

COMPARATIVE DATA ON AUTOMATIC GUNS

Type	Calibre (mm)	Operation	Weapon Weight (lb)	Weapon Length Overall (in)	Muzzle Velocity (ft/sec)	Rate of Fire (rds/min)	Projectile Weight (oz)	Remarks
Browning (Brit. re-design)	7.7	recoil-operated; mechanically locked breech	22	44.5	2,660	1,200	0.344	Belt-fed.
Vickers K	7.7	gas-operated	19.5	—	2,400	950-1,200	0.344	Drum-fed.
Gorman MG.81	7.92	ditto	14	—	2,450	1,200-1,500	0.45	
Rheinmetall-Borsig MG.17	7.92	recoil operated; mechanically locked breech	28	47.2	2,450	1,100	0.45	Belt-fed.
U.S. Browning	12.7	ditto	52	58	2,500	850	1.7	Belt-fed.
Oerlikon F.F.	20	ditto (with free blow-back)	53	52.8	1,930	520	4.82	"Mine" shell with 0.69 oz H.E. charge.
Hispano Mk. V	20	ditto	105	81	2,750	600	4.25	Splinter shell. No remote cocking.
Mausers MG.151/20	20	ditto	98	80	2,600	680	5.35	Made in 95 working hours (mass production); also produced with 15 mm calibre (muzzle velocity 3,150 ft/sec).
Mausers MG.213/20	20	gas-operated	165	—	3,300	1,200	7.4	Extra-long "mine" shell with 0.9 oz H.E. charge.
Rheinmetall-Borsig M.K. 108	30	recoil-operated with free blow-back	132	41.5	1,650	650	11.6	"Mine" shell with 3 oz H.E. charge.
Mausers MG.213/C	30	gas-operated	166	63	1,750	1,100	11.6	Made in 75 working hours.
Vickers-Colt type 1932	37	recoil-operated with mechanically locked breech	200	77	1,950	100	23.5	To replace M.K. 108. As installed in Perth flying boats.
M.K.214/A	50	automatically actuated charging cradle.	1,060	163	2,750	145	53.5	Adapted tank gun. "Mine" shell with 12.3 oz H.E. charge.
M.K.112	55	gas-operated	600	79	2,000	300	52.4	For 1,000 yd combat range. "Mine" shell with 14.8 oz H.E. charge.
M.K.412	55	ditto	398	—	2,140	—	52.4	Parallel development to M.K.112.
M.K.114	55	ditto	1,550	—	3,300	180	63.5	For 2,000 yd combat range, with semi-rigid mounting. "Mine" shell with 16 oz H.E. charge.
M.K.214/B	55	ditto	1,430	—	—	180	63.5	Parallel development to M.K.114.
M.K.115	55	recoilless (venturi-relief)	395	—	2,000	300	54.4	Combustible cartridge case. Development not completed.

FIGHTER ARMAMENT . . .

or cloud interception could be anywhere near effectual. Such a device, too, will bring some welcome relief from the growing ammunition loads which the interceptor aircraft is compelled to carry. Designs for instruments of this kind exist, but the writer is doubtful whether they are approaching operational use by any of the Western Powers.

According to German assessment, 50 per cent probability of destruction could be expected from a two 30 mm M.K.108 gun installation firing over 700 yards' range at flight-path angles up to 30 deg, provided that the EZ/42 gyro-sight was used. The assumption is an aggregated rate of fire of 600 rounds/min lasting three seconds, and a muzzle velocity of 1,870 ft/sec, i.e., the expenditure of 20 shells, with four direct hits effecting the destruction. Without gyro-sight, equal probability can be predicted when fire is opened over 450 yards only. Hence, an automatic sight is an excellent protection for the interceptor, besides giving better chances of success.

Weight and Bulk.—In piston-engined interceptors a low armament-installation weight is of primary importance, but the space required does not matter a great deal. Jet and rocket interceptors, however, present "logistic" armament problems: they are more susceptible to bulk than to weight. Holes, blisters, or protruding barrels are no longer tolerated. Then there are the problems of facilitating armament servicing and re-arming, both of which are operationally vital: the higher the target's speed and altitude, the smaller the time interval available between alert and interception. Standing interceptor patrols may no longer be considered a tactical error of the First World War. Servicing and re-arming, therefore, dominate the practical usefulness of an interceptor aircraft.

As has been said, the large-calibre gun is necessarily long and needs much ammunition space. In jet-fighter design the fuselage nose is easily occupied by four guns of, say, 55 mm calibre; the cockpit may even have to be shifted back (decreasing the field of vision), and no space may be left for radar equipment. Moreover, the recoil loads may have a disturbing effect upon automatic detection, ranging and firing devices. Even 20 mm guns can produce vibrations causing distressing consequences for airframe and accessories. Moreover, the fuselage nose is better employed to house the pilot, especially if he is to be in the prone attitude. Finally, the best place for a refuelling "probe" is undoubtedly at the fuselage nose.

Wing installation of guns no longer seems a practical proposition: modern jet interceptors have thin wings, and these are sensitive against shock loads from recoil. Wing roots,

too, are generally occupied by air intakes and/or discharge ducts. Also an eccentric installation of heavier-calibre guns presents potential danger if one of the weapons jams.

One may safely predict that in future interceptors the fuselage nose will no longer be available to house a gun installation, apart from the fact that the structural system will be unfavourable to it. These reasons make it desirable to replace guns by some other form of armament, and one with which the aircraft designer can do better. Rockets produce no recoil, and, if they are small enough, they can be stored anywhere and be launched from any place.

Although economical aspects claim only minor attention in a struggle for the survival of a nation, interceptor armament claims consideration in this respect. Costs of equipment and, in particular, armament, form rather formidable items, yet the actual operation life of such an aircraft is amazingly short. During the last war, the average flying life was 40 to 50 flying hours (more than double the average life of a fighter during the First World War); an increase to, say, 400 flying hours is hoped for with very modern types—of vastly higher initial cost. A simplified armament, consisting in effect of little more than the missiles to be fired, will thus be beneficial from the point of reducing labour, saving material and lowering final cost. In maintenance, too, rocket missiles of the R.4/M type will score.

Estimating formulæ have been worked out, on the basis of experimental data, to assess quantitatively the calibre influence upon weapon property and performance; and similar formulæ established for supersonic rocket missiles allow us to compare automatic shell-guns with such missiles. Quantitatively, the investigation leads to the conclusion that the advantages of rockets, in all respects, are too great to be overlooked.

(To be concluded)

LOWERING PRODUCTION COSTS

AT the annual general meeting of Joseph Lucas, Ltd., Sir Peter Bennett, O.B.E., J.P., M.P. explained how the company was endeavouring to reduce selling costs by a continuous programme of reducing all manufacturing costs that came under its control.

The manufacturing time set for any product was treated as its index of controllable cost and compared with the time set by American manufacturers for a corresponding product. When the volume of production was similar, as in the case of aircraft equipment, the variation between the British and U.S. times was negligible; in car equipment, the American production of which was very much greater, the comparison showed an appreciable (though narrowing) gap.