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NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS

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EFFECT OF BLADE LOADING ON THE CLIMB AND HIGH-SPEED PERFORMANCE OF A THREE-BLADE HAMILTON STANDARD NO. 6507A-2 PROPELLER ON A REPUBLIC P-47D AIRPLANE

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NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS

MEMORANDUM REPORT

for the

Air Technical Service Command, Army Air Forces

L-594

EFFECT OF BLADE LOADING ON THE CLIMB AND HIGH-SPEED PERFORMANCE OF A THREE-BLADE HAMILTON STANDARD NO. 6507A-2 PROPELLER ON A REPUBLIC P-47D AIRPLANE

By John J. Gardner

SUMMARY

As part of a general propeller flight test program at Langley Laboratory, climb and high-speed tests of a Hamilton Standard No. 6507A-2 three-blade propeller have been made to determine the effect of blade loading on propeller efficiency.

The normal and military power climb efficiencies were found to be about equal at altitudes below 16,000 feet. At higher altitudes, the efficiency for the military power condition was 1 to 2 percent lower. At an airplane Mach number of 0.7 a gain of 8 percent in efficiency was obtained with an increase in the power coefficient per blade from 0.06 to 0.09.

Tests at reduced engine speed indicated that, for an advance-diameter ratio of 2.5 and a power coefficient per blade of 0.08, an increase in efficiency of the order of 7 percent was obtained by a reduction in propeller-tip Mach number from approximately 1.16 to 1.06.

INTRODUCTION

At the request of the Air Technical Service Command, Army Air Forces, flight tests of a Hamilton Standard No. 6507A-2 three-blade propeller have been made on a P-47D airplane to determine the effect of blade loading on propeller efficiency.

Climbs were made at normal and military power at an indicated airspeed of 165 miles per hour. Other tests were run at 2700 engine rpm at a constant power coefficient per blade of approximately 0.06 and at the additional values of 0.08 and 0.09 through an airplane Mach number range of 0.3 to 0.725. Data were also obtained at a reduced engine rpm of 2520 at constant power coefficients per blade of 0.08 and 0.10 over a similar airplane Mach number range.

SYMBOLS

V	true airspeed
n	propeller rotational speed, revolutions per second
D	propeller diameter
J	advance ratio (V/nD)
β	section blade angle at 0.75 R
θ	blade angle at any section
R	propeller tip radius
r	propeller-section radius
x	r/R
b	blade-section chord
h	blade-section maximum thickness
r_s	radial distance from thrust axis to survey point
x_s	r_s/R
C_T	propeller thrust coefficient
C_P	propeller power coefficient
η	propeller efficiency
σ	ratio of density of free air to density of air at sea level

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TABLE I

FLIGHT DATA OBTAINED FROM NORMAL AND MILITARY

CLIMB TESTS OF HAMILTON STANDARD NO. 6507A-2 THREE-BLADE

PROPELLER ON P-47D AIRPLANE

Fig.	Run	J	C_P	C_T	η	n (rps)	M	M_t	σ
3	3-1	.920	.107	.0910	.778	21.25	.228	.811	.905
3	3-2	.957	.115	.0911	.758	21.30	.239	.819	.864
3	3-3	.957	.121	.0991	.783	21.50	.242	.830	.815
3	3-4	.978	.128	.1023	.779	21.35	.247	.830	.794
3	3-5	.990	.135	.1058	.784	21.50	.255	.842	.747
3	3-6	1.029	.142	.1079	.781	21.40	.263	.844	.711
3	3-7	1.059	.151	.1129	.794	21.35	.271	.848	.674
3	3-8	1.076	.156	.1143	.789	21.50	.279	.860	.642
3	3-9	1.096	.164	.1188	.795	21.45	.285	.866	.612
3	3-10	1.128	.171	.1208	.795	21.32	.294	.869	.585
3	3-11	1.154	.182	.1268	.803	21.35	.302	.876	.557
3	3-12	1.201	.189	.1264	.801	21.25	.315	.883	.533
3	3-13	1.217	.198	.1295	.797	21.30	.322	.891	.508
3	3-14	1.239	.205	.1322	.799	21.30	.330	.901	.490
3	3-15	1.251	.209	.1345	.807	21.50	.339	.917	.471
3	3-16	1.277	.218	.1347	.789	21.45	.348	.924	.453
3	3-17	1.287	.226	.1418	.808	21.45	.352	.927	.432
3	3-18	1.331	.232	.1394	.800	21.50	.367	.939	.414
3	3-19	1.355	.241	.1430	.802	21.42	.374	.944	.401
3	3-20	1.379	.249	.1449	.801	21.45	.383	.958	.387
3	3-21	1.399	.256	.1456	.798	21.50	.391	.961	.373
3	3-22	1.420	.263	.1482	.800	21.50	.399	.969	.361
4	5-1	.974	.160	.1291	.786	22.35	.257	.869	.748
4, 6(a)	5-2	1.019	.172	.1311	.777	22.45	.273	.884	.687
4	5-3	1.061	.188	.1392	.786	22.40	.285	.892	.629
4, 6(b)	5-4	1.128	.200	.1402	.791	22.50	.308	.912	.581
4	5-5	1.156	.215	.1483	.797	22.40	.314	.911	.535
4, 6(c)	5-6	1.187	.230	.1517	.783	22.47	.326	.924	.494
4	5-7	1.235	.239	.1525	.788	22.52	.343	.936	.463
4, 6(d)	5-8	1.273	.250	.1566	.798	22.50	.356	.948	.439
4, 6(e)	5-9	1.297	.262	.1580	.782	22.50	.366	.959	.417
4, 6(f)	5-10	1.322	.270	.1595	.781	22.50	.376	.968	.399
4	12-1	.880	.125	.1102	.776	22.30	.236	.874	.943
4	12-2	.916	.142	.1192	.769	22.32	.246	.879	.853
4	12-3	.979	.150	.1202	.785	22.23	.260	.874	.764
4	12-4	1.025	.167	.1271	.780	22.18	.272	.876	.704
4	12-5	1.049	.182	.1347	.776	22.19	.281	.888	.651
4	12-6	1.102	.193	.1389	.793	22.26	.296	.894	.597
4	12-7	1.139	.206	.1401	.775	22.27	.308	.903	.554
4	12-8	1.175	.225	.1510	.789	22.28	.319	.909	.512
4	12-9	1.213	.231	.1514	.795	22.32	.334	.927	.487
4	12-10	1.246	.248	.1565	.786	22.31	.345	.936	.458
4	12-11	1.270	.257	.1606	.794	22.26	.354	.944	.432
4	12-12	1.317	.261	.1562	.788	22.35	.371	.959	.410

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TABLE I

FLIGHT DATA OBTAINED FROM NORMAL AND MILITARY

CLIMB TESTS OF HAMILTON STANDARD NO. 6507A-2 THREE-BLADE

PROPELLER ON P-47D AIRPLANE

Fig.	Run	J	C_P	C_T	η	n (rps)	M	M_t	σ
3	3-1	.920	.107	.0910	.778	21.25	.228	.811	.905
3	3-2	.957	.115	.0911	.758	21.30	.239	.819	.864
3	3-3	.957	.121	.0991	.783	21.50	.242	.830	.815
3	3-4	.978	.128	.1023	.779	21.35	.247	.830	.794
3	3-5	.990	.135	.1058	.784	21.50	.255	.842	.747
3	3-6	1.029	.142	.1079	.781	21.40	.263	.844	.711
3	3-7	1.059	.151	.1129	.794	21.35	.271	.848	.674
3	3-8	1.076	.156	.1143	.789	21.50	.279	.860	.642
3	3-9	1.096	.164	.1188	.795	21.45	.285	.866	.612
3	3-10	1.128	.171	.1208	.795	21.32	.294	.869	.585
3	3-11	1.154	.182	.1268	.803	21.35	.302	.876	.557
3	3-12	1.201	.189	.1264	.801	21.25	.315	.883	.535
3	3-13	1.217	.198	.1295	.797	21.30	.322	.891	.508
3	3-14	1.239	.205	.1322	.799	21.30	.330	.901	.490
3	3-15	1.251	.209	.1345	.807	21.50	.339	.917	.471
3	3-16	1.277	.218	.1347	.789	21.45	.348	.924	.453
3	3-17	1.287	.226	.1418	.808	21.45	.352	.927	.432
3	3-18	1.331	.232	.1394	.800	21.50	.367	.939	.414
3	3-19	1.355	.241	.1430	.802	21.42	.374	.944	.401
3	3-20	1.379	.249	.1449	.801	21.45	.383	.958	.387
3	3-21	1.399	.256	.1456	.798	21.50	.391	.961	.373
3	3-22	1.420	.263	.1482	.800	21.50	.399	.969	.361
4	5-1	.974	.160	.1291	.786	22.35	.257	.869	.748
4, 6(a)	5-2	1.019	.172	.1311	.777	22.45	.273	.884	.687
4	5-3	1.061	.188	.1392	.786	22.40	.285	.892	.629
4, 6(b)	5-4	1.128	.200	.1402	.791	22.50	.308	.912	.581
4	5-5	1.156	.215	.1483	.797	22.40	.314	.911	.535
4, 6(c)	5-6	1.187	.230	.1517	.783	22.47	.326	.924	.494
4	5-7	1.235	.239	.1525	.788	22.52	.343	.936	.463
4, 6(d)	5-8	1.273	.250	.1566	.798	22.50	.356	.948	.439
4, 6(e)	5-9	1.297	.262	.1580	.782	22.50	.366	.959	.417
4, 6(f)	5-10	1.322	.270	.1595	.781	22.50	.376	.968	.399
4	12-1	.880	.125	.1102	.776	22.30	.236	.874	.943
4	12-2	.916	.142	.1192	.769	22.32	.246	.879	.853
4	12-3	.979	.150	.1202	.785	22.23	.260	.874	.764
4	12-4	1.025	.167	.1271	.780	22.18	.272	.876	.704
4	12-5	1.049	.182	.1347	.776	22.19	.281	.888	.651
4	12-6	1.102	.193	.1389	.793	22.26	.296	.894	.597
4	12-7	1.139	.206	.1401	.775	22.27	.308	.903	.554
4	12-8	1.175	.225	.1510	.789	22.28	.319	.909	.512
4	12-9	1.213	.231	.1514	.795	22.32	.334	.927	.487
4	12-10	1.246	.248	.1565	.786	22.31	.345	.936	.458
4	12-11	1.270	.257	.1606	.794	22.26	.354	.944	.432
4	12-12	1.317	.261	.1562	.788	22.35	.371	.959	.410

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TABLE I

FLIGHT DATA OBTAINED FROM NORMAL AND MILITARY

CLIMB TESTS OF HAMILTON STANDARD NO. 6507A-2 THREE-BLADE

PROPELLER ON P-47D AIRPLANE

Fig.	Run	J	C_P	C_T	η	n (rps)	M	M_t	σ
3	3-1	.920	.107	.0910	.778	21.25	.228	.811	.905
3	3-2	.957	.115	.0911	.758	21.30	.239	.819	.864
3	3-3	.957	.121	.0991	.783	21.50	.242	.830	.815
3	3-4	.978	.128	.1023	.779	21.35	.247	.830	.794
3	3-5	.990	.135	.1058	.784	21.50	.255	.842	.747
3	3-6	1.029	.142	.1079	.781	21.40	.263	.844	.711
3	3-7	1.059	.151	.1129	.794	21.35	.271	.848	.674
3	3-8	1.076	.156	.1143	.789	21.50	.279	.860	.642
3	3-9	1.096	.164	.1188	.795	21.45	.285	.866	.612
3	3-10	1.128	.171	.1208	.795	21.32	.294	.869	.585
3	3-11	1.154	.182	.1268	.803	21.35	.302	.876	.557
3	3-12	1.201	.189	.1264	.801	21.25	.315	.883	.533
3	3-13	1.217	.198	.1295	.797	21.30	.322	.891	.508
3	3-14	1.239	.205	.1322	.799	21.30	.330	.901	.490
3	3-15	1.251	.209	.1345	.807	21.50	.339	.917	.471
3	3-16	1.277	.218	.1347	.789	21.45	.348	.924	.453
3	3-17	1.287	.226	.1418	.808	21.45	.352	.927	.432
3	3-18	1.331	.232	.1394	.800	21.50	.367	.939	.414
3	3-19	1.355	.241	.1430	.802	21.42	.374	.944	.401
3	3-20	1.379	.249	.1449	.801	21.45	.383	.958	.387
3	3-21	1.399	.256	.1456	.798	21.50	.391	.961	.373
3	3-22	1.420	.263	.1482	.800	21.50	.399	.969	.361
4	5-1	.974	.160	.1291	.786	22.35	.257	.869	.748
4, 6(a)	5-2	1.019	.172	.1311	.777	22.45	.273	.884	.687
4	5-3	1.061	.188	.1392	.786	22.40	.285	.892	.629
4, 6(b)	5-4	1.128	.200	.1402	.791	22.50	.308	.912	.581
4	5-5	1.156	.215	.1483	.797	22.40	.314	.911	.535
4, 6(c)	5-6	1.187	.230	.1517	.783	22.47	.326	.924	.494
4	5-7	1.235	.239	.1525	.788	22.52	.343	.936	.463
4, 6(d)	5-8	1.273	.250	.1566	.798	22.50	.356	.948	.439
4, 6(e)	5-9	1.297	.262	.1580	.782	22.50	.366	.959	.417
4, 6(f)	5-10	1.322	.270	.1595	.781	22.50	.376	.968	.399
4	12-1	.880	.125	.1102	.776	22.30	.236	.874	.943
4	12-2	.916	.142	.1192	.769	22.32	.246	.879	.853
4	12-3	.979	.150	.1202	.785	22.23	.260	.874	.764
4	12-4	1.025	.167	.1271	.780	22.18	.272	.876	.704
4	12-5	1.049	.182	.1347	.776	22.19	.281	.888	.651
4	12-6	1.102	.193	.1389	.793	22.26	.296	.894	.597
4	12-7	1.139	.206	.1401	.775	22.27	.308	.903	.554
4	12-8	1.175	.225	.1510	.789	22.28	.319	.909	.512
4	12-9	1.213	.231	.1514	.795	22.32	.334	.927	.487
4	12-10	1.246	.248	.1565	.786	22.31	.345	.936	.458
4	12-11	1.270	.257	.1606	.794	22.26	.354	.944	.432
4	12-12	1.317	.261	.1562	.788	22.35	.371	.959	.410

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TABLE II

FLIGHT DATA OBTAINED FROM HIGH-SPEED, 2700 ENGINE

RPM TESTS OF HAMILTON STANDARD NO. 6507A-2 THREE-BLADE

PROPELLER ON P-47D AIRPLANE

Fig.	Run	J	C_P	C_T	η	n (rps)	M	M_t	σ
7, 8	3-23	2.622	.182	.0434	.625	22.35	.708	1.105	.645
7	3-24	2.486	.173	.0462	.664	22.23	.669	1.079	.642
7	3-25	2.187	.180	.0638	.775	22.50	.596	1.043	.623
7	3-26	1.943	.185	.0775	.814	22.30	.524	.996	.621
7	3-27	1.674	.183	.0904	.827	22.45	.454	.967	.618
7	3-28	1.398	.181	.1050	.811	22.70	.384	.943	.618
7	3-29	1.152	.184	.1215	.761	22.50	.314	.910	.620
7	3-30	.884	.181	.1441	.704	22.50	.240	.886	.623
7, 8, 11	5-11	2.499	.227	.0607	.668	22.42	.704	1.130	.467
7, 11	5-12	2.252	.243	.0820	.760	22.37	.631	1.084	.448
7, 11	5-13	2.075	.244	.0962	.818	22.37	.588	1.066	.443
7, 11	5-14	1.850	.251	.1119	.825	22.39	.516	1.016	.428
7, 11	5-15	1.617	.250	.1289	.834	22.38	.451	.986	.431
7, 11	5-16	1.405	.253	.1476	.820	22.40	.392	.961	.432
7, 11	5-17	1.086	.250	.1711	.743	22.34	.303	.927	.432
7, 8	13-16	2.443	.265	.0742	.684	22.53	.719	1.171	.405
7	13-17	2.133	.271	.0964	.759	22.50	.628	1.117	.393
7	13-18	1.892	.270	.1152	.807	22.37	.553	1.071	.395
7	13-19	1.661	.276	.1315	.791	22.53	.489	1.046	.393
7, 9(a), 11	13-25	1.488	.244	.1333	.813	22.49	.430	1.003	.450
7, 9(b), 11	13-24	1.694	.246	.1188	.819	22.52	.490	1.032	.450
7, 9(c), 11	13-23	1.990	.237	.0955	.802	22.50	.573	1.071	.460
7, 9(d), 11	13-22	2.225	.238	.0805	.753	22.41	.637	1.103	.469
7, 9(e), 11	13-21	2.403	.233	.0680	.701	22.50	.690	1.136	.477
7, 9(f), 11	13-20	2.484	.233	.0650	.693	22.50	.713	1.149	.477
7	17-14	2.429	.272	.0826	.738	22.29	.687	1.122	.398
7	17-15	2.224	.284	.0976	.764	22.50	.634	1.098	.382
7	17-16	1.937	.282	.1203	.826	22.27	.552	1.052	.382
7	17-17	1.696	.280	.1318	.798	22.40	.485	1.021	.382
7, 11	17-18	2.079	.257	.0992	.802	22.45	.579	1.048	.434
7, 11	17-19	1.845	.256	.1154	.832	22.40	.517	1.020	.431
7, 11	17-20	1.596	.253	.1298	.819	22.31	.446	.985	.436
7, 11	17-21	1.383	.254	.1469	.800	22.40	.388	.964	.434
7	17-22	2.545	.189	.0488	.657	22.11	.681	1.081	.624
7	17-23	1.973	.191	.0818	.845	22.26	.527	.991	.619
7	17-24	2.269	.191	.0630	.748	22.37	.607	1.037	.618
7	17-25	1.692	.192	.0948	.835	22.24	.454	.957	.612
7	17-26	1.422	.187	.1075	.818	22.31	.381	.925	.628
7	17-27	1.174	.190	.1294	.799	22.30	.315	.901	.613
7	17-28	.892	.188	.1492	.708	22.24	.239	.876	.621

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TABLE III

FLIGHT DATA OBTAINED FROM HIGH-SPEED, 2520 ENGINE

RPM TESTS OF HAMILTON STANDARD NO. 6507A-2 THREE-BLADE

PROPELLER ON P-47D AIRPLANE

Fig.	Run	J	C_P	C_T	η	n (rps)	M	M_t	σ
10, 11	18-1	2.435	.230	.0703	.744	21.26	.651	1.063	.440
10, 11	18-2	2.664	.229	.0575	.669	21.28	.709	1.095	.452
10, 11	18-3	2.571	.243	.0676	.715	21.11	.681	1.075	.438
10, 11	18-4	2.182	.246	.0907	.804	21.01	.576	1.010	.436
10, 11	18-5	1.865	.243	.1115	.856	21.11	.495	.970	.436
10, 11	18-6	1.633	.243	.1264	.849	21.14	.434	.942	.438
10, 11	18-7	1.304	.240	.1499	.815	21.14	.346	.904	.440
10	18-8	2.686	.296	.0773	.701	21.15	.709	1.092	.452
10	18-9	2.572	.303	.0888	.754	21.07	.680	1.074	.439
10	18-10	2.425	.299	.0970	.787	21.06	.641	1.049	.444
10	18-11	2.170	.304	.1155	.824	21.05	.574	1.010	.439
10	18-12	1.875	.303	.1363	.844	21.10	.498	.971	.438
10	18-13	1.627	.300	.1522	.825	21.14	.433	.941	.438
10	18-14	1.311	.299	.1812	.795	21.11	.348	.904	.439
10, 11	19-1	2.698	.235	.0601	.690	21.17	.709	1.089	.447
10, 11	19-2	2.633	.247	.0677	.722	21.10	.696	1.084	.451
10, 11	19-3	2.405	.239	.0778	.783	20.99	.630	1.036	.441
10, 11	19-4	2.121	.242	.0930	.815	20.97	.555	.991	.442
10, 11	19-5	1.860	.246	.1111	.840	21.28	.495	.972	.428
10, 11	19-6	1.619	.240	.1242	.838	21.30	.431	.940	.432
10, 11	19-7	1.285	.245	.1564	.820	21.08	.339	.898	.431
10	19-8	2.736	.297	.0769	.708	21.19	.720	1.096	.434
10	19-9	2.558	.292	.0872	.764	20.97	.664	1.052	.451
10	19-10	2.380	.289	.0974	.802	20.97	.618	1.023	.461
10	19-11	1.851	.302	.1375	.843	21.27	.490	.966	.433
10	19-12	2.194	.310	.1176	.832	20.97	.575	1.004	.431
10	19-13	1.621	.306	.1557	.825	21.02	.426	.929	.430
10	19-14	1.306	.306	.1829	.781	20.90	.342	.891	.430

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TABLE III

FLIGHT DATA OBTAINED FROM HIGH-SPEED, 2520 ENGINE

RPM TESTS OF HAMILTON STANDARD NO. 6507A-2 THREE-BLADE

PROPELLER ON P-47D AIRPLANE

Fig.	Run	J	C_P	C_T	η	n (rps)	M	M_t	σ
10, 11	18-1	2.435	.230	.0703	.744	21.26	.651	1.063	.440
10, 11	18-2	2.664	.229	.0575	.669	21.28	.709	1.095	.452
10, 11	18-3	2.571	.243	.0676	.715	21.11	.681	1.075	.438
10, 11	18-4	2.182	.246	.0907	.804	21.01	.576	1.010	.436
10, 11	18-5	1.865	.243	.1115	.856	21.11	.495	.970	.436
10, 11	18-6	1.633	.243	.1264	.849	21.14	.434	.942	.438
10, 11	18-7	1.304	.240	.1499	.815	21.14	.346	.904	.440
10	18-8	2.686	.296	.0773	.701	21.15	.709	1.092	.452
10	18-9	2.572	.303	.0888	.754	21.07	.680	1.074	.439
10	18-10	2.425	.299	.0970	.787	21.06	.641	1.049	.444
10	18-11	2.170	.304	.1155	.824	21.05	.574	1.010	.439
10	18-12	1.875	.303	.1363	.844	21.10	.498	.971	.438
10	18-13	1.627	.300	.1522	.825	21.14	.433	.941	.438
10	18-14	1.311	.299	.1812	.795	21.11	.348	.904	.439
10, 11	19-1	2.698	.235	.0601	.690	21.17	.709	1.089	.447
10, 11	19-2	2.633	.247	.0677	.722	21.10	.696	1.084	.431
10, 11	19-3	2.405	.239	.0778	.783	20.99	.630	1.036	.441
10, 11	19-4	2.121	.242	.0930	.815	20.97	.555	.991	.442
10, 11	19-5	1.860	.246	.1111	.840	21.28	.495	.972	.428
10, 11	19-6	1.619	.240	.1242	.838	21.30	.431	.940	.432
10, 11	19-7	1.285	.245	.1564	.820	21.08	.339	.896	.431
10	19-8	2.736	.297	.0769	.708	21.19	.720	1.096	.434
10	19-9	2.558	.292	.0872	.764	20.97	.664	1.052	.451
10	19-10	2.380	.289	.0974	.802	20.97	.618	1.023	.461
10	19-11	1.851	.302	.1375	.843	21.27	.490	.966	.433
10	19-12	2.194	.310	.1176	.832	20.97	.575	1.004	.431
10	19-13	1.621	.306	.1557	.825	21.02	.426	.929	.430
10	19-14	1.306	.306	.1829	.781	20.90	.342	.891	.430

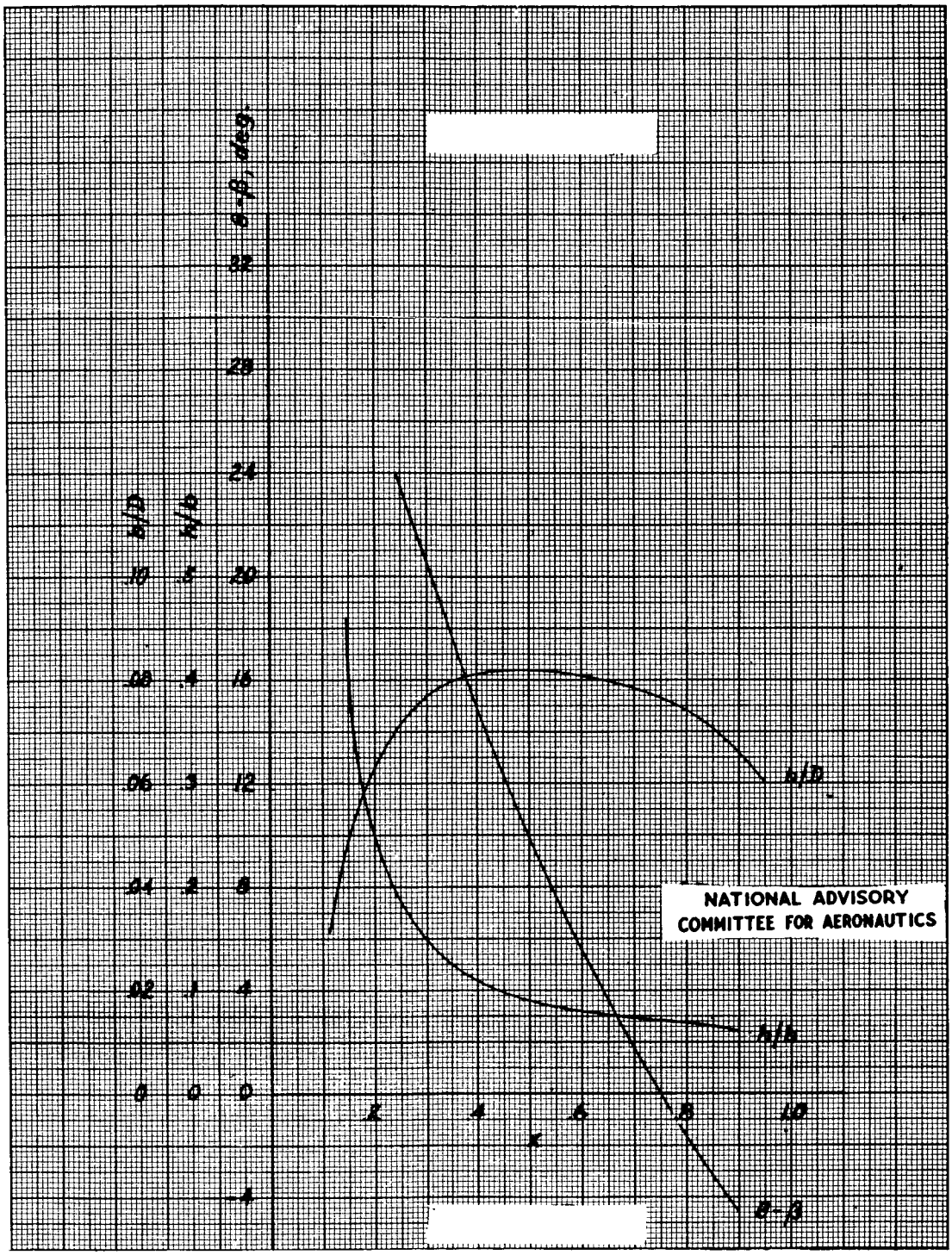

Figure 1.- Blade-form curves of Hamilton Standard No. 6507A-2 three-blade propeller.

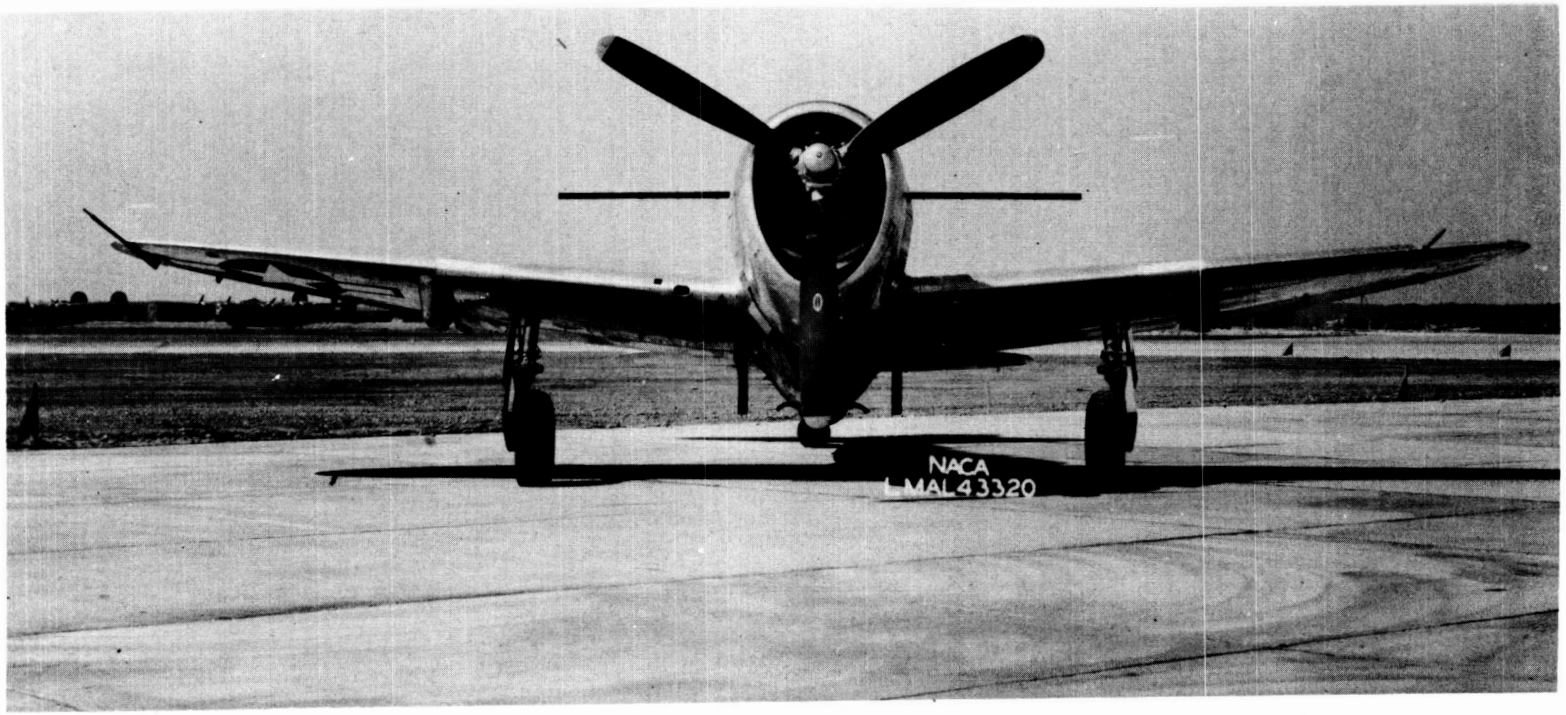

Figure 2.- Hamilton Standard No. 6507A-2 three-blade propeller on Republic P-47D airplane.

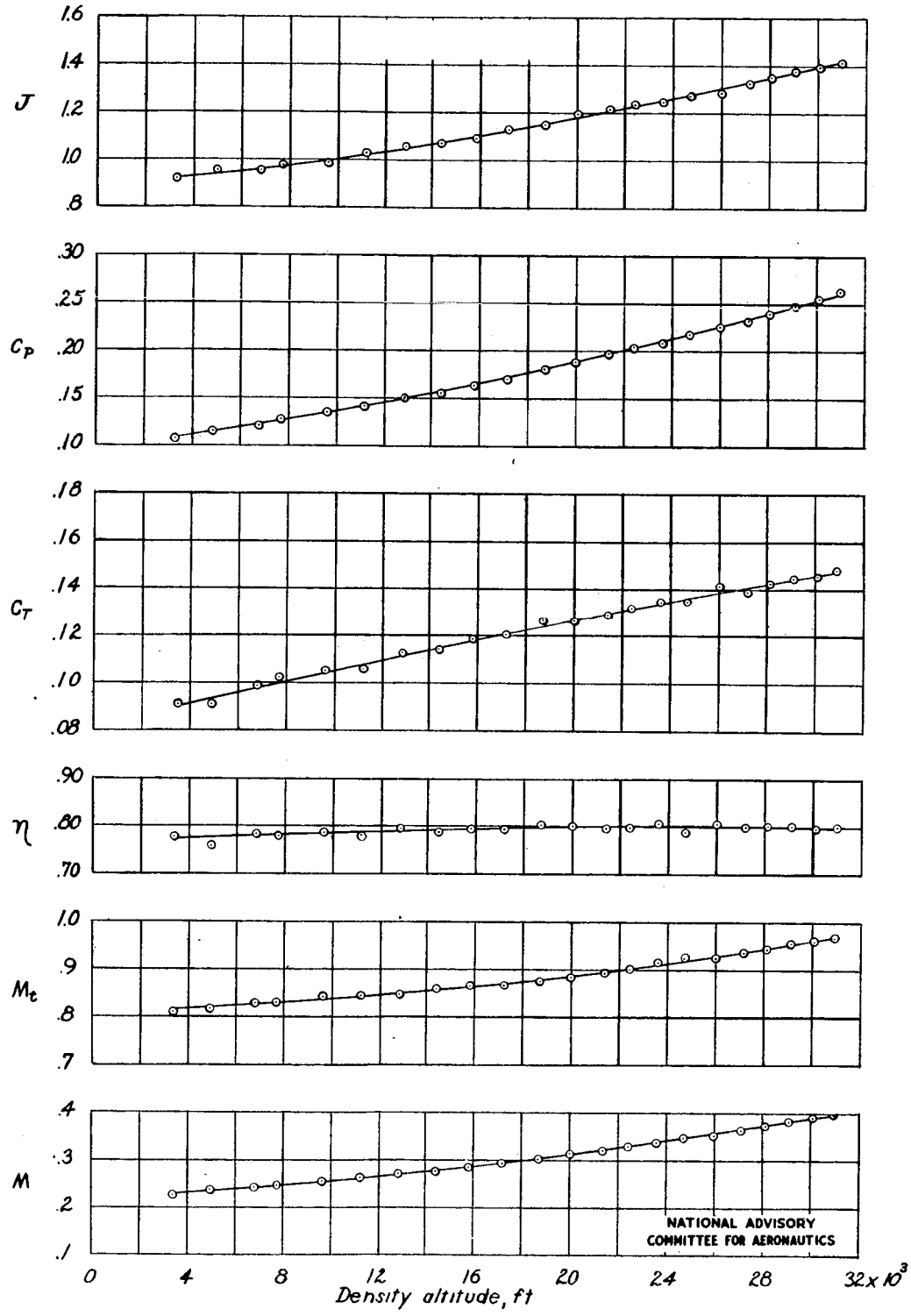

Figure 3.- Normal power climb tests of the three-blade Hamilton Standard 6507A-2 propeller on the P-47D airplane at an indicated airspeed of 165 miles per hour.

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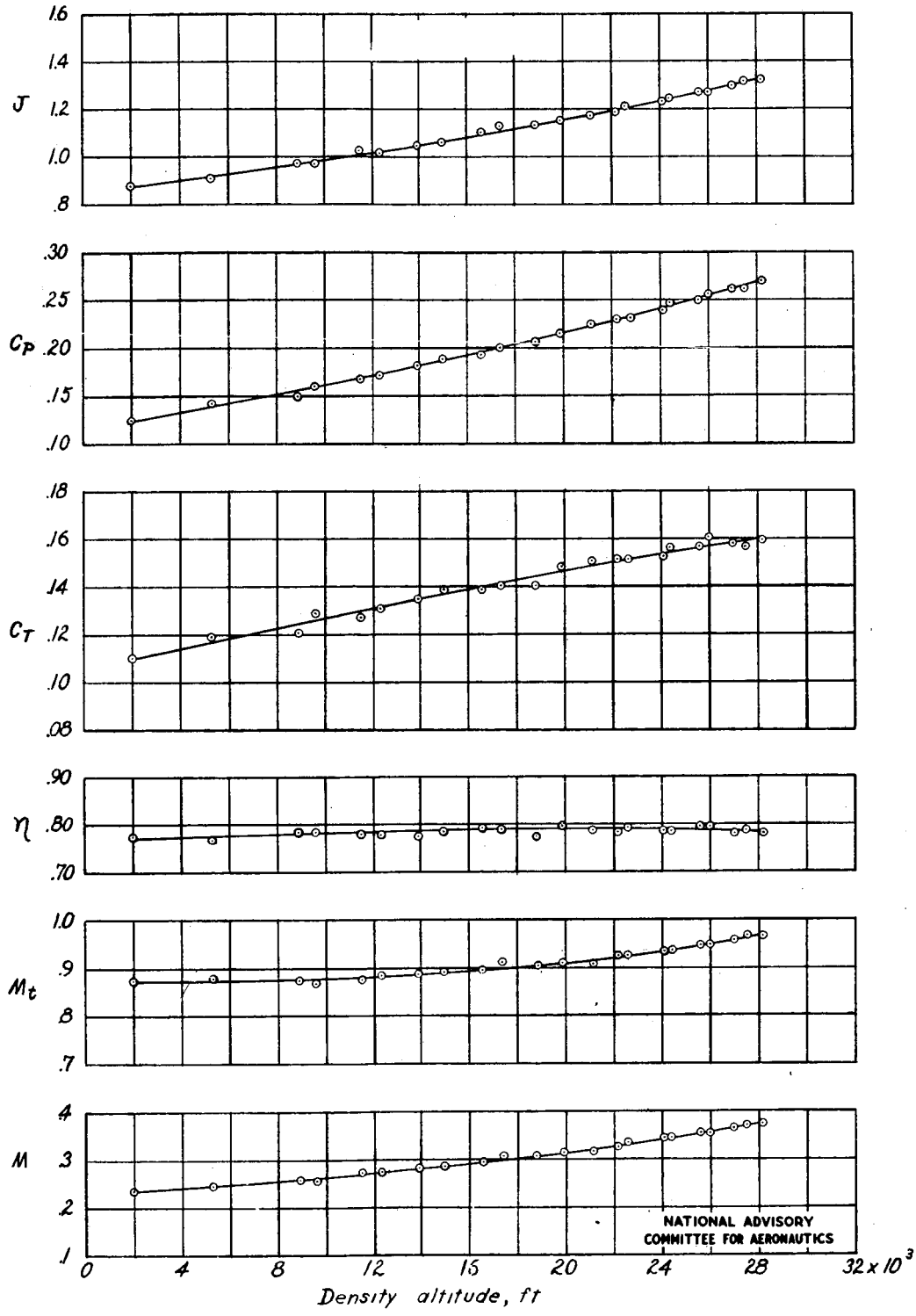

Figure 4.- Military power climb tests of the three-blade Hamilton Standard 6507A-2 propeller on the P-47D airplane at an indicated airspeed of 165 miles per hour.

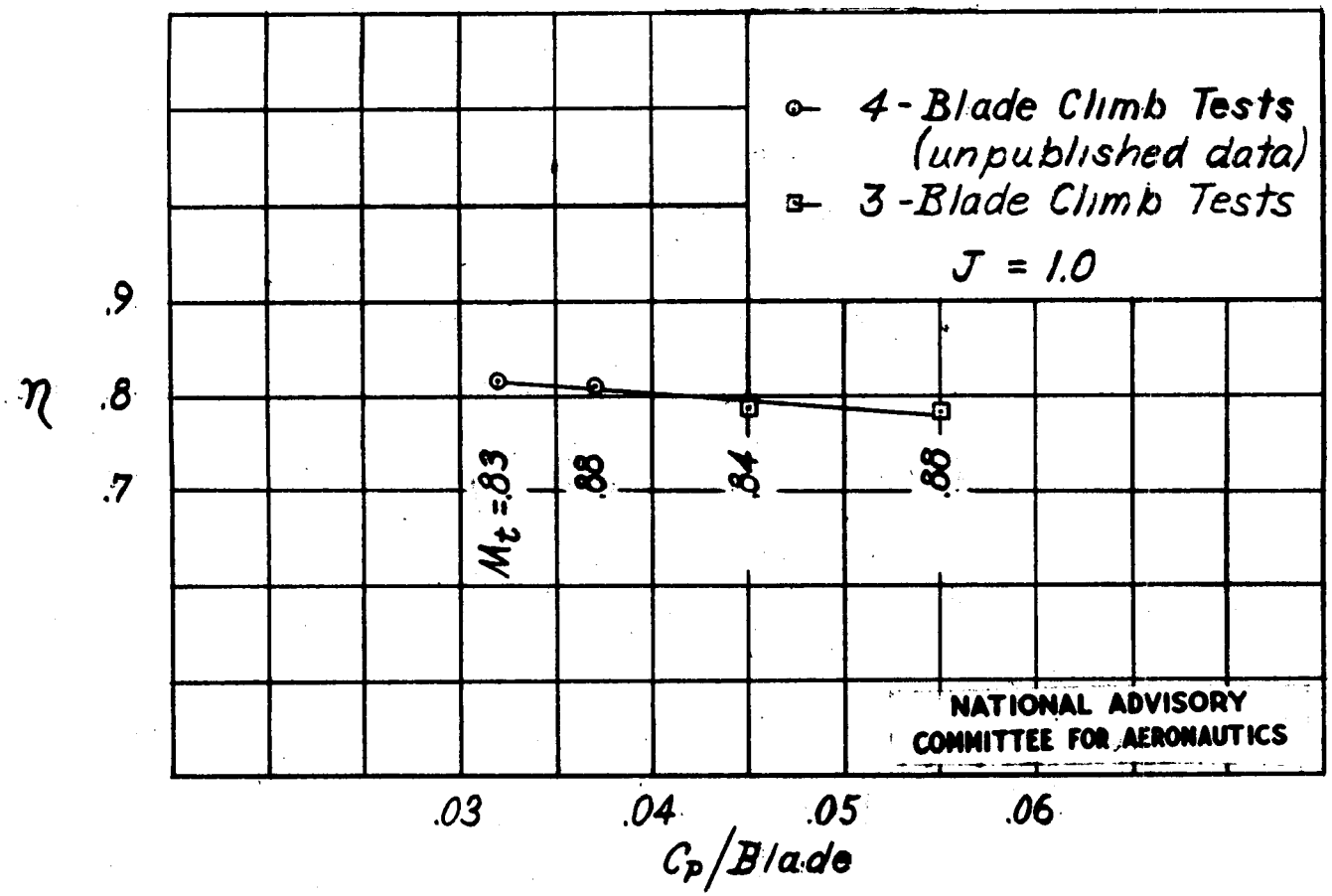

Figure 5.- Effect of blade loading on climb efficiency. Three- and four-blade tests of Hamilton Standard No. 6507A-2 propeller.

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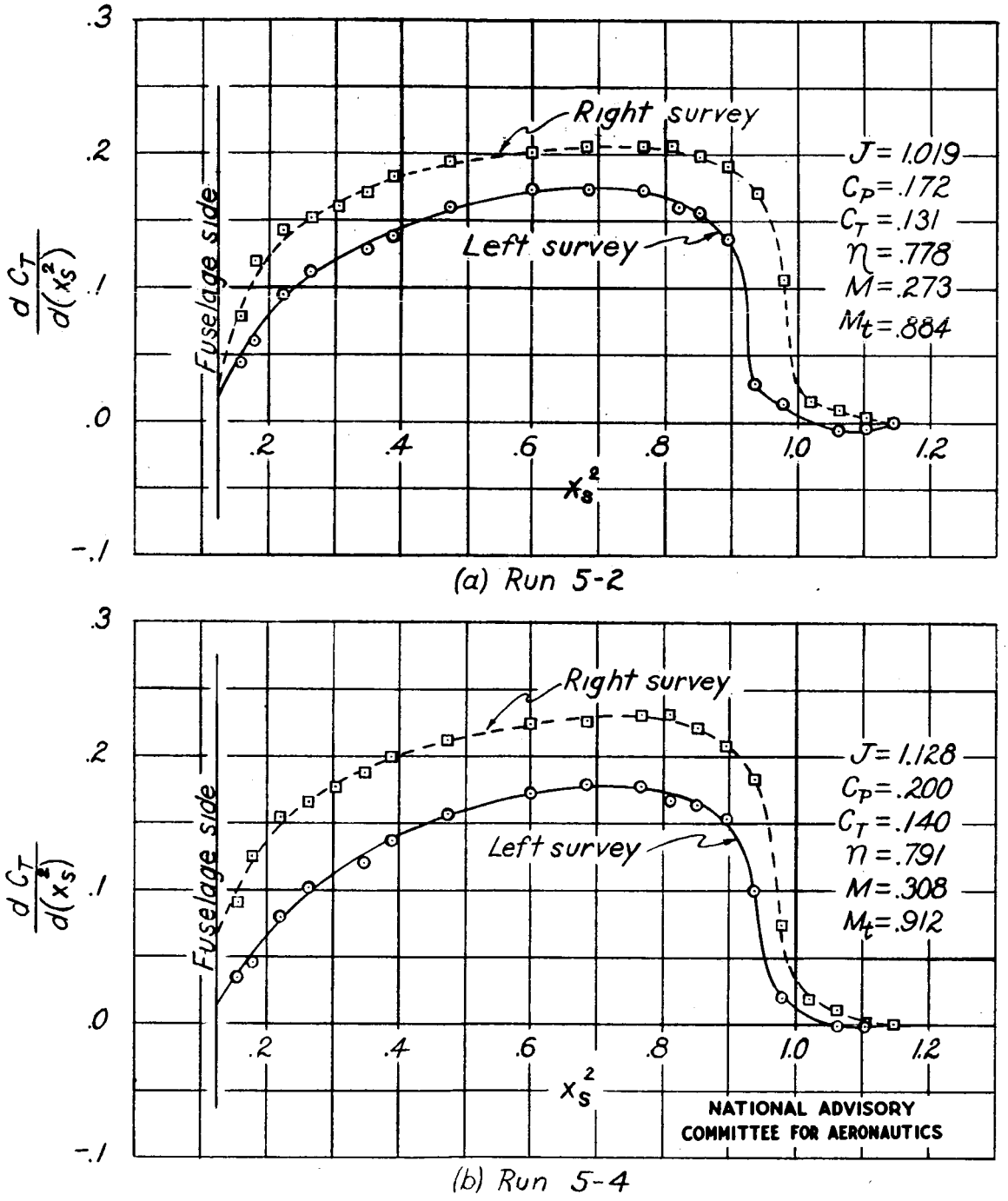

Figure 6.- Thrust grading curves for climb at military power. Indicated airspeed, 165 miles per hour. Hamilton Standard No. 6507A-2 three-blade propeller on the Republic P-47D airplane.

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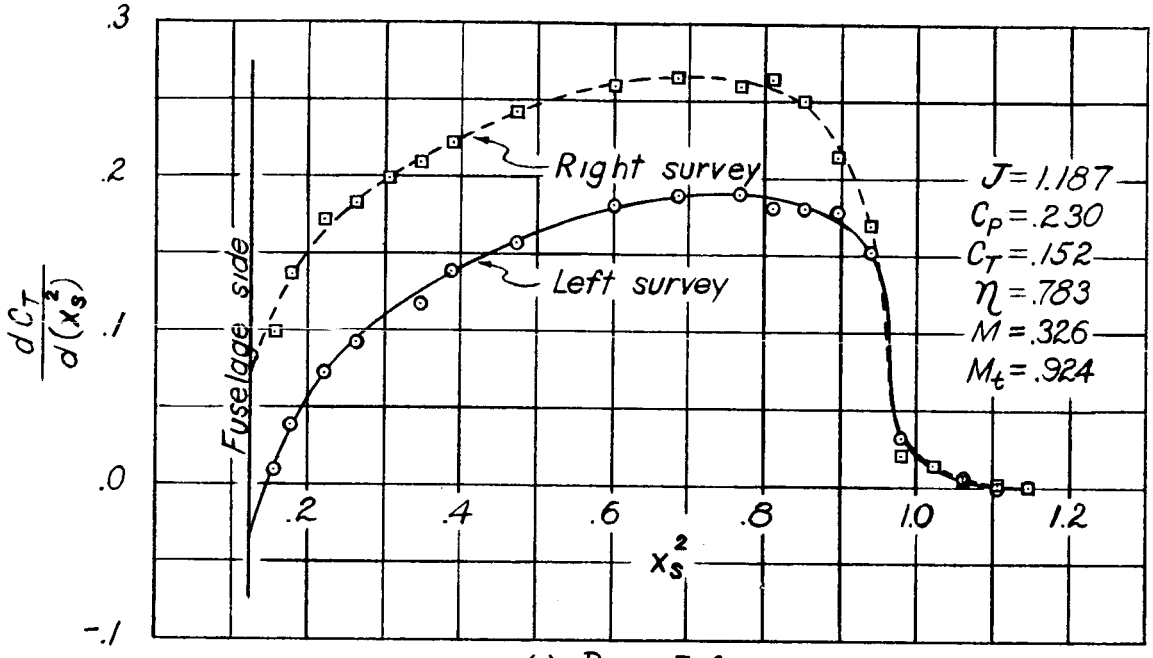
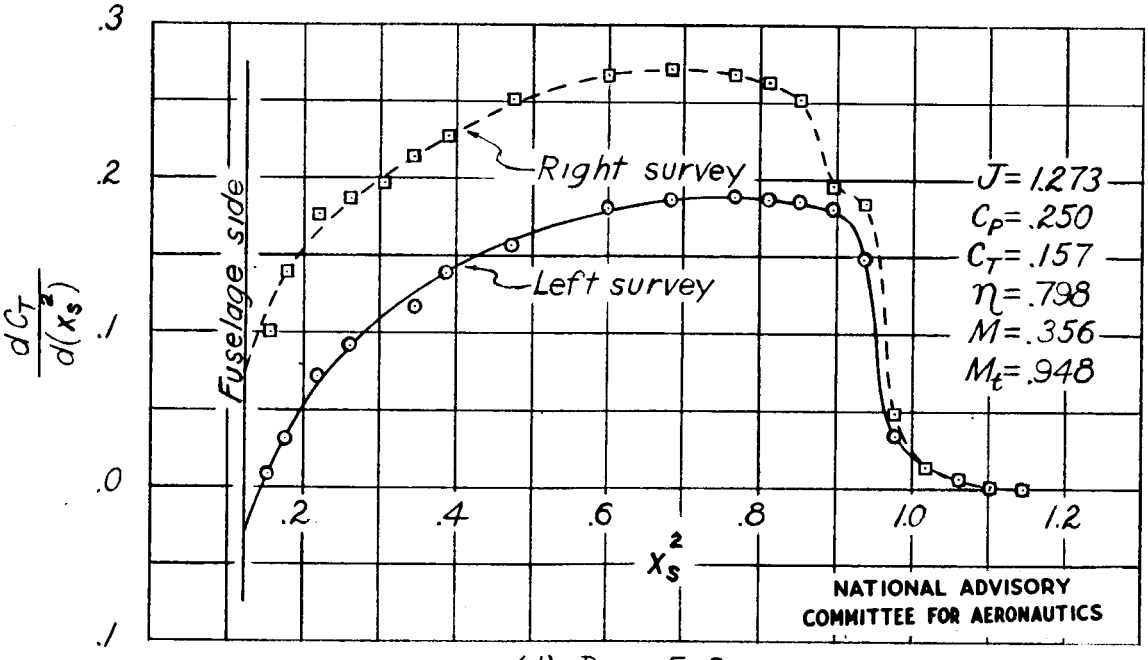


(c) Run 5-6



(d) Run 5-8

Figure 6.- Continued.

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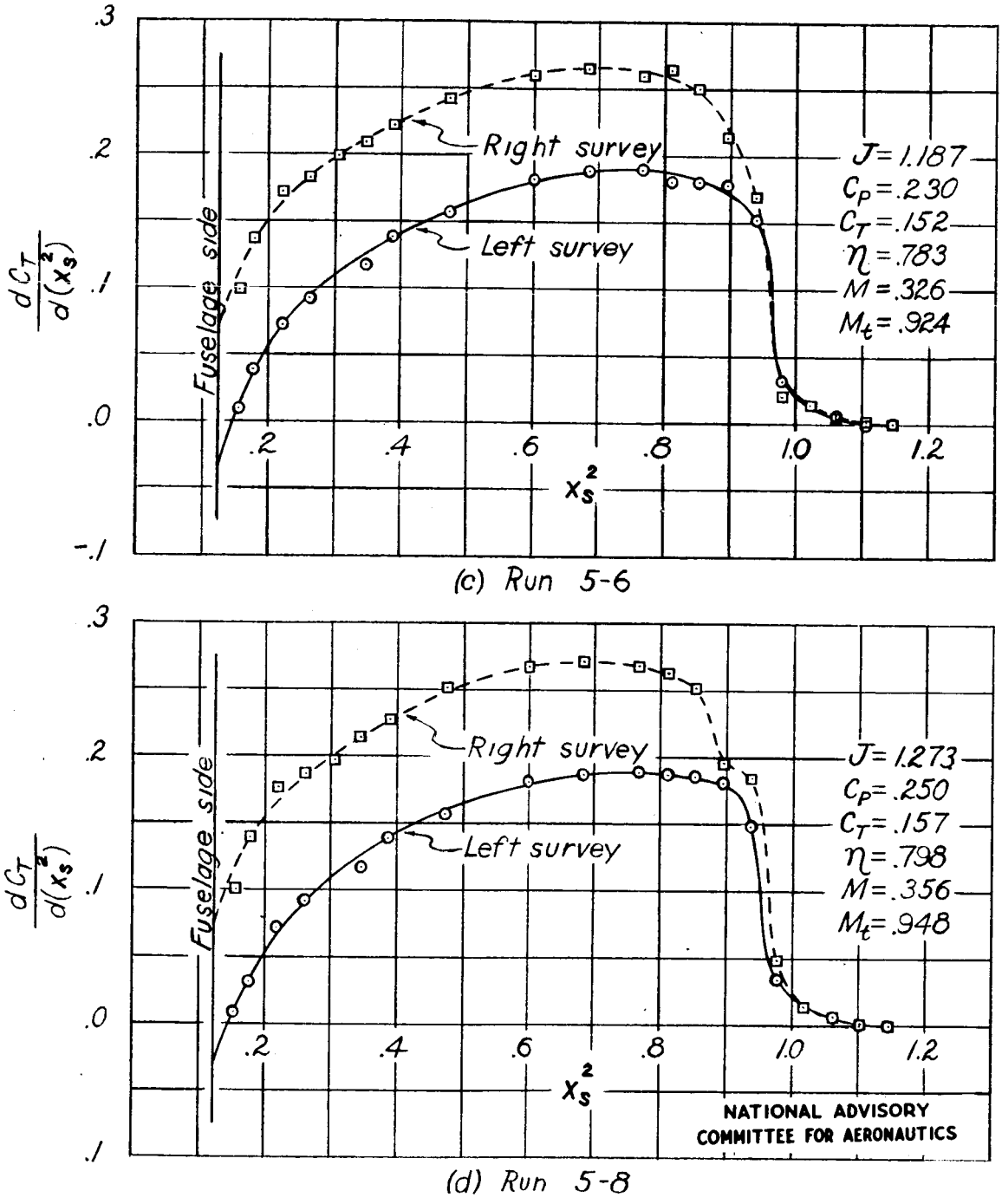
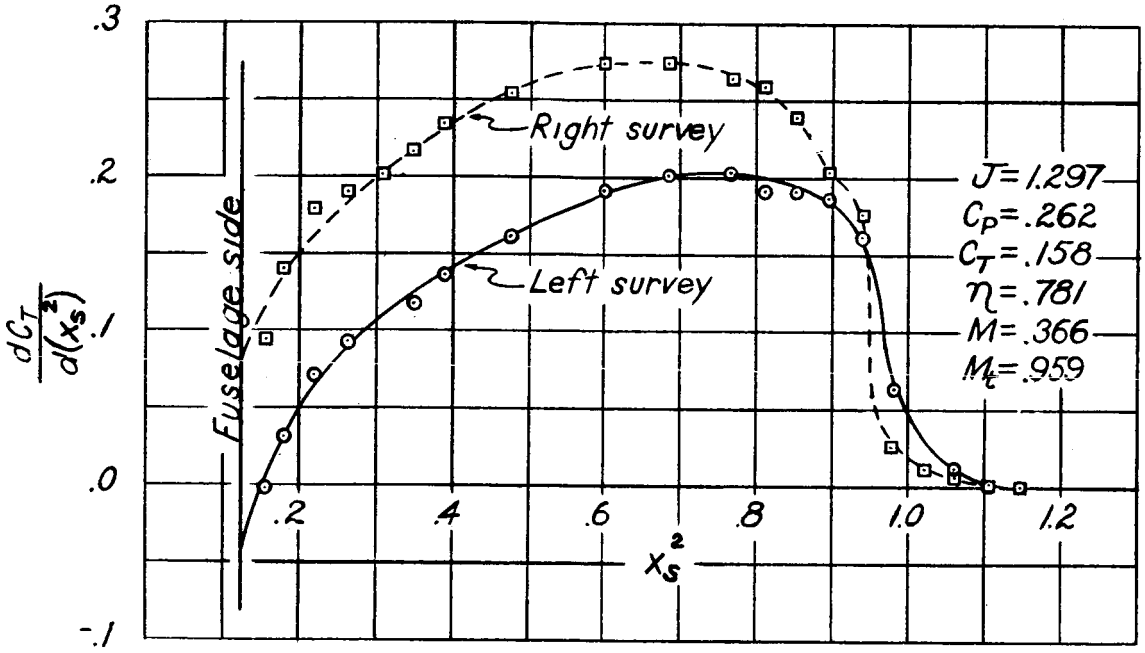
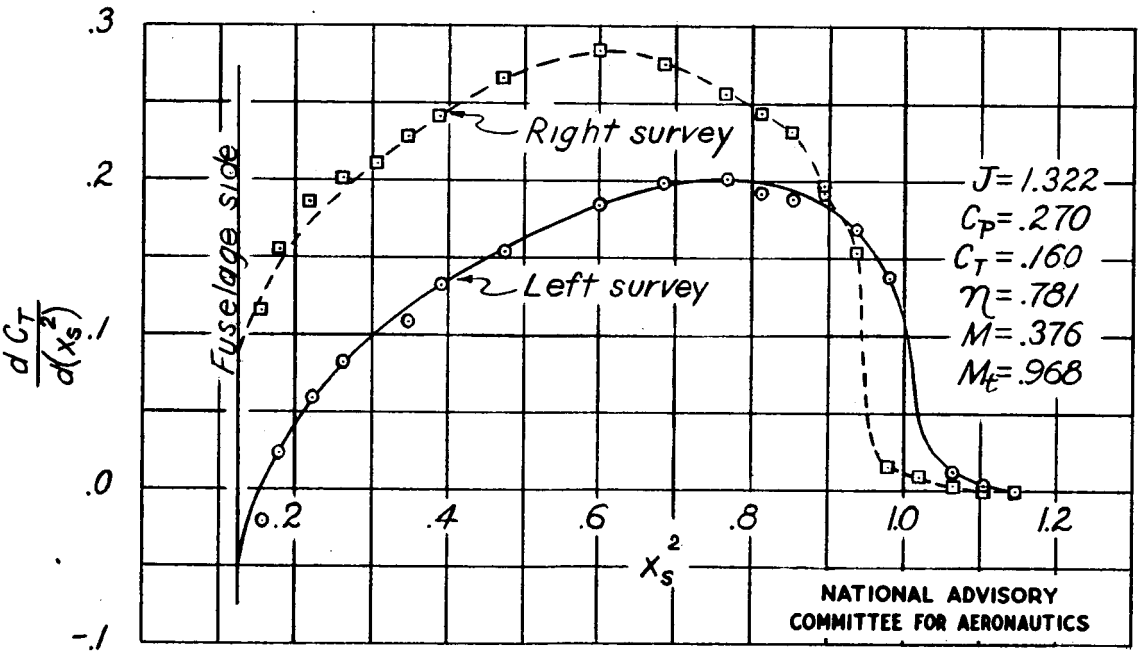


Figure 6.- Continued.

L-594



(e) Run 5-9



(f) Run 5-10

Figure 6.- Concluded.

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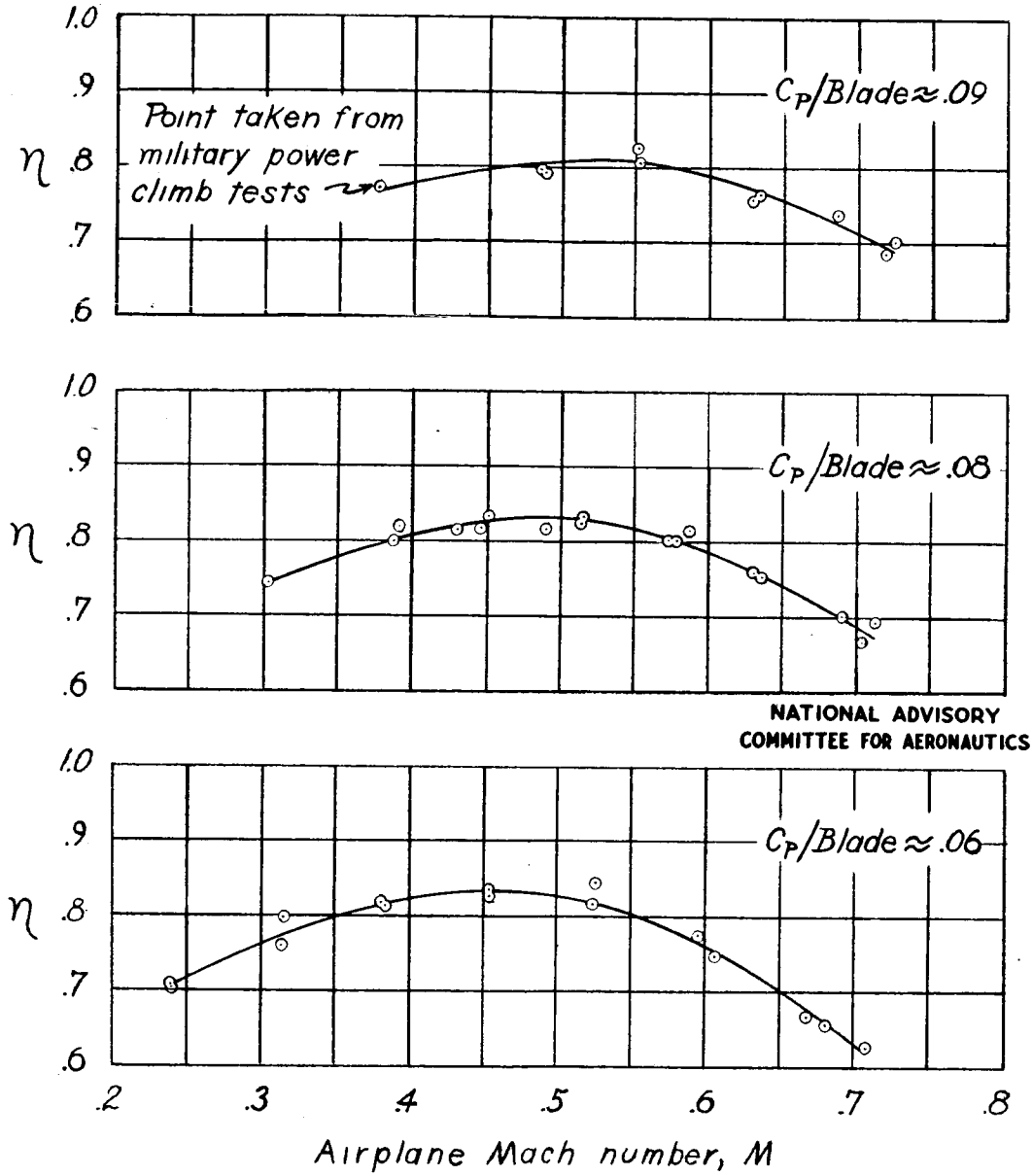

Figure 7.- Effect of blade loading on propeller efficiency over airplane Mach number range. 2700 engine r.p.m. Hamilton Standard No. 6507A-2 three-blade propeller on P-47D airplane.

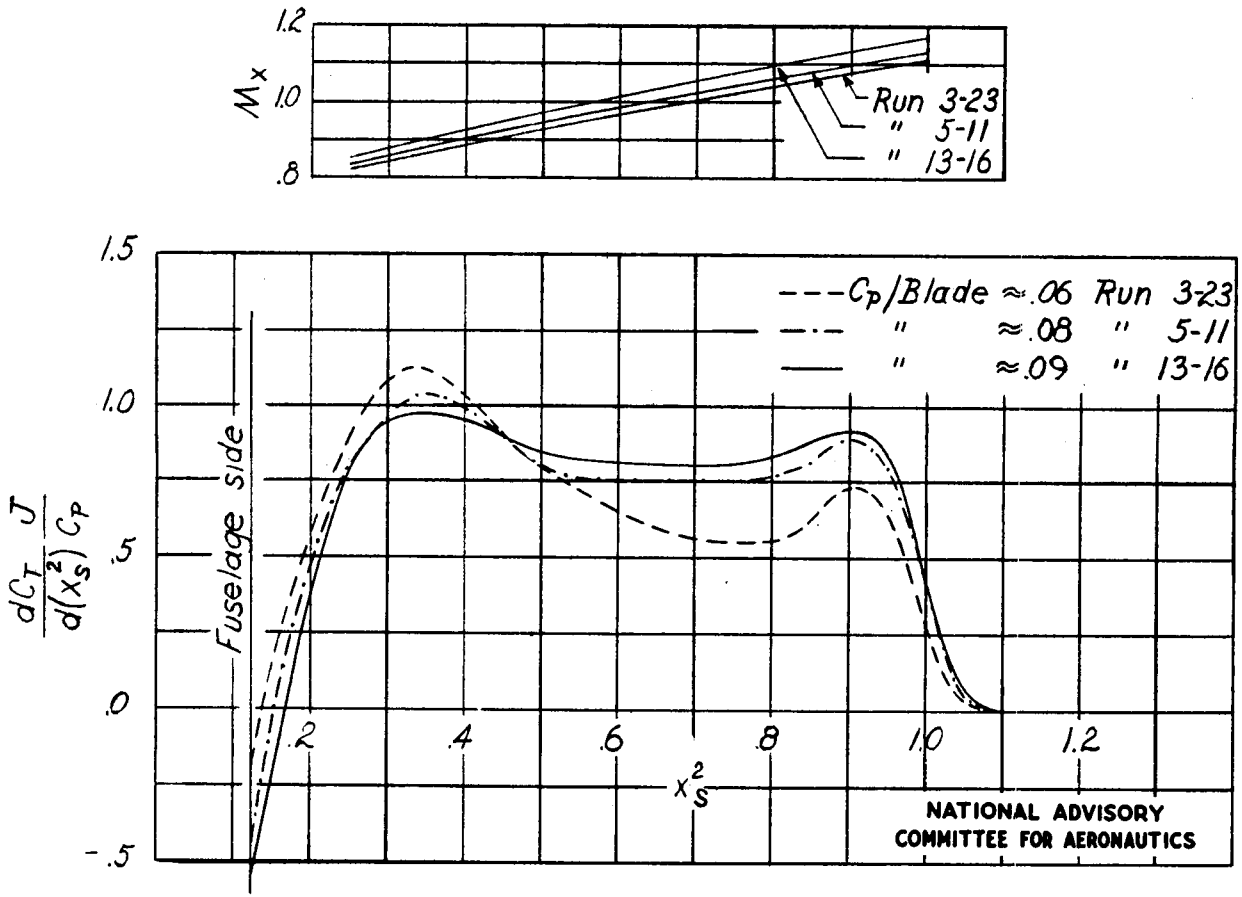

Figure 8.- Comparative thrust-grading curves for several blade loading conditions. Advance-diameter ratio approximately 2.5, airplane Mach number approximately 0.7. Hamilton Standard No. 6507A-2 three-blade propeller on P-47D airplane.

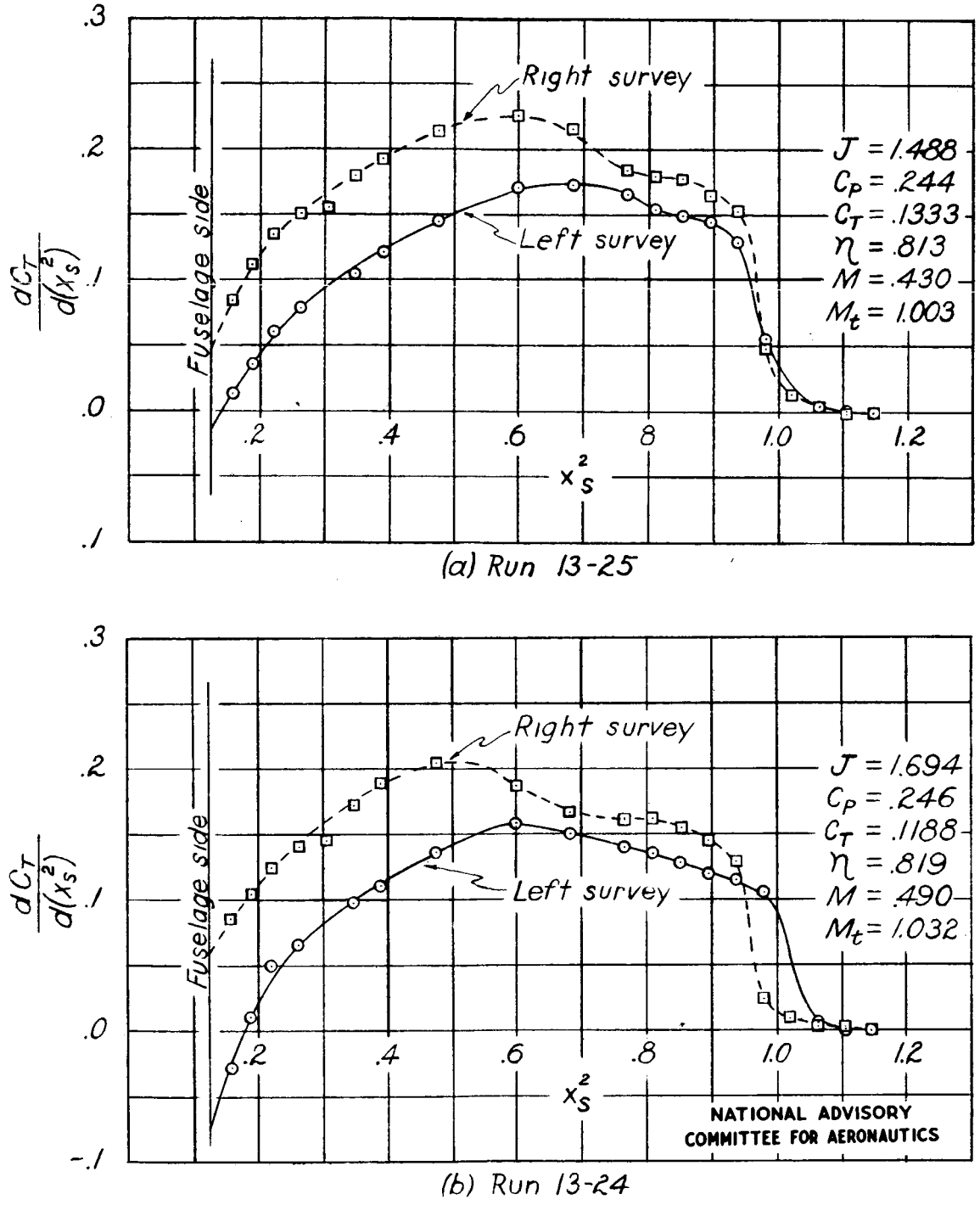

Figure 9.- Thrust grading curves for tests at constant power coefficient per blade of 0.08 over airplane Mach number range. Hamilton Standard No. 6507A-2 three-blade propeller on P-47D airplane.

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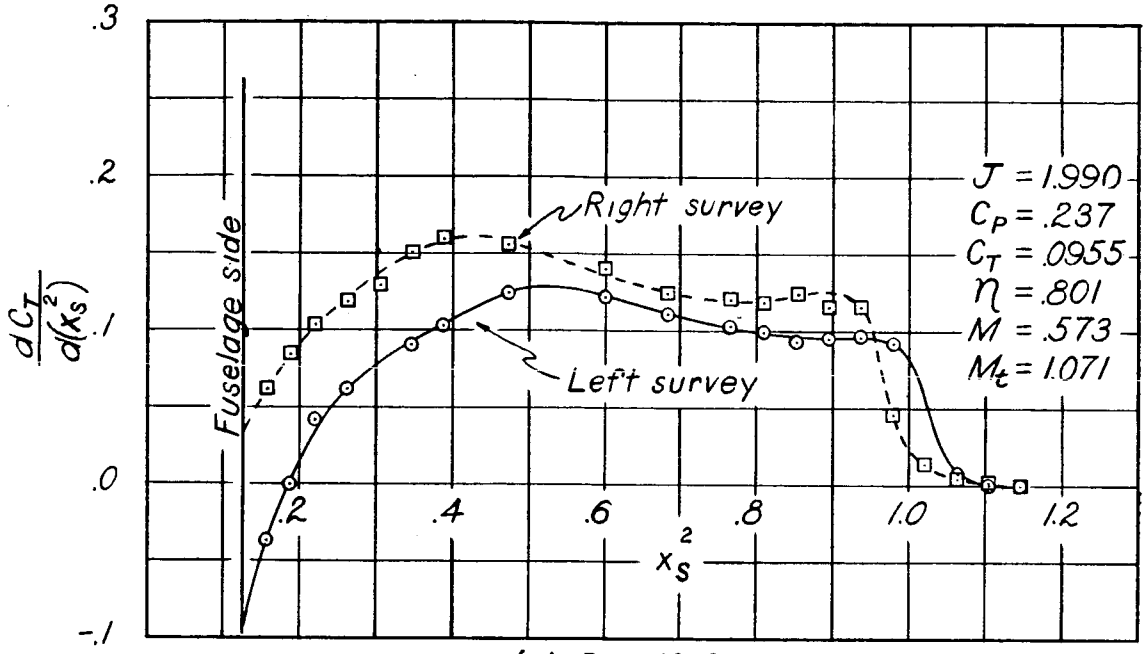
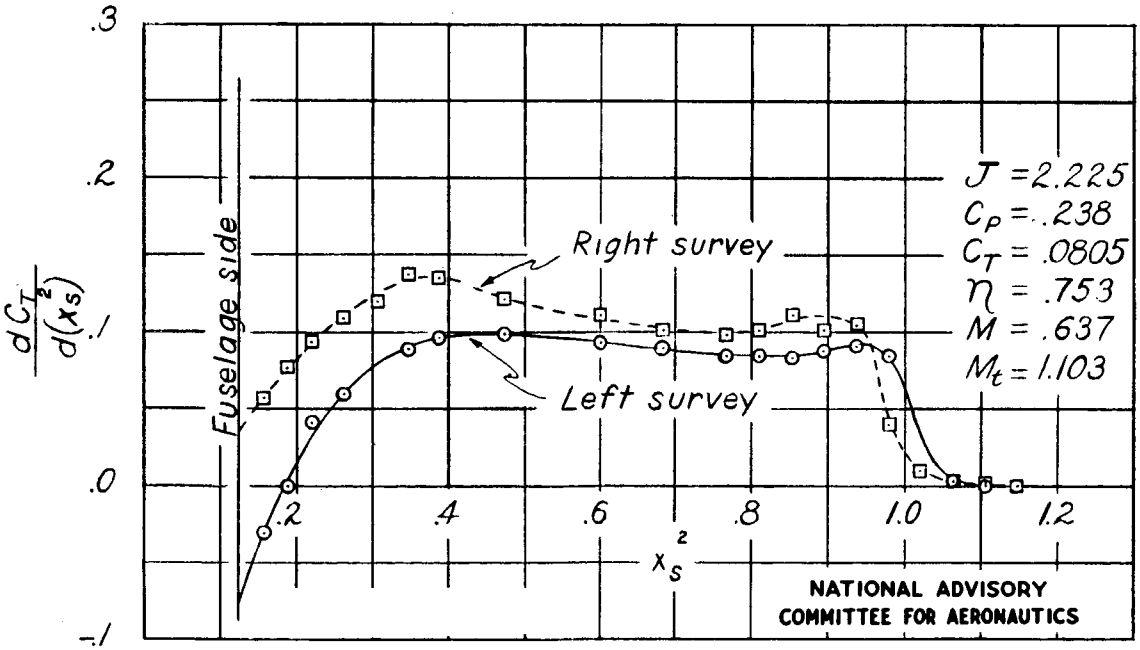


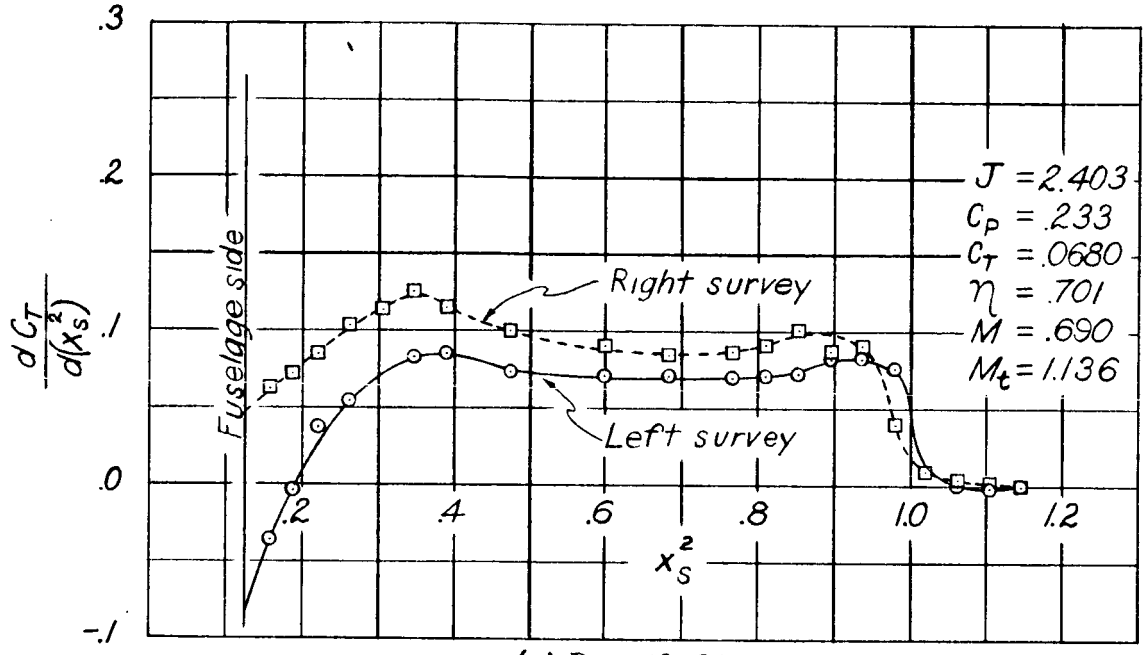
(c) Run 13-23



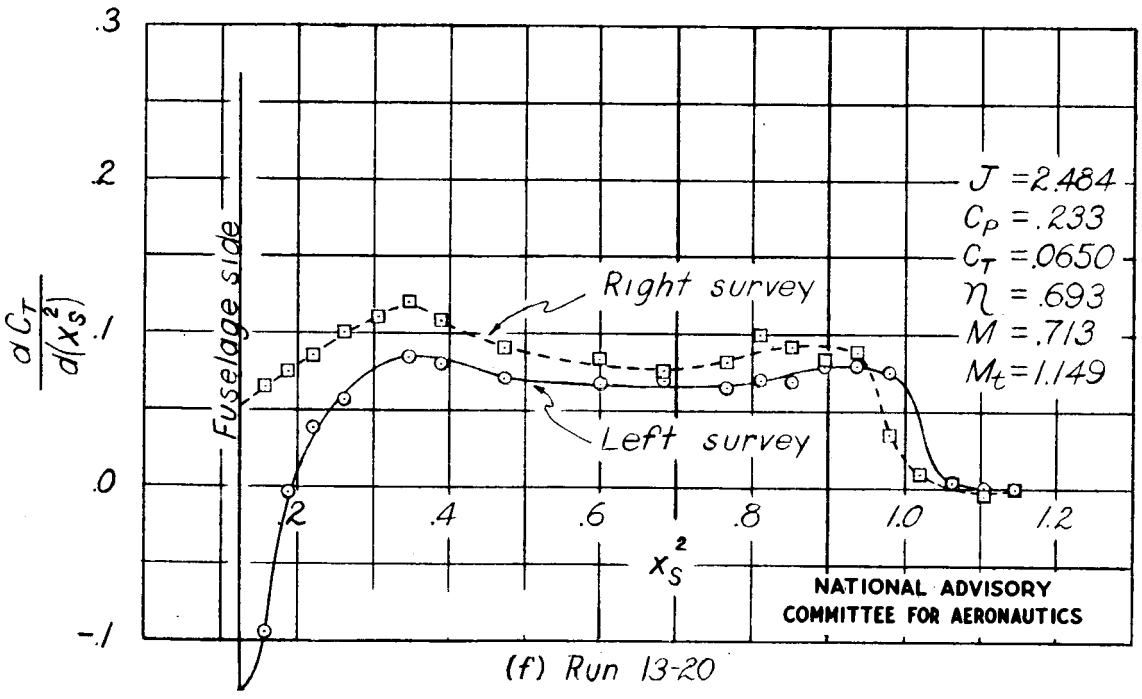
(d) Run 13-22

Figure 9.- Continued.

L-594



(e) Run 13-21



(f) Run 13-20

Figure 9.- Concluded.

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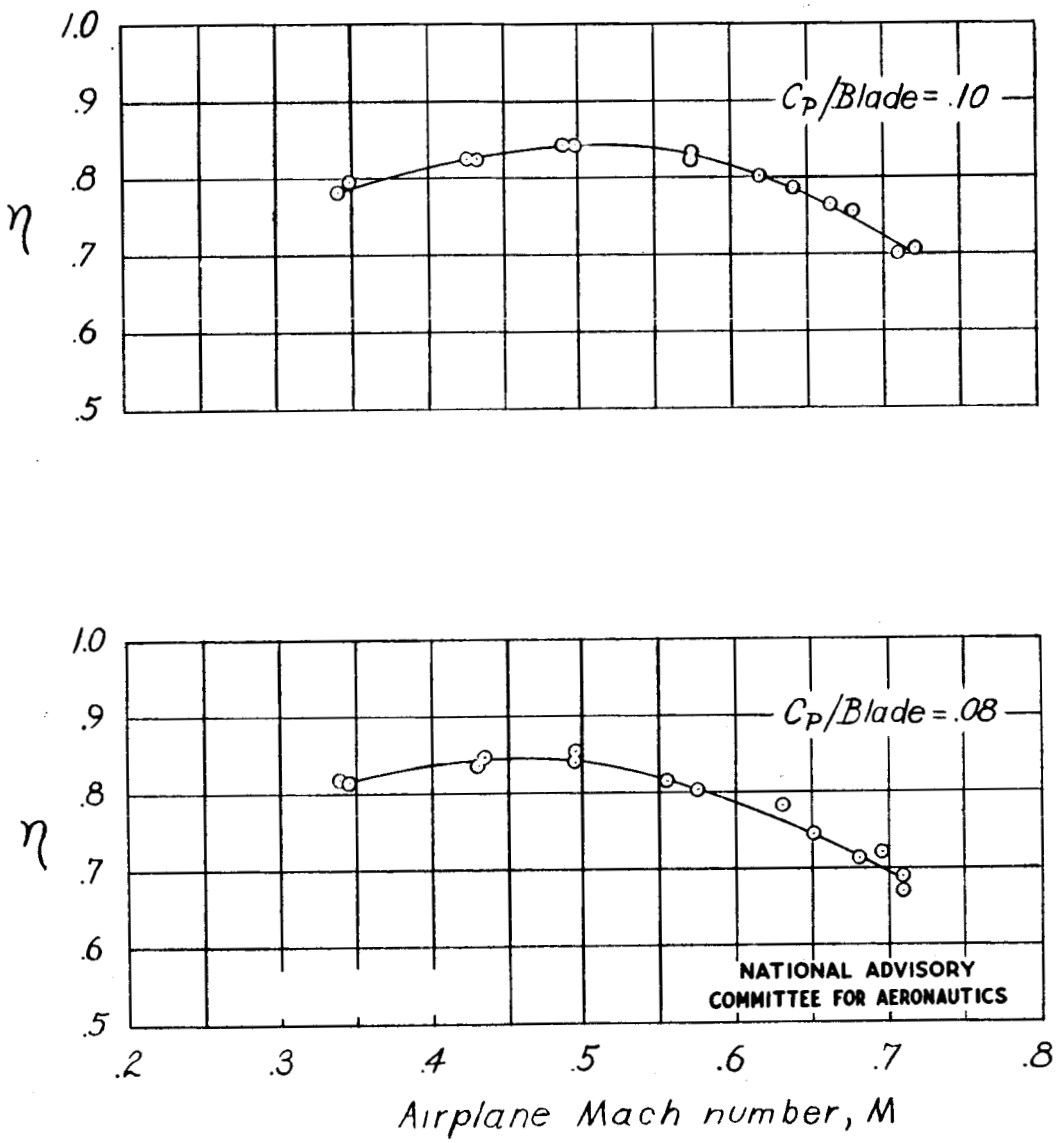

Figure 10.- Effect of blade loading on propeller efficiency over airplane Mach number range. 2520 engine rpm. Hamilton Standard No. 6507A-2 three-blade propeller on P-47D airplane.

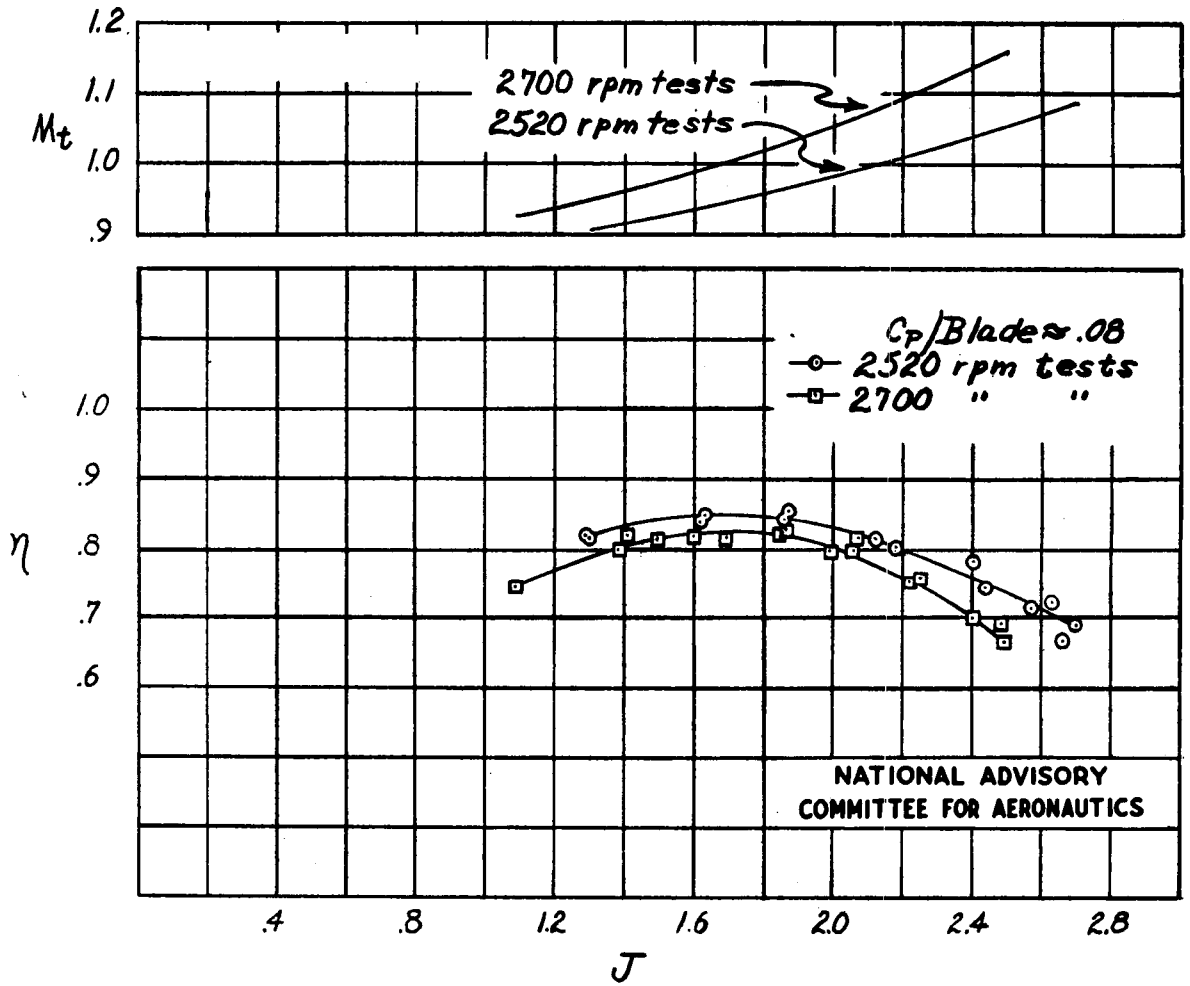

Figure 11.- Effect of compressibility on propeller efficiency for constant power coefficient. Power coefficient per blade approximately 0.08. Hamilton Standard No. 6507A-2 three-blade propeller on a P-47D airplane.