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THE COLLEGE OF AERONAUTICS

DEPARTMENT OF PRODUCTION AND INDUSTRIAL ADMINISTRATION

Test Report No. PLBO/7

Evaluation of PERPRO tools grade RD 92 machining EN 9

SUMMARY

Four tips of RD 92 were tested at 600 fpm cutting speed, 0.010 in./rev. feed and 0.10 in. depth of cut to 0.030 in. flankwear. Two tips gave a tool life of 56 min., but with severe crater wear. The other two tips gave a shorter life - one failing after 30 min. cutting as a result of the breakdown of the crater lip.

Test conditions

The following cutting conditions were used during the tests:

Work material:	EN 9
Cutting speed:	600 fpm
Depth of cut:	0.10 in.
Feed:	0.010 in./rev.

and the tools used were:

RD92 NT153
RD92 NT154
RD92 NT155
RD92 NT156

Test results

The flankwear was measured as shown in figure 1 and the maximum deformation occuring along the cutting edge was also measured; the results are given in Tables 1 - 4.

Figure 2 illustrates the growth of the flankwear of the four tips which were tested. Two tips, NT154 and NT155, gave a tool life of 56 min. which is similar to the life of Sanvik S1P under the same conditions (see report No. PLBO/5). With these tips a smear of material appeared below the band of wear (see Figure 4B) and throughout the test the wear at the depth of cut was about twice as great as the wear near the nose. The other two tips gave a shorter tool life - NT156 gave 41 min. and NT153 failed at the nose after 30 min. testing. Less smear occured with NT153 and NT156 and the wear at the nose, up to failure, was of the same order as the wear at the depth of cut.

Figure 3 shows the Tallysurf records of the crater wear of the tips at the end of the tests. Although not identical the crater wear in all cases was quite severe and the figure shows that the failure of NT153 was the result of the breakdown of the crater lip.

Figures 4 and 5 give photographs showing the growth of the crater and flankwear of NT156.

Conclusions

The results showed that of the four RD 92 tips which were tested two gave a tool life similar to that of Sanvik S1P, but with heavy crater wear. The other two tips gave a shorter life, one failing after 30 min. cutting as a result of the crater lip breaking down.

Table 1

Material: EN 9
Tool: RD92 NT153
Feed: 0.010 in./rev.

Date: 2/12/63
Cutting speed: 600 fpm
Depth of cut: 0.10 in.

TIME min.	FLANKWEAR - in. Fa	Fb	Fc	DEFORMATION	HARDNESS vhn	REMARKS
6	.004	.004	.0075	-	245	
12	.006	.0065	.011	-		
18	.008	.008	.017	.001		
24	.0115	.010	.020	.002		
30	.022	.026	.023	.003		Lip of crater breaking down
36	.043	.045	.025	.004		

Table 2

Material: EN 9
Tool: RD92 NT154
Feed: 0.010 in./rev.

Date: 4/12/63
Cutting speed: 600 fpm
Depth of cut: 0.10 in.

TIME min.	FLANKWEAR - in. Fa	Fb	Fc	DEFORMATION	HARDNESS vhn	REMARKS
3	.003	.003	.004	-	245	
6	.0035	.005	.008	-		
9	.005	.0065	.010	-		
12	.006	.007	.012	-		New bar
15	.006	.0075	.0125	.0005	254	
18	.007	.0085	.014	.0005		
21	.0075	.0085	.014	.001		
24	.008	.0085	.0145	.001		Smear band beneath wear
27	.008	.010	.016	.001		Smear band beneath wear
30	.009	.010	.020	.001		Smear band beneath wear
33	.009	.011	.0225	.0015		Smear band beneath wear
36	.011	.0125	.024	.0015		Smear band beneath wear
39	.011	.0125	.024	.0015		Smear band beneath wear
42	.0115	.013	.024	.0025		Smear band beneath wear
45	.0115	.0145	.025	.0025		Smear band beneath wear
48	.012	.016	.025	.0025		Smear band beneath wear
51	.012	.016	.028	.0025		Smear band beneath wear
54	.012	.016	.028	.0025		Smear band beneath wear
57	.0125	.016	.032	.0025		Smear disappeared

Table 3

Material:	EN 9	Date:	4/12/63
Tool:	RD92 NT155	Cutting speed:	600 fpm
Feed:	0.010 in./rev.	Depth of cut:	0.10 in.

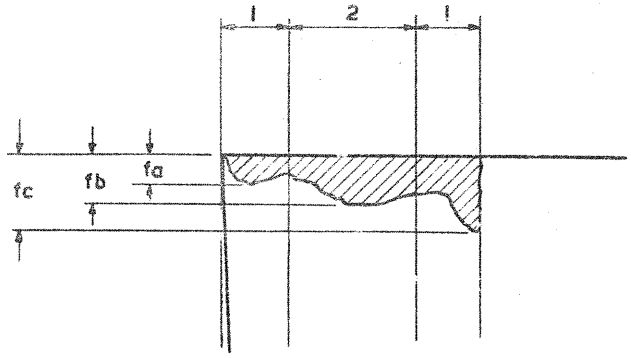
TIME min.	FLANKWEAR - in. Fa	Fb	Fc	DEFORMATION	HARDNESS vhn	REMARKS
3	.0025	.0025	.0045	-	245	
6	.0045	.0045	.007	-		
9	.006	.006	.008	-		
12	.006	.006	.009	-	254	New bar
15	.0065	.0075	.0105	-		
18	.007	.008	.0115	-		
21	.007	.008	.0125	-		Smear beneath wear band
24	.007	.008	.014	.0005		Smear beneath wear band
27	.009	.010	.0155	.001		Smear beneath wear band
30	.009	.010	.017	.001		Smear beneath wear band
33	.0105	.010	.018	.001		Smear beneath wear band
36	.0105	.011	.021	.002		Smear beneath wear band
39	.0105	.012	.022	.002		Smear beneath wear band
42	.011	.012	.024	.0025		Smear beneath wear band
45	.0115	.014	.024	.0025		Smear beneath wear band
48	.0135	.0155	.026	.0025		Smear beneath wear band
51	.0135	.0155	.029	.0025		Smear beneath wear band
54	.0135	.016	.029	.0025		Smear beneath wear band
57	.014	.016	.0315	.0025		Smear beneath wear band

Table 4

Material: EN 9
Tool: RD92 NT156
Feed: 0.010 in./rev.

Date: 6/12/63
Cutting speed: 600 fpm
Depth of cut: 0.10 in.

TIME min.	FLANKWEAR - in. Fa	Fb	Fc	DEFORMATION	HARDNESS vhn	REMARKS
9	.007	.006	.006	-	254	
12	.007	.007	.010	-		
22	.012	.012	.016	.001		
28	.014	.014	.0205	.002		
36	.017	.015	.026	.003	274	New bar
41	.030	.0185	.031	.003		



FLANKWEAR MEASUREMENT

FIG. 1

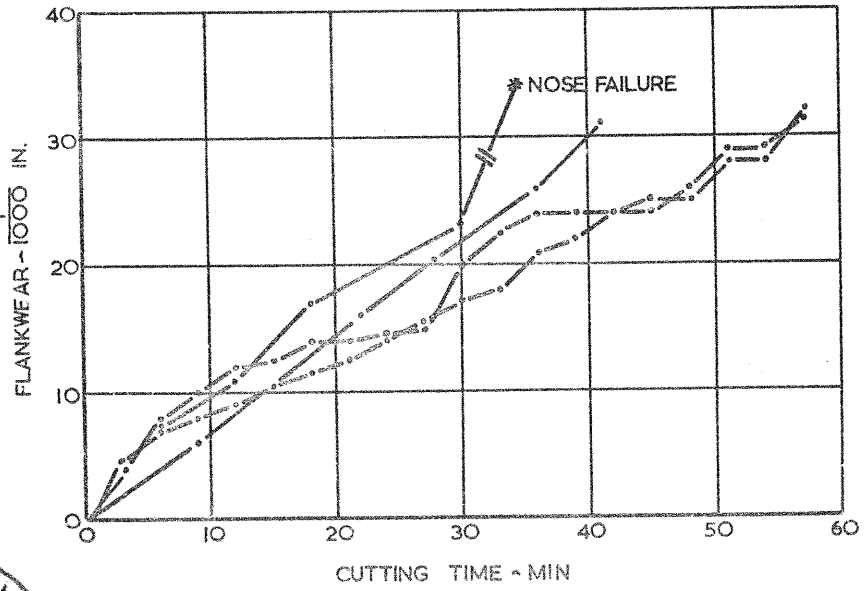
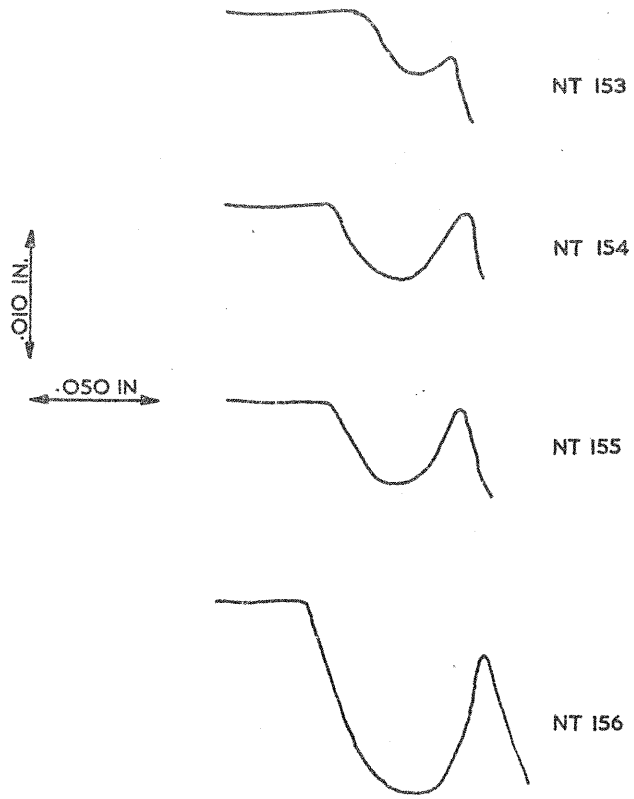
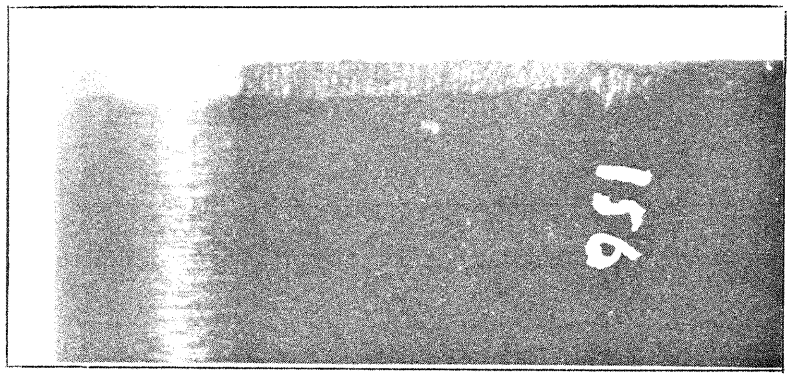


FIG. 2

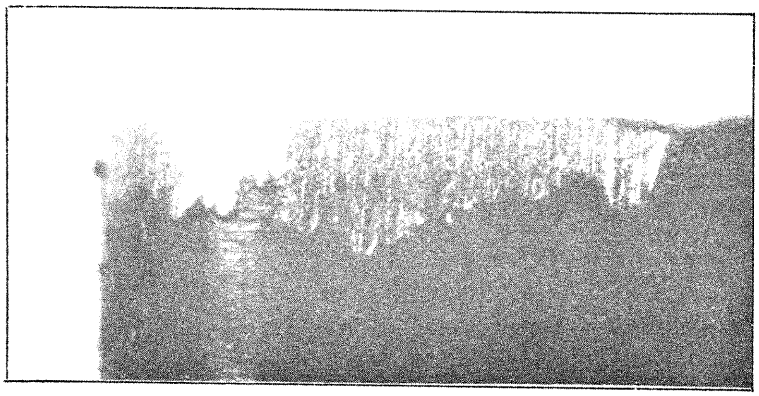


CRATER WEAR OF RD 92 TIPS AT END OF TEST

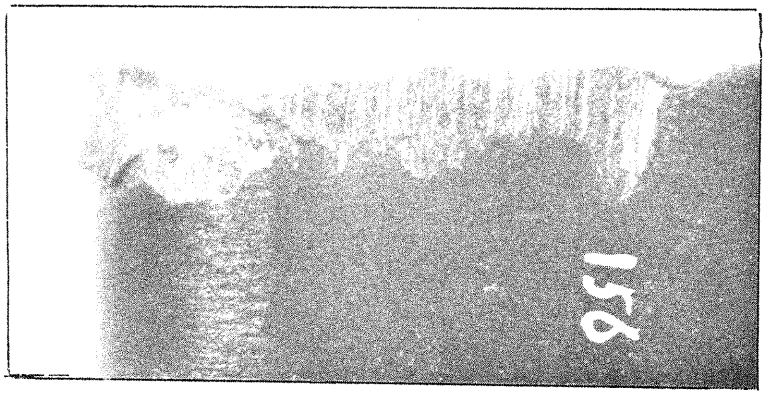
FIG. 3



A



B



C

Fig. 4 Flankwear RD 92

a .010 in
b .020 in
c .030 in

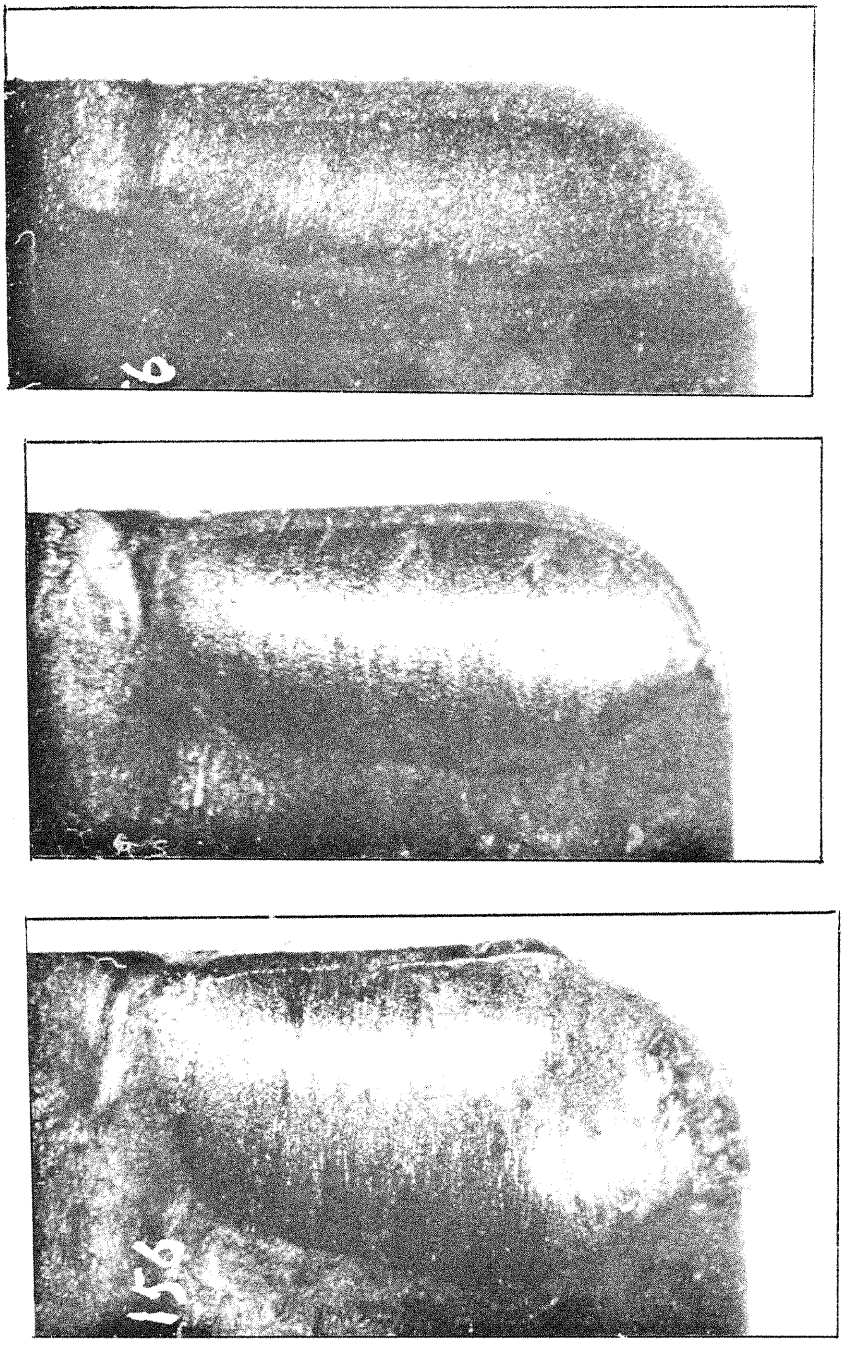


Fig. 5 Crater wear RD 92 corresponding to

a .010 in flankwear
b .020 in flankwear
c .030 in flankwear