Potential show-stoppers

- ***Which areas of the trigger have the highest risk factors, in terms of:***
  - **Cost-to-complete**
  - **Effort**
  - **Trigger Performance *(Slice Test Programme)***
  - **Production**
  - **Installation and Commissioning**
  - **Operation and Maintenance**
- ***Can we plan <u>now</u> for backup solutions in critical places?***

Potential show-stoppers

- ***Cost-to-complete:*** — ***Prob*** ***Impact***

  - **WHAT IF - pricing of a major component increases sharply - e.g. recent price rises with PPrASIC?** — **Low** **Low**

    - **Current price trends are *downwards* - especially FPGAs**
    - **Buy required number of devices as soon as possible**

  - **WHAT IF - costs of 9U board assembly *(or re-work)* prove very high?** — **Medium** **Low**

    - **Discuss and negotiate details with several companies soon**

  - ***Overall - LOW Risk Factor***

Potential show-stoppers

- ***Effort:*** — ***Prob*** — ***Impact***

  - **WHAT IF - on-line software in all institutes continues to suffer very severely from lack of people** — **High** — **High**
    - **Back-up solutions???**
  - **WHAT IF - electronic engineering support *(currently adequate)* starts to decline *(very vulnerable to market forces)*** — **Medium** — **Medium**
    - **Back-up solutions???**
  - **WHAT IF - level of firmware support remains sub-critical *(there is currently no contingency)*** — **Low** — **Medium**
    - **Trade cost savings in hardware items for extra engineering effort**
  - ***Overall - HIGH Risk Factor***

Potential show-stoppers

- ***Trigger Performance (Slice Test Programme) - 1:*** ***Prob*** ***Impact***
  - ***WHAT IF -*** **assembly of 9U boards containing fine-pitch BGAs continues to be a very difficult procedure?** **Medium Medium**
    - **Carry out test assembly trials with several companies to assess problems**
    - **Modify architecture to allow use of lower-density components**
  - ***WHAT IF -*** **PB exhibits unacceptable crosstalk/BERs, either between CPMs (JEMs) or between CPMs (JEMs) and CMMs? Low High**
    - **Re-simulate, re-design and re-make PBs**
  - ***WHAT IF -*** **high insertion forces with current PB connectors creates an unreliable system? Low High**
    - **Re-survey market for high-density low-insertion force connectors**
    - **Modify PB and Processor board designs to use alternative connectors**

Potential show-stoppers

- ***Trigger Performance (Slice Test Programme) - 2:*** — ***Prob*** — ***Impact***

  - ***WHAT IF -*** **studies over wide phase-space reveal low-level fatal PPrASIC bug(s)?** — **Medium** — **Medium**
    - **Re-design ASIC and re-submit → programme delay**
    - **Consider radical architectural change(s) → FPGA with serial LVDS O/Ps**
  - ***WHAT IF -*** **system-wide timing procedures prove to be unmanageable?** — **Low** — **Medium**
    - **Prepare detailed test plans for timing methodology**
  - ***WHAT IF -*** **on-line software is not fully written/debugged** ***(→ extended Slice Test programme → delayed PRRs)?*** — **High** — **Medium**
    - **Back-up solutions ???**
  - ***Overall - MEDIUM Risk Factor***

Potential show-stoppers

- ***Construction:*** — ***Prob*** — ***Impact***

  - ***WHAT IF -*** **assembled/tested PPrMCMs have very low yield** ***(→ major re-work could delay completion of trigger)?*** — **Low** — **Medium**

    - **Valuable lessons should be learnt from Slice Test programme to enhance yield**

  - ***WHAT IF -*** **assembly of 9U boards with FP BGAs is low-yield** ***(→ extensive time-consuming and expensive re-work)?*** — **Low** — **Low**

    - **Continue to explore state-of-the-art techniques available in industry**
    - **Explore possibility of using more than 1 assembly company**

  - ***Overall - LOW Risk Factor***

Potential show-stoppers

- ***Installation and Commissioning:*** ***Prob*** ***Impact***
  - ***WHAT IF -*** **key components or sub-systems are not available on time?** **High** **High**
    - **Monitor progress regularly - anticipate problems with critical items**
  - ***WHAT IF -*** **on-line software is not fully debugged** ***(→ extended commissioning → delayed trigger availability)*****?** **High** **High**
    - **Back-up solutions???**
  - ***Overall - HIGH Risk Factor***

Potential show-stoppers

- ***Operation and Maintenance:*** — ***Prob*** — ***Impact***

  - ***WHAT IF -*** **a custom component suffers a high rate of "infant mortalities"?** — **Low** — **Medium**
    - **Consider establishing appropriate burn-in procedures**
    - **Provide for higher levels of spare components and associated modules**
  - ***WHAT IF -*** **we lose key engineering people during operation** ***(→ lack of continuity → maintenance becomes difficult)?*** — **High** — **Medium**
    - **Establish a good system of continuous information transfer**
  - ***WHAT IF -*** **documentation is not systematically maintained - e.g. firmware version control, etc** ***(→ maintenance difficult)?*** — **High** — **Medium**
    - **Establish rigorous documentation system**
  - ***Overall - MEDIUM Risk Factor***