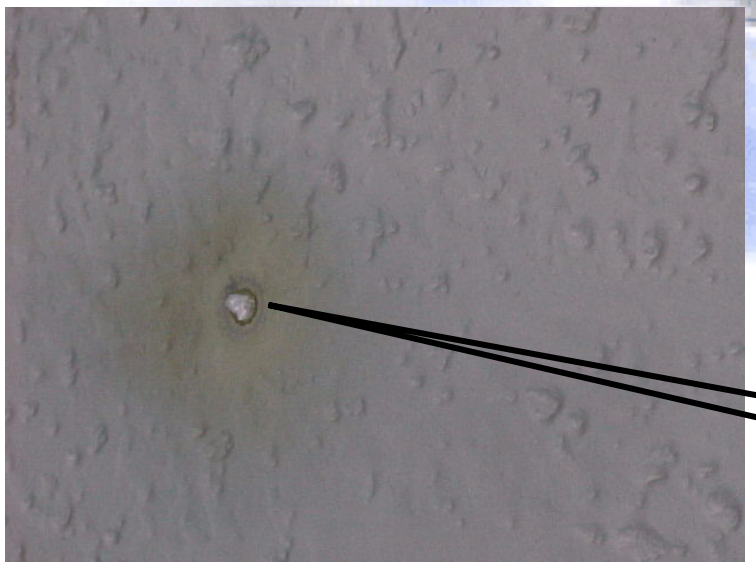
NO.	A/C TYPE	DATE	DEPARTURE	DESTINATION	PHASE	REMARKS
[redacted]	B[redacted]	[redacted]	CTS	KMQ	APP	

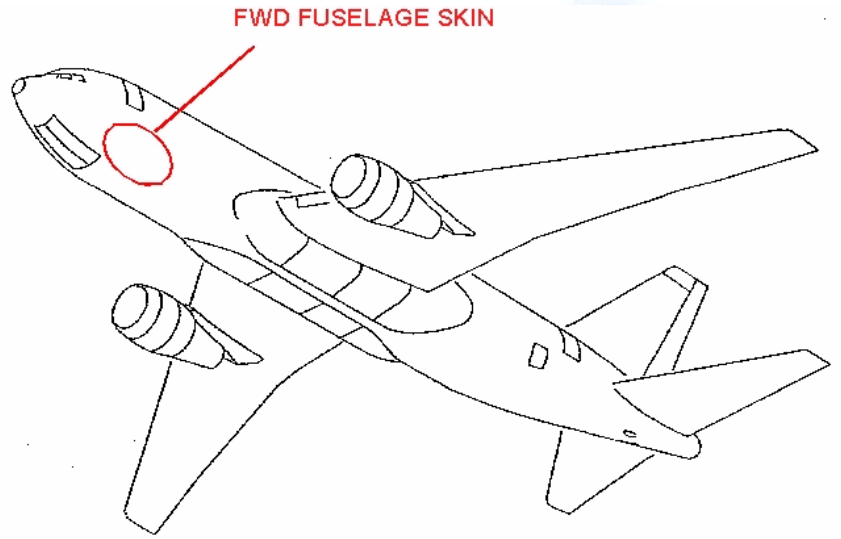




767 Lightning Strike Experience

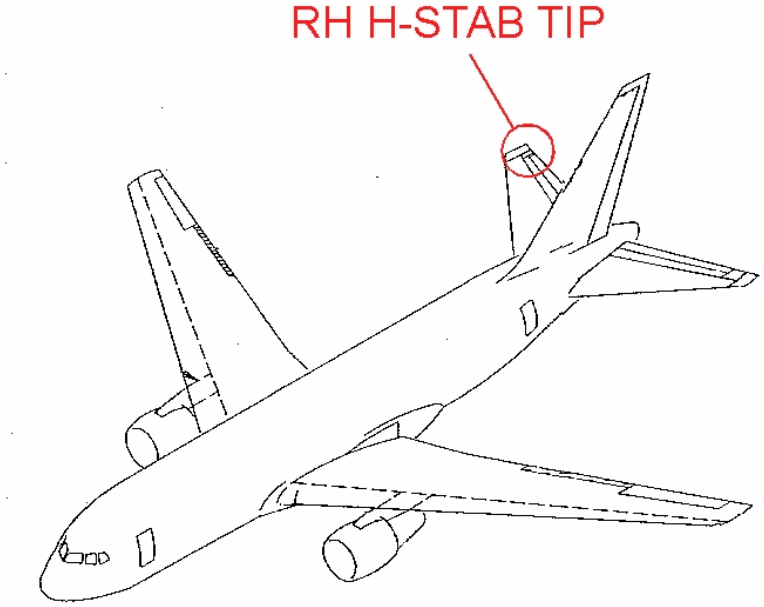




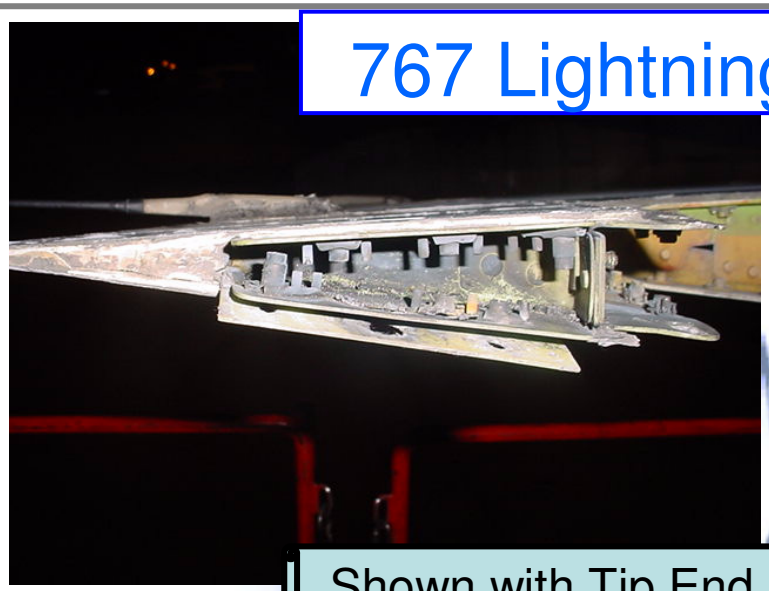


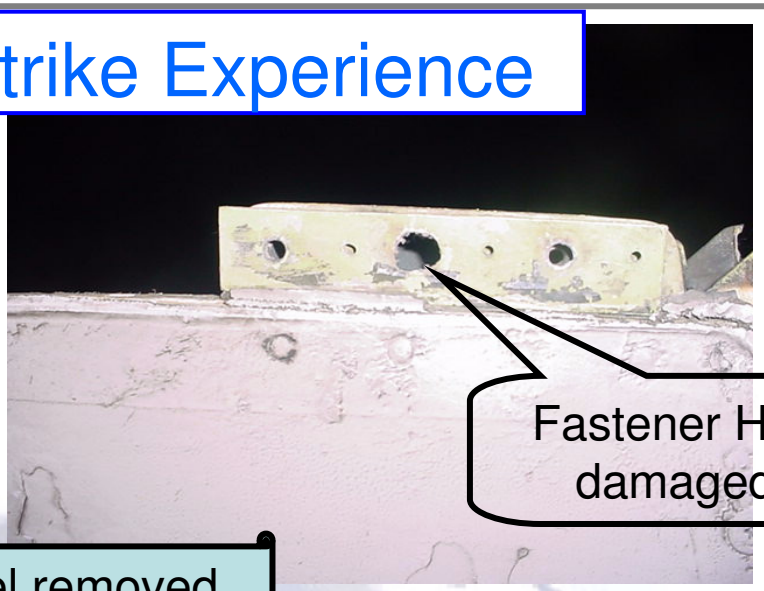
767 Lightning Strike Experience

NO.	AIRCRAFT TYPE	DATE	DEPARTURE	DESTINATION	PHASE	REMARKS
1	B767-381	[redacted]	NGS	HND	ARC	



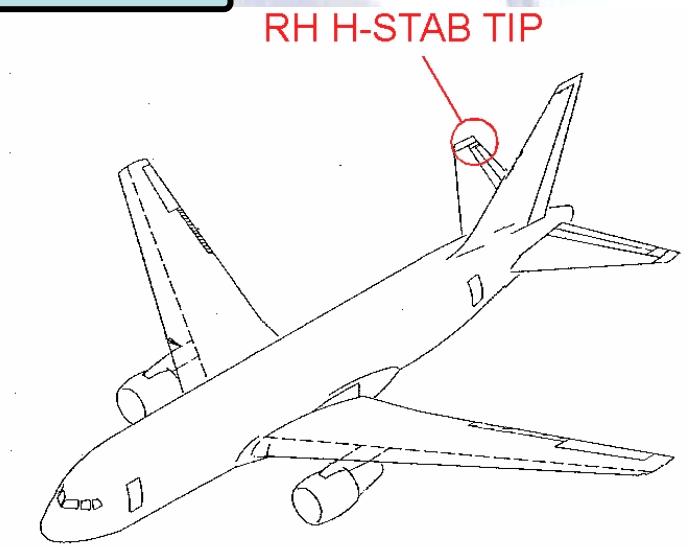
767 Lightning Strike Experience





Fastener Hole damaged.

Shown with Tip End Panel removed.



767 Lightning Strike Experience

NO.	A/P TYPE	DATE	DEPARTURE	DESTINATION	PHASE	REMARKS
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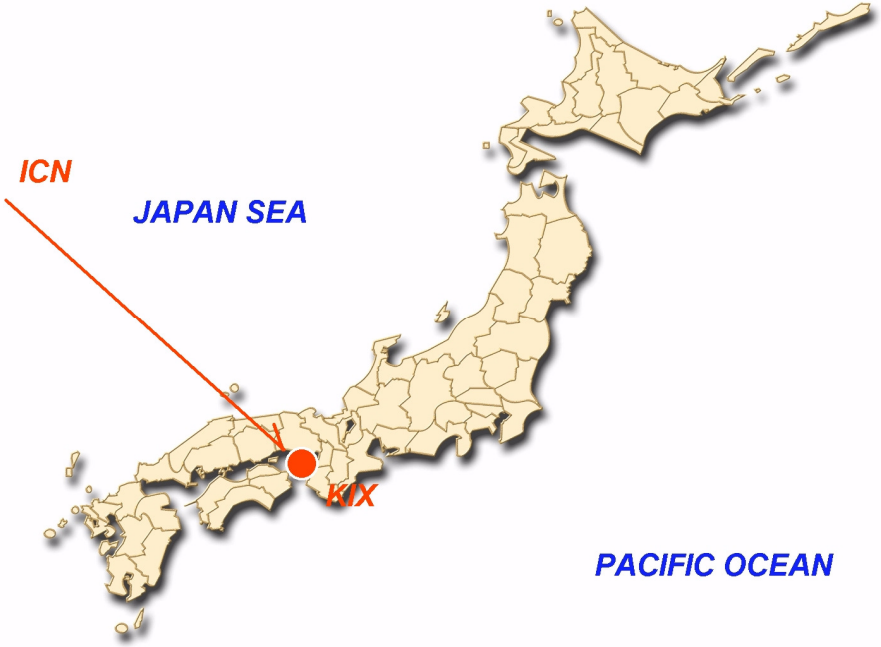
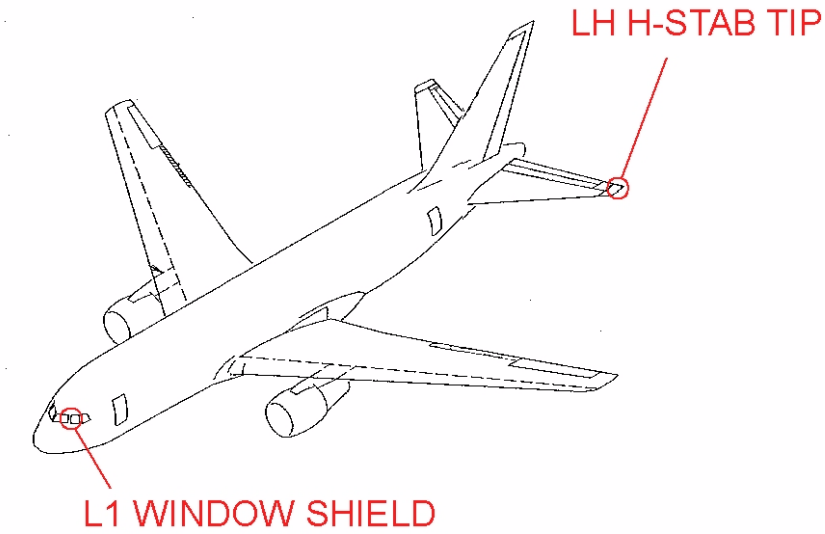
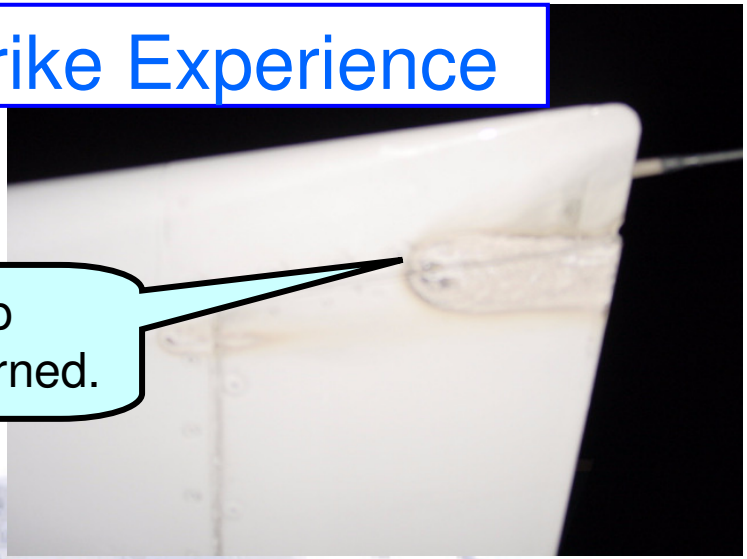
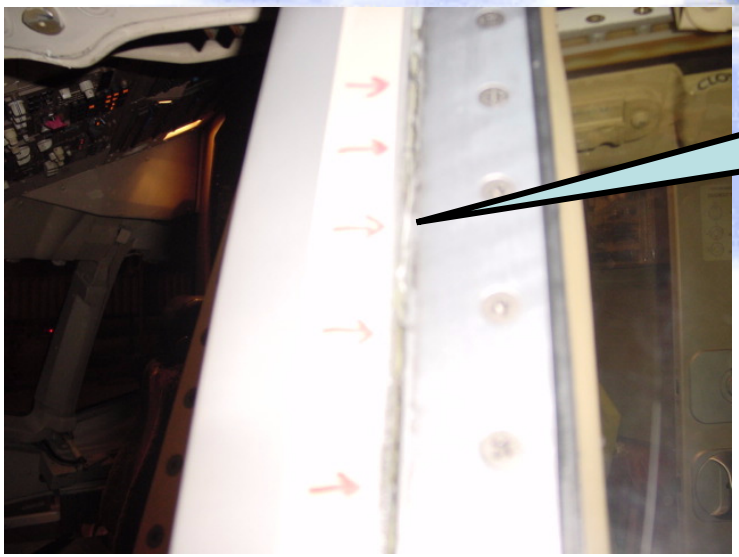




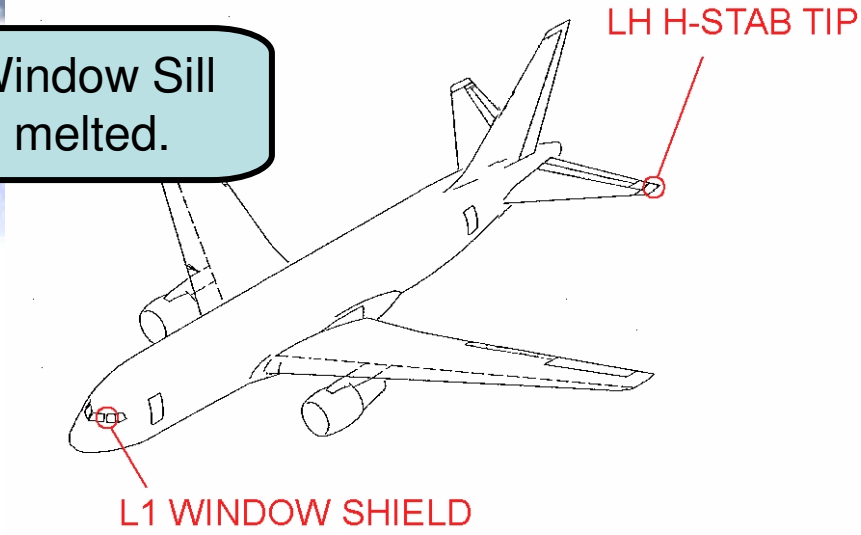
767 Lightning Strike Experience

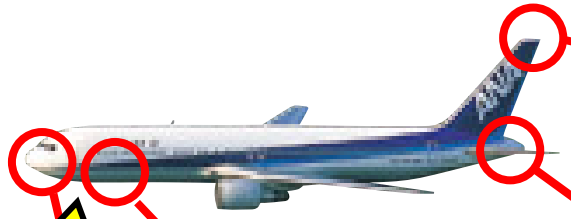


H-Stab Tip
Composite burned.



Window Sill
melted.

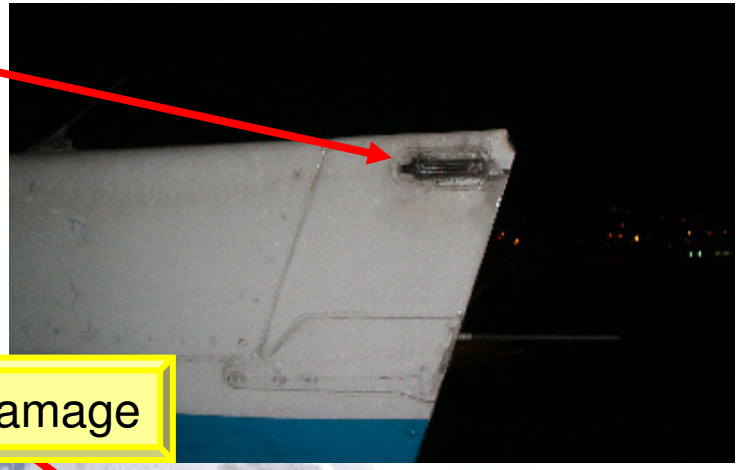




Lightning Out

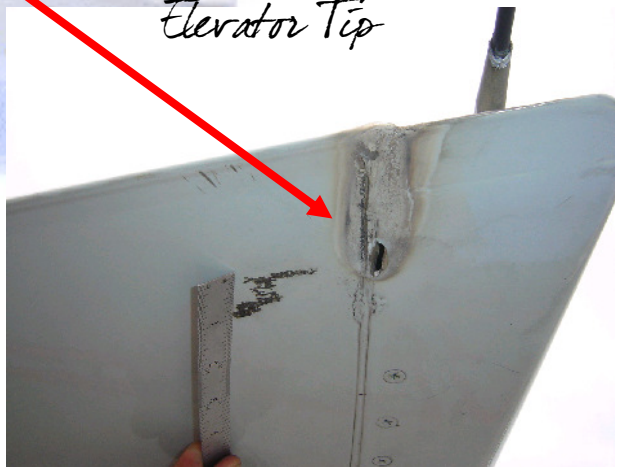
Lightning In

Rudder Tip



Typical B767 Lightning Strike Damage

Elevator Tip



747-400 Lightning Strike Experience

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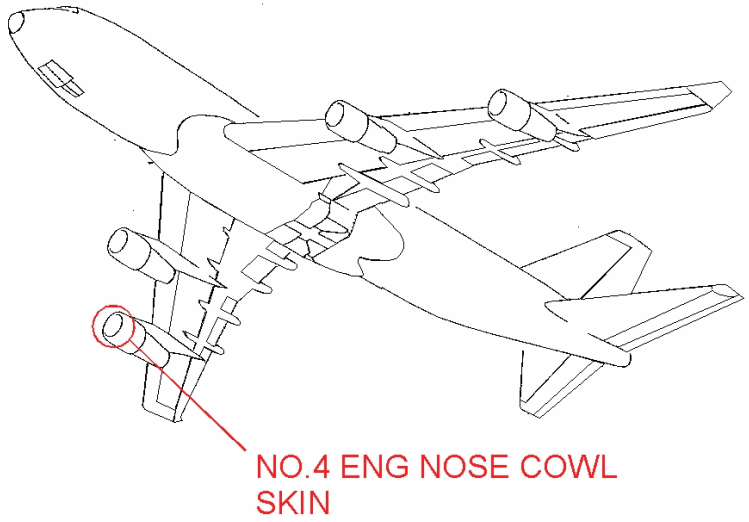
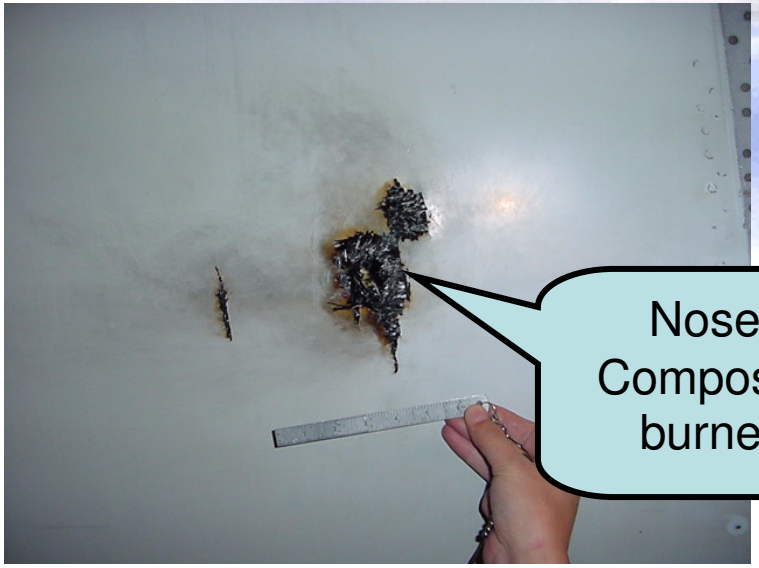
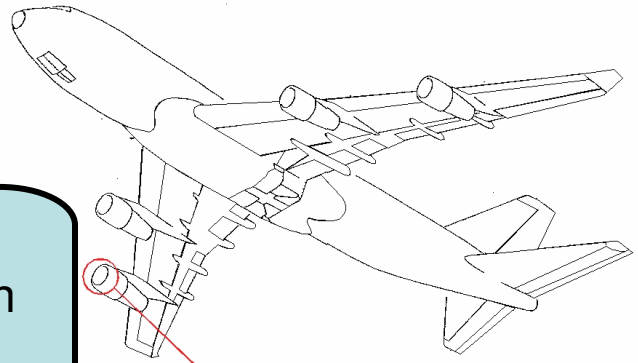


747-400 Lightning Strike Experience

Rivets burned.

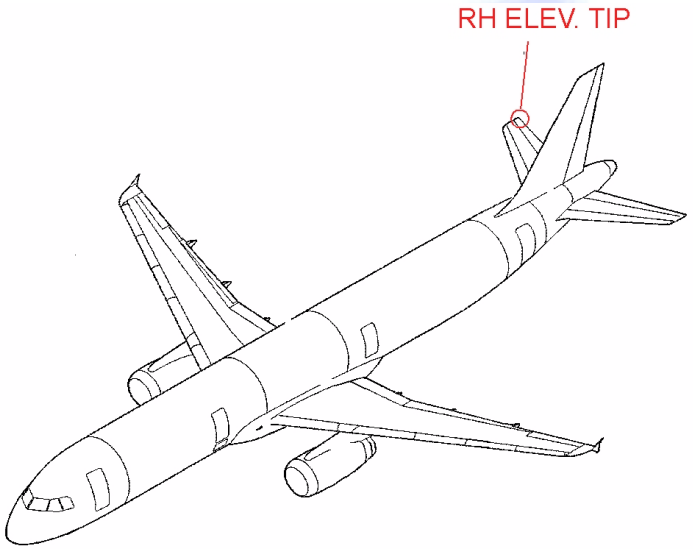


Nose Cowl Composite Skin burned.



A320 Lightning Strike Experience

NO.	A/C TYPE	DATE	DEPARTURE	DESTINATION	PHASE	REMARKS
1	A320	[redacted]	HND	SYO	APP	



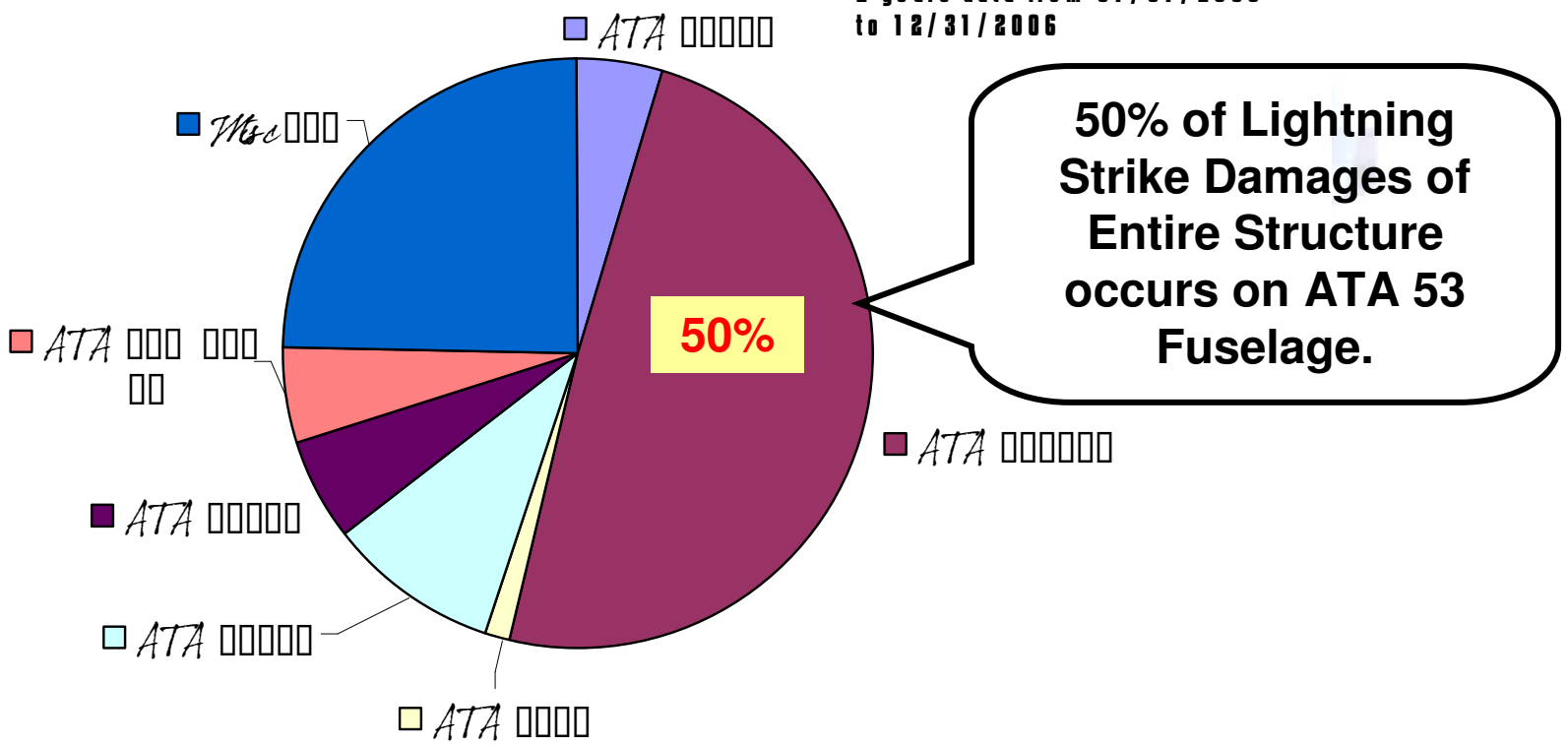
A320 Lightning Strike Experience

Elevator Tip Composite Skin Burned.

767 Lightning Data

333 Reports by ATA Chapters

2 years data from 01/01/2005
to 12/31/2006



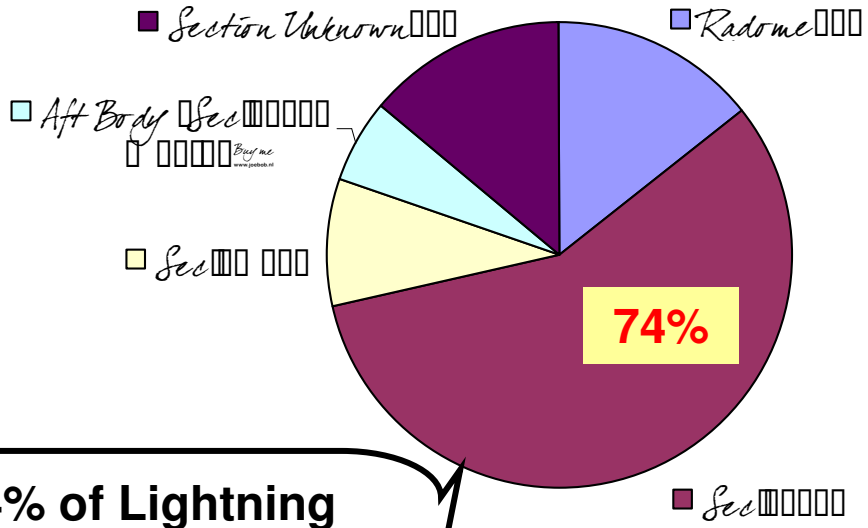
50% of Lightning Strike Damages of Entire Structure occurs on ATA 53 Fuselage.

Ex: ATA □□, □□□□□ ATA Chapter □□, No of Damage

767 Lightning Data

ATA 53 Damages (172 Reports) by Locations

2 years data from
01/01/2005 to
12/31/2006

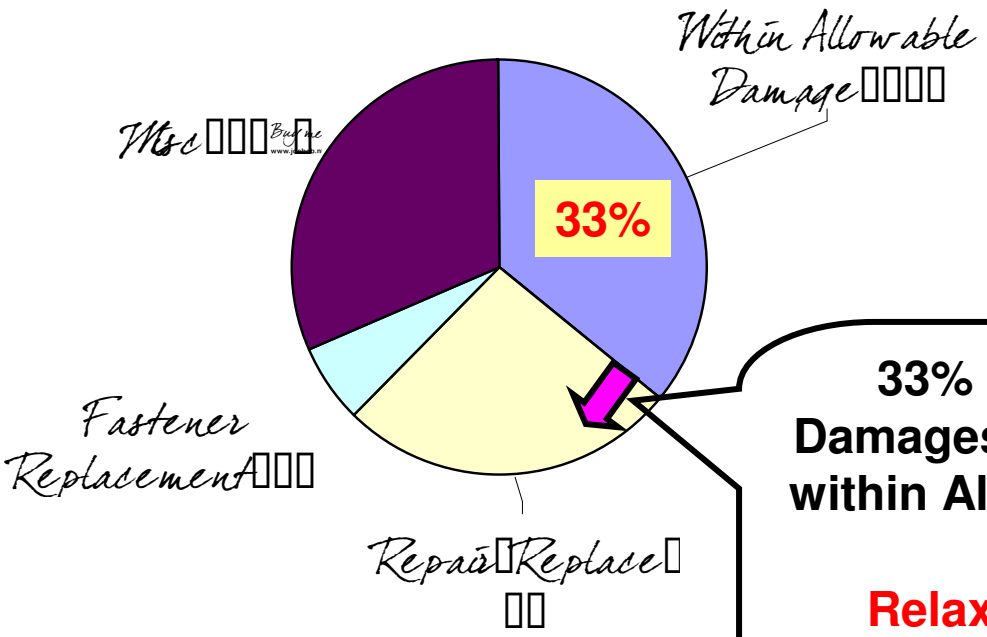


74% of Lightning Strike Damage of ATA 53 occurs on Sec. 41 including Radome.

Ex: Radome, 25 Radome damaged, 25 reports

767 Lightning Data

333 Reports by the Dispositions

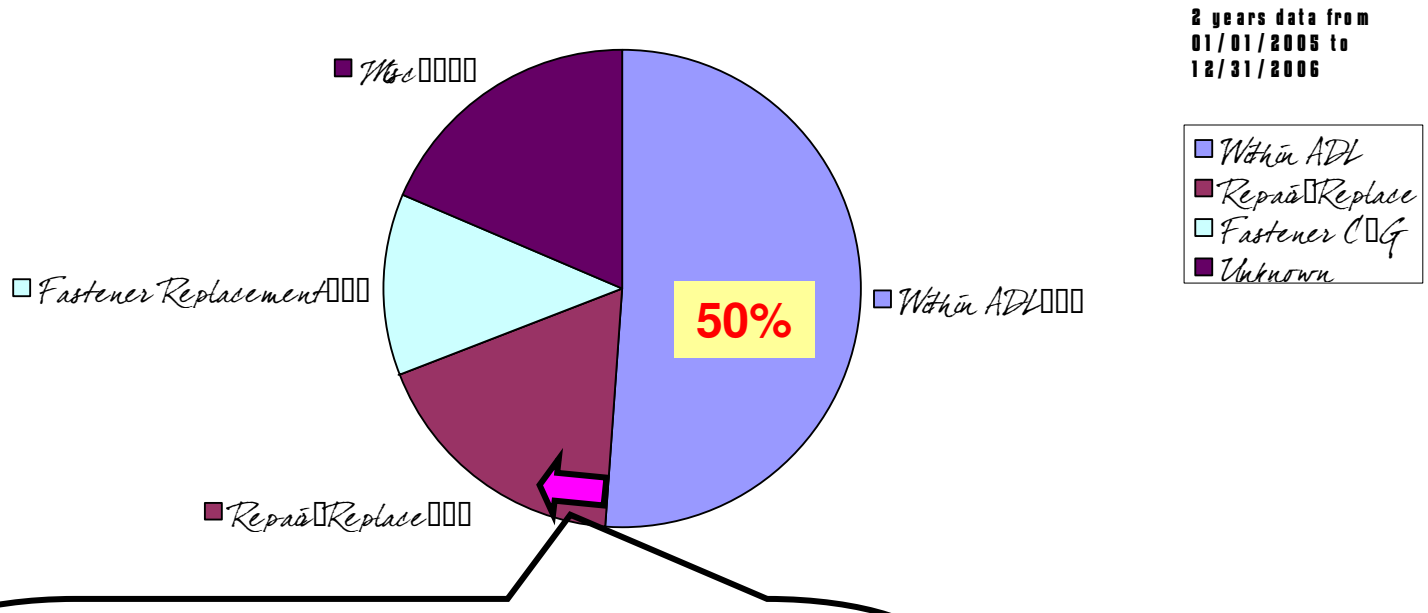


33% of Lightning Strike Damages of Entire Structure is within Allowable Damage Limit.

Relaxation of ADL could reduce maintenance burden.

767 Lightning Data

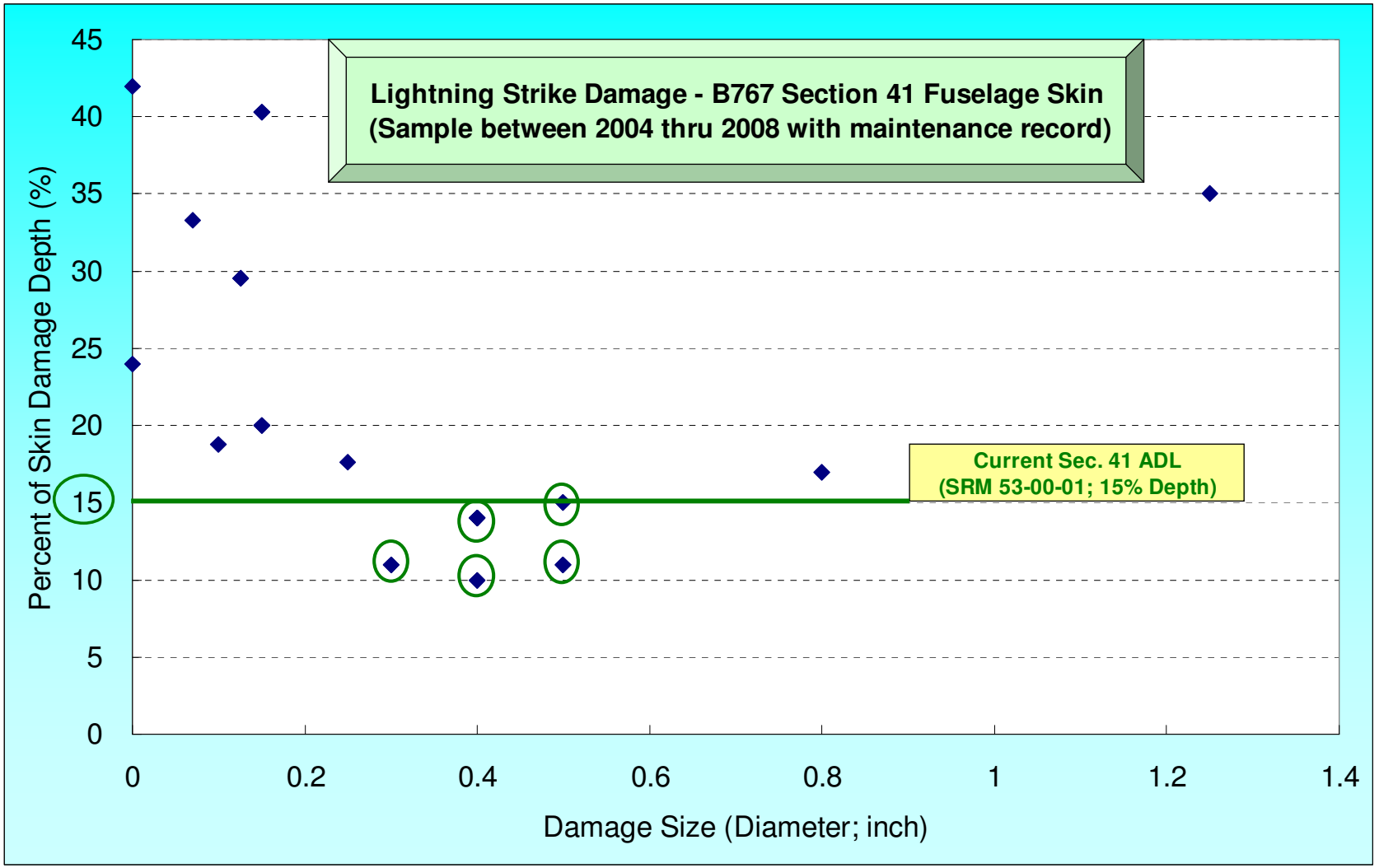
ATA 53 (172 Reports) by Dispositions



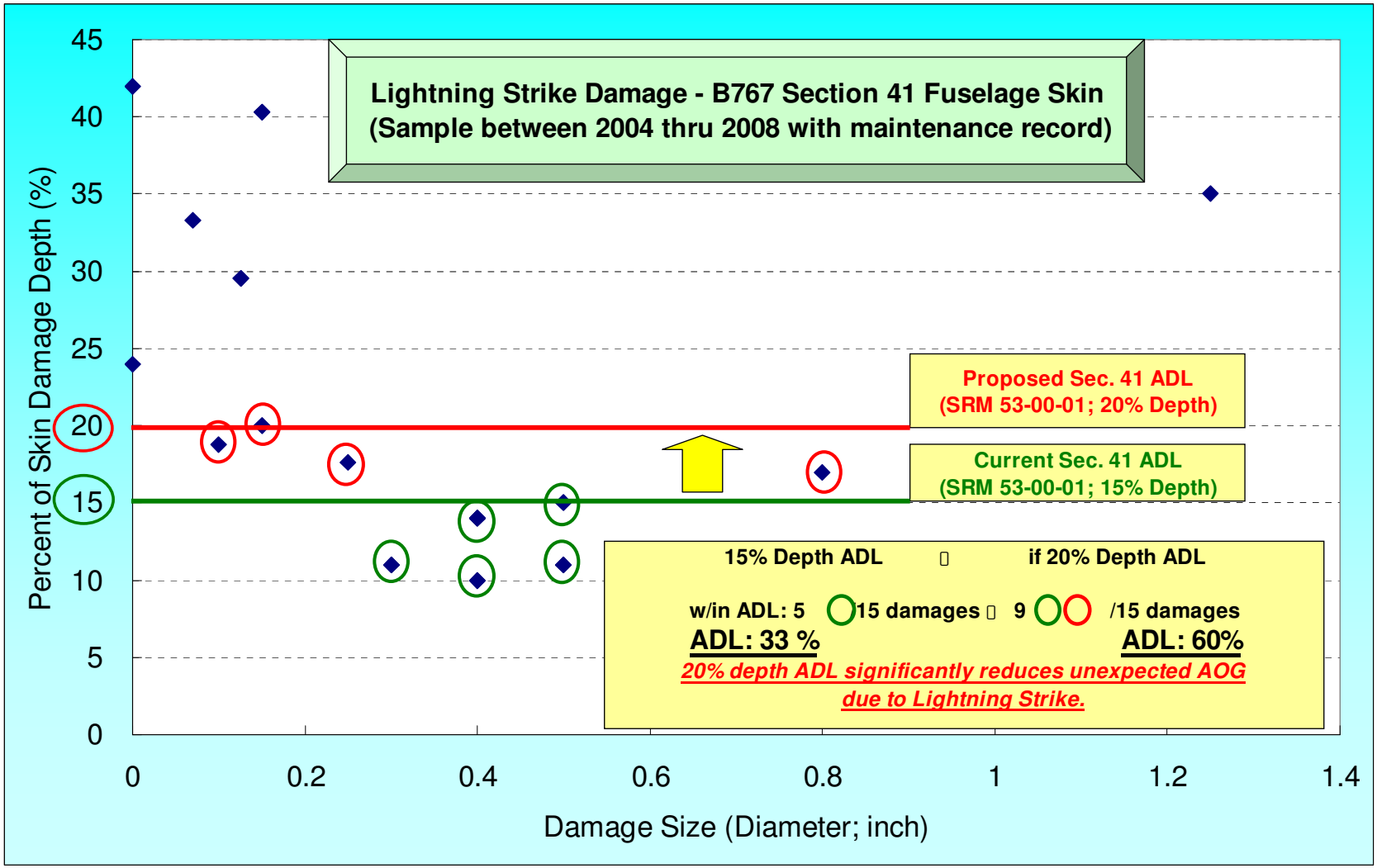
50% of Lightning Strike Damages of 53 is within Allowable Damage Limit.

Relaxation of ADL could reduce maintenance burden.

Our Proposal for Expansion of ADL of 41 Fuselage Skin.



Proposal: ADL up to 20% Depth for Sec 41 Fuselage Skin.



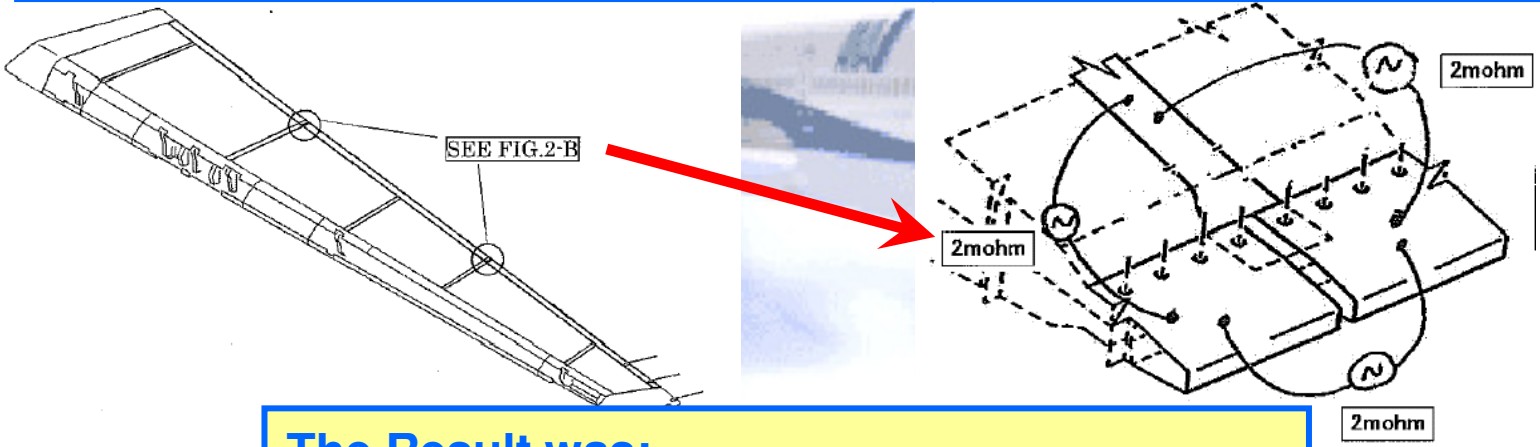
What ANA did as preventive actions:

Goal: To maintain sufficient conductivity performance

A320

We did:

1. **Resistance check & correction at the Elevator Trailing Edge Strap to relax maintenance burden.**



The Result was:

Before: 6 Repairs / 1 year

After: Just 1 Allowable damage / 1 year

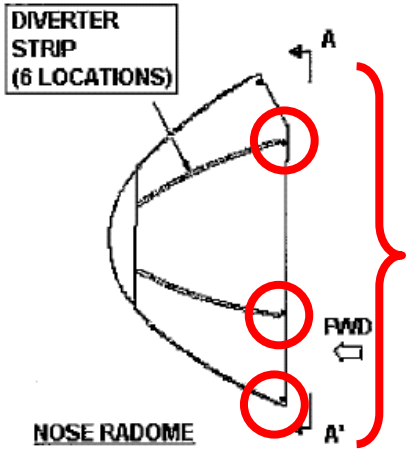
What ANA did as preventive actions:

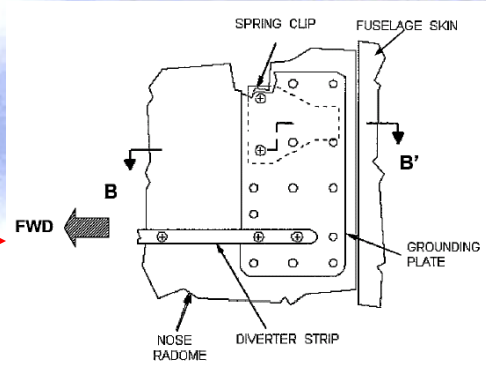
Goal: To maintain sufficient conductivity performance

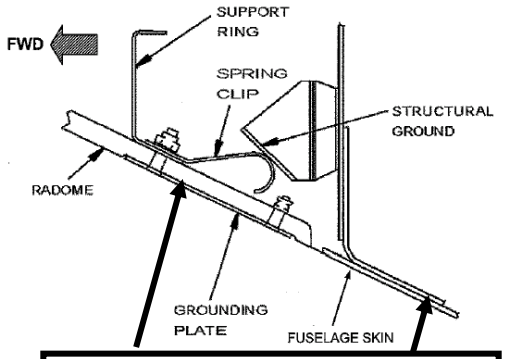
B767

We did:

1. **Resistance check and correction at the attaching points to relax maintenance burden due to Radome Repair.**



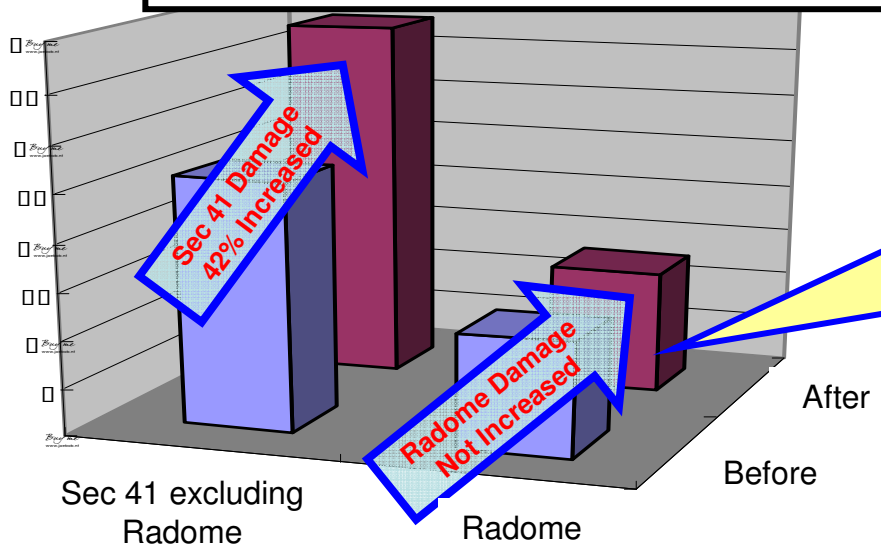




Resistance Check

B767

Lightning Strike - Sec 41 / Radome
Before vs After the correction



Increase of Radome Composite Repair could be restrained by conductivity correction.

The Result was:

Before: 0.2 Radome Repairs / airplane / year

After: 0.2 Radome Repairs / airplane / year

In Sec 41 Lightning Damage 42% Increased environment,

Radome damage increase was restrained.

Requests to Airplane Manufactures:

- **Establishment of appropriate Conductivity Performance**

- **Establishment of appropriate Allowable Damage Limit**

- **Establishment of appropriate Fly-Back to Main Base criteria.**

Thank you