

# SAFETY BULLETIN

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## ENGINE BOOTSTRAP CHAIN HOIST FAILURE WHILE TASK CARRIED OUT

### INTRODUCTION

An engine bootstrap chain hoist is a tool used to raise and lower aircraft engines during maintenance and repair. It typically consists of a system of manually or electrically operated chain hoists that can be used to lift the engine (with cradle) to desired locations on the base or aircraft pylon. The number and type of hoists required may vary depending on the aircraft type and specific maintenance needs. However, an engine bootstrap chain hoist failure can be a serious safety hazard. If the hoist fails while an engine is being lifted, the engine could fall and cause damage to the engine or can cause serious injuries to the aircraft maintenance personnel. Inspection should be done regularly to ensure the engine chain hoist is safe to be used and also experienced aircraft maintenance staffs should be assigned while performing this specific task to prevent any unexpected incident to occur.

### INCIDENT BACKGROUND:

The incident reported via the hazard report states that the AirAsia 9M-AQN No.2 engine has dropped during engine removal process. The failure of right hand forward engine bootstrap chain hoist at initial lowering phase, resulted in rapid descent of engine and hit the engine stand causing damage to the engine's fan air duct.

### CONTRIBUTING FACTORS:

#### TYPE OF HAZARD CATEGORY

##### 1. HUMAN FACTORS

Lack of experience and training of technicians involved in the aircraft engine removal process can pose significant risks and increase the likelihood of errors or failures. This is because the engine removal process is complex and requires a high level of expertise. If the aircraft maintenance staffs are not properly trained, they might use it incorrectly that could lead to an accident. Perhaps the staff might be engaged in numerous engine removal process for different types of aircrafts before, but this might be their first experience with the A320 aircraft engine removal process.

Besides that, fatigue can have a significant impact on human performance, and it can be a major contributing factor to accidents during the aircraft engine removal process. So, in this case the maintenance personnel involved might experience fatigue, potentially leading to reduced alertness during engine removal due to tasks performed in the evening.

### ROOT CAUSES:

##### 1. EQUIPMENT FAILURE:

The main root cause that caused this incident is because of the engine bootstrap chain hoist failure. The brake disc mechanism inside the chain hoist is wear and leads to a rapid descent of the engine during the engine removal process.

## 2. LACK OF KNOWLEDGE:

Lack of knowledge during aircraft engine removal using chain hoist can lead to errors, mishandling, and potential failures. It is important that the aircraft maintenance staffs to understand the engine removal process and knowing the correct steps to handle the task as well as the equipment used during this removal process.



### WAYS TO OVERCOME:

- Always refer and consult the aircraft's maintenance manual before beginning the engine removal process. The manual will provide specific instructions on how to safely remove the engine from the aircraft.
- Carry out a pre-task inspection check of the chain hoist to ensure safe and efficient engine removal. The important aspects that need to be inspected before conducting the engine removal process are stated below:
  - ✓ **Check the load chain:**  
Ensure that the load chain is long enough to reach the load and that it is properly installed and also check for stiffness of the chain, any signs of wear, damage, or corrosion on the chain hoist as well.
  - ✓ **Verify the hoist capacity:**  
Verify that the hoist capacity exceeds the weight of the load. It is critical that the hoist selected has a capacity that exceeds the weight of the load.
  - ✓ **Check the internal brake mechanism:**  
Check the brake system to ensure that it is functioning properly. This includes checking the brake friction surfaces for oil or other contaminants, as well as ensuring that the brake parts are not damaged or worn. In case of any malfunction on the brake system, it can damage the engine of the aircraft and lead to major injuries to the personnel or even fatalities during the engine removal process.
- Organisations should provide proper training to aircraft maintenance staffs involved in aircraft maintenance and repair on the safe operation of the chain hoist. Inexperienced staffs who are not familiar with work procedures and type of aircraft should be assisted by experienced and qualified aircraft maintenance staffs especially during performing this type of critical task. It is better to be safe than sorry.
- Organisations should perform regular and ongoing maintenance of the hoist to ensure its safe and reliable operation. This includes cleaning, lubricating, and replacing any worn or damaged parts. This can help to prevent hoist failure during operation.
- Organisations should identify potential hazards associated with the engine removal process and implement appropriate control measures to prevent any unexpected incident during the engine removal process.

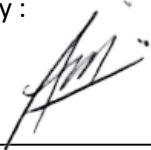
- The Safety Action Group (SAG) members should propose additional solutions such as implementing fail safe mechanism in order to avoid the same situation happen again.

## CONCLUSION

In a nutshell, it can be concluded that, the aircraft engine removal process is considered critical due to its complex tasks involved, safety considerations, and the need for preventive maintenance. In case of any concerns about the safety of the engine removal process, the operation should be stopped and the concerns should be consulted with an experienced and qualified aircraft maintenance personnel. Sometimes, the failure of equipment such as the chain hoist during aircraft engine removal is unpredictable and cannot be avoided. However, the aircraft maintenance staffs and also the organisation should work together to implement preventive measures to ensure that this incident will not repeat again in the near future.

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