

Universal Risk Scale(s)

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Topics

- » Uses
- » Description
- » Voluntary, Involuntary Risk for Individuals
- » Setting Standards with URS
- » System Safety Applications
- » Recommendations



URS, what is it?

- » A method of comparing risks from multiple known risks.
- » A method of communicating risk and explaining level of concern and orders of magnitude.
- » A method of selecting acceptable risks..."How safe is safe enough?"
- » A useful tool for system safety professionals.
- » A potential tool to calibrate RAC matrices.

URS Format



Use of logarithmic scale facilitates comparison of risks over many orders of magnitude.



Process of Developing URS



Work has been sponsored by DDESB.

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Individual Involuntary P_f

Individual Involuntary P_f





Voluntary P_f

Individual Risk (P_f) (Voluntary Actions)

Regulatory Standards Ar	nual Risk Actual Risk Experience	
and Legal Precedents	10 ⁰	
	10 ⁻¹	 ✓ Going over Niagara Falls in a barrel (1901-2010)⁹ ✓ Climbing Mt. Annapurna (1990-2003)⁸ ✓ Russian Roulette
	10 ⁻²	 ✓ Space Vehicle Crew Member, US (1967-2011)⁻¹²
 Nuclear Power Plant Workers (UK HSE) Israeli MOD Launch Operations (Mission Essential) Swiss Ammunition Storage (Directly Involved) RCC Std. 321-97 (Mission Essential) Swiss Ammo Storage (Handling by Army Personnel) 	10 ⁻³ 10 ⁻⁴ 10 ⁻⁵	 Logging, US (2011-2014) ¹¹ Commercial Fishing (2000-2010) ¹⁰ Oil and Gas Extraction GOM (1996-2006) ²³ Chemical Manufacturing (2012) ²³ Gilding, US (2013-2014) ¹³ Mining/Quarrying, US (2003-2012) ¹⁴ Hostile Actions, US Military (1989-2010) ³ All Job-Related, US (2004-2015) ¹⁵ All Job-Related, US (1993-2012) ¹⁴ Casthell Discond (2000 - 2014) ¹⁸
	10 ⁻⁶	 Accidental Drowning (1992-2010) ¹⁴
DDESB Criterion	10 ⁻⁷	MVA = Motor Vehicle Accidents

Comparison of Standard to Accident Data



Comparison of crossover indicates risk criteria is more or less conservative than the selected set of actual risks.



The risk of our "system" can be compared to other known risks.

Individual Voluntary (Worker) P_f



Helps make more informed decisions.

URS for Total System Risk

for US Populations – Transportation Systems



Annual Risk of Fatality



Summary

- » URS is useful for:
 - > Setting standards
 - > Communication of risks
 - > Determining "How safe is safe enough?"
 - > Informing decision-makers
- » More research is needed for:
 - > Comparing system risks
 - > Evaluating total system risk

If agencies, safety organizations, or professional societies are interested in value-added research, this is a worthwhile project.