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NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS.

TECHNICAL MEMORANDUM No 3

LAYING OUT OF A PRACTICAL AIR ROUTE.

By Lt. V. S. Miner, U.S. Air Service,
and
T. Carroll, N.A.C.A.

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The value to the nation of air routes as military assets is very well recognized, and the secondary value as commercial assets is beginning to be more clearly recognized in this country. It is peculiarly unfortunate that the value of air routes is less generally appreciated in the United States than it is and has been for some time by the European nations. Also, unfortunately, the problem of laying out an air route has been constantly approached by all those who have given it consideration in this country in the apparent attitude that it is one of the hardest things in the world to do. Whereas, as a matter of fact, a very serviceable air route can be laid out with an absolute minimum of ground work.

It is recognized by every one in the flying world that an air route which will afford a secondary landing field at every 25 miles, an endless line of ground markers, supplemented at night by light-houses and the more ambitious program of wireless direction and meteorological information should be the perfect airway. The pivotal requirements of an airway are: First, as direct a point-to-point line as possible, obvious from the necessity of keeping the total mileage at a minimum. Secondly, avoidance of mountains, open water and marshes and desolate land where a forced landing

would isolate the airplane and its passengers from immediate assistance. Thirdly, while the compass course is a perfectly feasible method of navigation, still it is of almost an absolute necessity that certain landmarks be checked from time to time to correct for drift. Furthermore, it is of the utmost assistance to the pilot to know at any given point in his trip what his approximate mileage is and the approximate mileage to his destination. This, of course, will be eventually made easy by the already suggested ground markers which will tell at a glance the absolute distance to the nearest terminal.

However, in the accompanying map we have an airway which is probably one of the most constantly travelled in the United States which crosses what is apparently some of the least desirable flying terrain in the world, excepting of course routes through desolate mountain regions. Still with a minimum of ground preparation with the aid of this map it becomes a very practicable, easy and safe air route.

In this map, which has been gotten up by Lt. V. S. Miner, of the U.S. Air Service, Langley Field, Va., a simple hydrographic map between Washington and Langley Field has been used as the basis. The direct route has been laid out as a straight line between these points. This, however, is not designated as the airway. It merely indicates the straight line. A supplementary line has been drawn following this direct line as closely as possible but following the better terrain and it is along this line

that the better judgment of the pilot will tell him to fly. Along the margins on the right-hand side of the map in either direction is a scale showing the exact mileage along the route. Also at each terminal, the compass course is indicated, giving the declination and the magnetic course.. Landmarks are indicated by arrows and the word "check", and in each case they are of such a nature that they can be seen from a considerable distance, varying according to the weather conditions, from the route itself, and it is expected that the pilot travelling the route will avail himself of these check marks to ascertain his exact position. Furthermore, while no attempt is made to cover every possible landing field, some of the best at distances not exceeding 20 miles apart are indicated and each of these have small supplementary inserts showing enlarged diagrams of that particular field. It is perfectly evident to even the most uninitiated of what value this is in assuring a pilot that it is a field which has been examined by some flyer and has been approved as a good landing field, and further that the exact places along these fields where it is best to make the actual landing are indicated. Another unique feature is that each of these fields is numbered and upon the reverse side of the map all the available information in regard to assistance in the way of transportation, gasoline and mechanical help is tabulated, which is of immense assistance to the pilot after he has landed at the field.

All of this information has been compiled from casual observa-

tion and reports from various members of the flying personnel of Langley Field who have had occasion to drive through this section and who have compared the fields with their observations made from the air; no little part of this being done by Lt. Miner himself.

Unfortunately, this map has been gotten up with particular reference to the southern end of this route and it is noticeable that the end of the route between the Potomac River and Washington is not as thoroughly covered as that to the south. This, of course, can be easily remedied, and the many unique features of this map make it particularly noteworthy. It is believed that by placing this map in the hands of any pilot of sufficient qualifications to pilot an airplane across country that a reasonably selected and perfected air route has been laid out with very nearly all of the required information for his guidance, and it is suggested that, using this map as a basis, more work of this nature be carried out. The amount of ground work necessary in preparing this map is negligible and its utility is best vouched for by the pilots who have flown this route a great many times and who endorse the extreme utility of the map.

No. 1 - Fair grounds. Telegraph and telephone on grounds. C. & O. Railroad depot 500 yards outside of gate.

No. 2 - Guard of Marines on field. Gas and oil at Yorktown which is 5 miles from field. Telephone on field.

No. 3 - Telephone in house 1/4 mile south of field. Taxi can be had at Glouchester Point. Ferry to Yorktown from Glouchester Point. Telephone Mr. Withers (Reserve Officer), whose home is 1 mile south of field, will gladly render assistance.

No. 4 - Gas, oil, and telephone at Samos, 2 miles from field. Urbana is 12 miles by road.

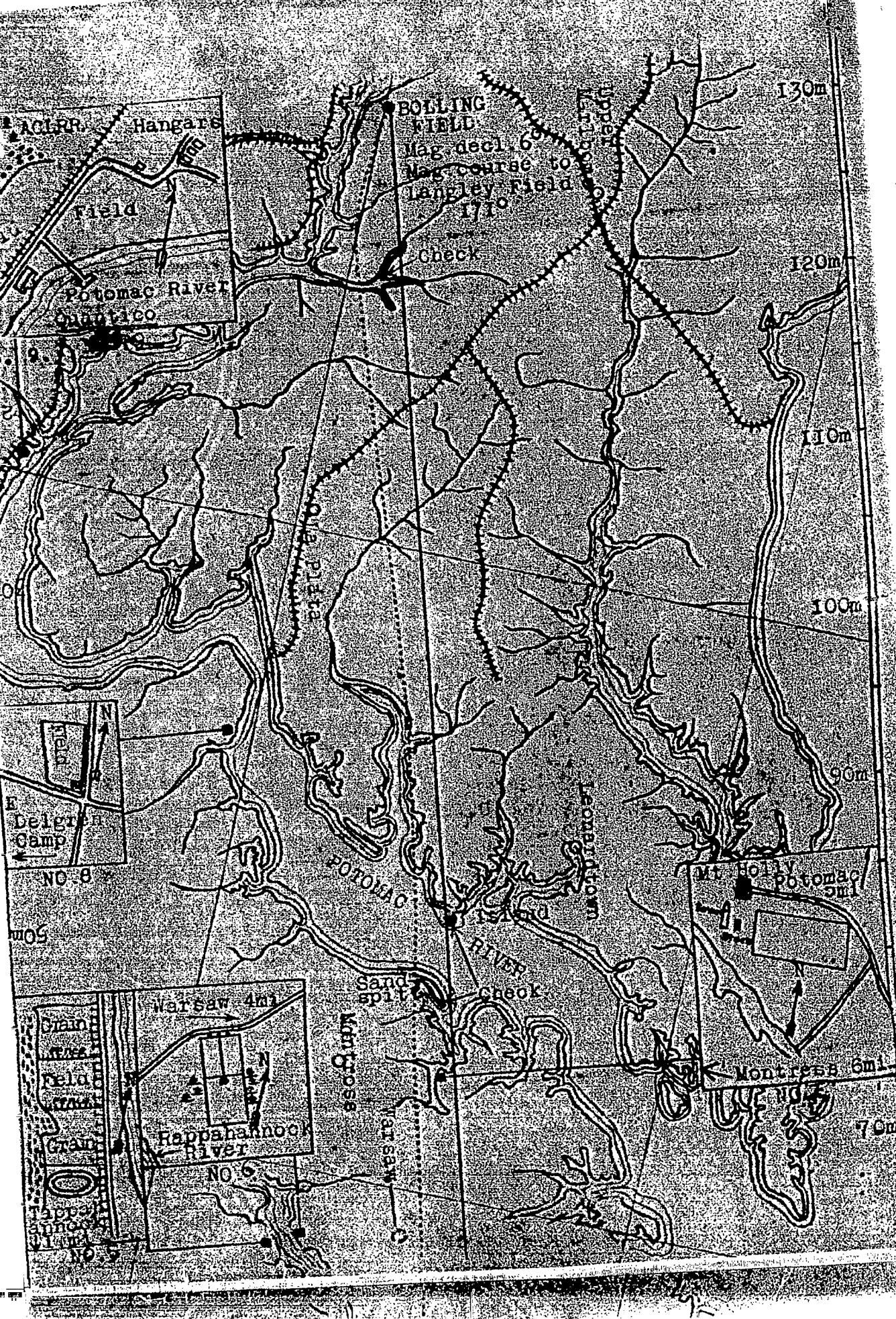
No. 5 - Telephone at house at south of field (Phillip's farm). Gas and oil at Rappahannock which is 1 mile south of field.

No. 6 - Telephone at house at end of field. Judge Chin in Warsaw will take care of pilots.

No. 7 - Mr. T. N. Massey understands aeronautical work. Telephone at Mt. Holly 300 yards from field. Mr. Massey owns field.

No. 8 - Navy Field.

No. 9 - Marine Field.



ACLRR.
Hangars
Field
Potomac River
Quantico
BOLLING FIELD
Mag. decl. 6°
Mag. course to Langley Field
171°
Check
130m
120m
110m
100m
90m
Delgren Camp
NO. 8
POTOMAC
RIVER
Island
Leonardtown
Mt. Holly
Potomac
Sand spit
Check
Montross
Warsaw
Warsaw 4mi
Grain
Field
Grain
Rappahannock River
NO. 6
Montress 6mi
70m

60m
50m
40m
20m
10
0m
Heatsville
Lanchaster
Rappahannock
River
Check
Saluda
Gloucester
Mathews
Check
York River
Yorktown
Williamsburg
James
River
Hampton
Field
Field
Wind mill
N
No. 3
York River
N
York-
town
No. 2
LANGLEY FIELD
Mag. decl. 5½° W
Mag. course to
Bolling Field
351°