



Annual Report

[Translation from the Swedish original]

Financial Year 2016

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1. Focus of operations

1.1 Tasks

The Swedish Accident Investigation Authority (Statens haverikommission, SHK) has the task of investigating serious accidents and incidents in aviation, maritime transport, rail transport, road transport and other activities, all from a safety perspective. "Other activities" includes all other activities in society that cannot be classified as aviation, maritime transport, rail transport or road transport. SHK's investigative duties cover both civilian and military activities.

SHK also cooperates with the relevant safety authorities in their effort to prevent accidents, as well as with other countries' accident investigation authorities and certain international bodies that work in this field such as the European Aviation Safety Agency (EASA), the European Maritime Safety Agency (EMSA) and the European Union Agency for Railways (ERA).

The purpose of SHK's investigations is to

- clarify, as far as possible, the sequence of events and their causes, as well as damages and other consequences,
- provide the basis for decisions aiming at preventing similar events from occurring in the future, or limiting the effects of such events, and
- provide a basis for an assessment of the operations performed by the public emergency services in connection with the event and, if there is a need, for improvements to the emergency services.

The sole purpose of SHK's operations is to improve safety. The authority has no inspection remit, nor is it any part of its task to deal with issues of blame, liability, damages or matters of certification, disciplinary measures, etc. This means that such matters are neither investigated nor discussed in connection with an investigation.

1.2 Provisions that regulate SHK's operations

SHK's operations are primarily regulated by the Accident Investigation Act (1990:712), the Accident Investigation Ordinance (1990:717), the Ordinance (2007:860) with instructions for SHK, as well as Regulation (EU) No 996/2010 of the European Parliament and of the Council on the investigation and prevention of accidents and incidents in civil aviation, and Commission Regulation (EU) No. 1286/2011 on adopting a common methodology for investigating marine casualties and incidents.

Also of great importance to the investigations are Directive 2009/18/EC of the European Parliament and of the Council establishing the fundamental principles governing the investigation of

accidents in the maritime transport sector (the Maritime Accident Investigation Directive), and Directive 2004/49/EC of the European Parliament and of the Council on safety on the Community's railways (the Railway Safety Directive),¹ as are Annex 13 of the Chicago Convention² and the IMO Code³.

2. RESULTS

2.1 *Structure of the Results section*

General

SHK's report is divided into the following sections: civil maritime transport, rail, civil aviation, military and other operations.

SHK has chosen to report statistics pertaining to the past three years; first in total and then for each investigation area. This is followed by a more detailed commentary on the statistics and other circumstances that have a bearing on the fulfilment of the objective.

Statistics pertaining to the total number of cases received and concluded, as well as the opening and closing balance (backlog), the number of cases in which a decision was made to launch an investigation or to carry out a formal preliminary assessment (applies only to maritime occurrences), the number of final reports and the extent to which it was possible to establish the probable cause of the accident, the number and proportion of final reports produced within twelve months and the average and median times to conclude the investigation in months are provided for each area. Furthermore, the report includes the number of ongoing investigations at the end of the year, the proportion of these that had then exceeded 12 and 18 months respectively, as well as the average and median investigation times in months at that point in time. Finally, a report is given of SHK's assessment of the responses to its safety recommendations to, e.g. supervisory authorities received over the year.

“New cases” are all accidents and incidents reported to SHK over the course of year. “Cases concluded” are all cases pertaining to accidents and incidents that SHK has concluded over the course of the year. “Investigations commenced” denotes the occurrences that SHK has decided to investigate over the course of the year, and “final reports published” denotes investigations concluded over the course of the year for which final reports have been published.

¹ The Railway Safety Directive has been replaced in 2016 by Directive (EU) 2016/798 of the European Parliament and of the Council of 11 May 2016 on railway safety, which is already partly in force, with other parts being implemented gradually by 2020 at the latest.

² The Convention of 7 December 1944 on International Civil Aviation, Annex 13, which contains international standards and recommended practices for the investigation of accidents and incidents in civil aviation.

³ The International Maritime Organisation (IMO) Code of International Standards and Recommended Practices for a Safety Investigation into a Marine Casualty or Marine Incident (Casualty Investigation Code).

With regard to foreign investigations in which SHK has participated but where the investigation was or is led by the investigatory authority of another state, only the number of new cases and cases concluded and the opening and closing balances are reported.

Incidents

In this context, it should be noted that incidents are not reported separately from accidents. The reason for this is primarily that it is often purely down to chance whether an occurrence has had such consequences as would lead it to be classified as an accident or as an incident in accordance with the law. In many cases involving minor accidents, there are often circumstances which mean that the occurrence can also be considered a near-miss in terms of a larger, serious accident.

Handling of safety recommendations

Safety recommendations are only reported for investigations led by SHK. The number of recommendations made over the course of the year is stated here, along with the number of these recommendations that were implemented and not implemented, respectively, as well as the opening and closing balance. A safety recommendation is considered to have been implemented if its purpose has been fulfilled, even if the recipient of the recommendation has chosen another way to implement it. That a recommendation has not been implemented means the recipient has adopted a final position on it and decided not to take any action in response to the recommendation, or in any case no action that SHK deems appropriate, or that the recipient has not provided a response to the recommendation within the prescribed deadline and SHK has determined that keeping the case open serves no purpose.

2.2 Objectives

The investigations of accidents and incidents carried out by SHK are to be concluded without delay, if possible within twelve months of the accident or incident taking place.

2.3 Operational development

2.3.1 Overall assessment

SHK's overall assessment is that its operations have continued developing in a positive direction and that the authority has generally fulfilled its objectives in 2016, while there is still room for improvement in terms of investigation times. SHK's cooperation with the relevant safety authorities, other countries' investigation bodies and international bodies active in this field functions well overall and is being continuously developed.

Operations are almost entirely governed by events. New accidents and incidents demand a rapid response in the initial phase, both to enable an accurate assessment of whether or not they are to be investigated and to ensure that no investigation material is lost. In turn, this repeatedly leads to ongoing investigations having to be put aside. One consequence of this is that investigation times can be difficult to predict. In some cases, primarily those with international involvement, they can also be difficult, even impossible, to influence on the part of SHK. Consequently, it is not always “possible” to conclude an investigation within twelve months of the occurrence. Naturally, this does not prevent SHK from constantly having to actively strive to achieve this objective. SHK’s assessment is also that the efforts that has been made and continue to be made in this regard have brought SHK gradually closer to this objective. The challenge for the near future will be to ensure the sustainable continuation of this positive trend.

Measures to improve the planning and follow-up of investigations have been implemented. Since 2016, SHK’s operational plan has contained the objective that at least 80 per cent of SHK’s investigations are to be concluded within twelve months and that no investigation is to take longer than 18 months. The work to introduce a comprehensive operations management system continues and is expected to be fully implemented in 2017.

SHK’s operational area is wide and the Ordinance (2007:860) with instructions for SHK contains requirements as to the human resources expertise that SHK must have in place. Investigators have a high level of specialist expertise within their fields, which means that they are only capable of standing in for one another in a limited capacity. This makes SHK’s supply of staff vulnerable.

SHK is facing a number of retirements in the coming years. Work to recruit replacements has begun, but there is a risk of losing expertise when experienced investigators retire. Furthermore, one rescue services investigator has left their post in 2016 and a replacement eventually needs to be recruited.

2.3.2 *Investigation of accidents and incidents*

Authority-wide results

The following section contains an account of SHK’s authority-wide results with regard to new cases and cases that have been concluded, investigations that have been commenced, final reports that have been published, investigation times and issued and implemented safety recommendations.

Table 1. The number of cases received and concluded (including those led by another state).

Year	2014	2015	2016
Opening balance	64	59	48
New cases	461	415	413
Concluded cases	466	426	420
Closing balance	59	48	41

The number of new cases is about the same as in 2015 but lower than 2014. The total closing balance of cases at the end of the year has continued to decrease.

Table 2. Investigations commenced and final reports published.

Year	2014	2015	2016
Investigations commenced	35	24	25
Final reports published	36	35	24
Probable cause of accident established	35	35	23

The number of final reports published decreased in 2016, primarily as a result of the number of commenced investigation in the past two years having been lower than previously. In turn, this is due to investigatory activities being governed by events, rather than to any change in how it is decided which occurrences are to be investigated. The number of reported occurrences has decreased and the degree of severity of the occurrences that are reported, which governs what is to be investigated, varies. In addition, the substantial effort that has been made in recent years to work through old investigations has resulted in a continued decrease in the opening balance of ongoing investigations.

The probable cause of the accident has been established in all cases but one, which is the same level as in 2014, but a decrease compared with 2015, when the cause was established in all concluded investigations.

Table 3. Number and proportion of investigations led by SHK concluded within 12 months and mean and median investigation times in months.

	2014	2015	2016
Total number of reports published	36	35	24
Number concluded within 12 months	17	28	16
Percentage concluded within 12 months	47	80	67
Mean investigation time	16.2	10.9	12.8
Median investigation time	13.0	11.4	11.8

The proportion of investigations that could be completed within twelve months was 67 per cent, which is lower than in 2015, when the corresponding figure was 80 per cent. However, this is still a significant improvement on the figure for 2014. Both the average and the median investigation time for the investigations concluded over the course of the year have increased somewhat, but are still decidedly below those of 2014.

Table 4. The number of ongoing SHK investigations at the end of the year, the percentage of these that had exceeded 12 and 18 months respectively at that time, and the mean and median investigation times at that point in time, in months.

	2014	2015	2016
Number of ongoing investigations at the end of the year	32	22	23
Percentage that had exceeded 12 months	13	18	9
Percentage that had exceeded 18 months	3	5	0
Mean investigation time at the end of the year	6.6	7.2	6.5
Median investigation time at the end of the year	5.8	5.8	6.8

The balance of ongoing investigations at the end of the year is at the same level as in 2015, but is decidedly lower than the year before that.

The percentage of ongoing investigations at the end of the year that were, at that time, older than 12 and 18 months, respectively, has continued to decrease sharply. At the end of 2016 there were only two ongoing investigations that were older than 12 months and none that were older than 18 months.

Of the investigations that took longer than twelve months to conclude, two investigations within civil maritime transport and one within civil aviation can be specifically noted. These took between 22 and 25 months. They were of such a complex nature that it was clear early on that it would not be possible to complete them within twelve months.

For several years, investigations of military activities have stood out as the area in which it has been most difficult to achieve the objective of a maximum investigation time of twelve months. In some cases, but not all, there are well-grounded explanations for these investigation times. The two military final reports published in 2016 had an average investigation time of 17.5 months. Over several years, this is a clear reduction, but further action needs to be taken to achieve the objective within this area.

In addition, SHK published three investigations in 2016 that took 12–14 months to complete.

The limited, and sharply reduced, number of ongoing investigations that were older than twelve months at the turn of the year (two) indicates that the long-term trend is still towards shorter investigation times and that the actions taken in order to achieve this objective have had the intended effect.

Table 5 Safety recommendations.

Year	2014	2015	2016
Opening balance	76	38	30
Issued	61	65	88
Implemented	84 ⁴	55	47
Not implemented	15	18	8
Closing balance	38	30	63

The number of safety recommendations issued has increased markedly compared with both 2015 and 2014. The number of responses to recommendations that have been processed has decreased and the closing balance has therefore increased compared with 2015 and 2014, primarily due to 50 of the recommendations having been issued in the final months of the year and the recipient of the recommendations having 90 days in which to submit their response.

Civil maritime transport

With regard to civil maritime transport, all investigations in which SHK has decided to delegate the task of leading the investigation to the investigative body of another state, in accordance with Section 8 d of the Accident Investigation Ordinance (1990:717) are reported separately (see Table 6). These decisions are motivated by the requirement in the same provision that each accident or incident at sea be subject to only one investigation conducted by an EU member state. According to the Maritime Accident Investigation Directive, concerned member states are therefore to reach an agreement regarding which of them is to lead any such investigation.

There is almost no potential for SHK to influence the investigation times of these investigations, and these cases are concluded only once a final report is issued by the other country's accident investigation authority. Consequently, these investigation times are not reported here. Any safety recommendations in such cases are followed up by the foreign investigation body and not by SHK, which is also why the recommendation handling process is not reported for these investigations.

⁴ Seven recommendations that were implemented in 2014 have been incorrectly reported as open in the annual reports for 2014 and 2015.

Table 1. Total number of cases (including investigations led by another state).

Year	2014	2015	2016
Opening balance	21	19	16
New cases	222	217	209
Concluded cases	224	220	218
Closing balance	19	16	7

The number of occurrence reports received has decreased marginally compared with both 2015 and 2014. The closing balance has continued to decrease and has been more than halved compared with the figures for 2015 and 2014.

Table 2. Preliminary assessments, investigations commenced and final reports published – investigations led by SHK

Year	2014	2015	2016
Preliminary assessments	22	6	6
Investigations commenced	10	8	6
Final reports published	11	10	10
Probable cause of accident established	11	10	10

The number of investigations commenced has also decreased somewhat compared with 2015 and 2014. Six preliminary assessments have been made by SHK over the course of the year, which is in line with 2015, but fewer than in 2014. As mentioned in the annual report for 2015, one of the reasons for the reduction in the number of preliminary assessments compared with 2014 is that having several years' experience of working in accordance with the Maritime Accident Investigation Directive has led to a more restrictive interpretation than was initially the case of what is to be considered a serious (but not a very serious) casualty in accordance with the directive.

The number of reports published is at the same level as in 2015 and 2014. Ten final reports have been published over the course of the year. Probable causes of the accidents and incidents have been established in all cases, which was also the case in 2015 and 2014.

Table 3. Number and percentage of investigations concluded within 12 months and mean and median investigation time in months – investigations led by SHK.

	2014	2015	2016
Total number of reports published	11	10	10
Number concluded within 12 months	2	7	7
Percentage concluded within 12 months	18	70	70
Mean investigation time	20.4	12.6	14.4
Median investigation time	16.9	11.9	11.8

Of the final reports published over the course of the year, 70 per cent were concluded within twelve months, which is the same as in 2015 and a substantial improvement on 2014, when only 18 per cent were concluded in less than twelve months.

The mean investigation time for cases concluded in 2016 was 14.4 months, which is a deterioration compared with 2015, but a significant improvement compared with 2014. The deterioration is due to the investigation time for two of the investigations being very long. However, the median investigation time has continued to decrease compared with both 2015 and 2014.

The three reports for which the investigation time exceeded twelve months will be commented on specifically below.

Final report RS 2016:03 covers a series of maritime incidents on the Malmö – Travemünde route between 28 March 2013 and 11 March 2014. The investigation time for this case was 25 months. The reasons why this took so long to investigate included the case having been initiated at a time when the workload was very high in the maritime investigation area. The case therefore had to be put in the back of the queue behind other older investigations that were prioritised. Added to this was the fact that the person who was primarily working on the case left and a new investigation group had to take over.

It was admittedly clear at an early stage of the investigation that the fundamental cause of the majority of the incidents was the deficient installation of a new control system. However, the investigation showed that the vessel has been operating with these relatively serious operational disruptions for a fairly long time without the shipping company, the classification society or the supervisory authority intervening in a sufficiently effective manner. Consequently, the focus of the investigation ended up shifting onto organisational issues, rather than the purely technical causes of the operational disruptions. This resulted in the investigation becoming relatively complex and extensive.

SHK's final report RS 2016:10 concerned the cargo vessel KERTU that was owned by an Estonian shipping company and registered in Malta. The vessel ran aground in bad weather off Landsort and refloated itself after four hours. The vessel then anchored, but was taking in water at such a rate that it was close to foundering. The situation was made worse by the fact that the Swedish authorities involved did not intervene until more than ten hours had elapsed. It was then possible to evacuate the vessel, pump out the water and tow her into port. The damage to the vessel was such that she was subsequently scrapped. The investigation time was 25 months.

The causes of the grounding itself were relatively uncomplicated, but the complete sequence of events can be described as complex and drawn-out. A major focus of the investigation was on the provisions that regulate rescue operations and the intervention of the authorities with regard to vessels and the preparedness of the Swedish authorities involved to deal with serious accidents of this type. It was therefore clear at an early stage that the investigation would be extensive and that it would not be possible to conclude it within twelve months. To some extent, this also led to other ongoing investigations that would be possible to conclude in a shorter space of time, being prioritised.

The final report RS 2016:01 deals with a collision in the fairway off Malmö on 16 March 2015. The investigation time was just over 12 months. In spite of a heavy workload within the maritime investigation area, the goal was to complete the investigation before the anniversary, but this was not possible, primarily due to the external consultation process taking longer than expected. Consequently, the investigation time ended up exceeding twelve months by about one week.

Table 4. Number of ongoing SHK investigations at the end of the year, the percentage of these that had then exceeded 12 and 18 months respectively, and the mean and median investigation times in months.

	2014	2015	2016
Number of ongoing investigations at the end of the year	11	10	6
Percentage that had exceeded 12 months	18	20	0
Percentage that had exceeded 18 months	9	10	0
Mean investigation time at the end of the year	6.6	7.7	4.3
Median investigation time at the end of the year	6.3	6.1	4.2

There has been a marked improvement in terms of both the mean and the median investigation time for the investigations that were still ongoing at the end of the year. At the turn of the year, there were,

unlike in 2015 and 2014, no investigations that were older than 12 months.

Table 5. Safety recommendations – investigations led by SHK

Year	2014	2015	2016
Opening balance	8	23	6
Issued	33	26	51
Implemented	16 ⁵	29	25⁶
Not implemented	2	14 ⁷	3
Closing balance	23	6	29

In 2016, 51 safety recommendations were issued and 28 responses have been processed. With regard to the closing balance of 29 recommendations, either the deadline for a response has not yet passed or the response has not yet been conclusively processed by SHK.

Of the responses to recommendations that have been processed over the course of the year, 25 safety recommendations have been deemed implemented or partly implemented. The remaining three recommendations have been deemed not implemented. The recommendations that have been deemed either only partly implemented or not implemented are described below.

Final report RS 2015:07, which concerned a grounding in Trollhätte Canal on 12 November 2014 involving the dry cargo vessel NOSSAN, contained the recommendation that the Swedish Civil Contingencies Agency (MSB) review the level of knowledge and expertise as well as planning within the municipal emergency services as regards rescue operations with respect to accidents to ships and take action, if necessary, to reinforce its capacity to – in collaboration with and with the support of other actors – undertake rescue operations in conjunction with accidents involving shipping (RS 2015:07 R4). The background to this recommendation was that the investigation gave rise to questions whether municipal emergency services have sufficient knowledge, expertise and plans to deal with maritime accidents within the area of municipal responsibility.

MSB's response to the recommendation included the statement that MSB provides training in fighting fires on board vessels in port, that this training encompasses how to collaborate with other actors and how responsibilities are allocated, not least when vessels are in port. MSB intended to review the information it puts out about this training, especially how it is marketed. Furthermore, MSB claimed that it has produced a model that will provide fire and rescue services with improved support when planning operations. The model, called the

⁵ One of which was assessed to have been partly implemented and one of which was withdrawn by SHK.

⁶ Five of which were assessed to have been partly implemented.

⁷ Ten of which were concluded as no response to the recommendation was received by SHK.

eight-step model, involves identifying and remedying deficiencies that arise.

According to SHK, the response to the recommendation did not make it clear whether the training offered by MSB also encompasses types of accidents other than fires or the way in which the training available currently deals with all aspects of the problems described in the report. At the time of the accident in question, it was a matter of a grounding and subsequent sinking, but there are also other types of maritime accidents that may occur within the area of municipal responsibility – that do not involve fire – in which the emergency services need to have specific knowledge and expertise, e.g. when it comes to collisions or loss of stability because of shifting cargo. Nor did it state how the introduction of the eight-step model would implement the safety recommendation. Given this, the recommendation was deemed not to have been implemented.

The aforementioned final report RS 2016:03, which concerned a series of incidents on board the vessel FINNTRADER, contained the recommendation that Finnlines Ship Management AB (Finnlines) ensure that the procedures for incident reporting are improved so that they comply with the applicable regulations (RS 2016:03 R5). The background to this recommendation was that the investigation showed that reporting to the supervisory authority was deficient in terms of the incidents concerned.

In its response to the recommendation, Finnlines claimed, among other things, that all masters had been given SHK's report and verbal information about their obligations in terms of reporting and about how important incident reporting is. However, no update to the current job description in the shipping company's safety management system was deemed necessary as, according to the company, it was already clear the way it was.

While it is true that SHK was of the opinion that many of the actions Finnlines has taken were adequate, it did not share the assessment that the job description for masters that the shipping company referred to did not need to be changed. The job description only referred to the reporting of marine casualties in accordance with Chapter 6, Section 14 of the Swedish Maritime Code. Accordingly, there was no reference to the reporting obligations pursuant to Section 20 of the Swedish Accident Investigations Ordinance (1990:717) and the Swedish Maritime Administration's Decree (SJÖFS 1991:5) with Regulations on the Reporting of Maritime Casualties and the Registration of Maritime Declarations, which also encompasses reporting of incidents and less serious maritime casualties. Given this, SHK did not share the shipping company's assessment that the job description was already clear and made the assessment that the recommendation had been only partly implemented.

The same report contained the recommendation that the classification society DNV GL work as part of its supervisory activities to ensure that incident reporting from vessels to the supervisory authority takes place in accordance with the applicable regulations (RS 2016:03 R6). DNV GL's response to the recommendation indicated that the society had concluded that the instructions, in terms of the society's own reporting to the supervisory authority, had not been complied with in this case, but stated that those involved had now been reminded of their obligations. In its assessment of the response to the recommendation, SHK concluded, that the recommendation was aimed at ensuring that the society's supervisory activities would also encourage *vessels* that the society inspects to report accidents and incidents in accordance with legal and regulatory requirements. The recommendation was therefore deemed not to have been implemented.

DNV GL was also recommended to consider establishing procedures for how long or under what circumstances a condition of class may be extended (RS 2016:03 R7). The background was that the investigation had shown that DNV GL had avoided coming closer to a withdrawal of FINNTRADER's classification certificate by repeatedly extending the deadline for the condition of class. The investigation also showed that the internal procedures placed no restriction on the number of times the condition of class could be extended. Nor did the procedures contain any specific terms and conditions under which an extension could be granted.

It was evident from the response to the recommendation that DNV GL also did not believe that the case had been managed in accordance with established practice or in line with the intentions of the governing documents. With hindsight, it would have been better to issue a classification certificate that meant that all the problems would have had to be rectified before the vessel was put back into service, rather than granting FINNTRADER repeated extensions to the deadline. SHK found it positive that DNV GL had come to this realisation. However, the response did not indicate whether DNV GL had given more detailed consideration to changing or clarifying the procedures for extensions of classification certificates in order to avoid this situation being repeated. The recommendation was therefore considered only partially implemented.

DNV GL was also recommended to review its procedures for ensuring that relevant expertise is used when approving and inspecting supervisory objects (RS 2016:03 R8). DNV GL described its training and qualification programme in its response. This description stated that inspectors' training and qualifications determine what inspections and investigations the inspectors are authorised to perform. The response also stated that DNV GL understood that relevant expertise had been available in the case in question. However, the response could perhaps be interpreted as saying that DNV GL did not believe there was any need to make changes to the applicable procedures. In any case, the response did not state whether the society had considered

reviewing its procedures in order to ensure that inspections are performed by people with the correct expertise. Accordingly, the response could only be regarded as partly satisfactory.

DNV GL was finally recommended to clarify the distribution of responsibilities within its organisation and the communication pathways between the classification society and the supervisory authority and the rules for reporting to the supervisory authority (RS 2016:03 R9). In its response to the recommendation, the society provided an account of how reporting to and communication with the supervisory authority is managed in its internal database. However, SHK found that the response did not indicate what the society had done to further clarify to its staff the division of responsibilities and the communication pathways between the society and the supervisory authority. Nor did it indicate what had been done in order to make the regulations concerning accident and incident reporting well-known internally within the organisation. Consequently, SHK found that the recommendation could not be deemed to have been implemented.

The final report RS 2016:05, which concerned the collision between the vessels STENA JUTLANDICA and TERNVIND in Gothenburg's archipelago on 19 July 2015, contained the recommendation that the shipping company Stena Line Scandinavia AB (Stena Line) review its working schedules or in some other way compensate for the risks of fatigue that may arise in its operations (RS 2016:05 R5). The background was that SHK had found in the investigation that the second officer's summer working schedule itself constituted a major risk of fatigue that may be expressed as impaired performance in terms of attentiveness, planning and decision-making. SHK had also found that fatigue may have been a contributory cause of the accident.

In its response to the recommendation, Stena Line claimed that it draws up its schedules in such a way that the rest periods between shifts are compliant with the applicable regulations and that it ensures that watches are followed by sufficient rest.

However, SHK pointed out that the report did not claim that Stena Line's scheduling did not comply with applicable working time legislation; instead what it said was that, in spite of this, the schedule in question still resulted in a major risk of fatigue at certain times during the shift. It was SHK's understanding that it would be possible for Stena Line to improve its scheduling on the basis of what is known from research and with the assistance of available scheduling tools so that it becomes as good as possible for all bridge officers. However, Stena Line does not appear to have considered reviewing its scheduling, which is why the recommendation could only be deemed partly implemented.

Stena Line was also recommended to consider revising on-board instructions with the intention of prioritising the reporting to the joint rescue coordination centre (JRCC) (RS 2016:05 R6). The background

to this was that the investigation had shown that, according to separate alarm instructions, contact with outside parties only appears as point 14 on the collision check-list that the crew used during the accident, and that internal reporting to the shipping company was a higher priority than raising the alarm with public rescue services, e.g. the Joint Rescue Coordination Centre (JRCC).

In this respect, Stena Line's response referred to existing procedures within its safety management system (SMS). However, the response did not indicate how these procedures related to the collision check-list and the alarm instructions that the crew on STENA JUTLANDICA used in conjunction with the accident. Nor did it indicate whether Stena Line had considered revising these check-lists or whether it is instead the procedures in the SMS system, to which the company refers, that are to be used. Finally, it also did not indicate how contact with the JRCC is to be prioritised in relation to raising the alarm with the shipping company's on-shore organisation and other actors. In light of this, SHK's was of the opinion that the recommendation had only been partly implemented.

Table 6. Maritime investigations led by another state.

Year	2014	2015	2016
Opening balance	6	4	2
New cases	2	1	0
Concluded cases	4	3	1
Closing balance	4	2	1

Over the course of the year, no investigation has been initiated that is led by another country's investigation body.

In maritime investigations that are led by another state's investigation body, subsequent to an agreement between the states concerned, SHK often has a limited involvement in the investigation. However, the amount of work required varies greatly and some of these investigations require a significant input of labour. This has a detrimental impact on the other investigations being conducted by SHK. Beyond SHK's own contributions to such investigations, SHK has very limited, if any, power to influence the investigation process and thereby also the investigation times.

Over the course of the year, one final report has been published for a foreign-led investigation in which SHK has participated.

Rail

Table 1. Total no. of cases.

Year	2014	2015	2016
Opening balance	5	4	1
New cases	59	47	50
Concluded cases	60	50	46
Closing balance	4	1	5

The number of occurrence reports received has increased somewhat in 2016 compared with 2015, but is at a lower level than in 2014. With regard to the closing balance, this has increased compared with 2015 and 2014 as a result of a, for the rail area, relatively large number of investigations being commenced in the latter part of the year.

Table 2. Investigations commenced and final reports published.

Year	2014	2015	2016
Investigations commenced	4	1	5
Final reports published	5	4	1
Probable cause of accident established	4 ⁸	4	1

The number of investigations commenced has increased compared with both 2015 and 2014. Over the course of the year, a final report was published in one case, which is a reduction compared with 2015 and 2014. However, this is explained by the fact that the opening balance of ongoing investigations consisted of only one case and the five investigations that were commenced over the course of the year were commenced in its latter half. The probable cause of accident was established in the single concluded case, which was also the case for all the final reports published in 2015 and 2014.

Table 3. Number and proportion of investigations concluded within 12 months and mean and median investigation times in months.

	2014	2015	2016
Total number of reports published	5	4	1
Number concluded within 12 months	0	4	1
Percentage concluded within 12 months	0	100	100
Mean investigation time	21.6	11.7	8.9
Median investigation time	20.3	11.8	8.9

⁸ One of the concluded investigations was a thematic investigation, *Safety on railway work sites*, in which the establishment of individual causes of accidents was not a topic.

It was possible to complete the investigation that was concluded this year in barely nine months. It was also possible for all the investigations concluded in 2015 to be completed within less than twelve months. This is a marked improvement when compared with 2014, when none of the investigations concluded were completed within 12 months. The mean and median investigation times have clearly improved compared with both 2015 and 2014.

Table 4. The number of ongoing investigations at the end of the year, the proportion of these that had then exceeded 12 and 18 months respectively, and mean and median investigation times in months.

	2014	2015	2016
Number of ongoing investigations at the end of the year	4	1	5
Percentage that had then exceeded 12 months	0	0	0
Percentage that had then exceeded 18 months	0	0	0
Mean investigation time at the end of the year	5.1	3.9	4.6
Median investigation time at the end of the year	5.5	3.9	3.3

The number of ongoing investigations at the end of the year was higher than in 2015, which is due to five new investigations having been commenced in the latter part of the year. The median investigation time of these investigations was at a lower level at the turn of the year than in both 2015 and 2014, even though the mean investigation time for these had increased marginally compared with 2015.

Table 5. Safety recommendations.

Year	2014	2015	2016
Opening balance	1	6	0
Issued	15	4	1
Implemented	10	9 ⁹	0
Not implemented	0	1	0
Closing balance	6	0	1

Over the course of the year, one safety recommendation has been issued. The response to this recommendation has not yet been conclusively processed by SHK.

⁹ Of which one is deemed to be partially implemented.

Civil aviation

For the area of civil aviation, investigations that are conducted in accordance with Annex 13 to the Chicago Convention by accident investigation authorities in other countries – but in which SHK shall or may appoint an accredited representative – are reported separately (see table 7). There is almost no potential for SHK to influence the investigation times of these investigations, and these cases are concluded only once a final report is issued by the other country's accident investigation authority. Consequently, these investigation times are not reported. The safety recommendations issued by the foreign investigation body are followed up by that authority and not by SHK, which is why statistics concerning the processing of recommendations are also not reported for these cases.

Table 1. Total number of cases (including investigations led by another state).

Year	2014	2015	2016
Opening balance	36	31	24
New cases	150	126	123
Concluded cases	155	133	124
Closing balance	31	24	23

The number of occurrence reports received has decreased somewhat compared to both 2015 and 2014. The total balance of civil aviation cases has also continued to decline somewhat compared with the previous year.

Table 2. Investigations commenced by SHK, by aviation category and type of aircraft.

Category	2014	2015	2016
Commercial aviation	7	1	7
Private aviation	9	11	6
Civil state aviation	1	-	-
Total	17	12	13
<i>Of which type of aircraft</i>			
Large aircraft ¹⁰	5	-	6
Multi engine light aircraft	-	2	1
Single engine light aircraft	2	5	-
Seaplane	2	-	-
Helicopters	4	1	3
Gliders	4	4	2
Hot air balloons	-	-	1
Other	-	-	-

¹⁰ Large aircraft are aircraft with a maximum take-off mass of more than 5,700 kg.

The number of investigations commenced has increased marginally since 2015, but is lower than in 2014. Largely, however, the number tracks the variations in the number of occurrence reports received.

Table 3. Final reports issued by SHK, by aviation category and type of aircraft.

Category	2014	2015	2016
Commercial aviation	9	3	3
Private aviation	10	13	8
Civil state aviation	-	1	-
Total	19	17	11
<i>Of which type of aircraft</i>			
Large aircraft	4	2	4
Multi engine light aircraft	1	-	-
Single engine light aircraft	7	3	3
Seaplane	1	1	-
Helicopters	6	4	2
Gliders	-	7	2
Hot air balloons	-	-	-
Other	-	-	-
Probable cause of accident established	19	17	10

Over the course of the year, 11 final reports have been published, which is a reduction compared with 2015 and 2014. It has been possible to establish probable causes of the accidents and incidents in all but one case, which is a marginal reduction compared with 2015 and 2014.

Table 4. Number and proportion of investigations concluded within 12 months and mean and median investigation time in months – investigations led by SHK

	2014	2015	2016
Total number of reports published	19	17	11
Number concluded within 12 months	14	16	8
Percentage concluded within 12 months	74	94	73
Mean investigation time	12.9	8.4	10.9
Median investigation time	11.2	9.4	11.2

Of the final reports published over the course of the year, 73 per cent were completed in less than twelve months. This is a decrease compared with 2015, but largely the same as in 2014.

The mean investigation time for the investigations concluded in 2016 has increased in relation to 2015, but is lower than in 2014. The median has also increased compared with 2015 but is at the same level as in 2014.

The increased average investigation time is mainly due to one older case with extensive international connections that was concluded this year, with an investigation time of just over 22 months. The investigation of what became known as “the mail cargo accident” in Oajevágge, Jokkmokk Municipality has also taken up significant manpower over the course of the year, which contributed to other investigations having to take somewhat of a back seat. The concentration of resources into the investigation of this accident, which is one of the most extensive investigations since the Hercules accident near Kebnekaise with extensive international involvement, on the other hand made it possible to publish a final report after only just over 11 months.

The three investigations for which the investigation time exceeded twelve months will be commented on specifically below.

Final report RL 2016:02 concerns an accident on the island of Björnö, Västerås Municipality, on 13 February 2015 involving an aeroplane of the PA46-500TP (Malibu Meridian) model, operated by a private individual. The investigation time was slightly less than 13 months. The main reason why the investigation took so long was that an examination of the engine needed to be performed in the United States.

The report RL 2016:05 concerns an accident at Malmö Sturup Airport on 27 June 2015 involving an aeroplane of the Piper PA34-200T (Seneca II) model, operated by a flying school. The investigation time was just over 14 months. The investigation led to more detailed investigations of the EU regulations that apply to flying schools, in light of another accident at a Swedish flying school that occurred during the course of this investigation.

Final report RL 2016:07 concerned a large aircraft on a scheduled passenger flight between Bromma and Visby. The attachment of one propeller blade broke during flight, which led to powerful vibrations in the aeroplane. The crew were, however, able to shut off the affected engine and land normally with one functioning engine. The investigation time was just over 22 months.

Six similar incidents involving this type of aircraft occurred in the period from 2007 to 2014. Two of these are being investigated by foreign safety investigation authorities. These investigations are not yet concluded.

The investigation was technically complicated and required extensive cooperation with the type certificate holders for the propeller and the

aeroplane. For example, the design and manufacturing changes that took place involving the propeller type since it was originally certified had to be examined. Furthermore, it was necessary to coordinate the work that involved the two foreign accident investigations of similar incidents that were ongoing. In particular, the international aspects and the associated long response times during the consultation process had a detrimental impact on the investigation time.

Table 5. Number of ongoing SHK investigations at the end of the year, the proportion of these that had exceeded 12 and 18 months respectively at that time, and the mean and median investigation times in months.

	2014	2015	2016
Number of ongoing investigations at the end of the year	12	7	9
Percentage that had then exceeded 12 months	0	14	0
Percentage that had then exceeded 18 months	0	0	0
Mean investigation time at the end of the year	5.7	7.4	7.0
Median investigation time at the end of the year	5.7	6.2	7.7

Of the investigations that were still ongoing at the end of the year, there were none that had a investigation time that, at that time, was in excess of twelve months, which is an improvement compared with 2015 and the same as in 2014.

Table 6. Safety recommendations.

Year	2014	2015	2016
Opening balance	19	9	4
Issued	13	9	23
Implemented	16 ¹¹	12 ¹²	2¹³
Not implemented	7	2	2
Closing balance	9	4	23

In 2016, 23 safety recommendations were issued and 4 responses were processed. With regard to the closing balance of 23 recommendations, either the deadline for a response has not yet passed or the response has not yet been conclusively processed by SHK.

Among the responses processed over the course of the year, one safety recommendation has been deemed implemented and one has been deemed only partly implemented. Two recommendations have been

¹¹ Seven recommendations that were implemented in 2014 were mistakenly reported as still open in the annual reports for 2014 and 2015.

¹² One of which has been deemed only partly implemented.

¹³ One of which has been deemed partly implemented.

deemed not to have been implemented. The recommendations that have been deemed either only partly implemented or not implemented are commented below.

Final report RL 2015:10 contains a recommendation that the Estonian civil aviation supervisory authority tighten up its supervision of one operator that in a short period of time had been involved in several serious incidents in conjunction with flights in Sweden, the aim being to ensure that its operations were being run in accordance with the applicable aviation safety requirements, particularly with respect to those deficiencies identified in the report (RL 2015:10 R1).

The background was that during a flight to Torsby in Värmland, the aeroplane ran off the runway following a landing in falling snow. Several deficiencies in the operator's safety management system (SMS) were found to have led to this serious incident.

In its response to the recommendation, the Estonian supervisory authority claimed that it had conducted a comprehensive review of the operator, which was also ordered to report to the authority on a monthly basis.

However, given that SHK has not been given access to the result of this review, the recommendation was deemed to have been only partly implemented.

Final report RL 2016:02, which concerned the above mentioned accident on Björnö, Västerås Municipality, contained the recommendations, that the Swedish Transport Agency firstly look into the feasibility of installing operational CCTV cameras for investigatory purposes at Swedish commercial airports (RL 2016:02 R1) and secondly that it work to ensure that the use of operational CCTV cameras for investigatory purposes is addressed in an appropriate manner in its international aviation safety work (RL 2016:02 R2).

The background to these recommendations was that it was established in the report that it can be of great benefit to SHK if photographic evidence of an occurrence is available, but that, at present, the presence of photographic documentation of occurrences at an airport, or its immediate vicinity, is entirely dependent on the occurrence happening to have been filmed or photographed by an individual or being captured by a CCTV camera intended for other purposes. SHK's deemed it to be clear that photographic material from airport cameras would contribute to making the evidence for SHK's investigations more robust and making its analyses more robust.

In its response to the recommendations, the Swedish Transport Agency reported that it had conducted an analysis, considered the matter and come to the conclusion that the limited safety benefits in

relation to the expected costs does not justify a requirement for CCTV cameras at airports for safety investigation purposes.

In its assessment of this response, SHK claimed that it is not possible without further investigation to make any statement concerning which camera systems might be appropriate and about the cost of these. It is therefore surprising that the Swedish Transport Agency, without any investigation of this kind, would claim that it was possible to judge the limitations in the use of such systems and conclude that the cost of these is too high in relation to the benefit. The recommendation was therefore deemed to not to have been implemented.

Table 7. Foreign aviation investigations in which SHK has participated.

Year	2014	2015	2016
Opening balance	21 ¹⁴	19	17
New cases	9	8	6
Concluded cases	11	10	10
Closing balance	19	17	13

Over the course of the year, SHK has participated in six new foreign investigations through an accredited representative or an expert in accordance with Annex 13 to the Chicago Convention. In 2015, SHK was involved in eight new foreign investigations and the corresponding figure for 2014 was nine. It has been possible to conclude ten such cases in 2016. The outgoing balance has therefore decreased somewhat in relation to both 2015 and 2014.

To a varying degree, also these investigations result in an input of labour on the part of SHK. Consequently, they also have a detrimental impact on SHK's own investigations in terms of investigation times and the total number of investigations completed.

Military occurrences

Table 1. Total number of cases (including investigations led by another state).

Year	2014	2015	2016
Opening balance	1	3	5
New cases	18	17	21
Concluded cases	16	15	22
Closing balance	3	5	4

The number of occurrence reports received has increased somewhat compared with 2015 and 2014. The closing balance at the end of the year has decreased somewhat compared with 2015, but is marginally higher than in 2014.

¹⁴ One international case, L-122/13, was missing from the closing balance for 2013 in previous annual reports.

Table 2. Investigations commenced and final reports published.

Year	2014	2015	2016
Investigations commenced	3	2	1
Final reports published	1	2	2
Probable cause of accident established	1	2	2

One new investigation has been commenced over the course of the year, which is a marginal reduction in relation to both 2015 and 2014, when two and three investigations, respectively, were commenced. Two final reports have been published, which is the same as the previous year. As in 2015 and 2014, it was possible to establish the causes of the occurrences in both investigations.

Table 3. Number and proportion of investigations concluded within 12 months and mean and median investigation times in months.

	2014	2015	2016
Total number of reports published	1	2	2
Number concluded within 12 months	1	0	0
Percentage concluded within 12 months	100	0	0
Mean investigation time	6.0	18.4	17.5
Median investigation time	6.0	18.4	17.5

Neither of the investigations concluded were completed within 12 months, which was also the case in 2015. The mean investigation time was just over 17 months. Commentary on these investigations will be proved in the following section.

Final report RM 2016:01 concerns an accident during training of navigation in darkness that involved a G boat from the Swedish Armed Forces colliding with a buoy on 1 October 2014 at Klövholmsgrund, Stockholm County. The investigation time was just over 16 months. While the investigation was relatively extensive and at times has had to take a back seat to other investigations, this still does not fully explain the long investigation time.

Report RM 2016:02 deals with a serious incident involving a near collision between a Swedish and a Norwegian combat aeroplane during a joint exercise at the Swedish Armed Forces' air wing F21 in Kallax on 5 May 2015. The investigation time was 18 months. The investigation time must be regarded as unacceptably long for this type of investigation, even though this can be partly explained by the relatively extensive amendments to the report resulting from the points of view submitted during the external consultation process.

Table 4. The number of ongoing investigations at the end of the year, the proportion of these that had then exceeded 12 and 18 months, respectively, and mean and median investigation times in months.

	2014	2015	2016
Number of ongoing investigations at the end of the year	3	3	2
Percentage that had then exceeded 12 months	33	33	50
Percentage that had then exceeded 18 months	0	0	0
Mean investigation time at the end of the year	9.0	8.5	12.4
Median investigation time at the end of the year	9.4	7.9	12.4

At the end of the year, the mean and median investigation times for cases that were ongoing at that time were longer than was the case in both 2015 and 2014.

Table 5. Safety recommendations.

Year	2014	2015	2016
Opening balance	37	0	16
Issued	0	16	13
Implemented	37 ¹⁵	0	20
Not implemented	0	0	3
Closing balance	0	16	6

Over the course of the year, 13 safety recommendations were issued and 23 responses have been processed. With regard to the closing balance of six recommendations, the deadline for responses to these has not yet passed. Of the responses processed, 20 have been deemed implemented and three as not implemented. An account of the latter appears below.

Final report RM 2015:01, which concerned a serious incident during an aerial combat exercise southwest of Gällivare on 20 March 2014 involving two JAS 39 Gripen operated by the Swedish Armed Forces, contained the recommendation that the Armed Forces investigate whether the method stipulated in *Management for Military Aviation (LML)* for ensuring a balance between tasks and resources is effective and is applied in the correct manner in order to achieve its aim (RM 2015:01 R2). The background to this recommendation was that the system that the Armed Forces reportedly used for ensuring that there is a balance between tasks and resources (LML) did not, as was shown by the investigation, function in practice.

¹⁵ Of which three have been deemed partially implemented.

In its response to the recommendation, the Armed Forces described the method in LML. As far as could be determined from the response, no investigation of whether the method was actually effective and being applied in the correct manner had neither been implemented nor planned for the future. In the light of the observations made and reported in SHK's final report, this was not satisfactory and the recommendation could not be considered to have been implemented.

Final report RM 2016:01, which concerned the aforementioned accident involving a G boat at Klövholmsgrund, contained the recommendation that the Armed Forces take action to ensure that equipment is not used without the risks of integration being analysed in accordance with the Armed Forces' systems safety handbook (RM 2016:01 R3). The background to this recommendation was that risks involved in the used of image intensifiers had not been identified by the Armed Forces.

In its response to the recommendation, the Armed Forces stated that it had chosen not to treat image intensifiers as an integration product and that the use of image intensifiers is instead dealt with in the risk analysis. However, there was no account of what considerations had taken place and what the circumstances were that lead to image intensifiers not being treated as an integration product. In the light of the fact that image intensifiers are considered an integration product when used in other types of vehicle in the Armed forces, e.g. aircraft, the Armed Forces' choice in this case was difficult to understand. Given this, it was not possible to regard the Armed response as satisfactory. The recommendation was deemed not to have been implemented.

In the same final report the Armed Forces was also recommended to ensure that the planning of working hours provides good conditions in which to conduct basic training without the risk of fatigue (RM 2016:01 R4). The background was the long period on duty that preceded the accident and the indications of fatigue demonstrated in the investigation.

In its response to the recommendation, the Armed Forces stated that the current regulations are satisfactory, that these are based on research and that the crew's mental and physical status was included as a factor in the risk analysis.

SHK argued that a period on duty of 15–16 hours is not appropriate for students involved in a basic navigation training course. The Armed Forces had also not provided any more detailed account of the research to which the response refers in this respect. Given this, it was not possible to regard the Armed Forces' response as satisfactory and the recommendation was therefore deemed not to have been implemented.

Other accidents or incidents

Table 1. Total number of cases (including investigations led by another state).

Year	2014	2015	2016
Opening balance	1	2	2
New cases	12	8	10
Concluded cases	11	8	10
Closing balance	2	2	2

The number of occurrence reports received has increased somewhat compared with 2015, but is lower than in 2014. The closing balance remains at the same low level as previous years.

Table 2. Investigations commenced and final reports published.

Year	2014	2015	2016
Investigations commenced	1	1	0
Final reports published	0	2	0
Probable cause of accident established	–	2	–

Table 3. Number and proportion of investigations concluded within 12 months and mean and median investigation times in months.

	2014	2015	2016
Total number of reports published	0	2	0
Number concluded within 12 months	–	1	–
Percentage concluded within 12 months	–	50	–
Mean investigation time	–	14.5	–
Median investigation time	–	14.5	–

No new investigations have been commenced and no final reports have been published over the course of the year.

Table 4. The number of ongoing investigations at the end of the year, the proportion of these that had then exceeded 12 and 18 months, respectively, and mean and median investigation times in months.

	2014	2015	2016
Number of ongoing investigations at the end of the year	2	1	1
Percentage that had then exceeded 12 months	50	0	1
Percentage that had then exceeded 18 months	0	-	0
Mean investigation time at the end of the year	8.5	0.2	12.3
Median investigation time at the end of the year	8.5	0.2	12.3

The investigation that was still ongoing at the end of the year concerns an accident involving a collapsed wind turbine. The investigation time was just over twelve months at that time, and it is expected that the final report will be published at the beginning of 2017.

Table 5. Safety recommendations.

Year	2014	2015	2016
Opening balance	11	0	4
Issued	0	10	0
Implemented	5 ¹⁶	5	0
Not implemented	6	1	0
Closing balance	0	4	4

The balance of safety recommendations issued is made up of those responses that had not yet been conclusively assessed by SHK at the end of the year.

2.3.3 *Other safety related activities and collaboration with other bodies*

Pursuant to Section 1 of the Ordinance (2007:860) with instructions for the SHK, the authority is to cooperate with the concerned safety authorities in their efforts to prevent accidents. SHK is also to collaborate with authorities and organisations in other countries in matters within SHK's scope of responsibility. Both national and international collaboration functions well and is being developed continuously.

In accordance with Section 6, second paragraph of the Accident Investigation Ordinance (1990:717), the Swedish Transport Agency, the Armed Forces and the Civil Contingencies Agency (MSB) have the right to insight into SHK's investigations. This allows these

¹⁶ One of which was deemed to be partly implemented.

authorities, when necessary, to take regulatory or supervisory action without delay. These authorities follow SHK's investigations by appointing an advisor in each investigation, who can then keep the respective authority informed of the progress of the investigation without being a part of the investigation team.

SHK also has regular meetings with these and other relevant authorities in order to discuss procedures for cooperation, as well as specific safety recommendations that are issued as part of investigations. Legislative changes are also discussed in these meetings, as are other topical matters that are of interest from a safety perspective.

In addition to the contact that takes place continually within the scope of the various accident investigations, SHK has also had two meetings in 2016 with the Swedish Transport Agency's Road and Rail Department and two meetings each with the "maritime section" and "civil aviation section" of the Agency's Civil Aviation and Maritime Department. One collaboration meeting has been held with the Armed Forces and one with the Swedish Maritime Administration. As agreed with MSB, no formal collaboration meetings have been held by the authorities in the past year, but one is being planned for the beginning of 2017.

A large proportion of the international collaboration in which SHK is involved can be regarded as mandatory as a consequence of international legal instruments. This is especially true for the EU, where such collaboration is formally regulated in Regulation (EU) No. 996/2010 of the European Parliament and of the Council on the investigation and prevention of accidents and incidents in civil aviation and Directive 2009/18/EC of the European Parliament and of the Council establishing the fundamental principles governing the investigation of accidents in the maritime transport sector (the maritime accident investigation directive) and 2004/49/EG on safety on the Community's railways (the railway safety directive)¹⁷.

Furthermore, many of SHK's accident investigations are of an international nature. This is especially applicable to aviation and maritime occurrences. It is therefore important for SHK to create and maintain good contacts and increase the sense of mutual understanding between accident investigation authorities in different countries, even outside of the "mandatory" forums that are regulated by EU legislation. At the senior management level, SHK collaborates annually both with other Nordic accident investigation authorities and within ITSA (the International Transport Safety Association), which includes fifteen other foreign authorities, including several of the largest and, for SHK, most important partners in terms of international investigations, for example the United States, Canada, France, the

¹⁷ The Railway Safety Directive has been replaced in 2016 by Directive (EU) 2016/798 of the European Parliament and of the Council of 11 May 2016 on railway safety, which is already partly in force, with other parts being implemented gradually by 2020 at the latest.

United Kingdom and Australia. SHK also participates regularly at the investigator level in an international knowledge and skills sharing, mainly within the various types of transport.

2.3.4 *Human resources*

In accordance with Chapter 3, Section 3 of the Ordinance concerning Annual Reports and Budget Planning Documents (2000:605)¹⁸, SHK shall document measures implemented in order to ensure that skilled staff are available to accomplish the duties that are laid down in the authority's instructions and, where appropriate, in the Government's appropriation directions or in any other decision. This includes an assessment of how the measures implemented have contributed overall to the accomplishment of these duties.

General

Section 4 of the SHK Instructions Ordinance¹⁹ states what certain types of expertise are to be represented among the authority's accident investigators. At least one investigator aside from the Director General must be a lawyer with professional experience as a judge. There must also be accident investigators who have operational and technical expertise from the aviation, maritime and rail sectors, general technical expertise, expertise in the field of civil protection and rescue services, as well as expertise in behavioural sciences.

At the end of 2016, SHK had 34 employees: 12 female and 22 male. Two employees were on leaves of absence. The average age of SHK's employees was 50. Over the course of the year, one new member of staff was hired and three members of staff left their respective positions.

Apart from this, in accordance with its instructions, SHK engages experts and specialists in various areas as consultants in order to assist the authority in its investigations.

Attracting and recruiting

Those applying for work at SHK have to feel that the recruitment process is professional, efficient and transparent. Information about available positions is published primarily on SHK's website, at the national work exchange (Arbetsförmedlingen), in daily newspapers and in various trade magazines. Recruitments at SHK are managed in accordance with the coherent process *Recruitment* within the scope of the operations management system.

When recruiting investigators, applicants are required to have many years of experience in the relevant area of expertise and a good ability to express themselves verbally and in writing. The applicants'

¹⁸ Förordning (2000:605) om årsredovisning och budgetunderlag.

¹⁹ Förordning (2007:860) med instruktion för Statens haverikommission.

theoretical and practical skills are investigated using tests. A major emphasis is placed on applicants' personal qualities.

As mentioned previously, SHK has employed one person in 2016 replacing an employee who left the authority.

The experience from past recruitments is that SHK is perceived as an attractive place to work at and that it is not difficult to recruit qualified staff. However, there are difficulties identifying and attracting female applicants to investigator positions (see the organisational governance section for more information about this).

SHK has contracted out work to consultants in several fields. The procurement processes are conducted in accordance with the coherent support process *Procurement* within the scope of the operations management system. In order to obtain a consultancy contract, there is a requirement for a high level of expertise in the field in question and experts are required to monitor developments in their field and take responsibility for any necessary professional development.

Developing

SHK's remit places great demands on the experience and skills of its staff. The compulsory requirements for candidates consist of theoretical knowledge and practical experience in their individual investigation area. Professional development is conducted in accordance with the coherent process *Professional Development* within the scope of the operations management system.

All newly employed investigators begin with an introductory training programme that includes training in advanced accident investigation, knowledge of public administration, safety at accident sites and other work environment issues, in addition to all internal procedures and rules. Accident investigator skills are updated, maintained and developed continuously by means of workplace-based learning, as well as continuation courses and refresher courses.

Detailed recommendations are issued by the International Civil Aviation Organisation (ICAO) with respect to the training of civil aviation investigators. An air accident investigator must have considerable experience from the field of aviation as a base for further training to become an accident investigator. Individual development plans corresponding to ICAO's *Training Guidelines* are available for all air accident investigators. These are followed up continuously and supplemented when necessary with new training programmes in order to update investigators' knowledge so that this keeps pace with developments in the field. Training in advanced accident investigation with a focus on civil aviation takes place abroad as this is not available in Sweden.

There are also relatively clear demands placed on investigator expertise and professional background within the field of maritime

investigation. The International Maritime Organisation's (IMO) code for Safety Investigation into a Marine Casualty or Marine Incident (Casualty Investigation Code) and EU Directive 2009/18/EC establishing the fundamental principles governing the investigation of accidents in the maritime transport sector, both refer to the part of IMO Res. A.996 (25) which concerns expertise criteria for marine accident investigators. To fulfil these requirements, there are individual development plans for SHK's maritime investigators that are supplemented when necessary.

The rail transport area has no similar qualification at the international level, but SHK still has corresponding development plans for its rail investigators.

At least one performance review is conducted per year with all employees. This involves existing skills plans being followed up and a plan for future professional development being established.

Retaining

Staff turnover was 8.5 per cent in 2016, a reduction of 3.1 percentage points in comparison with the previous year when staff turnover was 11.6 per cent.

SHK offers interesting and stimulating duties of an advanced nature with good opportunities for professional development. The authority applies an individual pay structure for each employee, offers competitive salaries, flexible or non-regulated working hours and works actively with work environment and equal treatment and discrimination issues. The authority also offers its employees health examinations, one hour of preventive healthcare (friskvård) per week and a yearly allowance to cover costs for preventive healthcare.

Monthly information meetings are held for the entire staff so that all employees have an opportunity to follow along with what is happening at SHK. Departmental meetings, which are also an important source of information, are held regularly. In addition to this, all employees are involved in the authority's operational planning through a two-day internal conference which is held every autumn.

Phasing out

So far, SHK has not had any need to work actively with restructuring or phasing out at the organisational level.

A number of accident investigators are reaching retirement age in 2017 and work to recruit two replacements began this year so as not to risk losing important expertise.

One administrator is taking early retirement at the beginning of 2017. SHK has decided not to replace this member of staff as the procedures within the support process *Manage Cases* has been simplified and has

therefore allowed the registrar to take on additional administrative duties.

One of SHK's investigators in the area of civil protection and rescue services left their post in spring 2016. SHK has decided to defer a possible replacement in this area until it is clear what the results will be of the legislative review (SOU 2014:82) concerning the investigation of rescue services operations in the Accident Investigation Act (1990:712). In the meantime, SHK has contracted out work in this area to outside consultants in order to meet the skills requirements.

Skills transfer

SHK's operations management system creates clarity in terms of how SHK's operations function and facilitate the transfer of knowledge.

There is collaboration across investigation areas and departmental boundaries in terms of the use of staff resources. In order to ensure that there is a transfer of skills, duties are redistributed between existing members of staff and opportunities are created for on the job learning, e.g. by ensuring that less experienced investigators work together with those who are more experienced. New members of staff undergo an extensive introduction programme with the support of internally appointed mentors.

The training period for a new investigator is long, and in order to ensure transfer of skills, SHK tries to recruit replacements in good time prior to retirement, which leads to increased staffing costs.

Overall assessment

SHK complies with the skills requirements laid down in its Instructions Ordinance. SHK considers that measures taken in terms of the supply of skills, have contributed to the fulfilment of the authority's duties in accordance with the Instructions.

In order for SHK to be able to work efficiently and fulfil its duties and set goals, it is necessary to have qualified personnel on permanent contracts with a long history of experience and a high level of expertise. SHK has therefore had a strategy that involves increasing the number of permanently employed investigators in preference to the use of temporary contracted consultancy services. This strategy, combined with a reduced staff turnover in recent years, has led to greater efficiency in the form of shorter investigation times and smaller backlogs. The increase in staff has been financed by a considerable decrease in consultancy costs in recent years.

As mentioned above, the training period for a new investigator is long. It is almost impossible to find people who both fulfil the high demands in terms of experience and theoretical knowledge in their

respective field of investigation and have prior experience of advanced accident investigation.

This means that the authority is very vulnerable not only because of retirements, which are of course predictable, yet still costly if a replacement is to work in parallel with the individual who is to leave so as to ensure that the skills are transferred.

It also means that any other leave of absence, e.g. for studies, parental leave, sick leave or in order to gain experience in other areas, leads to a considerable setback in the investigative work. It is often the case that by the time a temporary replacement has been trained to a level sufficient in order to begin to take independent responsibility for an investigation, their temporary contract is almost at an end. This in turn leads to hiccups in planning and has a particularly detrimental impact on the ambition to shorten investigation times.

Organisational management

SHK's appropriation letter for 2016 stated that the authority is to draw up a long-term strategy and an action plan for achieving a more equal staff gender distribution.

SHK's strategy and action plan for a more equal gender distribution were finalised in May 2016. The strategy states that the current staff composition reflects the labour market, i.e. almost all investigators are men and almost all administrators are women. SHK cannot take responsibility for changing the gender segregation in the labour market as a whole, but it can and should take reasonable steps to achieve a more equal gender distribution among its own staff.

SHK has taken the following action in 2016:

- A review of the recruitment process has been conducted in order to ensure that the process is neutral and objective from a gender equality perspective.
- An employeeship workshop has been held with discussions about the role of civil servant, in order to highlight SHK's goal to be an authority that is transparent and characterised by equal opportunities and rights, broad-mindedness and respect.
- A preliminary study has been initiated that involves interviews with staff about their perception of barriers to a more equal staff gender distribution. The results of the investigation will be compiled and analysed in 2017.
- A survey has been conducted in order to find out how well members of staff feel that they can combine their work at SHK with parenthood. The results of the survey will be compiled and analysed in 2017.

2.3.5 *Efficiency and sound economic management*

Section 2.2.3 presented two key performance indicators as grounds for an assessment of the extent to which the authority has succeeded in its ambition to streamline investigative operations in order to achieve the goal of investigation times that, if possible, do not exceed twelve months. Three additional key performance indicators (KPIs) that SHK uses as a basis for the assessment of whether or not operations have been run efficiently and in a sound economic way are presented below.

1. Total working hours distributed among SHK's processes.
2. The number and proportion of full-time equivalents (FTEs) in SHK's support functions in relation to the total number of FTEs.
3. Costs for administrative support in relation to total operational costs.

KPI 1 – Total working hours distributed among SHK's processes

Below is a summary of how the total working hours for all employees, and respectively for investigators only, are distributed among SHK's processes.

Table 1. Distribution of total working hours among SHK's processes.

Process	Proportion in % of total working hours 2014		Proportion in % of total working hours 2015		Proportion in % of total working hours 2016	
	All employees	Investigators	All employees	Investigators	All employees	Investigators
Accident and incident investigation	49	61	48	61	54	69
External cooperation	8	9	7	9	8	10
Professional development	8	11	5	7	5	7
Management and governance	16	13	17	12	15	7
Support	19	6	23	11	18	7

SHK's core duties include investigations, national and international cooperation with other authorities etc. on safety matters, and professional development. In 2016, 67 per cent of the total working hours have been spent on SHK's core activities. This is an increase of seven percentage points in comparison with the previous year, when the proportion was 60 per cent. The proportion for SHK's accident investigators was 86 per cent of the total time, which is an increase of nine percentage points in comparison with 2015, when the proportion was 77 per cent. The corresponding figures for 2014 were 65 and 81 per cent, respectively.

The fact that the total amount of time spent on core activities has increased can be explained to some extent by five investigators having

been recruited in 2015, which took up some of the existing investigators' time that year. Only one investigator has been recruited in 2016. In 2015, SHK utilised a great deal of resources on the development of its external website and the creation of an intranet, which meant that these resources were not being utilised in core activities. Development work of this type has not had the same impact on the investigation group in 2016.

In addition to this, the increase in the proportion of time spent on core activities on the part of investigators is probably partly explained by ambiguities in the time reporting system in 2015 that were corrected in 2016.

Time spent on professional development is at the same level as the previous year, but is lower than in 2014. This is explained by the fact that SHK has, for budgetary reasons, been somewhat more restrictive in terms of professional development measures in 2015 and 2016 than in 2014.

KPI 2 – The number and proportion of full-time equivalent employees (FTEs) in support functions in relation to the total number of FTEs

As a measure of efficiency and sound economic management, the number of FTEs in support functions is reported in relation to SHK's total number of FTEs. A decrease in the proportion of administrative staff in relation to the number of staff working in core activities may be an indication that the authority's activities are being run more efficiently. However, too small a proportion may mean that staff working in core activities need to spend more of their working hours on administration at the risk of decreased productivity. Based on the authority's current remit and organisational division, SHK assesses that in order to achieve efficiency and a good balance between support functions and core activities, the proportion of support staff should not exceed 30 per cent of the total number of FTEs.

Table 2. Number and proportion of support staff FTEs in relation to SHK's total number of FTEs.

Year	Total FTEs	Number of FTEs in support functions	FTEs in SHK's support functions, as a proportion of the total number of FTEs
2014	27.95	6.98	25 %
2015	30.29	7.73 ²⁰	26 %
2016	30.46	7.78²¹	26 %

The proportion of SHK's total number of FTEs made up of support staff was 26 per cent, which is the same as the previous year.

²⁰ Including the one FTE that consisted of an externally contracted agency caretaker in 2015.

²¹ Including the proportion of one FTE that consists of an externally contracted agency caretaker in 2016 (SHK's in house caretaker was on a leave of absence for five months).

SHK, which is a relatively small authority, procures certain administrative services externally in order to be cost effective. These services include financial and human resources administration, IT operations and support, as well as support in larger procurement processes. These services are not included in the statistics above.

KPI 3 – Cost of administrative support in relation to total operational costs

The cost of SHK’s administrative support in relation to SHK’s total operational costs and how these have changed over time is reported below as another measure of efficiency and sound economic management.

Reasoning similar to the above can also be applied here. A reduction in the cost of administrative support in relation to the total operational costs can be an indication that the authority’s operations have been run more efficiently, but reduced resources in the support functions may also mean that staff involved in core activities have to allocate more of their working hours to administrative duties at the risk of reduced productivity in the core activities. SHK assesses that in order to achieve efficiency and a good balance between support functions and core activities, the cost of administrative support should not exceed 20 per cent of SHK’s total operational costs.

Table 3. Cost of administrative support in relation to total operational costs.

Year	Cost of administrative support in relation to total operational costs
2014	17.4 %
2015	16.1 %
2016	17.1 %

The cost of administrative support includes salaries for permanent staff and bought-in services within the support functions management, finance, registry, IT, communications, procurement and internal services.

SHK’s administrative support cost has increased in relation to total operational costs by one percentage point in comparison with the previous year. This increase is explained by the increase in the cost of salaries for administrative permanent staff. SHK’s caretaker was on a leave of absence for the whole of 2015, as opposed to five months in 2016. In August 2015, one administrator was recruited to a two-year temporary position and in November 2015 a replacement member of staff was recruited to the administration department, resulting in increased salary costs.

Other measures to increase efficiency

In addition to the key performance indicators above, in the following an account is given of other significant measures implemented in order to increase efficiency and improve economic management in the future.

SHK's operations management system

SHK's efforts to introduce a comprehensive operations management system are nearly complete and it is expected to be fully implemented in 2017. The operations management system will clarify how SHK's operations function and create a comprehensive view in which the core activities and support functions are well-defined and the division of responsibility is clear. Furthermore, the system is expected to facilitate the dissemination of knowledge and more uniform working practices, as well as reducing unnecessary administration. An effective operations management system will also lay the foundations for suitable procedures for follow-up and evaluation of operational performance.

Electronic case management system

In January 2014, SHK introduced an electronic case management system. In order to further improve the efficiency of the authority's case management, SHK has requested permission from the Swedish National Archives (Riksarkivet) to destroy paper documents once they have been scanned and stored in SHK's case management system and electronic archive (e-archive). The National Archives decided on 14 September 2016 to grant this request. This decision came into force on 1 October 2016 and allows SHK to transition to completely digital case management. The new procedures were introduced on 1 January 2017.

Development of SHK's website and intranet

SHK has improved its internal and external communications by developing a new modern website that was launched in 2015 and an intranet that came online in 2016.

2.3.6 *Costs*

SHK has chosen to report the costs for 2016 separating specific investigative costs and general operational costs. Specific investigative costs are costs directly attributable to individual investigations, and general operational costs are costs for staff, training, intelligence, collaboration with other safety authorities, premises management and other running costs which are not directly attributable to any particular investigation.

Specific investigative costs

Table 1. Specific investigative costs (SEK, thousands).

Year	Civil maritime	Rail	Civil aviation	Military events	Other events	Total
2014	628	285	1,314	364	727	3,318
2015	795	85	1,389	362	482	3,113
2016	452	39	2,010	676	1,356	4,533

The specific investigative costs are event driven and are determined primarily by which investigative initiatives are required and how much support from external consultants is required for ongoing investigations and investigations concluded over the course of the year. SHK's specific investigative costs have increased by SEK 1,420,000 compared with the previous year. This increase is explained by the fact that SHK has had higher costs for external consultants in 2016 than in 2015. There are two investigations that have been the principal drivers of cost in 2016, the mail cargo aviation accident in Oajevágge, and the accident involving a wind turbine in Lemnhult.

General operational costs

Table 2. Operational costs (SEK, thousands).

Year	Civil maritime	Rail	Civil aviation	Military events	Other events	Total
2014	9,948	6,558	15,199	1,882	2,824	36,411
2015	13,254	6,300	13,062	3,979	2,425	39,020
2016	10,651	3,713	20,036	3,742	2,995	41,136

SHK's general operational costs have increased by SEK 2,116,000 compared with the previous year. This is explained by the increase in staff costs in conjunction with new staff appointments in the latter part of 2015.

The distribution of these operational costs is also event driven as they are distributed on the basis of actual number of working hours spent in each investigation area.

In civil aviation, general operational costs have increased by SEK 6,974,000 compared with 2015. This is largely explained by the aforementioned mail cargo aviation accident in Oajevágge, which required major staff contributions over the course of the year. In addition, the number of employees in this area has increased by one FTE compared with the previous year. SHK's two military investigators have also been involved to a greater extent in investigations in the civil aviation area in 2016 than they were in 2015. For the same reason, the costs in the military area have decreased in 2016.

The reduction of SEK 2,603,000 in the maritime area is explained by the fact that there were investigations being conducted in 2015 that were extensive and demanded comparatively more time of investigators specialized in human and organisational factors and rescue services, as well as administrative staff, in 2015 than in 2016.

The reduction of SEK 2,587,000 within the rail area is explained by there only being one ongoing investigation in the first half of 2016. During this period, one rail investigator devoted much of their working hours to SHK's intranet and another was involved in the aforementioned investigation into the wind turbine accident in Lemnhult. In addition, the number of employees in this area has decreased by one FTE compared with the previous year.

The cost increase of SEK 570,000 within the other occurrences area is explained by the fact that the accident involving the wind turbine in Lemnhult having required major resources.

Total costs per investigation area

Table 3. Total costs (SEK, thousands).

Year	Civil maritime	Rail	Civil aviation	Military events	Other events	Total
2014	10,576	6,843	16,513	2,247	3,551	39,730
2015	14,049	6,385	14,452	4,340	2,907	42,133
2016	11,103	3,752	22,046	4,418	4,351	45,670