Norwegian Safety Investigation Authority

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REPORT AVIATION 2025/05

Aviation incident 120 NM southwest of Stavanger Airport Sola, Norway, on 20 October 2020 involving Sikorsky S-92A, LN-OMI, operated by Bristow Norway AS

This report has been translated into English and published by the NSIA to facilitate access by international readers. As accurate as the translation might be, the original Norwegian text takes precedence as the report for reference.

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Illustration photo: Bristow Group Inc.

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Table of contents

Report on aviation incident

Table 1: Data

Type of aircraft:	Sikorsky Aircraft Corporation S-92A
Nationality and registration:	Norwegian, LN-OMI
Owner:	TVPX Aircraft Solution Inc.
Operator:	Bristow Norway AS
Crew:	2: commander and co-pilot (uninjured)
Passengers:	11 (uninjured)
Location:	About 120 NM southwest of Stavanger Airport Sola, Norway (ENZV)
Time of incident:	Tuesday October 20, 2020, at 1142–1207 hours

All times given in this report are local times (UTC + 2 hours) unless otherwise stated.

Notification

On 21 October 2020, the day after the incident had occurred, the Norwegian Safety Investigation Authority (NSIA) received a report from Bristow Norway AS on a serious aviation incident. The report concerned a fire warning in a S-92A helicopter en route from Stavanger Airport Sola (ENZV) to the Ekofisk Kilo (ENXK) oil and gas platform.

In accordance with ICAO Annex 13, 'Aircraft Accident and Incident Investigation', the NSIA notified the National Transport Safety Board (NTSB) in the USA, the country of manufacture, that an investigation had been initiated. The European Union Aviation Safety Agency (EASA) and the Civil Aviation Authority Norway (CAA-N) were also notified.

Summary

On Tuesday 20 October 2020, Sikorsky Aircraft Corporation S-92A, LN-OMI, operated by Bristow Norway AS, was en route from Stavanger Airport Sola (ENZV) to the Ekofisk Kilo (ENXK) oil and gas platform.

Just under an hour into the flight, a fire warning for engine 1 was triggered. The emergency procedure for an engine fire was consulted and the crew decided to shut down the affected engine without any other indications of an actual fire. Despite both fire extinguishing bottles being deployed, the fire warning continued. The crew still did not register any other indications of fire and concluded that the warning was false. They considered it best to continue the flight towards either Ekofisk Kilo or Ekofisk Lima (ENEL).

Before landing on Ekofisk Lima, the crew restarted engine 1 and the landing took place without further problems. After landing, the engine and engine compartment were inspected, and it was ascertained that there had been no fire.

There have been a number of false engine fire warnings on S-92 helicopters. However, the warnings have normally only lasted a short time. The NSIA believes that false warnings poses a serious problem, particularly because false warnings reduce confidence in the fire warning system. The incident touches on several issues concerning false fire warnings and how they are dealt with.

1. Factual information

1. Factual information

1.1 History of flight

On Tuesday 20 October 2020, LN-OMI, a Sikorsky S-92A helicopter, was en route from Stavanger Airport Sola (ENZV) to the Ekofisk Kilo (ENXK) oil and gas platform. The helicopter was operated by Bristow Norway AS as flight BHL203.

The sequence of events is mainly based on information obtained from the crew and data from the helicopter's flight data recorder (FDR) and cockpit voice recorder (CVR).

Just under an hour into the flight, the fire warning for engine 1 was triggered. The helicopter was equipped with two external tail-mounted cameras filming the helicopter's engines, main rotor and main gearbox, but these showed no signs of flames or smoke. Nor were there any other indications of engine fire, such as irregular or erratic engine indications.

20 seconds after the fire warning went off, the crew reduced the collective pitch[1] to single-engine operation. They confirmed that the warning concerned engine 1 and shut down the engine about 10 seconds later. The first fire extinguisher bottle was deployed 50 seconds after the warning commenced. However, the warning did not stop, and after another 30 seconds, the crew deployed the second bottle.

The fire warning continued, and at that point the crew had no additional fire extinguishing agents for the engines or the APU.[2] After the fire warning had stayed on for about two minutes, the commander and co-pilot discussed whether it would be expedient to return to Sola airport or continue to Ekofisk. It would take about 50 minutes to fly back to Sola, and just under 20 minutes to Ekofisk. They agreed that it was best to continue towards Ekofisk, to either the Lima or Kilo platform. They agreed not to ditch the helicopter. They also considered whether to issue a Mayday call, but decided not to.

The crew registered that the turbine temperature in engine 1 was low, and considered this to indicate that any possible fire would have to be on the engine's exterior. The warning continued. After just over three minutes of continuous warning signal, the crew agreed that it was most likely a false warning. It was again discussed whether to issue a Mayday call (this was not done), and whether engine 1 could be restarted before landing.

After the fire warning had lasted for just under four and a half minutes, the crew decided that there were grounds for issuing a Mayday call and that it was best to continue to the platform. The commander issued a Mayday call to the air traffic control service (Polaris Control), informing them that they believed it to be a false warning. They wanted to reduce their altitude to 1,000 ft and continue to Ekofisk Lima (ENEL) instead of Kilo; see Figure 1. At that point, the helicopter was 25 nautical miles from the platform, and the fire warning continued. The crew did not request assistance or to be escorted by a nearby SAR helicopter, nor was this initiated by others.

[1] The collective pitch regulates the pitch of the main rotor blades regardless of their position in the rotation. Higher collective pitch increases the overall lift of the rotor disc, while lower pitch reduces the lift.
[2] The auxiliary power unit (APU) is a gas turbine capable of supplying electrical, pneumatic and hydraulic power to the helicopter systems, but not power to the rotor system.

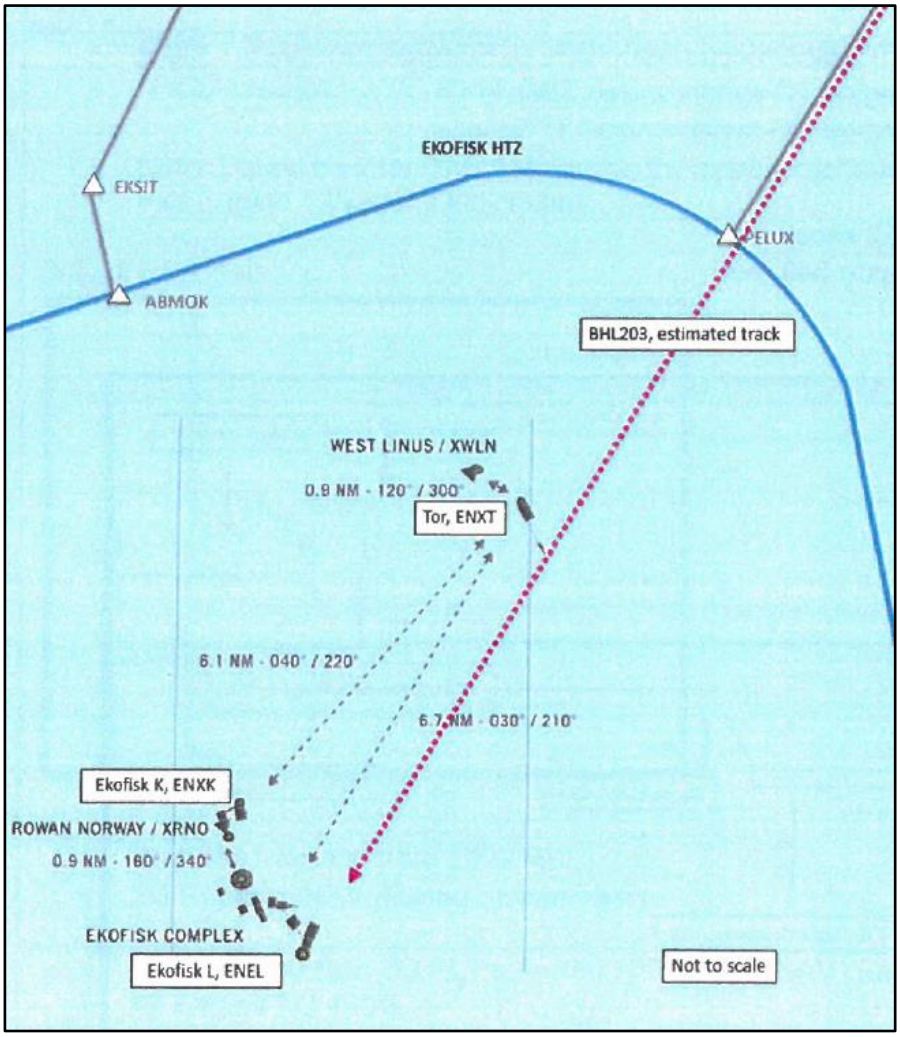


Figure 1: LN-OMI's estimated flight route to Ekofisk Lima. Source: Bristow Norway/NSIA

Six minutes after the fire warning signal commenced, the crew retrieved the Emergency/Abnormal Checklist; see Figure 8. The crew again discussed the possibility of ditching but agreed to continue towards Ekofisk Lima.

Fourteen and a half minutes after the fire warning first started, it stopped briefly before starting again. The warning remained on continuously for another 4 minutes before it stopped again. Half a minute later, the crew restarted engine 1.

The helicopter landed on Ekofisk Lima about 6 minutes later, and just over 25 minutes after the fire warning had first been triggered. Upon inspection of engine 1 and the surrounding area, it was ascertained that there had been no fire or incipient fire, and that it therefor had been a false warning.

The fire detectors in question and both fire bottles were replaced at Ekofisk Lima before the next flight.

The crew told the NSIA that they knew that it has been false fire warnings on the S-92A, but that the warning had been intermittent or gone out after a short period.

1.2 Injuries to persons

Table 2: Injuries to persons

Injuries	Crew	Passengers	Other
Fatal			
Serious			
Minor/none	2	11	

1.3 Damage to aircraft

None

1.4 Other damage

None

1.5 Personnel information

1.5.1 COMMANDER

Male, 41 years old, had a valid Airline Transport Pilot License (ATPL(H)). He had a Class 1 medical certificate without restrictions. The commander had had a rest period of 12 hours before going on duty. He had had 10 hours of service in the last 24 hours.

Table 3: Flying experience, commander

Flying experience	All types	On type
Last 24 hours	1	1
Last 3 days	Not specified	Not specified
Last 30 days	Not specified	Not specified
Last 90 days	133	133
Total	5,170	3,795

1.5.2 CO-PILOT

Male, 34 years old, had a valid Commercial Pilot License (CPL(H)). He had a class 1 medical certificate without restrictions. The co-pilot had had a rest period of 15 hours before going on duty. He had had 10 hours of service in the last 24 hours.

Table 4: Flying experience, co-pilot

Flying experience	All types	On type
Last 24 hours	1	1
Last 3 days	Not specified	Not specified
Last 30 days	Not specified	Not specified
Last 90 days	133	126
Total	3,495	1,464

1.6 Aircraft information

1.6.1 GENERAL INFORMATION

The Sikorsky S-92A is a heavy helicopter with two engines, a four-blade main rotor and a four-blade tail rotor; see Figure 2.

Figure 2: Sikorsky S-92 from Bristow. The helicopter in the photo was not involved in the incident. Photo: Bristowgroup.com/NSIA

The helicopter type has a crew of two pilots and can carry up to 19 passengers in offshore configuration. A full-scale version of the S-92 was first presented in 1992. After completion of development and testing, a type certificate for the USA was issued by FAA[3] in 2002 and subsequently for Europe by JAA/EASA[4] in 2004.

[3] The US Federal Aviation Administration (FAA).
[4] JAA/EASA: JAA refers to the Joint Aviation Administration, a former European regulatory authority for civil aviation and the predecessor of EASA. EASA is the European Union Aviation Safety Agency.

The helicopter type was put into service in Norway to transport oil workers to and from offshore installations in 2007. After the Turøy accident in 2016 involving an EC 225 Super Puma helicopter, the S-92 is the only type of helicopter that performs this service on the Norwegian continental shelf.

The S-92 is equipped with flotation elements and is approved for ditching in wave heights up to sea state 6 (significant wave height up to 6 m).

1.6.2 FIRE WARNINGS AND FIRE EXTINGUISHING

1.6.2.1 Fire warnings

The helicopter type is equipped with five optical sensors to detect fire related to the engines and the auxiliary power unit (APU*).* Each engine has two forward-facing detectors located on the rear fire bulkhead in each engine compartment. The fifth flame detector is mounted in the APU compartment. If the sensors detect infrared light with a wavelength corresponding to fire, an engine fire warning will be triggered in the cockpit in the form of an aural alert and warning lights.

A master caution panel is located at each side at the glare shield. Each panel has six push buttons with internal lights whereas one is FIRE PRESS TONE. Central on the glare shield is the Fire/Arm panel with three lights/push buttons: FIRE ENG #1ARM, FIRE APUARM and FIRE ENG #2 ARM. The aural warning will disappear if the FIRE PRESS TONE is pushed. If the actual button on the central Fire/Arm panel is pushed, the aural warning will disappear, fuel will be shut off to the affected engine and the fire extinguishing system will be armed. The text ARM will illuminate (see Figure 3).

Figure 3: The warning light panels and their position in the cockpit. Source: Flight Safety International (Pilot Training Manual)/NSIA

The system installed in the S-92 has led to several false warnings. The NSIA has been sent an overview of the number of fire warnings for the helicopter type registered in CAA-N's national

database, and the number of warnings that have been registered by Bristow; see Figure 4. CAA-N's figures include both operators of S-92s in Norway in the period 2007 to 2021. The database was searched for reports concerning a S-92 containing at least one of the following words: *fire*, *brann*, *false* or *alarm* ('brann' is the Norwegian word for fire). CAA-N states that there could be up to 15 per cent uncertainty associated with the figures, since the search has not been reviewed in detail.

The figures from Bristow Norway cover the period from 2013 to 2021.

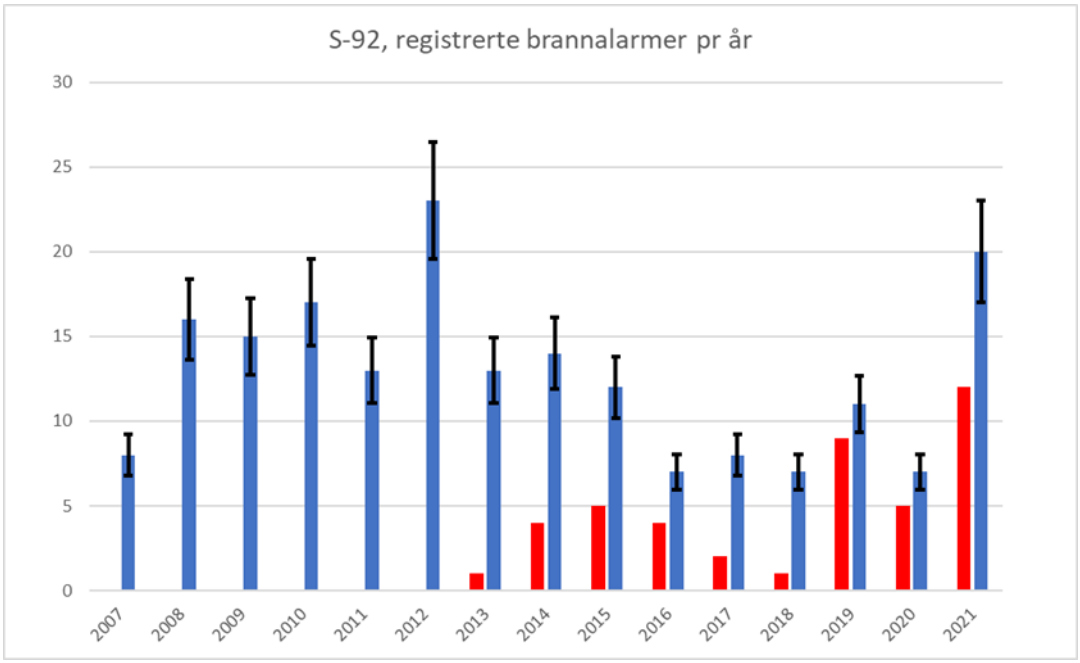


Figure 4: False fire warnings on S-92 helicopters registered by CAA-N (blue bars) and Bristow (red bars), respectively. CAA-N's figures are also marked with up to 15 per cent uncertainty (black bars). Source: CAA-N and Bristow and the NSIA

After the incident, Bristow Norway has examined electrical connectors in the fire warning system in the company's helicopter fleet and identified some corrosion. The operator believes that the number of false warnings has decreased on helicopters where the parts affected by corrosion have been replaced. Examples of corroded parts are shown below in figure 5.

Figure 5: Examples of corrosion found on connectors in the S-92's fire warning system at Bristow's facilities. Photo: Bristow Norway/NSIA

Sikorsky has issued three Alert Service Bulletins (ASB) associated with the engine fire detection system on the S-92A.

ASB 92-26-002, released in 2011, required a one-time replacement of the original flame detectors, which had to be replaced by upgraded ceramic capacitors and Zener diodes to improve flame detection and reduce false warnings at high operating temperatures.

ASBs 92-26-006 and 92-26-007 released in 2016, required a one-time installation of a #2 engine outboard flame detector bracket and wire harness developed to increase stability and reduce component wear attributed to false fire indications.

The LN-OMI modification status was according to these ASBs. Despite this, the operator still recorded several incidents of false warnings. The incident covered in this report is the first that Bristow has registered where the warning remained continuously on.

The operator has stated that crew members do not train for false warnings or to distinguish between false warnings and actual fires during simulator training. They only practice handling a simulated real fire.

1.6.2.2 Fire extinguishing

The S-92 has two pressurized containers, each containing 1.1 kg of Halon 1301 fire extinguishing agent. One is the main container, and the other is the reserve. The main container has two tubes that direct fire extinguishing agent to the right and left engine, respectively. The reserve container can also discharge fire extinguishing agent to the APU. The fire extinguishing agent is released by a switch with the positions *Main* and *Reserve*. When the switch is activated, the fire extinguishing agent is discharged to the unit that is armed. The helicopter is also equipped with a portable fire extinguisher for use in the cockpit or cabin.

1.6.3 TAIL-MOUNTED CAMERA

A tail-mounted camera system has been developed for the helicopter type. The basic system consists of two cameras mounted on the tail fin and the tail boom, respectively. The tail-fin camera films the upper part of the helicopter with the rotor head and the engine exhaust outlets, while the tail-boom camera films the cargo hold, the cargo door and ramp and the surrounding area; see Figure 6 and 7. This allows the crew to watch the area in real time on the cockpit screens, both when the helicopter is in the air and on the ground or on a helicopter deck. The installation also has options for recording images and audio.

Offshore Norge's guideline 066[5] sets out additional requirements for member companies that acquire commercial flight services on the Norwegian continental shelf to have camera surveillance of the helicopter's exterior. About half of Bristow Norway's helicopters were equipped with this type of camera at the time of the incident. LN-OMI was equipped with a tail-mounted camera system.

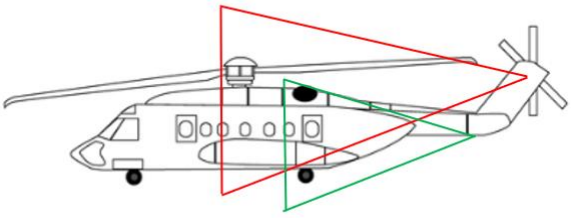


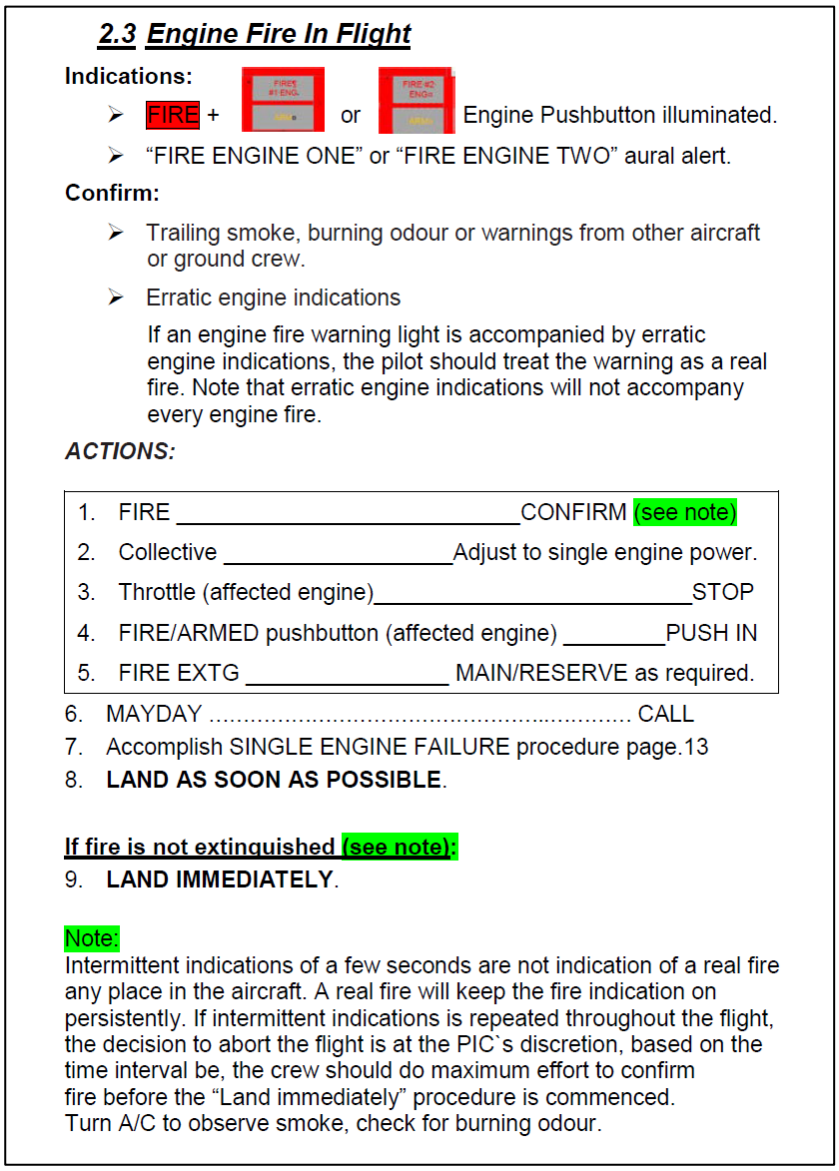
Figure 6: Typical sectors captured by the two tail-mounted cameras. Illustration: Wikipedia

Figure 7: Tail camera view. Illustration: Sikorsky/NSIA

[5] *Offshore Norge is an industry organisation for companies with activities related with the Norwegian Continental Shelf, including energy companies.*

1.6.4 HANDLING OF INDICATED ENGINE FIRE

At the time of the incident, the 15th revision of the *Emergency/Abnormal checklist* from 25 September 2016 was the valid checklist for such situations[6]. The figure below is taken from this checklist.



2.3 Engine Fire In Flight

Indications:

- FIRE + or Engine Pushbutton illuminated.
- "FIRE ENGINE ONE" or "FIRE ENGINE TWO" aural alert.

Confirm:

- Trailing smoke, burning odour or warnings from other aircraft or ground crew.
- Erratic engine indications

  If an engine fire warning light is accompanied by erratic engine indications, the pilot should treat the warning as a real fire. Note that erratic engine indications will not accompany every engine fire.

ACTIONS:

1. FIRE _____ CONFIRM (see note)
2. Collective _____ Adjust to single engine power.
3. Throttle (affected engine) _____ STOP
4. FIRE/ARMED pushbutton (affected engine) _____ PUSH IN
5. FIRE EXTG _____ MAIN/RESERVE as required.
6. MAYDAY ..... CALL
7. Accomplish SINGLE ENGINE FAILURE procedure page.13
8. **LAND AS SOON AS POSSIBLE**.

If fire is not extinguished (see note):

9. **LAND IMMEDIATELY**.

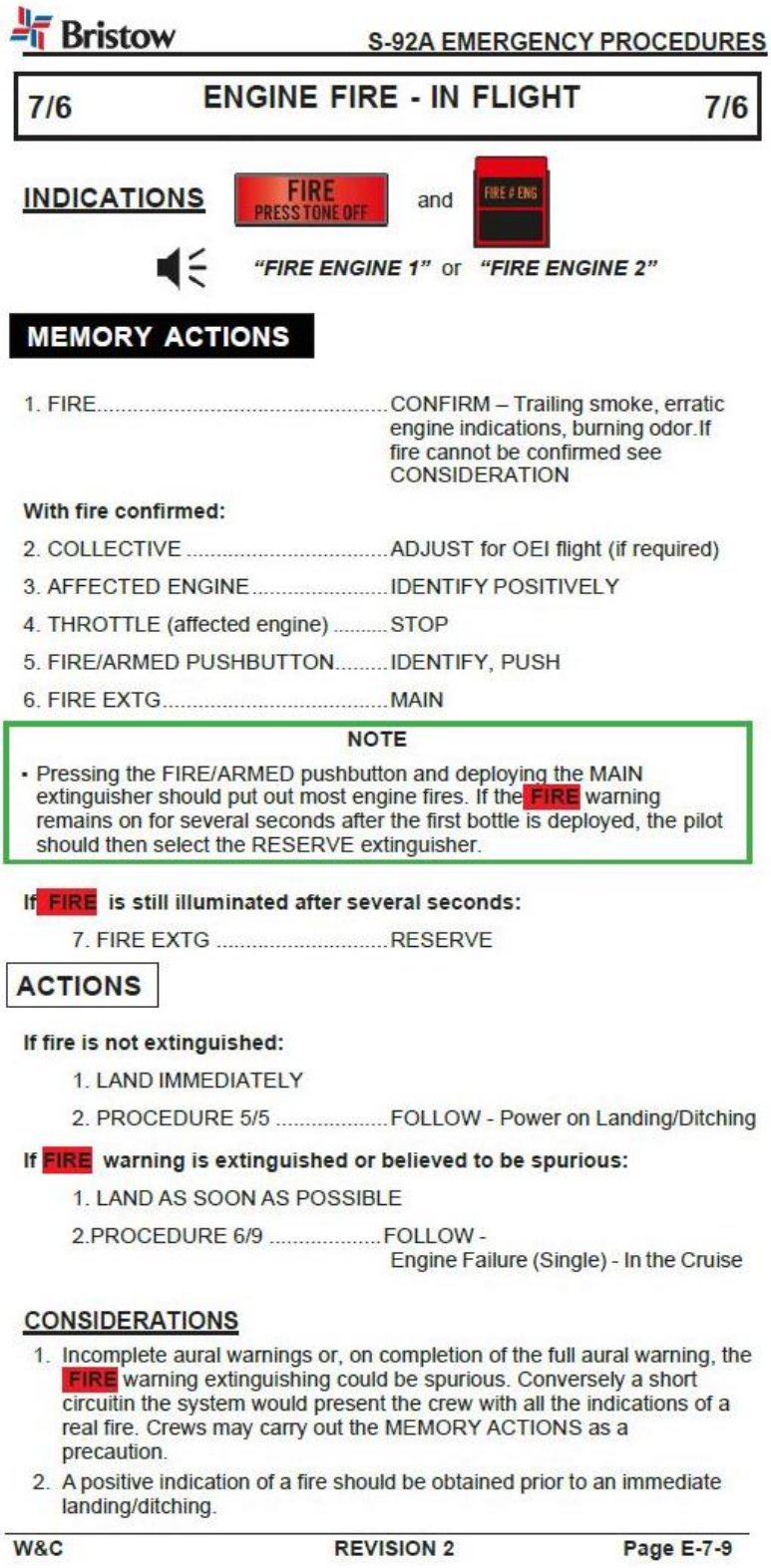
Note:
Intermittent indications of a few seconds are not indication of a real fire any place in the aircraft. A real fire will keep the fire indication on persistently. If intermittent indications is repeated throughout the flight, the decision to abort the flight is at the PIC`s discretion, based on the time interval be, the crew should do maximum effort to confirm fire before the "Land immediately" procedure is commenced.
Turn A/C to observe smoke, check for burning odour.

Figure 8: Checklist for indicated engine fire valid at the time of the incident. Source: Bristow/NSIA

1.6.4.1 Revised emergency procedure

In May 2020, the *Emergency/Abnormal checklist* was replaced by S-92A *Emergency procedures*. This was revised by Bristow Norway and differs from the procedures in force at the time of the incident; see Figure 9. Notably, the revised procedures removed the sentence *"A real fire will keep the fire indication on persistently."* is deleted in the May 2022 revision (see Figure 8).

[6] *A Bristow Norway proprietary checklist.*



Bristow S-92A EMERGENCY PROCEDURES

7/6 ENGINE FIRE - IN FLIGHT 7/6

INDICATIONS FIRE PRESS TONE OFF and FIRE # ENG

"FIRE ENGINE 1" or "FIRE ENGINE 2"

MEMORY ACTIONS

1. FIRE..... CONFIRM – Trailing smoke, erratic engine indications, burning odor.If fire cannot be confirmed see CONSIDERATION

With fire confirmed:

2. COLLECTIVE ..... ADJUST for OEI flight (if required)
3. AFFECTED ENGINE..... IDENTIFY POSITIVELY
4. THROTTLE (affected engine) ..... STOP
5. FIRE/ARMED PUSHBUTTON..... IDENTIFY, PUSH
6. FIRE EXTG..... MAIN

NOTE

- Pressing the FIRE/ARMED pushbutton and deploying the MAIN extinguisher should put out most engine fires. If the FIRE warning remains on for several seconds after the first bottle is deployed, the pilot should then select the RESERVE extinguisher.

If FIRE is still illuminated after several seconds:

7. FIRE EXTG ..... RESERVE

ACTIONS

If fire is not extinguished:

1. LAND IMMEDIATELY
2. PROCEDURE 5/5 ..... FOLLOW - Power on Landing/Ditching

If FIRE warning is extinguished or believed to be spurious:

1. LAND AS SOON AS POSSIBLE
2. PROCEDURE 6/9 ..... FOLLOW - Engine Failure (Single) - In the Cruise

CONSIDERATIONS

1. Incomplete aural warnings or, on completion of the full aural warning, the FIRE warning extinguishing could be spurious. Conversely a short circuitin the system would present the crew with all the indications of a real fire. Crews may carry out the MEMORY ACTIONS as a precaution.
2. A positive indication of a fire should be obtained prior to an immediate landing/ditching.

W&C REVISION 2 Page E-7-9

Figure 9: Engine fire in flight checklist, revised 10 May 2022. Source: Bristow/NSIA

1.7 Meteorological information

After the time of the warning, the flight could continue under visual meteorological conditions (VMC) at 1,000 ft. The METAR[7] report for ENLE (Ekofisk Lima) described visibility of more than 10 km, wind of 29 kt from 150°, local air pressure (QNH) of 1,001 hPa, and cloud base at 1,400 ft.

At the NSIA's request, the Norwegian Meteorological Institute has stated that the significant wave height in the area was 2.5 m. This corresponds to sea state 4.

1.8 Aids to navigation

Flight Management System (FMS), non-directional beacon (NDB) and Airborne Radar Approach (ARA).

1.9 Communications

The crew were in contact with the air traffic service (Polaris Control) during the flight. Before landing on Ekofisk Lima, the crew were in contact with Ekofisk Information (Ekofisk HFIS[8]) on frequency 130,550 MHz.

1.10 Aerodrome information

Ekofisk Lima was equipped with foam extinguishing systems that covered the helicopter deck. Near the helicopter deck were two fire hydrants and several CO_2 and foam or powder extinguishing devices. There was also various emergency equipment available for handling emergency and fire situations.

1.11 Flight recorders

The helicopter was equipped with a combined voice and flight data recorder (CVFDR). The NSIA listened to the voice recordings together with representatives from Bristow Norway's pilots union. This provided a good understanding of the crew's handling of the situation. Information from the flight recorder was retrieved from Bristow Norway and made available to the NSIA.

1.12 Accident site and wreckage information

Not applicable.

1.13 Medical and pathological information

Not applicable.

1.14 Fire

The fire warning system for fire in engine 1 was triggered, but it was concluded after landing that there had been no fire or incipient fire on board.

[7] METAR (METerological Aerodrome Report) is a standardized format for reporting aviation weather information.
[8] HFIS is the Helicopter Flight Information System

1.15 Survival aspects

The helicopter was fitted with floats and certified for ditching in wave heights of up to sea state 6, corresponding to significant wave heights up to 6 meters. A ditching procedure was described in the *Emergency/Abnormal Checklist*, and everyone on board was wearing a survival suit with an emergency locator transmitter and a breathing lung.[9]

Search and rescue (SAR) helicopters were stationed in several places in Norway, both offshore and onshore, including one at Sola and two on Ekofisk.

1.16 Tests and research

The fire detectors involved in this incident were not quarantined for investigation, but rather returned by the operator to Sikorsky. As a result, the incident fire detectors were not examined by the NSIA.

1.17 Organization and management information

At the time of the incident, Bristow Norway had around 400 employees. Internationally, the company operated a total of 63 Sikorsky S-92 helicopters for transport operations and 10 for SAR services in the UK (as of March 2021). Bristow Norway's main administrative and operational base is at Stavanger Airport Sola, and it is an established supplier of helicopter services to oil companies on the Norwegian continental shelf (Sources: Wikipedia and Bristow Norway).

1.18 Additional information

None.

1.19 Useful or effective investigation techniques

No methods warranting special mention have been used in this investigation.

[9] A small bag containing air that can serve as emergency air and extend the time it is possible to stay under water. It can also prevent breathing water.

2. Analysis

2. Analysis

2.1 Introduction

False warnings can be difficult to handle, especially if the checklists do not provide sufficient decision-making support. There is no predetermined answer as to how to act in such situations. The analysis below looks at the options available to the crew and the type of situations that could have occurred. The consequences of the crew first handling the fire warning as if it were real, and then making decisions on the assumption that it was false, are discussed in section 2.2. An analysis of false fire warnings on S-92 helicopters is given in section 2.3 and procedures and training in section 2.4.

2.2 Review of the flight

2.2.1 THE WARNING AND THE IMEDIATE ACTIONS

The crew became aware of an aural alert and warning lights indicating a fire in engine 1. They then checked the tail-mounted camera without seeing anything abnormal and observed that the warning light was continuously lit. No other fault indications were observed. The crew agreed that there was a fire warning on engine 1.

The crew was aware of the possibility of faults in the fire warning system, but believed that, in such case, the warning signal would go out after a short time or flash intermittently. The checklist mentions trailing smoke as an indicator of a real fire. The crew had already checked the tail-mounted camera, but did not check for trailing smoke by for example flying a circle. It appears that the crew initially believed that a continuous fire warning was a sufficient indication of a confirmed fire. This perception might have been augmented by the note in the checklist: *"A real fire will keep the fire indication on persistently."* The NSIA believes that checking for trailing smoke and observe via the camera can be good tools for decision making.

The crew chose to proceed with the *Engine Fire in Flight* checklist without discussing the indications listed under CONFIRM. However, the Confirm items on the emergency checklist are not absolute. The crew then stopped engine 1 and deployed a fire extinguisher bottle into the engine. When the fire warning signals continued, they also deployed the reserve bottle.

Shortly after the reserve bottle was deployed, the crew concluded that the fire warning was probably false. Their belief that the warning was false was relayed to Polaris Control in connection with the Mayday call they issued five minutes after the situation arose.

At that time, the helicopter was in a situation with an ongoing fire warning, but with no further possibilities of extinguishing a possible fire. The last two items on the checklist are LAND AS SOON AS POSSIBLE and LAND IMMEDIATELY. The crew chose the first option and set course for Ekofisk Lima. This decision was according to the checklist and based on the crew's belief that the fire warning was false.

The NSIA note that the crew did not declare Mayday until later. A situation that leads to a single engine offshore flight with pax on board should imply an immediate Mayday call, as stated as action 6 on the emergency checklist. The consequences of an engine fire can be severe. Fire warnings must consequently be taken seriously even if the fire warning system is prone to faults. However, the crew had no other warnings indicating that there was a fire on board. Training and better understanding of the fire warning system my provide the crew with better decision-making tools.

2.2.2 DECISION TO FLY TO EKOFISK LIMA

Although the sea state was within the limits of the helicopter's capabilities, the NSIA understands that ditching was not an appealing option, given that the crew believed that the warning was false. An immediate landing at sea could increase the risk for those on board and very likely lead to loss of the helicopter. Report 1998/02 on the ditching of a Super Puma southwest of Sola on 12 January 1996, provides a good picture of the problems that may occur in connection with ditching. The decision to land in the sea or not is difficult, especially during harsh weather conditions. In some cases, however, a landing in the sea is the safest, or only option.

Flying towards Ekofisk Lima fulfilled the checkpoint LAND AS SOON AS POSSIBLE, but would increase the risk in several areas:

- If there still was a fire on board the helicopter, it would not be a good idea to land on an oil installation.
- Landing on Ekofisk Lima with only one engine in operation would entail an increased risk.
- Restarting the engine could pose a safety risk, especially because it was not clear why the fire warning had been triggered.
- Could a possible fire be reignited when the engine was restarted? In such case, the crew would have had no possibility of extinguishing the fire.

The crew could have chosen to set course for land. This would increase the flight time significantly, but the SAR helicopter at Sola could have flown out to meet them. Upon reaching them, the SAR helicopter could have followed the flight and observed possible secondary indications of fire and assisted during a possible ditching. In a normal situation, this would mean that LN-OMI would have to fly an extra 15 minutes over the open sea before reaching the SAR helicopter. By setting course for Sola, the crew could also have landed on a runway without having to restart engine 1. Another advantage of flying to Sola would be that the fire and rescue service at Sola is well equipped to handle a helicopter fire.

2.2.3 THE LANDING ON EKOFISK LIMA

As the helicopter approached Ekofisk Lima, the crew became more certain that the fire warning was false. The belief that the fire warning was unreliable was reinforced by the fact that the warning briefly disappeared before coming back on again. They therefore restarted engine 1 and landed.

The NSIA recaps that the crew first handled the fire warning as real before later concluding that it was false. The biggest difference between these two conclusions was that they had not found any other indications during the process that there really was a fire on board.

Although there was a high probability that the fire warning was false, it could not be ruled out that there had been a fire on board that had been extinguished by the fire extinguishing bottles. The NSIA has previously investigated an incident involving an engine fire on a DHC-8-402, where the fire warning remained on even after the fire had been extinguished (Report 2007/33). Restarting engine 1 could, at worst, initiate a new fire or a new fault that could affect the safety of the helicopter.

Based on such uncertainty, an alternative could have been to set course for land instead of landing on an oil and gas platform with fewer aids available and potentially greater consequences.

At times, the checklists provided little help for the crew to make decisions. It will therefore be up to the commander to make the decisions that seem right in the situation at hand, based on available

knowledge and information. The crew agreed with the decisions made, including the decision to land on Ekofisk Lima.

2.3 False warnings

Based on the finding of corrosion by the operator on their other S-92 helicopters, it is possible that the false warning during this accident flight was caused by corrosion or other damage to the fire detectors and its wiring. However, this could not be confirmed as the fire detectors in question were never examined and tested. Generally, corrosion can be an issue on aircraft flying in the vicinity of salt water.

Figure 4 shows that there had been a high number of false fire warnings on S-92 helicopters. A large percentage of these warnings are related to Bristow Norway. The NSIA believes that false warnings poses a serious problem, particularly because false warnings reduce confidence in the fire warning system. The number of incidents should form the basis for raising questions with both CAA-N and the operators. The NSIA is surprised that CAA-N has not been aware of the high number of reported false fire warnings associated with the S-92. A fire warning system that triggers a high number of false warnings can pose a significant safety risk, in the event of both false warnings and real fires being misinterpreted.

The flights often take place over inhospitable seas, and almost half of all landings take place on offshore installations. Accordingly, from a risk perspective, the safety authority should devote much attention to this helicopter type. The helicopter type was at the time of the incident the only one used for transporting oil workers to and from the Norwegian continental shelf. Consequently, incidents and accidents involving the helicopter type can also have major negative consequences for the oil and gas industry. The NSIA is also surprised that Bristow Norway appears to have accepted the high number of false warnings. Only after the incident in question did the company undertake a more thorough inspection of the fire warning system. Corrosion found in components in the fire warning system may have contributed to several of the false warnings.

The NSIA has not looked more closely at Bristow Norway's dialogue with the helicopter manufacturer Sikorsky regarding false fire warnings. However, it must be expected that the two major S-92 operators in Norway, Bristow Norway and CHC Helicopter Service, receive sufficient support to be able to resolve technical issues associated with the helicopter type. The NSIA believes that the high number of faults may constitute a breach of the requirements for certification of the fire warning system.

The NSIA has contacted EASA due to the high number of reported faults in the S-92's fire warning system. EASA has stated that they will raise the issue with Sikorsky and the Federal Aviation Authority (FAA). The NSIA presumes that Bristow Norway, Sikorsky, CAA Norway, EASA and FAA will exchange information about the issue and take the necessary measures. For this reason the NSIA does not propose any safety recommendations.

About half of Bristow Norway's helicopters are currently equipped with tail-mounted cameras, which also is a requirement according to Document 066 from Offshore Norge. This can help the crews determine whether there is a real fire. In the opinion of the NSIA, consideration must be given to having a uniformly equipped helicopter fleet.

2.4 Procedures and training

The crew that was involved in this incident had not been trained specifically to handle false warnings. They did have a checklist they could use, but a situation with a continuous false warning was not mentioned. Consequently, the crew had to make several decisions based on their best judgement.

The NSIA believes that Bristow Norway should provide the crews with a better basis for decision-making in the event of a fire warning. Part of this work must be to revise the emergency checklist to also include using the tail-mounted cameras to determine whether a fire warning is real. Furthermore, the restart of engines and the term LAND AS SOON AS POSSIBLE should be discussed based on, among other things, the prevailing risk and available aids. The NSIA also believes that the company should provide simulator training in how to handle false warnings.

Finally, the NSIA wishes to point out that the wording used in parts of the new checklist for *Engine Fire In Flight* makes the content difficult to decipher. Point 1 in the section *Considerations* is difficult to read and understand (see Figure 9). A checklist that addresses fire on board must be clear and unambiguous.

3. Conclusion

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3.1 Main conclusion

False warnings have occurred a number of times in the fire warning system on this helicopter type. This may explain why the crew first stopped the affected engine and deployed both fire bottles, before they concluded that the warning was false, restarted the engine and landed on the oil and gas platform Ekofisk Lima.

3.2 Investigation results

A. The crew members were aware that the fire warning system on the S-92 gave a relatively high number of intermittent false warnings.

B. The fire warning in question was atypical because the warning signals remained constant for a long time.

C. The crew found no secondary indications of a real fire on board.

D. The engine was shut down and both fire extinguishing bottles were deployed, but the warning continued.

E. After both fire extinguishing bottles had been deployed, the crew did not have any available fire extinguishing agents in the event of a real fire in the engine or APU.

F. Because of uncertainty about the situation, the crew decided to continue the flight to Ekofisk and not return to Sola.

G. The crew issued a Mayday call but did not request assistance or escort from SAR helicopters in the area.

4. Safety recommendations

4. Safety recommendations

The NSIA issues no safety recommendations.

Norwegian Safety Investigation Authority
Lillestrøm, 10 March 2025

Abbreviations and references

Abbreviations

APU	Auxiliary Power Unit
CAA-N	Civil Aviation Authority Norway
ICAO	International Civil Aviation Organization
EASA	European Union Aviation Safety Agency
ft	foot (0.305 m)
NTSB	National Transportation Safety Board
SAR	Search and Rescue
NSIA	Norwegian Safety Investigation Authority