

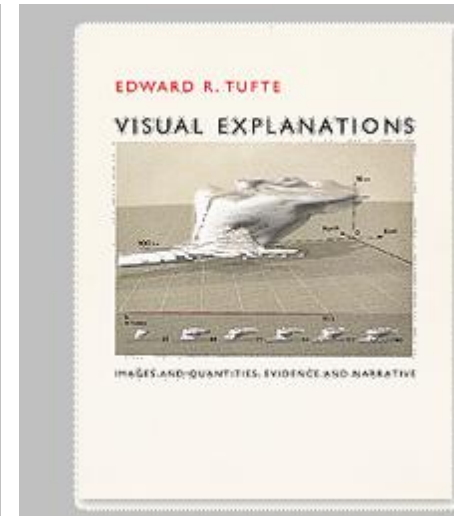
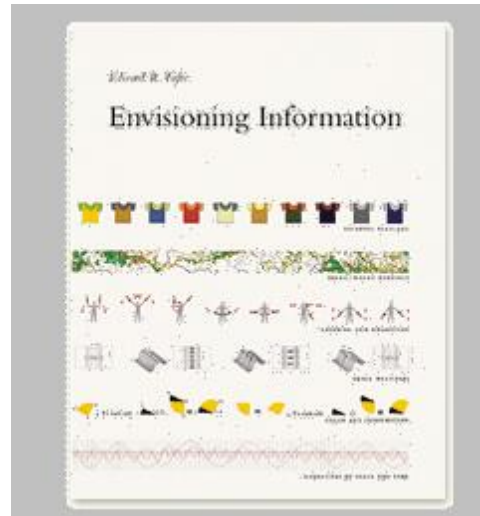
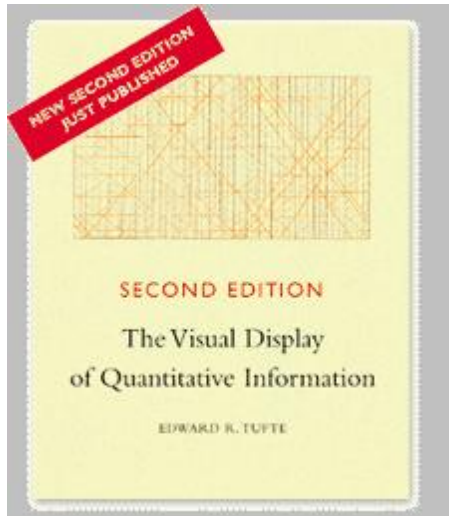
Graphics

Philip Wadler
Professional Issues

Part 0

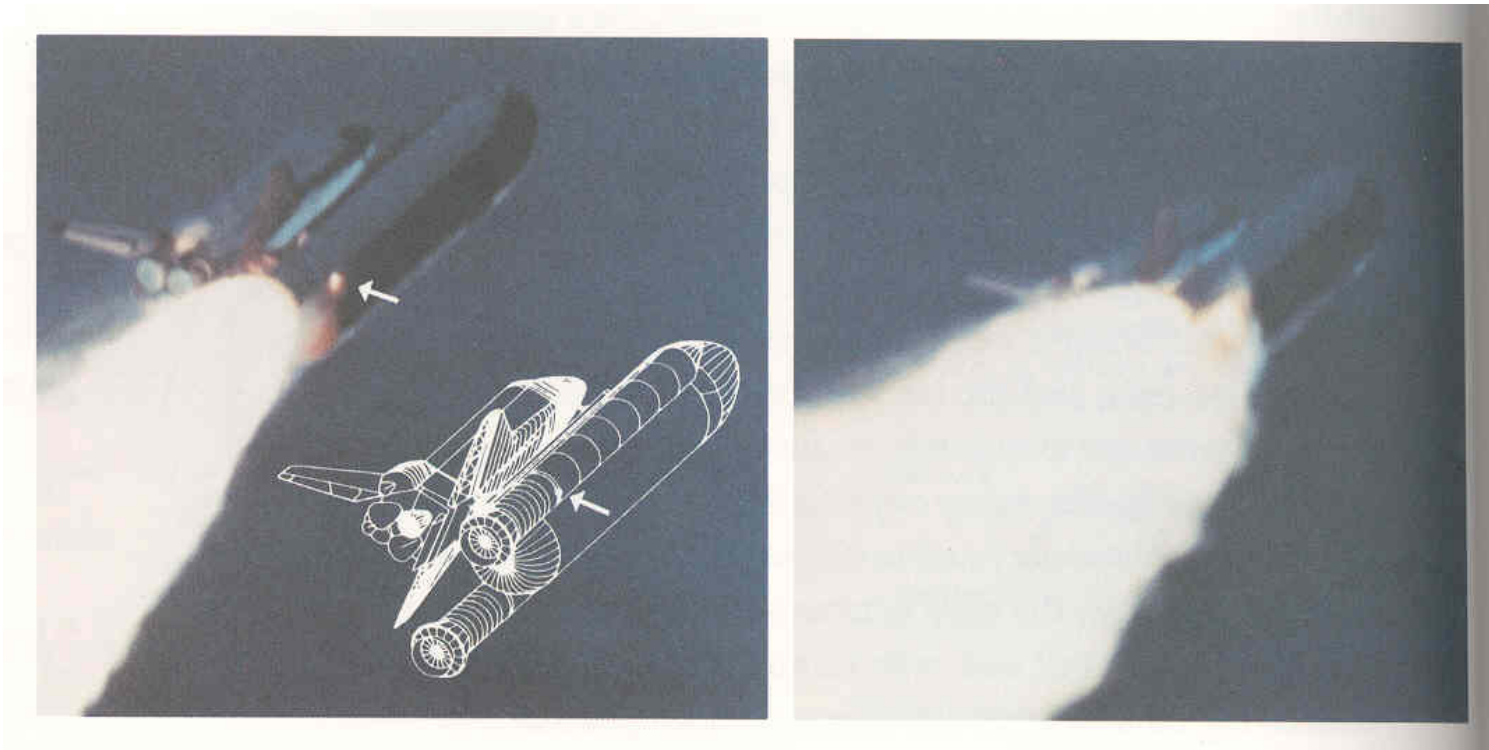
Challenger

Edward Tufte



Challenger

28 January 1986



History of O-ring damage

Thiokol engineers to Nasa, 27 January 1986

1161
Oct 30, 1985
AFT

HISTORY OF O-RING DAMAGE ON SRM FIELD JOINTS

	SRM No.	Cross Sectional View			Top View		Clocking Location (deg)
		Erosion Depth (in.)	Perimeter Affected (deg)	Nominal Dia. (in.)	Length Of Max Erosion (in.)	Total Heat Affected Length (in.)	
61A LH Center Field**	22A	None	None	0.280	None	None	36° --66°
61A LH CENTER FIELD**	22A	NONE	NONE	0.280	NONE	NONE	338° -18°
51C LH Forward Field**	15A	0.010	154.0	0.280	4.25	5.25	163
51C RH Center Field (prim)***	15B	0.038	130.0	0.280	12.50	58.75	354
51C RH Center Field (sec)***	15B	None	45.0	0.280	None	29.50	354
41D RH Forward Field	13B	0.028	110.0	0.280	3.00	None	275
41C LH Aft Field*	11A	None	None	0.280	None	None	--
41B LH Forward Field	10A	0.040	217.0	0.280	3.00	14.50	351
STS-2 RH Aft Field	2B	0.053	116.0	0.280	--	--	90

July

*Hot gas path detected in putty. Indication of heat on O-ring, but no damage.
 **Soot behind primary O-ring.
 ***Soot behind primary O-ring, heat affected secondary O-ring.

Clocking location of leak check port - 0 deg.

OTHER SRM-15 FIELD JOINTS HAD NO BLOWHOLES IN PUTTY AND NO SOOT NEAR OR BEYOND THE PRIMARY O-RING.

SRM-22 FORWARD FIELD JOINT HAD PUTTY PATH TO PRIMARY O-RING, BUT NO O-RING EROSION AND NO SOOT BLOWBY. OTHER SRM-22 FIELD JOINTS HAD NO BLOWHOLES IN PUTTY.

History of O-ring temperatures

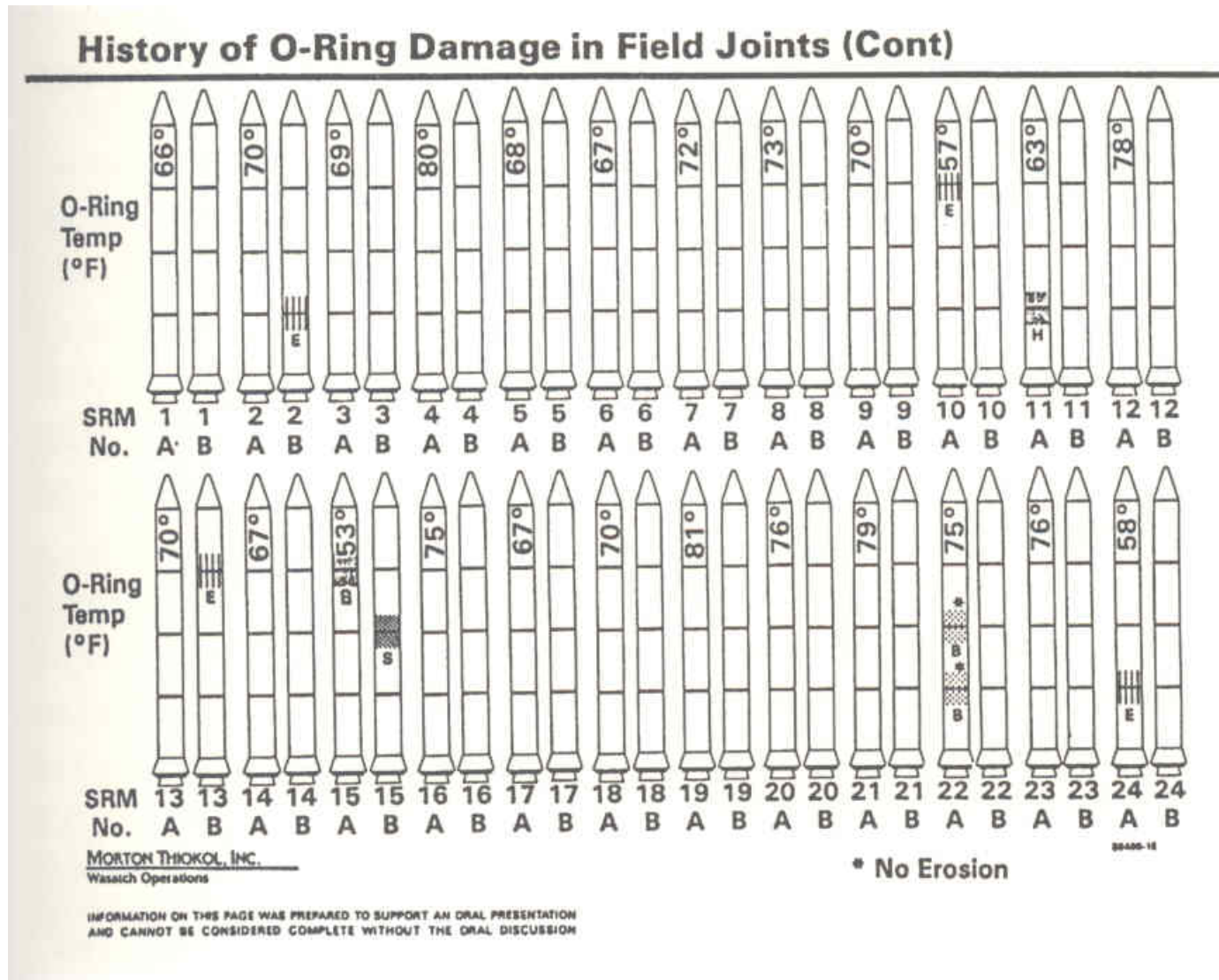
Thiokol engineers to Nasa, 27 January 1986

HISTORY OF O-RING TEMPERATURES
(DEGREES - F)

<u>MOTOR</u>	<u>MBT</u>	<u>AMB</u>	<u>O-RING</u>	<u>WIND</u>
DM-4	68	36	47	10 MPH
DM-2	76	45	52	10 MPH
QM-3	72.5	40	48	10 MPH
QM-4	76	48	51	10 MPH
SRM-15	52	64	53	10 MPH
SRM-22	77	78	75	10 MPH
SRM-25	55	26	29	10 MPH
			27	25 MPH

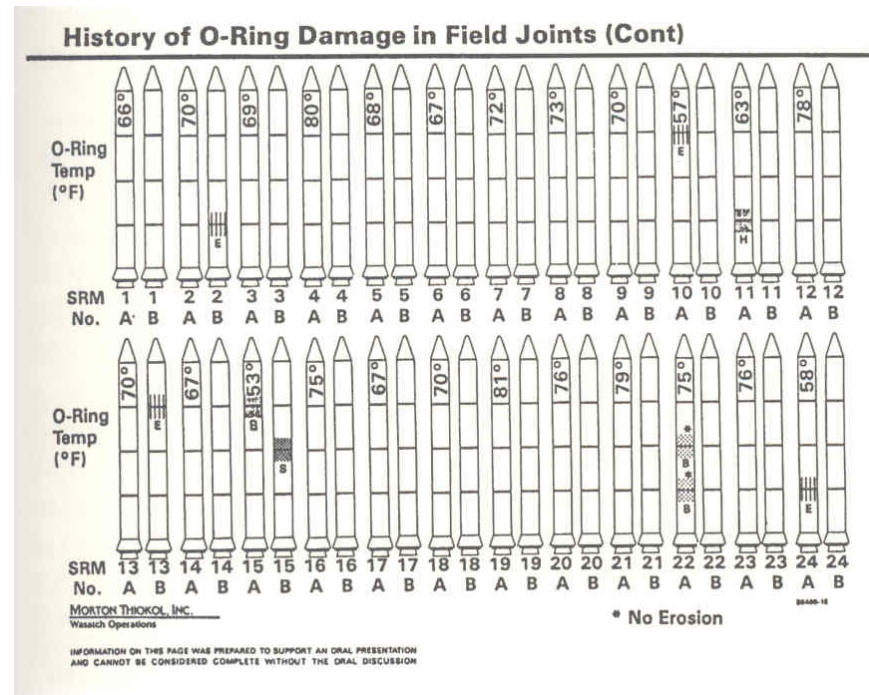
History of O-Ring damage

Thiokol presentation to Presidential Commission, 1986



History of O-Ring damage (CYA)

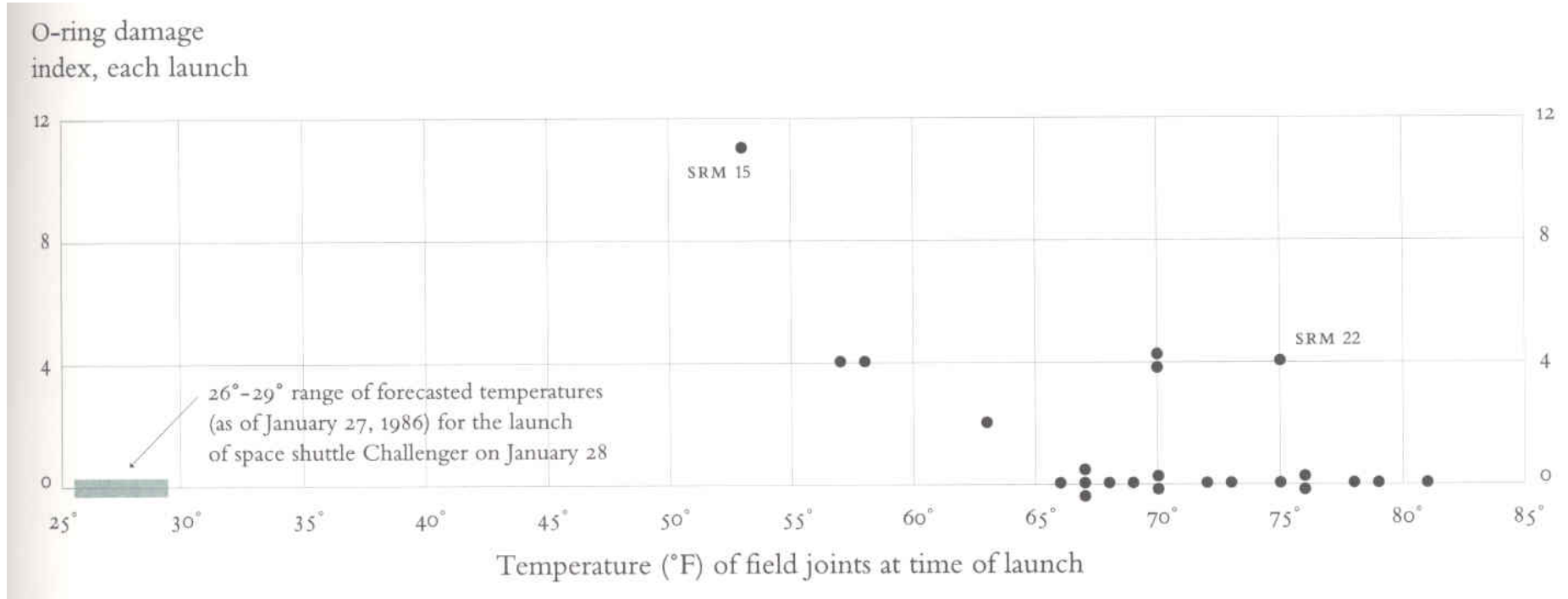
Thiokol presentation to Presidential Commission, 1986



INFORMATION ON THIS PAGE WAS PREPARED TO SUPPORT AN ORAL PRESENTATION AND CANNOT BE CONSIDERED COMPLETE WITHOUT THE ORAL DISCUSSION

O-ring damage index vs. temperature

Edward Tufte, *Envisioning Information*, 1997



Part 1

Columbia

Part 2





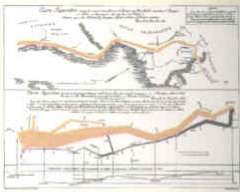
Interface design

Guide to exhibits

90% of display is information

Touch any item for more information.


English Español Deutsch Français Italiano 中文 日本語

INFORMATION	FACILITIES	PERMANENT WORKS	SPECIAL EXHIBITIONS, NOVEMBER 1999
art information	cascade espresso bar	American Painting	 Architectural Designs of Humphry Repton
bookstores	checkroom	British Painting	 Henri Matisse: <i>Les periennes</i> , 1919
calendar	concourse buffet	Dutch Painting	 Henri Rousseau: French Winged Confections
copyrights	elevators	European Sculpture and Decorative Arts, 14th–19th century	 Susan Rothenberg: Recent Paintings
film programs	facility for disabled	Flemish Painting	 The Great Age of Tedious British Watercolors: 1750 to 1880
gallery talks	first aid	French Painting and Sculpture	 Information Designs of Charles Joseph Minard
guides	garden cafe	German Painting	
hours	lost and found	Information Design	
photography	restrooms	Italian Painting and Sculpture	
security	stairways	Netherlandish Painting	
slide lectures	telephones	Spanish Painting	
special programs	terrace cafe	Twentieth-century Painting and Sculpture	
Sunday concerts			
tours			
wheelchairs/strollers			

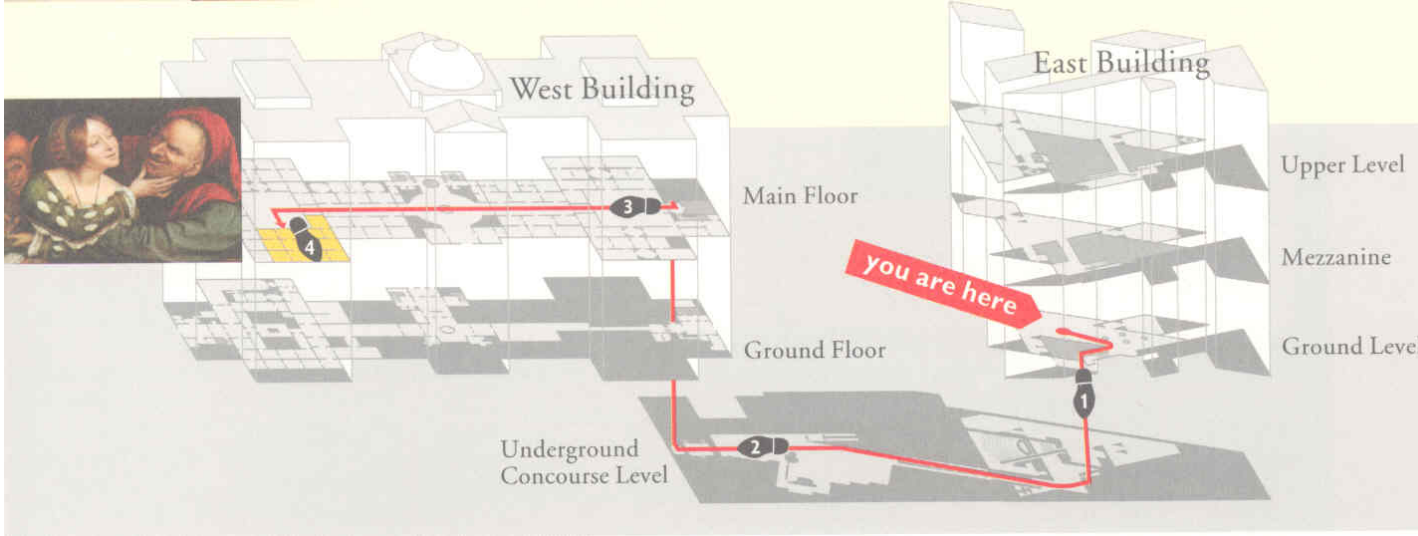
Navigation

Printed directions plus souvenir

Flemish Paintings	touch here, then turn around for your picture and printout	touch here to return to table of contents
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- 1 Locate yourself within the gallery picture on the left. Cross the lobby and descend one flight of stairs to the concourse level.
- 2 Travel to the farthest opposite end of the concourse past the concourse buffet and the bookstore.
- 3 Ascend two floors on the elevator or escalator to the main floor of the West Building. Turn right.
- 4 Continue to the opposite end of the West Building. Turn left to begin the Netherlandish/Flemish exhibit.



A typical web interface

18% of display is information

