ANALYSIS OF PHYSICAL DEFECTS FOUND BY THE ARMED SERVICES IN PILOTS CERTIFIED TO BE WITHOUT DISQUALIFYING DEFECT BY CIVIL PILOT TRAINING EXAMINATION

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Independent examinations of pilots were made at approximately the same time by two physicians, one for the Civil Aeronautics Administration and the other for the armed services. These examinations offer an opportunity for analysis of disagreement. The study is based on 1286 pilots who had completed primary training and had been medically certified for the secondary stage of Civil Pilot Training. Medical officers of the Army Air Force examined 925 of these pilots and disqualified almost half of them. The Naval Aeronautics Bureau medical officers examined 361 and disqualified about one-fourth of this number. The large difference between the Army and the Navy and the degree of disqualification of previously certified men might easily be explained if the examiners of the Armed Forces employed higher standards of qualification than had the Civil Aeronautics physicians. In the main, however, the same standards were employed in both examinations. The most important exception is vision, since here refraction was used by the Army and the Navy but not by the civil examination.

If we consider only those characteristics for which the same measures were used by both the Civil Aeronautics and the military and naval physicians

and eliminate such defects as might have developed between the two examinations (insufficient dentition, weight, etc.) we find that of the disqualifying defects noted only 16 percent were recorded as the same by the two examiners. In these cases there was agreement as to the defect and its severity, but the Army and Navy doctors considered the defect to be a flying handicap, whereas the previous examiners had not. Predominant among these defects to which the Army and Navy gave more importance for the same standard are color vision, height and two cardio-vascular measures, blood pressure and the Schneider.

The principal cause of such a high rate of disqualification among these previously certified men is, therefore, disagreement between the two examiners as to the existence of a defect or as to its severity. For example, the Armed Forces cited poor visual acuity as a disqualifying characteristic of 86 men. This is before refraction and strictly comparable to the civil examination. For 85 of these 86 men the Army and Navy physicians recorded a different visual acuity than had been found on the previous examination. Similarly 69 pilots were disqualified with nervous and psychiatric defects as part or all of the reason. Only one of these 69 had been noted as having such a defect by the doctors who had qualified them for Civil Pilot Training.*

With the data provided by these disagreements about disqualifying defects, we were able to study (1) differences between disqualification by Army and by Navy physicians, (2) the reasons for disqualification in

* Five of the 69 were Navy disqualifications on the basis of "Falling Test". Neither C.A.A. or Army physicians used this test.

different regions where different medical personnel made the examinations, and (3) the types of defect found in pilots already certified as adequate by civil aero-medical examination.

Differences Between Army and Navy in Defects Noted for Disqualification

Table 1 shows that when a large number of cases examined by many different physicians is considered, there is real agreement between Army and Navy medical personnel, about the types of defect that should disqualify candidates for air-training. Analysis presented later will show that this agreement does not hold from doctor to doctor within the examining staff. The significant difference appearing in Table 1 is the proportion of total disqualification by doctors representing the two branches of the Armed Forces. Within this group of pilots, all of whom had been certified as eligible by one qualified aero-medical representative, the Army disqualified 46 percent and the Navy 28 percent of the cases examined. There is no explanation of such a discrepancy between rejection rates except an unreasonable difference in the severity of the criteria.

TABLE 1

PERCENT OF PILOTS ACCEPTED BY C.P.T. WHO WERE FOUND TO HAVE DISQUALIFYING DEFECTS BY ARMY AND NAVY PHYSICIANS

Types of defects noted as basis for disqualification*	Army % of 925	Navy % of 361
Cardio-vascular	22	12
Anthropometric	16	12
Vision other than acuity	16	11
Visual acuity	8	3
Adaptability Rating for Military Aviators (ARMA)	7	-
Teeth	7	3
Nose and throat	6	3
Nervous or psychiatric	6	2
Miscellaneous	6	3
Color vision	3	2
Hearing, eardrum, etc.	1	1
Total % disqualified	48	28
Total # examined	925	361

Cardio-vascular, anthropometric and vision (other than color vision) defects** were most commonly found by both Army and Navy physicians. Hearing, color vision and miscellaneous (hay fever, skin disease, medical history, etc.) defects were the least common causes for disqualifying.***

* Any pilot appears only once within any class of defects. That is, if a disqualification had several disqualifying cardio-vascular measures he was counted only once in the cardio-vascular defect class. However, a pilot may appear in more than one of these major classifications.

** An itemized list of the recorded defects included in each class appears in the final table.

*** A disqualifying defect as presented in Tables 1 - 5 was not necessarily the sole cause for disqualification. For about half of the cases defects in more than one class were cited as the basis for rejection.

The significance of the material in this table may be illustrated by consideration of the 22 percent and 12 percent of examinees disqualified for cardio-vascular defects by the Army and Navy respectively. It is difficult to accept unchallenged a procedure of pilot selection wherein one set of physicians can examine and pass the cardio-vascular fitness of 201 men who, when re-examined by another group (Army) are disqualified (not necessarily for cardio-vascular reasons alone). Of these 149 were given a different cardio-vascular record and the remaining 52 were given the same record. It is also difficult to understand how pilots certified by one examining personnel, when divided into two presumably random samples and re-examined by two different groups of physicians (civil examination first, followed by either Army or Navy examination) could be disqualified for cardio-vascular defects at the rate of 22 out of one hundred by one medical staff and only 12 out of one hundred by the other.

On the average, then, while naval and military physicians place the same relative emphasis upon the different types of defects, the Army rate of disqualification is twice as high as that of the Navy.

Differences in Examinations by Regions

Tables 2 and 3 given the regional figures for Army and Navy disqualifications which together make up the total defect percentages just discussed.

Regional staffs differ widely in the emphasis placed upon defects.

TABLE 2

PERCENT OF PILOTS ACCEPTED BY C.P.T. WHOM ARMY PHYSICIANS FOUND WITH VARIOUS TYPES OF DISQUALIFYING DEFECTS

	Region 1	2	3	4	5	6	7	All Regions
	% of 140	% of 151	% of 169	% of 166	% of 136	% of 107	%of 56	% of 925
Cardio-vascular	38	16	11	16	37	17	18	22
Anthropometric	21	13	10	18	20	13	11	16
Other vision	21	11	17	20	15	12	12	16
Visual acuity	7	6	9	11	12	7	-	8
A.R.M.A.	14	-	11	4	6	9	2	7
Teeth	9	5	12	7	7	4	5	7
Nose and throat	4	2	12	8	7	3	-	6
Miscellaneous	4	5	7	4	10	3	9	6
Nervous or psychiatric	3	7	9	5	6	9	9	6
Color vision	4	9	1	2	5	1	2	3
Hearing, eardrum, etc.	1	-	-	2	4	3	-	1
Total % disqualified	56	42	49	45	57	44	41	48
Total # examined	140	151	169	166	136	107	56	925

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TABLE 3

PERCENT OF PILOTS ACCEPTED BY C.P.T. WHOM NAVY PHYSICIANS FOUND WITH VARIOUS TYPES OF DISQUALIFYING DEFECTS

	Region 1	2	3	4*	5	6	7	All Regions
	% of 97	% of 22	% of 67		% of 61	% of 80	% of 34	% of 361
Cardio-vascular	18	5	4		16	13	3	12
Anthropometric	19	14	3		13	11	6	12
Other vision	19	14	9		8	9	-	11
Visual acuity	1	5	7		-	4	-	3
Teeth	2	5	4		3	1	3	3
Nose and throat	7	-	-		3	1	3	3
Miscellaneous	2	-	3		5	3	3	3
Nervous & psychiatric	4	5	-		2	4	-	2
Color vision	1	-	3		2	3	-	2
Hearing, eardrum, etc.	1	-	-		3	1	-	1
Total % disqualified	37	32	22		28	26	15	28
Total # examined	97	22	67		61	80	34	361

* Only one case examined by the Navy in Region 4

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There is also wide disparity among the total disqualification rates. A pilot certified for C.P.T. training had less than an even chance of qualification if he was examined by the Army in Regions 1 or 5 while he had a 3 out of 5 chance with Army physicians in Region 7. If he went to the Navy in the same region his chances of acceptance were better than 4 out of 5 and in Region 2 they were as good as 2 out of 3. Such differences in rejection rates among a group of pilots selected by previous medical examination is inconsistent with an objective and coordinated medical examination program. When we consider the individual percentages of the table it seems incredible that a cardio-vascular defect severe enough to disqualify should be found among 37 or 38 percent (Army Regions 1 and 5) of men who had already been examined and qualified for secondary flight training. Similarly it reflects badly on standards of examination to have a difference in the measurement of visual acuity (Snellen chart) sufficiently large to qualify in one examination and disqualify in another in more than 10 percent of the cases examined (Army Regions 4 and 5).

TABLE 4

PERCENT OF ARMY DISQUALIFICATIONS WITH VARIOUS DISQUALIFYING DEFECTS

	Region 1	2	3	4	5	6	7	All Regions
	% of 79	% of 63	% of 82	% of 75	% of 78	% of 47	% of 23	% of 447
Cardio-vascular	67	38	22	36	65	38	43	45
Anthropometric	38	32	21	40	35	30	26	32
Other vision	37	25	34	45	26	28	30	32
Visual acuity	13	14	18	25	20	17	-	17
A.R.M.A.	24	-	23	8	11	21	4	15
Teeth	15	11	24	15	12	9	13	15
Nose & throat	8	5	26	17	13	6	-	13
Miscellaneous	8	11	15	8	17	6	22	13
Nervous or psychiatric	5	16	18	11	10	21	22	13
Color vision	6	21	1	4	9	2	4	7
Hearing, eardrum, etc.	3	-	-	4	6	6	-	3
Total %*	224	173	202	213	224	184	164	205
Total # disqualified	79	63	82	75	78	47	23	447

* More than 100% because of multiple-defect disqualifications.

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TABLE 5

PERCENT OF NAVY DISQUALIFICATIONS WITH VARIOUS DISQUALIFYING DEFECTS

	Region 1	2*	3	4*	5	6	7*	All Regions
	% of 36		% of 15		% of 17	% of 21		% of 101
Cardio-vascular	47		20		59	48		42
Anthropometric	50		13		47	43		42
Other vision	50		40		29	33		39
Visual acuity	3		33		-	14		10
Teeth	6		20		12	5		10
Nose and throat	19		-		12	5		11
Miscellaneous	6		13		17	10		10
Nervous & psychiatric	11		-		6	14		9
Color vision	3		13		6	10		6
Hearing, eardrum, etc.	3		-		12	5		4
Total %**	198		152		200	187		183
Total # disqualified	36		15		17	21		101

* Too few cases disqualified to allow reliable percentages.

** More than 100% because of multiple-defect disqualifications.

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Differences in the relative emphasis placed upon defects as shown in Tables 4 and 5 make it fairly obvious that various types of specialization among the medical personnel of the different regions determines the bases for disqualification. Sixty-seven and 65 percent respectively of the Army disqualifications in Regions 1 and 5 were recorded as having disqualifying cardio-vascular defects compared with a 22 percent occurrence of this disqualifying cause in Region 3. Army doctors in Region 7 noted 22 percent of their disqualifications as having nervous and psychiatric disorders while the doctors of Region 1 so noted only 5 percent of their disqualifications. True presence or absence of the defect could not explain the fact that Region 2's military medical personnel disqualified 21 percent of their rejects for color vision, whereas among Region 3's disqualified pilots there was such defect in only one percent. Region 3 in the Army mentioned 26% of their cases for nose and throat defect. Region 7 mentioned none.

The Navy examinations show as much discrepancy as the Army among regions, but because the severity of their standards is more reasonable the number of disqualifications is usually too small to allow many reliable comparisons. Fifty percent of Region 1 and only 13 percent of Region 3 Navy disqualifications included anthropometric defects (usually height and/or weight) in the disqualifying diagnosis. Navy doctors in Region 1 were also interested in nose and throat conditions, finding disqualifying defects of this type among 19 percent of the rejected pilots. The Navy medical staff in Regions 2 and 3 apparently did not share this interest since they found no cases with nose and throat conditions sufficiently bad to disqualify.

These differences among regions are not chance differences. The differences in emphasis between Army Regions 1 and 2, for instance, would occur only two times out of 100 as a chance disparity between two groups of this size, if they were from the same universe.

All of these pilots had been previously qualified for secondary training by a civil medical examination. One possible explanation is that the standard used by each physician is to reject a given proportion of all cases examined by him, usually on the basis of the physician's chief clinical interest, and that this rejection is made irrespective of the true occurrence of the defect. This conclusion need not imply that the previous examination was more reliable, but it does imply that if pilots were sent to enough doctors they would eventually all be disqualified. Such a situation is certainly not consistent with the objectives of the aero-medical profession. More objective and uniform standards must be developed.

Combinations of Disqualifying Defects

As stated above, each of the defects which provide the data for this analysis was not necessarily alone the reason for disqualification. Army or Navy physicians cited more than one defect in disqualifying more than half the cases. Defects as they disqualified alone and in combination with other defects, are presented in Tables 6 and 7.

TABLE 6

BASES FOR DISQUALIFICATIONS BY ARMY PHYSICIANS OF PILOTS ACCEPTED BY C.P.T.

	Region 1		Region 2		Region 3		Region 4	
	In Comb.	Alone	In Comb.	Alone	In Comb.	Alone	In Comb.	Alone
A.R.M.A. and F.A.T.	17	2	-	-	19	-	6	-
Visual acuity	9	1	6	3	12	3	15	4
Color vision	3	2	5	8	-	1	2	1
Other vision	25	4	11	5	20	8	27	7
Hearing, eardrum, etc.	2	-	-	-	-	-	2	1
Nose and throat	6	-	2	1	15	6	12	1
Teeth	11	1	6	1	16	4	10	1
Nervous or psychiatric	4	-	10	-	14	1	7	1
Anthropometric	25	5	14	6	13	4	26	4
Cardio-vascular	34	19	18	6	12	6	26	1
Miscellaneous	5	1	4	3	8	4	3	3
Total disqualifications	79		63		82		75	
Total examined	140		151		169		166	

	Region 5		Region 6		Region 7	
A.R.M.A. and F.A.T.	8	-	10	-	1	-
Visual acuity	13	3	5	3	-	-
Color vision	7	-	-	1	1	-
Other vision	20	-	10	3	3	4
Hearing, eardrum, etc.	5	-	3	-	-	-
Nose and throat	8	2	1	2	-	-
Teeth	9	-	2	2	2	1
Nervous or psychiatric	8	-	10	-	3	2
Anthropometric	20	7	8	6	3	3
Cardio-vascular	37	14	14	4	6	4
Miscellaneous	13	-	2	1	5	-
Total disqualifications	78		47		23	
Total examined	136		107		56	

TABLE 7

BASES FOR DISQUALIFICATIONS BY NAVY PHYSICIANS OF PILOTS ACCEPTED BY C.P.T.

	Region 1		Region 2		Region 3	
	In Comb.	Alone	In Comb.	Alone	In Comb.	Alone
Visual acuity	1	-	-	1	5	-
Color vision	-	1	-	-	1	1
Other vision	9	9	2	1	2	4
Hearing, eardrum, etc.	1	-	-	-	-	-
Nose and throat	7	-	-	-	-	-
Teeth	2	-	-	1	2	1
Nervous and psychiatric	4	-	1	-	-	-
Anthropometric	12	6	2	1	1	1
Cardio-vascular	16	1	1	-	3	-
Miscellaneous	2	-	-	-	1	1
Total disqualified	36		7		15	
Total examined	97		22		67	

	Region 5		Region 6		Region 7	
Visual acuity	-	-	3	-	-	-
Color vision	1	-	2	-	-	-
Other vision	5	-	3	4	-	-
Hearing, eardrum, etc.	1	1	1	-	-	-
Nose and throat	2	-	1	-	1	-
Teeth	1	1	1	-	-	1
Nervous and psychiatric	1	-	3	-	-	-
Anthropometric	6	2	5	4	1	1
Cardio-vascular	8	2	9	1	-	1
Miscellaneous	3	-	2	-	-	1
Total disqualified	17		21		5	
Total examined	61		80		34	

Differences among the various examining personnel represented here are not caused only by differences in the amount of multiple defect mentions. There are differences among regions in mentions of defect which alone caused disqualification. Nineteen out of 79 (Region 1), for instance, and only 1 out of 73 (Region 4) were disqualified for cardio-vascular inefficiency alone by the Army. Color vision in the Army and anthropometric considerations in the Navy also show differences between regions when judged as sole causes of disqualification. The occurrences are small because double and triple mentions are frequent.

Itemized Mentions of Disqualifying Defects That Make Up the Classifications Used in the Analysis

The wide range of material presented in Table 8 indicates the preoccupation of the Armed Services in finding reasons for disqualification. Especially noteworthy in this connection are the items listed under nervous system and psychiatric and under cardio-vascular. Unfortunately, the method did not allow definition of which of any set of individual notations determined the disqualification. Still, it seems unlikely that anything but a pre-determined rate of rejection could account for finding such a multiplicity of defects among a group of young men whom other physicians had found to have adequate physical fitness for flying.

TABLE 8

ITEMIZED MENTIONS OF DISQUALIFYING DEFECTS FOUND BY ARMY AND NAVY PHYSICIANS AMONG PILOTS ACCEPTED BY C.P.T.

	Army		Navy	
	No.	Per mille of total pilots examined (925)	No.	Per mille of total pilots examined (361)
Visual acuity	78	84	8	22
Color vision	29	31	6	17
Other vision				
Accommodation	26	28	1	3
Angle of convergence	29	31	6	17
Associated parallel	1	1	-	-
Depth Perception	33	36	1	3
Diplopia	6	6	-	-
Eye inspection	5	5	-	-
Field of vision	2	2	-	-
Moderate Ptosis	-	-	1	3
Ophthalmoscope	8	9	-	-
Prism divergence	34	37	3	8
Pupils	1	1	1	3
Red lens test	1	1	-	-
Refraction	49	53	18	50
Rod test	43	46	12	33
Scar, right cornea	1	1	-	-
Strabismus, external right eye	1	1	-	-
Hearing, Eardrums and mastoid				
Eardrums	5	5	2	6
Hearing	4	4	1	3
Mastoid	3	3	-	-
Nose and throat				
Nares	32	35	11	30
Pharyngitis	1	1	-	-
Tonsils	18	19	2	6
Sinusitis	1	1	-	-
Tonsilitis	4	4	-	-
Teeth				
Calculus	1	1	-	-
Fillings	1	1	1	3
Gingivitis	5	5	1	3
Insufficient dentition	56	60	6	17
Malocclusion	11	12	3	8
Pyorrhea	1	1	-	-
Nervous system and psychiatric				
Depression	1	1	-	-
Enuresis	3	3	-	-

TABLE 8 (continued)

Nervous system & psychiatric (cont.)				
Equilibrium (falling* and self-balancing test)	1	1	5	15
Nail biting	1	1	-	-
Nervous system	24	26	6	17
Neuro circulatory instability	6	6	1	3
Nightmares	1	1	-	-
Pavor nocturnis	4	4	-	-
Sea and car sickness	1	1	-	-
Somnambulism	14	15	1	3
Somnilogism	1	1	-	-
Speech defect	1	1	-	-
Stammering	2	2	-	-
Anthropometric				
Bones, joints and muscles	7	8	8	22
Chest	1	1	-	-
Figure	2	2	1	3
Frame	-	-	1	3
Height	101	109	15	42
Posture	-	-	1	3
Weak feet	1	1	-	-
Weight	121	131	25	69
Cardio-vascular				
Arteries	1	1	-	-
Blood pressure	58	63	9	25
Expiration	17	18	4	11
Fainting & unconsciousness	31	33	1	3
Impaired circulation-thrombosis	-	-	1	3
Heart	10	11	4	11
Neuro-circulatory asthenia	4	4	1	3
Pulse	46	50	11	30
Schneider	106	114	26	72
Tachycardia	4	4	1	3
Temperature	5	5	-	-
Varicose veins	2	2	4	11
Vasomotor instability	13	14	1	3
Miscellaneous				
Albumin in urine	4	4	-	-
Asthma	2	2	-	-
Chronic bronchitis	1	1	-	-
Endocrine system	3	3	-	-
Excision of pilonidal cyst	1	1		-
Fractured skull	1	1	1	3
Genito-urinary	3	3	2	6
Hay fever	8	9	1	3
Headaches	2	2	-	-
Hemorrhoids	2	2	3	8
Hernia	3	3	-	-
Hydrocele	1	1	-	-

*Given by Navy only

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TABLE 8 (continued)

Miscellaneous (cont.)				
Kahn	1	1	-	-
Lung markings	1	1	-	-
Mammary glands	1	1	-	-
Medical history	4	4	-	-
Meningitis	1	1	-	-
Meningocele of skull (born)	1	1	-	-
Migraine	1	1	-	-
Phimosis	2	1	-	-
Respiratory infection	1	1	4	11
Sex-female	1	1	-	-
Skin	7	8	1	3
Skin-draining empyema	-	-	1	3
Thyroidectomy	1	1	-	-
Tuberculosis	2	2	-	-
Tumor (small on neck)	1	1	-	-
Voice	1	1	-	-
Adaptability Rating for Military Aviation	59	64	-	-