



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

JUN 04 1979

MEMORANDUM FOR: Docket File 71-6698

FROM: Richard H. Odegaarden, Transportation Branch
Division of Fuel Cycle and Material Safety, NMSS

SUBJECT: MEETINGS WITH APPLICANTS CONCERNING APRIL 6, 1979
ORDER TO SHOW CAUSE

DATE: May 24, 1979

ATTENDEES: Jim Clark, Nuclear Fuel Service
Wes Lewis, Nuclear Fuel Service
Charles E. MacDonald, NRC, FCTR
Richard H. Odegaarden, NRC, FCTR

DISCUSSION: General discussion on the present status of the Model No.
NFS-4 packaging Order. Nuclear Fuel Services (NFS)
indicated NAC would probably represent NFS in this matter.

A handwritten signature in cursive script, reading "R H Odegaarden".

Richard H. Odegaarden
Transportation Branch
Division of Fuel Cycle and
Material Safety, NMSS

STRAIGHTNESS FOR
FOR NAC-1E CASK

AXIAL LOCATION	DEVIATION					
	30.	90.	150.	210.	270.	330.
4.5	0.000	0.000	0.000	0.000	0.000	0.000
6.5	.007	.020	.006	.011	.035	.011
12.5	-.003	.033	.012	.012	.024	.019
18.5	-.025	.032	.011	.002	-.019	.032
24.5	-.047	.039	.008	-.007	-.013	.043
30.5	-.058	.024	.003	-.006	.018	.055
36.5	-.076	.002	-.008	-.010	-.002	.072
42.5	-.082	-.028	-.030	-.003	.006	.078
48.5	-.082	-.044	-.046	.011	.023	.081
54.5	-.066	-.047	-.060	.008	.025	.076
60.5	-.061	-.059	-.074	.018	.013	.087
66.5	-.054	-.067	-.063	.015	.007	.081
72.5	-.043	-.076	-.076	.036	.018	.077
78.5	-.032	-.082	-.078	.023	-.005	.054
84.5	.002	-.074	-.074	-.001	-.021	.059
90.5	-.039	-.070	-.066	-.044	-.019	.056
96.5	.017	-.030	-.084	-.051	-.000	.069
102.5	.013	-.004	-.100	-.065	.001	.079
108.5	.023	-.014	-.099	-.077	-.014	.078
114.5	.016	-.024	-.089	-.072	-.014	.073
120.5	.016	-.039	-.077	-.071	-.021	.056
126.5	.015	-.037	-.064	-.083	-.033	.064
132.5	.016	-.035	-.061	-.088	-.038	.058
138.5	.011	-.022	-.054	-.078	-.043	.062
144.5	.011	-.003	-.049	-.045	-.041	.064
150.5	.006	.001	-.042	-.048	-.036	.054
156.5	.005	.006	-.024	-.037	-.014	.049
162.5	-.005	.013	-.029	-.015	-.010	.038
168.5	-.014	.007	-.032	-.003	-.007	.020
174.5	.000	.000	0.000	0.000	0.000	.000

MEASURED DIAMETERS
FOR NAC-1E CASK

AXIAL LOCATION	DIAMETER			OVALITY
	30-210	90-270	150-330	
4.5	13.466	13.464	13.454	.012
6.5	13.485	13.519	13.471	.048
12.5	13.477	13.521	13.486	.044
18.5	13.453	13.477	13.500	.047
24.5	13.416	13.490	13.506	.090
30.5	13.408	13.506	13.514	.106
36.5	13.387	13.464	13.522	.135
42.5	13.390	13.442	13.505	.115
48.5	13.406	13.443	13.493	.087
54.5	13.420	13.442	13.475	.055
60.5	13.436	13.418	13.472	.054
66.5	13.441	13.404	13.477	.073
72.5	13.475	13.406	13.461	.069
78.5	13.475	13.377	13.437	.098
84.5	13.486	13.369	13.446	.117
90.5	13.403	13.375	13.451	.076
96.5	13.453	13.434	13.447	.019
102.5	13.437	13.461	13.442	.024
108.5	13.437	13.436	13.440	.004
114.5	13.436	13.426	13.448	.022
120.5	13.439	13.404	13.444	.040
126.5	13.426	13.394	13.464	.070
132.5	13.424	13.391	13.462	.071
138.5	13.430	13.399	13.474	.075
144.5	13.465	13.420	13.481	.061
150.5	13.459	13.429	13.479	.050
156.5	13.470	13.456	13.493	.037
162.5	13.483	13.467	13.477	.016
168.5	13.487	13.464	13.456	.031
174.5	13.506	13.464	13.469	.042

RAW DATA
FOR NAC-1E CASE

AXIAL LOCATION	DISPLACEMENT					
	30.	90.	150.	210.	270.	330.
4.5	.284	.320	.362	.286	.311	.318
6.5	.276	.300	.356	.275	.276	.307
12.5	.283	.285	.350	.276	.289	.298
18.5	.302	.285	.351	.281	.333	.288
24.5	.322	.276	.355	.298	.329	.273
30.5	.330	.290	.360	.298	.299	.260
36.5	.345	.310	.371	.304	.321	.241
42.5	.348	.339	.393	.298	.314	.236
48.5	.345	.354	.409	.285	.298	.232
54.5	.326	.355	.423	.290	.298	.236
60.5	.319	.366	.438	.281	.311	.224
66.5	.309	.372	.427	.286	.319	.230
72.5	.295	.380	.440	.266	.309	.233
78.5	.281	.385	.442	.280	.333	.255
84.5	.244	.375	.438	.306	.351	.250
90.5	.283	.370	.431	.350	.350	.252
96.5	.224	.328	.449	.359	.333	.238
102.5	.225	.301	.465	.374	.333	.227
108.5	.212	.310	.464	.387	.349	.230
114.5	.216	.318	.454	.384	.351	.232
120.5	.213	.332	.442	.384	.359	.248
126.5	.212	.328	.430	.398	.373	.240
132.5	.208	.325	.427	.404	.379	.245
138.5	.210	.310	.420	.396	.386	.240
144.5	.207	.290	.415	.364	.385	.238
150.5	.209	.285	.408	.368	.381	.247
156.5	.207	.278	.390	.359	.361	.251
162.5	.215	.270	.396	.338	.358	.261
168.5	.221	.274	.399	.328	.357	.279
174.5	.204	.280	.367	.326	.351	.298
	REPRODUCIBILITY DATA					
126.5	.210	.325	.430	.401	.372	.242
102.5	.223	.301	.464	.373	.337	.223
42.5	.345	.341	.343	.299	.313	.255
4.5	.284	.318	.363	.285	.311	.319

STRAIGHTNESS FOR
FOR NAC-1D CASK

AXIAL LOCATION	DEVIATION					
	30.	90.	150.	210.	270.	330.
4.5	0.000	0.000	0.000	0.000	0.000	0.000
12.5	.080	.021	.005	.075	.041	.020
18.5	.080	.021	.008	.047	.037	.045
24.5	.079	.029	.013	.018	.046	.053
30.5	.079	.038	.011	-.001	.044	.066
36.5	.081	.041	.004	-.027	.044	.068
42.5	.086	.045	-.004	-.033	.046	.071
48.5	.084	.043	-.011	-.038	.045	.070
54.5	.082	.041	-.018	-.038	.043	.067
60.5	.074	.042	-.038	-.037	.046	.104
66.5	.054	.050	-.053	-.044	.048	.102
72.5	.055	.053	-.057	-.044	.061	.108
78.5	.053	.049	-.063	-.038	.063	.106
84.5	.044	.046	-.061	-.032	.063	.108
90.5	.032	.038	-.045	-.023	.047	.122
96.5	.032	.027	-.047	-.021	.062	.112
102.5	.024	.020	-.036	-.015	.050	.124
108.5	.013	.011	-.039	-.008	.051	.118
114.5	.006	.011	-.042	-.000	.053	.119
120.5	-.006	.012	-.038	-.002	.041	.107
126.5	-.006	.018	-.030	-.006	.050	.093
132.5	.014	.027	-.030	-.008	.054	.070
138.5	.017	.029	-.024	-.005	.051	.054
144.5	-.006	.027	-.024	.006	.054	.035
150.5	-.029	.020	-.024	.007	.052	.026
156.5	-.024	.009	-.026	.023	.049	.008
162.5	-.032	-.001	-.019	.038	.036	.013
168.5	-.031	-.005	-.009	.009	.007	.012
174.5	.000	.000	.000	0.000	.000	.000

MEASURED DIAMETERS
FOR NAC-1D CASK

AXIAL LOCATION	DIAMETER			OVALITY
	30-210	90-270	150-330	
4.5	13.477	13.479	13.481	.004
12.5	13.634	13.545	13.512	.122
18.5	13.608	13.544	13.544	.064
24.5	13.579	13.565	13.562	.017
30.5	13.562	13.575	13.577	.015
36.5	13.540	13.581	13.576	.041
42.5	13.541	13.591	13.576	.050
48.5	13.535	13.590	13.572	.055
54.5	13.535	13.589	13.566	.054
60.5	13.529	13.597	13.588	.068
66.5	13.505	13.610	13.575	.105
72.5	13.507	13.630	13.582	.123
78.5	13.512	13.631	13.578	.119
84.5	13.511	13.630	13.586	.119
90.5	13.509	13.610	13.621	.112
96.5	13.514	13.617	13.613	.103
102.5	13.513	13.601	13.640	.127
108.5	13.511	13.597	13.636	.125
114.5	13.513	13.602	13.638	.125
120.5	13.501	13.594	13.635	.134
126.5	13.510	13.612	13.633	.123
132.5	13.519	13.628	13.614	.109
138.5	13.526	13.631	13.609	.105
144.5	13.516	13.635	13.594	.119
150.5	13.495	13.629	13.589	.134
156.5	13.518	13.618	13.574	.100
162.5	13.527	13.598	13.590	.071
168.5	13.501	13.569	13.604	.103
174.5	13.524	13.570	13.605	.081

CAVITY MEASUREMENTS
FOR NAC-1D CASK

AXIAL LOCATION	RADIUS					
	30.	90.	150.	210.	270.	330.
4.5	6.726	6.748	6.765	6.751	6.731	6.716
12.5	6.809	6.771	6.772	6.825	6.774	6.740
18.5	6.812	6.772	6.776	6.796	6.772	6.768
24.5	6.813	6.782	6.783	6.766	6.783	6.779
30.5	6.816	6.792	6.782	6.746	6.783	6.795
36.5	6.820	6.796	6.776	6.720	6.785	6.800
42.5	6.828	6.802	6.770	6.713	6.789	6.806
48.5	6.828	6.801	6.764	6.707	6.789	6.808
54.5	6.829	6.800	6.758	6.706	6.789	6.803
60.5	6.823	6.803	6.740	6.706	6.794	6.848
66.5	6.806	6.812	6.726	6.699	6.798	6.849
72.5	6.809	6.817	6.724	6.698	6.813	6.858
78.5	6.809	6.814	6.719	6.703	6.817	6.859
84.5	6.803	6.812	6.722	6.708	6.818	6.864
90.5	6.793	6.806	6.740	6.716	6.804	6.881
96.5	6.796	6.796	6.739	6.718	6.821	6.874
102.5	6.790	6.790	6.751	6.723	6.811	6.889
108.5	6.782	6.783	6.750	6.729	6.814	6.886
114.5	6.777	6.784	6.748	6.736	6.818	6.890
120.5	6.768	6.787	6.754	6.733	6.807	6.881
126.5	6.782	6.794	6.763	6.728	6.818	6.870
132.5	6.793	6.804	6.764	6.726	6.824	6.850
138.5	6.798	6.808	6.772	6.728	6.823	6.837
144.5	6.778	6.807	6.773	6.738	6.828	6.821
150.5	6.757	6.801	6.774	6.738	6.828	6.815
156.5	6.765	6.792	6.774	6.753	6.826	6.800
162.5	6.759	6.783	6.782	6.768	6.815	6.808
168.5	6.763	6.781	6.794	6.738	6.788	6.810
174.5	6.796	6.787	6.804	6.728	6.783	6.801

RAW DATA
FOR NAC-1D CASK

AXIAL LOCATION	DISPLACEMENT					
	30.	90.	150.	210.	270.	330.
4.5	.292	.304	.329	.267	.312	.324
12.5	.209	.281	.322	.193	.269	.300
18.5	.206	.280	.318	.222	.271	.272
24.5	.205	.270	.311	.252	.260	.261
30.5	.202	.260	.312	.272	.260	.245
36.5	.198	.256	.318	.298	.258	.240
42.5	.190	.250	.324	.305	.254	.234
48.5	.190	.251	.330	.311	.254	.232
54.5	.189	.252	.336	.312	.254	.232
60.5	.195	.249	.354	.312	.249	.192
66.5	.212	.240	.368	.319	.245	.191
72.5	.209	.235	.370	.320	.230	.182
78.5	.209	.238	.375	.315	.226	.181
84.5	.215	.240	.372	.310	.225	.176
90.5	.225	.246	.354	.302	.239	.159
96.5	.222	.256	.355	.300	.222	.166
102.5	.228	.262	.343	.295	.232	.151
108.5	.236	.269	.344	.289	.229	.154
114.5	.241	.268	.346	.282	.225	.150
120.5	.250	.265	.340	.285	.236	.159
126.5	.236	.258	.331	.290	.225	.170
132.5	.225	.248	.330	.292	.219	.190
138.5	.220	.244	.322	.290	.220	.203
144.5	.240	.245	.321	.280	.215	.219
150.5	.261	.251	.320	.280	.215	.225
156.5	.253	.260	.320	.265	.217	.240
162.5	.259	.269	.312	.250	.228	.232
168.5	.255	.271	.300	.280	.255	.250
174.5	.222	.265	.290	.290	.260	.239
REPRODUCIBILITY DATA						
144.5	.240	.246	.325	.280	.215	.220
108.5	.235	.269	.346	.291	.230	.154
72.5	.210	.236	.370	.322	.231	.181
4.5	.292	.303	.328	.266	.311	.324

STRAIGHTNESS FOR
FOR NAC-1B CASK

AXIAL LOCATION	DEVIATION					
	30.	90.	150.	210.	270.	330.
4.5	0.000	0.000	0.000	0.000	0.000	0.000
6.5	-.012	.020	.045	-.020	-.028	-.017
12.5	.001	.059	.050	.023	-.011	-.033
18.5	-.001	.051	.054	.055	-.012	-.029
24.5	-.002	.008	.066	.066	-.015	-.018
30.5	-.006	.024	.081	.074	-.020	-.055
36.5	-.005	.040	.076	.089	-.039	-.047
42.5	-.014	.055	.094	.078	-.048	-.018
48.5	-.022	.070	.081	.068	-.062	-.015
54.5	-.048	.058	.082	.012	-.063	-.016
60.5	-.016	.070	.058	.023	-.068	-.010
66.5	.011	.062	.057	.021	-.070	-.008
72.5	.018	.064	.086	.011	-.063	-.016
78.5	.015	.062	.074	.014	-.060	-.024
84.5	.020	.069	.063	.022	-.065	-.035
90.5	.010	.036	.079	.039	-.072	-.012
96.5	-.003	.023	.067	.044	-.050	.000
102.5	-.005	.061	.073	.035	-.057	-.034
108.5	-.012	.051	.078	.032	-.052	-.022
114.5	-.026	.077	.093	.022	-.062	-.015
120.5	-.005	.065	.064	.002	-.052	-.012
126.5	.006	.061	.047	.004	-.038	-.014
132.5	-.008	.067	.025	-.004	-.046	-.025
138.5	-.028	.074	.014	.015	-.009	-.006
144.5	-.062	.047	.001	.008	.007	.012
150.5	-.038	.027	.003	.036	.013	.021
156.5	-.012	.009	.005	.046	.014	.017
162.5	-.010	.010	-.008	.023	.010	.001
168.5	-.010	-.010	-.021	-.009	.013	.017
174.5	0.000	.000	.000	.000	0.000	0.000

MEASURED DIAMETERS
FOR NAC-1B CASK

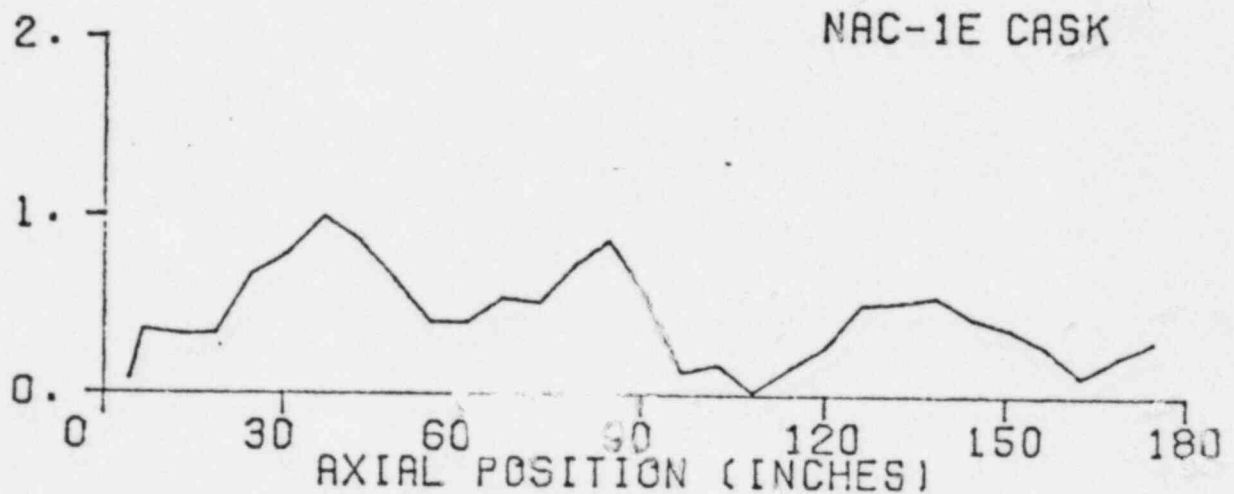
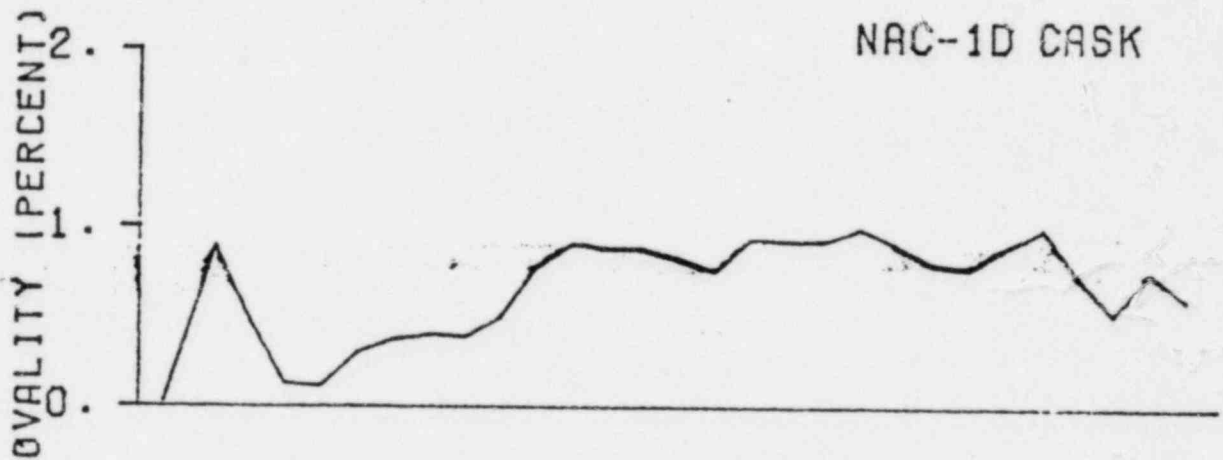
AXIAL LOCATION	DIAMETER			QUALITY
	30-210	90-270	150-330	
4.5	13.502	13.555	13.519	.053
6.5	13.470	13.547	13.547	.077
12.5	13.527	13.602	13.537	.075
18.5	13.558	13.594	13.545	.049
24.5	13.568	13.547	13.568	.021
30.5	13.574	13.557	13.546	.028
36.5	13.590	13.554	13.549	.041
42.5	13.571	13.560	13.596	.036
48.5	13.553	13.560	13.588	.035
54.5	13.473	13.547	13.588	.115
60.5	13.516	13.553	13.570	.054
66.5	13.542	13.543	13.571	.029
72.5	13.539	13.552	13.592	.053
78.5	13.540	13.552	13.572	.032
84.5	13.554	13.554	13.551	.003
90.5	13.561	13.514	13.590	.076
96.5	13.554	13.522	13.590	.068
102.5	13.544	13.553	13.563	.019
108.5	13.535	13.547	13.580	.045
114.5	13.511	13.563	13.602	.091
120.5	13.514	13.561	13.577	.063
126.5	13.527	13.570	13.558	.043
132.5	13.506	13.567	13.525	.061
138.5	13.505	13.612	13.533	.107
144.5	13.466	13.600	13.538	.134
150.5	13.518	13.586	13.550	.068
156.5	13.555	13.568	13.549	.019
162.5	13.534	13.565	13.520	.045
168.5	13.504	13.548	13.523	.044
174.5	13.523	13.544	13.527	.021

CAVITY MEASUREMENTS
FOR NAC-1B CASK

AXIAL LOCATION	RADIUS					
	30.	90.	150.	210.	270.	330.
4.5	6.761	6.752	6.773	6.741	6.803	6.746
6.5	6.749	6.772	6.819	6.721	6.775	6.728
12.5	6.761	6.811	6.826	6.766	6.791	6.711
18.5	6.759	6.804	6.832	6.799	6.790	6.713
24.5	6.757	6.761	6.846	6.811	6.786	6.722
30.5	6.753	6.777	6.863	6.821	6.780	6.683
36.5	6.753	6.793	6.860	6.837	6.761	6.689
42.5	6.744	6.809	6.880	6.827	6.751	6.716
48.5	6.735	6.824	6.870	6.818	6.736	6.718
54.5	6.709	6.812	6.873	6.764	6.735	6.715
60.5	6.740	6.824	6.851	6.776	6.729	6.719
66.5	6.767	6.817	6.852	6.775	6.726	6.719
72.5	6.773	6.819	6.883	6.766	6.733	6.709
78.5	6.769	6.817	6.873	6.771	6.735	6.699
84.5	6.774	6.824	6.864	6.780	6.730	6.687
90.5	6.763	6.792	6.882	6.798	6.722	6.708
96.5	6.750	6.779	6.872	6.804	6.743	6.718
102.5	6.747	6.817	6.881	6.797	6.736	6.682
108.5	6.740	6.807	6.888	6.795	6.740	6.692
114.5	6.725	6.834	6.905	6.786	6.729	6.697
120.5	6.746	6.822	6.878	6.768	6.739	6.699
126.5	6.756	6.818	6.863	6.771	6.752	6.695
132.5	6.742	6.824	6.843	6.764	6.743	6.682
138.5	6.721	6.832	6.834	6.784	6.780	6.699
144.5	6.687	6.805	6.823	6.779	6.795	6.715
150.5	6.710	6.785	6.828	6.808	6.801	6.722
156.5	6.736	6.767	6.832	6.819	6.801	6.717
162.5	6.737	6.769	6.821	6.797	6.796	6.699
168.5	6.737	6.749	6.810	6.767	6.799	6.713
174.5	6.746	6.759	6.833	6.777	6.785	6.694

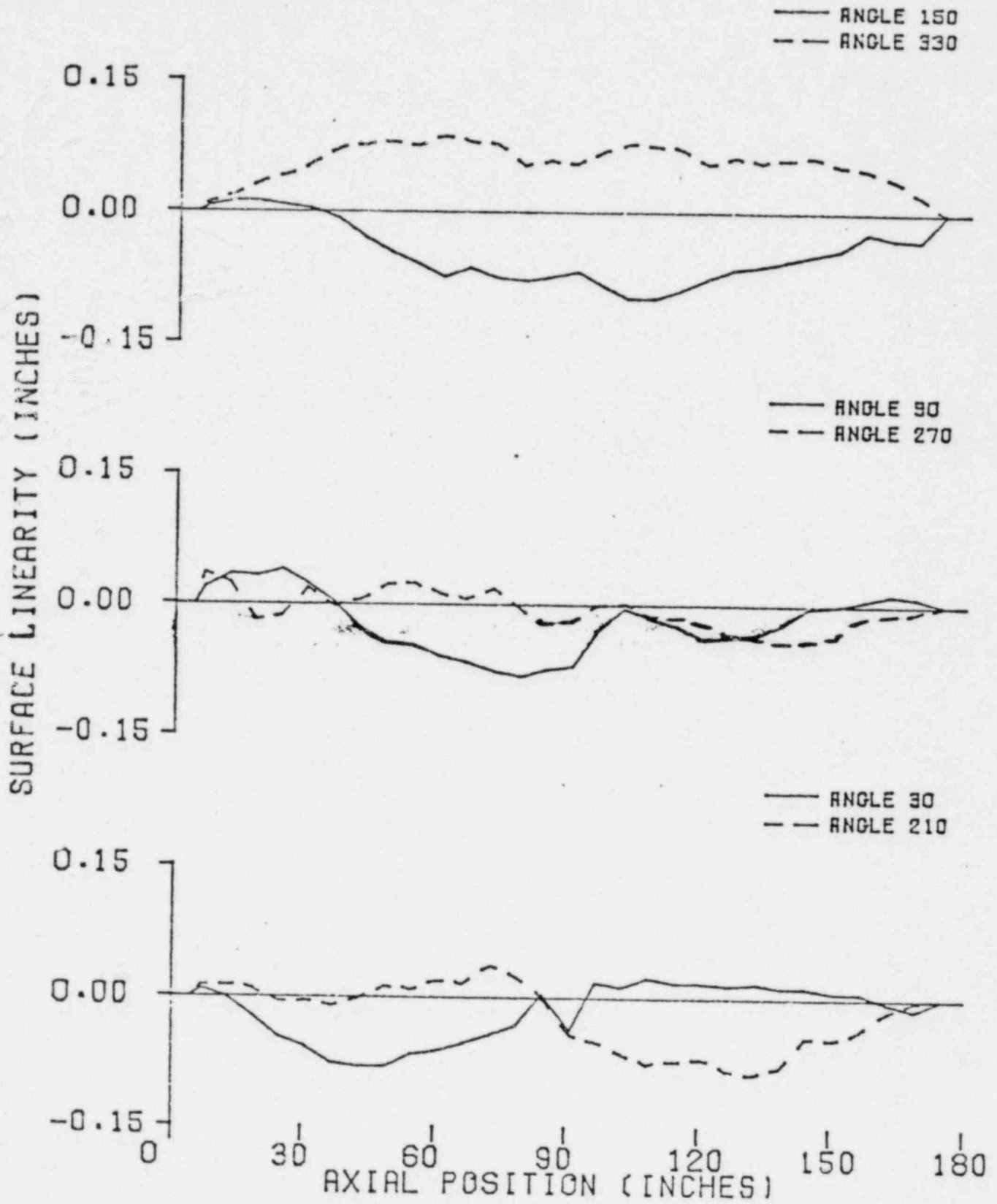
RAW DATA
FOR NAC-1B CASK

AXIAL LOCATION	DISPLACEMENT					
	30.	90.	150.	210.	270.	330.
4.5	.264	.265	.260	.265	.228	.251
6.5	.276	.245	.214	.285	.256	.269
12.5	.264	.206	.207	.240	.240	.286
18.5	.266	.213	.201	.207	.241	.284
24.5	.263	.256	.187	.195	.245	.275
30.5	.272	.240	.170	.185	.251	.314
36.5	.272	.224	.173	.169	.270	.308
42.5	.281	.208	.153	.179	.280	.281
48.5	.290	.193	.163	.188	.295	.279
54.5	.316	.205	.160	.242	.296	.282
60.5	.285	.193	.182	.230	.302	.278
66.5	.258	.200	.181	.231	.305	.278
72.5	.252	.198	.150	.240	.298	.288
78.5	.256	.200	.160	.235	.296	.293
84.5	.251	.193	.169	.226	.301	.310
90.5	.262	.225	.151	.208	.309	.289
96.5	.275	.238	.161	.202	.288	.279
102.5	.278	.200	.152	.209	.295	.315
108.5	.285	.210	.145	.211	.291	.305
114.5	.300	.183	.128	.220	.302	.300
120.5	.279	.195	.155	.238	.292	.298
126.5	.269	.199	.170	.235	.279	.302
132.5	.283	.193	.190	.242	.288	.315
138.5	.304	.185	.199	.222	.251	.298
144.5	.338	.212	.210	.227	.236	.282
150.5	.315	.232	.205	.198	.230	.275
156.5	.289	.250	.201	.187	.230	.280
162.5	.288	.248	.212	.209	.235	.298
168.5	.288	.268	.223	.239	.232	.284
174.5	.279	.258	.200	.229	.246	.303
REPRODUCIBILITY DATA						
162.5	.291	.245	.208	.209	.233	.297
138.5	.304	.186	.195	.223	.250	.293
72.5	.251	.198	.152	.239	.298	.288
4.5	.265	.264	.261	.265	.226	.252



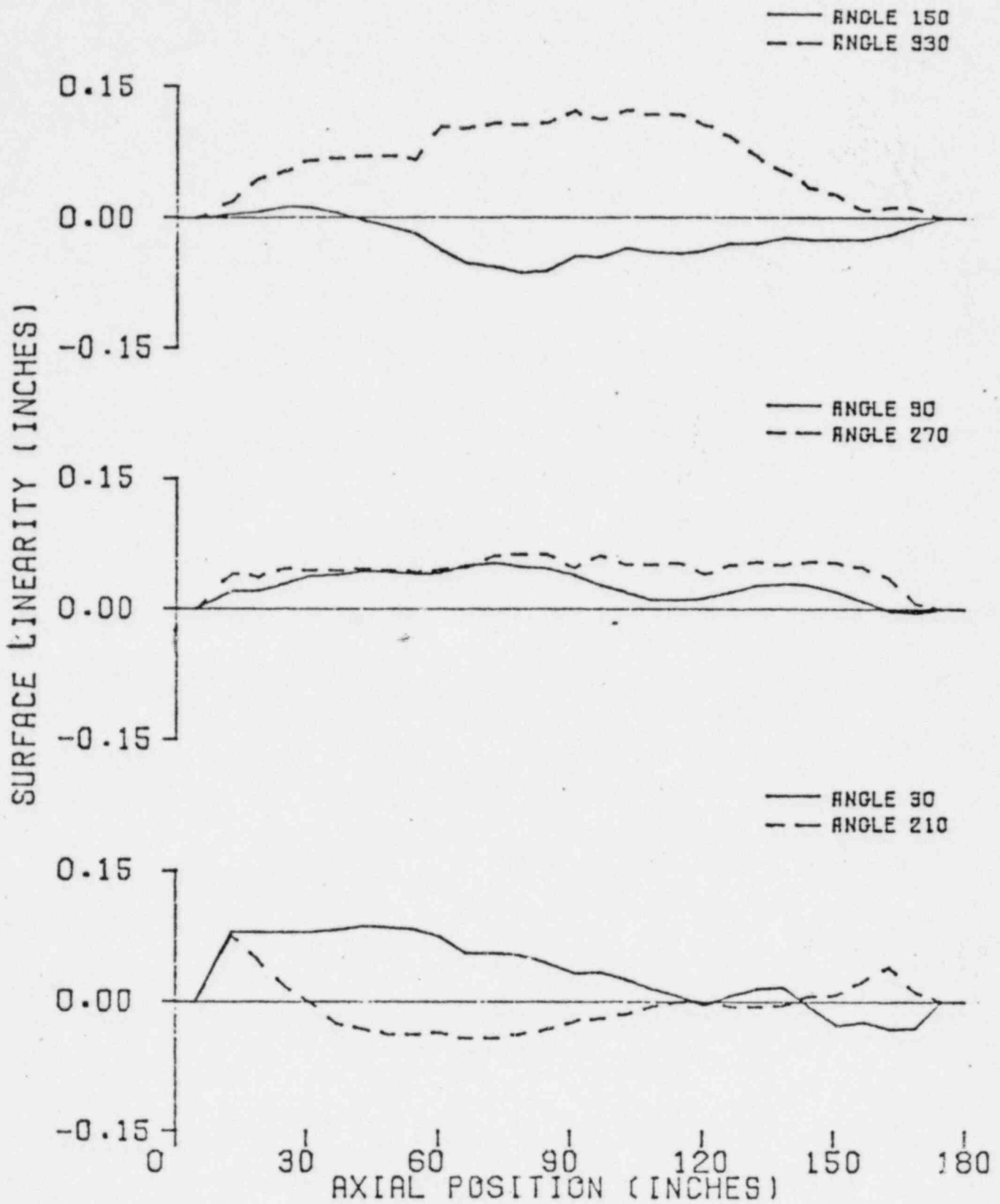
OVALITY OF THE INTERNAL CASK CAVITY
AS A FUNCTION OF MEASURED DIAMETERS

NAC-1E CASK



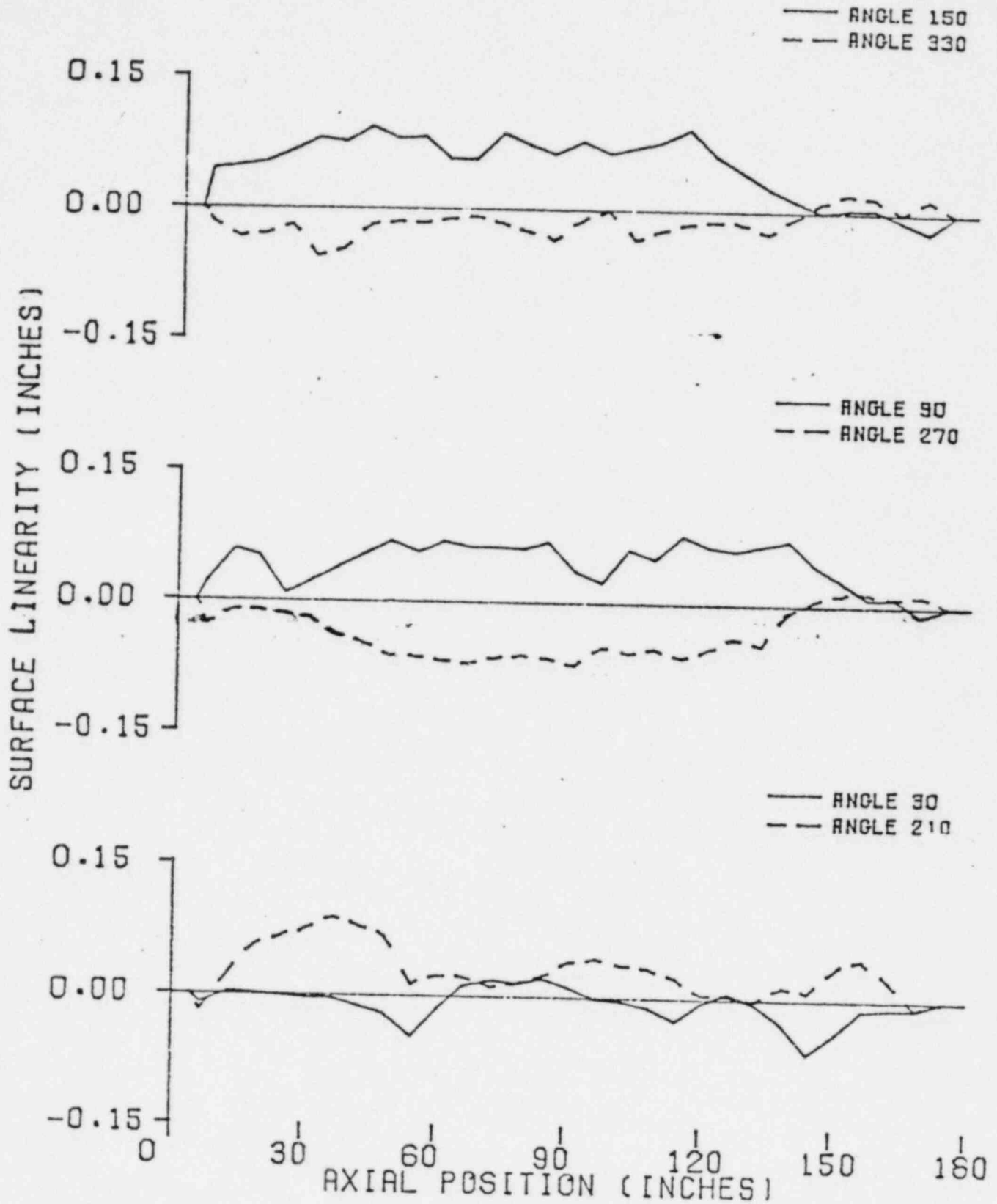
SURFACE LINEARITY OF THE NAC-1E
INNER CASK CAVITY AT VARIOUS VERTICAL PLANES

NAC-1D CASK



SURFACE LINEARITY OF THE NAC-1D
INNER CASK CAVITY AT VARIOUS VERTICAL PLANES

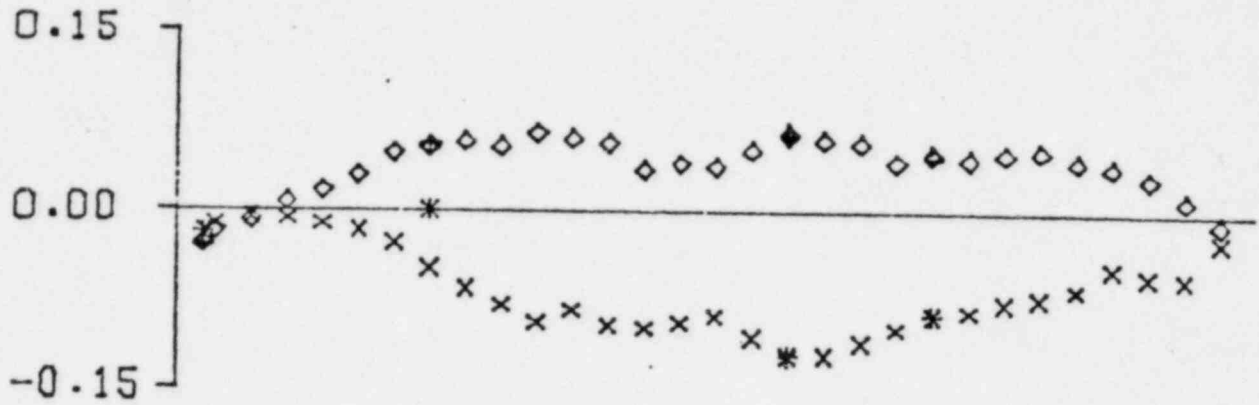
NAC-1B CASK



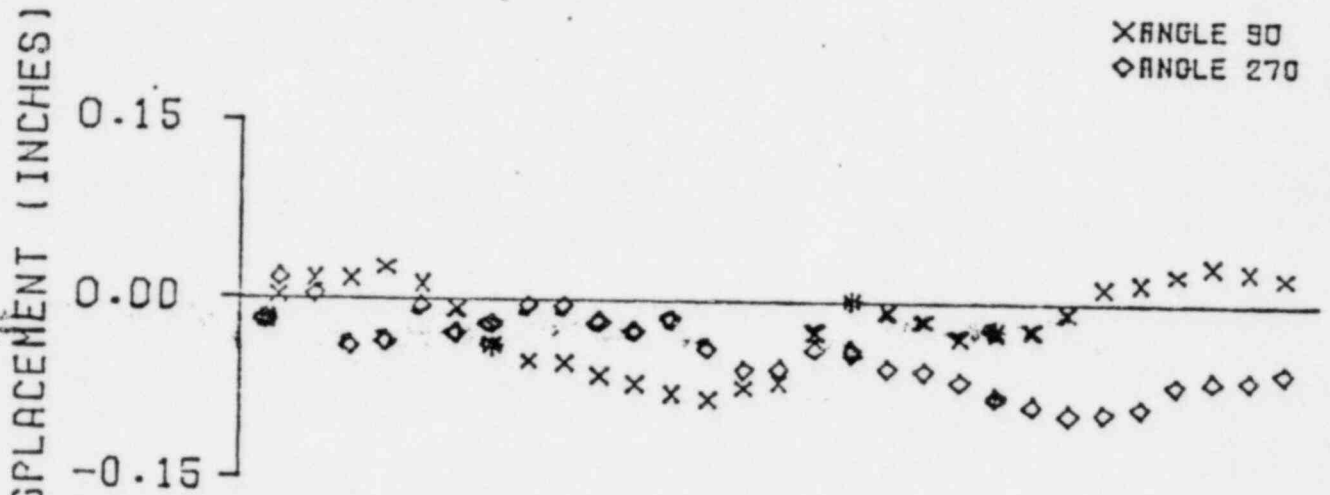
SURFACE LINEARITY OF THE NAC-1B
INNER CASK CAVITY AT VARIOUS VERTICAL PLANES

NAC-1E CASK

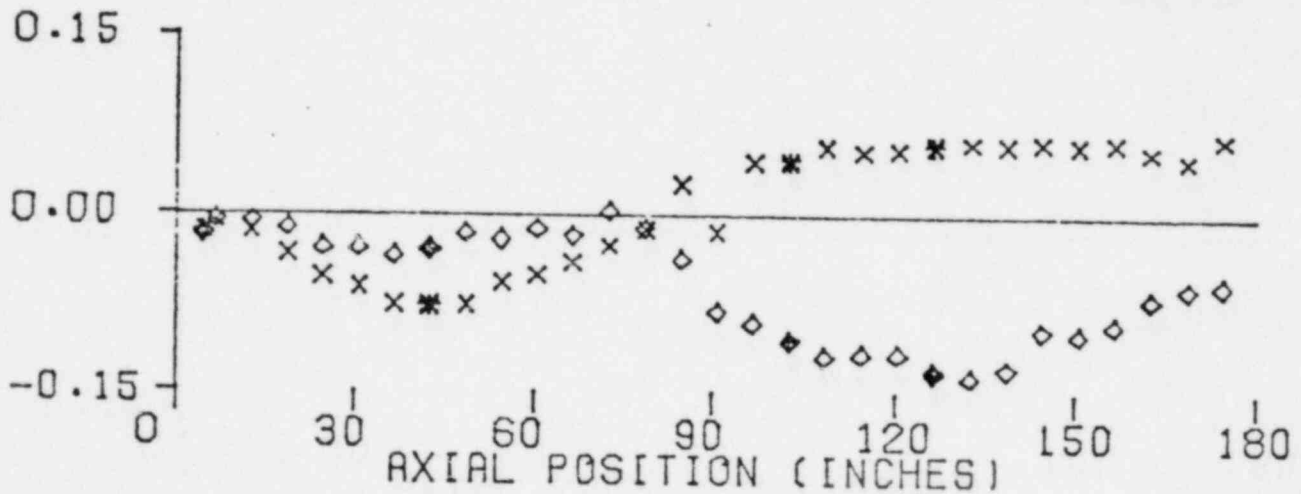
X ANGLE 150
◇ ANGLE 330



X ANGLE 90
◇ ANGLE 270



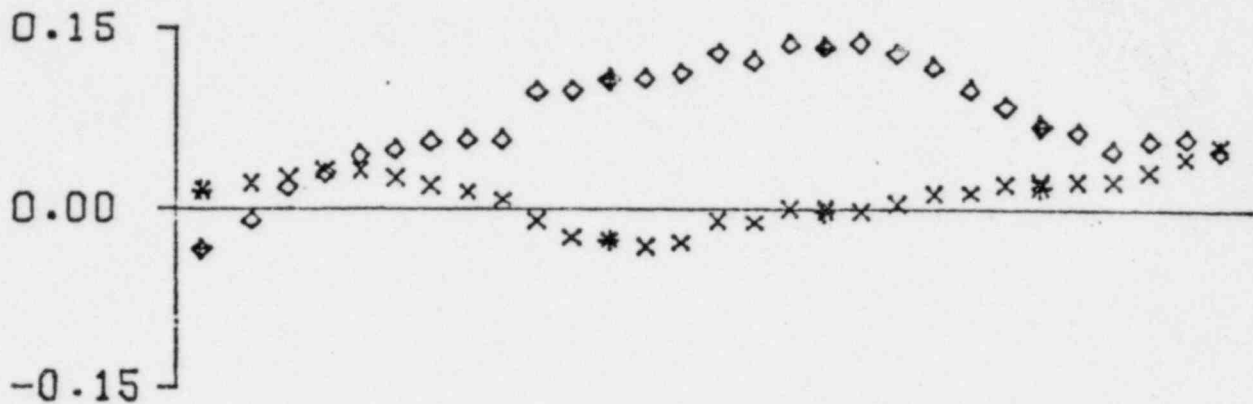
X ANGLE 30
◇ ANGLE 210



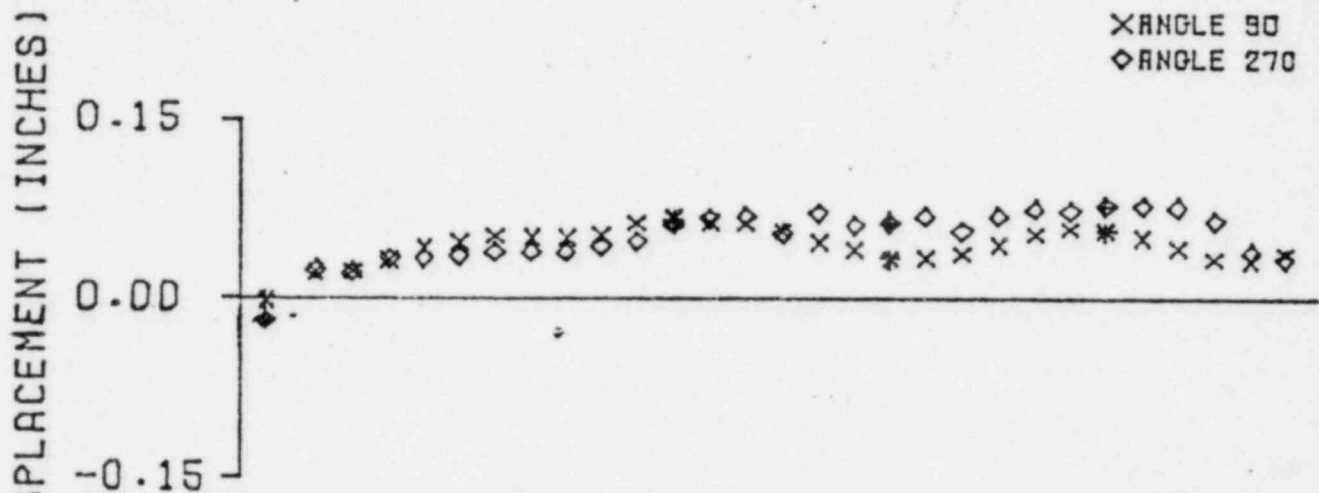
RAW DATA DISPLACEMENT OF RADIUS FROM
NOMINAL RADIUS OF THE NAC-1E INNER CASK CAVITY

NAC-1D CASK

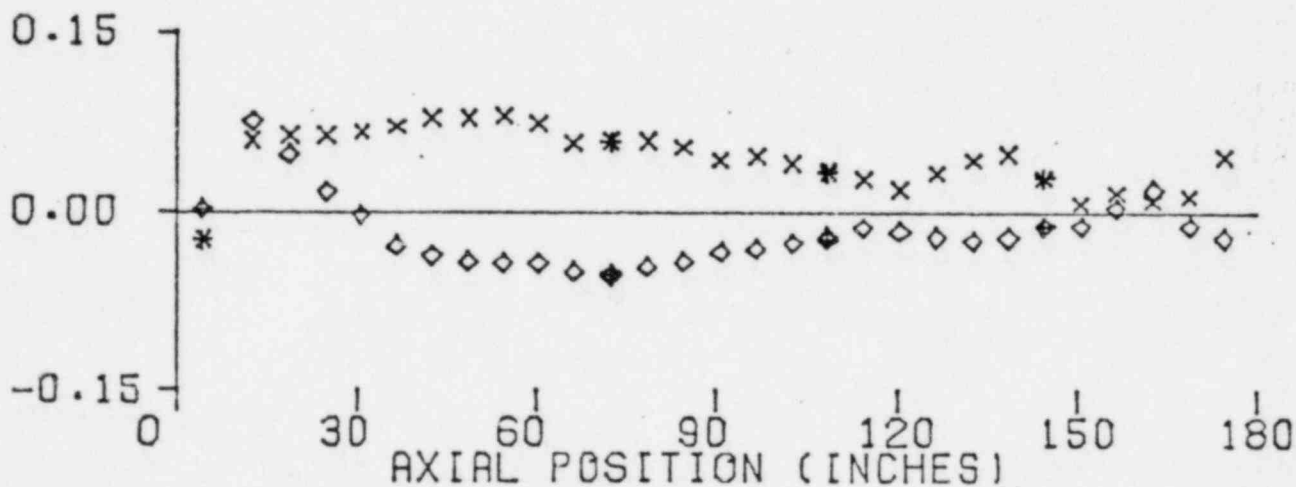
X ANGLE 150
◇ ANGLE 330



X ANGLE 90
◇ ANGLE 270

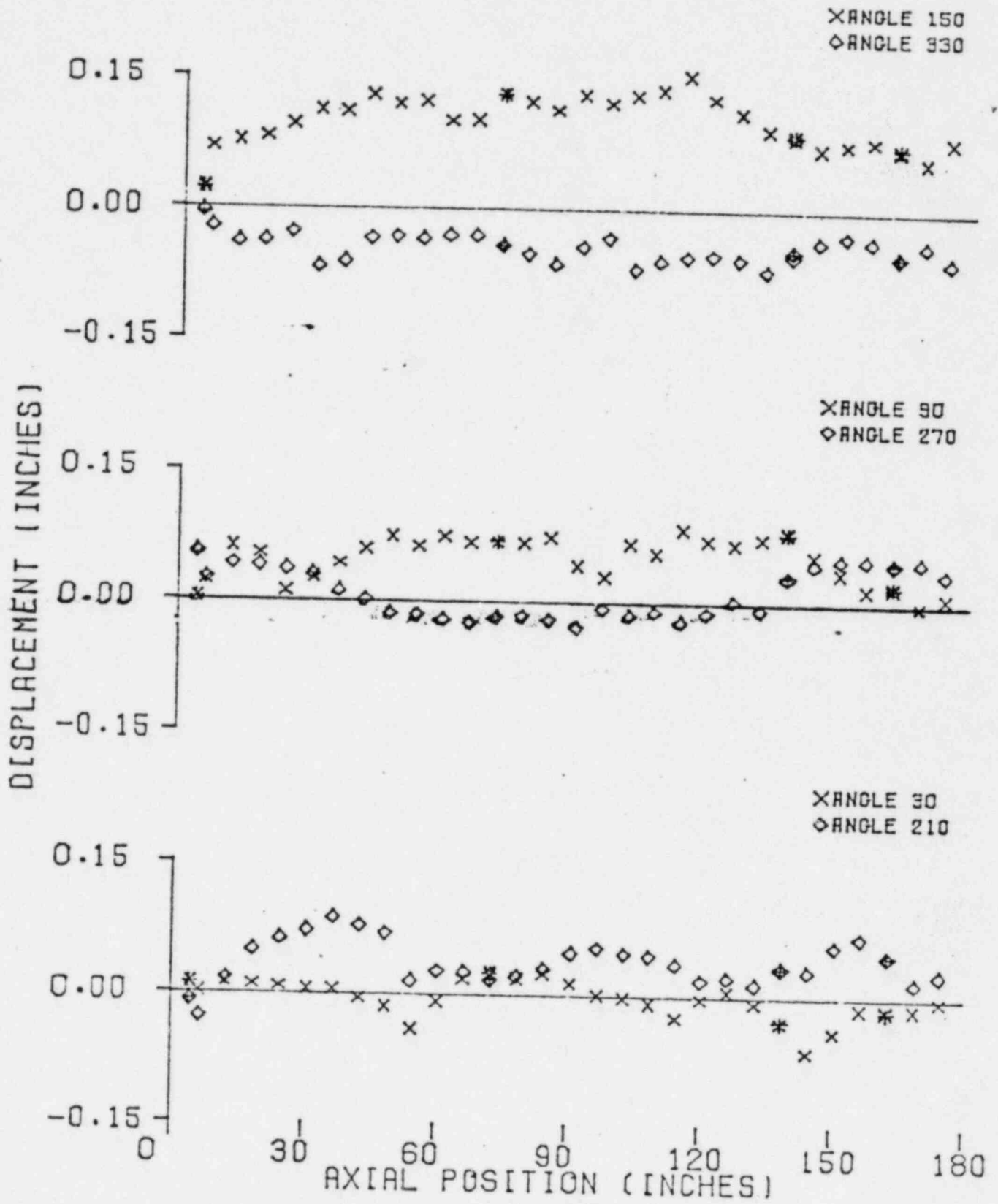


X ANGLE 30
◇ ANGLE 210



RAW DATA DISPLACEMENT OF RADIUS FROM
NOMINAL RADIUS OF THE NAC-1D INNER CASK CAVITY

NAC-1B CASK



RAW DATA DISPLACEMENT OF RADIUS FROM
NOMINAL RADIUS OF THE NAC-1B INNER CASK CAVITY

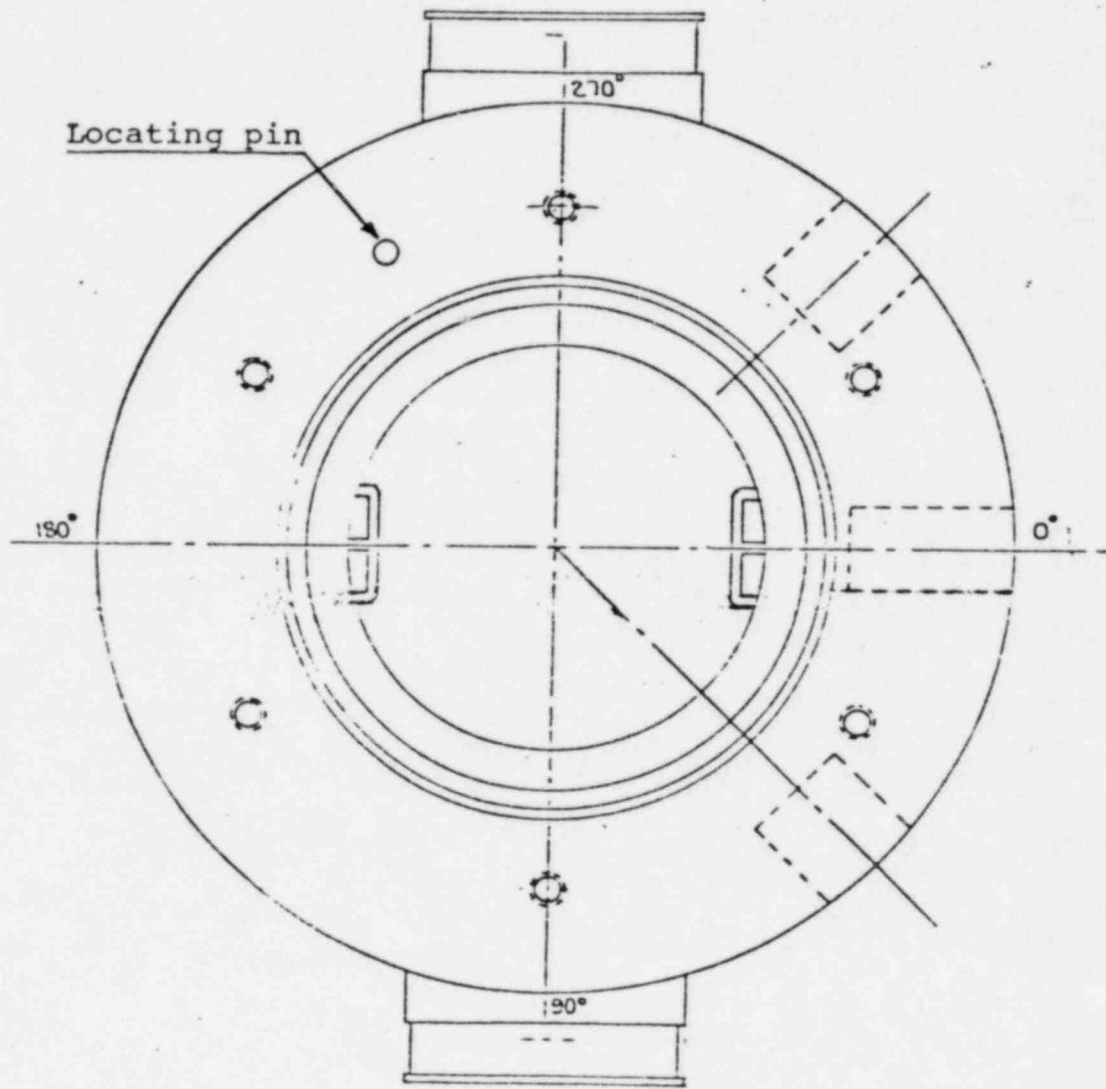
SUMMARY OF MEASURED SURFACE
LINEARITY AND OVALITY OF THE CASK CAVITY

Surface Linearity*
(Inches)

<u>Cask</u>	<u>Orientation</u>						<u>Maximum Ovality** (Inches)</u>
	<u>30°</u>	<u>90°</u>	<u>150°</u>	<u>210°</u>	<u>270°</u>	<u>320°</u>	
NAC-1B	0.082	0.087	0.115	0.109	0.086	0.076	0.134
NAC-1D	0.118	0.058	0.076	0.119	0.063	0.124	0.134
NAC-1E	0.105	0.121	0.112	0.124	0.078	0.098	0.135

* Surface linearity is defined as the absolute maximum deviation of the points measured from a straight line formed from the first and last measured points.

** Ovality is defined as the difference between the maximum and minimum of the measured diameters within a given cavity cross section.



CASK CAVITY ORIENTATION WITH RESPECT TO MEASUREMENTS