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Pipelining in challenging areas -a Canadian Regulatory perspective

PHMSA R&D Forum

24 June 2009

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The NEB is a Quasi Judicial Body

Decisions in the public Interest **"within the mandate set by Parliament in the regulation of pipelines, energy development and trade"**

Protecting yet enabling

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Working with Stakeholders to prevent this from happening!


SECTION ONE MAIN NEWS

THE HOUSTON POST

FINAL EDITION

500 Pupils and Teachers Die As Blast Wrecks Texas School

Muffled Cries Of Buried Children Spur Men Probing Debris

THE CASUALTIES

FOR LITTLE CHILDREN

Pitiful Scenes Are Enacted as 399 Torn Bodies Recovered

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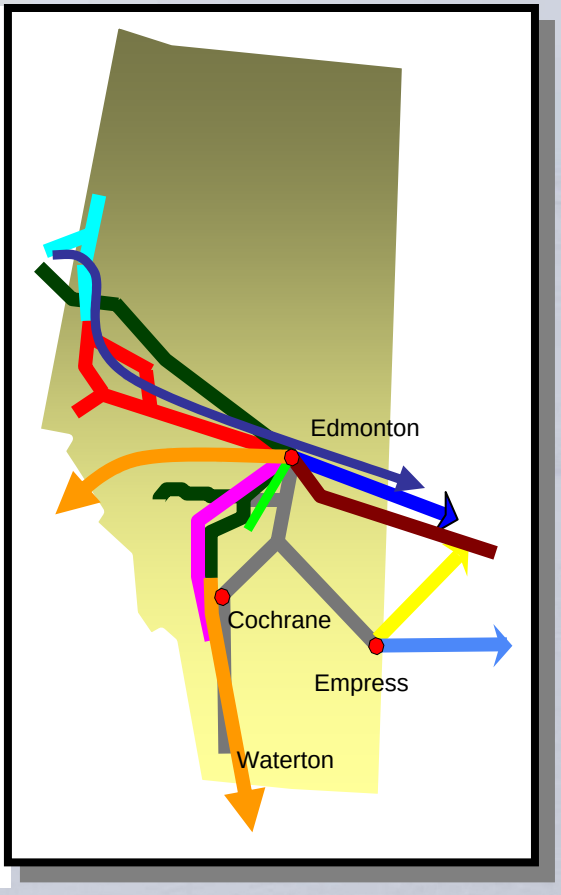
While enabling Canadian competitiveness



We support science based, well argued,
Technical innovation

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Benefits of NEB PHMSA Collaboration

- The NEB is appreciative of the amount and quality of R&D commissioned or supported by PHMSA
- Sharing experiences on the development of and implementation of Integrity Management Systems
- Reducing regulatory inconsistency has a high value add for the industry and the public
- Sharing experiences in GIS mapping, SCC monitoring, construction issues, 80% smys, AIV,RBDA.

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Project Life Cycle

Application

Environmental Screening/ Assessment

Regulatory Authorizations
- environmental conditions

Compliance Verification
- compliance meetings
- inspections
- environmental program audits

Decommissioning Abandonment

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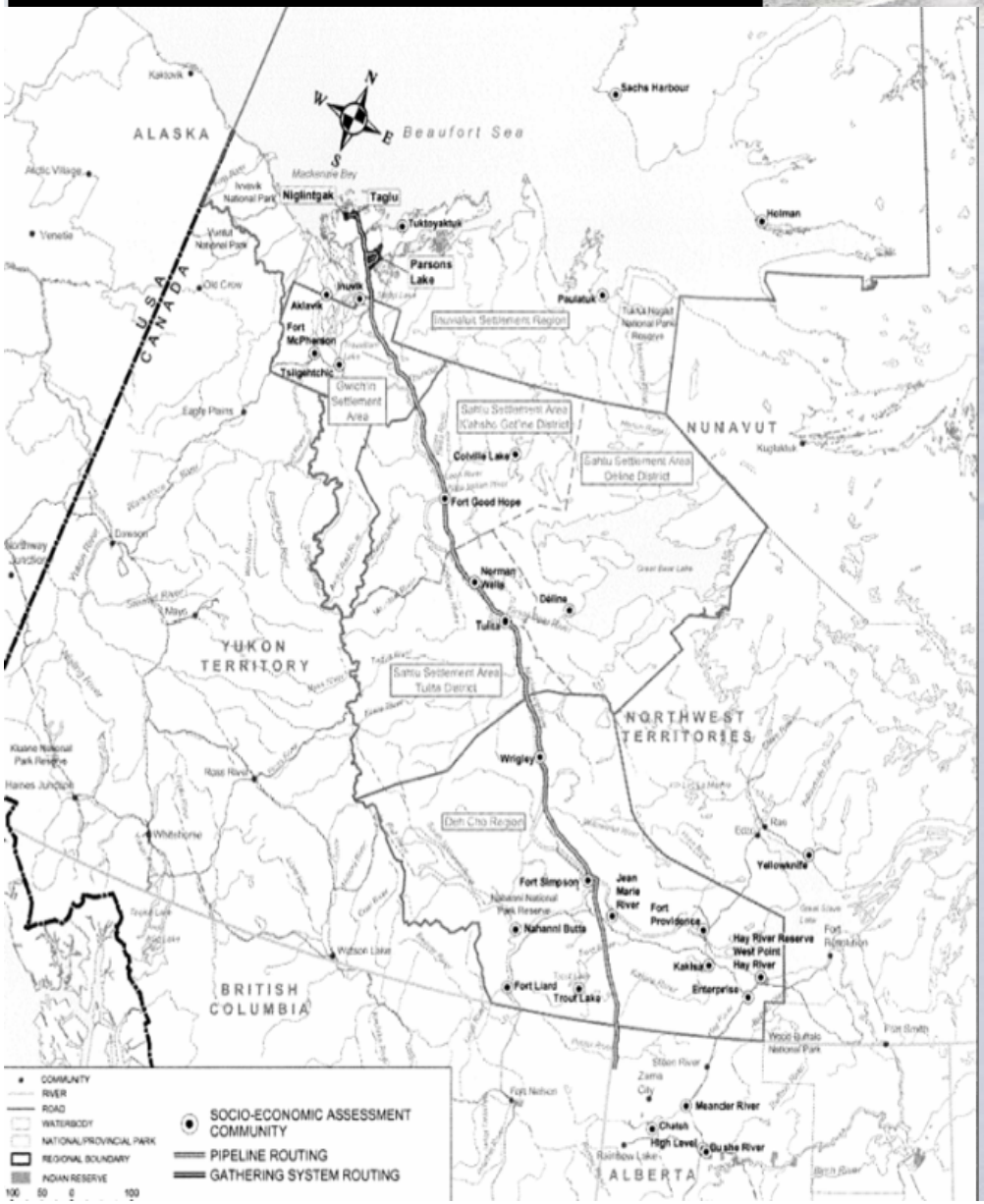
MGP proposed pipeline and facilities



1194 km of 30 inch natural gas pipeline from Inuvik NWT to the Alberta/NWT border;
three gas fields in the gathering system, and a processing plant
480 km, 10 inch NGL line from Inuvik to Norman Wells NWT.

Estimated cost of the facilities is $16.2 billion CDN.

Capacity of the gas pipeline is 1.2 Bcf/d expandable to 1.8 Bcf/d.

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Technical Considerations

- remote winter construction in Canada's North
- high pressure (18.7 MPa natural gas pipeline)
- 643 watercourse crossings
- presence of continuous, discontinuous and sporadic permafrost
- environmentally sensitive terrain
- effects of climate change throughout life of project
- need for remote slope monitoring

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Some Potential Research Areas

Design

Calibration of Limit States design methods*

Validating target levels of reliability for high pressure/large diameter scenarios –economic rather than safety drivers.

Effect of longitudinal strain concentration at joint transitions, acceptable defect sizes

Weld misalignment in welds subject to plastic strains, acceptable high/lows

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Crossings

Aerial crossing design methods, for icing and wind loading conditions.

Weather Data sufficiency for extremal analysis ?

Security protocols?

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Some Potential Research Areas

- Directional drilling
- Speculation that the annulus around the drill string in ice-rich permafrost could grow very quickly and trigger instability issues on the approach slopes. Are chilled drilling muds or freeze point depressants appropriate solutions? What can be learned from E&P activity in the North?
- Cuttings disposal methods.

Some Potential Research Areas

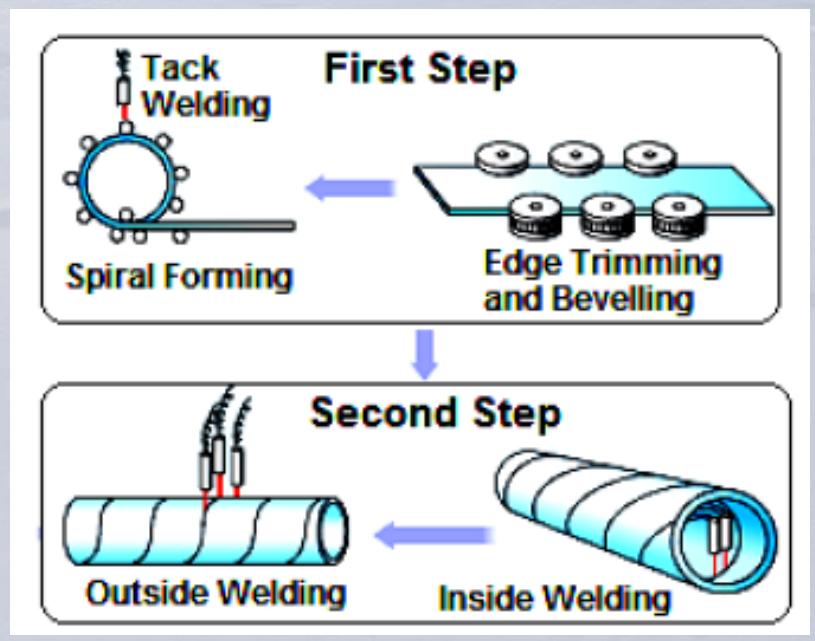
Materials

The shape of the strain curve and Thermal strain aging

- Is a suitable proxy for an X80 /X100 steel stress–strain curve shape definition the ratio of the stress at 0.5% strain to that at 2% strain, (termed Y/S2.)?
- What is the effect of Y/S2 on compressive strain capacity?
- Do these values remain constant even after the pipeline is heated for coating purposes?

Some Potential Research Areas

- Materials and joining
- Variability of material properties in coil strip?
- Need for change in API 5L?
- Development of economically based fracture control plans.
- Clearer understanding of tearing mechanics and CTOA results.

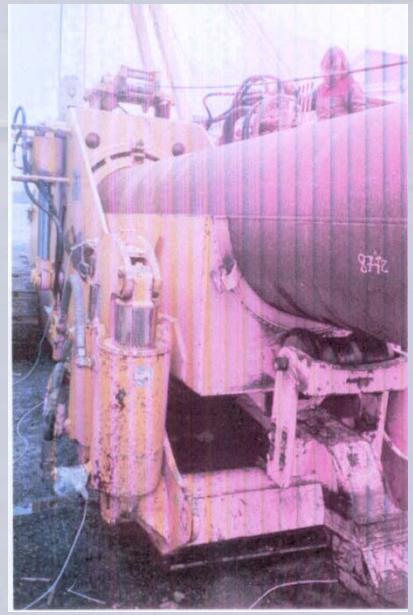


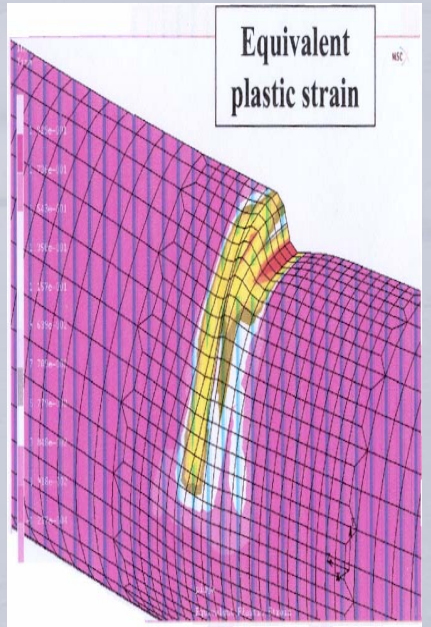
Some Potential Research Areas

Design/construction

Cold bending strain limits

Strain compatibility for coatings





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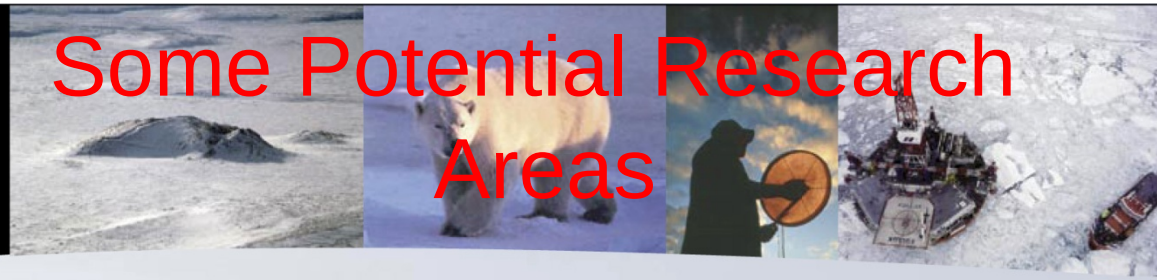

Some Potential Research Areas

Operations

- Gas pipelines are subject to Joule-Thompson cooling. Operating temperatures could be very cold for some sections (consistently between -10 and -20) Is maintenance welding on a pipeline this cold feasible/safe?

- How does one make a tie in to a pipeline flowing at -20C? What would be the appropriate defect acceptance criterion for fillet welds ? Are the provisions in the standards adequate?

- Are there operability issues with buried / above ground valves at low temperatures?

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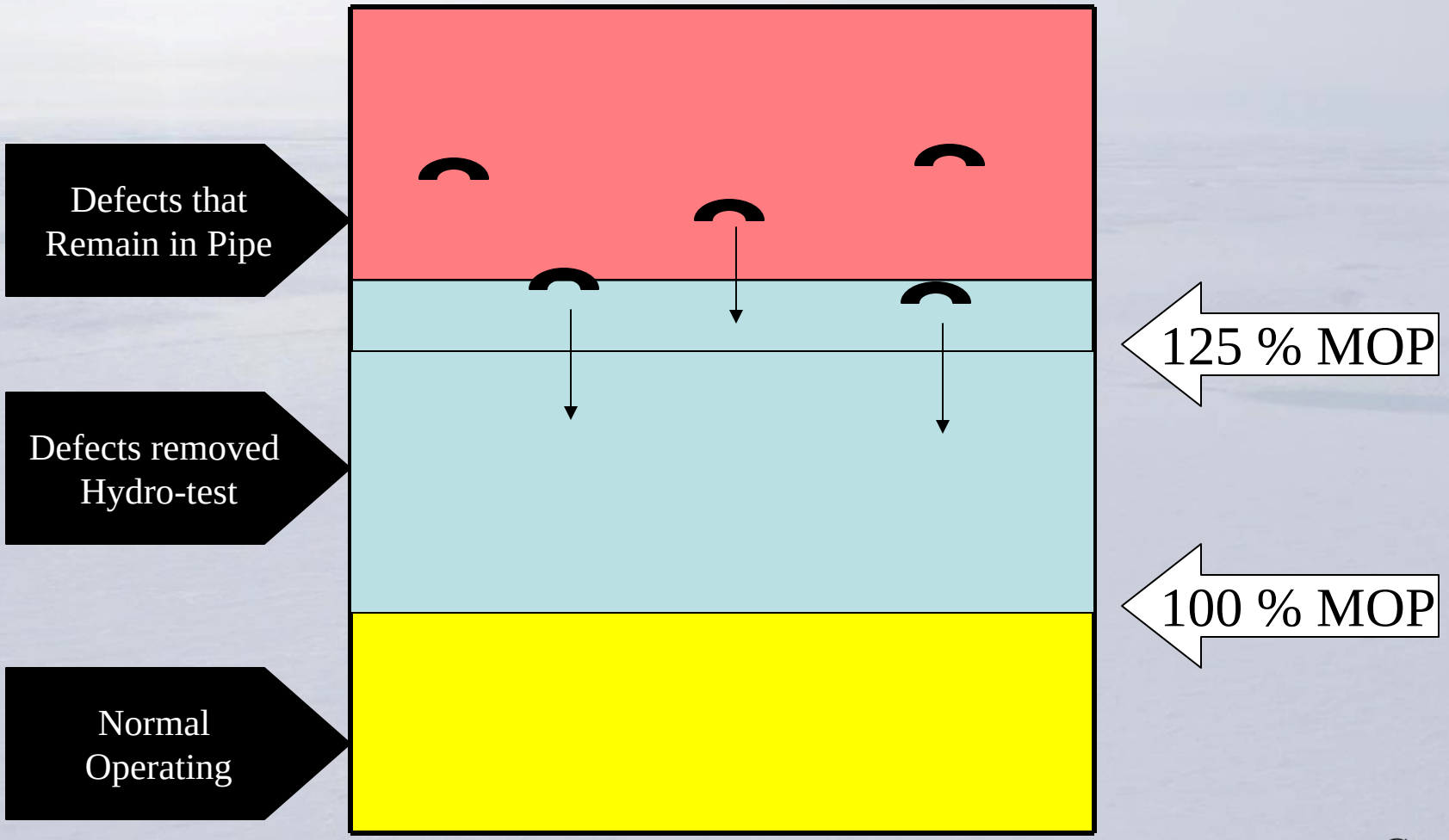
Hydrotesting Options



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Alternatives to Hydrotesting

Need for equivalency

Pneumatic testing – long hold times, low accuracy in pressure measurement

AIV regarded by NEB as a demonstration project with Caveats on the need for effective demonstrated, implemented QMS procedures.

Absolute need for good record keeping

- Can the approach be scaled / sustained over 3 construction seasons,1200km, several spreads?
- Improvements in leak testing methods

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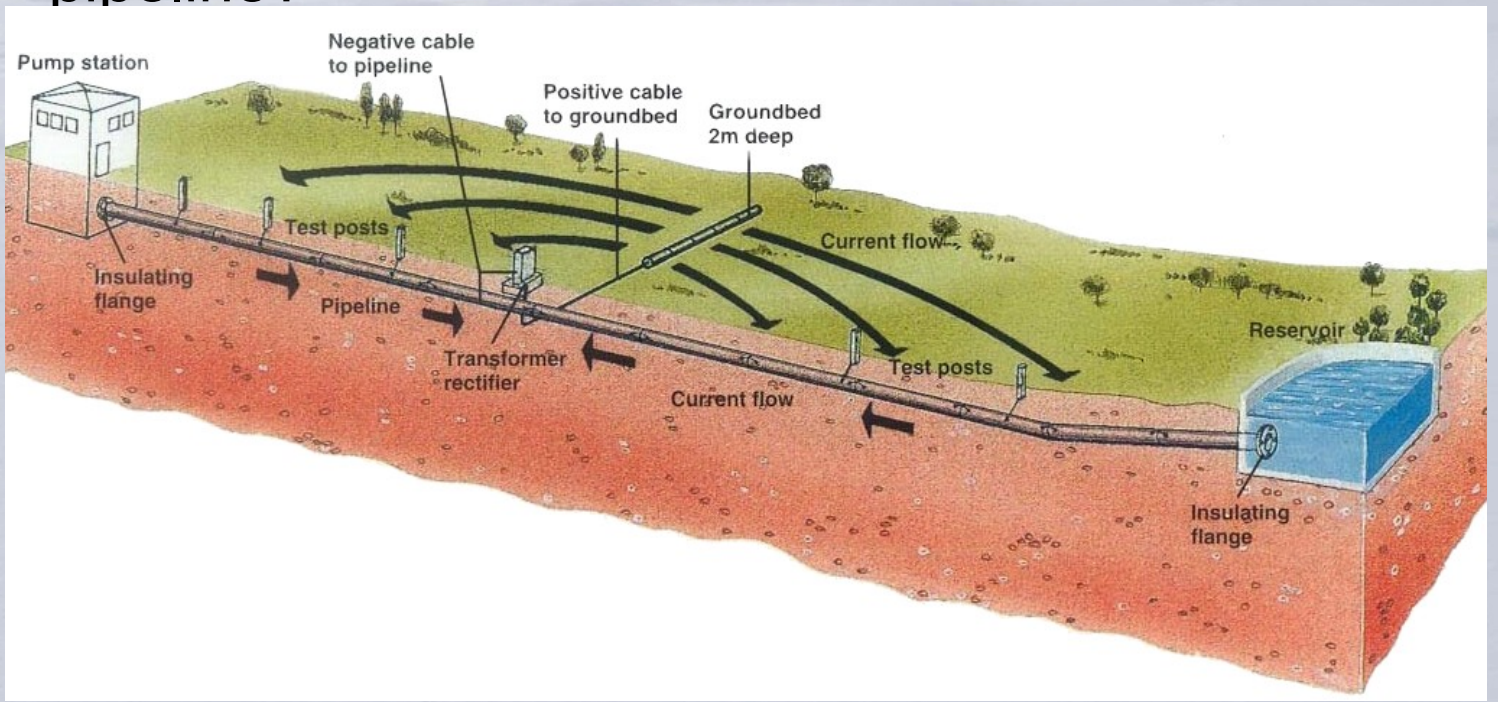
Cathodic Protection

Are there locations where telluric currents be used as a source of cathodic protection on portions of a northern pipeline?



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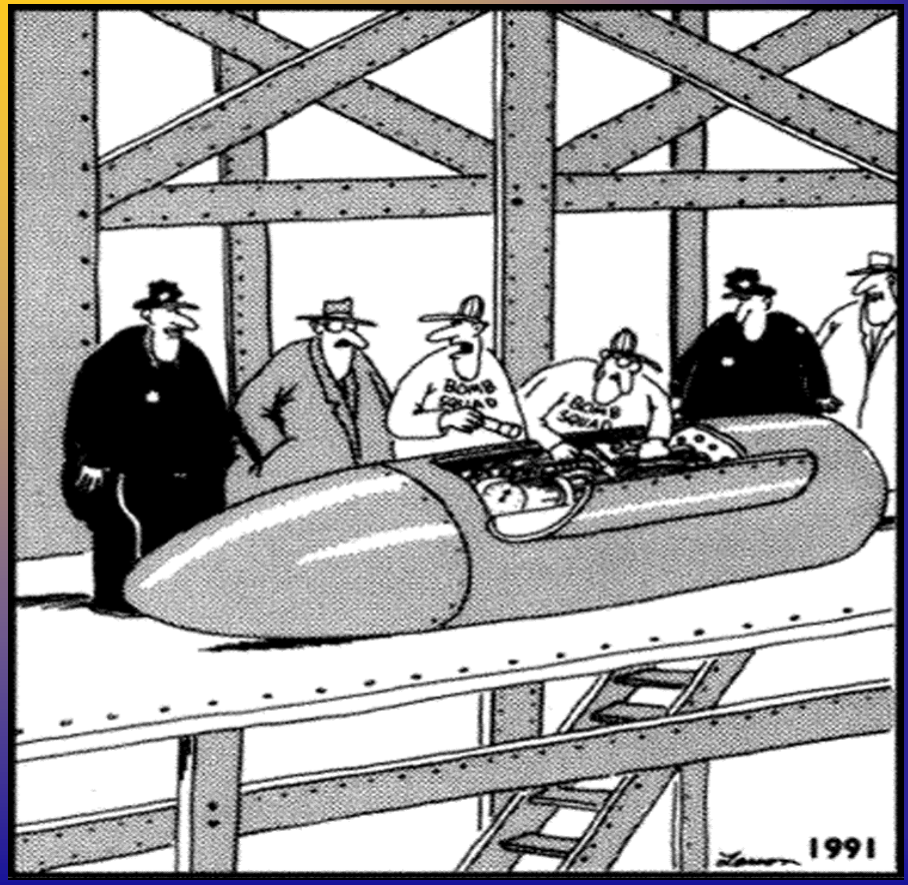
Human factors

"Well, it's a delicate situation, sir.... sophisticated firing system, hair-trigger mechanisms, and Bob's wife just left him last night, so you know his mind's not into this."



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R&D on Human factors

Equipment design should accommodate decreased dexterity and mobility.
The effects of very low temperatures and low lighting on productivity

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Questions?

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