Kapton™/Polyimide

JSWAG

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OUTLINE

- **Introduction**
- **Objective**
  - Notable Events
- **Kapton**
  - History
  - Characteristics
  - Identifying Degradation
  - Dangers/ Risks
  - Reducing the Risk
- **Summary**

GOALS

Reduce the rate of Kapton Degradation

Identify Kapton Damage

Positively impact safety and fleet readiness by improving EWIS preventative maintenance practices.

TRENDS 2012-2022

Degraded Kapton

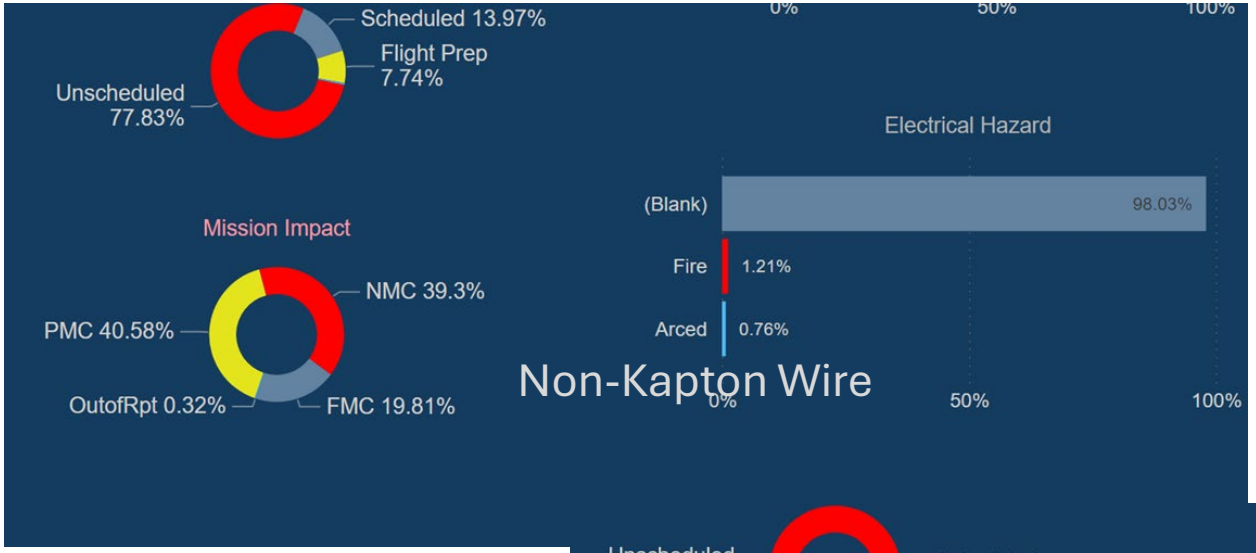
Fires** 500%

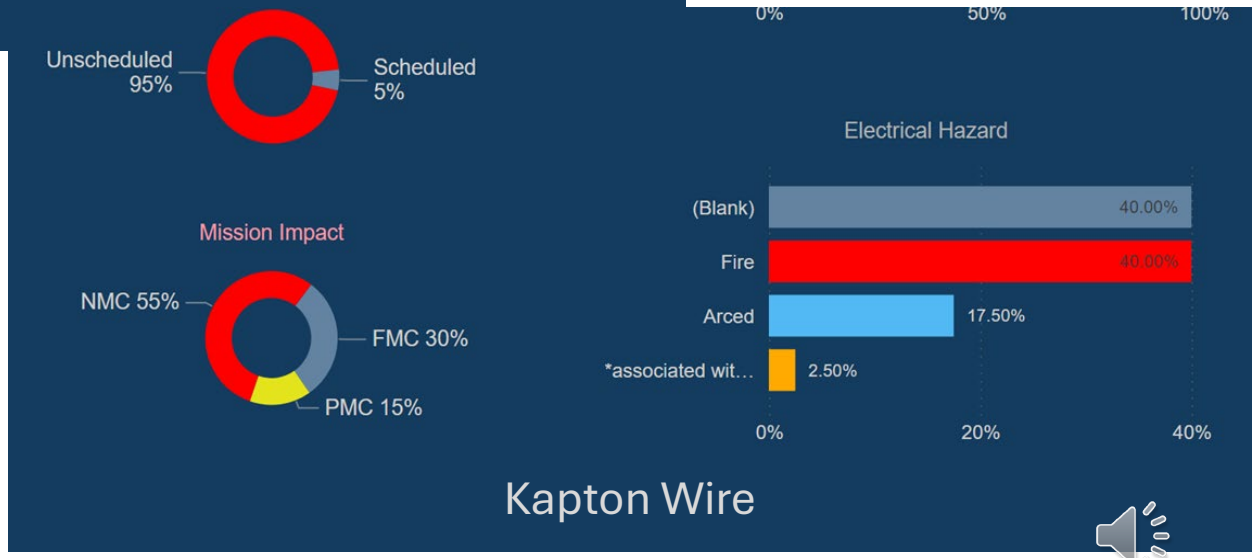
Arcing/charring 1920%

* Per fleet DECKPLATE and EI data

** Primary or secondary contributor

COMPARISON

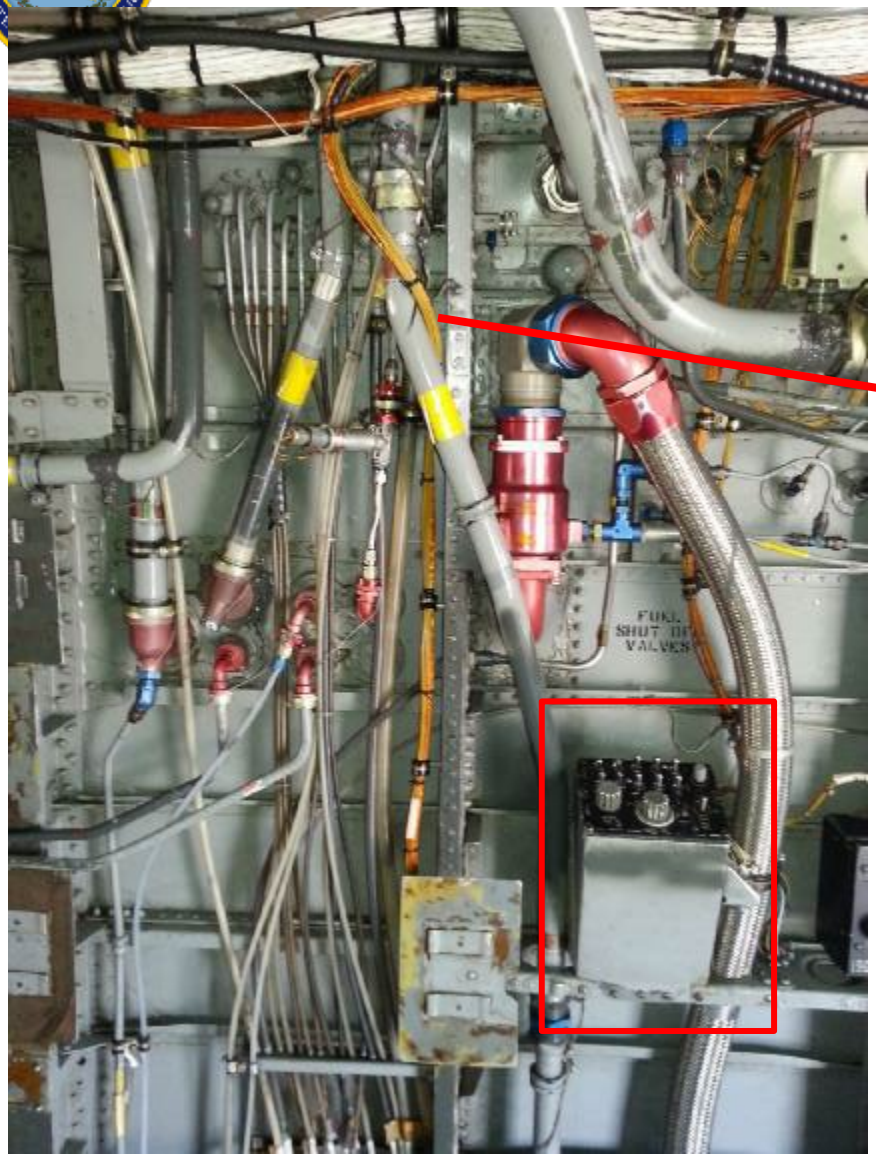


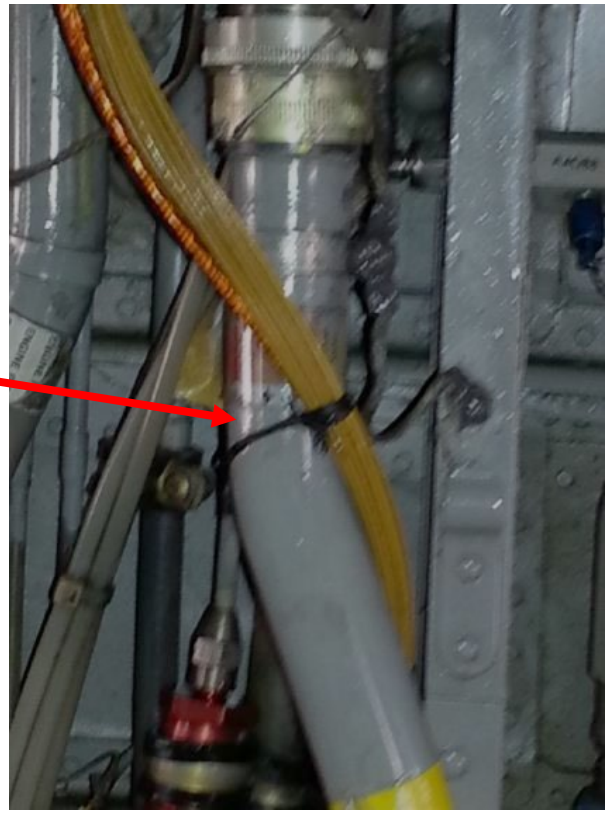


Fire/arcing is 50 times more likely with degraded Kapton.

*Data source: DECKPLATE E-6B 2012-2024

OBJECTIVE

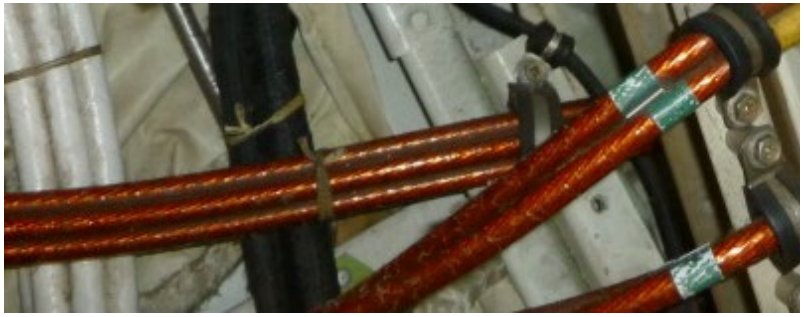




Kapton chafing on fuel line.
Point of origin.

HISTORY

- Polyimide-insulated electrical wire (MIL-DTL-81381)
  - Outer coating (topcoat): Modified Aromatic Polyimide Resin.
  - Inner coating: Fluorocarbon Polyimide Tape.
- Developed in the 1960's by DuPont – Kapton is the brand name.
- Found in: Apollo Lunar Module and Space Shuttle orbiter class, civilian and military aerospace, and wide-range of electronics manufacturing.

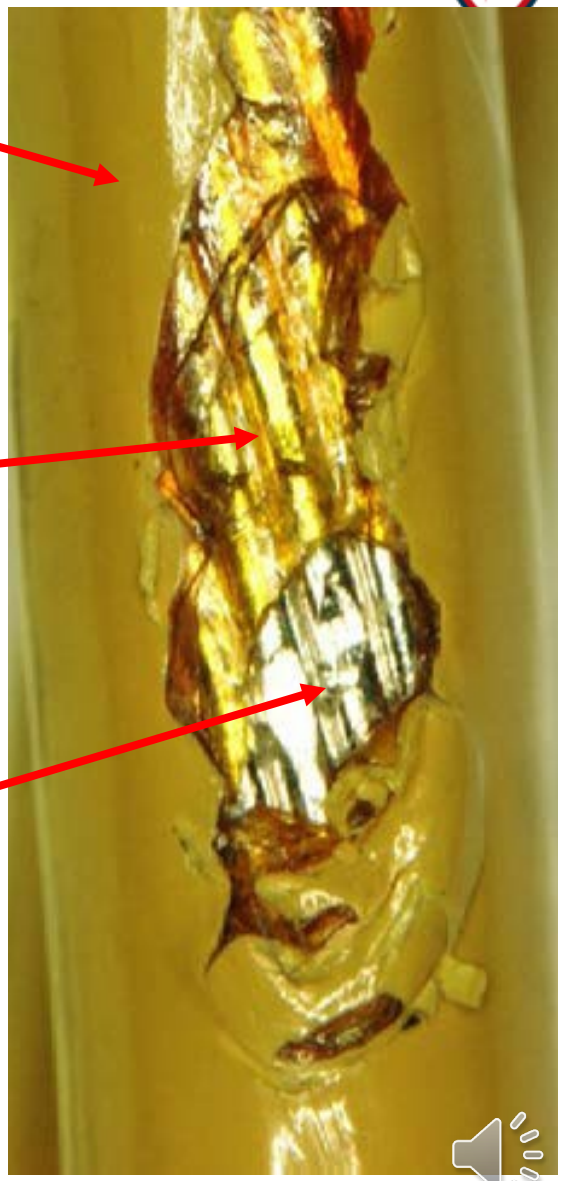


KAPTON™ CHARACTERISTICS

Top Coat: Wide color range - white, yellow or clear most common.

Inner layer (Polyimide): Translucent amber color.

Conductor: Metallic.



KAPTON™ DEGRADATION

Polyimide film degrades very quickly when exposed to a combination of heat, humidity and mechanical strain. Degradation accelerates when this film is wrapped around a conductor.

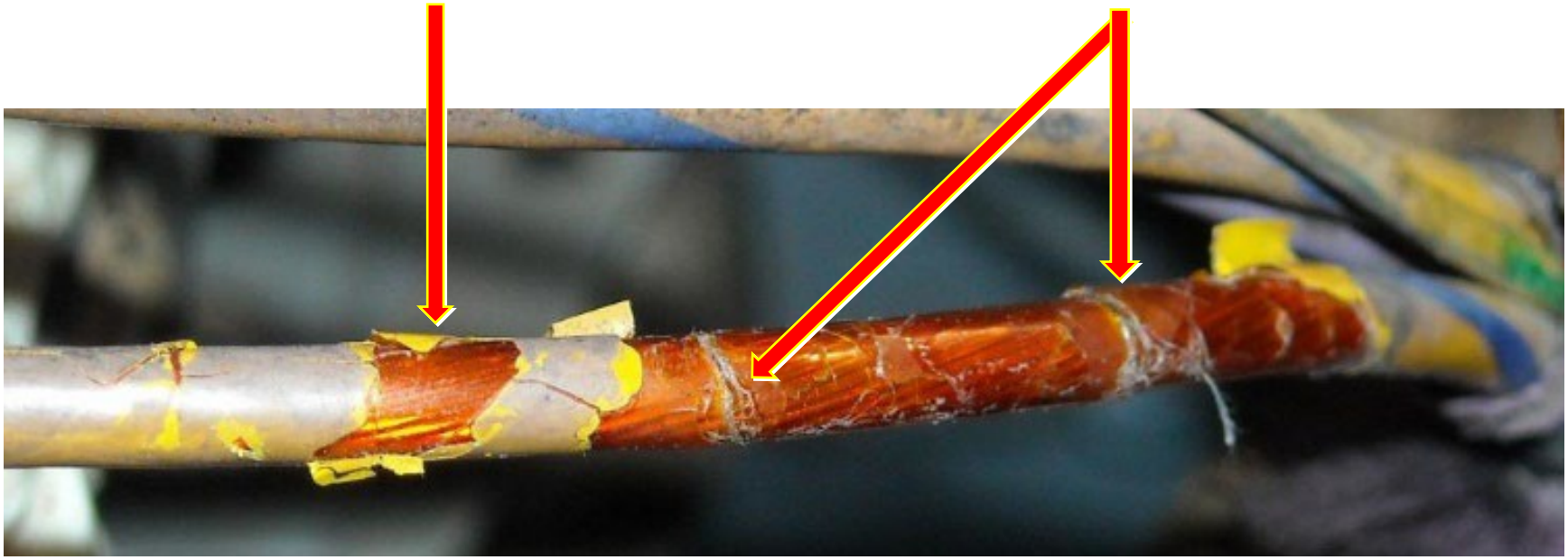
Kapton can become brittle in less than 6 years.

KAPTON™ SIGNS OF DEGRADATION

NOTE

Slight flaking of the topcoat does not require repair or replacement

Topcoat flaking Radial cracks



Brittle insulation

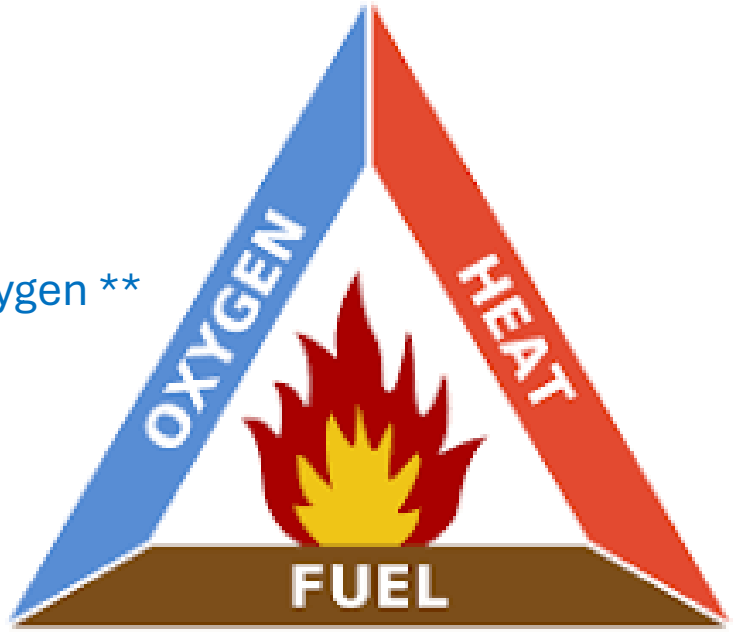
Any cracking, or other damage (cuts, chafing, etc.) of the Kapton® polyimide film requires repair or replacement in accordance with WP 014 00 and WP 004 01.

M81381 VIOLENT ARCING / FIRE HAZARD

➢ = Kapton compounds

➢Nitrogen.**

Moisture + Kapton pounds (hydrolysis)



➢Oxygen **

➢Hydrogen **

➢Carbon * **

Bonus Info

* Burnt/charred carbon is conductive thus your insulator becomes a conductor of electricity.

** Rapid expansion of the gases from the generated heat will cause mini-explosions of fire and molten metal.

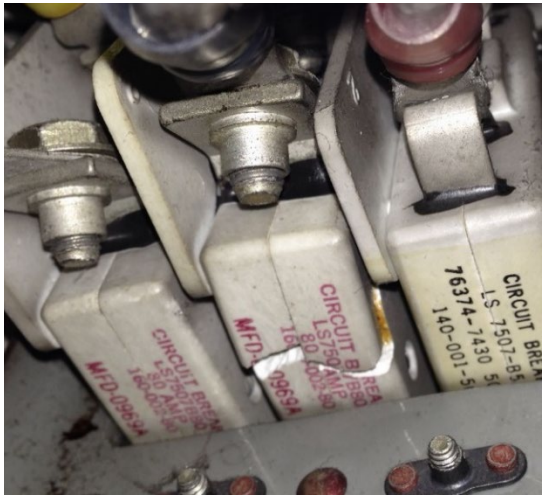
REDUCING THE RISK

If a CB <u>must</u> be reset prior to ruling out (or correcting) a short:

a) never reset more than once,

b) ensure everyone on-board is aware when a CB has been reset, and

c) never set other CBs if they trip, or its possible they tripped, after resetting the initial CB.



Should only be done when absolutely necessary!
Does the risk outweigh the reward?

REDUCING THE RISK / SUMMARY

Reduce rate of Kapton degradation

- Limit handling / impacting / flexing
- Protect from fluid exposure
- Identify and report

Repair/replace degraded Kapton

- Only qualified technicians
- Only authorized repairs
- Take your time

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