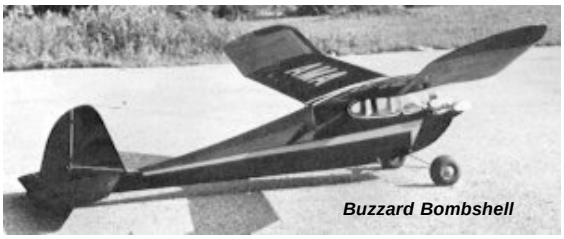
The Flightline

Volume 35, Issue 12 Newsletter of the Propstoppers RC Club AMA 1042 December 2005

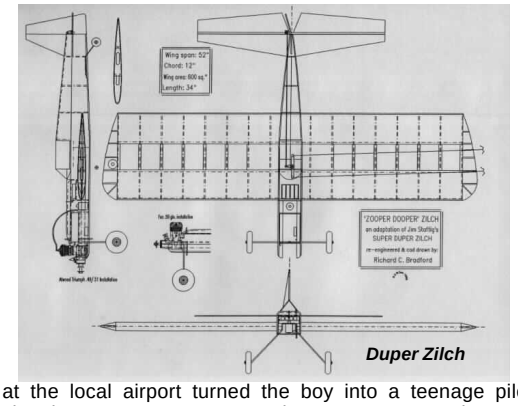
Meet Vice-President Dave Bevan

Dave Bevan has been a Propstopper for some years although he has been a low key member until volunteering for the role of Vice President last month. I have the privilege of working with and associating with Dave for over thirty years, mostly through our work at Boeing. However, we shared a modicum of modeling during that time when we were both focused on earning a living. But I knew that Dave's lust for matters aviation and modeling had driven his earlier life so I asked him to share some of his background with the Propstoppers. Here is his "train of consciousness" biography, illustrated by "your's truly". Ed.

Dave; This whole thing started by building model airplanes. Around the age of eight there was a list of nearly a hundred models built. Pre-teen activity included Henry Struck's Flying Cloud Wakefield, the Buzzard Bombshell, Zilch CL stunt, lots of Comet, Megow, Scientific, Joe Ott, etc.



Buzzard Bombshell



Duper Zilch

A job at the local airport turned the boy into a teenage pilot and mechanic. Flew Aeronca C-3&7AC, Piper J-3, PA-16, and PA-22.

Aeronca C-3

Continued on page 3

Agenda for December 7th Meeting
Middletown Library 7:30 pm

- Approval of November meeting minutes
- Membership Report
- Finance Report
- Flying Field Status and Issues
- Initial Planning for 2006 Events
- Show and Tell

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Calendar of Events

Club Meetings

Regular Meeting 7:30 pm
Wednesday 7th December 2005
Middletown Library
Behind Weather's Dodge on Rt, 452

Tuesday Breakfast Meeting
The Country Deli, Rt. 352 Glenn Mills
9 till 10 am. Just show up.
Flying afterwards at Sleighton Field

Regular Club Flying

At Middletown / Sleighton Field
Monday - Friday;
!0 am until dusk - Electric Only
Saturday
10 - 3pm-for FUEL PLANES and
10 - Dusk for Electric
Sunday - 12 - Dusk – Electric Only

At Christian Academy; Electric Only
Monday through Friday after School till dusk
Saturday 10 am till dusk
Sunday, after Church; 12 pm till dusk

Indoor Flying

Tinicum School Fridays;
1/6, 2/3, and 3/3; 7 - 9 PM.

Special Club Flying

Saturday mornings 10 am Sleighton Field
Tuesday mornings 11 am Sleighton Field
Thursday evenings 4:30 on, at CA field.

Note; only electric powered airplanes. Beginners using due caution and respecting club rules may fly GWS Slow Stick without instructors.

Propstoppers RC Club of Delaware County, Pennsylvania.
Club Officers

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Propstoppers Web Site; www.propstoppers.org

Minutes of the Propstoppers Monthly Meeting November 2nd at the Middletown Library

Vice President Dick Seiwell called the meeting to order at 7:30 p.m.
President Steve Boyajian presiding
The roll-call by membership chair Ray Wopatek showed 15 members present
The minutes as printed in the newsletter were moved and accepted by the membership
The treasurer's report by Jim Barrow was presented to the membership without objection

Old Business:
Dick Seiwell noted that all documentation for the new field has been submitted and accepted by Middletown Township. We're now able to use the field according to the agreed upon rules and hours.

New Business:
Nominations for club officers were opened.
Dick Seiwell was nominated to serve as president.
Dave Bevan was nominated for vice president.
Current officers, Jim Barrow as treasurer and Dick Bartkowski as secretary were also nominated.
With no more nominations submitted, nominations were closed and the above slate was accepted by unanimous vote of the members present.
The meeting was adjourned at 8:30 p.m.

Richard Bartkowski, Secretary

Burt Rutan with NASA Johnson Spaceflight Center Chief Engineer, Max Faget, and Astronaut Neil Armstrong, at the rollout of Rutan's Space Ship One in Mojave, California. Max Faget was the leading figure in the development of the designs for the Gemini, Apollo and Space Shuttle spaceships. He served as Chief Engineer for the twenty years that spanned the heart of the Space Program.
See the accompanying article on Hypersonics to Space.

Piper PA-22

Took a BS in Aeronautical Engineering at Virginia Tech. Worked for Glenn L. Martin when he was alive, doing aerodynamics analysis, wind tunnel tests, and flight tests from Mach 0 to 22 on jets, props, rockets, air-to-air, launch vehicles, reentry vehicles, warheads, "upper atmosphere research (read spy plane)".

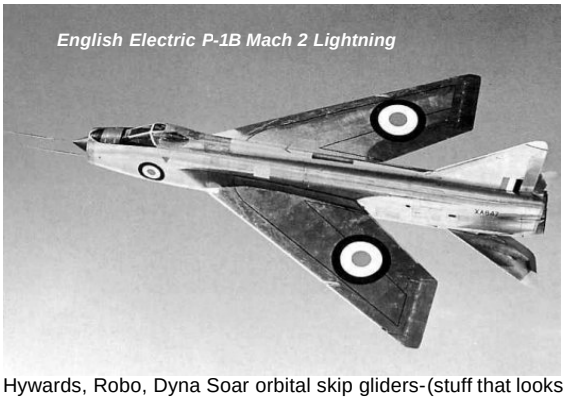

Glenn L Martin

Cleaned up the Mach buffet, tuck and such on B-57 Canberra, and reworked the controls so we had a 54,000 lb twin-jet high-speed bomber with good low-speed maneuverability and low control forces with completely manual surfaces-no hydraulics or boost.

Martin B-57 Canberra

Worked on Variable Stability F-106, English Electric P-1B Lightning.

NASA Convair F-106


English Electric P-1B Mach 2 Lightning

Hywards, Robo, Dyna Soar orbital skip gliders-(stuff that looks like the subsequent Shuttle).


Project HYWARDS Boost-Glide Concept

X-20 Dyna Soar

Member of Baltimore Aerocraftsmen MAC, flying 1/2A, A gas and trying to get on the Nordic team.

Sixteen years later he joined Boeing Vertol as head of VSTOL Aero. Twenty eight years with Boeing brought varied assignments in R&D sales, technology manager of subway-surface railcars, and manager of the Boeing V/STOL Wind Tunnel.

The Boeing Philadelphia subsonic wind tunnel is the largest privately owned wind tunnel in the United States. The nine-blade fan (shown here), measuring 40 feet (12 meters) in diameter, can generate up to 15,000 horsepower and speeds greater than 220 knots. Since opening in 1968, the facility has logged nearly 70,000 test hours.

At retirement I managed the Aerodynamics group, the Dynamics group, Noise Control group, Flying Qualities group, wind tunnel and simulator groups -all the people others called technical weenies.

Before retiring in 1995, we conducted classes at Boeing for the Widener and U. of Penn students entering the SAE - sponsored college contest for the radio-controlled model that would take off within 200 feet with the greatest payload, but the students have to predict the takeoff distance and weight! That activity continues at Widener.

Around 1995, at Warner School in Wilmington, the guidance counselor and principal asked if we would teach kids to build a glider, 10 kids at a time, who might have some potential if they could be reached. We did that for three years, but the little balsa glider design has now been built by something like 450 kids, mostly at the American Helicopter Museum and Education Center.

We give aerodynamic demonstrations at schools in Havertown School District, Friends Central in Ardmore, Darby, Feasterville, Ogontz Avenue and other places, and Cub Scout gatherings from Chadds Ford to Lansdale. We coach the Science Olympiad "Wright Stuff" indoor rubber – powered projects at Pierce Middle School and have done home schooled groups as well as hundreds of other groups at AHMEC.

After retirement, a bunch of us got together and built the American Helicopter Museum and Education Center. This now gives us a chance to enjoy interacting with and teaching school children and home schoolers and others, all the way from preschool to post-doctoral, about aviation in general and helicopters in particular.

As they say, those who can, do, and those of us who can't, teach.

Dave Bevan

Hypersonics to Space

When preparing Dave Bevan's story I began to research some of the advanced programs Dave had been involved with at the Glenn L Martin Company. They led me to the extraordinary story of these developments and the associated organizations and men responsible.

Most developments of aeronautical interest to us modelers derive, I am afraid, from the pursuit of military advantage. Simply put, the objectives in military technology are to see further and attack further and faster than our enemies. This is true for hand held weapons like swords and lances and everything since. The first aviation applications were the use of balloons to see further, and it only took a few years following practical airplanes to recognize then develop them for military uses. Initially they were used for reconnaissance but quickly carried munitions to deliver lethal force to distances way beyond other means.

Once begun on this course, airplane development expanded enormously and engineers developed airplane technology and the means to understand it. Early in these developments the US Government chose to invest in aeronautical technology beyond the military services by organizing the National Advisory Committee for Aeronautics; NACA.

Very early in aeronautical developments Breguet developed the fundamental equation that relates an airplane's range to three specific properties of the design, indeed, it is known as the Breguet Range Equation;

The three terms; propulsive efficiency, the fraction of the weight that is fuel and the L/D (The Lift divided by the Drag, the basic aerodynamic properties of an airplane.)

All three of these elements have been at the heart of aeronautics development from the very beginning, both in industry and at NACA. And by the middle of WWII they had led to the airplanes we know and enjoy. As we also know some of these airplanes by then had the performance to dip into the region of compressible aerodynamics and bump up to the speed of sound, then jet propulsion was added to the equation and NACA began to formally add research into transonic and supersonic aerodynamics to their previous thrust in subsonics. Of course, the goals were high L/D, low weight and efficient propulsion, just like in Breguet's day, 35 years earlier.

Then, on 6th June, 1944, came the Normandy invasion and on 13th June Germany responded by launching its first "Velgeltungswaffe Ein" (or "Vengeance Weapon No. 1") missiles against England, followed by its first strike of V-2s (German Designation V-4) on London in September.

Because they flew at speeds of up to Mach 5 (3400 miles per hour), the V-2 missiles were invulnerable to interception by even the fastest fighter planes.

And, because they flew out of the atmosphere, on motor thrust alone, they did not behave according to the Breguet Range Equation; other factors were dominant. NACA were not working on these!

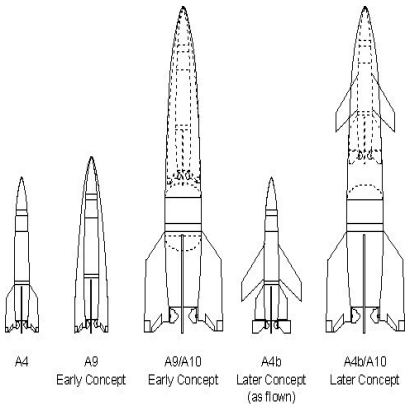
When the Allies captured the Baltic town of Peenemünde in the summer of 1945, technical experts discovered, among the various V-2 test facilities, a "super-supersonic" wind tunnel, which, though small (0.4-meter diameter), was operational-on an intermittent-flow basis-to Mach 5, as well as a larger, continuous-flow "super-supersonic" tunnel, which was under construction for a speed ten times that of sound.

Nowhere else in the world were there high-speed tunnels like these two. Nazi engineers had built them for the purpose of testing long-range ballistic missiles, two of which (the A-9 and A-10) were planned for the aerial bombardment of the eastern United States.

Here was an air vehicle which did not cruise in the atmosphere held up by aerodynamic forces of the wings. It relied on blasting out of the atmosphere using powerful rockets. More, if these rockets could achieve a velocity of 17,500 mph, then they would circle the earth in orbit, totally devoid of aerodynamic lift. Further, if the vehicle had wings it could return to the earth's atmosphere and fly to complete the mission.

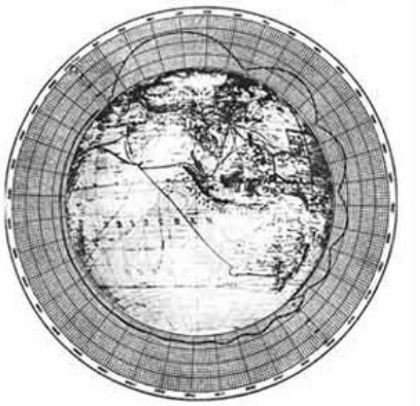
These developments were the passion of Werner Von Braun who subsequently realized them by becoming an American and leading his Huntsville team to Space. But he was not the sole German with a space technology vision. Eugen Sänger (1905-1964) and his assistant Irene Bredt had worked on the theory of a rocket-powered glider based on Sänger's Doctoral thesis from 1933. They finalized their report.

Nazi space-based V weapon concepts



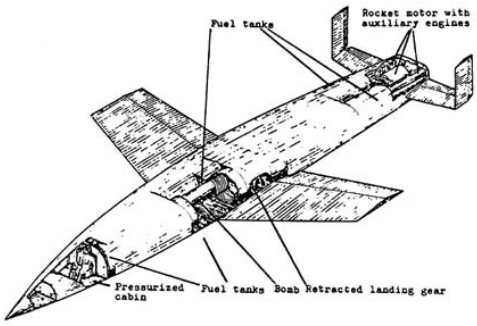
The Von Braun Glider-Missile A-9.

in the summer of 1944. The concept was for a rocket powered glider to achieve orbit then, on re-entry, skip off the upper atmosphere to continue further, and so forth, like pebbles on a pond, until re-entry. Any craft that could convert the kinetic energy it had acquired during boost and ballistic flight into aerodynamic lift could use this for trajectory shaping and, as the end result, get an enormously increased range.



Trajectory of Global Reach Sänger-Bredt Rocket Glider-Bomber, from Sänger-Bredt report august 1944, © Irene Sänger-Bredt

This principle was, of course, apparent to practitioners like Werner von Braun and Walther Dornberger in Peenemünde, who argued that their A4, supplied with wings could attain more than double the ballistic range. Using a booster stage, the A10, the glide range would span the Atlantic.

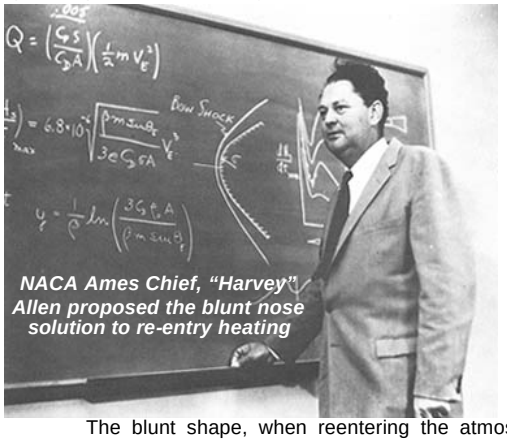


Antipodal Reach Rocket -Glider by Eugen Sänger and Irene Bredt.

Though there was early debate inside the NACA and elsewhere about whether ballistic missiles would ever amount to much the effects of Peenemünde was for Langley to organize three separate study groups.

They opined that a successful intercontinental ballistic missile would have to be accelerated to a speed of 15,000 miles per hour at an altitude of perhaps 500 miles and then guided to a precise target thousands of miles away. Sophisticated and reliable propulsion, control, and guidance systems were thus essential, as was the reduction of the structural weight of the missile to a minimum. Moreover, some method had to be found to handle the new and complicated technical problem of aerodynamic heating. As one of these missiles arched over and slammed back into Earth's atmosphere, the air around its nose - which carried the warhead - heated up to tens of thousands of degrees, hotter than the surface of the sun. The part of this heat generated outside the boundary-layer surface by shock-wave compression, and which was not in contact with the missile structure, dissipated harmlessly into the surrounding air; but the part that arose within the boundary layer, and which was in contact with the missile structure, was great enough to melt the missile. Many dummy warheads burned up because they were unprotected from the effects of aerodynamic heating.

NACA Ames Chief, “Harvey” Allen, proposed a "blunt-body" shape-familiar to us all now because of the rounded nose and bottom side of the Mercury, Gemini, and Apollo space capsules, but a strange idea at the time.



NACA Ames Chief, “Harvey” Allen proposed the blunt nose solution to re-entry heating

The blunt shape, when reentering the atmosphere, would force the buildup of a powerful bow-shaped shock wave, Allen predicted. The shape of this shock would deflect heat safely outward and away from the structure of the missile. However, industry did not pick up on the blunt-body idea very quickly. People accustomed to pointed-body missiles remained skeptical of the revolutionary blunt-body principle until the late 1950s, when the principle became crucial for missile design and for the design of the future blunt reentry capsules of the Mercury, Gemini, and Apollo programs.

In June 1952 the NACA Aerodynamics Committee recommended that Ames and Langley laboratories increase their emphasis on hypersonics research. Robert J. Woods, designer of the X-1, X-2, and X-5 aircraft for the Bell Aircraft Corporation, proposed that the Committee direct some part of its organization to address the basic problems of hypersonic and space flight. Accompanying his letter was a document from Walter Dornberger, formerly commander of the German rocket test facilities at Peenemünde and now employed by Bell, outlining the design requirements of a hypersonic aircraft. Dornberger was still intrigued by an elaborate concept for an "antipodal" rocket plane which had been proposed by his colleagues Eugen Sänger and Irene Bredt. The Bell engineer called for the NACA to define and seek to procure a manned research airplane capable of penetrating the hypersonic flight regime. This led directly to the X-15 program. The pioneering X-15 reentry systems, their derivatives, and the X-15's reentry flight experiences led directly to the systems and techniques employed later in the shuttle.

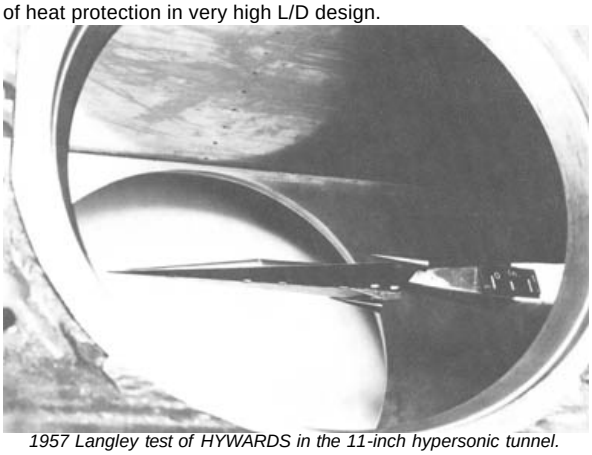
NACA X-15 Hypersonics Research Vehicle

Project HYWARDS

Langley researchers began wind tunnel and structures testing of the X-15 in early 1956. One can imagine, then, how surprised the NACA researchers were in March 1956 when they heard rumors that the air force had established Project HYWARDS which, among other things aimed at a configuration having (1) a delta wing with a flat bottom surface and (2) a fuselage crossing the relatively cool shielded region on the top (or lee) side of the wing. The flat-bottomed wing design had "the least possible critical heating area for a given wing loading," which translated into the need for "least circulating coolant, least area of radiative shields, and least total thermal protection in flight." Here was the first clear delineation by the NACA or anyone else of design features that could significantly alleviate the aerodynamic heating problems of hypersonic flight, "space leap," and reentry. In the future, designers would incorporate these basic features in the air force's Dyna-Soar (a program whose intent was to combine all post-1953 feasibility studies on a boost-glide research vehicle into a single plan leading to an operational USAF vehicle) and NASA's space shuttle.

In the course of supporting HYWARDS, the Langley study group became engaged in a debate with a parallel group of researchers at Ames. The Langley study shed some new and surprising light on the requirements of lift-drag ratio (L/D), an important gauge of the aerodynamic efficiency of wings at different angles of attack, for hypersonic gliders. The Langley

group knew that regarding aircraft range at ordinary speeds this factor was as important as the weight and propulsion factors. But at the near-orbital launch speed required for "once-around" or global range, the group found theoretically that the glider weight would be carried initially almost entirely by the centrifugal force produced by the launch. Considering this, the group perceived that aerodynamic L/D lost most of its importance. Thus, for global range, the study showed that a certain glider design with low L/D (with a smaller and therefore lighter wing) would require only about three percent higher launch velocity than a design with L/D four times higher than called for by high-L/D designs. The Ames people seem to have accepted Becker's ideas with little question. Perhaps they realized that there were no quick and easy solutions to the enormous technical problems of heat protection in very high L/D design.



1957 Langley test of HYWARDS in the 11-inch hypersonic tunnel.

Langley and Ames had a more compelling reason, however, to compromise over their different HYWARDS glider configurations than some new technical consensus over the optimum L/D or over structural heating requirements. The first man-made satellite to orbit the Earth - the Soviet Union's Sputnik 1 - was moving overhead.

Since Sputnik was launched on 4 October Americans had been huddling near radios and televisions straining to hear the "beep-beep-beep" of the distant satellite. What they heard from the satellite alarmed them, but what they heard about the satellite bothered them even more. The Soviet achievement embarrassed American scientific and technological prestige, the politicians were beginning to say, and it posed a new communist threat to national security.[60]

Although the Main Committee took no official notice of it at its annual meeting on 10 October, Sputnik had captured the minds and imaginations of some within the NACA. Many attending Round III "felt mounting pressures" to solve the critical reentry problem of the ballistic vehicle and even to take on satellite research. Langley and Ames had been studying the problems and potentials of lifting bodies - that is, wingless bodies capable of generating lift - since the early 1950s.

NACA Lifting Body Re-entry vehicle concept demonstrators

Theoretical and experimental results from ICBM research demonstrated very clearly by October 1957 that ballistic operation - throwing a vehicle into the upper atmosphere or into space rather than flying it there and back - minimized both the launch energy required and the reentry heat load. High reentry deceleration rates and the necessity of an uncontrolled parachute landing still handicapped the ballistic vehicle, but at least NACA labs had found a way to greatly alleviate the deceleration problem by designing, according to Allen's blunt-body principle, a wingless body with small L/D which was capable of significant lift.

Ira Abbott of NACA headquarters declared that the NACA should immediately begin to study the satellite reentry problem for non-lifting or slightly lifting vehicles. It should be "in addition to continuing R&D on the boost-glide system, however, not it's alternate." There was good reason for the NACA to think that its work on the boost-glide system was still, in spite of the growing reaction to Sputnik, more immediate and urgent from a military point of view than was work on satellites: after all, the air force had only two months earlier proposed Project Dyna-Soar to follow the X-15 project.

A revolution in public mentality was unfolding. Until the last ninety days of 1957, space had been a dirty word in American political arenas. Ira Abbott recalls that the NACA stood "as much chance of injecting itself into space activities in any real way [in the pre-Sputnik period] as an icicle had in a rocket combustion chamber." When he mentioned the possibilities of space flight to a House subcommittee in the early 1950s, Abbott was accused by one congressman of talking "science fiction." Space had also had negative connotations in certain NACA quarters. The NACA had taken formal notice of space flight as early as 1952, but only as a natural extension of aerodynamic flight through the atmosphere into space and return. The predominant attitude of the Committee and leaders of its research organization during the period 1952 to 1958 was to avoid "Buck Rogers stuff."

This NACA era was brought to a close following the final Conference on High Speed Aerodynamics. The organizers managed to elicit papers which summarized all the disparate work on the various challenges of space technology, and spacecraft configurations including winged, lifting body and also a new, simple, non-lifting satellite vehicle (which was to follow a ballistic path in reentering the atmosphere) by Max Faget, head of the Performance Aerodynamics Branch of PARD. (See the picture on page 2). Faget read his paper (coauthored by Langley's Benjamin J. Garland and James J. Buglia) first. He highlighted several advantages of the simple non-lifting ballistic vehicle, a pet concept: Since it follows a ballistic path there is a minimum requirement for autopilot, guidance, or control equipment. This condition not only results in a weight saving but also eliminates the hazard of malfunction. In order to return from orbit, the ballistic reentry vehicle must properly perform only one maneuver. This maneuver is the initiation of reentry by firing the retrograde rocket. Once this maneuver is completed (and from a safety standpoint alone it need not be done with a great deal of precision), the vehicle will enter the earth's atmosphere. The success of the reentry is then dependent only upon the inherent stability and structural integrity of the vehicle.

Faget concluded that the state of the art in ballistics was "sufficiently advanced so that it is possible to proceed confidently with a manned satellite project" of the type he was proposing. He recommended specifically the design of a nearly flat-faced cone configuration, one that capitalized on Allen's blunt nose concept in the extreme; it became the configuration of the immensely successful Gemini and Apollo satellites to follow.

However, the work by NACA and their predicesors on skip gliders was not in vain, as it led directly to the equally successful Space Shuttle some years later. Although the path to

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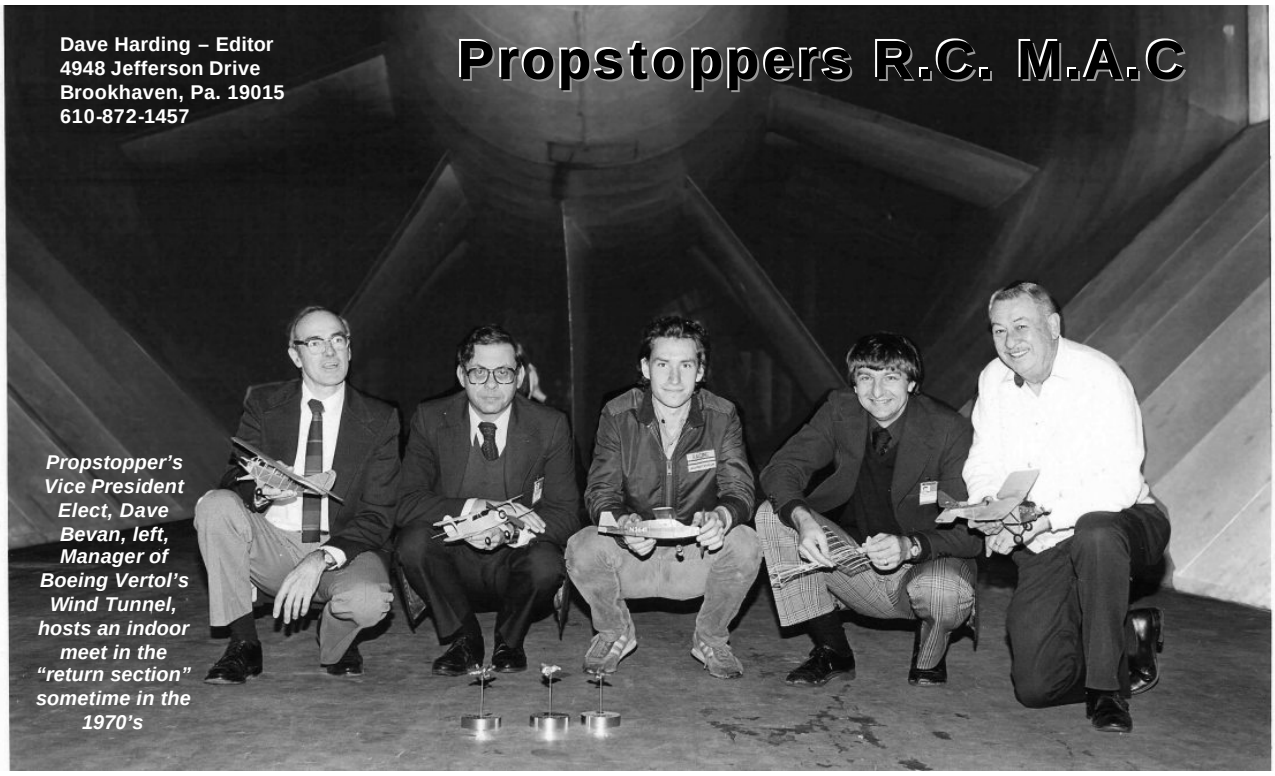
Propstoppers R.C. M.A.C



Propstopper's Vice President Elect, Dave Bevan, left, Manager of Boeing Vertol's Wind Tunnel, hosts an indoor meet in the "return section" sometime in the 1970's

an Air Force skip glider bomber program was broken by the cancellation of Dyna Soar by Secretary of Defense, Robert McNamara.

NASA Gemini blunt non-lifting re-entry vehicle

The Langley engineers flying back to Hampton after the last NACA Conference on High-Speed Aerodynamics ended in March 1958 knew that some basic, quick, and dependable vehicle like the one Faget recommended would most probably carry the first man into space.

If they had known that in less than four months, on 16 July, Congress would pass the National Aeronautics and Space Act, dissolving the NACA and establishing NASA, the Langley engineers flying home from Ames might have thought back with satisfaction on the quality of the 46 papers they had just heard at the NACA conference. Their work had shifted from the traditional subsonic aerodynamics to tackle the daunting challenges of hypersonic flight and re-entry from space. It was the very foundation for the initial entry to space and the subsequent development of the re-usable Space Shuttle.

Dave Harding

from multiple internet sources, incl uding the official NASA website;

http://history.nasa.gov/SP-4305/ch12.htm
http://www.astronautix.com/index.html

December Indoor Flying; Friday 2nd
Tinicum School, 7 to 9 pm
Join us to fly or enjoy the fun.

Monthly Club Meeting
7:30 Wednesday 7th December
At the Middletown Library, on Rt. 452 behind Weather's Dodge.

Won't you bring a model or project to share in Show and Tell, or a demonstration or briefing sharing your knowledge with your fellow members? If you are lucky, or good, you may be featured in Flightlines!