

## APPENDIX A

### RESPONSES RECEIVED ON DRAFT REPORT 'FLARE LAUNCHED WITH FATAL CONSEQUENCES'

The fourth and fifth columns provide the literal text of the responses of the parties. The last column contains an explanation from the Dutch Safety Board of the way the responses were processed.

Nr.	Partij	Section	Text to be corrected (first ... last word)	Argumentation / substantiate your correction	Corrected	Response from the Dutch Safety Board
1	Relatives	1.5	During ... investigation.	The footnote on page 7 (footnote 7) refers to two previous occurrences, whereas this footnote refers to only one other occurrence. It also refers to a different product and a different make. It is not clear whether this product also came from a different factory.	Yes	Text supplemented.
2	Relatives	2.2	The ... known.	This sentence speaks of 'grenades' where the remaining flares seem to be concerned. This is confusing (and perhaps suggestive).	Yes	Text amended in accordance with reaction.
3	Relatives	2.2	This ... investigation.	As per the previous comment on footnote 2 (page 5), it is not clear whether this product also came from a different factory. In addition, reference is made to a 'flaire' instead of a 'flare'.	Yes	Added that this concerned a product from a different manufacturer. 'Flaire' changed to 'flare'.
4	Relatives	3.5	After ... lifted.	It is not clear whether the Dutch Safety Board will continue to have the remaining Bontekoning flares seized now that the seizure by the Public Prosecution Service has been lifted, nor whether lifting the seizure also means that the attempt to bring the remaining five flares to the Netherlands will be abandoned (and that these flares will be destroyed).	Partly	On 16 February 2024, the Dutch Safety Board was informed that the remaining flares had been destroyed.
5	Relatives	3.7	Eventually ... tons.	It would be more accurate to speak of compression being under a 'weight' of 18 tonnes rather than a 'pressure', given that tonne is not a unit of pressure.	Yes	Footnote added.
6	Relatives	A.6	2nd test .... Flares	In this line, the second fall test is dated 23 July 2023. It is more likely that this should be 23 July 2021 (as per the narrative in section 3.3, page 17, bullet 2, line 32).	Yes	Typo. Text amended in accordance with reaction.

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7	Lecea	3.3 Manufacture of the flare	Interim finding Batch 113 was released on 23 July 2021, before the obligatory SOLAS temperature and humidity tests had been performed. This is regarded as an administrative action.	<p>LECEA Interim Finding Response: The system for carrying out final tests carried out on batches manufactured by LECEA are those established in Resolution MSC.81(70) - Revised Recommendation on Testing of Life-Saving Appliances - (adopted on December 11, 1998) / Part 2 - Production and Installation Tests / 4 Pyrotechnics: "A statistically adequate sample of pyrotechnics from each batch produced should be activated and observed for proper operation. The tests in section 4 of part 1 should be performed once for every 10 batches of signals produced; however, such tests should be conducted at least once every year, but need not be conducted more often than once in every calendar quarter. Where production of a signal is continuous, the tests in section 4 need only be performed once every year if the Administration is satisfied that the quality control procedures being followed together with continuous production methods make more frequent testing unnecessary."</p> <p>Batch 113 had passed all the in-process tests and one of the final control tests required by the regulations. Two tests (Temperature Cycle and Elevated Humidity) were applied to batch 113 however it was not mandatory to do so for this specific batch, nor was it mandatory before the batch was released.</p> <p>No batch manufactured by LECEA has been validated or placed on the market without complying with the requirements of the regulations.</p>	Yes	Added that additional tests must be performed for every 10 batches of flares that are produced. The subsequent tests consisted of a fall test (performed on 23 July 2021), temperature tests (performed in the period between 9 August and 9 September) and a humidity control test (performed between 11 and 26 August 2021).
8	Lecea	3.3 Manufacture of the flare	Batch 113 was filled and pressed on 21 July 2021, on which date the temperature of the outdoor air quickly exceeded the limit of 25°C after 12.30, without this being regarded as anomalous during production.	It should be noted that the temperature in Factory (Larrea) is typically lower than in Foronda (Vitoria) and as such it would be inaccurate to use the temperature in Foronda (Vitoria) as a reference temperature. It is also necessary to take into account that the number of engines pressed for batch 113 corresponds to two composition trays. The pressing of the engines was completed by between 12 and 12:30 p.m. and from there transferred to the intermediate warehouse which has also has humidity and temperature control.	Partly	Added that this does not concern the temperature and humidity at the production site, but that on that basis the issue does arise of how the mixture behaves during these changing circumstances.
9	Lecea	3.4 Rejection of batches produced previously	Interim finding The faulty temperature sensor in the drying room was only discovered after the 'evaporation' period of batch 114. The sensor was checked after the temperature in the drying room was 'felt' to be far too high. There was no monitoring of the temperature control and/or the sensor. It therefore cannot be ruled out that the sensor was already not working properly during the production of batch 113, which could have resulted in the temperature rising without being noticed – not to the extreme level observed in batch 114, but nevertheless above 25°C.	<p>LECEA Interim Finding Response: A rise in temperature would have been noticed during the work process. A batch of composition that has not dried to the requirement changes properties and becomes impossible to measure, manipulate and press and cannot be worked with. An example of this is where our technical checks detected this issue with batch 114, which was rejected. There were no non-conformity with lot 113.</p>	No	<p>There is no question of a clear tipping point. The drying process begins slowly. The temperature and humidity can change rapidly and to an extreme extent, and the filling and pressing process lacks monitoring and/or surveillance of those variables.</p> <p>See also reaction 8.</p>

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10	Lecea	3.7 Analysis of possible non-conformities	Interim finding During the evaporation process (20 to 21 hours), nothing is logged. Neither is there any monitoring of the cooling other than physical observation of the 12 temperature or determining by eye whether the mixture has already started to dry.	LECEA Interim Finding Response: We do not believe that there are shortcomings in process monitoring in the assembly and drying phase (see responses to other findings). However as an organization we have a commitment to quality improvement and as such upgrades have been made to equipment for temperature and humidity monitoring where the mixture is prepared, where it is left to rest for the acetone to evaporate and where work is carried out.	No	This is not factually incorrect. The Dutch Safety Board maintains its position.
11	Lecea	3.7 Analysis of possible non-conformities	Interim finding Faulty filling and pressing of a flare without a cardboard inlay cannot be ruled out and is technically possible. In the absence of a cardboard inlay, the edges are not removed by the press, resulting in undesirable transitions that can lead to additional combustion surface area.	LECEA Interim Finding Response: We do not believe faulty filling is a factor. There are at least three process checks to ensure the cardboard tubes are inserted correctly in the motor chamber prior to pressing. Firstly, the cardboard tubes are inserted in the motor chamber the day before the actual day of pressing. Once inserted they are placed with their open end up on a tray that stores 105 units. An additional visual inspection is made of the tray. Secondly, at the time of pressing, each motor chamber with cardboard inserted is checked prior to placing into the press for composition pressing. Finally, after pressing, each motor is checked and 'cleaned' individually with a specific tool to eliminate any leftover remains of composition inside and on the edges of the motor chamber. If there is no cardboard inserted it would be obvious during this 'cleaning' process.	Yes	Added that the manufacturer considers it unlikely that a motor without a cardboard inlay would be filled without this being noticed.
12	Lecea	3.7 Analysis of possible non-conformities	The work in question is performed in a relatively poorly lit space. The placement and removal of the rocket motor is routine work, where only disruptions to the process will prompt additional attention.	LECEA does not agree with the subjective assessment that the space is a "relatively poorly lit space".	Deels	Added that the Dutch Safety Board considers the space to be poorly lit.
13	Lecea	3.7 Analysis of possible non-conformities	Interim finding The three pressure/time tests on the motors are only an indication of the overall composition of the solid propellant. Despite the fact that there is an existing production methodology, it must be questioned to what extent the current process involving producing approximately 675 motors in a space of six hours in uncontrolled temperature and humidity conditions is amenable to proper control.	The composition is kept in properly controlled temperature and humidity conditions during the 20 - 21 hours, period required for drying and the evaporation process of the acetone. Only after this process is checked and complete to the accepted requirement that it is moved from this environment. After this stage, during the pressing process, the temperature and humidity conditions that the composition is exposed does not have any effect on the structure and behavior of the composition.	No	Testing is performed on random samples and these may not be representative of the situation at the end of the filling process.
14	Lecea	3.9 Quality assurance – guarantee?	Interim finding Internal procedures and the accreditation by Lloyd's Register as the notified body provide no guarantee of a safe product, due to fact that unnoticed non-conformities are possible during the process.	LECEA Interim Finding Response: The system for carrying out in-process and final tests, carried out on batches manufactured by LECEA, are those established in the applicable regulations and audited quality management system.	No	This is not factually incorrect.  A certified process is not a 100 per cent guarantee against errors.

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15	Lecea	4 CONCLUSIONS	Despite the fact that the Dutch Safety Board had no authority beyond the borders of the Netherlands to demand information or cooperation, the Board received full cooperation in the investigation and is therefore the Board is in a position to answer some of the investigation questions.	LECEA would really appreciate if you specific our name in the acknowledgement as [...received full cooperation and transparency from LECEA.]	Yes	Added that this concerns cooperation on the part of the manufacturer LECEA.
16	Lecea	4 CONCLUSIONS	During filling, for a relatively long period (six hours), there is no monitoring of the quality of the composition of the mixture in terms of the drying and/or start of curing, in particular during the final period of filling.	LECEA Response: LECEA does not agree that there is no monitoring of the quality of the composition. The fact LECEA have detected and rejected non-conforming batches of composition is clear evidence of monitoring and action.	No	The Dutch Safety Board is of the view that there is no quality monitoring of the mixture (filling) during filling of the motors.
17	Lecea	4 CONCLUSIONS	Batch 113 was released on 23 July 2021, even before the performance of the SOLAS temperature and humidity tests that were carried out in August and September.	LECEA Response: LECEA complied with all required testing protocols. In accordance with the applicable regulations, once every ten batches or once a year, if 10 batches of product are not manufactured, all the tests established by product are carried out.  To validate each batch, one of the indicated tests is carried out and some more can be carried out later, as was the case in batch 113, in which samples were taken and 2 more tests were carried out after the validation of the batch. The two tests (Temperature Cycle and Elevated Humidity) were applied to batch 113, but could have been done in the previous or subsequent batch. It was not mandatory to do so for this specific batch, nor was it mandatory before the batch was released, taking into account that it had passed all the in-process tests and one of the final control tests required by the regulations.  No batch manufactured by LECEA has been validated or placed on the market without complying with the requirements of the regulations.	Yes	Text amended in accordance with reaction. See also reaction 7.
18	Lecea	4 CONCLUSIONS	There is a possibility that the cardboard inlay was not present in the motor unit. The resulting gap could have led to an increased combustion surface area, and it can therefore not be ruled out in advance as a cause of the excessive combustion observed.	LECEA Response: We do not believe faulty filling is a factor. There are at least three process checks to ensure the cardboard tubes are inserted correctly in the motor chamber prior to pressing. Firstly, the cardboard tubes are inserted in the motor chamber the day before the actual day of pressing. Once inserted they are placed with their open end up on a tray that stores 105 units. An additional visual inspection is made of the tray. Secondly, at the time of pressing, each motor chamber with cardboard inserted in checked prior to placing into the press for composition pressing. Finally, after pressing, each motor is checked and 'cleaned' individually with a specific tool to eliminate any leftover remains of composition inside and on the edges of the motor chamber. If there is no cardboard inserted it would be obvious during this 'cleaning' process.	No	See reaction 11.
19	Lecea	4 CONCLUSIONS	A type approval for the flare was issued by Lloyd's Register Marine Deutschland. In view of the gaps identified, the type approval issued by Lloyd's Register – which creates the expectation that the safe use of the product is guaranteed – nevertheless does not offer any guarantee regarding use now or in the future.	LECEA Response: The process prior to the release of the batch of an article manufactured by LECEA includes in-process and final tests that are carried out following the indications of current regulations and it is compliance with these requirements and the quality management system of LECEA that is audited and certified by the Notified Body.	Partly	Text amended to say that the impression may be created, but the type approval indicates that a product conforms to a predetermined standard.

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20	Lecea	5 RECOMMENDATIONS	<p>Based on the findings of this investigation, there are lessons to be learned. The Dutch Safety Board has observed that there are gaps in the production process. Certification offers no guarantee to the user.</p> <p>In view of the uncertainty in the phase in which the motors are filled with the mixture that eventually forms the solid propellant and are then pressed, the Dutch Safety Board makes the following recommendations:</p> <p>To Lecea as the manufacturer of the Pirolec flare:</p> <ul style="list-style-type: none"> <li>- Integrate control measures into the production process to prevent the prepared mixture from being exposed to excessive ambient temperatures and/or excessive humidity for too long.</li> <li>- Integrate control measures into the process to ensure that the cardboard inlay is inseparably connected to the motor unit.</li> </ul>	<p>LECEA Response:</p> <p>LECEA does not agree that there are gaps or uncertainties in the production phases or processes. LECEA has an ongoing commitment to continuing quality improvement and as a matter of course always look at ways to continually improve on protocols and process. This is evidenced by improvements to equipment used to monitor temperature and humidity as well as the addition of ISO 14001 Environmental Management System to LECEA's existing ISO 9001 Quality Management System.</p>	Partly	<p>Given the contents of the report, the Dutch Safety Board believes that monitoring and recording the ambient temperature and humidity during the production process is important.</p>
21	Lecea			<p>COMMENTS FROM LECEA</p> <p>LECEA has provided full cooperation and transparency during the investigation into this case. This has included allowing a site visit by investigators and several videocalls, as well as access to confidential production protocols and procedures. LECEA would like it noted that the production protocols and procedures are commercial-in-confidence documents and feel that it is appropriate that the contents details of the manufacturing protocols and procedures be redacted from any final published report.</p>	Yes	<p>Confidential product information removed.</p>
22	CIAIM			<p>General</p> <p>In general, we find the report biased towards a manufacturing defect, without paying much attention to other causes and other circumstances of the accident. This is understandable given that the DSB investigation has had very detailed information on the manufacturing process.</p> <p>The report focuses on the only controlled process, the manufacturing process, without examining other uncontrolled processes: transport, storage, handling on board, assuming that the flare has not been subjected to shocks, drops, excessive temperatures, vibrations, since it left the factory.</p> <p>CIAIM does not share the approach taken in examining the use of the flare. The report seems to trivialize the use of a distress flare for recreational use. A flare is a distress signal and contains explosive material, it is not a toy, it should always be handled with due precautions, and SOLAS expressly states this in chapter V rule 35. Please note that if the flare had not been launched, the accident would never have occurred. Had the skipper never faced an emergency situation the flare would have been removed from service and destroyed, causing no damage.</p>	Partly	<p>The Dutch Safety Board does not offer any opinion on why the flare was launched.</p> <p>In addition, it is also undesirable for this incident to occur when a flare is launched as part of training or in an emergency situation.</p> <p>See report sections 1.3, 2.3 and 3.5.</p>

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23	CIAIM	3.3	Batch 113 was filled and pressed on 21 July 2021, on which date the temperature of the outdoor air quickly exceeded the limit of 25°C after 12:30, without this being regarded as anomalous during production.	A relationship between the temperatures at Vitoria Airport and the facilities has not been properly established. The factory is located on a mountainside, surrounded by a forest and at an altitude of 570 meters, the airport is located on a plain, surrounded by asphalt and at an altitude of 513 meters.	Partly	See reaction 8.
24	CIAIM	3.3	The faulty temperature sensor in the drying room was only discovered after the 'evaporation' period of batch 114. The sensor was checked after the temperature in the drying room was 'felt' to be far too high. There was no monitoring of the temperature control and/or the sensor. It therefore cannot be ruled out that the sensor was already not working properly during the production of batch 113, which could have resulted in the temperature rising without being noticed – not to the extreme level observed in batch 114, but nevertheless above 25°C.	Agree on the first paragraph. The 2nd is tendentious. It cannot be ruled out that the sensor was not working properly during the production of batches 113, 112, 111, etc. During the production of these batches, the temperature was not felt to be high.	No	The functioning of the sensor was not monitored. It cannot be ruled out that the sensor was already defective during production of batch 113.
25	CIAIM	3.7	Faulty filling and pressing of a flare without a cardboard inlay cannot be ruled out and is technically possible. In the absence of a cardboard inlay, the edges are not removed by the press, resulting in undesirable transitions that can lead to additional combustion surface area.	First sentence: Tendentious. It is technically possible, but very unlikely, as an operator would have noticed it (all motors are visually checked). Second sentence: Disagree. It is questionable that the lack of a cardboard inlay leads to additional combustion area: <ul style="list-style-type: none"> <li>• The absence of cardboard inlay leaves more room for the same quantity of mix (50g). If the stamp has a fixed stroke, the situation in figure 11 is not possible.</li> <li>• The filled motor unit is also brushed clean if necessary</li> <li>• Lid assembly cleans residues from the walls of the motor unit.</li> </ul>	Partly	Agree with the point that figure 11 is not entirely accurate if the stamp has a fixed height setting, but this would lead to the same effect, namely failure to compact the contents properly and a risk of cracks forming.  See also reaction 11.
26	CIAIM	3.7	The three pressure/time tests on the motors are only an indication of the overall composition of the solid propellant. Despite the fact that there is an existing production methodology, it must be questioned to what extent the current process involving producing approximately 675 motors in a space of six hours in uncontrolled temperature and humidity conditions is amenable to proper control.	Tendentious. The fabrication process and the tests performed are in conformity with the relevant regulations: MSC/Res. 81(70), MSC/Circ. 1629 and IMO LSA Code. There is not single evidence that the flares in batch 113 were defective, all flares tested were satisfactory.	No	Testing is performed on random samples and this does not guarantee that there will not be a defective flare among them.  See also reaction 13.

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27	CIAIM	3.8	TNO points to the possible presence and ignition of hydrogen gas, for example as a result of static electricity, which could have simultaneously ignited the candle unit and the motor. Simultaneous ignition of the solid propellant at the bottom and the hydrogen gas at the top of the motor could subsequently also have led to excessive pressure and the explosion of the motor.	sailing along the equator thunderstorms at sunset are common (daily). The static electricity present at the equator is usual and normal and produces beautiful thunderstorms (especially if you are not underneath).	No	This is not factually incorrect.
28	CIAIM	3.9	Internal procedures and the accreditation by Lloyd's Register as the notified body provide no guarantee of a safe product, due to fact that unnoticed non-conformities are possible during the process.	Unnoticed non-conformities are possible in all industrial processes (accident investigation bodies are well aware of this fact). Safety of products is statistically demonstrated by proper testings and processes are updated when proved inadequate. In this case, no single fault has been found, since all tests performed on the retired flares were satisfactory. DSB has identified areas of improvement, but there is no evidence of non-conformity during the fabrication of 113 batch.	No	This is not factually incorrect.  See also reaction 14.
29	CIAIM	Conclusions		We miss a paragraph dedicated to the non-conformity of shipboard procedures with the regulations applicable to flares, see SOLAS Ch. V, Reg 35. We are talking about explosives so their use must limit to emergency situations. As mentioned before, if the flare had not been launched, the accident would never have occurred.	No	The Dutch Safety Board does not offer any opinion on why the flare was launched.  In addition, it is also undesirable for this incident to occur when a flare is launched as part of training or in an emergency situation.
30	CIAIM	Conclusions		We also miss a statement that the tests performed were in accordance with the IMO regulations, particularly the LSA Code.	Yes	Text amended in accordance with reaction. See also reaction 7.
31	CIAIM	Conclusions		We also do not believe that it can be ruled out that the flare may have suffered some damage during transport and storage. At this respect we notice a different treatment of DSB on remote hypothesis. The report mentions specifically the TNO scenario which is presented as a remote theoretical hypothesis, but does not mention the hypothesis of damage during transport and storage, while we believe that this is a more likely hypothesis than TNO's.	No	The Dutch Safety Board focused the investigation on the production of the flare.  See report sections 1.3, 2.3 and 3.5.
32	CIAIM	Conclusions		Regarding the cardboard inlay, although there is a remote possibility that it was not present, a relationship between the absence of the cardboard and excessive combustion has not been solidly established. At the very least, the presence of excessive burning surfaces should have been demonstrated by proceeding to manufacture and assemble several flares without the cardboard inlay.	No	This proposal was discussed with LECEA during the investigation, but LECEA argued that it was too dangerous.
33	CIAIM	Conclusions		Lastly, we disagree with the statement that the type approval issued by Lloyd's Register Marine Deutschland does not offer any guarantee regarding use now or in the future, since not a single non-conformity has been found in any of the flares examined, nor it has been established that the explosion was due to a defect in the fabrication process.	No	The absence of a previous occurrence is no reason to conclude that the production process or the flares are free from defects.
34	Lloyd's Register	2.3	where the requirements are stricter	The certificate was issued under the Mutual Recognition Agreement between the REU and the USA, the testing and certification requirements are the same under mutual regulation and so suggest the reference to "stricter requirements" are removed.	Yes	Amended in accordance with reaction and footnote added.

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35	Lloyd's Register	3.9	Internal Procedures ....process	The type approval issued does not create the expectation that the safe use of the product is guaranteed. The Type approval is a statement of fact that a product meets a specified standard and that there are suitable quality assurance procedures in place to ensure subsequent manufactured products are likely to meet the same performance standard. Expectation of safety is outside this process and comes from International statutes such as SOLAS and the LSA Code. Suggest this text is amended or deleted.	No	This is not factually incorrect.  See also reaction 14.
36	Lloyd's Register	Conclusions	During Filling .....observed	We would expect that if these factors were significant a similar performance defect would be expected to be found in the rest of the batch. No subsequent tests on the same batch gave the same issue. We request this fact is included in this section of the report.	Partly	The absence of a previous occurrence is no reason to conclude that the production process or the flares are free from defects.
37	Lloyd's Register	Conclusions	Finally, the ....hypothesis	We suggest consideration of deleting this finding due to the theoretical nature of the conclusion	No	The Dutch Safety Board considers this hypothesis unlikely, but cannot rule it out either.
38	Lloyd's Register	Conclusions	A type approval ....now or in the future	The type approval issued does not create the expectation that the safe use of the product is guaranteed. The Type approval is a statement of fact that a product meets a specified standard and that there are suitable quality assurance procedures in place to ensure subsequent manufactured products are likely to meet the same performance standard. Expectation of safety is outside this process and comes from International statutes such as SOLAS and the LSA Code. Suggest this text is amended or deleted.	Yes	See reaction 19.