AEROSPACE STANDARD

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Superseding AS13000

Problem Solving Requirements for Suppliers

RATIONALE

This technical report is being stabilized and will no longer be updated. This technical report will eventually be cancelled and superseded by AS13100 at a future date to be determined.

STABILIZED NOTICE

This document has been declared "STABILIZED" by SAE G-22 Aerospace Engine Supplier Quality (AESQ) Committee and will no longer be subjected to periodic reviews for currency. Users are responsible for verifying references and continued suitability of technical requirements. Newer technology may exist.

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TABLE OF CONTENTS

1. SCOPE 2
1.1 Purpose 2

2. APPLICABLE DOCUMENTS 2
2.1 SAE Publications 2

3. DEFINITIONS 2

4. OVERVIEW OF PROBLEM SOLVING 3

5. COMMUNICATION 3

6. TRAINING 3

7. QUALITY SYSTEM 3

8. 8D PROCESS 3
8.1 D0 Implement Immediate Containment and Prepare for 8D 3
8.2 D1 Form the Team 4
8.3 D2 Define the Problem 4
8.4 D3 Develop Containment Actions 5
8.5 D4 Identify and Verify Root Causes 5
8.6 D5 Identify Corrective Action 5
8.7 D6 Implement Corrective Action 6
8.8 D7 Define and Plan Preventive Action 6
8.9 D8 Recognize the Team 7

9. NOTES 7

APPENDIX A PROBLEM SOLVING TEMPLATE 8
APPENDIX B 8D CHECK LIST 11
APPENDIX C TRAINING SYLLABUS 18

1. SCOPE

The supplier shall use the following process to respond to a customer request for corrective and preventive action.

1.1 Purpose

The purpose of this document is to define the customer requirements regarding the use of Eight Disciplines (8D) method to respond to a customer request for corrective action.

8D is a widely used and effective problem solving process and there are many practitioners and training providers that can support skills development.

2. APPLICABLE DOCUMENTS

The following publications form a part of this document to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order. In the event of conflict between the text of this document and references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

3. DEFINITIONS

ESCAPE POINT: The earliest point in the process where the problem should have been detected.

FAILURE MODE: The manner in which a component, subsystem, system, or manufacturing/assembly process could potentially fail to meet or deliver its intended function(s) or process requirements.

GENERATION POINT: The point in the process where the failure mode was created.

INTERIM CONTAINMENT ACTION (ICA): Immediate temporary actions taken in order to eliminate or significantly reduce the effect of the Failure Mode on the customer(s) until permanent corrective actions are in place and verified.

PERMANENT CORRECTIVE ACTION (PCA): Long-term actions taken to address the problem from its root cause(s) and fix it permanently.

PROBLEM: Description of an issue where a product does not meet the required standard.

RECURRENCE: Subsequent nonconformance with the same underlying Root Cause.

ROOT CAUSE: The fundamental deficiency or failure of a process that when resolved, prevents or significantly reduces the likelihood of recurrence of the problem.

SYMPTOM/FAILURE MODE EFFECT: Measurable events or effects that indicate the existence of one or more problems.

4. OVERVIEW OF PROBLEM SOLVING

8D Problem solving covers three key stages of correction:

- Act rapidly to put immediate containment action in place to protect the customer.
- Find and fix the root cause with a permanent corrective action on all current product.
- Prevent the recurrence of the problem in the future by identifying and implementing preventive action anywhere possible within the organization.

5. COMMUNICATION

Reporting of 8D progress shall be communicated as agreed with the customer.

The supplier shall use the 8D form (see APPENDIX A) or equivalent content, as required by the customer.

6. TRAINING

The correct training of 8D practitioners is key to the successful outcome of the process. Each supplier shall employ or have access to a problem solving practitioner who has been trained by a training provider meeting the requirement of the “training syllabus” (see APPENDIX C).

7. QUALITY SYSTEM

The supplier shall have a documented problem solving process within its own quality system which meets the requirements of this standard. The process shall be fully implemented and subject to audit.

The documented problem solving process shall describe the training and competences requirements for problem solving practitioners.

8. 8D PROCESS

The 8D practitioner shall ensure completeness of all 8D steps (Appendix B).

8.1 D0 Implement Immediate Containment and Prepare for 8D

Where a symptom is observed and there is customer impact the supplier shall take immediate containment action to protect the customer.

D0 shall be completed and returned to the customer within 2 days of the problem being identified unless otherwise agreed.

Actions:

- Define the symptom (this must be quantified).
- Define and implement containment actions (sometimes called Emergency Response Actions).
- Check that the containment action works (provide evidence).
- Check if the symptom has been seen before.
- Suspend all shipment of suspect nonconforming hardware.
- Initiate is/is not chart as required by the customer.

Ensure that:

- The symptom has been defined and quantified.
- The stakeholders affected have been identified and notified.
- Management is committed to fixing the problem using 8D.
- Additional resources are involved as needed.
- Raise an 8D form in your quality management system.

8.2 D1 Form the Team

The supplier shall form a cross-functional team of people who have the knowledge, skill, experience, time, authority and will to work the problem at pace right through to a satisfactory conclusion. At least one member of the team shall be appropriately trained in the application of the 8D methodology and shall be accountable for the application of this standard.

Actions:

- Identify a Champion for the team that can make sure that actions are taken and any road blocks are removed.
- Identify a Team Leader that can focus and motivate the team.
- Select team members.
- Define the team goal.
- Define the roles of the team members.

8.3 D2 Define the Problem

The supplier shall define the nonconformance to the customer requirement by identifying and describing in quantifiable terms what is wrong. This statement is called the problem description.

Actions:

- Collect, and analyze data to find out “what is wrong with what.” Develop a problem statement by describing the problem in quantifiable terms. The description shall address:
    - Problem discovery point: where is the earliest point within the process where the problem can be observed?
    - Problem manifestation: what are the indications that a problem exists? It is best if the problem can be described in terms of customer experience.
    - Problem impact: what is the impact in terms of quality, reliability and productivity?
    - Problem focus: Can the investigation focus be narrowed to speed convergence to the root cause?
- Record the process flow as appropriate.
- Review the problem description with the customer and affected parties.

8.4 D3 Develop Containment Actions

The supplier shall implement actions to immediately stop the symptoms from affecting the customer until the problem can be resolved permanently.

Actions:

- Select and implement the most effective containment action.
- Work with the customer to determine the locations of affected product and the responsibilities, methods and timescale to contain that product.
- Check that the containment action is effective. Read across to other affected product as appropriate.
- Maintain records of containment as required by the customer.
- Notify customer of resumption of shipping as agreed to by customer.

8.5 D4 Identify and Verify Root Causes

The supplier shall find the root cause by identifying potential causes and selecting the ones which explain the problem. The supplier shall find the generation points where the symptom was created and the escape points where the problem should have been detected and contained.

Actions:

- Update the problem definition if necessary.
- Find the root causes of the problem, of the escape and of the quality management system.
- Verify the root causes.
- Verify the escape point(s) and establish why they were present.

8.6 D5 Identify Corrective Action

The supplier shall identify the corrective actions that permanently eliminate the root causes of both generation and escape.

D5 shall be completed in a timely manner not to exceed 30 days of the problem being identified unless otherwise agreed.

Actions:

- Identify permanent corrective actions.
- Verify that the corrective actions will be effective and do not cause further problems.
- Define the actions required to fix the control system at the escape point so that further occurrences will be detected and not released.

8.7 D6 Implement Corrective Action

The supplier shall implement and test the corrective actions that fix the root causes and the quality control system at the escape point.

Actions:

- Plan the implementation of the corrective actions.
- Implement the corrective actions that fix the root causes.
- Check that the root causes are fixed and that the problem will not happen again.
- Implement the corrective actions that fix the quality control system at the generation and escape point(s) ensuring that it will detect and not release the problem again.
- As required, remove containment measures when it’s no longer detecting non-conformant products.
- Update the appropriate quality documentation as required by the customer (such as PFMEA and the control plan).
- Check that the corrective actions continue to be effective by monitoring through inclusion into the internal auditing program.

8.8 D7 Define and Plan Preventive Action

The supplier shall take systemic action to prevent recurrence of this problem and other similar problems and capture the lessons learned.

NOTE: The team may not have the authority to implement systemic actions but can make recommendations to the Champion for implementation.

The champion shall ensure that recommendations are appropriate to the scale of problem and have responsibility for implementation.

Actions:

- Identify further affected parties and opportunities for similar problems.
- Implement and check actions to prevent further problems.
- Make recommendations on systemic fixes.
- Document the lessons learned in relation to the problem within the system so that the lessons are referred to, to maximize the value of the problem solving effort and prevent any similar problems.
- Define and schedule actions to confirm the effectiveness of the corrective/preventive actions implemented.

8.9 D8 Recognize the Team

The supplier shall recognize the success of the team and formally close the project.

Actions:

- Document the lessons learned from the 8D process.
- Maintain all problem solving records.
- Recognize the team for their contribution and celebrate the achievements.
- Close the project.

9. NOTES

9.1 A change bar (l) located in the left margin is for the convenience of the user in locating areas where technical revisions, not editorial changes, have been made to the previous issue of this document. An (R) symbol to the left of the document title indicates a complete revision of the document, including technical revisions. Change bars and (R) are not used in original publications, nor in documents that contain editorial changes only.

PREPARED BY SAE COMMITTEE G-22, AEROSPACE ENGINE SUPPLIER QUALITY (AESQ)

APPENDIX A - PROBLEM SOLVING TEMPLATE

AESQ - 8D REPORT

Report #	Supplier Name	Supplier Code	Date Opened	Targeted Closure	Date Closed

Progress Tracker	Discipline	0	1	2	3	4	5	6	7	8
		 Implement Immediate containment and prep.	 Form the team	 Define the Problem	 Develop Containment Actions	 Identify and verify Root Cause	 Identify Corrective Action	 Implement Corrective Action	 Define and plan Preventive action	 Recognize the team
Closure Date										
Effectiveness check Date										

D — Implement Immediate containment and prepare

0

Part Number		PO nº:	Customer contact:
Part Description		PO item:	Witnessed by:
Affected Engines:			Customer reference number
Delivery affected?		No ☐ Yes ☐	Emergency Response Actions taken
Suspect root cause identified?		No ☐ Yes ☐	Action / Date
Root cause verified?		No ☐ Yes ☐	
Emergency Response Action?		No ☐ Yes ☐	
Recurring problem? If yes, attach report		No ☐ Yes ☐	Emergency action 3

Make first draft of IS/IS NOT chart for better problem understanding, then complete team definition – Attach sheet

D — 1A Form the team — 1B Closure & Sign-Off

1

Function	LAST NAME, First name	Cell/Phone/Pager	e-mail	Signature	Date
Please select					
Please select					
Please select					
Please select					
Please select					
Please select					

D — Define the Problem

Define customer experience

2

Failure mode: (what's wrong with what?) and effect (at supplier and at customer)	Customer problem type definition	Recurring problem? If yes, attach report	Failure mode in (D)(P)FMEA?
		No ☐ Yes ☐	No ☐ Yes ☐

What is required by the specification?	What's the specification? Whose document is it?

Affected part quantification		
# of parts produced within Problem Boundary	Nº of parts affected	% of parts affected

Problem source: where in manufacturing process (if known)

Problem boundaries (Bad parts / Total parts)

☐ Sub Supplier : Name	☐ Customer of Customer
☐ Supplier: Name	☐ Aircraft Operators
☐ Customer	☐ Spare Parts
☐ (Other 1):	☐ (Other 2):

Problem part earliest known occurrence date	
Problem part earliest known awareness date	
Problem part earliest known shipment date	

PLACE PHOTO HERE DEPICTING ISSUE

To place photo here follow these instructions:
Copy your picture to clipboard (Ctrl+C)
Unprotect form by clicking on the "Protect Form" button (found on the Forms toolbar, View → Toolbars → Forms
Select all text on this box including these instructions
Paste your picture (Ctrl+V)
Resize and align picture as needed
Protect form by clicking on the "Protect Form" button on the Forms toolbar
Continue filling out this form as needed

D3 Develop containment actions

Eliminate or significantly reduce the effects of the failure mode on the customer

#	Action	Resp.	Date Start	Metric	% Eff.	Part ID	Date Finish
1							
2							
3							
4							
5	Read across action taken			-	-		

D4 Identify and verify Root Causes

Identify & verify all causes that explain the occurrence of the failure mode

#	Cause source	Cause description	Verified	Date	Verification method (attached)
1	Please select		No ☐ Yes ☐		
2	Please select		No ☐ Yes ☐		
3	Please select		No ☐ Yes ☐		
4	Please select		No ☐ Yes ☐		

Has Escape Point Causes been addressed	Can causes explain differences in IS/IS NOT chart?	Identified Causes in Process FMEA?
No ☐ Yes ☐	No ☐ Yes ☐	No ☐ Yes ☐

D5 Identify Corrective Action

Identify & verify corrective actions to eliminate failure mode's causes

#	Cause source	Selected Permanent Corrective Action(s) Add more lines if necessary	Verified	Date	Verification method (attached)
1	Please select		No ☐ Yes ☐		
2	Please select		No ☐ Yes ☐		
3	Please select		No ☐ Yes ☐		
4	Please select		No ☐ Yes ☐		

D6 Implement Corrective Action

Define and execute an implementation plan for the corrective action.

#	Selected Permanent Corrective Action - PCA	PCA Implementation Plan	Team Member	Implementation Date	Customer concurrence	PCA Status
1					No ☐ Yes ☐	Please select
2					No ☐ Yes ☐	Please select
3					No ☐ Yes ☐	Please select
4					No ☐ Yes ☐	Please select

D — Define and plan preventive action

Modify systems to Prevent Recurrence of this and similar problems. Recommend systemic improvements

7

7A

	Selected Preventive Action - PA	PA Implementation Plan	Team Member	Target Date	Actual Date	PA Status
1						Please select
2						Please select
3						Please select

7B List similar Processes / Items with the potential of the same defect
Beginning a new 8D report for each is highly recommended

Process / Item	Responsible	8D # / Planned validation date	

7C Review and revise if necessary the following
Attach copies of the revised documents

#	Reviewed document	Nature of revision	Resp.	Review Completion Date Planned	Review Completion Date Actual
☐	Quality awareness communication				
☐	Design FMEA				
☐	Process Flow Chart				
☐	Process FMEA				
☐	Process Control Plan				
☐	Work Instructions				
☐	Inspection standard – Receiving				
☐	Inspection standard – Shipping				
☐	PPAP resubmission				
☐	Process Change Request				
☐	Engineering Change Request				
☐	Change Authorization				
☐	Other:				
☐	Relevant QMS practices				
☐	Read across action taken	Discuss with your quality specialist if document issuance is appropriate			

D — Recognize the team

Recognize the efforts and success of the 8D team. Report results to customer and all stakeholders

8

8A Follow-up Meetings **8B Closure & Sign-off**

Planned date	Actual date	Planned date	Actual date	Verification	Title	Signature	Date
				Vendor Management			
				Customer			

8C Team Recognition

When:	Where:	How:

APPENDIX B - 8D CHECK LIST

The following checklist is designed to assist in assessing the quality of the 8D activity.

Review the following assessing questions during execution of each step and before proceeding to the next step.

D0 assessing questions	
Emergency Response Action (ERA)	Are emergency response actions necessary? Is a field action required as part of the emergency response? How was the emergency response action verified? How was the emergency response action validated?
8D Application Criteria	How well does the proposed 8D meet the application criteria? Has the effect of the issue been quantified?) Have measurements been taken to quantify the symptom(s) demonstrated? Does a performance gap exist AND/OR has the priority (severity, urgency, growth) of the symptom warranted initiation of the process? Is the cause unknown? Is management committed to dedicating the necessary resources to fix the problem at the root cause level and to prevent recurrence? Does the symptom complexity exceed the ability of one person to resolve?
Other	Will the new 8D duplicate an existing 8D?
Common Tasks	Have all changes been documented (e. g., FMEA, control plan, process flow)? Do we have the right team composition to validate the current step and proceed to the next? Have we reviewed the measurable(s)? Have we determined if field action is required? Can we anticipate need for deployment of timely on-site support? Have we reviewed all these assessing questions with the sub tier if the issue was caused by the latter?

D1 assessing questions	
Warm Up	What have you done to make the room user-friendly? When and where will the team meet? What has been done to help team members build their relationships with each other? What has been done to help team members focus on the team's activity? Has the purpose of the meeting been stated? Has the team been informed of the agenda for the meeting?
Membership	Are the people affected by the problem represented? How is customer’s viewpoint represented? Does each person have a reason for being on the team? Is the team large enough to include all necessary input but small enough to act effectively? Does the team membership reflect the problem's current status? Do the team members agree on membership?
Product /Process Knowledge	What special skills or experience will the team require in order to function effectively?

Operating Procedures and Working Relationships	Have the team's goals and membership roles been clarified? Does the team have sufficient decision-making authority to accomplish its goals? How will the team's information be communicated internally and externally? Do all members agree with and understand the team's goals? Are team members' roles and responsibilities clear? Is a facilitator needed to coach the process and manage team consensus?
Roles	Has the designated Champion of the team been identified? Has the Team Leader been identified?
Common Tasks	Have all changes been documented (e. g., FMEA, control plan, process flow)? Do we have the right team composition to validate the current step and proceed to the next? Have we reviewed the measurable(s)? Have we determined if a field action is required? Have we reviewed all these assessing questions with the sub tier if the issue was caused by the latter?

D2 assessing questions	
Symptom	Can the Symptom be subdivided?
Problem Statement	Has a specific Problem Statement been defined (object and defect)? Have 'Repeated Whys' been used? What's wrong with what? Do we know for certain why this is occurring?
Problem Description	Has Is/Is-Not Analysis been performed (what, where, when, how big)? When has this problem appeared before? Where in this process does this problem first appear? What, if any, pattern(s) is (are) there to this problem? Are similar components and/or parts showing the same problem? Has the current process flow been identified? Does this process flow represent a change? Have all required data been collected and analyzed? How does the ERA affect the data? Is there enough information to evaluate to identify potential root causes? Do we have physical evidence of the problem? Has a Cause & Effect Diagram been completed?
Type of Problem	Does this problem describe a 'something changed' or a 'never been there' situation?
Review of Problem Description	Has the Problem Description been reviewed for completeness with customer and affected parties? Should this problem be reviewed with executive management? Should financial reserves be set aside? Should any moral, social or legal obligations related to this problem be considered?
Common Tasks	Have all changes been documented (e. g., FMEA, control plan, process flow)? Do we have the right team composition to validate the current step and proceed to the next? Have we reviewed the measurable(s)? Have we determined if a field action is required? Have we reviewed all these assessing questions with the sub tier if the issue was caused by the latter?

D3 assessing questions Before ICA (Interim Containment Action)	
Implementation	Are ICAs required? Is a field action required as part of the ICA? What can we learn from the ERA that will help in the selection of the 'best' ICA? Based on the criteria established, does the ICA provide the best balance of benefits and risks? How does this choice satisfy the following conditions? The ICA protects customers 100 percent from the effect. The ICA is verified. The ICA is cost-effective and easy to implement. Have you shipped, or is there any suspect material in transit to any customer? Do you have any similar parts in finished stores with the same problem? Do you have any suspect material currently in production that may exhibit this problem? Does this problem exist in similar customer part numbers? Has a sub-tier supplier contributed to this problem? Is there any suspect material in transit, including to customer?
Planning	Have the appropriate departments been involved in the planning of this decision? Are the appropriate Advanced Product Quality Planning (APQP) tools available (e.g., FMEA, control plans, instructions)? Have plans, including action steps, been identified (who needs to do what by when)? Has a validation method been determined? Does the customer have a concern with this ICA (is customer's approval required)? Have we identified what could go wrong with our plan and have preventive and contingency actions been considered? Are implementation resources adequate?
Post Implementation	Does the validation data indicate that the customer is being protected? Can the ICA effectiveness be improved?
Common Tasks	Have all changes been documented (e. g., FMEA, control plan, process flow)? Do we have the right team composition to validate the current step and proceed to the next? Have we reviewed the measurable(s)? Have we determined if a field action is required? Has timely on-site support been deployed as needed? Have we reviewed all these assessing questions with the sub tier if the issue was caused by the latter?

D4 assessing questions	
General	Has the factual information in the Problem Description been updated? Is it consistent with the previously performed is/is not analysis? What sources of information have been used to develop the potential root-cause list?
Root Cause	Is there a root cause (a single verified reason that accounts for the problem)? What factor(s) changed to create this problem? What data is available that indicates any problem in the manufacturing or design process? How did we verify this root cause? Does this root cause explain all the facts compiled at D2? Does the root cause analysis address the system level issue?

Potential Root Cause	Have appropriate Advanced Product Quality Planning (APQP) tools been considered? (e.g., FMEA, control plans, instructions) Is there more than one potential root cause? Does each item on the potential root-cause list account for all known data? Has each item been verified (used to make the effect come and go)? How did you determine assignment of percent contribution? If the level is achievable, has the team considered and reviewed with the Champion the benefit of developing a separate problem description (and, by definition, separate 8D) for the one or more contributing potential root cause(s)? If the level is not achievable, has the team considered and reviewed with the Champion the benefit of alternate problem-solving methods?
Escape Point	Does a control system exist to detect the problem? Has the current control system been identified? Does this control system represent a change from the original design? Has it been verified that the control system is capable of detecting the problem? Is the identified control point closest to the root cause/potential root cause? Is there a need to improve the control system?
Common Tasks	Have all changes been documented (e. g., FMEA, control plan, process flow)? Do we have the right team composition to validate the current step and proceed to the next? Have we reviewed the measurable(s)? Have we determined if a field action is required? Have we reviewed all these assessing questions with the sub tier if the issue was caused by the latter?

D5 assessing questions Before PCA (Permanent Corrective Action)	
Decision	What criteria have been established for choosing a PCA for the root cause and escape point? Does the Champion agree with these criteria? Is a field action required as part of the PCA? What choices have been considered for the PCAs? Document the rationale for the validation analysis What features and benefits would the perfect choice offer? How can we preserve these benefits? What risks are associated with this decision and how should they be managed? Does the Champion concur with the PCA selections?
Verification	What evidence (proof) do we have that this will resolve the problem at the root-cause level? Did you verify the whole variation range of parameters affecting the cause occurrence? Which variables did we measure during the verification step? Do these indicators constitute sound verification?
After PCA Decision	What are the possibilities that this choice, once implemented, will create other troubles? Can the customer live with this resolution? Will our containment continue to be effective until our choice can be implemented? What resources will be required for PCA implementation? Do we have these resources? What departments will need to be involved in the planning and implementation of this decision? Have actions been considered that will improve the ICA prior to PCA implementation?

Common Tasks	Have all changes been documented (e. g., FMEA, control plan, process flow)?
	Do we have the right team composition to validate the current step and proceed to the next?
	Have we reviewed the measurable(s)?
	Have we determined if a field action is required?
	Have we reviewed all these assessing questions with the sub tier if the issue was caused by the latter ?

D6 assessing questions	
Planning	What departments are needed to implement the PCAs?
	Are representatives of those departments on our team to plan and implement their roles and responsibilities?
	What customer and/or supplier involvement is needed?
	Who will do the planning for the customer and for the supplier?
	Do we have the necessary resources to implement this plan? What is needed?
	At what point(s) is this plan vulnerable? What can be done to prevent these points?
	How are we monitoring completion of the plan?
	When will the ICA be removed?
	How will we communicate this plan to those who have a need to know? What training will be required?
	What measurable(s) will be used to validate the outcome of the PCAs (both short-term and long-term)?
Validation	Has the ICA been discontinued?
	Has the unwanted effect been totally eliminated?
	How can we conclusively prove this?
	How are we continuing to monitor long-term results? What is the measurable? Is this the best way to prove the root cause is eliminated?
	How have we confirmed the findings with the customer?
	Have we updated all quality documentation pertaining to this issue (e.g., process flow charts, Process control plan, work instructions, visual aids, etc.)?
Common Tasks	Have all changes been documented (e. g., FMEA, control plan, process flow)?
	Do we have the right team composition to validate the current step and proceed to the next?
	Have we reviewed the measurable(s)?
	Have we determined if a field action is required?
	Have we reviewed all these assessing questions with the sub tier if the issue was caused by the latter?