

COPY

Wilmerding, Pa.
May 9, 1923.

Mr. Edmond E. Johnson,
764 West End Avenue,
New York City

Dear Sir:

Following your visit in Pittsburgh several weeks ago, we wrote to Captain B. Crossley-Meats and also to the Westinghouse Brake & Saxby Signal Company at London, England, sending you copies of this correspondence.

We have since reviewed the specifications for your test Mono-Rail car which you left with us, and for this particular car would recommend an Automotive type of band brakes controlled by our Automotive Equipment. The adhesion between the wheel and the rail is, of course, the limiting factor in making stops, and on level road bed from an initial speed of 100 miles per hour, the shortest possible stop which can be made will be between 1300 and 1350 feet, which is at a retardation of approximately 8 feet per second.

Mr. J. F. Craig or Mr. J. R. Bartholomew at our New York Office, 165 Broadway, will gladly give you any further information which may be required for the application of Westinghouse Air Brakes to this vehicle.

Very truly yours,

Automotive Division.

HDH-BAO

COPY

Copy to New York

Wilmington, Pa.
May 29, 1923.

Mr. Edmund E. Johnson,
764 West End Ave.,
New York City, N. Y.

Dear Sirs:

In accordance with your request of May 21, we are sending to Captain B. Crossley-Montes a copy of our letter to you dated May 9. We do not have any definite specifications for your Mono-Rail car but those which you gave the writer personally and are, therefore, unable to send Captain Crossley-Montes anything definite along that line. The stopping distance which was estimated is independent of the weight of the vehicle and depends only on the initial speed and the supposition that maximum braking power is applied to all load carrying wheels. This also neglects any variation such as might be caused by wind resistance, slippery rails or other factors.

Our reservoirs can be furnished in sizes ranging in capacity from 600 cubic inches upward as required by the operating conditions and other determining elements. For your demonstration car it is probable that a reservoir of about 2400 cubic inches capacity would be used although this cannot be definitely determined until we make an actual layout for the equipment. Regardless of the size of reservoir, however, the Air Brake system should be entirely independent from any other air auxiliaries as it is most important that sufficient air is available at all times for brake operations without the chance of leakage or depletion through other air devices.

We are at the present time developing a small air compressor for use in automotive service but will not be ready to market this for several months. If you are ready for a compressor before this time it is possible that one of the mechanical tire pumps, of which there are a number on the market, will answer your purposes.

We shall be glad to have you communicate directly with our New York office at 165 Broadway for any further information on this question which you may desire.

Very truly yours,

HEN-BAO

"Maercomb"
Maidehead.

20. May 1923.

Dear Captain Meates.

Mr Johnson has spoken much
of you & your association with Edmund in
this Inshore Enterprise. She told me
that you came on here yesterday & would
like to have met me, being myself also
interested in a friendly way, & I can assure
you I was disappointed at having missed
you. Perhaps we may meet at the time
of the races as she tells me you have very
kindly suggested.

Yours sincerely

E. B. South

ROLLS-ROYCE, LTD

DERBY.

TELEGRAMS:
"ROYCAR, DERBY."

TELEPHONES:
DERBY 1320 (6 LINES)
IN YOUR REPLY PLEASE
QUOTE

D/BP/N9/EM

24th May, 1923.

E. E. Johnson Esq.,
"Larklands"
ASCOT,
Berks.

Dear Sir,

We beg to acknowledge receipt of your letter CM/MW of the 19th inst., accepting our quotation for supplying and fitting bearer blocks to the engine case of one Hawk No.168.

The work will be proceeded with and we anticipate being able to hand over to the Railway Company in the course of a few day's time.

As requested, we will send the engine carriage paid and will render the Invoice to Mr Johnson in the usual way.

Assuring you of our attention at all times,

We are,

Yours faithfully,

FOR AND ON BEHALF OF

ROLLS-ROYCE, LIMITED.

Mr. John De Lozey
SECRETARY

Phone: MAIDENHEAD, 297.

EDMOND E. JOHNSON,
MAESCOURT,
MAIDENHEAD,
BERKS.

MEMORANDUM.

Captain B. Crossley Meates,
Larklands,
ASCOT,

REFERENCE.

MW.

BERKS.

Wed:13: June:23.

Dear Sir,

I enclose herewith quotation and illustration from the Hendee Manufacturing Company, which Mr. Johnson has asked me to send you, and the following is an extract from his letter dated the 2nd instant.

"I find the Ace Motor Cycle will not give sufficient speed, so propose using the "Indian Big Chief 74" good for a speed of 90 to 100 M.P.H.

I am not placing the Order for this machine until I can get a suitable Track.

The reason for the change in Demonstration Car is that I am advised not to form a Syndicate unless and until the demonstrations are over, which means that I have to bear the expense of the Demonstration Car until the demonstrations are over and the Syndicate formed."

Yours faithfully,

M. Welch.

ENCLOSURE

N^o 731

Letter from Hendee Manufacturing Co., dated the 1st instant.
Illustration of "Indian Big Chief 74."

ENCLOSURE

HENDEE MANUFACTURING COMPANY

Indian Motorcycles

BRANCHES
CHICAGO, ILL.
LONDON, ENGLAND.

SPRINGFIELD, MASS. June 1st, 1923.

attention
Haley,

Mr. Edmund B. Johnson,
764 West End Avenue,
Near 97th Street,
New York City.

Dear Mr. Johnson -

This will confirm verbal conversation with Mr. Richards today, for furnishing one INDIAN CHIEF Model 74" motor, together with extras as follows:-

INDIAN BIG CHIEF 74	\$345.00
Allowance for 2 tires and tubes	<u>14.00</u>
	\$331.00
Two side car wheels less tires	18.00
" long side car axles	10.00
One extra handle bar forging	<u>4.00</u>
	\$363.00
5% Excise Tax	<u>18.15</u>
Net	\$381.15

The above price, \$381.15, is net F. O. B. our Factory including drating for domestic shipment.

We understand that this machine is required with gear ratio of 2.4 to 1, which will necessitate making of special sprockets. We are unable, at this writing, to estimate the cost of these sprockets - in fact, a special factory assembly docket will be issued and charged based on factory cost. In placing order, kindly refer to this letter so that the quotation may be adhered to.

Hoping that we may be of service to you in furnishing this INDIAN, we are

Very truly yours,

HENDEE MFG. COMPANY.

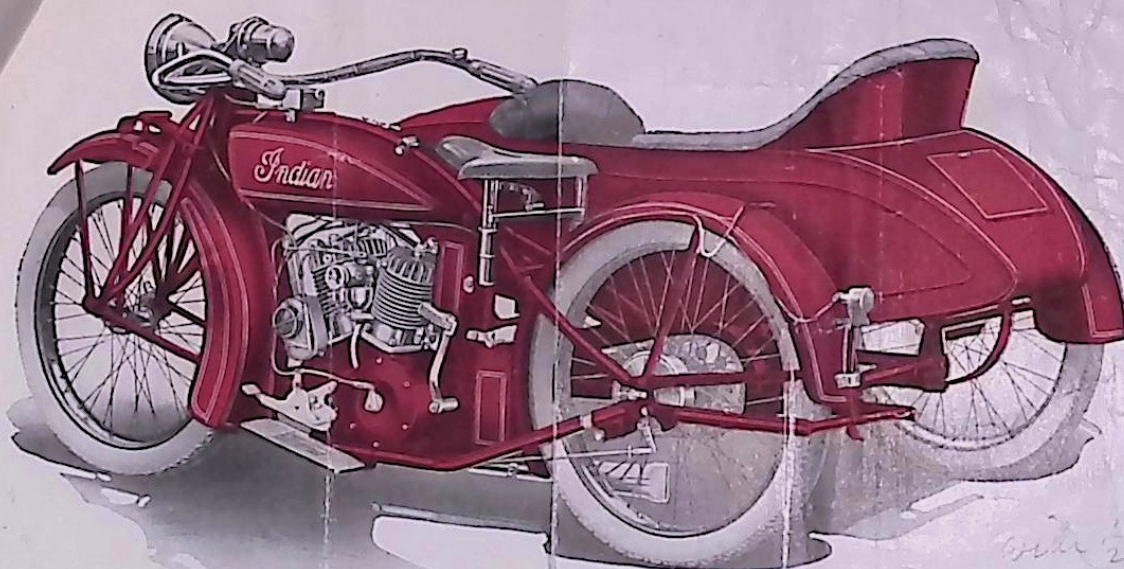
Sales Department.

REH/MFM



Indian Big Chief 74

THE HEAVY DUTY PLUGGER



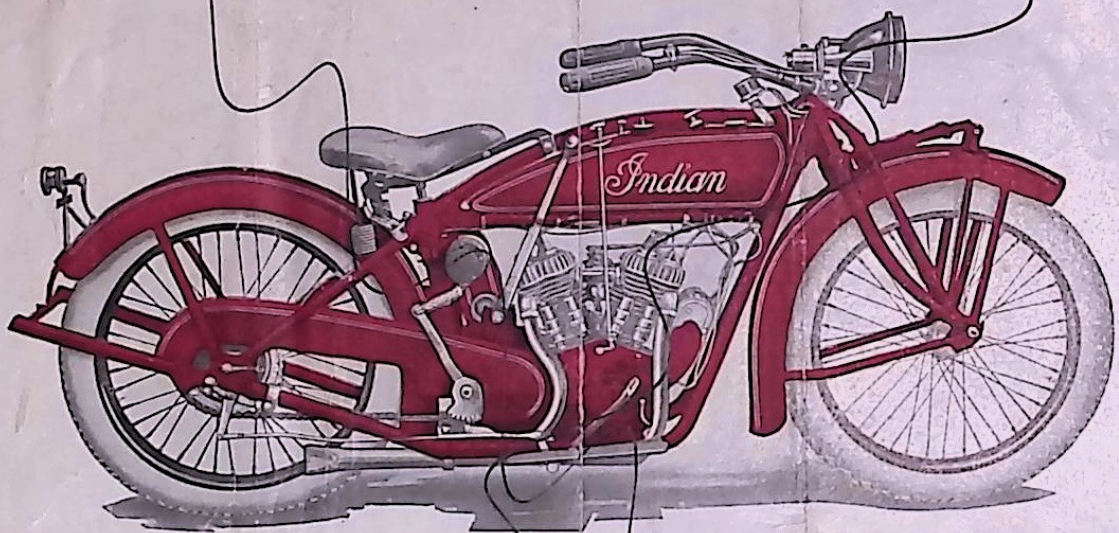
By virtue of its being the very latest addition to the INDIAN line we first present the BIG CHIEF 74, the super-powered, heavy duty plugger. This model is essentially the same as the CHIEF 61 with the exception of the powerplant which is built proportionately larger and stronger to take care of a piston displacement of 73.68 as compared with 60.88 on the CHIEF 61. This additional power and speed is provided to meet the maximum requirements for heavy duty side car service, as well as the exceptional speed demanded by police departments and individual riders who want the fastest machine on wheels.

SPECIFICATIONS

Ammeter, Brakes, Clutch, Generator, Ignition, Motor, Mudguards, Primary Drive, Seatpost, Storage Battery, Switch, see illustrations.	KICK STARTER: INDIAN light pressure type, sector acting on ratchet pinion mounted on main shaft of three speed gear. See cut under "Battery Casing".
CARBURETOR: INDIAN Schebler, Model H $1\frac{1}{4}$ ".	LAMPS: Head and tail, controlled by single switch.
CONTROLS: Throttle and spark by INDIAN "Twist-of-the-Wrist" wire cables. Clutch by left foot rocker pedal. Internal brake by right foot pedal. Valve lift by Press Rod.	LUBRICATION: INDIAN mechanical oiler and hand pump.
FINAL DRIVE: By roller chain $\frac{5}{8}$ " x $\frac{3}{8}$ ". One piece guard.	MOTOR: Power Plus, Bore $3\frac{1}{2}$ "; Stroke $4\frac{1}{16}$ ".
FINISH: INDIAN Red with double gold stripe.	MUFFLER: INDIAN tubular type.
FOOTBOARDS: INDIAN folding type with rubber matting.	SADDLE: INDIAN special Messenger air cushion with spring seatpost.
FORK: INDIAN triple stem type, leaf spring suspension.	STAND: INDIAN hinged type with spring latch.
FRAME: INDIAN Double Tube.	TANK: One piece, forming fuel and oil compartments. Gasoline capacity $3\frac{3}{8}$ gallons, oil capacity $3\frac{1}{2}$ quarts.
GEAR RATIO: Solo 4.8 to 1 on high; sidecar, 5.36 to 1 on high.	THREE SPEED GEAR: Progressive type, direct acting lever.
HANDLEBARS: INDIAN heavy service type with integral head bracket. Triple connection to fork.	TIRES: Firestone, Goodyear or U. S. Traxion Tread, optional.
HORN: Electric motor type.	TOOL EQUIPMENT: Full set of necessary tools in tool box.
	WHEELS: 28" x 3", 40 spoke, CC rims, knock-out axles, black finish.

Indian Scout

THE UNIVERSAL MOTORCYCLE



Light enough for the messenger boy, strong enough for the motor cop and safe enough for a girl to ride. That's why the INDIAN SCOUT is called the Universal Motorcycle.

The INDIAN SCOUT is justly termed the ideal solo mount. Its features of moderate weight, ease of handling, accessibility, low fuel consumption, cleanliness, silence of operation and classy appearance, combined with rugged strength and power, have appealed emphatically to old and new motorcyclists.

SPECIFICATIONS

AMMETER: Mounted on tank.
BATTERY: Vico, 3 cell unit in case on left side.
BRAKE: INDIAN internal expanding.
CARBURETOR: INDIAN Schebler, Model H $\frac{3}{4}$ ".
CONTROLS: Throttle and spark by INDIAN "Twist-of-the-Wrist" wire cables—clutch by left foot rocker pedal. Internal brake by right foot pedal. Valve lift by press rod.
CLUTCH: INDIAN multiple disc type operating in oil.
FINAL DRIVE: By roller chain, $\frac{5}{8}$ " pitch $\frac{3}{8}$ " wide.
FOOT GUARDS: INDIAN folding type with rubber matting.
FORK: INDIAN triple stem type, leaf spring.
FRAME: INDIAN double tube type.
GENERATOR: Splitdorf, driven by belt from transmission drive.
HANDLEBARS: INDIAN type with triple integral anchorage.
HORN: Electric Buzzer type.
IGNITION: Splitdorf magneto.
KICK STARTER: INDIAN light pressure type.

LAMPS: Head and tail, controlled by individual switches.
LUBRICATION: INDIAN Mechanical oiler and hand pump.
MOTOR: INDIAN Powerplus type, twin air cooled cylinders. Bore $2\frac{3}{4}$ ", stroke $3\frac{1}{8}$ ", piston displacement 36.38 cu. in.
MUDGUARDS: Pressed steel, one piece construction.
MUFFLER: INDIAN tubular type.
PRIMARY DRIVE: By spiral gears operating in oil bath.
SADDLE: INDIAN Special Persons with spring seatpost.
SEATPOST: Mounted on springs in mast tube.
SEATPOST: INDIAN hinged type with spring latch.
TANK: One piece, forming fuel and oil compartment. Gasoline capacity 3 gallons, oil 3 quarts.
THREE SPEED GEAR: INDIAN progressive type.
TIRES: Goodyear, Firestone or U. S. Traxion Tread.
TOOLS: Full set in box, specially constructed bracket left hand side next to battery casing.
WHEELS: 26 inch, CC rims, knockout axles, black finish.

EDMOND E. JOHNSON
MAIDENHEAD
ENGLAND

J. C. M. MONO-RAILWAY
764 WEST END AVENUE
NEW YORK CITY

NEAR 97TH STREET
PHONE:
RIVERSIDE 9737

Mon: 15: July: 23

Dear Capt. Crossley Meates

Encls: letter of 13th inst.
just rec^d. from Flexible Co. also leaflets.

Please return the Flexi
letter & say if you think this frame will answer
to raise & lower outer track wheels.

Rec^d. letter from my wife
this morning saying that you cannot entertain
the idea of coming out until Agreement sig^d.

I doubt however (for reasons
already conveyed to you) if the Agreement will be
signed until the demonstrations are over,
never the less I am going to have one more
shot, this time for the U.S. Government on the
question of the Mails, even so we have a poor
case in asking them to pay for the demonstrations.

The facts are that 1500
Tons of letters were carried by Air Mail last
year at the ordinary postage rates i.e. 2¢
per letter, which means a loss to the Air Mail on
any run over 1000 Miles.

at the Air Mail flying field
at Hempstead I was informed on Saturday, that

the power to keep the new type of aeroplane in the air amounted to only 10% of the Engine power available & before long they expected this would be reduced to 5%.

At present the maximum load for each aeroplane is 600 lbs of Mails & it costs 50¢ per mile to operate, when the Service is increased however, each aeroplane will carry a load of 1000 lbs of Mails at a running cost of 15¢ per Mile.

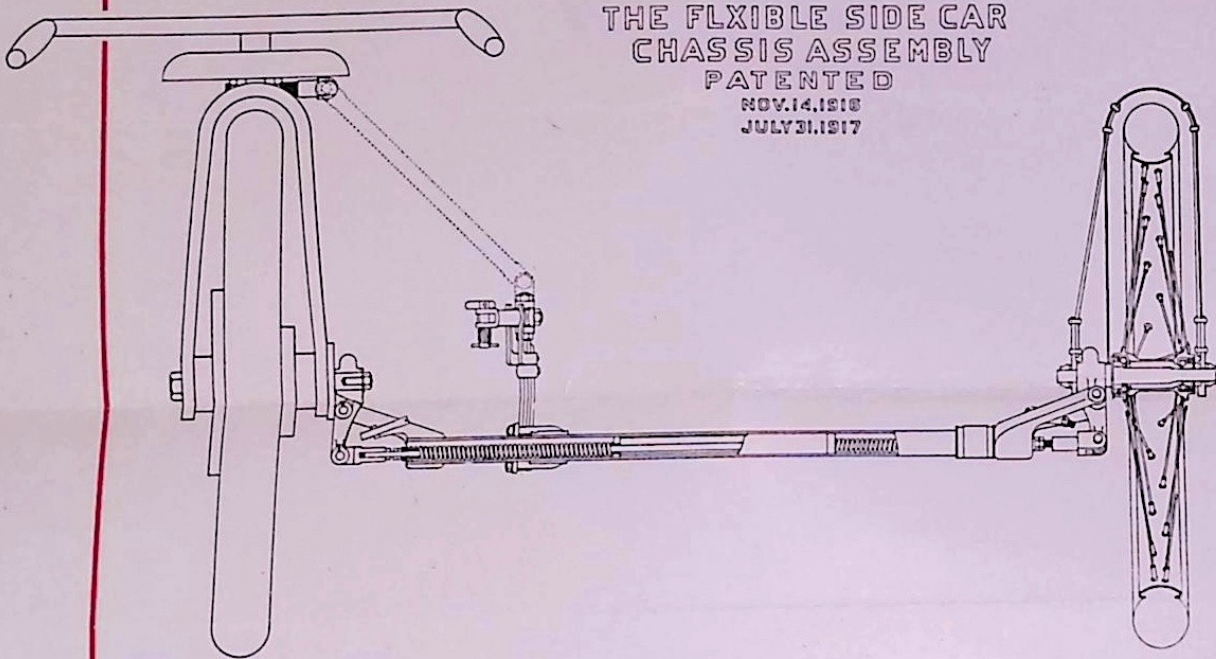
This all goes to weaken our proposition: but I must put up the best case I can in face of these facts.

I only wish you were here for it is a hard fight to have to face single handed.

With kind regards to your wife & family.

Yrs. sincerely

Edmond G. Johnson



THE FLXIBLE SIDE CAR
CHASSIS ASSEMBLY
PATENTED
NOV. 14, 1916
JULY 31, 1917

Note Especially the Simplicity and Sturdiness of Construction

A FEW QUESTIONS ANSWERED

Question. "Can the motorcycle fall clear over?"

Answer. No, the tilting is limited by the adjustable set screws in the rocker supports. The motorcycle and side car wheel can be adjusted to tilt to a limit of thirty degrees either way from perpendicular.

Q. "What keeps the motorcycle up while riding?"

A. The full floating coil springs within the rear tube of chassis keep the motorcycle in balance at all times. This is the original Flxible patented feature.

Q. "What eliminates the side pull?"

A. When you tilt your motorcycle in making a turn the rod in the rear tube of side car chassis transmits the tilting action through the rocker to the side car wheel, at the same time causing the side car wheel to turn in the same direction as the motorcycle is turning.

The combined tilting and turning movement of the Flxible is obtained by having the pivot of the rocker supporting the side car wheel mounted at an angle to the road surface. By practical experimenting and years of use the exact amount of tilting and turning action required to eliminate all side pull has been definitely determined. This Flxible feature is thoroughly covered by patents.

Q. "Can the car also be driven rigid?"

A. Yes, by merely raising the brace bar (see dotted line) from clip and inserting spring pin into lug under seat, another recently patented Flxible feature.

The Flxible Side Car Company,
LOUDONVILLE, OHIO, U. S. A.



ALL AGREEMENTS MUST BE CONFIRMED BY EXECUTIVE OFFICER IN WRITING AND ARE CONTINGENT UPON STRIKES, ACCIDENTS, DELAY OF CARRIERS AND OTHER DELAYS UNAVOIDABLE OR BEYOND OUR CONTROL, PRICES AND DETAILS OF CONSTRUCTION SUBJECT TO CHANGE WITHOUT NOTICE.

The Flexible Company

MOTORCYCLE SIDECARS

Wadonville, Ohio, U.S.A.

OFFICERS AND DIRECTORS

C. F. KETTERING, PRESIDENT
C. DUDTE, CH. BD. DIRECT.
H. H. YOUNG, VICE PRESIDENT
GENERAL MANAGER
G. B. SMITH, VICE PRESIDENT
O. D. CULLER, SEC. & TREAS.
G. B. McCANN, J. F. DERR.

CABLE ADDRESS: "FLXICO"
CODES:

A. B. C. 5TH EDITION IMPROVED
BENTLEYS AND WESTERN UNION.

July 13th, 1923.

Mr. Edmond E. Johnson,
c/o J.C.M. Mono-Railway,
764 West End Avenue,
New York City, New York.

Dear Sir:-

Your favor of the 12th at hand and contents noted and in reply would say that we believe our patented full-flexible chassis would be about the only thing on the market which would fill your requirements, owing to the fact that this type of chassis adapts itself to all road conditions, that is, on riding on the side of the road with a high crown your motorcycle and sidecar wheel are always in a perpendicular position. We are enclosing you such literature as we have illustrating this chassis.

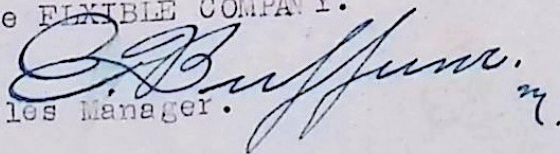
We furnish these chassis either in right or left hand. List price of same is \$75.00 each and on the left hand type there is an extra net charge of \$1.50 each. In as much as you are going to use these for experimental purposes we will be pleased to extend you our regular discount of 25% from the list price, net, f.o.b. our factory, plus tax.

Trusting to hear further and favorably from you, we remain,

Very truly yours,

The FLEXIBLE COMPANY.

Sales Manager.



EB:MJH
Encls.

WHY ACCEPT LESS ?

MANY riders choose their motorcycles very carefully, taking much time to investigate the details of motor, transmission, clutch, brakes, control, bearings, valves, saddle position, spring forks and other parts, to make sure of getting the kind of machine that is best adapted to the service they desire.

Then, having bought *the motorcycle*, such a rider often thinks that the rest of the outfit will take care of itself, so he simply orders "a sidecar", having an idea that all sidecars are about the same anyway.

But is this system wise?

If all sidecars are *not* the same---- if some one kind is emphatically more capable, and will really give much more efficient service, wouldn't it be worth while to choose that particular kind instead of accepting a just-ordinary type?

Be critical.

Decide upon the kind of sidecar just as carefully as you decide upon the kind of motorcycle to buy.

For there *is* a big difference in sidecars.

Differences not only in quality of material and workmanship, but in the most important essentials of design.

Furthermore, these differences in sidecar design will have great effect on the *motorcycle* that you use, so that the care used in obtaining the finest kind of machine will be offset if you attach to it a sidecar that handicaps it by excessive drag and injurious side strains.

Notice how side thrust is done away with and the motorcycle frame relieved of twisting strain by the patented design of the *Flxible* sidecar. The driver leans when going around a turn just as if driving a motorcycle without any sidecar at all, and glides around the curve in perfect balance without any tendency for the car to upset or run off the road at high speed.



Holiday voyagers passing on a narrow wooded lane--note sidecar wheels running along bank higher than road, without tipping motorcycle over, or making any difference in steering.



The Flxi rolls smoothly ahead with the motorcycle in its correct upright position, whether on level surface or on a slanting side slope.

In driving on the left side of a high-crowned road, instead of crowding the motorcycle over at an angle that makes steering difficult and wracks the frame severely by cross-strains, as it would if of ordinary rigid design, the Flxicar allows the motorcycle to continue in its correct *upright* position without being affected by the higher level upon which the sidecar wheel is traveling.

This is the *only* sidecar with which the motorcycle is not forced to lean one way or the other when traveling on side slopes or surfaces which place the motorcycle wheels either higher or lower than the sidecar wheel.

It is the *only* sidecar with which the driver can lean the machine and ride around a corner in the natural way, the same as if driving solo.

It is the *only* sidecar in which side strains are done away with and the frame and forks of the motorcycle saved from their harmful effects.

... chassis made entirely of fine steel which has

frame and forks of the motorcycle saved

It is the **only** sidecar using a chassis made entirely of fine steel which has been carefully heat-treated and scientifically tempered by the special Flxi process.

And riders who have used Flxible sidecars under the most severe conditions in all parts of the world, know that these distinctive features of Flxi construction are of immense value in practical service.



The live action and responsiveness formerly possible only with a solo motorcycle, with, the comfort, safety and companionship of a sidecar.

They mean more speed, more pleasant driving, greater ease of control, greater comfort for the passenger.

The motorcycle is relieved of strain, bending of frames and forks avoided, mechanical troubles greatly reduced by doing away with the jolts and jars transmitted from a rigid-car wheel, and expenses for repairs and upkeep of the motorcycle are kept down.

With **this** sidecar, almost as many miles per gallon of gasoline as with a solo motorcycle---and nearly as great mileage from tires. By eliminating the side drag and heavy pull caused by rigid construction, the Flxicar produces the free action that wears the rear tire of the motorcycle scarcely any more than if no sidecar were used.

So, after choosing the **motorcycle** that will be best for your use, bring the entire outfit up to the same high standard by choosing **the sidecar** that will allow the machine to do justice to its real ability--- the new Flxicar.



The free running of the Flxi, with complete absence of side pull or drag, gives undisputed leadership as a car for real performance.

COPY

GREAT WESTERN RAILWAY
General Manager's Office
Paddington Station

London W2, August 20, 1923

Dear Mr. Johnson:-

I have your letter of the 2nd inst. and the enclosures accompanying same, which I have perused with interest. While we may agree in principle that developments are likely to take place along particular lines, it must be left to the expert to devise satisfactory machinery, as was done in the case of aeroplanes. As you know the idea of flying in the air was in the minds of men long before anything of a practical character was demonstrated, but as soon as the 'key' of flying heavier-than-air machines was discovered, it took only a comparatively few years for the idea to be brought to its present state of perfection. The same will, no doubt, happen with regard to the railways as I cannot think that the present method of travelling in this country is the last word to be said on the subject. I still look forward to the day when the experts will have evolved some machinery that will enable traffic to be moved about from one part of the country to another, over either a mono-rail or the present second rail at much greater speeds than are now attained.

I shall be interested to know from time to time what progress has been made with the aerodynamical control to which you pledge your faith.

With kind regards,

Yours sincerely,

(Sgd) F.J.C. Pole

E.E. Johnson, Esq.,
764 West End Avenue,
New York City, USA.

COPY

Thursday, 2nd Aug. 1923

Felix J. C. Pole, Esq.,
General Manager,
Great Western Railway,
Paddington Station,
London, England

Dear Mr. Pole:

I have read with very great interest your account under the heading of "Greater Speed on Railways" which appeared in the "Weekly Dispatch" on July 22nd last. Your allusion to Mono-Railways having brought the matter under my notice. I trust therefore a few comments on my part will not be out of place.

The following remarks appeared in a paper read before the Society of Engineers on December 17th, 1917.

"It is remarkable that in an epoch of unprecedented acceleration in other directions, so little increase in railway speeds has occurred in the last 60 years. As early as 1846 a speed of 78 miles an hour was regularly attained on the Great Western Railway between Paddington and Didcot. In 1854 - 81 miles an hour was reached. Present day operation of steam and electric railways shows no practical improvement upon this record."

According to your statement a speed of 83 M.P.H. is sometimes attained on the journey from Swindon to London, that beats the 1846 speed by 5 M.P.H. which only shows that no real advance has been made in the matter of speed for the past 77 years.

I am pleased to note that you are of opinion that the MONO-RAILWAY is the solution to the speed question, you suggest however the gyroscopically controlled vehicles, a method which has been attempted by many and did not succeed, the chief reasons for its failure furnished to me at the Engineering Museum, South Kensington were:

- (1) The danger of employing gyroscopes on each vehicle of a train.
- (2) The cost of operating the gyroscopes being more than the cost of the additional rail on the twin rail system.

It was further stated by the same authority that while

Felix J. C. Pole, Esq.

-2-

2nd Aug. 1923

the gyroscopic system was a scientific success, it was at the same time a PROVED COMMERCIAL FAILURE.

The fact remains that not one of these systems have survived and there were quite a few, amongst them being, Brennan, Scherl and Schilowsky all of which had demonstration vehicles (Models of Brennan and Schilowsky types are still to be seen at the Museum) in operation about the same time 1907 to 1910 so that at least 13 years have elapsed since those demonstrations took place.

The AERO-DYNAMICAL CONTROL is the one I advocate in preference to the gyroscopic control and without raising the question of the Scientific merits of either system, I claim that my method supersedes on a commercial basis and that is the factor which decides the matter.

It stands to reason that a continuously moving mechanism such as a gyroscope, which needs additional motive power whether the vehicle be running or at rest, must be more costly to operate than a vehicle controlled by a mechanism, which does not call for a motive power installation to maintain equilibrium.

I quite agree with you that the whole matter is still in its infancy and have only to add that if Mr. H. G. Wells could only draw a picture of "The Mono-railway on the ground" which would produce the effect on the business man of making him give this matter serious consideration, he would have accomplished a timely service in the interests of rapid transit.

I enclose you a leaflet, the statements re railway speeds on page 2 being based on G.W.R. figures.

Yours sincerely,

(Sgd) Edmond E. Johnson

THE WEEKLY DISPATCH

July 22, 1923

GREATER SPEED ON RAILWAYS

By Felix J.C. Pole
(General Manager of the G. W. R.)

What is the meaning of this fact - that in England today a train has just started running that is one of the fastest in the whole world? It travels between Swindon and London, and its speed, on a journey of $77\frac{1}{4}$ miles, attains sometimes 83 miles an hour. It accomplishes the whole journey in 75 minutes.

Are we entering a new railway era? And what will be the effects upon English trade and English life of the quickening of life-blood through its veins - the veins of transport? These are questions which are being asked by intelligent people.

* * * *

COMPETING WITH THE AIR?

I am often asked by my more imaginative friends if the railway which has achieved such feats of swift transport will ever compete with the air. I think that the answer, as far as we can see it today, is decidedly in the negative.

After all, the functions of the two are entirely different. The aeroplane has an unrestricted field of action. It is not bound by rails, by hills or valleys. On the other hand, the railway is not affected to the same extent by wind or fogs. And unless some very radical difference in aeroplane construction is seen, it is obvious that the air, as a method of transport for heavy goods, is likely to be ruled out for an indefinite period.

The only manner in which I could imagine the railways competing with the air would be by the introduction of the monorail-- the single-lined, gyroscopically controlled land way. It is true that before the war some tests with models of this method of transport were shown before the Royal Society, with remarkable results. The miniature gyroscope car attained great speed

and smoothness, and by its ability to run on a single rail seemed to indicate new possibilities of cheapness of construction and the conquering of engineering difficulties.

But the whole thing is still in its infancy. Mr. H.G. Wells has drawn a very attractive picture of it in his "War in the Air" and there, for the moment, it must remain - a fascinating dream for the novelist rather than a serious consideration for the business man.

OPPORTUNITIES FOR INVENTORS

Each new invention breeds a host of appurtenant inventions. When the telephone was invented, for example, it became necessary to invent the switchboard, party line circuits, battery systems, in a word, a thousand and one inventions, without which it would be difficult if not impossible to telephone from New York to Chicago. Mr. Charles Scribner has taken out about 900 patents on telephone systems alone, which shows how vast is the field which is opened when a pioneer invention is introduced. The same applies to the steam locomotive, to the steamboat, to the harvesting machine, to the gas engine, in a word, to every invention of great

C. M. MONO-RAILWAY
764 WEST END AVENUE
NEW YORK CITY

NEAR 97TH STREET
PHONE:
RIVERSIDE 9737

Sat: 1: Sept: 23

omised I now enclose you a copy of reply from Mr. Pole rec^d by last mail, also copy of my letter to him together with copy of a portion of the "Weekly Dispatch" cutting.

I feel this information is going to be of service to me here and I intend to use it for all it is worth. Many thanks to you for the cutting.

Could you find out for me the various aeroplane lines from London to the Continent and elsewhere and give in each case the distance in miles together with the fares. Also the distance to the same places by Rail together with the 1st Class fares?

I want this information for a Commercial Statement I shall be preparing shortly. It will form the basis for the justification of increased Mono-Rail fares. The aeroplane fare I believe is about double 1st class R.M. fare. I should like to compare over several services the aeroplane fares per mile, with the R.M. fares per mile. I guess you will see what I am after.

Inventions #102 #103 #105 and #106 are now all completed signed and sealed.

I may say that I have simplified the Aerofoil incidence control, having cut out the intergeared pendulum and one of the valve chests and substituted a switch Value Pendulum.

This control with modifications I propose using for Invention #104 plus a diaphragm chamber, an additional valve chest and a Gyroscope. A miniature Bogie or truck is placed under the center of the vehicle, the switch Value will be mounted on and athwart this truck a hollow King pin (taking the place of the pendulum) passes through a hole in the bottom of the vehicle (this King pin carries no weight

ENCLO

1. Weekly Dispatch. Plot.
2. Copy of my letter to Pole dated Aug 2nd 23
3. "Pole" "me" "20th 23
4. Opportunity for Invention Cutting.
5. Post opportunities by Evans.
6. Diverse Invention System, which will give you an idea of how I have been recording the Inventions mentioned.

it is simply free to slide through the bottom of the vehicle) the hollow King pin forms the air inlet to the switch valve and it moves from side to side upon curves just like an inverted pendulum except that it leaves out gravity. Gravity is taken care of by a Gyroscope which is intergared with this control system.

This Invention is simply for the purpose of keeping others from the field. It is more complicated than the Pendular system, it offers more resistance, more friction and more working parts & for those reasons I consider it is not so good a control, never the less I must seek protection for the reason already intimated.

Invention #107 is the one which has given me the most amount of work, it involves 4 or 5 sheets of drawings with no end of detail. In addition to the list of Inventions sent you, I have added #113 Means for preventing derailment of, and brakes for, Mono-rail vehicles.

I am proceeding with caution and you may think that I am going to a lot of unnecessary trouble, but I hope the day will come when we shall reap the benefit of the work upon which I am now engaged.

Before I tackle the Car manufacturers, I have a strong feeling that I should approach the U.S. Government. Everyone here tells me that I won't stand the slightest chance & the more I hear that said the more I want to go. I have just heard that the U.S. Government have taken over the manufacture of the Liberty Engine, & that is another reason why I should go to them, more-over new laws will have to be framed to meet the new conditions called for by the Mono-Rail.

The Government have the Mails and also the Military to take into consideration and so why not the demonstrations under Government eyes. I am afraid after all the caution I have exercised I may in the finish take the imprudent step of ignoring the advise of all here. They tell me the U.S. Government is worse to tackle than the British Government.

I have not yet come to a decision upon this matter, though I am thinking it over, I should like a still stronger case & other points may turn up within the next few weeks which may influence my decision.

I suppose you have heard that my lot have gone to the Seaside in the caravan. A bit of a venture without me: but the fact remains that they have done it. Would you be so kind as to give it a look when they return, to see if it is protected for the winter, water out &c.

My kind regards to your wife & Roy who must be a big chap by now.
Yrs sincerely
Edmund S. Johnson

EDMOND E. JOHNSON
MAIDENHEAD
ENGLAND

J. C. M. MONO-RAILWAY
764 WEST END AVENUE
NEW YORK CITY

NEAR 97TH STREET
PHONE:
RIVERSIDE 9737

Fri:28:Sept:23.

Captain B. Crossley Meates,
Larklands,
Ascot,
Berks, England.

Dear Captain,

Not having heard from you in reply to my letter dated August 18th, I thought it better not to delay matters any longer, so I have prepared a rough preliminary Drawing of the proposed 40 ft. Demonstration Car, of which I enclose a blue print.

In the first place as to the mounting of the Engine and the Prop, I found that if the Engine were mounted as near the Nose as possible the length of shaft to drive the prop including for Nose structure to carry same would be 11 feet as against 8 feet if the Engine were mounted aft. In these circumstances the advantage lies not only in the shorter length of driving shaft called for aft but also more seating accommodation is afforded and in addition to that it will be cheaper to mount, as the front Prop carrying structure will be avoided and I might mention a reduction in air resistance will occur to the omission of same.

due

With the Engine mounted in the rear comes the question of the Radiator. I am told at 100 M.P.H. the Liberty Engine will require 60,000 sq.ft. of radiating surface, which to me seems a lot. No space is allocated to the radiator in the blue print, a suggestion has been made that it should be placed around the tail in the space allotted to Baggage and Mails, this however would mean a specially designed radiator and a costly one to build. This and many other questions arise upon which I should like to have your opinion.

The mens lavatory will have to be moved forward to allow space to get at the Engine and this will cut out another seat reducing the passenger accommodation to 10 instead of 11.

Since producing this Blue Print, I have learnt that the maximum efficient Angle of Incidence is 16 degrees, and if that is so the trailing edges of the aerofoils would actually touch the body of the Car at maximum Incidence, hence a pocket would be formed which would more or less destroy the action of one of the Aerofoils, to overcome this I think it will be essential to give up all idea of mounting one pair of Aerofoils seeing that the maximum width 9 ft.8 ins. at Maximum Incidence is all that the twin rail system will allow us.

I therefore propose mounting two pairs of Aerofoils fore and aft instead of the one pair as indicated in the Blue Print.

I am also told the less the span (chord) of an Aerofoil the greater its efficiency. If that is so additional aerofoils are clearly indicated both for efficiency and to avoid air pockets between the trailing edges and the sides of the Vehicle.

EDMOND E. JOHNSON
MAIDENHEAD
ENGLAND

J. C. M. MONO-RAILWAY
764 WEST END AVENUE
NEW YORK CITY

NEAR 97TH STREET
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RIVERSIDE 9737

Captain B. Crossley Meates.

-2-

Fri:28:Sept:23.

As to the mounting of the Aerofoils I may have this tested out here very shortly because the Curtiss Aeroplane Co., Garden City, Long Island have offered to make a Model to the said blue print size 24" long by 6" Maximum height, they inform me they have the best wind tunnel in the United States and will test for us the best position in which to mount the Aerofoils. It all depends however upon what price they quote, they say they will not charge me more than cost price.

Now as to the weight of the Vehicle I cannot help feeling that upon this point you do not fully appreciate that additional weight is of but very little importance so long as the additional weight will not raise the C. of G. for instance at 150 M.P.H. Air Resistance is from 10 to 100 times more important than weight.

The following table should serve to bring my point home.

Table of approximate H.P. required to overcome resistances with a Streamline Car and ball or roller bearings in still air and on level track. Effective Area 20 sq. feet.

Resistances	M.P.H.	Feet per Second.	5 Ton Vehicle.	10 Ton Vehicle.	20 Ton Vehicle.	40 Ton Vehicle.
Air	100	146.7	171	171	171	171
Rolling.	100	146.7	4	8	16	32
Total.			175 HP	179 HP	187 HP	203 HP.
Air	150	220	570	570	570	570
Rolling	150	220	6	12	24	48
Total			576 HP.	582 HP	594 HP	618 HP.

Take for example a 10 Ton Car compared with a 20 Ton Car at 150 M.P.H. it simply means that twice the weight only calls for an additional 12 H.P. and this compared with 570 H.P. is only a matter of 2.1%, I contend it matters not therefore whether the shell of the Car be of Aluminium or of say 1/16" Steel, the additional weight is not worth consideration except from the C.of G. point of view, what say you?

I have been taking the question up of Aerofoil control with the Sperry Gyroscope Co., who inform me that they have a Gyro out now capable of taking care of not only Gravity but Centrifugal Force. They claim that gravity and centrifugal force act upon their Gyro in the same manner, that rounding a curve at high speed will only occupy a short period with the result that any error introduced is negligible.

EDMOND E. JOHNSON
MAIDENHEAD
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J. C. M. MONO-RAILWAY
764 WEST END AVENUE
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NEAR 97TH STREET
PHONE:
RIVERSIDE 9737

Captain B. Crossley Meates.

-3-

Fri:28:Sept:23.

They further state that on a Mono-Rail Car the error introduced when rounding a curve would cause the Car to tilt inwardly which they claim would satisfy our requirements as to safety.

I intend to investigate this matter still further though I fear they will ask a stiff price.

I have now completed Inventions 102, 103, 105, 106, 109 and 113, and have 104, 107 and 114 on the way.

I shall be glad to receive any suggestions you can possible give in connection with the Blue Print enclosed.

Yours sincerely.

Edmond E. Johnson



Blue Print of Demonstration Car.

EDMOND E. JOHNSON
HAIDENHEAD
ENGLAND

J. C. M. MONO-RAILWAY
764 WEST END AVENUE
NEW YORK CITY

NEAR 97TH STREET
PHONE:
RIVERSIDE 9737

Mon: 1: Oct: 23

Dear Captⁿ /

To enable you to form a better opinion as to the shape of the proposed Demonstration Car I enclose Blue Print scale 1" to foot indicating maximum section of body.

The widest measurement 5ft occurs as in the Bakerloo cars upon the level of the arm rests.

Tell me what you think of this section and what improvements you may have to suggest, also how does it compare for space with the big Aero-plane fuselages.

I presume by this time you will have received my letter of the 28th ult along with Blue Print enclosure 806.

As soon as I know your views upon both of these Blue Prints, I shall be able to get along better, mean while I am leaving the Commercial side in abeyance.

The Caravan it appears made the trip without mishap.

I propose to attend the ~~the~~ Air Circus at the Michell flying field on Oct 18th

Best wishes

Yrs sincerely,

Edmond. E. Johnson



The Aeroplane has beaten the Railway already, Paris to Constantinople by airway 5hrs 1/10, 1st Class Rail fare 5hrs 12/8.60. Could you ascertain the distance in each case, as I have failed to get this information here.

Mat. Disp. & Salv. Sec.

HER/cm

October 3, 1923

Mr. Edmond E. Johnson
c/o J.C.M. Mono-Railway
764 West End Avenue
New York City

Subject: Liberty Engines

Dear Sir:

Reference is made to your letter of September 28th, inquiring as to the possibility of purchasing a low compression Liberty airplane engine.

I have been directed by the Chief of Air Service to inform you that a few Liberty 12 cylinder, high compression, 400 h.p. engines are being held for sale to the public at a price of \$2,500.00 each f.o.b. cars, Little Rock, Arkansas, for domestic use and \$4,000.00 each for export purposes.

It may be possible that a low compression, Navy type engine can be selected from the number of engines in storage. These engines, however, are all tractor type and were designed for use with a tractor propeller. As a matter of fact, no pusher propellers of any description are available for sale in the Army Air Service. Probably an engine of the type desired, as well as a pusher propeller, could be secured from the Navy Department. The sales of that Department are being consummated thru the Central Sales Section, Navy Department, Navy Yard, Washington, D.C.

In order that you may determine whether or not the Liberty 12, 400 h.p. engine is suitable for the purpose intended, would state that the engine is of a 12-cylinder V type having a 5" bore and 7" stroke. It develops 400 h.p. at 1700 r.p.m. The gasoline consumption is approximately 35 gallons per hour with wide open throttle at 1700 r.p.m. and oil consumption of approximately $1\frac{1}{2}$ gallons per hour.

Letter to E.E.Johnson
10/3/23

- 2 -

Its installation dimensions are as follows:

Over all length	69-5/64"
" " width.....	27" (approx.)
" " depth.....	42-7/32"
Height above bed	28-1/64"
Depth from bed.....	14-13/64"

Referring to the postscript on your letter, would advise that the question of radiating surface required for the Liberty engine at 150 m.p.h. is a technical one that cannot be answered inasmuch as the conditions under which the engine is required to operate are of paramount importance. It may be stated, however, that the radiator of the DH-4 airplane used with the Liberty 12 engine has the following dimensions:

Height	49-7/16"
Width.....	28-7/16"
Depth.....	5"
Full capacity, approximately	90 gallons per minute

Very respectfully,

E. G. HARPER
1st Lieut., Air Service
Acting Chief, Material
Disposal & Salvage Section

EDMOND E. JOHNSON
MAIDENHEAD
ENGLAND

J. C. M. MONO-RAILWAY
764 WEST END AVENUE
NEW YORK CITY

NEAR 97TH STREET
PHONE:
RIVERDALE 9737

TPW:M-9424

Tuesday, October 16, 1923.

Messrs. Curtiss Aeroplane & Motor Co. Inc.
Garden City, Long Island.
New York.

Dear Sirs:-

In reply to your letter of the 15th instant, I beg to confirm having handed you yesterday, check of One Hundred Dollars (\$100.00) as requested.

With Ten 12 ft. by 3 ft Aerofoils at 36 sq. ft. the total surface will be 360 sq. ft. with the weight of the Vehicle reduced to 10 Tons, the maximum angle of Incidence reduced from 16° to 14°, the C of G 60 inch above Mono-Rail and C of P 80" above Mono-Rail, I record the calculations for arriving at "landing speed" as follows:- *(see sketch dated Oct 15th)*

As $\begin{cases} 60": 4" \\ 30": 2" \end{cases}$: : 20,000 lbs : 1333 lbs

As 80":60" : : 1333 lbs : 1000 lbs

$L \approx K A V^2$

$1000 \approx .0025 \times 360 \times V^2$

$V = \sqrt{\frac{1000}{.0025 \times 360}} = 33.3 \text{ M.P.H.}$

The landing speed 33.3 M.P.H. is the theoretical figure without allowing for disturbance which will be determined amongst other things in the tests you are about to apply.

I think we are agreed that Sidewind pressure and centrifugal force will be treated by you as indicated in my letter to you of the 9th instant. In regard however to the former Mr. Miller raises the point that under certain conditions an addition 20° of



AND E. JOHNSON
MAIDENHEAD
ENGLAND

J. C. M. MONO-RAILWAY
764 WEST END AVENUE
NEW YORK CITY

NEAR 97TH STREET
PHONE:
RIVERSIDE 9737

2/

Messrs. Curtiss Aeroplane & Motor Co. Inc.

Incidence might be called for. I do not quite follow the reasoning for this statement. It should be borne in mind that each pair of aerofoils is acting in series so that whatever additional Incidence called for would be halved.

The maximum Incidence as above stated has now been reduced to 14° but if 20° has to be added to this, the maximum Incidence would then become 34° .

I will be glad if you will be kind enough to give this point further consideration, bearing in mind, that the outer track wheels take the load until the flying speed has been attained.

Perhaps you will be good enough to write informing me your opinion and how the additional Incidence is arrived at.

Yours faithfully,

EEJ:FO

(Copy)

THE CURTISS ENGINEERING CORPORATION
GLENN H. CURTISS, PRESIDENT
GARDEN CITY, L. I., N. Y.

RETURN THIS ORIGINAL COPY
AFTER YOUR REPLY IS RECORDED

EXPERIMENTAL AND AERONAUTICAL RESEARCH LABORATORIES AT GARDEN CITY, LONG ISLAND

TO Mr. Edmund E. Johnson
764 West End Avenue
New York City

SUBJECT: Mon: 15: Oct: 23

T.P.W:M-9424

Dear Sir:

We wish to acknowledge receipt of your letter of October 15th in which you supply us with additional data concerning proposed wind tunnel test of your mono-rail car with aerofoils mounted. This will also confirm your conference on October 15th with our Mr. Hubbard and with our Mr. Wright, in which you further explained your drawing, Enclosure #811, in your letter of October 15th.

During this conference tentative figures indicated that it will be necessary to add two extra sets of aerofoils which would increase the cost of the contemplated test by \$60⁰⁰.

You also requested us to make an ink tracing of your model drawing, with three blue prints, on which we estimated \$15⁰⁰.

In conjunction with our estimate of October 1st in letter #9215, the above brings the total amount of your order to \$494⁰⁰.

We will proceed at once with this work in order to complete the model within two weeks.

We will appreciate receiving your check for \$100⁰⁰ covering preliminary work involved.

We shall also desire to receive an additional \$200⁰⁰ upon completion of the model; the balance of the order, namely \$194⁰⁰, to be received on completion of the test and delivery to you of test report.

We trust that the above terms will be satisfactory to you.
Very truly yours
(Sgd) Curtiss Aeroplane & Motor Company Inc.
F. T. Russell
Vice President

P.S. It is further the understanding of this Company that the Model constructed under the terms of this agreement

is to be the property of Mr. Edmund E. Johnson to be delivered to him upon request. F.T. Russell.

YOUR REPLY HERE

Mr. F.P. Wright
Chief Engineer

Mon: 15: Oct. 23.

Messrs Curtiss Aeroplane & Motor Co. Inc.,
Clinton Road,
Garden City, L.I.

Dear Sirs:-

T.P.W: M-9215.

In accordance with the suggestion made by both Mr. Hubbard and Mr. Miller I have made another drawing of the Model Car Scale $\frac{1}{4}$ " to foot, and as arranged I have indicated 3 pairs of Aerofoils.

X
Each Aerofoil now measures 12 ft by 3 ft giving 36 square feet surface and for the six Aerofoils a total surface of 216 square feet. The chord at the top of each Aerofoil should however be reduced in order to lower to Center of pressure so as to correspond with the Center of Gravity. This would take about 9 square feet off each Aerofoil which would then give 6 Aerofoils at 27 sq. ft. 162 sq. ft. This is considerably larger than those suggested in my letter to you of the 9th inst.

You will observe the trailing edge clearances (at maximum efficient incidences 15 Degrees) are now at Nose 1-2" center 1-2" and at tail 2-2"

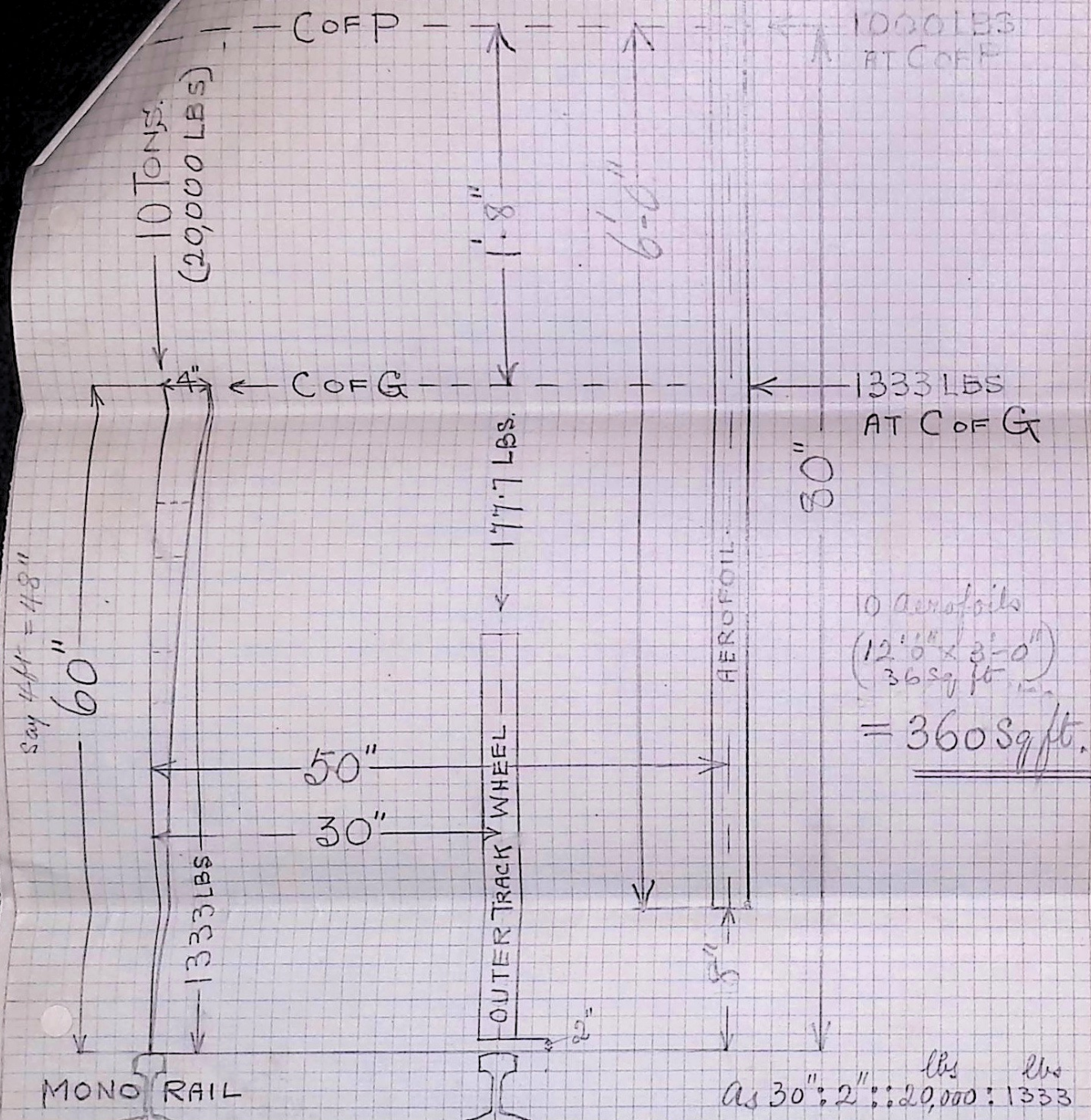
I note you think a 20 ton car is out of the question, and you suggest that you will determine from the wind tunnel tests the maximum weight car the aerofoils are capable of stabilizing.

Assuming the weight of the car to be ^{10 Tons} 15 tons the flying speed in still air and on level straight track might be approximated from the following data.

G of G 5 ft. above Mono-Rail head.
Aerofoil 50 inches from Mono-Rail.
outer track wheel 30 inches from Mono-Rail
2" list at outer track wheel will remove
G of G 4" from the perpendicular thus:-

(See Sketch
Next page 1a)

Mon. 16. Oct. 23



0 Aerofoils
 (12'0" x 3'0")
 36 sq ft
 = 360 sq ft.

As 30": 2" :: 20,000 lbs : 1333 lbs
 As 30": 4" :: 1333 : 177.7
 As 80": 60" :: 1333 : 1000

$L = KAY^2$ $K = \text{Lift Coef of Aerofoils} = .0025$
 $1000 = .0025 \times 360 \times Y^2$
 $V = \sqrt{\frac{1000}{.0025 \times 360}} = 33.3 \text{ MPH} = \text{Landing Speed with } K$
 (No interference)

October 15, 1923.

As 60": 4" :: 15 tons : 1 ton

To attain a stabilizing or flying speed the aerofoils must be capable of producing a side Thrust (the horizontal component to lift) of 2000 lbs.

With 2 Aerofoils	Thrust	1000 lbs each
" 4 "	"	500 " "
" 6 "	"	333 " "

With 2 Aerofoils	---
" 10 "	" "

10 TON CAR
THRUST 1000 LBS
500-lbs each
100 " "

With the above exceptions my letter to you of the 9th inst substantially holds good, and I accept your estimate dated the 1st inst. the Model to be made as per drawing enclosure No. 811 and the tests to be conducted as arranged. Model to be completed in two (2) weeks time and the tests to be completed the week following as arranged.

Reference The Seaboard National Bank, Mercantile Branch, (Mr. H. B. Groves Credit Dept.) 115 Broadway, New York City.

Yours faithfully,

Encls:
#811 Drawing of Model Car Scale 3/8" to foot

EDMOND E. JOHNSON
MAIDENHEAD
ENGLAND

J. C. M. MONO-RAILWAY
764 WEST END AVENUE
NEW YORK CITY

NEAR 97TH STREET
PHONE:
RIVERSIDE 9737

Tues: 9: Oct: 23

Messrs. Curtiss Aeroplane & Motor Co., Inc.,
Clinton Road,
Garden City, L.I.

Dear Sirs:-

TPW:M-9215

In reference to your letter to me of the 1st inst. and my call upon your Mr. Hubbard on the Third inst.

As arranged I have prepared a fresh full size drawing of the proposed Prototype Model Car which now measures 20 inches long and scales $1/2"$ to foot when compared with the 40 foot Demonstration car.

As suggested in my letter to you of the 26th ult. I have now indicated two pair of aerofoils of half the width, which at maximum incidence 16° gives a clearance of $1:2"$ between the trailing edge of the Nose Aerofoil and the body of the full size vehicle and $1:7"$ rear clearance. Each aerofoil scales $9'-0"$ x $2:6"$ giving $22\frac{1}{2}$ square feet per Aerofoil or 90 square feet of surface for the four aerofoils.

Your Mr. Hubbard desired some further data regarding Demonstration car in order that the correct size Aerofoils could be calculated, also the lower support of aerofoils to clear outer track wheels has yet to be settled and for these reasons the drawing that I am sending you is unfinished, as you will no doubt find the size indicated may have to be modified to meet the following estimated particulars:-

Weight of car loaded 20 tons.

(1) Gravity is the first consideration and with a $2"$ list at $2' 8"$ from the Mono-Rail. I calculate that the Aerofoils will be called upon to carry a load of $1\frac{1}{3}$ tons due only to the weight of the car (as $30": 20\text{ tons} = 1\frac{1}{3}\text{ tons}$) so that each Aerofoil under this heading should be capable of carrying a load of 666 lbs, this load of course, becomes less as the list decreases.

EDMOND E. JOHNSON
MAIDENHEAD
ENGLAND

J. C. M. MONO-RAILWAY
764 WEST END AVENUE
NEW YORK CITY

NEAR 97TH STREET
PHONE:
RIVERSIDE 9737

--2--

Messrs. Curtiss Aeroplane & Motor Co. Inc.

(2) Side Wind Pressure might be calculated same as for Aeroplanes.

(3) Centrifugal force is arrived at by treating maximum curves as being of one-half mile radius.

The description, pages four and five herewith should give a clear idea as to the mounting and duty the Aerofoils will be called upon to perform.

In the demonstration car each truck will be fitted with 200 HP to 250 HP motors for track wheel drive and in addition the vehicle will be provided with a 375 H.P. low compression pusher type Liberty Engine for propeller drive.

I estimate the car with equipment to give a cross sectional area of 80 square feet or an effective area of 20 square feet and from this the following table of approximate H.P. required to overcome resistances with ball or roller bearings in still air and on level track has been arrived at.

Rolling friction is taken at 3 lbs per ton
Air Resistance = $0.032 \times E_a V^2$

Where E_a = Effective Area of Body,
trucks, aerofoils, etcetera.

EDMOND E. JOHNSON
HAIDENHEAD
ENGLAND

J. C. M. MONO-RAILWAY
764 WEST END AVENUE
NEW YORK CITY

NEAR 97TH STREET
PHONE:
RIVERSIDE 9737

--3--

Messrs. Cnntiss Aeroplane & Motor Colins.

MILES PER HOUR	FEET PER SECOND	H.P. to overcome Resistances.			Track wheel drive	Propeller drive
		AIR	ROLLING	TOTAL	H.P. at 75% efficiency	H.P. at 60% efficiency
20	29.3	1.4	3.2	4.6	6.1	7.7
30	44	4.6	4.8	9.4	12.5	15.7
40	58.6	10.9	6.4	17.3	22.1	28.8
50	73.3	21.3	8.0	29.3	39.1	48.8
60	88	37	9.6	46.6	62.1	78.3
80	117.3	87	12.8	100	133	167
100	146.7	171	16.0	187	249	312
120	176	295	19.2	314	419	524
150	220	570	24.0	594	792	990

I have intentionally named the weight of the car high at 20 American tons because I want to determine if two pairs of aerofoils are capable of performing such heavy duty, as a matter of fact the weight of the car loaded should not exceed 15 American tons.

EDMOND E JOHNSON
HAIDENHEAD
ENGLAND

J. C. M. MONO-RAILWAY
764 WEST END AVENUE
NEW YORK CITY

NEAR 97TH STREET
PHONE:
RIVERSIDE 9737

--4--

Messrs. Curtiss Aeroplane & Motor Co. Inc.

I should estimate that the C of G *about 5 feet*
would lie somewhere ~~between three and four feet~~
above the Mono-Rail head. It is obvious that
the lower the C of G the greater the relief to
the aerofoils.

I propose giving you a call to-morrow
afternoon at 2:15 if convenient to you when I will
bring with me a model truck and permanent way as
arranged.

Yours faithfully,

Enclo Description- re Aerofoils
810- drawing under separate cover.

(copy)

Curtiss Aeroplane & Motor Co. Inc
Garden City. L.I.

Mr. Edmond. C. Johnson
J. C. M. Mono Railway
764 West End Avenue
New York City. N.Y.

Oct 1st 1923.

Dear Sir,

In connection with your recent interview with Mr. Gilmore, please be advised that we have estimated that we can construct a model of your car and conduct tests of same for a cost of \$419⁰⁰. We shall be pleased to hear from you as to whether or not you wish us to proceed on your model.

Very truly yours

(sgt) Curtiss Aeroplane & Motor Co. Inc
J. P. Wright
Assistant Chief Engineer.

T. P. W.: M-9215.

EDMOND E. JOHNSON
MAIDENHEAD
ENGLAND

J. C. M. MONO-RAILWAY
764 WEST END AVENUE
NEW YORK CITY

NEAR 97TH STREET
PHONE:
RIVERSIDE 9737

Captain B. Crossley-Meates,
Larklands,
Ascot,
BERKS. England.

Thurs:18:Oct:23.

Dear Captain,

I have now to report to you that Mono-Railway developments have taken an unexpected turn as the result of a sheer chance occurrence, brought about in the charms of a distant picturesque country suburb groomed to the last degree, in keeping with the beautiful grounds of the millionaires which abound in this garden of Palaces.

It came about in this way, I was staying the night with my sister-in-law at Hempstead Long Island who had previously ascertained for me that the Liberty Engine was manufactured by a local firm and so the next morning she drove me in her Car to the factory of Messrs Curtiss Aeroplane and Motor Co., Inc. located in a most gorgeous garden in the outskirts of Garden City.

I had the good fortune to attain a conference with the Chief Engineer Mr. Gilmore and the Assistant Chief Engineer Mr. Wright.

Mr. Gilmore after having furnished me with certain particulars in connection with the Liberty Engine examined a Blue Print of the 40 ft. demonstration car which I exhibited to him, who after much consultation expressed himself as being extremely interested in our project. At this point I left Mr. Gilmore and Mr. Wright (deeply engrossed in the proposition) to get some further particulars which I luckily had in the Car outside, for I foresaw some deep scheme brewing.

Upon my return after some deliberation Mr. Gilmore made me a suggestion and an offer.

The suggestion was that if I would be guided by his advice, I would not at the present moment incur the expenditure of one cent on building a Demonstration Car unless and until some further data had been obtained. The offer was that the Curtiss Co., would be prepared to build us a Prototype Model for Wind Tunnel testing to determine the necessary data which he considered an essential preliminary preparation to building the Car in contemplation.

I pointed out to Mr. Gilmore that much as I should like to accept his offer, I could not entertain it as it would need a Syndicate to be formed to meet the expense; he however informed me that they had a special department devoted to the building of Models and if I choose to let them build a Model he would undertake that all information would be kept confidential, and moreover as

EDMOND E. JOHNSON
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764 WEST END AVENUE
NEW YORK CITY

NEAR 97TH STREET
PHONE:
RIVERSIDE 9737

Captain B. Crossley-Meates

-2-

Thurs:18:Oct:23.

the matter was of such great interest they would put the job through for me at cost price.

On hearing this news I was overwhelmed, it fairly took the wind out of my sails and so too cut a long story short you will see by the enclosed correspondence that a Contract has been entered into at \$ 494 ⁰⁰ for the whole job.

I have now learnt that the Curtiss Co., will suffer a loss as they omitted to estimate for the Rolling moment apparatus which they will have to construct specially in order to conduct the wind tunnel tests and so taking everything into consideration I think you will agree that (although I have not attempted to make a better arrangement than the one which has matured) I might have done worse.

The Curtiss Co., say the Demonstration Car must not exceed 10 tons weight which means that the shell must be of Duralumin to weight between 2 and 3 tons, the trouble is to get sufficient Aerofoil surface in the restricted space available, even with the weight cut down to 10 American Tons, it requires 5 pairs of Aerofoils.

The estimated weights work out as follows:-

	Lbs
Shell (in Duralumin)	6000
Liberty Engine, Radiator and Water.....	1300
2 - 250 H.P. Engines with Radiator and H ₂ O.....	1600
Aerofoils 360 sq.ft. @ 2 lbs sq.ft.....	720.
Gasoline.....	1200
Oil.....	100
Trucks (Bogies) say.....	6000

	16920 lbs.
12 Passengers at 160 lbs.....	<u>1920</u>
	<u>18840.</u>

$\frac{18840}{2000}$ equals 9.4 Tons, say 10 TONS.

I enclose Copies of correspondence with the Curtiss Aeroplane and Motor Co., Inc., Garden City, L.I.

EDMOND E. JOHNSON
MAIDENHEAD
ENGLAND

J. C. M. MONO-RAILWAY
764 WEST END AVENUE
NEW YORK CITY

NEAR 97TH STREET
PHONE:
RIVERSIDE 9737

Captain B. Crossley-Meates.

-3-

Thurs:18:Oct:23.

By reference to Sketch Page 1a October 15th in the Curtiss Correspondence, you will observe the Centre of Pressure is 1 ft. 8 in. above the Centre of Gravity. I have done everything I can possibly think of to avoid this state of things, you will see what I stated on the previous page of the same letter about reducing the chord at the top of each Aerofoil, but Curtiss Co., say that nothing less than 360 square feet of Aerofoil surface should be employed in the first instance. You will also notice that the C. of P. being 1 ft. 8 in. above the C. of G. the load upon Aerofoils due to leverage is reduced by 333 lbs. and unless this extra load can be taken by additional Aerofoils mounted below the C. of G. it is obvious that the Mono-Rail will have to support this additional 333 pounds load, which amounts to a side thrust.

This difference of 1' 8" on one Aerofoil represents a surface of 3 ft by 1 ft. 8 in. equals 5 sq. ft. and on the 10 Aerofoils it becomes 50 sq. ft., so it is obvious in order to gain the ideal condition, that an increase of 50 sq. ft. Aerofoil area should be added below the C. of G.

Since writing the above I have had a further conference with the Curtiss Co., and they propose to carry through the tests with the Aerofoils as Blue Print I am sending you, when they have determined the C. of P. by actual experiment, then any additional Aerofoil area necessary below the C. of G. can be computed by calculation.

I have already mailed you this months "Popular Science" giving the latest in Mono-Railways.

With kind regards,

Yours sincerely,

Edmond E. Johnson



1. Copies of Curtiss Correspondence (under separate cover)
2. Copy of Air Service letter dated Oct. 3rd, 23 (-do-)
3. Blue print of Prototype Model (-do-)

Phone MAIDENHEAD, 297.

MEMORANDUM.

EDMOND E. JOHNSON,
MAESCOURT,
MAIDENHEAD,
BERKS.

Captain B. Crossley Meates,
Larklands,

REFERENCE. ASCOT,
MW. BERKS.

Mon:22:Oct:23.

Dear Sir,
I enclose herewith copy of a list of Inventions,
which Mr. Johnson has asked me to forward you.

Yours faithfully,

M. Welch



1. Copy of list of Inventions.

#109

Improved switch. Mono-railways. (Mono-rail
switch, also ditto united to twin rail
switch.) Conception: 4:Aug:23

N.P.# 2849
Sealed
26:Sept:23

INVENTIONS.

# 101	Means for stabilizing moving bodies. (Vertical aerofoils on either side of Vehicle)	U.S. PATENT #1,437,183 Nov.28th 1922
#102	Means for stabilizing moving bodies. (Vertical aerofoils mounted on or between sides of Vehicle). Conception: 27:Aug:23.	N.P.# 2849 Sealed Aug.27th 1923
#103.	Means for stabilizing moving bodies. (Horizontal aerofoils on either side of Vehicle) Conception: July 1921.	N.P.# 505 Sealed Aug.30th 1923
#104.	Means for controlling aerofoils attached to moving bodies. (Rail head control) Conception: 16:Aug:1923.	
#105	Improvements in and relating to Mono-rail track wheels and Mono-rail track. (Flanged Pilot wheels) Conception:16:Aug:23.(Really a few months earlier)	N.P.# 169 Sealed 16th Aug 1923
#106.	Improvements in and relating to Mono-rails and track wheels therefor. (Flangeless Pilot wheels) Conception: July 1923.	N.P.# 505 Sealed 30th Aug.1923
#107	Improvements in and relating to Bogies or Trucks for Mono-rail Vehicles. (Automatic raising and lowering of outer track wheels according to speed of Vehicle. Automatic control of feed pressure to Incidence (Aerofoil) servo motors governed by the load in Vehicle. Conception: November:1922.	
#108	Improved Mono-rail switch (Virgin track) (Switches mounted on Truck) Conception: Sept. 1922.	
#109	Improved switch. Mono-railways.(Mono-rail switch, also ditto united to twin rail switch.) Conception: 4:Aug:23	N.P.# 2849 Sealed 26:Sept:23

INVENTIONS (continued)

#110	Pendular floors or pendular seats (to oppose Centrifugal force) Conception: April 1922.	
#111	Reversible Propeller. Variable and reversible Camber. (Crank or Cranks arranged within blades of Prop and intergeared with Pitch control system) Conception: March 1923. Model April 1923.	
#112	Propeller as substitute for Aerofoils. (Depending upon the completion of Invention #111) (Prop to rotate about Vertical axis or Props in pairs Clutch system) Conception: 17:Feb:1922.	
#113	Means for preventing derailment of, and applying brakes to, Mono-rail Vehicles. (Horizontal aerofoils) Conception: Sept 1922.	N.P.#184 Sealed 10:Sept:23
#114	Means to anticipate the action of Centrifugal force upon Mono-rail Vehicles preparatory to entering Curves. (Trip before reaching curve) Conception: 18:Aug:23	
	<u>COPYRIGHT.</u> Pamphlet (American 1st Edition)	Class A, XKc., #753080 9:July:1923.
#115	Improved means for stabilizing moving bodies. (Vertical aerofoils mounted on either side of a Mono-rail Vehicle in combinations with (1) rigid body of Vehicle, (2) flanges on Mono-rail track wheels or horizontal Pilot Wheels) Conception: 26:Sept:1923.	

EDMOND E. JOHNSON
MAIDENHEAD
ENGLAND

J. C. M. MONO-RAILWAY
764 WEST END AVENUE
NEW YORK CITY

NEAR 97TH STREET
PHONE:
RIVERSIDE 9737

Captain B. Crossley-Meates,
Iarklands,
Ascot,
BERKS. England.

Mon:29:Oct:23.

Dear Captain,

The Model to blue print 811 (mailed to you on the 19th inst) is now almost completed.

The Curtiss Co., asked me to call and see them at Garden City last Wednesday, as you will see by the enclosed copy letter.

I am very much afraid we have to face a snag the magnitude of which is such that it may mean my returning to England before attempting to launch the ship.

It is a point we have completely overlooked.

The theoretical flying speed of the Vehicle works out at 33.3 M.P.H., the actual flying speed in still air after allowing for disturbances let us assume at 50 M.P.H. Now assume a 40 Mile side wind, this will mean that the flying speed will become 90 M.P.H. otherwise the trailing edges of one set of Aerofoils altogether exceeds the limits permissible with the twin rail system, and even if the outer track wheels are not raised until 90 M.P.H. has been attained I fear the limit will be exceeded, but this is not all, for if on top of this state of affairs centrifugal force is encountered the position becomes hopeless and we are face to face with a virgin track, which I dont suppose would ever mature during our life-time.

My only hope was to make a start upon an existing twin rail track and if that cannot be done I can assure you we stand a very poor chance.

The following Table which I have prepared will enable you to appreciate the underlying factors which govern the situation so far as side wind is concerned, though Centrifugal Force a far greater enemy, looms in the back ground.

EDMOND E. JOHNSON
HAIDENHEAD
ENGLAND

J. C. M. MONO-RAILWAY
764 WEST END AVENUE
NEW YORK CITY

NEAR 97TH STREET
PHONE:
RIVERSIDE 9737

Captain B. Crossley-Meates.

-2-

Mon:29:Oct:23.

Table of resultant wind angles for 10 Ton
J.C.M. Mono-Railway Vehicle at various
Vehicle and Wind Speeds.

Speed of Vehicle M. P. H.	Resultant wind angles from side wind thrusts at 90° to Vehicle Speed of Wind in M.P.H.				
	10	20	30	40	50
50	11°20'	21°50'	31°00'	38°40'	45°00'
60	9°30'	18°30'	26°35'	33°40'	39°40'
80	7°10'	14°00'	20°40'	<u>26°35'</u>	32°00'
100	5°45'	11°20'	16°40'	21°50'	26°35'
120	4°45'	9°30'	14°00'	18°30'	22°40'
150	3°50'	7°45'	11°20'	15°00'	18°30'

It is proposed to run test in yaw at 27°.

The Centrifugal force for a 10 Ton Vehicle upon a curve
of $\frac{1}{2}$ mile radius at 100 M.P.H. is

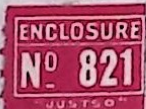
$$F = \left(\frac{W}{32.2} \right) \frac{V^2}{R}$$

F = Centrifugal force in lbs.
W = Wt. in lbs = 20,000
V = ft/sec. velocity = 147
R = Radius in feet = 2640

$$F = \frac{20,000}{32.2} \times \frac{147 \times 147}{2640} = 5084 \text{ lbs.}$$

I should imagine that a Centrifugal force of 5084 lbs
would be very nearly 4 times the force exerted by a 40 mile
side wind pressure.

Yours sincerely,



Letter from Curtiss Co., dated October 23rd, 1923.

(C O P Y)

Curtiss Aeroplane & Motor Co.,
Garden City,
Long Island,
NEW YORK.

Oct. 23rd, 1923.

Mr. Edmond E. Johnson,
764, West End Avenue,
NEW YORK CITY.

Dear Mr. Johnson:

Your letter of the 16th instant noted, and I have been asked by Mr. Wright to answer the technical questions which you refer to in this letter.

In regard to your figures on the ten 12ft by 3 ft Aerofoils, I have checked same and found them to be correct. The difference between the figure 33.3 M.P.H. and this figure corrected for interference, will, of course, be determined by the Wind Tunnel tests, as I told you in our conversation.

As to the side wind forces, I had Mr. Miller do some figuring on the point raised by him in our preceding conference. From these figures the maximum indicated angle is from 30 to 35 degrees for a side wind of 40 M.P.H. This angle, of course, becomes less for smaller wind Velocities.

To obtain an angle of this magnitude on the machine, the wings would have to be moved closer to the body.

We have started the model, and if convenient, it is desirable that you come out here as soon as possible, to talk over the connection of the body to the trucks, as this connection is not shown in the drawing.

Sincerely,

Curtiss Aeroplane & Motor Co., Inc.
(sgd) F.S. Hubbard.
Technical Engineer.

F.S.H. SB - 9582.



EDMOND E. JOHNSON
MAIDENHEAD
ENGLAND

J. C. M. MONO-RAILWAY
764 WEST END AVENUE
NEW YORK CITY

NEAR 97TH STREET
PHONE:
RIVERSIDE 9737

Tues: 30: Oct: 23

Dear Capt = /

I sent you by last mail copy
of a letter dated Oct 23rd rec^d from Curtiss Co.

I now enclose copy of my reply
to that letter.

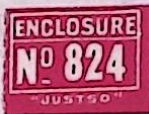
The table of Resultant wind angles
mentioned has already been sent to you.

I expect the wind tunnel tests
will take place this week. & if they dictate
a virgin track I very much fear I shall
have to pack up. Can you suggest anything?

Kind regards

Yrs sincerely

Edmond. E. Johnson



Copy letter to Curtiss Co. dated Oct 29th



Continental Aeroplane & Motor Co. Inc
Garden City

L.I. New York

Dear Sirs;

(loop)

Mon: 29: Oct: 22

F.S.H: SB-9582.

In further reference to your letter of the 23rd inst and my call at your address on the 24th inst.

As arranged with your M. Miller I now enclose a Table of wind angles which will serve as a guide in connection with the proposed wind tunnel tests.

Having determined the theoretical flying speed at 33.3 M.P.H. for the effect of Gravity & the resultant wind angles — as a basis for calculating side wind pressure, it now only remains to record centrifugal force for curves of minimum $\frac{1}{2}$ Mile radius with 10 ton vehicle at 100 M.P.H arrived at as follows:-

$$F = \left(\frac{W}{32.2} \right) \frac{V^2}{R}$$

F = Centrifugal force in lbs

W = Weight in lbs = 20,000

V = Ft/sec. Velocity = 147

R = Radius in feet = 2640

at 80 M.P.H. $F = \frac{20,000}{32.2} \times \frac{117 \times 117}{2640} = \underline{\underline{3220 \text{ lbs}}}$

at 100 M.P.H. $F = \frac{20,000}{32.2} \times \frac{147 \times 147}{2640} = \underline{\underline{5084 \text{ lbs}}}$

So far as I am aware this will be all the data you will require for the wind tunnel tests.

How you are going to determine the side thrust coefficients without weighting the prototype model to correspond with the Demonstration car I don't quite understand; but I gather you have some method of arriving at these results through the medium of a process of calculation.

It is obvious that the angle of Incidence called for by the proposed test in yaw at 27° will be considerably augmented by the additional side thrust involved due to Centrifugal force when encountering a curve of $\frac{1}{2}$ Mile radius & it remains to be seen whether it is possible to restrict either the magnitude of this angle or the space occupied by the trailing edges of the Aerofoils, to comply with the limited space afforded by the twin rail system, or whether a Virgin track becomes an essential

Yrs folly.

23

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97

Sat: 24: Nov: 23

POST CARD

CORRESPONDENCE

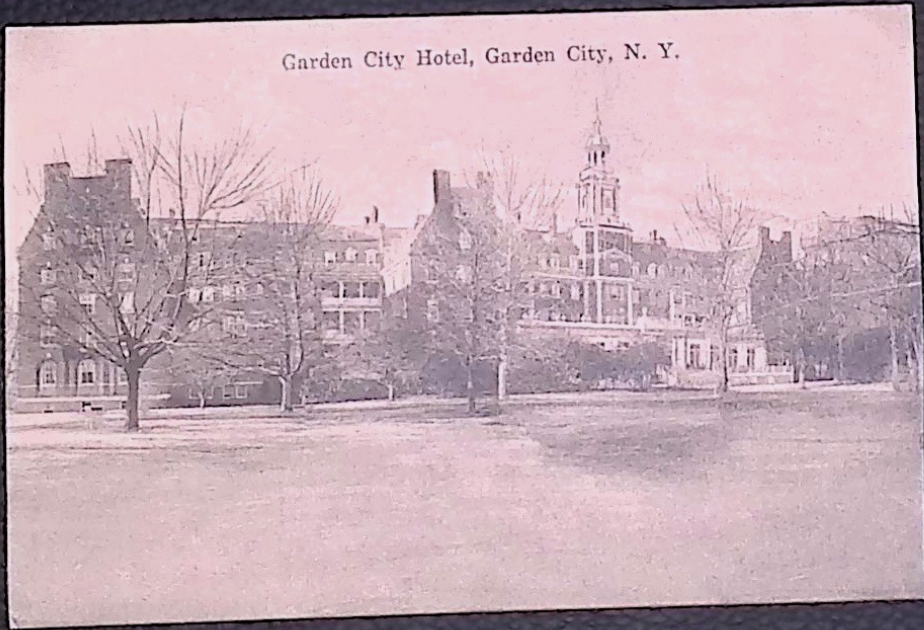
FOR ADDRESS ONLY

Dear Capt! Tests point to modifications
both of aerofoils + control of same, so
will make drawings of Commercial
Car in England.

Returning for Xmas with
best wishes.

Yours sincerely
Edmond. G. Johnson

Garden City Hotel, Garden City, N. Y.



Phone: MAIDENHEAD, 297.

EDMOND E. JOHNSON,
MAESCOURT,
MAIDENHEAD,
BERKS.

MEMORANDUM.

Captain B. Crossley-Neates,
Larklands,
ASCOT,
BERKS.

REFERENCE.

J/MW.

Mon:10:Dec:23.

Dear Captain,

Since hearing from you yesterday by phone, Williams called and spent the evening, and I think I have now cleared up one of the objections raised by him, which was that he claimed that there would normally be a stress on one or other side of the rail head, even when running at flying speed on straight track in still air due to gravity.

In the Curtiss Report it is stated that at constant speed and constant setting of the aerofoils, statical stability cannot be fulfilled, and consequently the vehicle is statical unstable.

With the Aerofoils set as at present arranged, it is obvious that the vehicle will always normally travel upon a list due to gravity, and consequently there will always normally be a side stress on one or other side of the rail head due to this condition. Therefore I think that Williams is right in his contention, and the comments made by Curtiss indicate that something should be done to overcome their contention that the vehicle is statically unstable under the conditions named.

The outcome of my discussion with Williams is instead of running the vehicle upon a list, that the normal running should be vertical, and by so doing side stress upon the rail head would be altogether eliminated, and the way to accomplish this will be to arrange the normal setting of the aerofoils so that the angle of incidence of all of them are inclined very slightly inwardly, that is to say that the trailing edges under normal conditions of each pair of aerofoils would be slightly further apart. This setting would give a slightly greater air resistance, but it would have the effect of making the vehicle ride in a vertical position (without list) for normal running, and would take off the side load upon the rail head which would otherwise occur.

As against the slight extra resistance resulting from the staggered normal setting of the aerofoils, the Gravity factor, (i.e. for the 40 ft Demonstration Vehicle, 1,000 lbs. load) would be eliminated, hence the aerofoils would be relieved from this load, and probably at the same time the vehicle would be

Captain B. Crossley-Meates. -2-

Mon:10:Dec:23.

statically stable, while side stress upon the rail head would be dispensed with.

In reference to your suggestion that I should secure a small run-about Car to facilitate transit between Maidenhead and Kingston, I may tell you that my wife is very anxious that I should bring her and the family to the United States.

It is just possible, therefore, that I shall attempt to sell the house and furniture forthwith, in which case we might take a furnished house for a short period until we can get away, which I anticipate would be about in April next; in that case we might take a furnished house in the vicinity of Kingston.

If I adopt this course it will mean that I shall have to sell up everything, including Caravan, Fuselage, Rolls-Royce Engine etc., To dispense with these items would not be an easy matter at this time of the year, so that perhaps I shall be compelled to stay here till March, consequently it is difficult for me at the moment to arrive at a decision, if therefore you can give me any suggestions in regard to the disposal of the Fuselage and the Rolls-Royce Engine it might expedite matters.

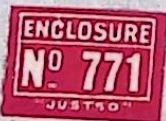
The disposal of the furniture is a very simple matter, but it would not be so easy to sell the house at this time of the year.

Hoping you will succeed in arranging an appointment with Fanny Adams at an early date.

With kind regards to your wife and family.

Yours sincerely,

Edmond G. Johnson



Copy of letter to Curtiss Aeroplane and Motor Co., Inc. dated the 10th instant.

(C O P Y)

Messrs Curtiss Aeroplane and Motor
Company, Inc.,

Garden City,

Long Island,

J/MW.

NEW YORK. U.S.A.

Mon:10:Dec:23.

England.

Dear Sirs,

On leaving your Factory on the evening of November 30th, your Mr. Miller very kindly promised to write me further re some points which arose during the conference which took place upon your Report on the Wind Tunnel Tests.

A partly filled Resistance Table accompanied my letter to you dated November 5th, and in that letter I suggested that you could complete the figures in the Table when the Wind Tunnel tests were through, and I would be very much obliged if you would return me the Table in question, after you have filled in what figures you can therein.

At 100 M.P.H. the load for Centrifugal Force is 5063 lbs, Gravity load is 1000 lbs. The maximum side wind load, Mr. Miller informed me would be 8450 lbs, which together make a total of 14,513 lbs.

As against this the aerofoil thrust with the three centre aerofoils raised in height 3 ft, would give a theoretical thrust of 15,480 lbs, which at .475 efficiency gives 7,337 lbs aerofoil thrust, to take care of 14,513 lbs, Centrifugal Force, Side wind, and Gravity load, and the power at 75% efficiency to overcome all resistances was stated by Mr. Miller to be at 100 M.P.H. 780 H.P. and at 150 M.P.H. 2500 H.P.

I would point out that the further tests we now propose will not be upon rolling moments, but upon actual side thrusts, which will call for an entirely different wind tunnel mounting and recording apparatus.

I have to thank you for the Report, which has been so ably conducted by you.

Yours sincerely,

Phone: MAIDENHEAD, 297.

EDMOND E. JOHNSON,
MAESCOURT,
MAIDENHEAD,
BERKS.

MEMORANDUM.

Captain B. Crossley-Meates,
Tarklands,

REFERENCE.

ASCOOT,

J/MW.

BERKS.

Tues:11:Dec:23.

Dear Captain,

I am in receipt of your letter of the 8th instant.

Taking the case you raise of two Vehicles passing one another on two tracks at high speed, I was endeavouring to avoid this condition at the outset, and this was one of the reasons why I selected the Southern Pacific Railroad, which I believe runs upon a single track across the States; in that case the Vehicles would only pass one another at stopping places.

This point, however, will need attention for while it may be possible to test out the Demonstration Vehicle upon a single track, we might not succeed in inducing a Railroad Company, having single track, to adopt our system, nevertheless there are quite a number of other Railroads besides the Southern Pacific who have single tracks worked upon the staff system.

Tunnels and Bridges will of course limit the height of the centre aerofoils, and also the width, unless they are negotiated below flying speed with outer track wheels lowered.

The height of an American Railroad Car above rail head is 15' 9", and in arriving at the additional 3 ft of extra aerofoil to be added, I have assumed that the rail would be mounted directly upon the cross ties, if however the Mono-rail be placed upon a longitudinal tie mounted upon the cross ties, then 6 ins. would have to be deducted from the height, in which case we can only increase the centre aerofoils by 2' 6" in height, however, on looking through the Sketch again I find that the top corners of the Vehicle are cut off, and in consequence I have this day written to obtain further information on the subject, as you will see by enclosed copy letter.

I am very pleased to see that you have been so prompt in writing Fanny Adams, for I can assure you I am full out to get a move on.

Captain B. Crossley-Meates

-2-

Tues:11:Dec:23.

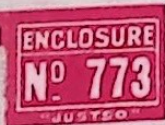
The next time I see you I should like to run over the points raised in Ernest South's letter, as I have reserved my reply to him until I saw you, also I would like to discuss the Sperry Control, which they have dealt with in a letter dated September 25th, likewise the Canadian Patent, but I will not worry you with these matters at the present moment.

You may wonder how it is possible that I should contemplate bringing the whole family with me to the States, in view of the fact that house rents are so prohibitive. For instance in New York City it costs about \$100 per room per annum unfurnished. Our idea is to buy a Motor Car and Trailer and trek across the States to a climate where we can camp out all the year round.

With best wishes.

Yours sincerely,

Edmond E. Johnson



Copy of your letter to F.P.A. dated the 9th instant.
Copy of letter to the Chief Clerk, Long Island Railroad,
dated the 11th instant.

Larklands
Ascot
6-12-23.

Dear Fanny

Please don't have fourteen fits when you see the enclosed report, I did when I first saw it but it seems more friendly on closer acquaintance. Johnson has just brought it back from the States, where the Curtis people have shown much enthusiasm for the monorail. His object in bringing the report & the model back with him is to arrange for similar tests on rather different lines & more cheaply. The Curtis have born about half the costs of these tests but even so they were expensive & they seem to have insisted on reading rolling moments (taking the rail head as a fixed point upon which side thrusts may be imposed.) while the data we really require are, 1). Horizontal thrust due to side wind of 60 mph on keel surface, to be read on stationary vehicle. 2). To find the actual head resistance of the Aerofoils & struts alone at several different angles of incidence, taking the Curtis figures for Downwash correction i.e. 6 degrees on 1st pair giving an equal lift coeff' to 18 degrees on last pair & setting incidence accordingly. and 3). To read off the actual Horizontal side thrust obtained from aerofoils attached to vehicle at incidence similar to 2). at 40MPH also to check theoretical figures for various angles of Yaw. You see the fundamental basis of this Monorail is THE COMPLETE ISOLATION OF ALL SIDE STRESSES FROM THE RAIL HEAD", Johnson & I are weary of repeating this to the various People who have delved into this Patent, they all seem to lose sight of this basis, I dare say a Tripes man could resolve the Curtis figures into the horizontal components 2) & 3) that we need but it is beyond me & I think that you will eventually agree that the Vehicle should be supported in a mercury bath & the actual horizontal thrusts read off. I believe that the mercury would remain unruffled in a 40MPH, wind & would reproduce as good a ground interference effect as the Yaw board shown in the photo, while a suitable float would cut out the gravity difficulty entailed in testing the vehicle upright. I am only troubling you with these requirements as you once told us that you could put us onto the right people if ever we wanted wind tunnel tests done & since even the Curtis Co had to make the special balance shown in the photo for the job it behoves us to go to the People with the best equipped lab'. It would be a great help if you could give us ~~your~~ ~~recommendations~~ ~~in~~ order of merit, & return the enclosed report & photos. If this report does interest you we should of course value your views, especially on the probable effect on the rate of change of downwash with angle of attack if the distance between trailing edge of one aerofoil & leading edge of next was increased by say 12%.

(C O P Y)

The Chief Clerk,

General Superintendants Office,

Long Island Railroad,

J/MW.

Pennsylvania Station

NEW YORK CITY,

U.S.A.

Tues:11:Dec:23.

My dear Sir,

I am sorry to say that I mislaid your name previous to my departure from the United States, and consequently have been compelled to address you as above.

You will recollect that you recently very kindly gave me some valuable information as to the outside dimensions of both Pennsylvania and Long Island Rolling Stock, and I would feel very grateful to you if you could supplement same by informing me the cross sectional dimensions of Tunnels to enable me to see the clearances, particularly between the top corner of the Vehicle and the side of the tunnel, also the position of the rails in relation thereto.

Is it the usual practice in the United States to run both tracks through one tunnel, or to run each track through a separate tunnel, as enclosed Illustration of Woodhead Tunnel?

I much regret having been unable to accept your kind invitation to attend the meeting of your Railroad Society, and shall hope to have the pleasure of seeing you again upon my next visit to the United States.

With many thanks for the information you have already given me, and wishing you a Merry Christmas.

Yours sincerely,

772. Illustration of Woodhead Tunnel.

Phone: MAIDENHEAD, 297.

MEMORANDUM.

EDMOND E. JOHNSON,
MAESCOURT,
MAIDENHEAD,
BERKS.

Captain B. Crossley-Meates,
Larklands,

ASCOT,

REFERENCE.

J/MW.

BERKS.

Fri:21:Dec:23.

Dear Captain,

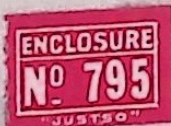
Received your enclosures this morning, which I return herewith, together with a copy of a letter received from The Rt. Hon. Sir William Bull, also copy of my letter to the Institute of Patentees which I trust will meet with your approval.

I have this day received a very interesting letter from E.W. Chalmers Kearney of The Kearney High-Speed Railway Co., Ltd., 100, Victoria Street, Westminster, S.W.1. You will recollect I have many times spoken to you of Kearney, and when you get a chance you really must come and see his Model with me. His system is admirably suited for Tubes and Subways, and might be run in conjunction with ours if we took the open country and transferred the passengers to his system at the outskirts of towns. By his letter he appears to be full out to co-operate with us, but I will let you see the letter some time during the Christmas holidays when convenient to you.

I send herewith a list of Engineers who have endorsed the Kearney High-Speed Railway System.

Yours sincerely,

Edmond E. Johnson



1. Your Enclosures dated the 17th and 18th instant.
2. Copy of letter from Sir William Bull, dated the 20th inst.
3. Copy of letter to the Institute of Patentees dated the 21st instant.
4. List of Engineers who have endorsed Kearney High-Speed Railway system.
5. Copy of letter to E.W. Chalmers Kearney, dated the 21st ins

Le Whave
Norton Rd
Letchworth
Herts

Dec 18th 23

My dear Ma,

I have just received
the enclosed letter from
Edwards - It looks as though
you will have to wait for
his return from Switzerland

Can you let me know
what is the best book
on Wireless - starting from
quite elementary stuff. I



KING

Physical Lab
Teddington. Me

17th Decem

your letter. I
for your friend.
to me making some f
ts and asking for
chosen should be i
to Switzerland at
researches on the c

ed to hear your go
My heartiest congr
e young person, an
y Christmas and th

Yours sincerely,

F. R. Edwards



Handwritten notes on the left margin, partially obscured by a vertical strip of paper.



TELEGRAMS:-
"PHYSICS, TEDDINGTON"



TELEPHONE:-
KINGSTON 3360 (10 LINES)

*The National Physical Laboratory,
Teddington, Middlesex.*

NEAREST ROUTE:-
ADELAIDE ROAD,
PARK ROAD,
PARK LANE. LH,

R.F.F.
G.R.E.

17th December, 1923.

ALL COMMUNICATIONS
TO BE ADDRESSED TO
THE DIRECTOR.

F.P. Adams, Esq.,
Te Whare,
Norton Road,
Letchworth,
Herts.

My dear Adams,

Thanks so much for your letter. I shall be delighted to do what I can for your friend. I think it will be best if he writes to me making some fairly clear statement as to what he wants and asking for an interview to be arranged. The date chosen should be in the latter half of January as I am off to Switzerland at the end of this week to conduct some researches on the coefficient of friction on snow slopes.

I am most gratified to hear your good news and envy you your happiness. My heartiest congratulations to you and your wife and the young person, and my very best wishes for a very Happy Christmas and the New Year.

Yours sincerely,

Henry R. Edwards



(C O P Y)

Vencourt,

King Street,

HAMMERSMITH.

20th December 1923.

Dear Sir,

I am in receipt of your letter of the 18th instant.

Since my lecture I have been inundated with correspondence. I have in the first instance sent your letter to the Institute of Patentees and if they report favourably upon it I will write you again.

Yours truly,

(sgd) William Bull,

P.S. The Pamphlet mentioned was not enclosed. Perhaps you will send this direct to the Institute of Patentees at 44, Great Russell Street, London, W.C..2.

(C O P Y)

Institute of Patentees,
44, Great Russell Street,
London,

5/17.

W.C.2.

Fri:21:Dec:23.

Dear Sirs,

I have this day received a letter from The Rt. Hon. Sir William Bull, asking me to forward you a pamphlet omitted from a letter to him dated the 18th instant. This letter he advises me has been forwarded by him to you.

I enclose the pamphlet in question, though it does not deal with the project from the scientific side.

I would suggest, to enable you to go into the merits of the proposition, that you be so kind as to give an appointment when the matter can be gone into with my colleague Captain B. Crossley-Meates, late of the Royal Air Force, and myself.

Yours faithfully,

Wishing you a Merry Christmas.

Yours sincerely,

(C O P Y)

E.W. Chalmers Kearney, Esq.,

100, Victoria Street,

Westminster,

J/MW.

S.W.1.

Fri:21:Dec:23.

Dear Mr. Kearney,

I unexpectedly returned to England before your letter reached me, as the Curtiss Aeroplane Co., completed their tests and report on November 30th last, and I sailed for England on December 1st by S.S. "Leviathan".

I should like you to meet Captain B. Crossley-Keates who is associated with me in the J.C.M. Mono-Rail venture, when possibly you would be so kind as to let him see a demonstration of your system. I intend to discuss the suggestions made by you in your letter with him shortly.

My intention is to return to the United States in the Spring.

Wishing you a Merry Christmas.

Yours sincerely,

- 21. H. E. ...
- 22. H. E. ...
- 23. S. L. A. Jordan
- 24. Captain H. J. Jackson
- 25. Benjn. T. King
- 26. L. Murphy
- 27. H. J. Mitchell
- 28. Prof. J. T. MacGregor
- 29. Morris
- 30. J. Northcote
- 31. P. Poffett
- 32. F. Pinner
- 33. H. Seal Ridley
- 34. J. S. ...
- 35. H. ...
- 36. H. ...
- 37. H. ...
- 38. H. ...
- 39. H. ...
- 40. H. ...

A.S. ...
 M.E.E. ...
 A.M.E. ...
 A.I.E.E. ...
 Engineering, London University
 ...
 ...
 ...
 ...
 ...

The Kearney High-Speed Railway has been endorsed by Engineers of all denominations and of the widest repute.

The following list is representative but not exhaustive.

- | | | |
|-----|-------------------------------|--|
| 1. | A. M. Arter | A.M.I.C.E., F.S.E. |
| 2. | A.S.E. Ackerman | B.Sc.(Eng.), A.M.I.C.E., M.S.E., etc. |
| 3. | H. Adams | M.I.C.E., M.I.Mech.E., F.S.I., etc. |
| 4. | W.H. Anderson | A.M.S.E. |
| 5. | R.H. Bicknell | M.Inst.C.E., M.Inst.W.E., etc. |
| 6. | Sir George Buchanan | K.C.I.E., M.I.C.E. |
| 7. | F.H. Brunt | M.Inst.C.E., M.S.E., M.Inst.W.E., M.C.I. |
| 8. | H. Brochie | A.M.S.E. |
| 9. | J. H. Blakesley | M.A., Past A.M.Inst.C.E. |
| 10. | G. A. Becks | F.S.E., (M.of Council, S.E.), A.M.I.C. |
| 11. | A. Stewart Buckle, | M.S.E., M.Inst. C.E. |
| 12. | Dr. H. Chatley | D.Sc. (Eng.), A.M.Inst.C.E. |
| 13. | J. T. Corbin | J.P., M.S.E. |
| 14. | A. F. de Fraine | A.M.S.E. |
| 15. | W. R. Davidge | A.M.I.C.E., F.S.I., F.R.I.B.A. |
| 16. | G. Noble Fell | A.M.I.C.E., M.S.E., M.Soc.I.C. (France) |
| 17. | J. Gell | M.I.E.E. |
| 18. | T. J. Gueritte | F.S.E., President, Society of Engineers, M.S.I.C. (France), etc. |
| 19. | Dr. H. S. Hele-Shaw | D.Sc. LL.D., M.I.C.E., F.S.E. etc. |
| 20. | A. R. Hoare | M.I.C.E., M.I.Mech.E., M.S.E., M.I.E.E. and M.Inst.T. |
| 21. | H. W. Healy | A.M.I.E.E. Past Presdt. A.P.S.E. |
| 22. | H. M. Jordan | A.M.I.C.E., A.M.I.Mech.E., A.M.S.E. |
| 23. | G. L. A. Jordan | A.M.I.Mech.E., A.M.I.Loco.E., etc. |
| 24. | Captain H. F. Jackson. | M.S.E. |
| 25. | Benjn. T. King | A.I.Mech.E. |
| 26. | L. Murphy | M.I.E.E., late A.M.I.Mech.E., etc. |
| 27. | R.J. Mitchell | A.M.I.Mech.E., M.S.E., A.M.I.E.E., etc. |
| 28. | Prof. J. T. MacGregor-Morris. | M.I.E.E., Professor of Electrical Engineering, London University. |
| 29. | J. Portsmouth | A.M. Inst. C.E. |
| 30. | F. Parfett | M.S.E. |
| 31. | F. Prasser | A.M.S.E. |
| 32. | M. Noel Ridley | M.Inst.C.E., M.C.I. |
| 33. | J. Riekie | M.Inst.Loco.Eng. Past M.I.Mech.E. |
| 34. | R. D'Arcy Swaindon | A.M.S.E. |
| 35. | R. W. Schofield | A.M.C.I., A.M.S.E. M.J.I.E. |
| 36. | J. E. Sears | C.B.E., M.A., A.M.I.C.E. M.I.Mech. E. |
| 37. | W.N. Twelvetrees | M.I.Mech. E. F.S.E. M.S.I.E. (France) |
| 38. | F J. Turquand | A.M.I.E.E. M.I.M.E. M.A.M.E.E. etc. |
| 39. | E. D. Thos-Jones | M.I.C.E., M.I.Mech. A.M.I.E.E. |
| 40. | Col. C.H. Vesturme-Bunbury | Late R.E. |
| 41. | H.S.G. Walker | B.A. late Engineer Crew Loco. Works. |
| 42. | Prof. J. W. Wilson | M.I.C.E., M.I.Mech.E. F.S.E. etc. |
| 43. | Col. F.C. Vincent | O.B.E. B.Sc., M.S.E. M.I.A.E. M.I.P.T. M.Am. Mining Congress, M.Am. Ph.A., M.Am.Soc. Railway Engineers; late Chief of Technical Department, Ministry of Munitions and War Office |

who in a long and varied experience of emergencies occurring."

immediate relief to the present railway one factor that can

MEMORANDUM.

EDMOND E. JOHNSON,
MAESCOURT,
MAIDENHEAD,
BERKS.

Captain B. Crossley Meates,
~~MAIDENHEAD~~s, Kingswood,
~~MAIDENHEAD~~, Brook Gardens,
~~BERKS.~~
Kingston Hill,
Surrey.

REFERENCE.

J/MW.

Thur:27:Dec:23.

Dear Captain Crossley-Meates,

Many thanks for the Lather Kream and present for children.

Enclose copy of letter received this day from E.W. Chalmers Kearney, also copy of my reply thereto. I think you will be extremely interested with his Model; the Film I have not seen so there will be something new for me also.

I am pleased to say that the Curtiss Report has come to hand, it having been carefully packed away in my Folder along with Patent Evidence of Conception Documents.

The Curtiss Report as you are aware was made to determine rolling moments, nevertheless all the tests were made with transverse vertical and horizontal planes at right angles to the ground, with the loads of gravity eliminated, consequently the readings I suggest may all be taken as the horizontal component side thrust.

The effects of gravity are obtained by adding or deducting the resultant load according to the list prevailing. If 2 inches be allowed between the outer track rails and the outer track wheels in normal position, the total list either on one or other side of the vehicle would be approximately 4 degrees, therefore, the addition or deduction for gravity load according to the list would be as follows:-.

- 1 Degree list..... Gravity Load 250 lbs.at C. of P.
- 2 Degrees list..... Gravity Load 500 lbs.at C. of P.
- 3 Degrees list..... Gravity Load 750 lbs.at C. of P.
- 4 Degrees List..... Gravity Load 1000 lbs.at C. of P.

If the algebraic sum of these gravity loads be added to the Curtiss readings, then I suggest that the horizontal side thrust component can be computed at any angle of list. If you agree with this reasoning I suggest that the further tests can be made with Model as at present arranged, thus avoiding the expense of the special mercury bath and other apparatus

Captain B. Crossley Meates. -2-

Fri:28:Dec:23.

involved in testing the vehicle in a vertical position, for exactly the same remarks equally apply for various angles of list resulting from centrifugal force.

According to the Curtiss Report readings, under the worst conditions we have a load of 14,513 lbs representing Gravity, Centrifugal Force and Side Wind, to be taken by the Aerofoils, which at .475 efficiency gives only a thrust of 7,337 lbs, and if these readings are correct the aerofoil area at present provided for, is about 50% deficient.

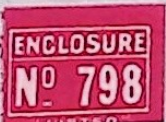
Whether it would be better to see if it is possible to make up this deficiency before making further tests, or to get the readings confirmed in some other wind tunnel is a matter which needs careful consideration before any further wind tunnel tests are made.

With kind regards,

Yours sincerely,

Edmond S. Johnson

P.S. I shall hope to hear or see something more of Francis Laur's Mono-Railway when in Paris.



1. Copy of letter from E.W. Chalmers Kearney dated the 26th instant.
2. Copy of letter to E.W. Chalmers Kearney dated the 28th instant.

(C O P Y)

The Kearney High-Speed Railway Co., Ltd.,
100, Victoria Street,
Westminster, S.W. 1.

26th December 1923.

E.E. Johnson, Esq.,
Maescourt,
Maidenhead.

Dear Mr. Johnson,

Thank you for your letter. I was surprised to hear you were back in England.

I shall be pleased to meet Captain Crossley-Meates and to show him the model and film of the Kearney Railway if you will let me know when I can come to town.

We are getting on quicker than I thought on this side and hope to make a start in earnest very shortly.

All good wishes to Mrs. Johnson and the Children and yourself.

Yours sincerely,

(sgd) Chalmers Kearney.

ENCLOSURE
N^o 798

(C O P Y)

W. Chalmers Kearney, Esq.,

The Kearney High-Speed Railway
Co., Ltd.,

100, Victoria Street,

J/MV.

WESTMINSTER, S.W.1.

Fri:28:Dec:23.

Dear Mr. Kearney,

Thanks for yours of the 26th instant. I am leaving for Paris in the morning and expect to return in a week or 10 days time when we shall hope to have the pleasure of accepting your kind invitation. I will communicate with you again upon my return.

Yours sincerely,

TEL. MAIDENHEAD 237.

MAESCOURT,
MAIDENHEAD,
BERKS.

ion,

Fri:11:Jan:24.

Dear Captain Crossley-Meates,

We arrived back from Paris on Wednesday night. I saw Francis Laur last Sunday, and will tell you the information gathered when I see you.

I am informed there is to be a Mono-Railway at the Wembley Exhibition, and am seeking further information re same.

I enclose copy of letter just received from The Curtiss Aeroplane & Motor Corporation. I have also received a reply from the Long Island Railroad re Tunnels, together with some other interesting letters from the United States, and when convenient to you I can bring them along.

The appointment with Mr. G.R. Edwards of the National Physical Laboratory is due next week, and before making same we shall have to come to some decision as to the proposed further wind tunnel tests; perhaps the enclosed letter from the Curtiss Aeroplane Co., will have some bearing upon the matter. Unless we can get considerably better readings than those obtained at Garden City, we shall have a very tough problem before us to provide the requisite aerofoil area indicated.

Hoping you are comfortably established in your new abode.

With kind regards,

Yours sincerely,

Captain B. Crossley-Meates,
Kingswood, Brook Gardens,
Kingston Hill, SURREY.

Ernest G. Johnson



Copy of letter from Curtiss Aeroplane & Motor Co., dated December 27th, 1923.

You will recall that the figures I gave you on horsepower are based on assumptions regarding the thrust/drift ratio of the complete vehicle. Please be advised that these figures are only roughly approximate. You should wait until



(C O P Y)

Curtiss Aeroplane & Motor Corporation,
Garden City,
L.I. NEW YORK.

December 27th, 1923.

Mr. Edmond E. Johnson,
Maescourt,
Maidenhead,
Berkshire, England.

Dear Mr. Johnson:

Attached herewith is the table you requested in your letter of November 15th.

In regard to the side thrust which you can obtain, this can be very approximately determined for 0° yaw conditions by means of the formula

$$\text{(Side thrust)} \quad T = \frac{K_n}{d} v^2$$

where K_n = rolling moment coefficient given in Fig. 3 of our Rept. # 2427 on your car tests; v = velocity in M.P.H.; and d = distance in inches from rail to mid-sections of aerofoils. The above formula gives the side thrust which you can actually obtain. The required side thrust under any conditions is given by using the value K_n given by formula (6) on page 4 of our report; then,

$$T = \frac{K_n v^2}{d}$$

But from formula (6) the required K_n is

$$K_n = \frac{Wh}{v^2} \left(\frac{2.15 v^2 \cos \theta}{gR} - \sin \theta \right)$$

Then making the substitution indicated above

$$T = \frac{Wh}{d} \left[\frac{2.15 v^2 \cos \theta}{gR} - \sin \theta \right]$$

(You should read carefully pages 2 - 6 of our Report # 2426.

We have filled in the table of side thrust for 0° yaw using $d = 78"$, and K_n (maximum) = 34.0 from Fig. 3.

You will recall that the figures I gave you on horsepower are based on assumptions regarding the thrust/drift ratio of the complete vehicle. Please be advised that these figures are only roughly approximate. You should wait until



your tests have been conducted at the R.A.E. on side force and drift before you start any power calculations.

It is very interesting to note that under certain wind conditions the power required for traction would be comparatively small due to the fact that there would be a negative drift component of the resultant pressure on the aerofoils.

I attach herewith a small sketch showing how this negative drift could actually reduce your traction!

Sincerely yours,
CURTISS AEROPLANE AND MOTOR COMPANY, INC.

(sgd) Wm. H. Miller,
Tech. Dept., Aerodynamical Section.

Phone: MAIDENHEAD, 297.

EDMOND E. JOHNSON,
MAESCOURT,
MAIDENHEAD,
BERKS.

MEMORANDUM.

Captain B. Crossley-Meates,
Kingswood,

REFERENCE. Brook Gardens,
J/MW. Kingston Hill,
SURREY.

Sat:12:Jan:24.

Dear Captain,

I have now made a few calculations arising out of the Curtiss Report, and enclose two rough Sketches indicating the results as I figure them.

Figure 1. indicates how the Gravity load is arrived at at C. of G. and also what it becomes at the C. of P.

Figure 2. in addition indicates Side Wind and Centrifugal Force at the C. of G. and also at the C. of P. Perhaps you will be kind enough to go over these figures and see if you agree them.

The Side Wind calculations are arrived at under the worst conditions, Table 4 and Figure 4, Curtiss Report, and if my figures are correct, a force of 11,755 lbs has to be combated with an aerofoil area of approximately 992 sq. ft. Can you think of any way to provide for this additional surface?

Aerofoil Thrust surface on Model = 360 sq. ft.

It appears to me that in order to get the most efficient setting of the aerofoils for Table 4, that the angle of incidence should first of all be placed at 30 degrees to allow for the 30 degree yaw, and an additional 16 degrees, which is the most efficient setting of the aerofoils, this makes a total setting of 46 degrees, whereas it would appear from the Curtiss Report that the maximum MEAN setting was only 16 degrees.

20

You will observe in the Curtiss Report, that the Incidence of the aerofoils has been gradually increased rearwards, and by so doing a gain of 15% efficiency has been attained. I am afraid, however, that this method will not be permissible owing to the additional space occupied by the trailing edges of the rear aerofoils.

Possibly another method of gaining efficiency would be to allow the aerofoils to follow the streamline of the vehicle, and thus they would not come one directly behind the other as at present, however, perhaps you can think of some way of gaining aerofoil efficiency, for at present we only have an efficiency of 47% there being 53% loss of efficiency due to interference.

The Thrust coefficient of Aerofoils .0025 Yours faithfully, being reduced to .00185.

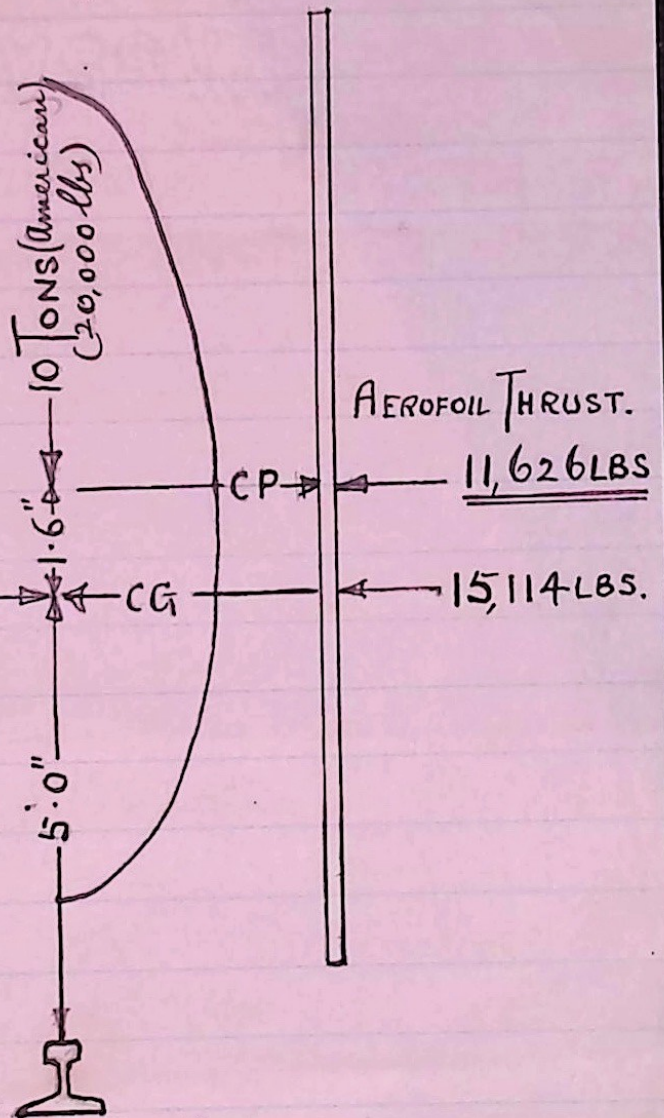
Edmond E. Johnson

Two Rough Sketches.

ENCLOSURE
No 847
"JUSTSON"

Determination of side loads and equivalent Aerofoil Thrusts.

LBS
 GRAVITY. 1333
 CENTRIFUGAL 5063
 SIDE WIND. 8718
LOAD AT C.G. = 15114 LBS



Rail head to C.P. = 6.6" (78")
 " " " C.G. = 5.0" (60")

As 78":60" :: $\frac{LBS}{15,114}$:: $\frac{LBS}{11,626}$ Aerofoil Thrust at C.P.
 = 5.8 American Tons.

Model has 10 Foils (12' x 3') = 360 sq ft.

At 100 M.P.H. Thrust = $\frac{34}{78} V^2 = 4359$ LBS.

34 from Fig 3 Curtiss Report.

Phone: MAIDENHEAD, 297.

EDMOND E. JOHNSON,
MAESCOURT,
MAIDENHEAD,
BERKS.

MEMORANDUM

Captain B. Crossley-Meates,
Kingswood,
Brook Gardens,
Kingston Hill.

REFERENCE.

J/MW.

Dear Captain,

I enclose my figures for the determination of Side Loads at C. of G. and equivalent Aerofoil Thrust at C. of P.

The figures for Gravity and Centrifugal Force I think you may take to be correct, they both having been checked by Messrs Curtiss. The Side Wind Load, however, requires verification, as I am not quite sure of this figure.

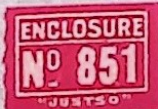
I also send you herewith some further particulars re Kearney High-Speed Tube for Sydney Harbour, and think if you read this through, some useful information may be gained therefrom.

Hope you will succeed in fixing up the appointment with Mr. G.R. Edwards for Friday afternoon as suggested.

Yours sincerely,

Edmond E. Johnson

P.S. Am also returning original calculations which will serve to form a check upon the new figures.



1. Aerofoil Thrust Calculations.
2. Particulars re Kearney High-speed Tube for Sydney Harbour.

Phone: MAIDENHEAD. 297.

EDMOND E. JOHNSON,
MAESCOURT,
MAIDENHEAD,
BERKS.

MEMORANDUM.

Captain B. Crossley-Meates,
Kingswood,

REFERENCE.

Brook Gardens,

J/MW.

Kingston Hill,
SURREY.

Thur:24:Jan:24.

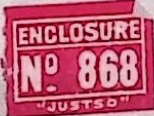
Dear Captain,

As arranged I shall hope to give you a call on Saturday next directly after lunch, Kearney having written me this morning confirming the appointment. (See enclosed copy letter.)

The N.P.L. have returned your Documents to this address; these I will hand you on Saturday. I have written the N.P.L. furnishing them with a copy of the last letter received from Messrs Curtiss Aeroplane & Motor Co., Garden City.

Yours sincerely,

Edmond E. Johnson



Copy of letter from E.W. Chalmers Kearney Esq., dated the 23rd instant.



(C O P Y)

The Kearney High-Speed Railway Co., Ltd.,
100, Victoria Street,
Westminster,
S.W.1.

23rd January, 1924.

Dear Mr. Johnson,

In reply to your letter of 22nd instant could you please come here first to see the film as this is where I have the screen and projector. Four o'clock Saturday afternoon would suit me best or later if you wish. Afterwards we could go on to the works and see the model. The film takes about 20 minutes to run through.

Do please bring Mrs. Johnson if she can come--I can give you tea here.

With kind regards,

Yours sincerely,

(sgd) Chalmers Kearney.



Train Resistances (including Air + Rolling)

1. For Resistance Formula's see - Report of Electric Test Commission page 465.

2. Molesworth gives for the Twin-Rail System a Rolling Friction of 20 lbs per Ton.

3. Zossen-Marienfelde Railway - Tests of Electrical Bogie Coaches. Journal of Institute of Electrical Engineers - Vol 33, 1904 page 894.

Drivers 49.2 Inches
Journal 6 Inches
Weight of Car 83 TONS
SPEED 60 M.P.H.

	LBS	LBS PER TON
Journal Friction	162	1.95
Track Resistance	39	.47
Flange Friction	595	7.17
<u>ROLLING FRICTION</u>	796	9.59
Air Resistance	784	9.45
TOTAL TRAIN RESISTANCE	1580	19.04

4. C.A. Carns Wilson - Institute of Civil Engineers Paper - Vol 171 page 227.

Eight wheeled Electric Motor Coaches of the
Indiana Union Traction Co. St. Louis.

SPEED 60 M.P.H.

	LBS PER TON
Journal Friction	1.8
Track Resistance	0.7
Flange Action	6.4
<u>ROLLING FRICTION</u> =	8.9
Air Resistance	26.1
Side Wind 12 Miles per Hour	2.2
TOTAL TRAIN RESISTANCE	37.2

Comparing 3 & 4 both at 60 M.P.H. The distribution of Power would be as follows:-

	ZOSSEN- MARIENFELDE	C.A. CARNS WILSON
Journal Friction	10.2%	4.8%
Track Resistance	2.5%	1.9%
Flange Friction	37.7%	17.2%
<u>ROLLING FRICTION</u>	50.4%	23.9%
Air Resistance	49.6%	70.2%
Side Wind	Nil	5.9%
TOTAL TRAIN RESISTANCE	100.0%	100.0%

5. John A. F. Aspinwall M.I.C.E. Institute of Civil Engineers. Paper No. 3280. Nov 26th 1901 Vol 147 p 248
SPEED ... 80 M.P.H.

	ASPINWALL LBS PER TON	5a. GOSS LBS PER TON
Miscellaneous	14.1	19.4
Axle Friction	2.0	2.0
<u>ROLLING FRICTION</u>	16.1	21.4
Atmosphere	11.7	6.4
	27.8	27.8

6. Berlin-Zossen Electrical Railway Tests
 Page 77 Plate X Va.
At 100 M.P.H.

Train Resistance	LBS	3200
Air Resistance		2550
<u>ROLLING FRICTION</u>		650
<u>Rolling Friction</u> = $\frac{650}{103.2 \text{ TONS}}$		<u>6.3 LBS PER TON.</u>

$\frac{650 \text{ ROLLING FRICTION}}{3200 \text{ TRAIN RESISTANCE}} = (\text{Nearly}) \frac{1}{5} \text{ OF TRAIN RESISTANCE}$
 = ROLLING FRICTION AT 100 M.P.H.

at 100 M.P.H Rolling Friction may be taken to be $\frac{1}{5}$ of Total Train Resistance as applied to the Twire Rail System.

$F = \frac{T}{5}$ at 100 M.P.H.
 $F = \frac{T - A}{5}$
 $T = A + 25\%$

Where F = Rolling Friction
 " T = Train Resistance
 " A = Air Resistance.

MONO-RAILWAY.

7. The foregoing results are all based on the Twin-Rail System, eliminating ONE of the tracks together with Flange Friction & substituting Ball Bearings:-

	LBS PER TON	LBS PER TON
Twin-Rail rolling friction (Molesworth)		20
Deduct 50% for ONE Rail	10	
" 10% " Flange Friction.	2	
" 25% " Ball Bearings	5	17
<u>ROLLING FRICTION FOR MONO-RAIL</u>		<u>3</u>

Mono-Railway - Rolling Friction at 3 LBS PER TON is confirmed in the Kearney High Speed Railway Pamphlet, Appendix IV. Page 344. For Ball Bearing Claim see Page 12 in 2nd Edition of Kearney's Pamphlet.

Average Rolling Friction

	LBS PER TON
3. Zossen-Marienfelde Ry (60 M.P.H.)	9.59
4. Wilson (60 M.P.H.)	8.9
5. Aspinwall (80 M.P.H.)	16.1
5a. Goss (80 M.P.H.)	21.4
6. Berlin-Zossen (100 M.P.H.)	6.3
	5) 62.29
<u>ROLLING FRICTION AVERAGE =</u>	<u>12.46 LBS PER TON.</u>

The TWIN-Rail - Rolling Friction although averages at 12.46 lbs per Ton. The conservative figure given by Molesworth at 20 lbs per Ton has been the basis of the Calculation.

to return to BE2E calculations with the assumption that the ROLLING FRICTION for the Mono-Railway would be the same as for the Twin System.

Applying Berlin-Zossen Formula to B.E2E.

$$\text{Air Resistance} = .0032 \times \frac{9}{10} \times 100 \times 100 = 72 \text{ LBS}$$

$$\text{TRAIN RESISTANCE} = A + 25\% = 72 + 25\% = 90 \text{ LBS}$$

$$\text{ROLLING FRICTION} = T - A = 90 - 72 = \underline{18 \text{ LBS}}$$

AT 100 M.P.H. ∴ OR ∴

$$\text{AIR RESISTANCE} \qquad \qquad \qquad 72 \text{ LBS}$$

$$\text{ROLLING FRICTION (Molesworth - Twin System)} \quad 20 \text{ LBS}$$

$$\text{TRAIN RESISTANCE} = \underline{92 \text{ LBS}}$$

$$\text{H.P.} = \frac{R \times V}{550} = \frac{92 \times 146.7}{550} = 24.5 \text{ HP}$$

Allow for 75% Efficiency

$$24.5 \text{ HP} + 8.2 \text{ HP} = \underline{32.7 \text{ HP}}$$

POWER required to overcome 92 LBS RESISTANCE at 100 M.P.H = 32.7 HP for the Twin Rail System as against 27 HP for the MONO-RAILWAY.

NOTE: The Resistance Coefficient given by Molesworth i.e. 20 LBS PER TON includes

AIR RESISTANCE

ROLLING RESISTANCE calculations should exclude air resistance, as this item had already been taken under its own heading.

Curtiss Report No. 2427.

ERRATUM.

Page 5, line 2, the word
"included" should read
"inclined".

CURTISS AEROPLANE AND MOTOR CO., INC.,

GARDEN CITY, N. Y.

ENGINEERING DEPARTMENT

Report #2427

November 27th, 1923

Wind Tunnel Test on Johnson Mono-
Rail Car.

(Tested in Curtiss 7 ft. Wind Tunnel.)

Submitted By:

Technical Dept. Aerodynamical Sect.

Notation

α = angle of attack (between aerofoil chord and relative wind direction)

β = angle of incidence (or setting of aerofoil chord to plane of symmetry)

ϵ = angle of downwash

$\frac{d\epsilon}{d\omega}$ = rate of change of ϵ with ω

V = Velocity in M.P.H.

T_0 = tension in wire with no wind.

T_{40} = " " " at 40 M.P.H.

ψ = Angle of yaw.

N = Rolling moment about rail in pounds, inches.

θ = angle of list.

n = number of aerofoils.

Note:- List angles and rolling moments are positive for clockwise rotation about rail when looking from rear to front of car.

Positive aerofoil angles tend to produce positive rolling and vice versa.

Yaw angles (ψ) are positive when generated by turning machine to right.

Determination of Rolling Moments of
Johnson Mono-Rail.

Object:

To determine the rolling moments on this machine due to the cross-wind force.

Method:

The test was carried out in the Curtiss 7 ft. Wind Tunnel at a wind speed of 40 M.P.H.

A $\frac{1}{16}$ th size model of the vehicle was mounted in the tunnel adjacent to an artificial ground and track, as shown in the accompanying photograph. The model was supported by the center rail (which was pivoted at each end) and also by a wire running from a $\frac{1}{4}$ inch circular rod (which projected from the model) to a "roof" balance located on the bridge above the air-stream. This wire was enclosed by a stream line fairing to eliminate the correction to the rolling moment, had the wire been exposed. The tension in the wire was read off the balance directly; and the product of the wire tension and its lever arm to the pivotal axis, gave the moment about the rail.

Two tests were conducted; one at 0° yaw, and the other at 30° . When the model was yawed to the wind, the rolling moments about the rail were directly determined by keeping the wire perpendicular to the axis of the rail.

The roof balance could be read directly to .001 lb., which was about the magnitude of its sensitivity.

Due to the fact that the downwash behind each aerofoil was unknown - and its determination was not to be included in the present report - it was necessary to make two or three trials, (assuming the rate of change of downwash with angle of attack) in order to determine approximately the proper relative settings of the aerofoils to give maximum cross-wind force at zero yaw. The angular setting of each aerofoil is given by

$$\dot{\alpha}_n = \alpha_n + (n - 1) \alpha_n \left(\frac{d\delta}{d\alpha} \right) \quad (1)$$

where n is the number of aerofoils α , the angle of attack of the

forward aerofoil i_n , the incidence of the aerofoil (number n), and ϵ the downwash angle. The incidence of the aerofoil is referred to the plane of symmetry of the car, and the chord line of the aerofoil.

The following values of $\frac{d\epsilon}{d\alpha}$ were assumed: $1/4$, $1/3$ and $1/2$. For example: if $\frac{d\epsilon}{d\alpha} = 1/2$, and the angle of attack of the forward aerofoil is 6° , the setting (incidence) of the fifth aerofoil is

$$i_n = 6^\circ + (5-1) \times 6^\circ \times 1/2 = 18^\circ$$

The last formula may be written also in the form

$$i_n = \alpha_i \left[1 + (n-1) \frac{d\epsilon}{d\alpha} \right] \quad (2)$$

When the model is yawed to the wind the incidence of the front aerofoil is referred to the plane of symmetry of the vehicle. Then the incidence of any other aerofoil is given by

$$i_n = i_i \left[1 + (n-1) \frac{d\epsilon}{d\alpha} \right]$$

Results:

The maximum rolling moment was obtained by assuming $\frac{d\epsilon}{d\alpha} = 1/2$. Thus the incidence of any aerofoil is equal to the incidence of the preceding one, plus one half of the incidence of the forward aerofoil.

Rolling moments about the rail are expressed in lbs. ins. on the full size machine at 1 M.P.H; for any speed

$$N = K_n V^2 \quad (\text{lbs.ins}) \quad (3)$$

where K_n = rolling moment coefficient, and V = Velocity in miles/hour.

The equation defining equilibrium of the vehicle in a turn, at constant speed is

$$W h \sin \theta + K_n V^2 - 2.15 \frac{W V^2 h \cos \theta}{gR} = 0 \quad (4)$$

where
 W = weight of vehicle.
 V = velocity in miles/hour.
 K_n = moment coefficient.
 h = distance in inches from rail to center of gravity, measured in plane of symmetry.
 R = radius of the turn in feet.
 g = gravitational acceleration.
 θ = angle of "list".

The speed, in general, is given by

$$V = \sqrt{\frac{Wh \sin \theta}{2.15 Wh \cos \theta - K_n}} \quad (\text{miles/hour}) \quad (5)$$

The angular settings of the aerofoils is found by solving first for K_n ; thus

$$K_n = \frac{Wh \left(\frac{2.15V^2 \cos \theta}{gR} - \sin \theta \right)}{V^2} \quad (6)$$

then looking for the value of α_i corresponding to this value of K_n in either Fig. 3 or Fig. 4. The settings of all other aerofoils than the forward ones are then given by

$$\alpha_n = \alpha_i \left[1 + \frac{n-1}{2} \right]$$

In using the formulas (3) to (6) care must be taken to insert the value of K_n with its proper sign.

In rectilinear motion the "getting off" speed is given by

$$V_{\min} = \sqrt{\frac{-Wh \sin \theta}{K_{n\max}}} \quad (7)$$

The quantity $(h \sin \theta)$ is simply the distance d through which the c.g. is moved laterally.

$$\theta = \arcsin \left(\frac{d}{h} \right)$$

If the c.g. is moved through 4" and $h = 60"$

$$\theta = \arcsin \left(\frac{4}{60} \right) = 3^{\circ}50' \quad (\text{approx})$$

$$V_{\min} = \sqrt{\frac{-20000 \times 4}{-34.3}} = 48.3 \text{ M.P.H.}$$

(where from Fig. 5 the maximum value of K_n is seen to be 34.3 at $\alpha_i = 10^{\circ}$)

Taking the maximum angle of list as $3^{\circ}50'$, the radius of turn as $\frac{1}{2}$ mile (=2640ft.) and the velocity of the turn as 100 M.P.H. the required K_n is

$$K_n = \frac{20000 \times 60 \left(\frac{2.15 \times 100^2 \times .9977}{32.2 \times 2640} - .0667 \right)}{100^2}$$

$$= \frac{20000 \times 60 \times .1863}{10000} = +22.4 \text{ lbs.ins. at 1 M.P.H.}$$

and, from Fig. 3 at 0° yaw, the angle of attack would be only $+5.4^\circ$ on the forward aerofoils with the other aerofoils included in their proper relative order as given by formula (2) when $\frac{d\epsilon}{d\alpha} = 1/2$.

If the car is moving in a straight line at 100 miles/hour;

$$K_n = \frac{-20060 \times 60 \times 0.667}{100^2} = -8.0 \text{ lbs. ins at 1 M.P.H.}$$

From fig. 3 the corresponding value of α_1 is -3.8° .

It is to be noted that the signs of the air load moments are reversed in the two cases at 100 M.P.H. Hence for the maximum list angle at 100 M.P.H. the aerofoils would be shifted from -3.8° during the straight run to $+5.4^\circ$ during the turn.

It is understood that the inventor proposes to take care of the aerofoil settings automatically. A complete stability analysis cannot be made until the inventor gives out details of his method of actuating the aerofoils.

At constant speed and constant setting of the aerofoils the moment acting when the car is not in equilibrium is

$$N = Wh \sin \theta + K_n V^2 - 2.15 \frac{WV^2 h \cos \theta}{gR} \quad (8)$$

and

$$\frac{dN}{d\theta} = Wh \frac{d}{d\theta} \left[\sin \theta - \frac{2.15V^2}{gR} \cos \theta \right]$$

The condition of statical stability in roll is that

$$\frac{dN}{d\theta} < 0$$

Performing the indicated differentiation above

$$\frac{dN}{d\theta} = Wh \left[\cos \theta + \frac{2.15 V^2}{gR} \sin \theta \right] \quad (10)$$

It is, therefore, evident that either in rectilinear or curvilinear motion the above condition (9) for statical stability cannot be fulfilled since the quantity in brackets in (10) will always be positive.

The vehicle is, therefore, statically unstable.

The curve for 30° yaw (Fig 4.) shows that the vehicle, when listing "hard over" into the wind cannot keep its equilibrium if the resultant velocity exceeds about

$$V_R = \sqrt{\frac{20000 \times 60 \times 0.667}{20.3}}$$

= 63 M.P.H.

Conclusions and Recommendations:

The total aerofoil area appears to be sufficient for motion with 0° yaw. However, it will be necessary to make extended tests in yaw to determine the performance of the vehicle with side winds. Downwash tests on the aerofoil system are also recommended.

Table I.
-Rolling Moments at 0° Yaw.-

Assumed: $-\frac{dE}{d\alpha} = \frac{1}{4}$

α	T_0	T_{40}	$T_{40}-T_0$	N	K_n
20	.640	.776	0.135	2.53	6.48
40		.905	.265	4.97	12.70
60		1.032	.392	7.35	18.80
80		1.150	.510	9.56	24.50
100		1.252	.612	11.47	29.40
120		1.303	.663	12.40	31.80
140					
160	.640				
180					

Table II.
Rolling Moments at 0° Yaw.

Assumed $\frac{dE}{d\alpha} = \frac{1}{3}$

α	T_0	T_{40}	$T_{40}-T_0$	N	K_n
20	.640	0.797	.157	2.94	7.55
40		.948	.308	5.78	14.80
60		1.087	.447	8.40	21.50
80		1.212	.572	10.71	27.50
100		1.306	.666	12.50	32.0
120		1.347	.707	13.25	33.9
140		1.344	.704	13.18	33.8
160	.640	1.310	.670	12.55	32.2
180					

Table III
Rolling Moments at 0° Yaw.

Assumed $\frac{dE}{d\alpha} = \frac{1}{2}$

α	T_0	T_{40}	$T_{40}-T_0$	N	K_n
20	0.640	.820	.180	3.38	8.65
4		.995	.355	6.66	17.05
6		1.150	.510	9.59	24.50
8		1.295	.655	12.30	31.50
10		1.355	.715	13.40	34.30
12		1.337	.697	13.08	33.50
14		1.305	.665	12.45	31.90
16	.640	1.263	.623	11.68	29.90
18					

Note:- $N = 18.75 (T_{40}-T_0)$

$K_n = \frac{363}{40\%} \quad N = 2.56 N$

or $K_n = 48 (T_{40} - T_0)$

TABLE IV

Rolling Moments at +30° Yaw.

Assumed $\frac{d\epsilon}{d\alpha} = 1/2$

α	$T_{40}-T_0$	N	K_n
+4	1.414	26.5	68.0
+2	1.390	26.0	66.6
0	1.325	24.8	63.6
-2	1.225	25.0	58.9
-4	1.076	20.2	51.6
-6	.910	17.1	43.6
-8	.746	14.0	35.8
-10	.590	11.1	28.3
-12	.493	9.25	25.6
-14	.437	8.20	21.0
-16	.422	7.91	20.3

Numerical Data

Scale of Model = $\frac{3}{4}$ " to foot.

Weight of Vehicle = 20,000 lbs.

Vertical distance from C.G. of Vehicle to rail = 60"

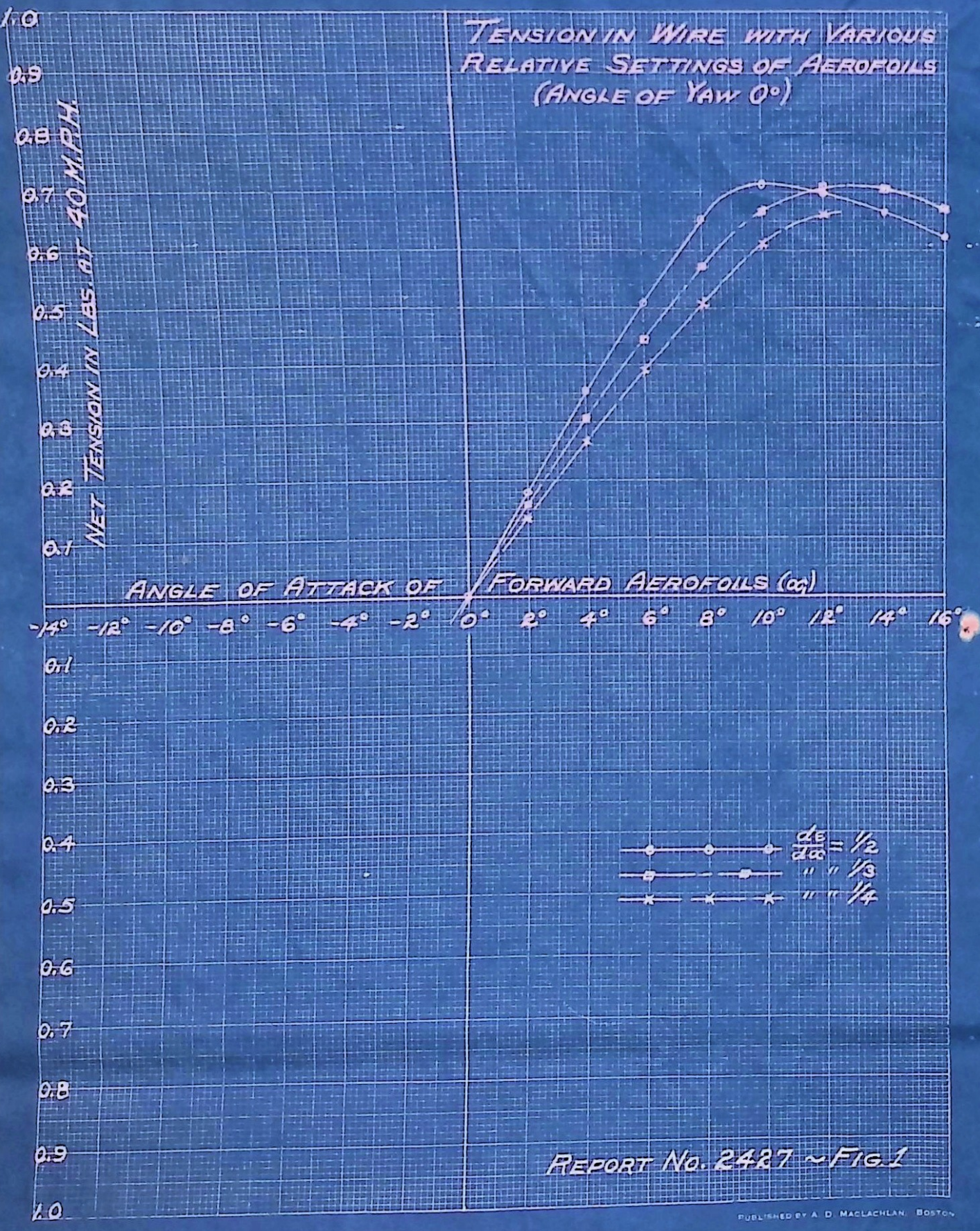
Factor for multiplying tension in wire to obtain moments about rail is 18.75.

Formulas:-

$$N = 18.75 (T_{40}-T_0)$$

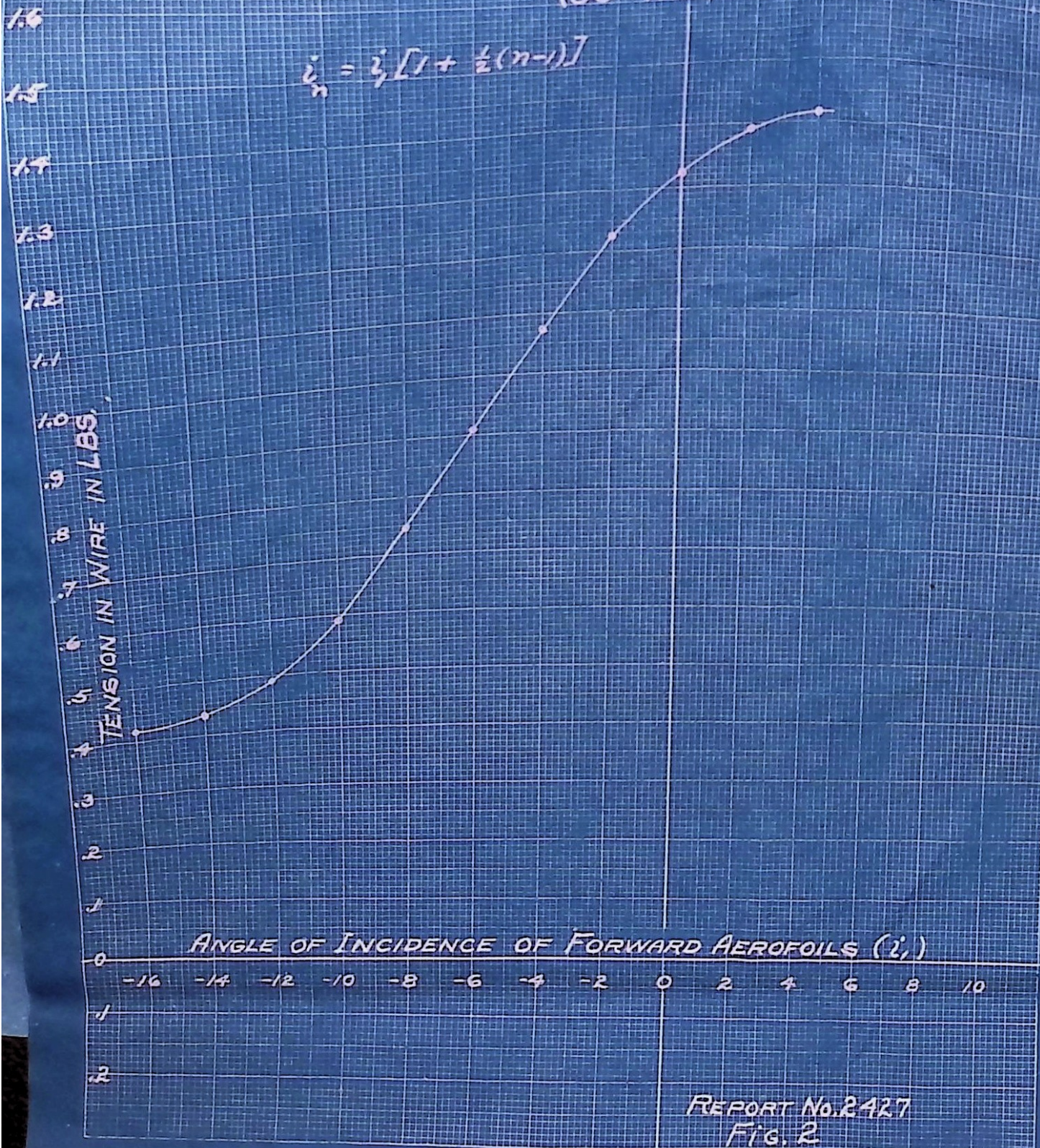
$$K_n = N \times \frac{16^3}{40^2} = 2.56N$$

$$= 48 (T_{40}-T_0)$$



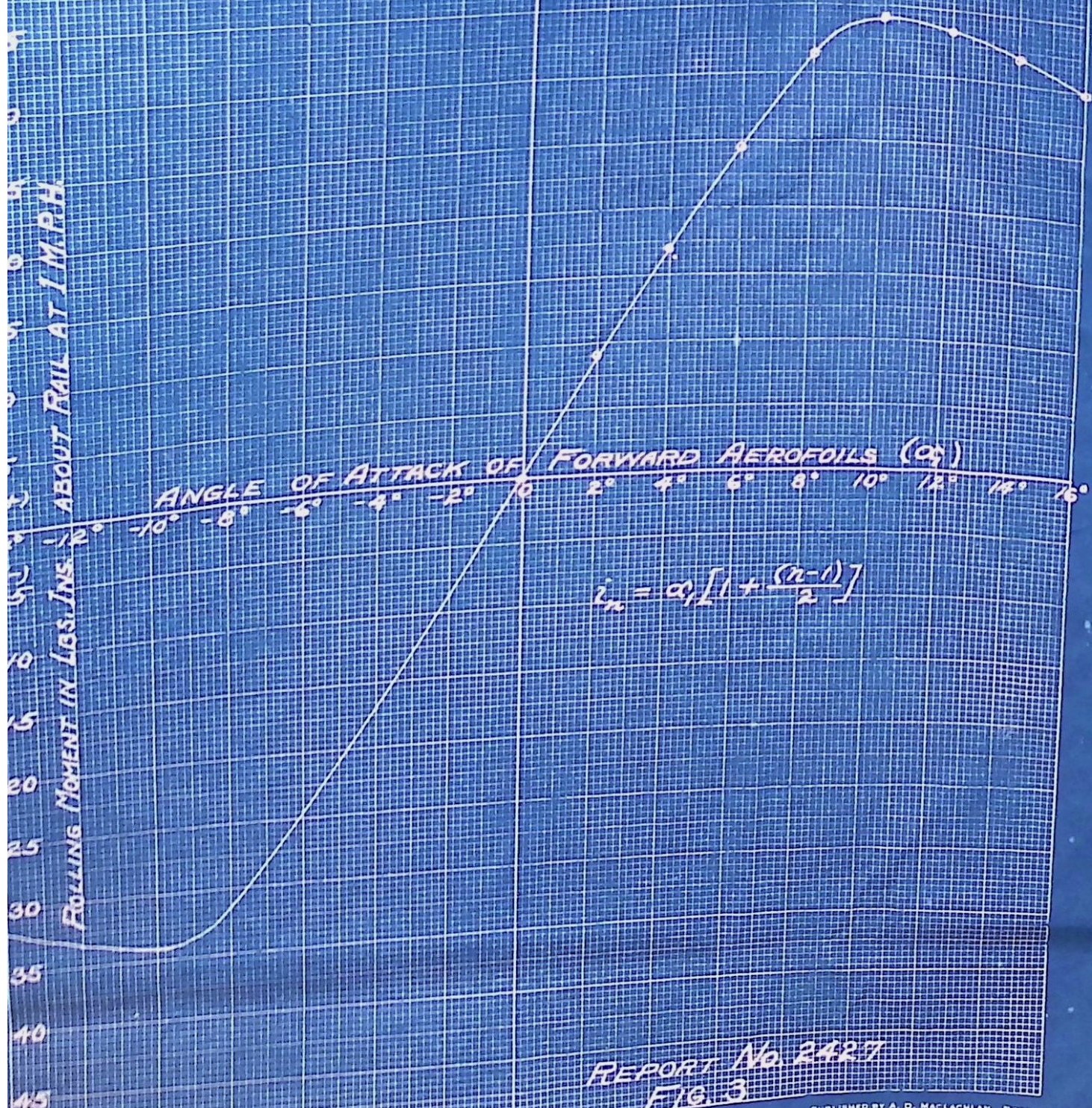
NET WIRE TENSION AT 40 M.P.H. (30° Yaw)

$$i_n = i_1 [1 + \frac{1}{2}(n-1)]$$



REPORT No. 2427
FIG. 2

FULL SCALE ROLLING MOMENTS
AT 1 MILE PER HOUR,
(YAW ANGLE 0°)



REPORT No. 2427
FIG. 3

FULL SCALE ROLLING MOMENTS AT 1 M.P.H.
(30° YAW)

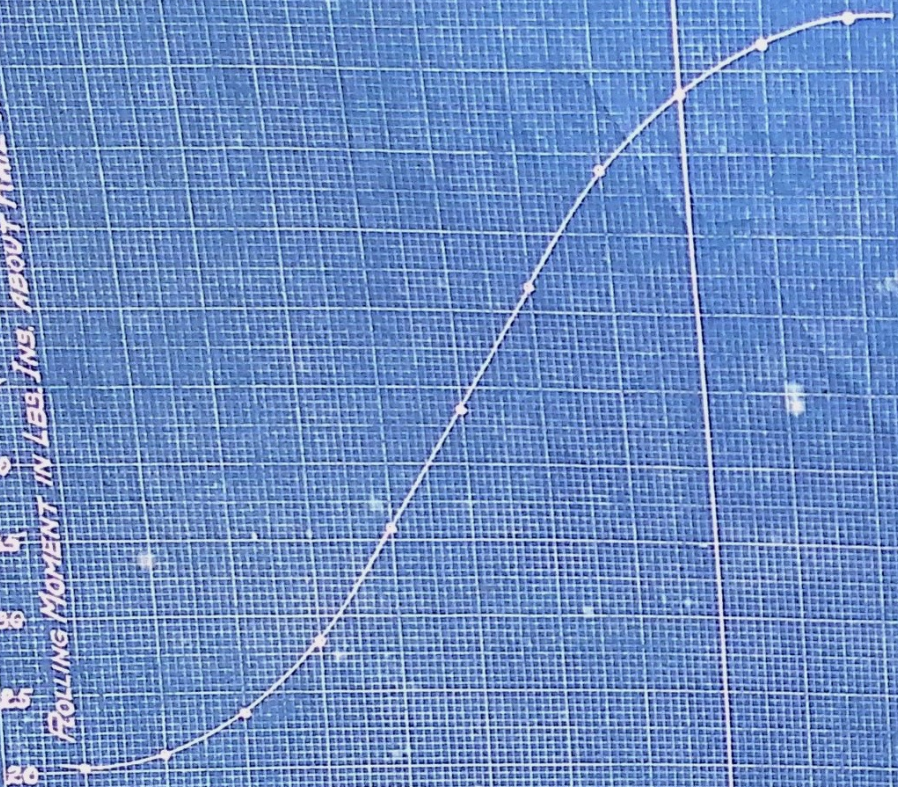
$$\xi_n = \xi [1 + \frac{1}{2}(\eta - 1)]$$

80

75

70

ROLLING MOMENT IN LBS. INCH. ABOUT PAUL AT 1 M.P.H.



ANGLE OF INCIDENCE OF FORWARD AEROFOILS (4)

0 -15 -14 -12 -10 -8 -6 -4 -2 0 2 4 6 8 10

5

10

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FIG. 4