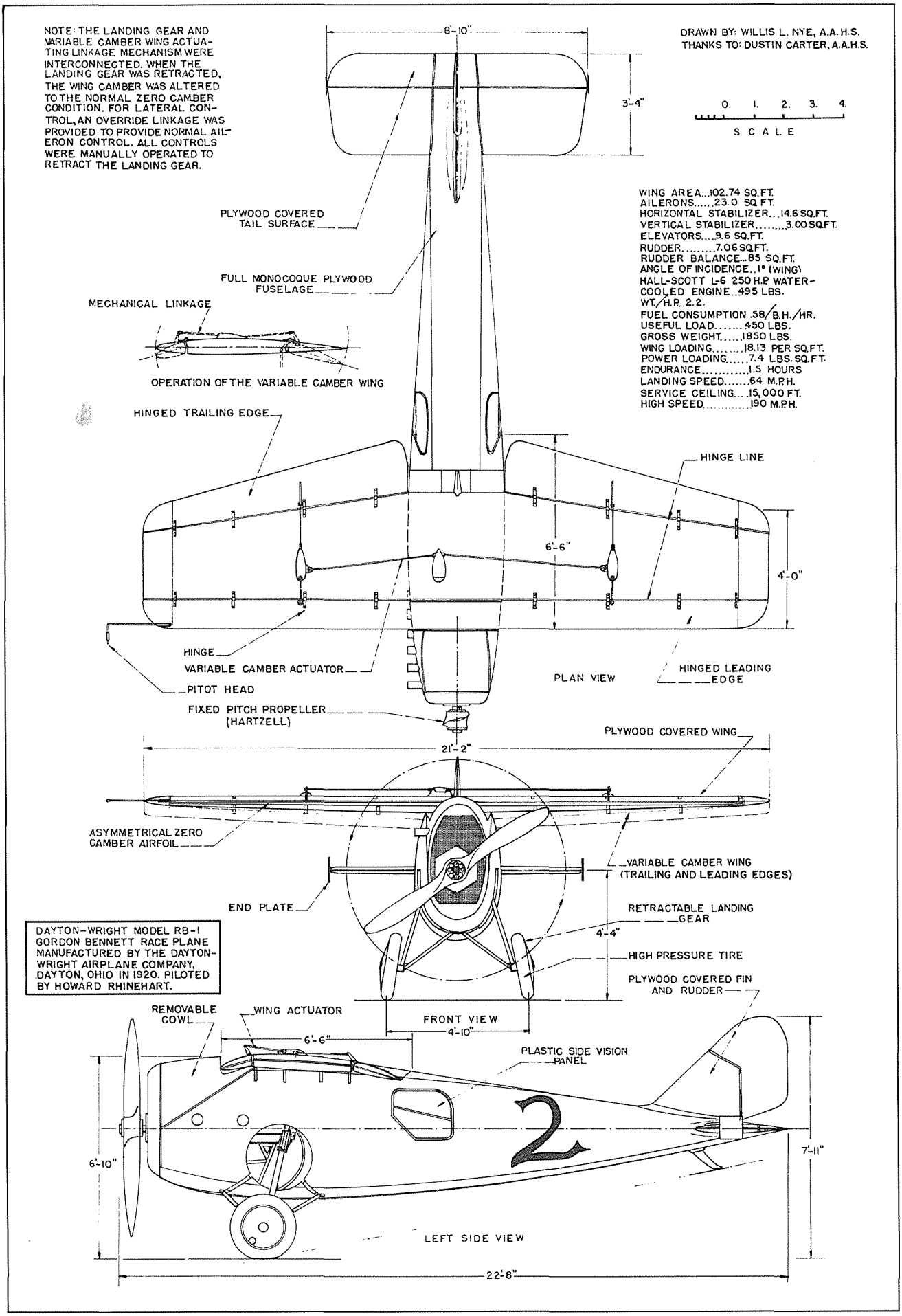

NOTE: THE LANDING GEAR AND VARIABLE CAMBER WING ACTUATING LINKAGE MECHANISM WERE INTERCONNECTED. WHEN THE LANDING GEAR WAS RETRACTED, THE WING CAMBER WAS ALTERED TO THE NORMAL ZERO CAMBER CONDITION. FOR LATERAL CONTROL, AN OVERRIDE LINKAGE WAS PROVIDED TO PROVIDE NORMAL AILERON CONTROL. ALL CONTROLS WERE MANUALLY OPERATED TO RETRACT THE LANDING GEAR.
DRAWN BY: WILLIS L. NYE, A.A.H.S.
THANKS TO: DUSTIN CARTER, A.A.H.S.
0. 1. 2. 3. 4.
SCALE
8'-10"
3'-4"
PLYWOOD COVERED TAIL SURFACE
FULL MONOCOQUE PLYWOOD FUSELAGE
MECHANICAL LINKAGE
OPERATION OF THE VARIABLE CAMBER WING
WING AREA...102.74 SQ.FT.
AILERONS.....23.0 SQ.FT.
HORIZONTAL STABILIZER...14.6 SQ.FT.
VERTICAL STABILIZER.....3.00 SQ.FT.
ELEVATORS....9.6 SQ.FT.
RUDDER.....7.06 SQ.FT.
RUDDER BALANCE...85 SQ.FT.
ANGLE OF INCIDENCE..1° (WING)
HALL-SCOTT L-6 250 H.P. WATER-COOLED ENGINE..495 LBS.
WT./H.P. 2.2.
FUEL CONSUMPTION .58/B.H./HR.
USEFUL LOAD.....450 LBS.
GROSS WEIGHT.....1850 LBS.
WING LOADING.....18.13 PER SQ.FT.
POWER LOADING.....7.4 LBS. SQ.FT.
ENDURANCE.....1.5 HOURS
LANDING SPEED.....64 M.P.H.
SERVICE CEILING....15,000 FT.
HIGH SPEED.....190 M.P.H.
HINGED TRAILING EDGE
HINGE LINE
6'-6"
4'-0"
HINGE
VARIABLE CAMBER ACTUATOR
PITOT HEAD
FIXED PITCH PROPELLER (HARTZELL)
PLAN VIEW
HINGED LEADING EDGE
PLYWOOD COVERED WING
21'-2"
ASYMMETRICAL ZERO CAMBER AIRFOIL
VARIABLE CAMBER WING (TRAILING AND LEADING EDGES)
END PLATE
RETRACTABLE LANDING GEAR
4'-4"
HIGH PRESSURE TIRE
PLYWOOD COVERED FIN AND RUDDER
DAYTON-WRIGHT MODEL RB-1 GORDON BENNETT RACE PLANE MANUFACTURED BY THE DAYTON-WRIGHT AIRPLANE COMPANY, DAYTON, OHIO IN 1920. PILOTED BY HOWARD RHINEHART.
REMOVABLE COWL
WING ACTUATOR
FRONT VIEW
4'-10"
6'-6"
PLASTIC SIDE VISION PANEL
2
6'-10"
7'-11"
LEFT SIDE VIEW
22'-8"

CHARLES HAMPSON GRANT

Early Bird – Model Builder – Inventor – Journalist Youth Builder

By WILLIS L. NYE

Few men have had the opportunity in their lives to influence the youth of America in the pursuits of honor and integrity, inventiveness and technical achievement, as has Charles Hampson Grant. Among the great and near great, his own work in the field of aerodynamics, as expressed through model aircraft building, in books, as editor of the foremost model aircraft magazine of its day, and as founder of a boy's camp dedicated to character improvement, has served as an inspiration to countless thousands of young men. In recognition of this, Charles H. Grant was awarded the Frank Brewer Trophy by the National Aeronautic Association in 1943.

The Henry Ford Museum at Dearborn, Michigan has a fine collection of historical aircraft, all in mint condition. One that usually catches the eye first is the Rhinehart-Baumann RB-1, the Gordon Bennett Trophy racing monoplane of 1920. This airplane incorporated two features without which modern aircraft could not perform as they do, the retractible landing gear, and the variable camber wing. The RB-1 was much ahead of its time, and today few people realize the early origins of both of these features, and even less of the influence of C.H. Grant in their concepts.

World War One had ended. The aviation industry was brought to a sudden and dramatic halt by cancellation of military contracts. The development efforts of aircraft manufacturers at home and abroad were to be directed in the avenues of peace. It was in the year 1920 that the struggling aviation industry in the United States was seeking an opportunity to demonstrate its technical competence to the world at large.

The final race for possession of the James Gordon Bennett Trophy was to take place on September 27th at Villasauvage Airdrome, Etampes, France. What finer event could occur to exhibit the technical superiority of American aircraft? The U.S. entered three racing airplanes, each of them original in design, but also inherently destined for failure. The VCP-1, redesignated the R-1 for the 1920 event, was entered by the U.S. Army Air Service, to be flown by Major Rudolph Schroeder. It came to a forced landing because of overheating of the powerful engine.[1]

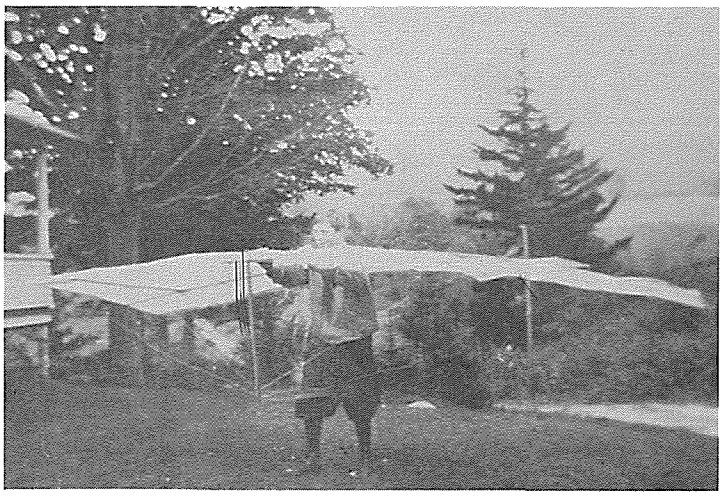
Two entries, of essentially similar design were built by the Curtiss Aeroplane & Motor Co. to the order of a Mr. S.E.J. Cox, a Texas oil promotor. Neither competed in the race, as one was cracked up prior to the race and the other was not ready at the prescribed time.[2]

The third design was built by the Dayton-Wright Company. Howard Rhinehart, one of the foremost pilots of the day, was to fly it. Orville Wright was the chief consulting engineer, and Milton Bauman was the chief engineer in charge of the design. Together with a fourth man, Charles Hampson Grant, their combined talents produced a very clean airplane of original concept. It had a monococque fuselage, a retractible landing gear manually operated, a cantilever wing of unusual construction, and the pilot sat enclosed inside the fuselage with no forward vision but with transparent panels in the fuselage sides. The RB-1 did not finish the race either, although its power, a 250 HP Hall-Scott engine, and its aerodynamic cleanliness, indicated that top speed would be near 180 m.p.h. at sea level, and thereby probably a winner.[3]

Rhinehart was forced to land soon after starting the race – he experienced severe control difficulties and the racer became nearly unmanageable. This was due to too little vertical fin area, and because there was separation of the air flow from the upper surface of the fuselage, the fin was operating in a "vacuum" at high speed. Rhinehart effected a safe landing but, with this catastrophe, American hopes of obtaining the Gordon Bennett Trophy permanently were dashed.

Nonetheless, detailed inspection of the RB-1 in the Ford Museum today reveals the foresight of the Dayton-Wright team. Howard Rhinehart and Charles Grant had been friends for a number of years. It was Rhinehart who approached Grant for new ideas in wing construction, knowing that Grant had already made a detailed study of the behavior of airfoils with leading edge slats and trailing edge flaps. Grant laid out the initial design and actuating linkage of a wing which would have the leading edge droop downward at the same time as the trailing edge. The structure was comprised of solid balsa wood with appropriate cutouts for components and reinforcements for attaching parts. The whole was covered by three-ply wood veneer.

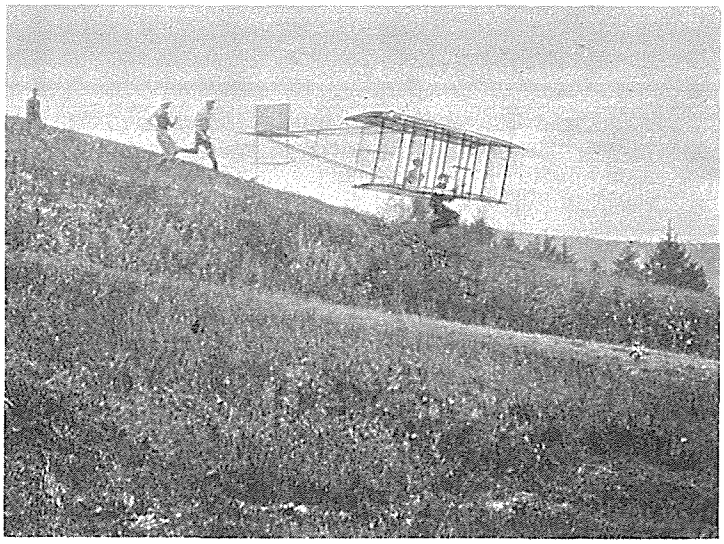
The concept has persisted throughout all of aerodynamic design, and that this first application was on a machine

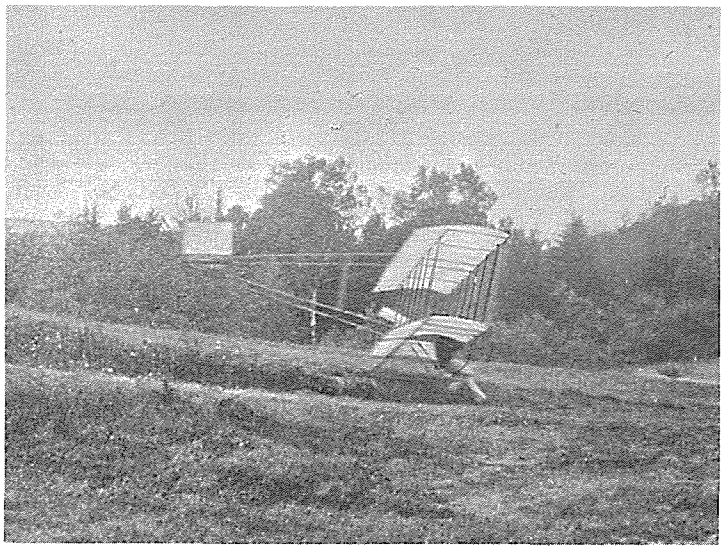


C. H. Grant, age 15, and his partially finished hang glider. He added a vertical fin and a pole for attachment to his bicycle, and made his first flight on 15 August 1910 at Peru, Vermont.

Opposite page, the second and most successful glider, flown in 1912. Duncan Grant is at left wingtip, Sam Ogden on right tip, David Baird at tail, and C. H. Grant at center.

Below, the start and finish of a successful hang glider flight down the slope of Cosmos Meadow, near Peru, c. 1913. In response to a gust of wind, Grant moved the aileron control opposite and wrongly, causing an abrupt stop with the left wingtip down.





which failed of its purpose may be laid to the untried nature of the airplane; later applications have proved imminently successful. Later extensions of the same theories have netted little recognition for the inventor, just as little credit has been given in accounts of the RB-1 to Grant for his part in the design.

Charles Hampson Grant was born in Elizabeth, New Jersey, in 1894. When he was only 14 a visit to an aviation show in New York City intrigued him by the obvious mass of knowledge required to create and build a successful aircraft. He immediately set about to obtain information from many sources, and perused every item available on the subject. He began to put this into actual practice by building every conceivable kind of flying model – his first one, purchased on the visit to the aviation show, was a disappointment since it did not fly.

Young Grant's second model – of his own design – was completed soon afterwards. The premier test flight was in the street in front of his home in Elizabeth, New Jersey, and it flew 128 feet, taking off R.O.G. and landing successfully. Once he had experienced the sound of wings, he never forgot. He read and re-read all of the existing texts and publications on the fascinating subject of aeronautics, and made the decision that he, too, would follow in the footsteps of Octabe Chanute and Professor Langley.

The Grant family moved to Peru (Vermont) in 1901 for the summer, probably among the first people in the area as vacationers. His father was a banker in New York, later Vice President of Lincoln National Bank, part of the Irving Trust Co., and the family thought that the invigorating air of Vermont would be helpful to the two boys, Charles and younger brother, Duncan. In 1905 they took up permanent residence. His mother, Gertrude Grant, was a painter of portraits and landscapes of some distinction, and the family home is today adorned with many of her paintings.

After the visit to the aviation show of 1908, Charles Grant experimented with many models, developing airfoil sections, propellers, and power methods, and with encouragement from his mother he obtained enough money for materials to build a glider, hang-type, of his own design. His conservative father frowned upon his aviation activities and "would not contribute to fooling around with contraptions of the Devil." The first configuration was of an airfoil surface attached by means of a vertical pole to the handlebars and to the seat of his bicycle.

Upon finishing it in July, 1909 Grant took it to a suitable hill nearby and made the first test. With a running start the doughty young birdman actually rose a short distance in the air but he stalled immediately and crash-landed. Though he wasn't hurt by this first venture into the wild blue yonder, young Grant learned some well-defined principles of aerodynamics in no uncertain way.

No one offered to assist him with the next, and successful, glider, though younger brother Duncan was there to help when it was launched. Duncan gave more of his aid later on as interest grew. Young Charles had great admiration for his brother, who was later killed during the great World War in a mid-air crash while flying a Sopwith Camel during practice maneuvers in England in 1918. A portrait of Lt. Duncan Grant, U.S. Air Service, 135th Aero Squadron, graces the home of the Grants in Peru today. It was painted by an old friend.

Charles' father cast the usual dour eye on the aeriel experiments of his older son, but Mother continued her encouragement and helped with the sewing of fabric for the surfaces of the second venture. The photograph reproduced here shows it when partially completed. Upper cabane struts, landing wires and a vertical fin were added before the first launching. Its span was 13 feet, chord 4 ft., and

wing area, 48 square feet. It weighed 30 pounds, and together with a hundred-pound boy, brought wing loading to 2.71 pounds per square foot.

Charles made his first successful flight from a launch pad in Peru, the long sloping roof of a farmhouse. He ran down the slope against a 15 to 20 mph breeze with the plane firmly gripped, and a saddle on the lower wing brace bar supporting him. He came to earth in a grassy meadow about 65 feet from the liftoff point, and then proceeded to do it again and again.

As his experience grew, and after more intensified study and more model work, another and more successful glider was constructed in 1911, this one in the classic biplane configuration of Octave Chanute's hang gliders. With the success of his previous flights young Grant gained the interest of several other youths, and although they did not assist him in construction, they served as ground crew.

Shown here in another photograph with Charles and Duncan are Samuel Robinson Ogden, a later volunteer of infantry in WWI and who lives today in Landgrove, Vt., and David Graham Baird, later to become a financier. Others were Kenneth Decker, Walker Glasford, Alvin Robinson, and Douglas MacLean. Grant reported later that, "Everyone thought I was nuts and usually approached me with an air of toleration and often sympathy . . . Others wanted no part of what I was doing and offered no help until the second glider was ready to fly."

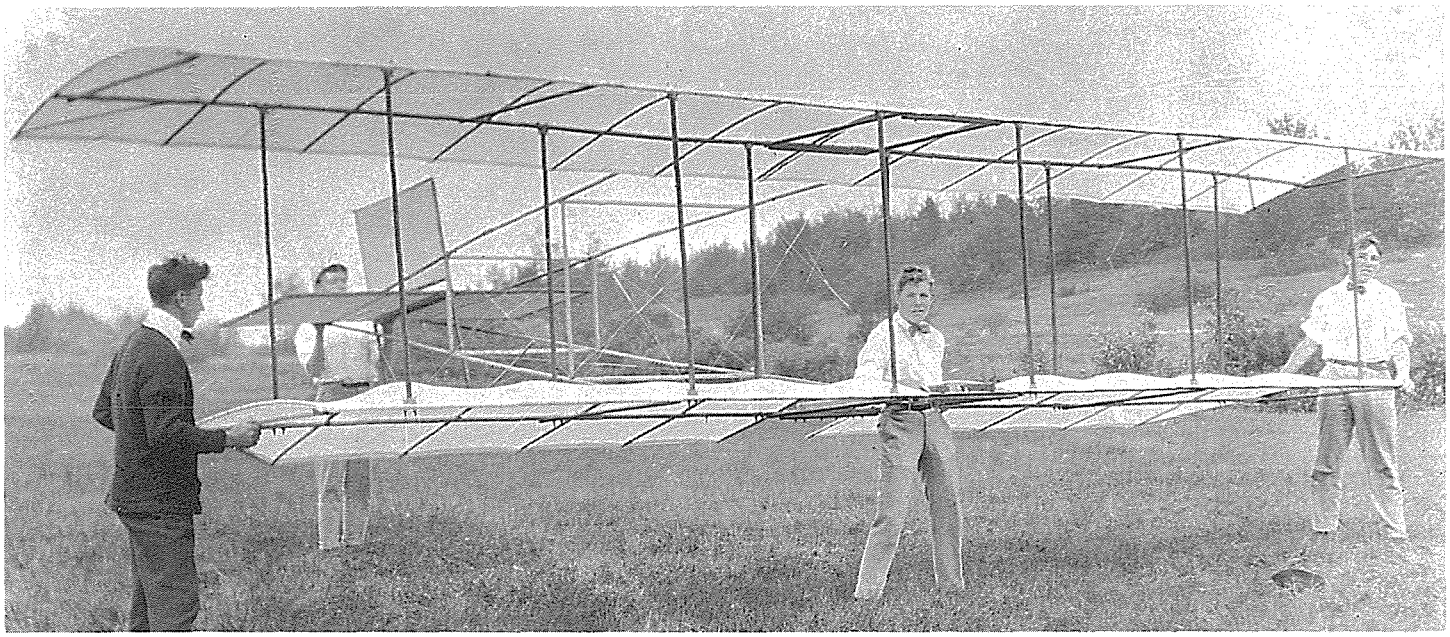
Grant took off in July, 1911. This hang-type glider had 211 square feet wing area and weighed 90 pounds. Upper wing span was 25 feet, lower span 22 feet, and both had a chord dimension of 4.5 feet. The tail surfaces were supported at the apex of four longerons. The wings were held together with vertical struts and music wire bracing. Grant had followed the then-prevalent practice in construction, with muslin covering of the airfoils, and primary structural members of straight-grained spruce. No movable flight controls were first provided, the whole direction and control of the hang glider being a function of the position of the pilot.[5]

The first flight of this new glider was made from the slopes of Cosmos Meadow near the Grant home in Peru. His ground crew ran along with him, supporting the 90-pound structure by the wing tips and tail, until flight speed was attained. At the proper instant a signal from Charles told the crew to let go and he was airborne. But not for long. The wind was gusty, and the wing cellule aimed too high. Suddenly the glider stalled and Grant came to a rough landing. The structure was damaged but the pilot emerged from the wreckage unhurt save a few bruises.

Further tests were terminated until the glider was rebuilt. This incident demonstrated the need for lateral controls, so Curtiss-type ailerons were added between the wings at their tips. Also it was realized that a high-lift airfoil would improve the overall performance and tend to delay the incipient stall. The fabric was removed and new wing ribs fabricated with greater camber. More flights followed, some over distances of 400 feet, and sometimes at altitudes of near 25 feet. By 1913, Grant had made many flights with only some minor accidents. The Curtiss-type ailerons are shown in a number of photographs with Grant at various altitudes and with his ground crew running along in the excitement. The ailerons were operable by means of cables and a control lever in front of the pilot section on the lower front wing spar. Also a pair of sturdy ash landing skids were attached to the lower wing for more convenient operation.

Grant wrote of these early attempts:

> "The thrill of such flights cannot be described. You feel that you, yourself, are really flying . . . a sensation that one does not get while riding in an engine driven airplane. There you are just riding in a vehicle and the sensation of flying is completely absent. Not so in a glider, which tends to react to every air current and which you must control by your own actions, operation of the ailerons for lateral control, or swinging one's body and legs forward for nosing down or backward for climbing.
>
> ". . . On the takeoff, the glider is held up so the pilot-support bars rest under the armpits. Then everyone who is assisting runs fast, all in the same direction with the glider headed into the wind and down the slope. The tail man drops the tail on a signal from the pilot, the glider then noses up and she and you glide into the "wild blue yonder" or thereabouts.
>
> "At the proper moment the pilot must swing his weight forward in the sling seat in order to nose down into the normal glidepath and avoid stalling . . . If the breeze holds steady, usually the flight continues to a level ground area at the foot of the hill. If not, the flight ends abruptly. In either instance, as he approaches the ground, the pilot eases backwards his



weight. The glider will nose upward in response and a stall landing is made on the skids at a ground speed of approximately ten miles per hour.

"Such flights continued through the Summer of 1913, and were repeated in 1914 and 1915. On one occasion a takeoff was attempted out over the hollow of a sandpit in the east side of the knoll in Cosmos Meadow. A beautiful flight was made, . . . however, on the following flight the wind was gusty, and immediately on lift-off it died completely. The glider nosed down and I landed, face down, against the upward slanting face of the old road embankment.

"The impact pushed my face into the gravel and telescoped the rear longerons. When attempting to get up, I found I was pinned to the ground by a sharp broken end of one of the longerons which had pierced my jacket and jammed deep into the ground. I pulled myself loose. It would take at least a month to repair the glider. I did not stop to think what might have been the result if that sharp longeron had jabbed forward three inches nearer my backbone."

This hang-glider was flown until the winter of 1916/17. As it was being removed from a barn where it was temporarily stored high winds wrenched it from the grasp of Grant and his assistants. It blew end over end into the nearby woods and was destroyed.

During his engineering course at Princeton in 1916 young Grant sought additional professional experience and obtained work under Grover Loening, then Chief Engineer of the Sturtevant Airplane Company of Boston. Largely as the result of his self-taught aerodynamics and glider experience, Loening gave him a job in the shop at $8.00 per week where he helped build the first metal-frame airplane, the "Sturtevant Battle Plane," "in order to get experience," he explained. The B.F. Sturtevant Company, parent company of the "Airplane Company," had been manufacturers of electric fans. The subsidiary company also built aero engines.

During the five years of gliding experiments, Grant was endlessly engaged in building flying models, not as an entertaining hobby, but for the purpose of genuine research into the laws of aerodynamics. In 1911 one of his models set a new record by rising off the ground in 2/5 second, and equalling the existing record for endurance then held by Percy Pearce, an old-time model builder, Grant's was an A-frame type pusher model, powered by two sets of rubber strands and propellers. In 1912, at a model meet held in Van Courtlandt Park in New York City, Grant won several long-distance flight events. His specialty was always directional flight control, and he was then experimenting with models that were stable in the three axes of rotation. These were the beginnings of his studies, later expounded in a series of articles in *Model Airplane News* Magazine, and still later incorporated in his book, *Model Airplane Design and Theory of Flight.*[6]

His contest winners were those which could be made to fly straight over a distance of 2,200 feet or more. Other contestant models persisted in wandering all over the course due to cross winds or because of lack of sufficient dynamic directional control. In 1915, while a student at Princeton, Grant constructed that flew 2,600 feet many times.

Grant entered Princeton at age 19 for the more formal aspects of education. Although he had worked as an experimenter and as a practical aircraftsman, and had the fundamental laws of aerodynamics well absorbed, he pointed his course toward civil engineering, a large part of which deals with stress analysis, strength of materials and structural design. He was elected Vice President of the Princeton Flying Club, and in the Spring of 1917 delivered the first lecture at the University on aerodynamics the assembled faculty and students. He designed one of the first practical retractible landing gears while at Princeton and showed it on an airplane of his own design which he called the Grant Fast Fighter.[7]

The tragic catastrophe of World War engulfed the United States in 1917. Young Grant, like hundreds of other patriotic students, volunteered for the Aviation Section, Signal Corps. He was turned down on the premise of a ruptured ear drum, but was eventually accepted in the engineering branch of the Signal Corps, Aviation Section, and sent to the School of Military Aeronautics at the Massachusetts Institute of Technology. He graduated in July, 1918, a 2nd Lieutenant.

Grant was ordered to Washington and then to McCook Field. The assignment resulted primarily from his submission of his design, the Grant Fast Fighter, through channels to the Aircraft Production Board Sub-Committee responsible for looking at new designs. It was rejected on the basis

RB-1 at Etampes, France, in readiness for the start of the Gordon Bennett Trophy Race, Sept. 1920. (Photo – USAF Museum,courtesy of Edwards)

that no new designs were being accepted for production, although the Committee acknowledged that it had merit and put it on the "secret list." He was not alone, as a number of other American Designs of great ingenuity were rejected at the vast program got under way.

The French Air Mission also surveyed the design, as they did all other promising ideas, inventions and current applications, and though nothing further came of it, recognition was accorded by the French in presenting Grant with the "Brevet D'Aviateur Militaire" award.

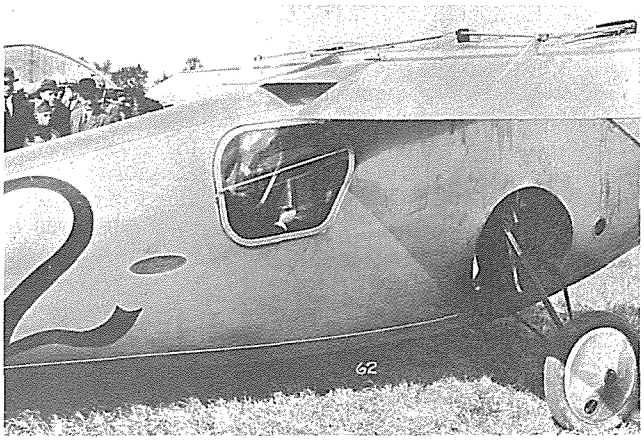
Grant wasn't entirely the loser with his Fast Fighter design. Even before entering the Service, he journeyed to the Curtiss plant at Buffalo, New York to submit his design to the Curtiss organization. Busy with their own very large program, and subcontracting, a lower echelon engineer interviewed him, and a job offer was made, but no hope of acceptance of his design was held out. On the way home to New York he met the future Mrs. Grant on the train. Miss Lillian May Browne was then a champion and exhibition ice skater. Grant pressed his case well, and throughout a lifelong companionship has felt that the mission was, after all, accomplished.

Grant came out of the service at the end of the war dedicated to two basic requirements in aviation development. First of all, he felt that *people* are the most important part of the world, so aircraft should serve the welfare of people. Secondly, men had to be trained to design and build safe aircraft if ever the general public were to fly in them and this great new means of transportation were to expand to fill the public needs.

Grant concluded that the most effective, safest, and least costly way to accomplish both of these objectives was by teaching the science of aircraft with models, or, preferably, miniature aircraft.

With this objective in mind he interested some business men in a venture to mass-produce completely assembled flying models for the commercial market – for the general public, and not only for the hobbyists. He had patents already covering the necessary features of foolproof model airplanes, and he proceeded to obtain others.

The postwar economy was erratic. His enterprise was entirely a success, but neglect by the business financiers to



Access to, and visibility from, the cockpit was through the side windows only. This view clearly shows the exterior linkage mechanism for operation of the variable camber wing. (USAF Museum, courtesy of Jerry L. Edwards)

pay the agreed upon patent royalties made it necessary to bandon the venture.

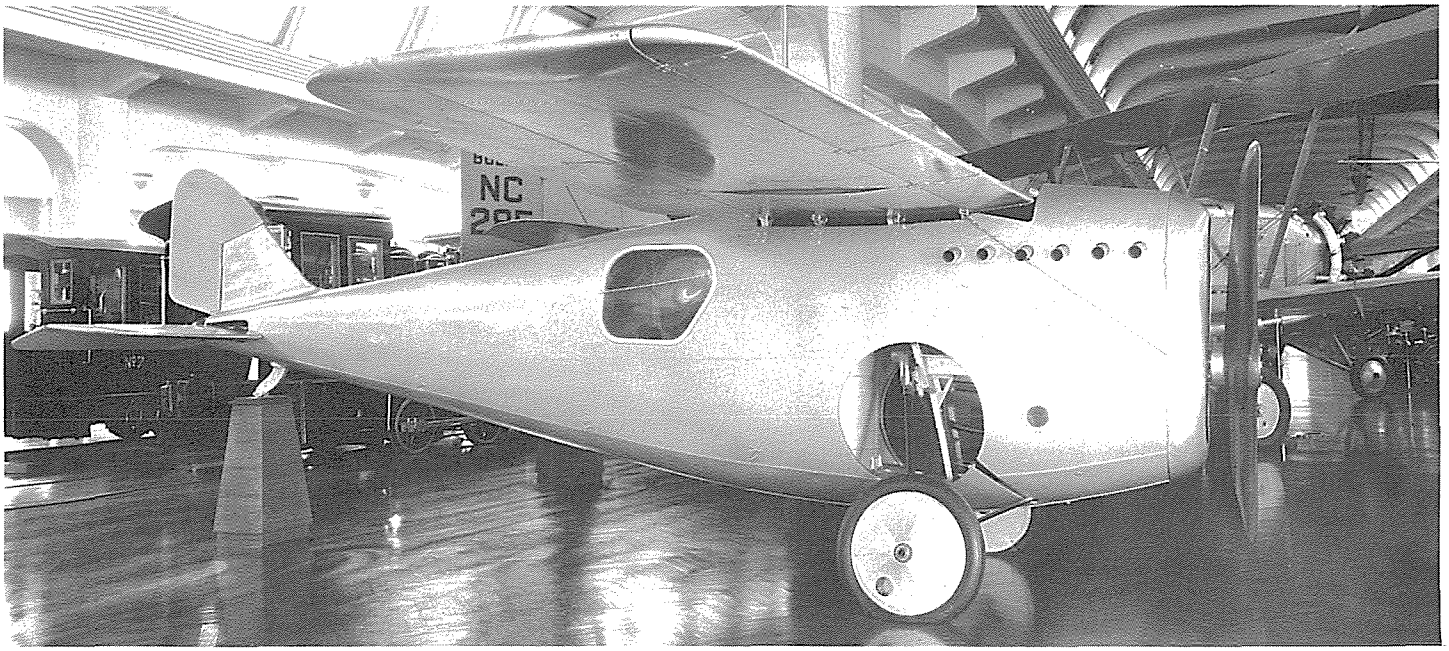
Before returning, with Mrs. Grant, to their beloved Vermont, Grant evolved the design of the RB-1's variable camber wing.

Coming home in 1921, Charles and Lillian Grant set out to carry out the other dedication. The "Camp Duncan Grant" was set up on the former Lyon place in Peru, advertised as the "Boy's Camp of Model Airplane Building and Designing." For the next twelve years he and his wife were to run the resort, each year as a summer camp with 25 to 35 boys of teenage, with a basic routine of health building, character training, and instruction in aerodynamics.

Some of Grant's students became prominent in the model aircraft industry, among them Howard G. McEntee, a major name in the radio control of pilotless aircraft; Joseph Kovel, who later worked with Grant and developed the first KG, a Grant-designed model using the first successful gasoline model engine, the "Brown Jr.". Dr. Walter Good, using a modified KG design, was credited for the perfection of the first radio-controlled model aircraft.

Grant again returned to the commercial model airplane field in 1928, this time with much better chances of

The Dayton-Wright RB-1 as may be seen today in the Ford Museum. **(Courtesy of Henry Ford Museum, Dearborn, Michigan)**



success. Lindbergh had made his epic flight and was on everyone's thoughts; the country was experiencing the rising tide of economic boom. This time it was with a completely tooled, stamped-out metal airplane model, assembled and ready to fly. He established his plant in Chester, Vt., and got under way, with the usual financial problems of starting businesses. Within a short while he came to the attention of the Kingsbury Mfg. Co. of Keene, N.H., with the result that the operation was transferred to Keene.

Grant felt that he wanted to introduce model aircraft to the millions of young men in such a manner that they could fly the product without having to learn the techniques of modelling first. The models were made of aluminum, and were completely stamped out with the stiffening, the dihedral and the directional control all built in. These became the famous "Silver Arrow" line, and in less than two years over $300,000 worth had been sold. But also within less than two years the Great Depression set in, and the Kingsbury factory closed down as the toy business collapsed.

In 1932 Grant became associated with the Magazine, *Model Airplane News*, the endeavor for which he is probably most famous. It had been started in 1929 as a model enthusiast magazine but the title was taken over as a commercial venture by Bernarr McFadden, who set it up separately from his other publishing enterprises (perhaps not feeling that model airplanes were here to stay).

Grant immediately began upon the formation of model flying clubs. His format for the magazine included good articles on the theory of model flight, construction, popular subjects, and good three-view drawings. *Model Airplane News* served as the focal point for the youths interested in modelling and aerodynamics, with a dash of history thrown in, articles by Bill Puglisi, Joe Nieto, and Bob Hare, to name a few.[8] The clubs flourished, the model contestants grew in number; from 45 in the 1933 "Nationals" to more than 1,500 in the 1942 "Nationals." Who can say the total number of young men influenced to some degree by these efforts? Surely, when the Second World War came, there were untold thousands who had had their introduction to aviation in some manner by *M.A.N.*

Seeing the importance of model airplane construction as an important asset to the national posture he journeyed to Washington to explain his ideas. Though scant attention was paid except through the usual lip service, Grant was able to compare later; ". . . Over in Germany Hitler was forming groups, and history also records that these very same youth formed a talented and trained pool of flyers and technicians that later became the Luftwaffe."

The first big change in model aircraft practice came in 1932, about two years after Grant's research stability data on tractor design became available. Then almost overnight the modellers abandoned the "twin pusher" as the standard contest model for "tractor propeller models." This was due to a practical solution for the tractor stability problem. In turn, it opened the door to the gasoline engine era, the missing link between models and full sized aircraft. Gas-engined models resembled fullscale airplanes in aerodynamic design characteristics much more than did the lightweight rubber-powered models. Thus stability characteristics were more critical but Grant's research data had taken this into account and made completely stable gas-engine models possible.

In 1931 and 1932 Maxwell Bassett had put a gas engine, developed by William Brown, into a light model designed to the then-current model practices. It made remarkable, but *unstable* flights. It had to be trimmed to stall and fall off, then to continue this maneuver in order to stay in flight and keep from spiral diving to a crash-landing. This prompted Grant to design a large gas model which particularly corrected spiral diving tendencies.

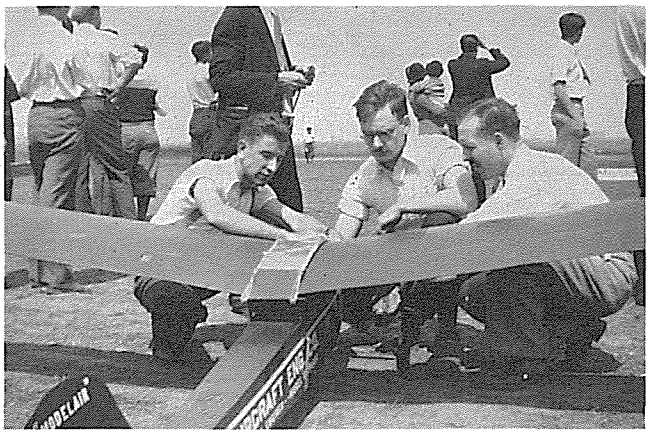
Having no precedents to design such an airplane, Grant designed it along fullscale lines, aerodynamically and structurally, but with the arrangement of weight and areas in accord with his research findings. Joseph Kovel, a close friend of Grant, built the first K.G. gas model from Grant's plans and after several short test flights, an extended flight of fourteen minutes resulted, with perfect stability in all axes of flight. It even made three-point landing, later to become a habit.

With this flight in August 1934 the real gas engined, stable, pilotless airplane era was born. Grant chose to call his basic rule of stability the "Law of Rotational Stability," for which the basis is keeping the design rotational longitudinal axis sloping positive to the line of flight. This causes the airplane to roll with the nose up and not down.[9]

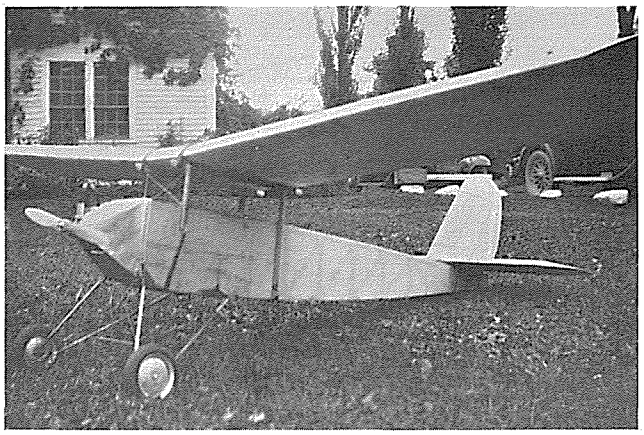
The ten-foot span version of the K.G. still holds a world's endurance record for a timed flight of 64½ minutes with one and one-half ounces of fuel. This flight occurred in 1935. After taking off from Hadley Field, near New Brunswick, N.J., the timing crew followed the model for thirty miles before it disappeared into the clouds, heading in the direction of Philadelphia at 3,000 ft. altitude. Two days later it was found undamaged at the Raratan Arsenal, on the telephone wires, sixty miles in the opposite direction toward New York. It had traveled 90 miles or more.

After demonstration of the model at many contests, and the plans, pictures and descriptions had appeared in many publications, airplanes of K.G. design were built in nearly every country of the world, hence the name the "pilotless airplane that flew around the world."

Joe Kovel, Al Huber, and C.H. Grant prepare the 10 ft. KG-2 for its record endurance flight, May 25, 1935 at Hadley Field, N.J.



The original KG, first completely stable pilotless gas-engined air craft, designed by Grant and built by Kovel in 1933.



The Academy of Model Aeronautics, which is today the major voice of the model fans, was founded through the cooperation of William Enyort, Secretary of the National Aeronautics Association, in response to the urging and the efforts of the staff of *Model Airplane News*. The International Gas Model Airplane Association, started by Grant and carried on under his leadership through M.A.N., numbered 6,000 members. The Academy was intended to be an organization of advanced scientific model builders that would be run by the builders themselves, and the efforts activated by Grant were finalized when the N.A.A. accepted the membership of the IGMAA as the nucleus of the Academy.

The Academy has served to establish the patterns for model airplane contests, standards, and specifications, and has its own organ, the *American Aircraft Modeller*, now published under the direction of William Winter, a former M.A.N. editor also.

That Charles Hampson Grant has carried out his dual objectives of better aircraft through greater stability and control experiments, and of building of the character of the youth of America through model activities, cannot be denied. He credits Professor Langley with the design of the first aircraft which combined stability, efficiency and control. "But, says Grant, "They substituted control for stability by putting a pilot in the airplane. Ever since, planes have had to rely on pilots and gadgetry for stability, rather than the inherent design of the airplane itself."

Part 2 of the story of Charles Hampson Grant will appear in a subsequent issue of the *JOURNAL*, and will show how Grant devoted his efforts to making aviation safer by the means of all possible types of high-lift devices and how he was rejected in attempts to have them accepted.

NOTES AND REFERENCES:

1. See *Model Airplane News*, Jan. 1963.
2. Matt, Paul R. *Historic Aviation Album*, Vol. 2, pages 62-65. "The Texas Wildcat."
3. "k" value, a factor in performance calculations used by aerodynamicists as a function of the wing area, power loading and power-to-surface ratio. It is a coefficient that varies with design and supplementary conditions. By using an appropriate "k" value it is possible to determine the approximate speed of an airplane in level flight at sea level.
4. Smart, Lawrence L. *The Hawks That Guided the Guns*. Privately printed, Redondo Beach, Calif., 1968. Pp. 17-21.
5. Jackman, Russell, and Chanute. *Flying Machines, Construction and Operation*. Chicago, Chas. C. Thompson, 1910.
6. Grant, Charles H. *Model Airplane Design and Theory of Flight*. New York City, Jay Publishing Co., 1941.
7. Nye, Willis L. "The Grant Fast Fighter," *Cross & Cockade Journal*, Vol. 9, No. 2, (Summer 1968), Page 188. This includes the drawings of the Fast Fighter by Grant, c. 1917. Grant called it a "Collapsible Landing Gear" in which the wheels moved upward and to the rear as the rear strut articulated along a sliding tube.
8. Nye also was one of the major contributors to M.A.N., including nearly sixty different aircraft in over 100 issues.
9. Ibid. *Model Airplane Design and Theory of Flight*. Ch. 19.

FUNDING FOR NASM DRAGS

The American Aviation Historical Society has long stressed the need for listing the national aeronautical collection from a minor function of the Smithsonian Institution to an operation worthy of the name, National Air & Space Museum. Progress has been made. The next major step, however, is to fund the brick and mortar, and that program needs impetus to get going.

In the July 1971 issue of *Aeronautics and Astronautics*, the American Institute of Aeronautics and Astronautics added its voice again to the clamour for action. In an article entitled "Air/Space Museum: More Blueprints But No Mortar" it cited the action of Smithsonian Secretary S. Dillon Ripley, testifying before both Senate and House Appropriations Committees earlier this year, in asking for an additional $1.9 million for "redesign of the Air & Space Museum." It went on to point out that, in his new post as Director of the Air & Space Museum, Michael Collins might find his trip to the Moon in Apollo 11 an easier feat than getting a new building for the nation's aeronautical collection.

What can be done about it? The answer, again, is the pressure of public opinion. Since the Senate Rules Committee, back in 1966, put a prohibition on construction of the Museum until the end of the Vietnam War, no request for construction funds has been made through the entire route of the Smithsonian hierarchy, the Bureau of the Budget, and the Executive Office to the Congress.

In an effort to get the new museum moving, participants at a January 1970 construction-planning symposium unanimously approved the following resolution jointly proposed by Senator Barry M. Goldwater, Wernher von Braun, Congressman Frank T. Bow, and Congressman James G. Fulton:

—"That the Smithsonian Institution should press for construction of the authorized National Air and Space Museum building;

—"That a study of changes in the original approved design should be undertaken immediately in order to determine the feasibility of lowering construction costs;

—"That a firm date of July 4, 1976, should be established for the opening of the new museum building as a major element of the Smithsonian Institution's contribution to the commemoration of the Bicentennial of the American Revolution;

—"That consideration be given to constructing a major underground parking facility beneath the Mall in order to alleviate the increasing problem of automobile parking in the vicinity of the Mall;

—"That consideration of the joint venture by the National Park Service and private capital be explored.

"This action would complement the requirement for parking facilities as a significant factor in construction of the National Air and Space Museum."

We applaud the resolution, but the time is rapidly approaching for action if the Museum is indeed to have any part in the 200th Anniversary of the founding of this republic.

Secretary Dillon's request for another $1.9 million to redesign is coupled with a further delay of a year while the proposed building is studied to reduce costs (by reducing size of the project) to the originally requested $40 million. While this is going on, the Smithsonian's management, as well as the elected representatives of the people, needs to be made aware of the growing national interest in the artifacts and the history of aviation.

Write to your Congressmen, both Senators and Representatives, and send a copy of each of your letters to S. Dillon Ripley, Secretary, The Smithsonian Institution, Washington, D.C.