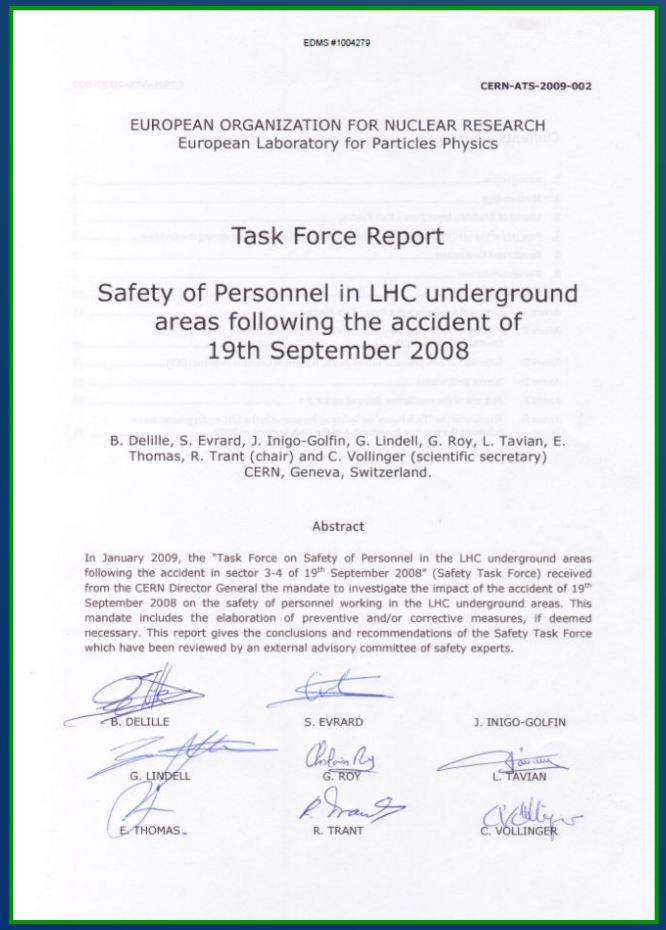
European Organization for Nuclear Research - Organisation européenne pour la recherche nucléaire

# Safety Task force follow-up in perspective to the 2nd LHC physics run in 2011

R. Trant

# Safety follow-up of 19th Sept. 2008 incident



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EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH
European Laboratory for Particles Physics

Task Force Report

Safety of Personnel in LHC underground areas following the accident of 19th September 2008

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Abstract

In January 2009, the "Task Force on Safety of Personnel in the LHC underground areas following the accident in sector 3-4 of 19th September 2008" (Safety Task Force) received from the CERN Director General the mandate to investigate the impact of the accident of 19th September 2008 on the safety of personnel working in the LHC underground areas. This mandate includes the elaboration of preventive and/or corrective measures, if deemed necessary. This report gives the conclusions and recommendations of the Safety Task Force which have been reviewed by an external advisory committee of safety experts.

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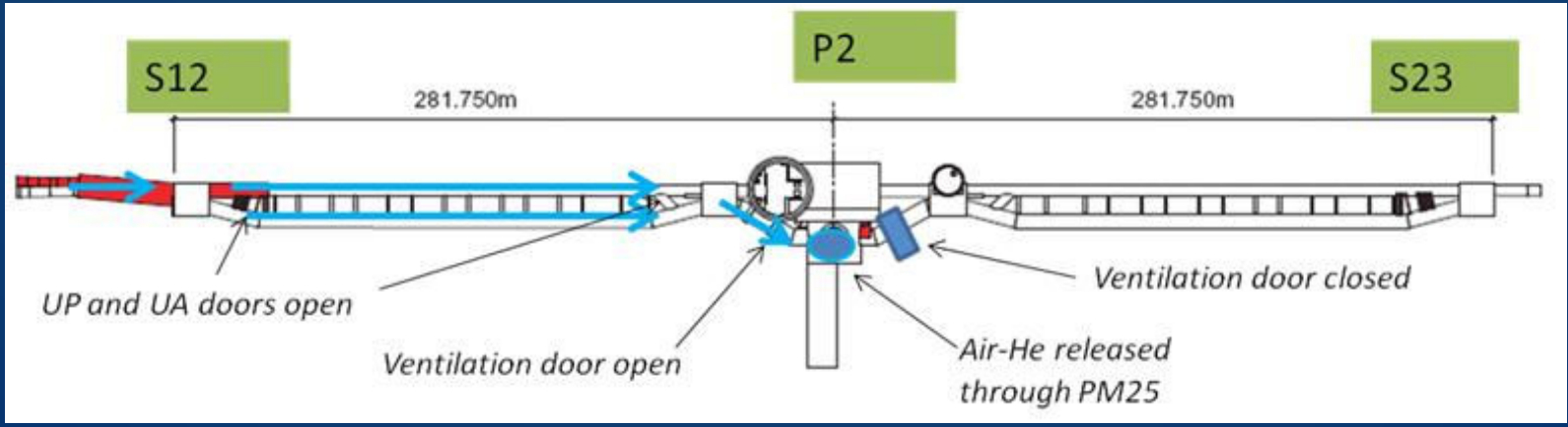
- "Safety Task Force"
  *SC, BE, EN, PH, TE, Staff Ass.*
  *[CERN-ATS-2009-002]*
- *External Advisory Committee*
  *[CERN-ATS-2009-003]*
- All recommendations endorsed by directorate
- All safety measures required for 2009/10 run implemented

# Task force conclusions

- **All efforts have to be made to *limit* an incidental helium release and the resulting overpressure.**
- **Any incidental helium release shall be *confined* to the ventilation sector where it occurs.**
- **This confinement must be carried out in combination with a *controlled release* of overpressure to the surface.**
- ***No access* shall be allowed to any ventilation sector of the LHC in which a large helium release has a non-negligible probability to occur. …**

# Recall of MCI scenario

| Worst case scenario | Maximum flow [kg/s] | Helium inventory loss [t] | |
|---|---|---|---|
| | | Fast release (During the first minutes) [t] | Total [t] |
| 1999 analysis (Break of jumper connection)* | 20 | 0.6 | 4.3 |
| 19th Sept. 2008 incident | ~ 26 | ~ 2 | ~ 6 |
| 2009 analysis (Electrical arc in mid-arc sub-sector) | 40** | 1.5 | 5 |



# Implementation status of TF recommendations

| Recommendation Numb | Closed issues | Open issues being | Open issues |
|---|---|---|---|
| # | | | |
| # | | | |
| # | | | |
| # | | | |
| # 5 | | ✓ | |
| # 6 | | | ✓ |
| # 7 | ✓ | | |
| # 8 | ✓ | | |
| # 9 | ✓ | | |
| # 10 | ✓ | | |
| # 11 | ✓ | | |
| # 12 | | ✓ | |
| # 13 | | ✓ | |
| # 14 | | ✓ | |

The sealing of the LHC tunnel towards other underground areas to protect them from Oxygen Deficiency Hazard (ODH) and from possible overpressure.

…the surface … Task Force recommends the implementation of a study group to propose possible options. One such option is to use the existing ventilation ducts equipped with overpressure relief devices and reinforced to withstand the high mass-flow rates.

…rea

# Additional recommendations by EAC – status

***[only the open issues]***

- "… The existing risk matrices from 1999 should be systematically reviewed again with regard to the latest experiences. …"
  [Preliminary risk analysis of the LHC cryogenic system, M. Chorowski, *et al., LHC-Project-Note-177,* (1998)]

  → ***open issue being addressed***
- … a strong consideration to formally track the progress of each recommendation, ...

  → ***open issue being addressed***
- The 2-Phase approach … technical implementation of the … control for tunnel access … not clear whether the control will be connected to the access interlock.

  → ***open issue being addressed***

# Open issues: being addressed or scheduled for next shut down

1. The consolidation/repair of potentially faulty bus-bar interconnects in the LHC machine together with the implementation of the improved machine protection systems (e.g. quench protection system, overpressure relief valves, etc.) shall be completed before repowering the magnets.
2. In addition, to limit incidental release at lower flow-rates the liquid helium shall be removed from the LHC machine before going into machine shutdown mode.
5. A detailed calculation of the overpressure values is recommended. This calculation should be done by means of Computational Fluid Dynamics software tool offering the possibility to take into account time dependant flow rates, helium gas expansion, thermal exchange with tunnel components, $He/O_2$ concentrations etc..

# Open issues: being addressed or scheduled for next shut down

12. Equip machine tunnel sectors with sensors to monitor air temperature and pressure, as well as air speed in the tunnel.
13. Carry out a risk assessment of particularities such as the He-Ring line and the cryogenic installations in the UX45, UX65, and UX85 caverns.
14. The Safety Task Force considers that the ventilation system is relevant for the safety of personnel and thus recommends to set-up a study of the LHC ventilation system with respect to monitoring and reliability of the system.

# Open issues

## Recommendation # 6

- For the ***guided release of static overpressure from the LHC tunnel to the surface,*** the Safety Task Force recommends the implementation of a study group to propose possible options. …

  →***WG* "Safety Task Force follow-up: 2nd phase" started in Dec. 2009 – chaired by Sylvain Weisz***

## Recommendation # 3

- The ***sealing of the LHC tunnel towards other underground areas*** to protect them from Oxygen Deficiency Hazard (ODH) and from possible overpressure.

  →***WG* "Safety Task Force follow-up: 2nd phase" started in Dec. 2009 – chaired by Sylvain Weisz***

* *This WG follows up all the recommendations made by the TF & EAC*

# Thank you