



Causes of Cable Faults and Repairs in Regional Seas

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Structure of fibre optic cable



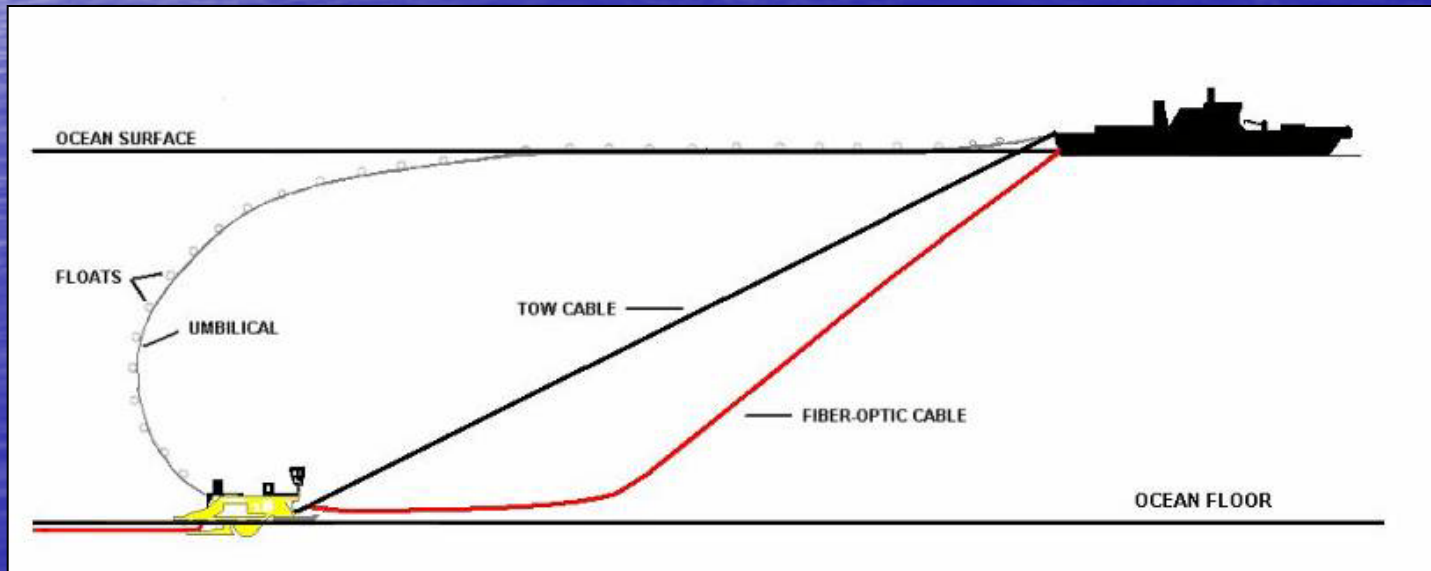
Construction varies with manufacturer & seabed conditions. Cables may have no armour in stable, deep-ocean sites or 1 or more armour layers for energetic zones, e.g. coastal seas

Types of cable damage (faults)

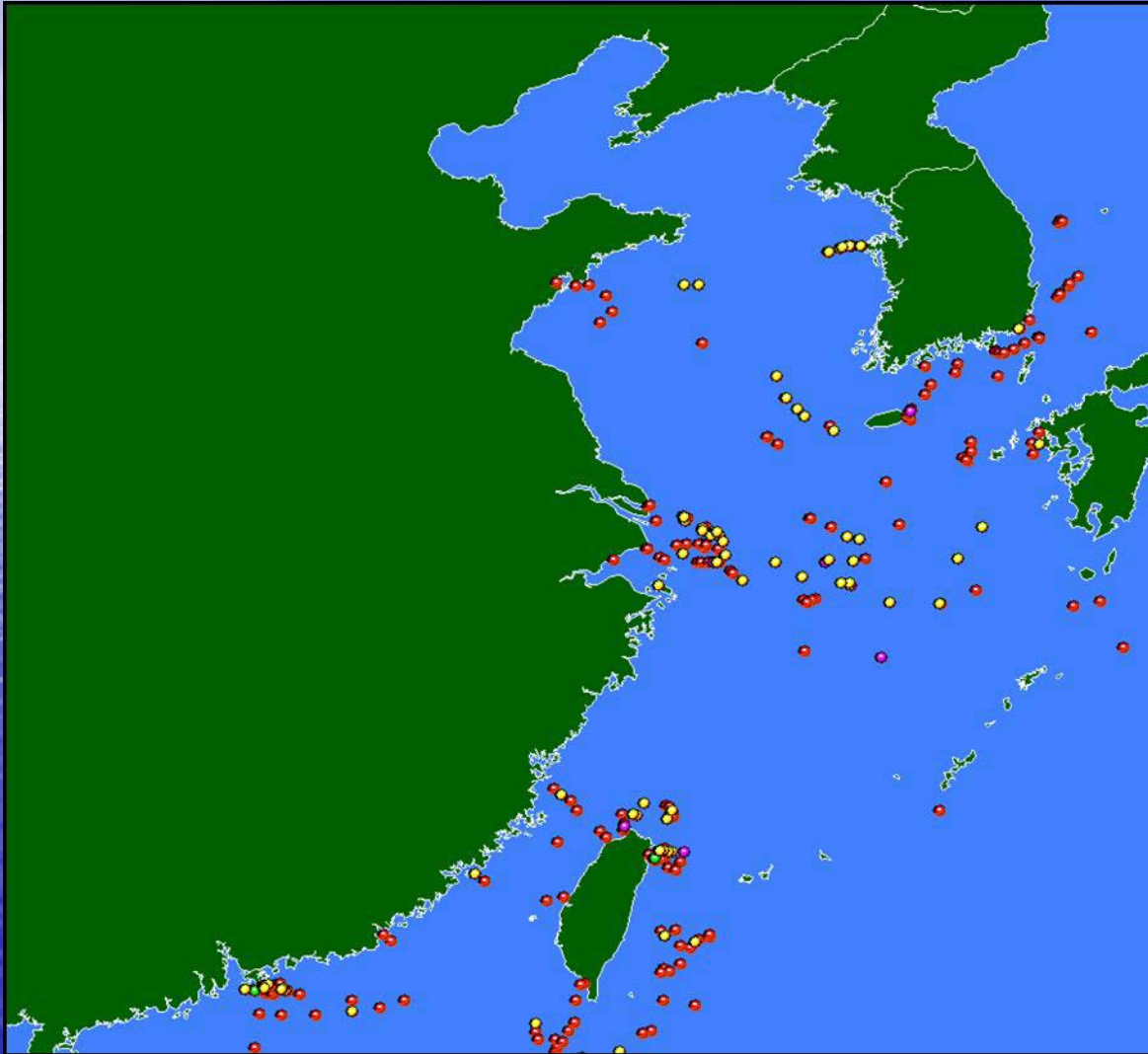
- Shunt fault – breaks insulation & allows electrical power for repeaters to shunt to sea water
- Shunt fault may leave fibres intact, difficult to determine precise location from instruments on shore
- Fibre fault – can disrupt communications, easier to determine accurate location from instruments on shore
- Complete break – electrical & fibre
- If a trawl or anchor drags along a cable, it may cause multiple faults along a substantial length

Cables are buried during installation

- Cables are buried during installation to depths of 1-3 meters into the seabed, down to water depths of 500-1000 meters, except in steep, hard or rocky areas
- Cable burial is done to protect from damage by fishing, anchors and other causes
- In some areas like the China Sea, faults occur in spite of cable burial



The East Asian region has high cable fault rates

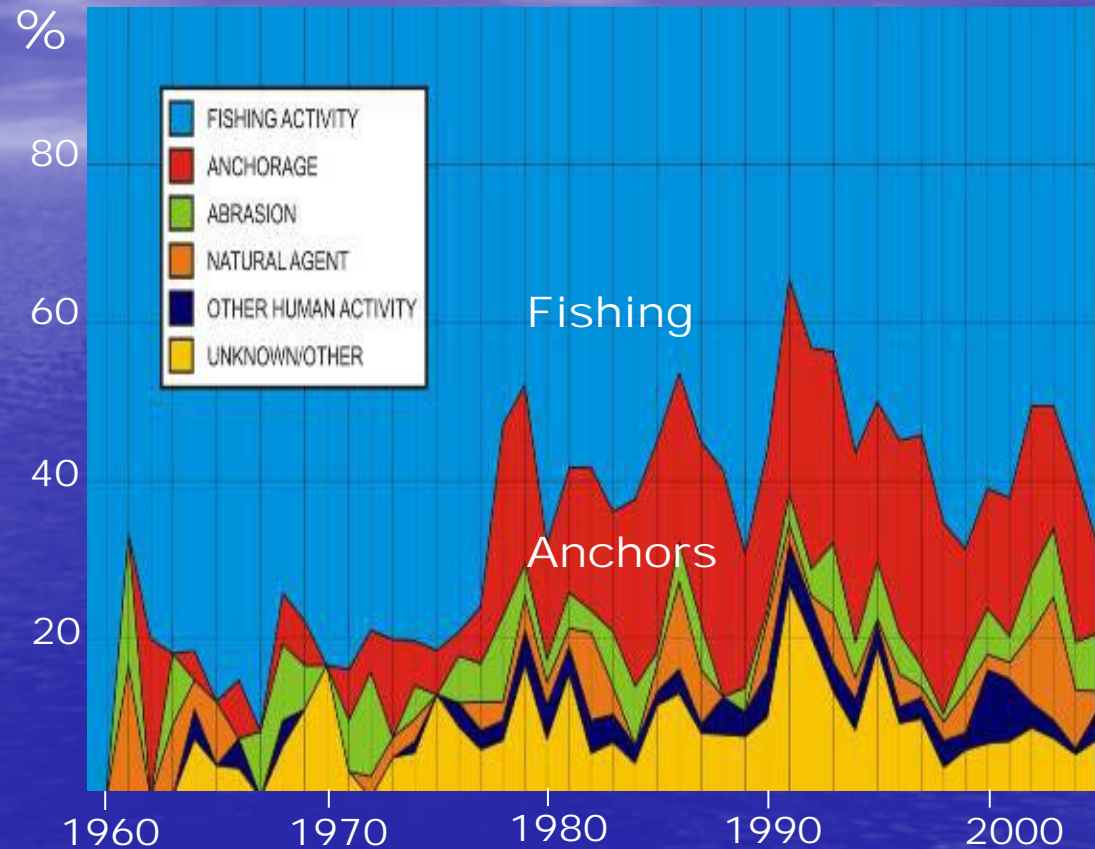


Presentation of available cable fault records

- Yellow = cause unknown
- Red = fishing, anchors, undersea landslides, various causes

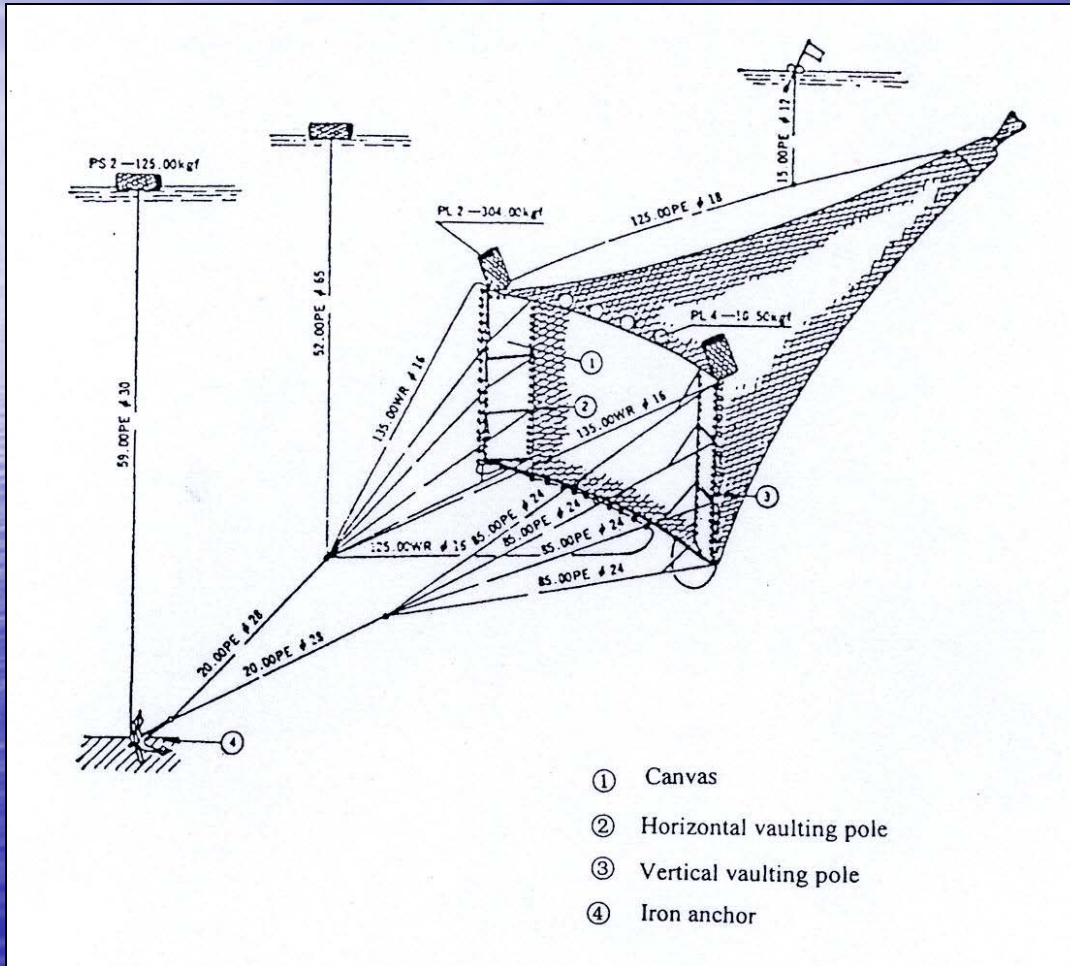
Causes of Undersea Cable Faults

- **Fishing** – high incidence but impact restricted to individual cables
- **Anchors** - medium incidence but can impact several cables
- **Natural Hazards** (e.g. earthquakes) – low incidence but can impact multiple cables
- Other causes (equipment failure & other) are less common



Cable faults caused by external aggression demonstrate the impact of human activities

Fishing is a major fault cause



Stow nets are used intensively in the East China Sea. Their large anchors drag through the mud and damage cables.

Fishing anchor dragged end of cable during installation

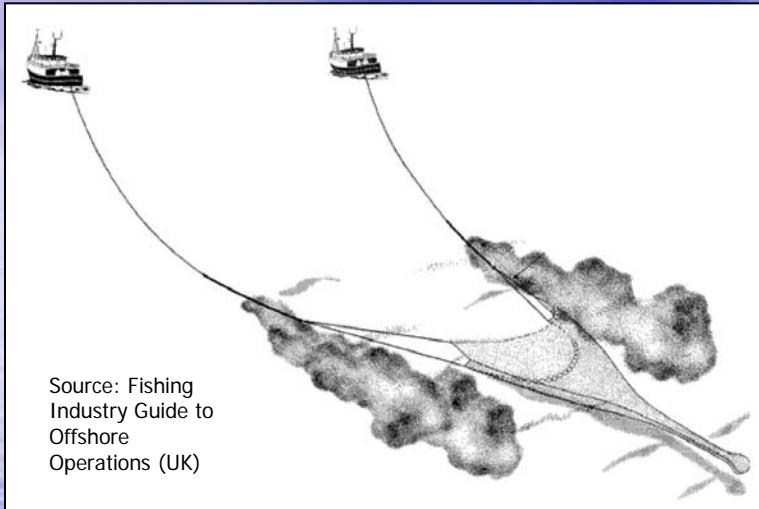


Various types of fishing cause cable damage

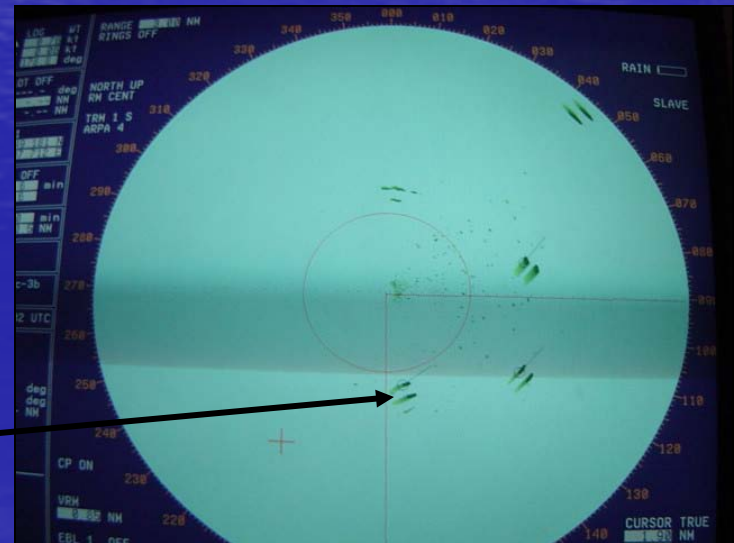


Large anchors of fishing vessels and merchant vessels also cause cable damage

Pair trawling uses a net towed between two vessels



- Trawling can break cables
- Pair trawlers near cables
- Pair trawlers on cables radar



Cable Damage by Fishing



Trawling & fixed nets including stow nets cause faults

Damaged cable with tangled fishing gear

Cable Damage by Ship Anchor



Anchoring
outside
designated
areas causes
faults

Ships' anchors cause faults – dragging anchor by error during passage

Recent fault records show that merchant ships sometimes do not fasten their anchors securely during short passages and these can cause cable faults.



Undersea earthquakes and landslides cause faults

- Hengchun earthquake and landslides on 26 December 2006 caused more than 15 faults on 9 cables
- Multiple faults have occurred in Ryukyu Trench from seabed movement
- Most faults caused by seabed movement occur in deep water on exposed cables

Cable Damage Can Cut Communications

- Immediate communications restoration & rerouting may be needed
- Satellites do not have enough capacity to restore the communications carried by a modern, high-capacity cable



Sharing the seabed in harmony