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Vitrinite Reflectance (Ro Max)
of coal samples from
Soquip et al. Naufrage No. 1

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Vitrinite Reflectance (Ro Max) of coal samples from Soquip et al. Naufrage No. 1

G.S.C. Locality No: D150 Location: 46°28'05.99"N, 62°27'50.746"W

R.T. Elevation: 86.5' Water Depth: 72.8' Total Depth: 10,188'

Sample Interval: 130- Interval Studied: 2210-10,110'

Information Release: Oct. 23, 1977 Depth Units: feet referenced to R.T.

At the request of J.S. Bell, vitrinite reflectance (Ro Max by rotation) has been determined on 11 coal samples, separated mechanically from selected rotary cuttings (Table II) for the purpose of establishing the amount of stratigraphic section missing due to erosion.

Soquip et al. Naufrage No. 1 is classified as a new-field wildcat well, located on Prince Edward Island, approximately 65 km (40 miles) northeast of Charlottetown.

Reflectances were determined using the Zeiss Photomultiplier III Zonax microcomputer system. Improved software provides three dynamic histograms that are continuously updated as the reflectance data are required.

The analysis of the well revealed the thermal maturation levels given in Table I. Specific maturation levels as set out in this report were based on those of Dow (1977) with modified terminology (Appendix II). These data suggest that approximately 1380 m (4500 feet) of section were removed by erosion.

Table I
Inferred Thermal Maturation Levels**

(g.l.-1350')*	0.4 - 0.5	% Ro	immature approaching maturity
(1350-2511')*	0.5 - 0.6	% Ro	marginally mature
(2511')*	0.6	% Ro	onset of significant oil generation
(4345')*	0.8	% Ro	peak of oil generation
(5767')*	1.0	% Ro	onset of significant wet gas generation
(6928')*	1.2	% Ro	onset of significant dry gas generation
7679'	1.35	% Ro	oil floor
10,183'	2.0	% Ro	wet gas floor
(12,767')*	3.0	% Ro	dry gas floor
10,188 T.D.	2.0	% Ro	

* Bracketed depths have been projected at a 0.224 log Ro/km maturation gradient.

** Maturation levels provided for all types of organic matter. Actual hydrocarbon products depend on type of organic matter present.

Remarks

The samples from this well span approximately 8000 ft of Pennsylvanian strata of the Pictou and Canso-Riversdale groups from depths 2220 to 10,110 ft (Soquip et al., 1975). Figure 1 shows the dispersal of true coal samples covering the lower section of the well. A linear regression line of R_o data was calculated for these samples by the least squares method and plotted on a semi-log scale (Figure 1). The slope of this line is $0.224 \log R_o/\text{km}$.

In this well, samples were typed as 'Bark Vitrain' if they contained only non-banded vitrinite. This indicates that their origin is probably from allochthonous woody material rather than stratified peat which produces normal banded coal. The non-banded vitrinite therefore is coalified in an environment which differs considerably from banded 'true coal' vitrinite. In general, 'Bark Vitrain' yields higher reflectance values than true coal at the same maturity level. Higher R_o values for this type of coal are also reported in Stach's textbook of Coal Petrology (Teichmüller, 1982). Therefore because they are considered less reliable they are not included in the calculation of the coalification gradient.

The reflectance histograms (Appendix III) show essentially single populations with normal distributions and therefore support the reliability of these data.

The slope of the maturation profile of the well is similar to the slope of the Maritime coalification curve; $0.212 \log R_o/\text{km}$ (Hacquebard, 1975). The zero level of maturity is usually considered to be approximately 0.2 % R_o Max (Dow, 1977). This conclusion is supported by maturation gradients that have been determined for numerous Canadian east coast offshore wells that are believed to be at maximum burial depth at present. Two examples are the Scotian Shelf Wenonah J-75 well (Avery, 1986) and the southern Grand Banks Puffin B-90 well (Avery, 1985). The zero level in these wells are 0.198 % R_o and 0.210 % R_o respectively. The amount of overburden eroded is based on the projection of the maturation gradient to 0.20 % R_o Max. At Naufrage No. 1 a projection of the maturation gradient to 0.20 % R_o yields an estimate of 4488 feet of removed section.


These vitrinite reflectance maturation data also provide evidence that the thermal regime at Naufrage No. 1 was suitable for the generation and preservation of hydrocarbons within the drilled section assuming potential source rocks and traps are present.

References

- Avery, M.P., 1985. Vitrinite reflectance (R_o) on the dispersed organics in the Amoco Imperial Puffin B-90. Geological Survey of Canada, Open File 1165.

- Avery, M.P., 1986. Vitrinite reflectance (Ro) of dispersed organics from Petro-Canada Shell Wenonah J-75. Geological Survey of Canada, Open File
- Dow, W.G., 1977. Kerogen studies and geological interpretations. Journal of Geochemical Exploration, no. 7, p. 79-99.
- Hacquebard, P.A., 1975. Pre- and post-deformational coalification and its significance for oil and gas generation. C.N.R.S., Paris, 1973. International Colloquium on Petrographie de la matiere organique des sédiments, etc., p. 225-241.
- Soquip et al., 1975. Well history report, Soquip et al. Naufrage No. 1. Open File report, Department of Energy, Mines and Resources, Ottawa.
- Teichmüller, M., 1982. Application of coal petrological methods in geology including oil and natural gas prospecting. In: Stach's textbook of Coal Petrology, 3rd edition, Berlin, Stuttgart, Gebrüeder Borntraeger, p. 367.

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A.M. Vonk/M.P. Avery
Eastern Petroleum Geology Subdivision

c.c. J.S. Bell, I.S.P.G., Calgary
K.D. McAlpine, E.P.G.S., Dartmouth
P.A. Hacquebard, E.P.G.S., Dartmouth
A.E. Jackson, E.P.G.S., Dartmouth
E.P.G.S. Files, Dartmouth
G.R. Campbell, COGLA, Ottawa
Central Technical Files, Ottawa
C. Beaumont, Dalhousie University, Halifax
H.J. Maccagno, COGLA, Halifax

Table II
Data Summary

Seq. #	Sample #	Depth in feet	Ro Max (S.D.)	Number of readings	Type
1	PH 1425	2200-2220	.84 (.09)	50*	Bark Vitrain
2	PH 1426	3800-3820	1.03 (.12)	50*	Bark Vitrain
3	PH 1427	4350-4360	1.34 (.20)	22*	Bark Vitrain
4	PH 1428	4710-4730	1.20 (.16)	50*	Bark Vitrain
5	PH 1430	6310-6330	1.44 (.13)	50*	Bark Vitrain
6	PH 1431	7730-7740	1.45 (.07)	50	True Coal
7	PH 1432	8210-8220	1.42 (.05)	50	True Coal
8	PH 1433	8420-8440	1.47 (.09)	50	True Coal
9	PH 1435	9030-9050	1.70 (.13)	50	True Coal
10	PH 1436	9320-9330	1.62 (.10)	50	True Coal
11	PH 1438	9800-9810	1.98 (.06)	50	True Coal
12	PH 1439	10090-10110	2.01 (.06)	50	True Coal

* Not included in regression line.

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Data Summary

Seq. #	Sample #	Depth in feet	Ro Max (S.D.)	Number of readings	Type
1	PH 1425	2200-2220	.84 (.09)	50*	Bark Vitrain
2	PH 1426	3800-3820	1.03 (.12)	50*	Bark Vitrain
3	PH 1427	4350-4360	1.34 (.20)	22*	Bark Vitrain
4	PH 1428	4710-4730	1.20 (.16)	50*	Bark Vitrain
5	PH 1430	6310-6330	1.44 (.13)	50*	Bark Vitrain
6	PH 1431	7730-7740	1.45 (.07)	50	True Coal
7	PH 1432	8210-8220	1.42 (.05)	50	True Coal
8	PH 1433	8420-8440	1.47 (.09)	50	True Coal
9	PH 1435	9030-9050	1.70 (.13)	50	True Coal
10	PH 1436	9320-9330	1.62 (.10)	50	True Coal
11	PH 1438	9800-9810	1.98 (.06)	50	True Coal
12	PH 1439	10090-10110	2.01 (.06)	50	True Coal

* Not included in regression line.

Table III

Formation tops

Formation	Depth
"Red beds" unit	130'
Pictou Group (massive sandstone unit)	2060' 8060'
Canso-Riversdale	9600'

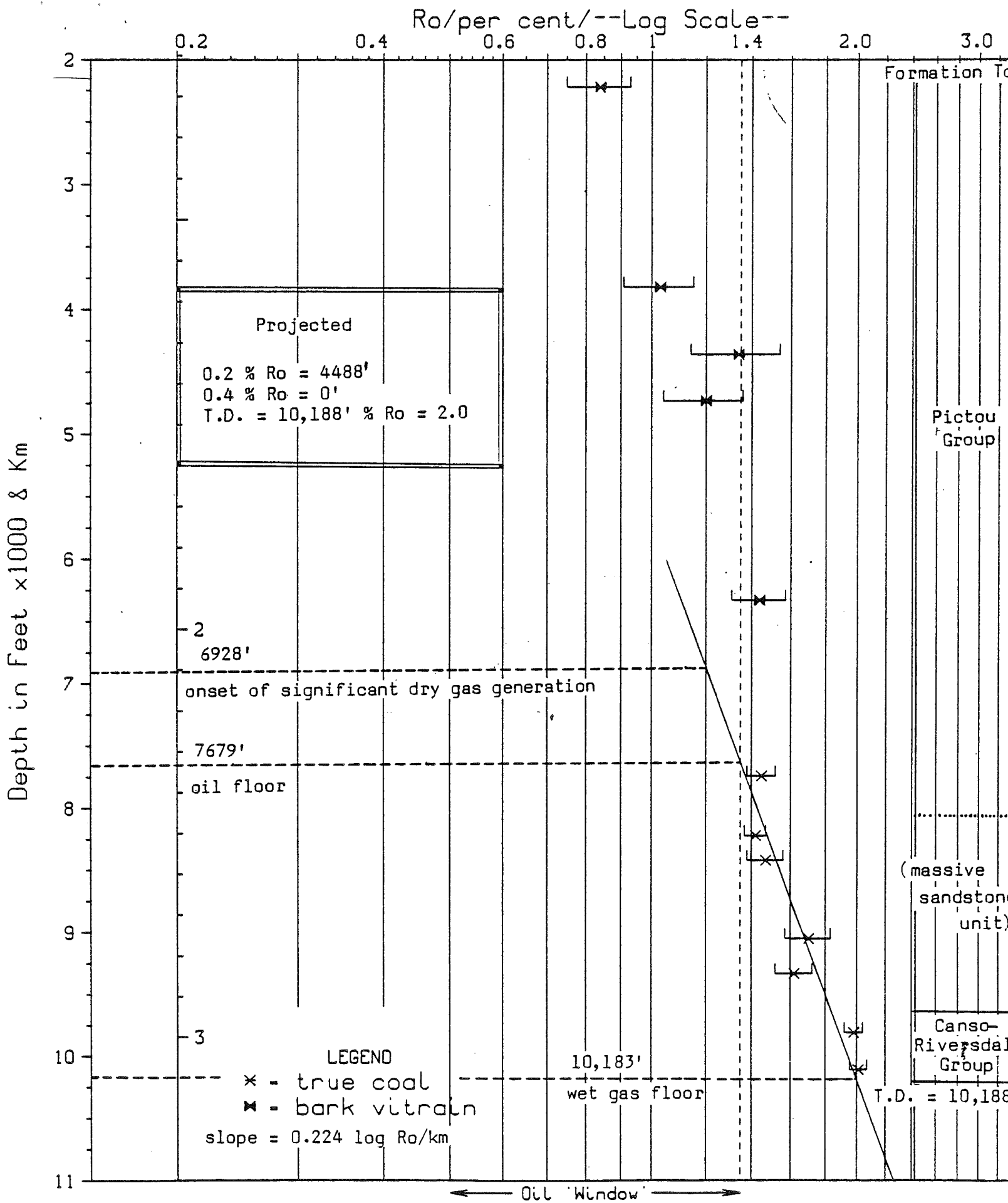


Fig. 1 Naufrage No. 1 % RoMax

Appendix I

Sample preparation

- sample locations to be examined were selected by visual estimates of % of coal particles in prewashed rotary cuttings.
- selected samples were washed to remove drilling mud
- specific gravity separation using tetrachloro ethylene (C_2Cl_2 s.g.= 1.62)
- coal mounted using epoxy resin (epo-tek-301) in predrilled plastic stubs and 1" diameter molds
- mounted samples were polished using modified coal petrology methods
- examined under immersion oil with total magnification of 1000 x

Appendix III

Vitrinite Reflectance Histograms

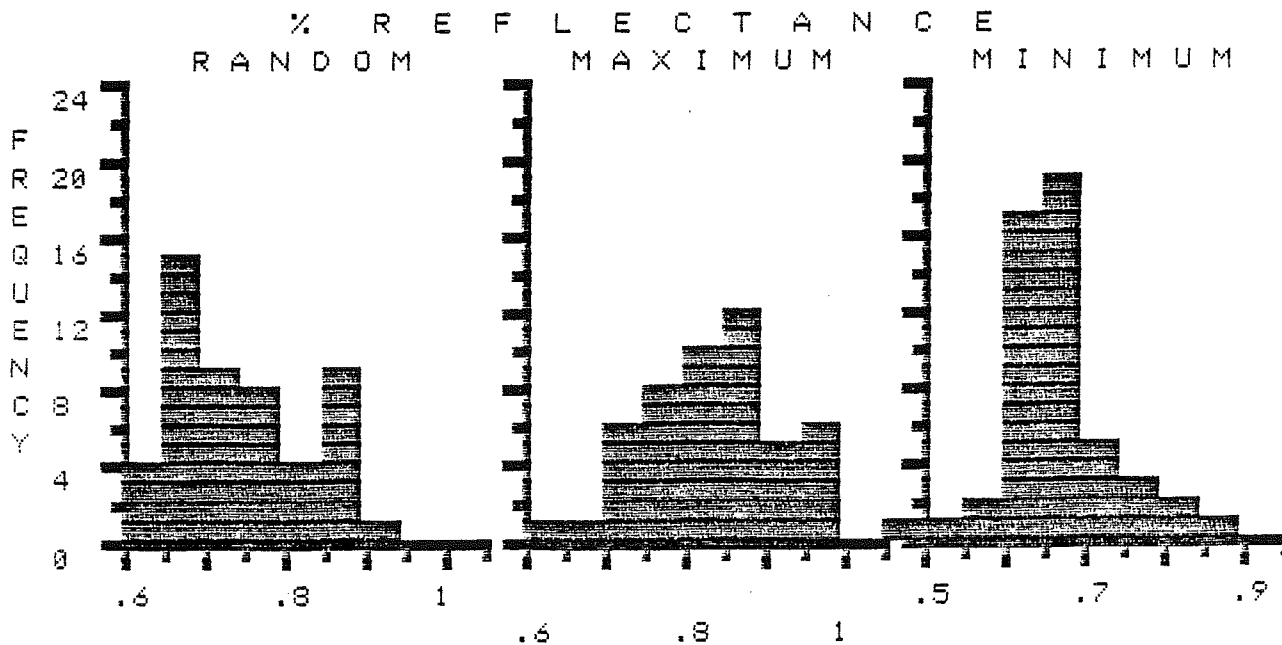
FILE >> PH1425 DESCRIPTION FOLLOWS :
 INT. >2200'-2220', NAUFRAGE #1, AMV, NOV-28-86

COL>	1	2	3	4	5	6	7	8	9	0
RND										
ROW	.63	.70	.67	.68	.92	.79	.89	.69	.73	.69
1	.75	.76	.63	.81	.69	.85	.69	.62	.86	.67
2	.62	.66	.82	.80	.85	.67	.69	.89	.72	.80
3	.89	.89	.76	.85	.69	.87	.67	.79	.74	.78
4	.66	.74	.71	.68	.70	.74	.75	.73	.77	.65
MAX										
ROW	.73	.82	.76	.81	.95	.85	.91	.87	.90	.81
1	.83	.81	1.06	.81	.70	.86	.72	.63	.87	.92
2	.87	.89	.82	.82	.95	.89	.70	.89	.77	.83
3	.89	.94	.78	.85	.73	.91	.79	.99	.76	.97
4	.85	.76	.72	.68	.98	.76	.89	.76	.80	.96
MIN										
ROW	.59	.64	.65	.68	.61	.77	.69	.62	.58	.67
1	.73	.67	.61	.67	.65	.72	.64	.53	.64	.65
2	.62	.63	.79	.76	.83	.64	.65	.81	.69	.69
3	.62	.70	.70	.68	.64	.85	.65	.66	.68	.68
4	.63	.68	.61	.61	.70	.69	.63	.63	.60	.65

STATISTICS BASED ON 50 POINTS.

	MEAN	STAND. DEV.	MIN	MAX	SUM
RND >	.75	.08	.62	.92	37.3
MAX >	.84	.09	.63	1.06	41.82
MIN >	.67	.06	.53	.85	33.41

U-TYPES	FREQUENCY (PERCENT)					
	U 5	U 6	U 7	U 8	U 9	U 10
RND >		38 %	34 %	26 %	2 %	
MAX >		4 %	28 %	44 %	22 %	2 %
MIN >	6 %	72 %	16 %	6 %		



FILE >> PH1426 DESCRIPTION FOLLOWS :
 INT. >3800'-3820', NAUFRAGE #1, AMV, NOV-28-86

ROW	1	2	3	4	5	6	7	8	9	0
RND										
ROW	.89	.96	.72	.76	.80	.82	.91	.97	1.03	.89
1	.95	1.04	.95	.89	.92	.84	.78	.78	.80	.90
2	.97	.80	.97	1.09	.88	.97	1.22	1.02	.90	.92
3	.87	.89	.96	.99	.93	1.03	1.03	.99	.98	1.06
4	.89	.75	.82	.78	.86	.97	1.07	1.02	1.00	.97

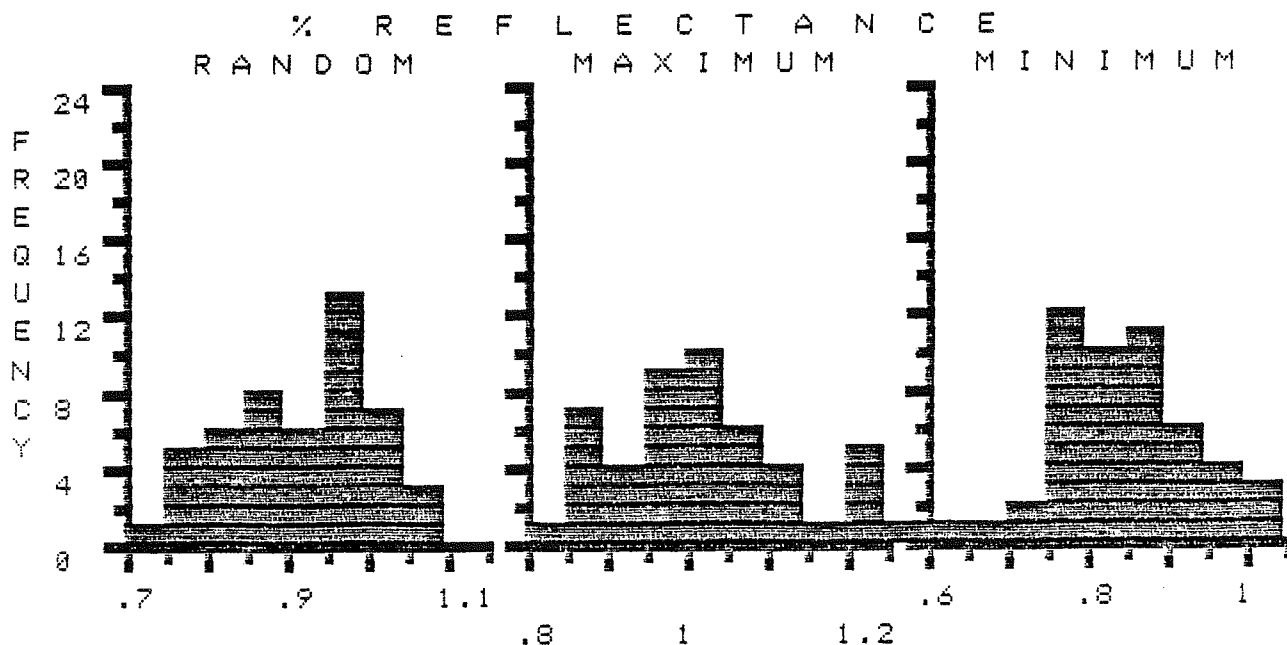
ROW	1	2	3	4	5	6	7	8	9	0
MAX										
ROW	1.26	1.10	1.36	.98	.89	.89	.93	1.16	1.05	.90
1	1.05	1.12	1.02	1.21	.92	1.04	.95	.87	.85	.93
2	.99	.85	1.04	1.12	1.21	.97	1.22	1.05	.95	.97
3	1.02	1.12	.98	1.09	1.00	1.03	1.21	1.03	.98	1.07
4	1.07	.83	.85	.89	1.22	1.02	1.30	1.03	1.00	.98

ROW	1	2	3	4	5	6	7	8	9	0
MIN										
ROW	.89	.89	.72	.76	.77	.81	.87	.96	.99	.88
1	.81	.87	.89	.83	.86	.79	.77	.64	.79	.87
2	.76	.77	.91	.69	.83	.91	.83	1.01	.81	.91
3	.84	.84	.76	.99	.88	.79	1.02	.95	.89	1.04
4	.89	.71	.82	.78	.75	.78	.94	.83	.94	.91

STATISTICS BASED ON 50 POINTS.

	MEAN	STAND. DEV.	MIN	MAX	SUM
RND >	.92	.10	.72	1.22	46.2
MAX >	1.03	.12	.83	1.36	51.57
MIN >	.85	.09	.64	1.04	42.44

V-TYPES	FREQUENCY (PERCENT)							
	V 6	V 7	V 8	V 9	V 10	V 11	V 12	V 13
RND >		12 %	28 %	38 %	20 %		2 %	
MAX >			16 %	26 %	32 %	10 %	12 %	4 %
MIN >	4 %	28 %	42 %	20 %	6 %			



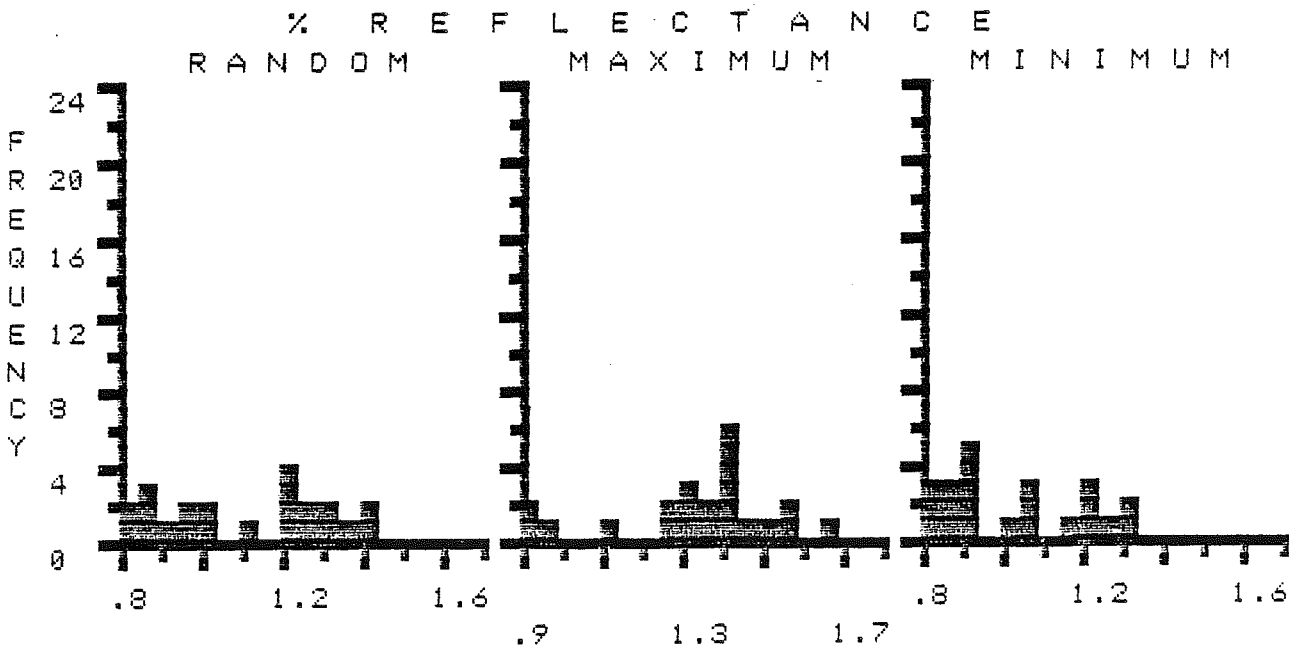
FILE >> PH1427 DESCRIPTION FOLLOWS :
 INT. >4350'-4360', NAUFRAGE #1, AMV, DEC-4-86

COL>	1	2	3	4	5	6	7	8	9	0
RND										
ROW	.93	.96	1.40	.86	1.21	.81	1.22	.89	1.02	1.34
1	.96	1.24	1.10	1.35	1.25	1.41	1.20	1.31	1.25	1.03
2	.82	.86								
MAX										
ROW	1.33	1.43	1.41	.93	1.37	.91	1.25	.98	1.13	1.42
1	1.36	1.33	1.56	1.44	1.65	1.44	1.41	1.56	1.26	1.52
2	1.46	1.30								
MIN										
ROW	.91	.90	1.09	.84	.87	.81	.93	.85	1.02	1.24
1	.94	1.23	1.07	1.33	1.24	1.31	1.18	1.26	1.07	.92
2	.82	.86								

STATISTICS BASED ON 22 POINTS.

	MEAN	STAND.DEV.	MIN	MAX	SUM
RND >	1.11	.20	.81	1.41	24.42
MAX >	1.34	.20	.91	1.65	29.45
MIN >	1.03	.18	.81	1.33	22.69

V-TYPES	FREQUENCY (PERCENT)									
	V 8	V 9	V 10	V 11	V 12	V 13	V 14	V 15	V 16	
RND >	22 %	13 %	9 %	4 %	27 %	13 %	9 %			
MAX >		13 %		4 %	9 %	22 %	31 %	13 %	4 %	
MIN >	27 %	22 %	18 %	4 %	18 %	9 %				



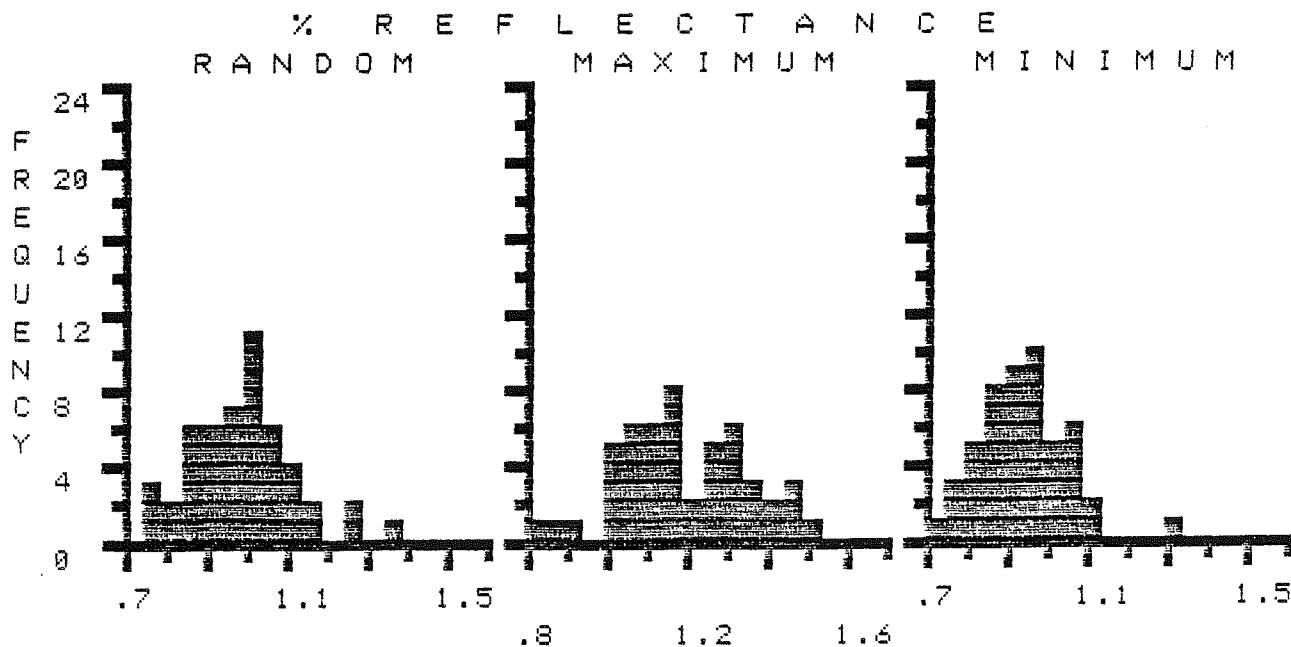
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 INT. >4710'-4730', NAUFRAGE #1, AMV, DEC-4-86

COL>	1	2	3	4	5	6	7	8	9	0
RND										
ROW	.78	.86	.81	.92	1.12	1.04	.77	.95	1.18	1.01
1	.93	1.07	1.26	.92	.93	.85	1.05	1.01	.94	.88
2	.91	1.10	1.10	1.01	.96	1.08	.79	.85	.81	1.03
3	.95	1.19	.98	1.05	1.27	1.01	1.01	1.01	1.07	.97
4	1.09	.96	.99	1.38	1.02	1.11	.89	1.02	.89	1.02
MAX										
ROW	.81	1.18	1.18	1.18	1.12	1.37	.85	1.00	1.27	1.16
1	1.45	1.15	1.26	.93	1.34	1.36	1.31	1.26	1.02	1.09
2	1.32	1.12	1.41	1.12	1.06	1.24	1.03	1.29	1.32	1.12
3	1.07	1.20	1.29	1.40	1.34	1.10	1.02	1.18	1.07	1.31
4	1.09	1.02	1.18	1.49	1.09	1.38	1.46	1.13	1.51	1.16
MIN										
ROW	.77	.84	.74	.81	1.02	.92	.77	.95	1.09	.99
1	.89	1.05	1.11	.88	.93	.85	1.05	.93	.92	.88
2	.91	1.06	1.01	.97	.95	1.05	.76	.84	.81	.84
3	.92	1.14	.96	1.00	.90	.97	.94	1.00	1.05	.88
4	.97	.91	.95	1.33	1.02	.89	.88	.96	.88	.96

STATISTICS BASED ON 50 POINTS.

	MEAN	STAND.DEV.	MIN	MAX	SUM
RND >	1.00	.13	.77	1.38	49.8
MAX >	1.20	.16	.81	1.51	59.81
MIN >	.94	.11	.74	1.33	47.1

V-TYPES	FREQUENCY (PERCENT)								
	V 7	V 8	V 9	V 10	V 11	V 12	V 13	V 14	V 15
RND >	6 %	16 %	26 %	34 %	12 %	4 %	2 %		
MAX >		4 %	2 %	22 %	28 %	14 %	18 %	10 %	2 %
MIN >	8 %	26 %	38 %	22 %	4 %		2 %		



FILE >> PH1430 DESCRIPTION FOLLOWS :
 INT. >6310'6330', NAUFRAGE #1, AMV, DEC-4-86

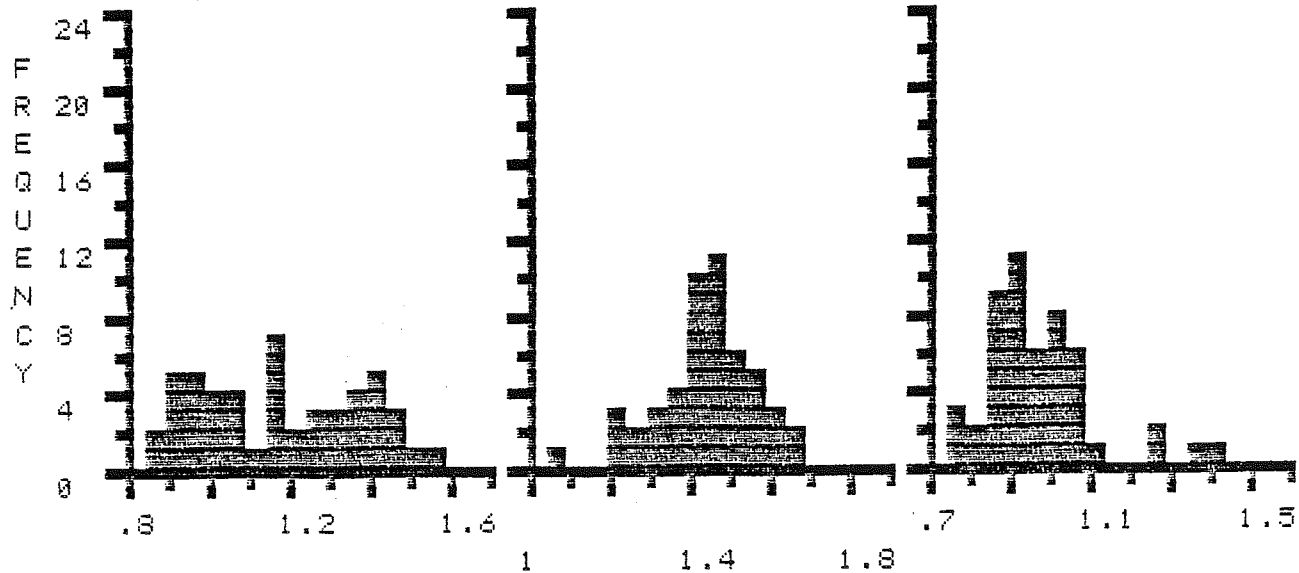
COL>	1	2	3	4	5	6	7	8	9	0
RND										
ROW	1.27	1.07	1.58	.98	1.11	1.30	1.16	1.35	1.47	1.00
1	1.20	1.09	.93	1.41	1.19	1.52	1.04	1.21	.92	.96
2	1.30	1.15	.92	1.15	1.43	1.27	1.31	1.26	1.41	1.40
3	.88	1.47	.95	.90	1.17	.87	1.37	.98	1.44	1.16
4	1.37	1.06	1.47	.97	1.04	1.06	1.04	.94	1.38	1.15
MAX										
ROW	1.60	1.55	1.64	1.51	1.51	1.38	1.35	1.40	1.55	1.44
1	1.45	1.29	1.25	1.45	1.33	1.52	1.44	1.21	1.31	1.51
2	1.30	1.22	1.48	1.42	1.63	1.42	1.53	1.44	1.45	1.42
3	1.20	1.55	1.05	1.47	1.58	1.35	1.45	1.46	1.48	1.59
4	1.44	1.65	1.47	1.47	1.67	1.42	1.48	1.35	1.42	1.54
MIN										
ROW	1.26	1.04	1.26	.97	.98	.91	.87	.92	.81	.87
1	.90	.87	.81	.85	1.04	1.41	.98	1.06	.89	.93
2	.94	1.04	.90	.91	1.07	1.05	1.01	.76	1.02	1.00
3	.88	.90	.91	.87	.86	.86	1.35	.97	1.05	1.08
4	1.10	1.02	.78	.90	.97	.96	1.04	.79	1.07	.91

STATISTICS BASED ON 50 POINTS.

	MEAN	STAND.DEV.	MIN	MAX	SUM
RND >	1.18	.20	.87	1.58	59.03
MAX >	1.44	.13	1.05	1.67	72.09
MIN >	.97	.14	.76	1.41	48.6

V-TYPES	FREQUENCY (PERCENT)									
	V 7	V 8	V 9	V 10	V 11	V 12	V 13	V 14	V 15	V 16
RND >		4 %	20 %	16 %	16 %	10 %	14 %	16 %	4 %	
MAX >				2 %		10 %	14 %	42 %	22 %	10 %
MIN >	6 %	22 %	34 %	28 %	2 %	4 %	2 %	2 %		

% R E F L E C T A N C E
 R A N D O M M A X I M U M M I N I M U M



FILE >> PH1431 DESCRIPTION FOLLOWS :
 INT. >7730'-7740', NAUFRAGE #1, AMV, DEC-7-86

COL>	1	2	3	4	5	6	7	8	9	0
RND										
ROW	1.40	1.36	.99	1.53	1.24	1.26	1.27	1.27	1.20	.91
1	1.29	1.30	1.34	1.33	1.56	1.44	1.47	1.33	1.39	.96
2	1.36	1.27	1.41	1.40	1.16	1.33	1.42	1.28	1.19	1.22
3	1.52	1.36	1.53	1.50	1.44	1.42	1.37	1.33	1.30	1.46
4	1.36	1.41	1.04	1.39	1.47	1.34	1.25	1.17	1.42	1.43

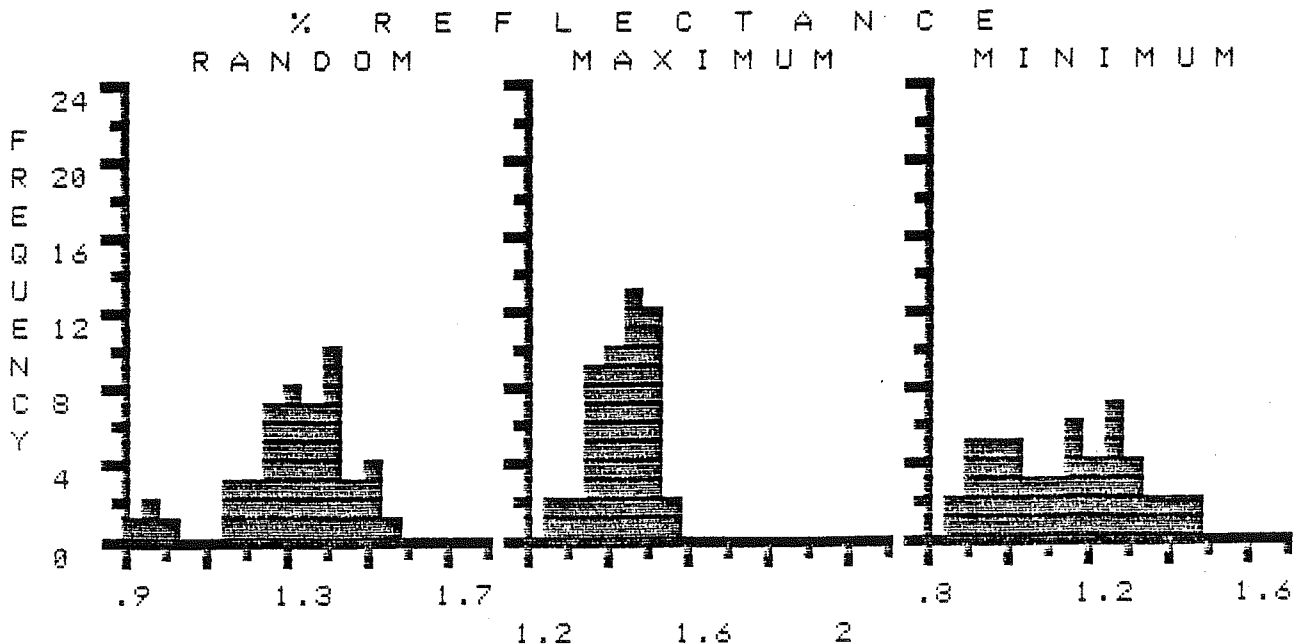
MAX										
ROW	1.47	1.52	1.43	1.54	1.52	1.28	1.45	1.45	1.29	1.42
1	1.44	1.39	1.37	1.44	1.56	1.46	1.53	1.33	1.47	1.39
2	1.36	1.54	1.42	1.45	1.49	1.40	1.42	1.52	1.35	1.35
3	1.52	1.48	1.54	1.54	1.48	1.54	1.50	1.38	1.38	1.51
4	1.47	1.46	1.31	1.41	1.49	1.58	1.35	1.45	1.43	1.43

MIN										
ROW	.92	1.29	.97	1.26	1.20	1.07	1.26	1.26	1.16	.86
1	1.24	1.30	1.13	1.25	1.25	1.04	1.42	1.04	1.03	.93
2	1.19	1.04	1.12	.94	.98	1.10	1.06	.93	1.18	.86
3	1.38	1.05	1.47	1.32	.97	1.02	1.31	1.29	1.18	1.43
4	1.34	1.37	.95	1.22	1.45	1.22	.96	.91	1.18	1.17

STATISTICS BASED ON 50 POINTS.

	MEAN	STAND.DEV.	MIN	MAX	SUM
RND >	1.33	.14	.91	1.56	66.39
MAX >	1.45	.07	1.28	1.58	72.3
MIN >	1.15	.17	.86	1.47	57.49

V-TYPES	FREQUENCY (PERCENT)							
	V 8	V 9	V 10	V 11	V 12	V 13	V 14	V 15
RND >		6 %	2 %	6 %	20 %	30 %	26 %	10 %
MAX >					4 %	22 %	46 %	28 %
MIN >	4 %	20 %	16 %	18 %	22 %	12 %	8 %	



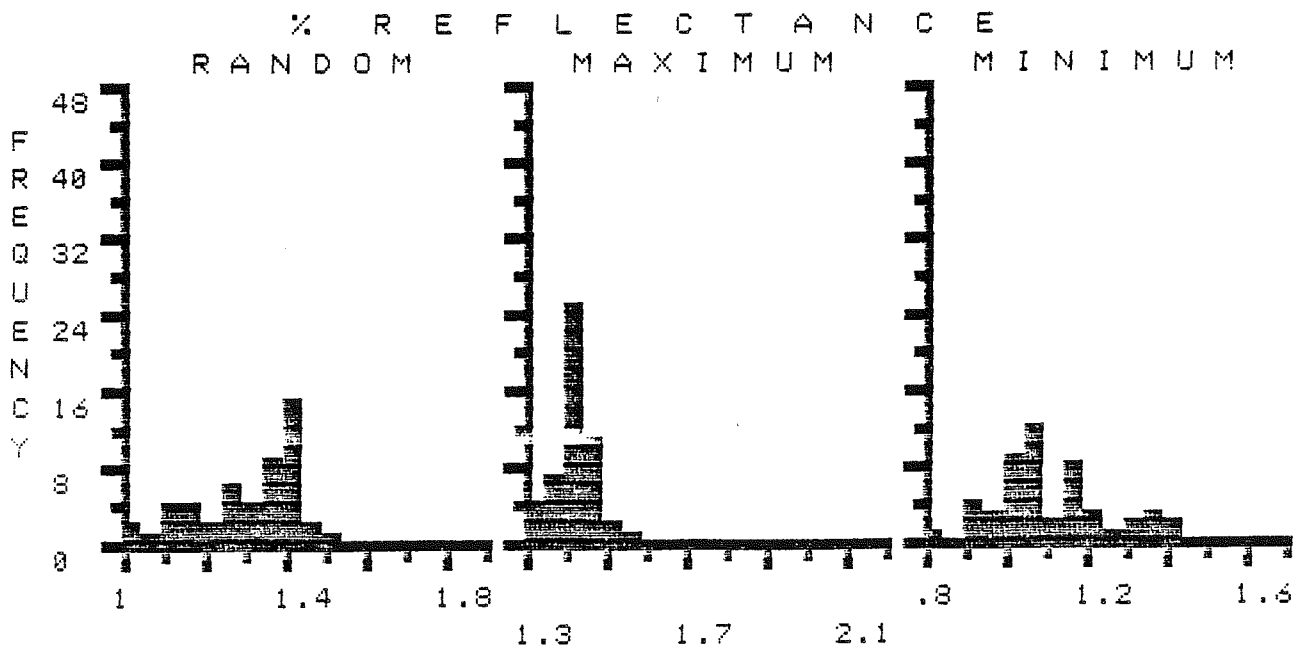
FILE >> PH1432 DESCRIPTION FOLLOWS :
 INT. >8210'-8220', NAUFRAGE #1, AMU, DEC-8-86

COL>	1	2	3	4	5	6	7	8	9	0
RND										
ROW	1.37	1.43	1.41	1.41	1.22	1.43	1.36	1.42	1.50	1.44
1	1.34	1.28	1.19	1.23	1.42	1.42	1.39	1.16	1.01	1.41
2	1.10	1.43	1.38	1.27	1.11	1.38	1.43	1.14	1.36	1.43
3	1.09	1.04	1.40	1.14	1.40	1.18	1.46	1.27	1.30	1.34
4	1.38	1.35	1.42	1.38	1.33	1.18	1.27	1.27	1.28	1.46
MAX										
ROW	1.44	1.45	1.42	1.44	1.43	1.44	1.41	1.47	1.50	1.57
1	1.35	1.42	1.42	1.39	1.44	1.43	1.40	1.44	1.39	1.41
2	1.34	1.44	1.41	1.35	1.48	1.41	1.43	1.40	1.41	1.43
3	1.37	1.40	1.46	1.39	1.41	1.50	1.46	1.47	1.31	1.47
4	1.38	1.42	1.46	1.47	1.34	1.40	1.45	1.43	1.31	1.48
MIN										
ROW	1.17	1.00	1.32	1.22	1.03	1.36	1.19	1.06	1.21	.83
1	1.28	1.06	1.18	1.05	1.16	1.16	1.34	1.05	1.00	1.38
2	.93	1.12	.98	1.19	1.01	.98	1.12	1.06	1.00	1.39
3	.93	1.02	1.05	1.00	1.17	1.05	1.41	1.05	.97	.93
4	1.01	1.24	1.05	1.01	.93	1.05	1.08	1.05	1.15	1.43

STATISTICS BASED ON 50 POINTS.

	MEAN	STAND.DEV.	MIN	MAX	SUM
RND >	1.32	.12	1.01	1.50	65.81
MAX >	1.42	.05	1.31	1.57	71.14
MIN >	1.11	.14	.83	1.43	55.41

V-TYPES	FREQUENCY (PERCENT)							
	V 8	V 9	V 10	V 11	V 12	V 13	V 14	V 15
RND >			6 %	16 %	16 %	26 %	34 %	2 %
MAX >						22 %	72 %	6 %
MIN >	2 %	14 %	42 %	20 %	8 %	10 %	4 %	



FILE >> PH1433 DESCRIPTION FOLLOWS :
 INT. >8420'-8440', NAUFRAGE #1. AMV. DEC-8-86

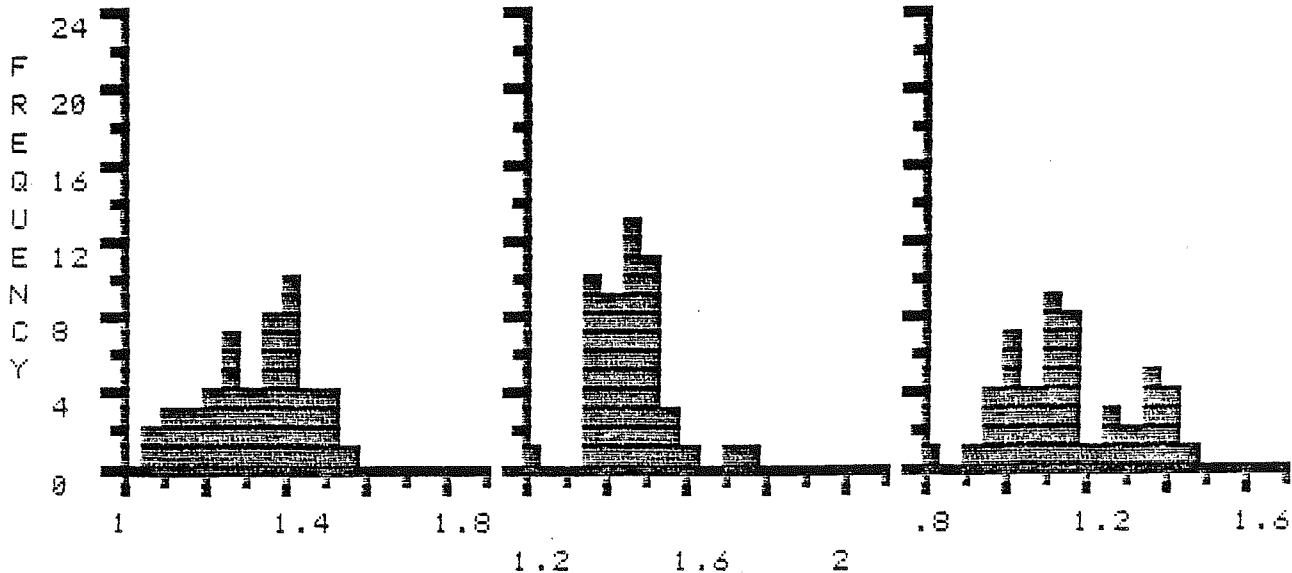
COL>	1	2	3	4	5	6	7	8	9	0
RND										
ROW	1.19	1.32	1.25	1.35	1.58	1.41	1.36	1.43	1.36	1.35
1	1.40	1.51	1.29	1.42	1.18	1.20	1.28	1.49	1.51	1.08
2	1.27	1.10	1.23	1.38	1.45	1.14	1.43	1.40	1.38	1.44
3	1.52	1.36	1.42	1.28	1.09	1.33	1.13	1.51	1.22	1.28
4	1.25	1.35	1.46	1.43	1.18	1.46	1.34	1.34	1.23	1.44
MAX										
ROW	1.43	1.45	1.53	1.36	1.64	1.52	1.48	1.48	1.48	1.37
1	1.51	1.54	1.71	1.43	1.38	1.38	1.38	1.54	1.54	1.40
2	1.36	1.49	1.23	1.41	1.58	1.45	1.55	1.49	1.41	1.51
3	1.52	1.43	1.53	1.48	1.46	1.35	1.53	1.59	1.38	1.44
4	1.50	1.76	1.46	1.45	1.40	1.47	1.37	1.40	1.38	1.45
MIN										
ROW	1.18	1.16	.92	.96	1.09	1.17	1.35	1.41	1.34	1.00
1	.99	1.36	1.17	1.20	1.18	1.10	1.02	1.40	1.10	1.08
2	1.04	1.04	.83	1.18	1.15	1.14	1.37	1.36	1.33	1.03
3	1.42	.99	1.40	1.08	.97	1.29	1.12	1.48	1.14	1.27
4	1.00	1.26	1.01	1.07	1.11	1.14	1.11	1.13	1.17	1.39

STATISTICS BASED ON 50 POINTS.

	MEAN	STAND.DEV.	MIN	MAX	SUM
RND >	1.34	.12	1.08	1.58	66.8
MAX >	1.47	.09	1.23	1.76	73.38
MIN >	1.16	.15	.83	1.48	58.2

V-TYPES	FREQUENCY (PERCENT)									
	V 8	V 9	V 10	V 11	V 12	V 13	V 14	V 15	V 16	V 17
RND >			4 %	12 %	22 %	24 %	28 %	10 %		
MAX >					2 %	20 %	44 %	28 %	2 %	4 %
MIN >	2 %	10 %	22 %	34 %	8 %	14 %	10 %			

% R E F L E C T A N C E
 R A N D O M M A X I M U M M I N I M U M



FILE >>.PH1435 DESCRIPTION FOLLOWS :
 INT. >9030'-9050', NAUFRAGE #1, AMV, DEC-9-86

COL>	1	2	3	4	5	6	7	8	9	0
RND										
ROW	1.50	1.50	1.71	1.37	1.47	1.49	1.59	1.62	1.44	1.67
1	1.24	1.28	1.55	1.52	1.57	1.55	1.71	1.50	1.44	1.66
2	1.33	1.68	1.29	1.45	1.59	1.69	1.65	1.62	1.52	1.54
3	1.26	1.76	1.57	1.65	1.11	1.75	1.22	1.75	1.55	1.71
4	1.40	1.51	1.56	1.66	1.73	1.67	1.54	1.49	1.77	1.73
MAX										
ROW	1.62	1.76	1.73	1.78	1.55	1.63	1.69	1.87	1.64	1.67
1	1.76	1.56	1.69	1.52	1.57	1.56	1.76	1.60	1.53	1.72
2	1.53	1.69	1.51	1.48	1.86	1.92	1.70	1.74	1.69	1.71
3	1.57	1.76	1.81	1.70	1.47	1.77	1.72	1.76	1.56	1.96
4	1.74	1.58	1.57	1.87	1.84	1.81	1.99	1.58	1.91	1.84
MIN										
ROW	1.40	1.46	1.60	1.01	1.14	1.38	1.29	1.45	1.33	1.41
1	.96	1.25	1.13	1.46	1.32	1.19	1.17	1.00	1.26	1.47
2	1.24	1.41	1.19	1.37	1.59	1.33	1.64	1.34	1.51	1.48
3	1.26	1.41	1.17	1.62	1.10	1.72	1.03	1.57	1.44	1.55
4	.97	1.06	1.16	1.62	1.62	1.55	.84	1.46	1.75	1.10

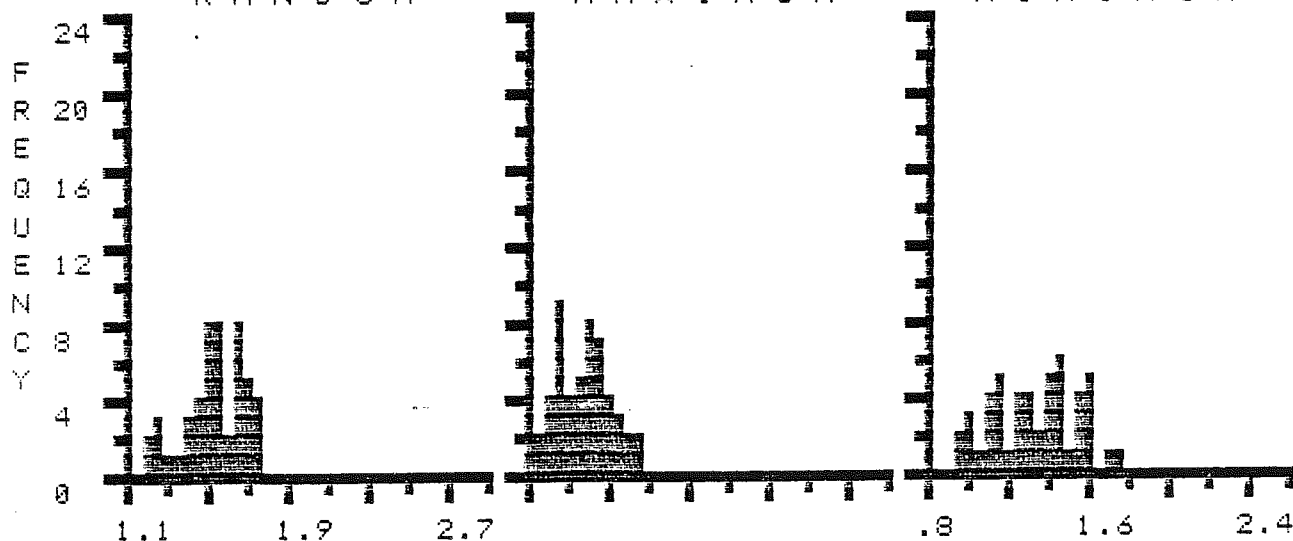
STATISTICS BASED ON 50 POINTS.

	MEAN	STAND.DEV.	MIN	MAX	SUM
RND >	1.54	.16	1.11	1.77	77.13
MAX >	1.70	.13	1.47	1.99	84.85
MIN >	1.34	.22	.84	1.75	66.78

V-TYPES FREQUENCY (PERCENT)

	V 8	V 9	V 10	V 11	V 12	V 13	V 14	V 15	V 16	V 17
18 V 19										
RND >				2 %	10 %	4 %	14 %	32 %	20 %	18 %
MAX >							4 %	26 %	18 %	30 %
14 %	8 %									
MIN >	2 %	4 %	8 %	18 %	10 %	12 %	22 %	10 %	10 %	4 %

% R E F L E C T A N C E
 R A N D O M M A X I M U M M I N I M U M



FILE >> PH1436 DESCRIPTION FOLLOWS :
 INT. >9320'-9330', NAUFRAGE #1, AMV, DEC-10-86

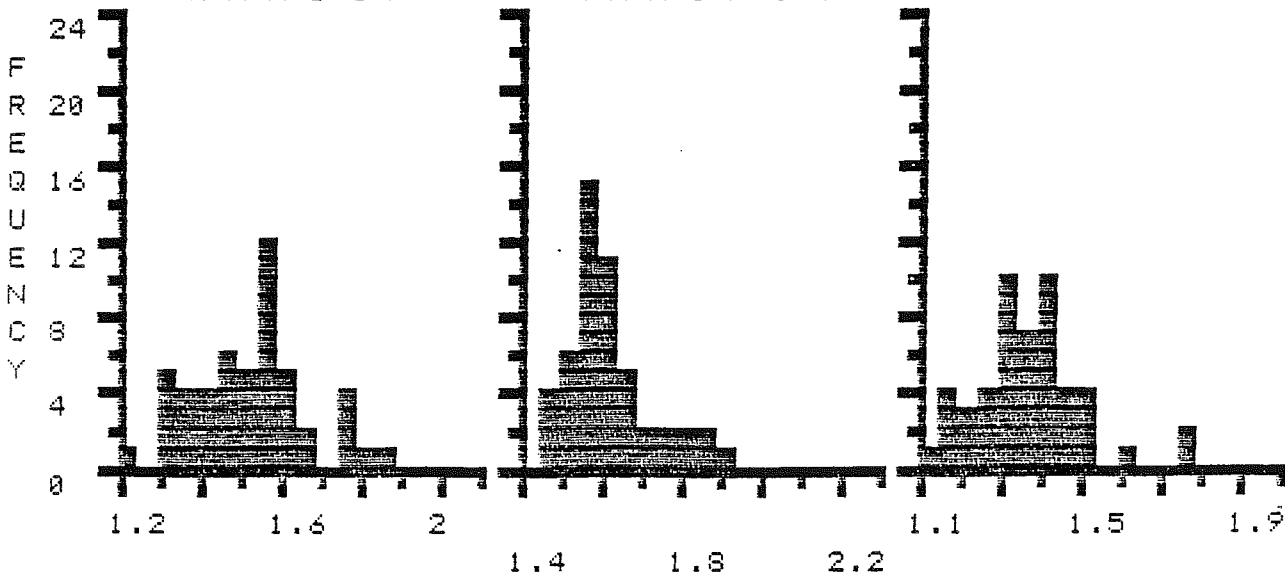
COL>	1	2	3	4	5	6	7	8	9	0
RND										
ROW	1.75	1.45	1.61	1.56	1.37	1.59	1.60	1.59	1.35	1.46
1	1.66	1.34	1.87	1.55	1.43	1.56	1.63	1.40	1.30	1.75
2	1.53	1.76	1.46	1.56	1.44	1.67	1.55	1.24	1.49	1.54
3	1.46	1.93	1.59	1.54	1.59	1.38	1.59	1.34	1.53	1.52
4	1.42	1.62	1.79	1.64	1.55	1.35	1.34	1.30	1.47	1.58
MAX										
ROW	1.90	1.61	1.61	1.61	1.60	1.65	1.65	1.59	1.45	1.52
1	1.80	1.59	1.87	1.58	1.67	1.61	1.73	1.45	1.49	1.78
2	1.54	1.81	1.58	1.64	1.56	1.68	1.56	1.61	1.54	1.55
3	1.54	1.86	1.59	1.54	1.59	1.61	1.59	1.58	1.59	1.52
4	1.61	1.73	1.79	1.67	1.55	1.57	1.56	1.62	1.47	1.60
MIN										
ROW	1.49	1.43	1.36	1.53	1.37	1.43	1.29	1.39	1.31	1.22
1	1.18	1.23	1.76	1.54	1.30	1.32	1.43	1.15	1.29	1.51
2	1.42	1.19	1.42	1.3	1.34	1.12	1.41	1.24	1.43	1.50
3	1.34	1.76	1.31	1.45	1.46	1.37	1.48	1.31	1.44	1.31
4	1.31	1.60	1.40	1.38	1.25	1.35	1.18	1.28	1.39	1.44

STATISTICS BASED ON 50 POINTS.

	MEAN	STAND.DEV.	MIN	MAX	SUM
RND >	1.53	.14	1.24	1.87	76.49
MAX >	1.62	.10	1.45	1.90	81.01
MIN >	1.37	.13	1.12	1.76	68.72

V-TYPES	FREQUENCY (PERCENT)									
	V 11	V 12	V 13	V 14	V 15	V 16	V 17	V 18	V 19	
RND >		2 %	18 %	20 %	34 %	14 %	8 %	4 %		
MAX >				8 %	42 %	32 %	8 %	8 %	2 %	
MIN >	10 %	14 %	34 %	28 %	8 %	2 %	4 %			

% R E F L E C T A N C E
 R A N D O M M A X I M U M M I N I M U M



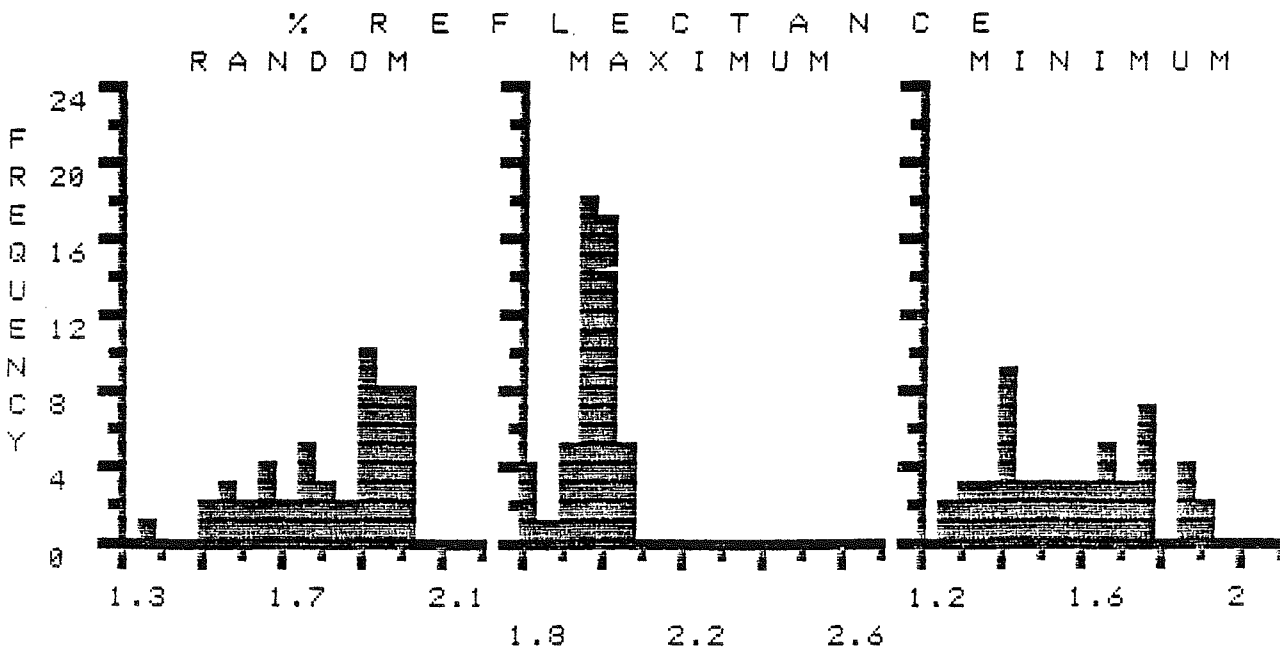
FILE >> PH1438 DESCRIPTION FOLLOWS :
 INT. >9800'-9810', NAUFRAGE #1, AMV, DEC-10-86

COL>	1	2	3	4	5	6	7	8	9	0
RND										
ROW	1.73	1.93	1.96	1.70	1.54	1.55	1.52	1.97	1.82	1.93
1	1.57	1.37	1.92	1.91	1.97	2.02	1.81	1.79	1.79	1.82
2	1.64	2.00	1.68	1.92	1.68	2.00	1.93	2.02	1.95	1.65
3	1.92	2.03	1.92	2.03	1.85	1.93	1.96	1.78	1.79	2.00
4	1.64	1.90	1.75	1.58	1.96	1.96	1.67	1.86	1.99	2.00
MAX										
ROW	1.84	1.99	1.96	1.93	1.99	1.97	2.01	1.97	1.97	2.00
1	1.96	2.00	1.94	1.98	1.97	2.04	1.84	1.82	1.88	1.84
2	1.99	2.00	2.03	1.97	1.97	2.01	2.00	2.04	1.96	2.09
3	1.93	2.04	1.94	2.07	1.99	2.00	2.00	1.97	2.05	2.00
4	2.03	2.03	2.06	1.99	1.99	2.00	1.90	1.98	2.06	2.00
MIN										
ROW	1.69	1.78	1.67	1.50	1.48	1.42	1.41	1.91	1.36	1.58
1	1.46	1.36	1.85	1.41	1.64	1.42	1.72	1.77	1.56	1.60
2	1.57	1.94	1.42	1.75	1.46	1.28	1.40	1.51	1.72	1.43
3	1.69	1.75	1.86	1.78	1.32	1.88	1.39	1.76	1.66	1.73
4	1.62	1.79	1.25	1.33	1.66	1.43	1.50	1.86	1.44	1.31

STATISTICS BASED ON 50 POINTS.

	MEAN	STAND.DEV.	MIN	MAX	SUM
RND >	1.83	.16	1.37	2.03	91.61
MAX >	1.98	.06	1.82	2.09	98.99
MIN >	1.58	.19	1.25	1.94	79.08

V-TYPES	FREQUENCY (PERCENT)									
	V 12	V 13	V 14	V 15	V 16	V 17	V 18	V 19	V 20	
RND >		2 %		10 %	12 %	14 %	10 %	36 %	16 %	
MAX >							10 %	46 %	44 %	
MIN >	4 %	12 %	24 %	12 %	16 %	20 %	8 %	4 %		



FILE >> PH1439 DESCRIPTION FOLLOWS :
 INT. >10090'-10110', NAUFRAGE #1, AMV, DEC-11-86

COL>	1	2	3	4	5	6	7	8	9	0
RND										
ROW	1.64	1.86	1.96	1.74	1.96	1.87	1.98	1.68	1.91	1.84
1	2.07	1.90	2.04	2.00	2.04	1.77	1.63	1.95	1.94	2.01
2	1.64	1.78	1.92	1.94	1.93	1.89	1.99	1.99	1.94	1.88
3	1.76	2.05	2.04	1.76	1.94	2.00	1.99	1.58	1.61	2.01
4	2.04	1.89	1.64	2.00	1.92	1.92	1.79	1.79	1.93	1.91
MAX										
ROW	1.96	1.91	2.02	2.01	1.97	2.00	1.99	1.99	2.01	1.96
1	2.09	2.02	2.05	2.08	2.05	1.95	2.00	1.95	2.13	2.03
2	1.95	1.95	1.99	1.99	1.96	1.99	1.99	1.99	2.01	1.97
3	1.89	2.07	2.13	2.06	1.94	2.00	2.03	2.03	2.04	2.13
4	2.06	1.95	1.96	2.08	2.02	2.02	2.00	1.87	1.99	2.07
MIN										
ROW	1.52	1.82	1.69	1.73	1.72	1.86	1.93	1.52	1.64	1.70
1	2.01	1.79	1.46	1.88	2.01	1.72	1.58	1.52	1.66	1.91
2	1.54	1.63	1.59	1.91	1.91	1.49	1.53	1.72	1.70	1.69
3	1.53	1.98	1.51	1.61	1.88	1.90	1.72	1.52	1.59	1.75
4	1.95	1.88	1.63	1.82	1.70	1.70	1.76	1.74	1.81	1.80

STATISTICS BASED ON 50 POINTS.

	MEAN	STAND.DEV.	MIN	MAX	SUM
RND >	1.89	.13	1.58	2.07	94.26
MAX >	2.01	.06	1.87	2.13	100.3
MIN >	1.73	.15	1.46	2.01	86.36

U-TYPES	FREQUENCY (PERCENT)							
	U 14	U 15	U 16	U 17	U 18	U 19	U 20	U 21
RND >		2 %	12 %	14 %	12 %	38 %	22 %	
MAX >					4 %	42 %	48 %	6 %
MIN >	4 %	22 %	12 %	26 %	18 %	14 %	4 %	

