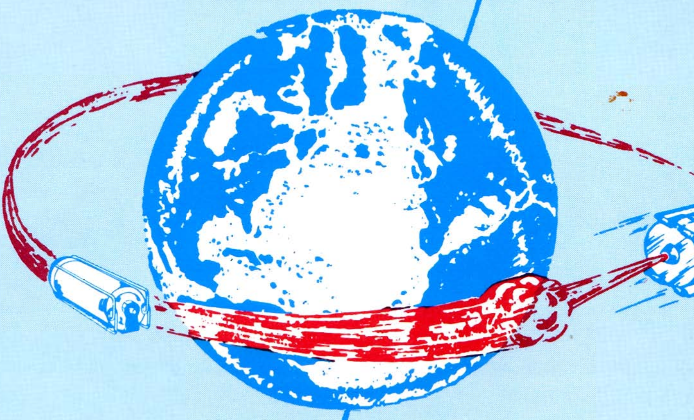
Building / Designing Maintenance & Care of

ARISTO·CRAFT

JETEX®

MINIATURE JET PROPULSION

ENGINES for MODELS



OUTDATES EVERY OTHER FORM OF MODEL POWER . . .

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$1.00

JET·AGE POWER for ACTION MODELS

TABLE OF CONTENTS

We are indebteded to the leading hobby and craft publications mentioned herein for their splendid cooperation in making much outstanding design material available to us.

Each engine uses a specific size solid fuel pellet, which is not a firework or explosive. Pellets are a gas producing fuel with a controlled rate of burning. Jetex Fuel Pellets are intended for use in Jetex Engines ONLY, and for outdoor flying. They must NOT be used in confined space without suitable ventilation.

PRINCIPLES OF JETS AND ROCKETS

Since Jetex fuel and motors were introduced in June of 1948, millions of model airplanes and other models have been built and operated by American boys using this jet-age powerplant. In fact, a 1961 compilation estimated that more than 50,000,000 flights with model airplanes have been made in the United States alone. (Jetex is a British development). Untold thousands of jet cars and boats models have also been constructed.

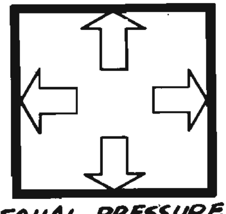
The simplicity and utility of these Jetex engines for the hobbyist has led to a new and widely accepted form of model flying, in keeping, one might say, with the revolution in full-scale aircraft brought about by the jet engne-fighters, bombers, business planes or transports—which similarly are propelled by the reaction principle.

There are many other important reasons for the popularity of jet propulsion in the modeling field, a most important one being the educational value of these engines, as for science projects. And what boy, or man, can resist the lure of such a fascinating device with its great appeal to scienctific curiosity?

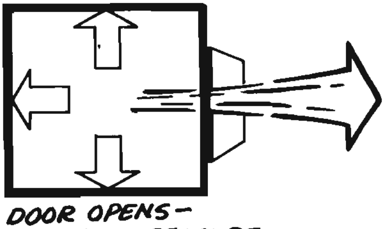
Magazine editors, hobby shop proprietors and model kit manufacturers all are deluged with questions: What makes it work? How does it work? What things can I do with it? Is it a real jet? How does it compare with real jets and rockets in operating principles? Who invented the jet—and when? Because there is no end to these questions which reflect your avid interest in jets and rockets, big or little, we shall cover here—before getting into detailed articles and plans of all kinds of vehicles you can power by Jetex—the truly amazing history of the jet principle, and how man has tried for centuries to bring the simple idea to fruition.

Moreover, we shall tell you how and why your model jet engine works.

Well, how does it work? Or should we ask, "Why does it work?" The favorite explanation of why it works goes something like this. Imagine a room or a box, or a ball-filled with air under high pressure. It is obvious that the compressed air is pushing equally hard, that is with equal pressure, against all sides—and on the floor and ceiling of that room. Suddenly, a door is opened! What happens? Obviously — or perhaps not quite so obviously—the pressure no longer is equal against all the surfaces of that room. In fact, it is much less on the side where the door was opened because the air is leaking or jetting through the opening.



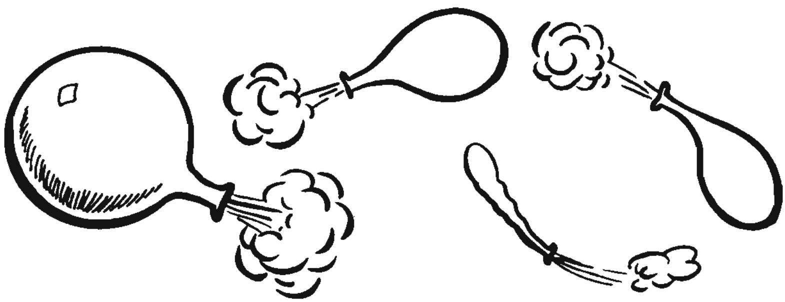
EQUAL PRESSURE ON ALL WALLS



DOOR OPENS— UNEQUAL PRESSURE

There is a simple law of physics, encountered in high school or college, which states that "To every action there is an equal and opposite reaction." If we visualize the room to be floating in space, so as to be free to move in any direction, it would slide in the direction of the wall opposite the door—the air pressure is much greater against that wall now that the door in the opposite side was opened and, in effect, that greater pressure pushes the room into motion.

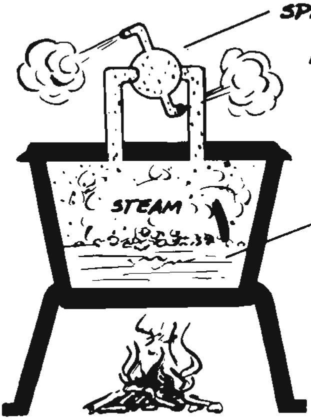
The idea can be quckly understood just by thinking of a toy balloon which is inflated then released from the hand with the neck untied. Everyone has seen the results of this experiment. The balloon zips about madly, until the compressed air within is exhausted.



ESCAPING COMPRESSED AIR PROPELLS BALLOON

This simple principle makes Jetex work. It propells great airliners like the Boeing 707 and fast fighter like the Lockheed Starfighter. It propells the mighty missiles like Atas, Titan and Saturn into orbit and launches space probes and vehicles into limitless space.

The ancients, surprisingly enough, knew all about this reaction principle but lacked the overall scientific knowledge and modern materials to put it to a practical application. Well, they did, at that, manage to put it to work in some highly interesting cases.

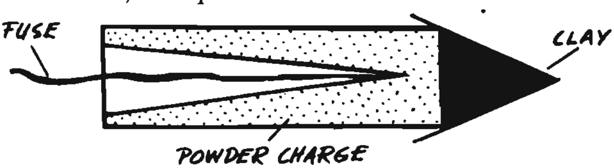


HERO'S "AEOLIPILE"

Almost two thousand years ago a man named Hero achieved a steam powered jet engine whose mechanical action greatly resembles that of a modern lawn sprinkler. Over a fire he suspended a sphere partially filled with water. On the circumference of the hollow sphere —should we say equator?—he placed two nozzles, one directly opposite the other. The ends of these nozzles were bent back at right angles so that, when the water was turned into steam, the escaping stream of steam through each nozzle caused the sphere to spin on its axle. A Fourth of July pinwheel is closely related to this ancient "aeolipile", as it was called.

Much later, in the thirteenth century in China, rockets were used during the siege of Kai-fungfu. The Chinese are credited with the invention of gunpowder and it is assumed that "dud" firecrackers— and we all have seen sizzlers, or firecrackers which hiss from an open end without exploding—suggested the concept of a rocket. So the rocket, and the jet or reaction principle, was effectively put to work in China, more than 700 years before the Nazi V-2 war rockets fell on London and other cities in World War 2.

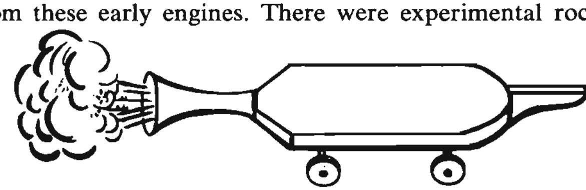
It is interesting to note certain fairly similar features of that ancient Chinese rocket, not only to modern giant solid-fuel space rockets, but to Jetex itself. It is now known that a hole drilled through the solid-fuel rocket charge enormously increases its thrust. A hollow core is left in the center of the solid fuel of the Polaris and Minuteman American missiles; and, in the very latest Jetex fuel, the high-thrust HT type, a ⅛ inch diameter hole is found through the center of the charge. In the Chinese rocket, this hole tapered in thickness from a big opening at the open end of the rocket, to a point near the forward end.



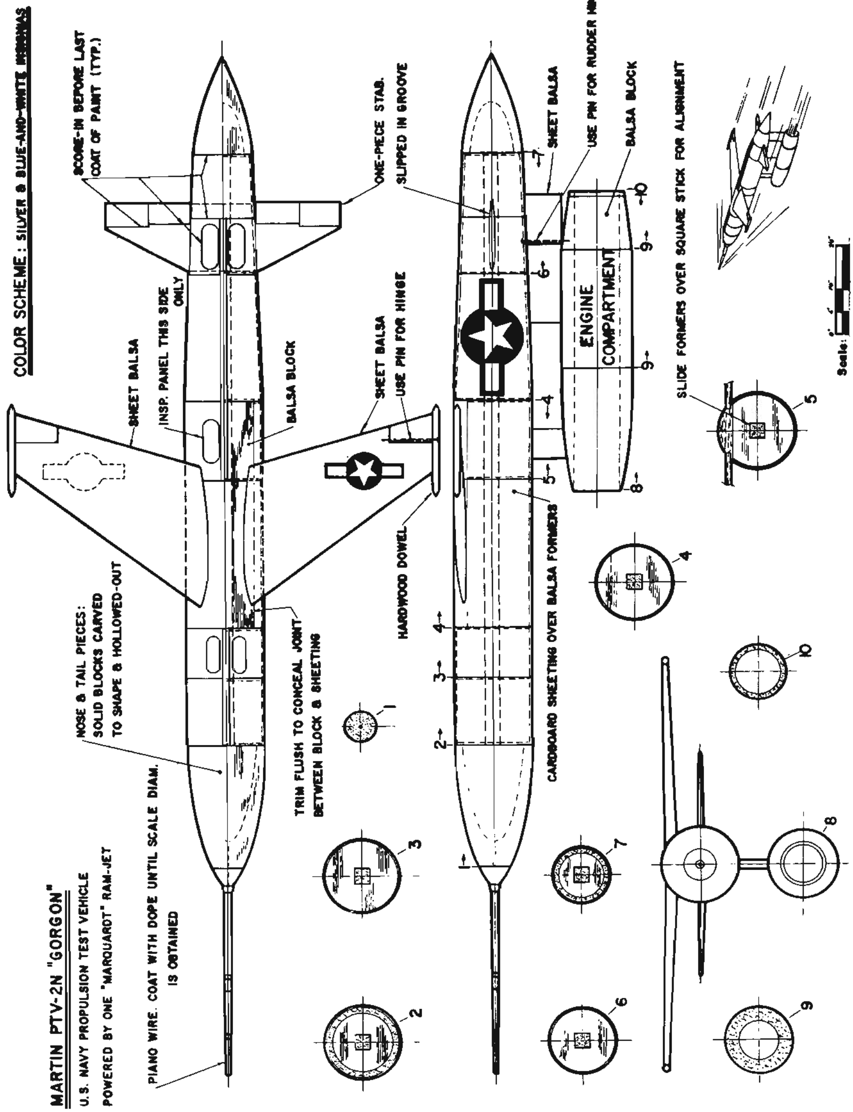
13th CENTURY CHINESE JET

It is said that the Arabs, not long after the Chinese development, discovered how to make a rocket-propelled torpedo. During the middle ages rocket and gun-powder formulae and even vehicles were suggested in various writings. Rockets brought about a victory in an Italian battle in the year 1379!

Ideas for rocket sleds and gun-powder carts all sounded good on paper but invariably blew up their daring riders. Man had still to master the control of the rate of burning or of the amount and duration of thrust from these early engines. There were experimental rocket wagons and cars.



14th CENTURY POWDER JET CAR



U.S. NAVY RAM·JET POWERED MARTIN PTV-2N "GORGON"

In the latter part of the eighteenth century, the British suffered a number of military defeats in India due to concentrated use of rockets which, having metal tube casings and heavier charges which burned faster, could be fired effectively 8,000 feet or more. Our own history records the use of British rockets against our own Fort Moultrie in the war of 1812, inspiring Francis Scott Key to note the "rockets red glare" in our national anthem.

Although numerous examples of rocket and jet propelled vehicles —including proposed airplanes — abound in the interveening years, it was not until World War 2 that rockets and jets demonstrated by spectacular success that the day was coming soon when the reaction propulsion principle would dominate high-speed travel, both strategic and tactical aerial warfare, and the bombardment by missiles of an enemy over thousands of miles away. Even prior to World War 1 it was conceded that "someday" reaction propulsion would enable man to soar free of the gravitional pull of mother earth. That someday, of course, is here.

During World War 1, Dr. Robert H. Goddard, widely considered to be the father of the modern rocket, began his experiments which ended in 1935 after demonstrating many basics of present-day rocket design. In 1930, a Goddard rocket using liquid oxygen and gasoline climbed to nearly a half mile at a peak velocity of 500 mph. Still later he applied the principle of the gyroscope and controllable fins to stabilize his liquid fueled rockets in flight. Here indeed was the near-future clearly foreshadowed. But Dr. Goddard was considered by many for a time to be just another inventor. His fame, unfortunately, came after his death when, first the Germans, and then the Russians and Americans developed their huge liquid-fueled rockets with basically similar control ideas.

Beginning in the days of World War 1, the famed German rocket pioneer, Herman Oberth and his associates began ther scarcely encouraged work that was to result in the spectacular war rockets of World War 2. In fact, our own famed rocket scientists, Dr. Werner Von Braun, came to the United States from Germany after the war, to be the guiding light of our famous Redstone Arsenal where the Redstone, Jupiter and now the Saturn have been developed.

It was Commander Whittle who, near the beginning of World War 2, was credited with the invention of the Whittle turbine, which was to become the basis of England's famous jet engines, and the first jet fighter in the world to see military service. About the same time, German scientists had perfected a turbine jet engine, and an experimental Heinkel was flying about the time the war began. As World War 2 closed out, Nazi jet and rocket fighters—and fighter bombers—were unable to stem the allied aerial attack, which simply overwhelmed all before it.

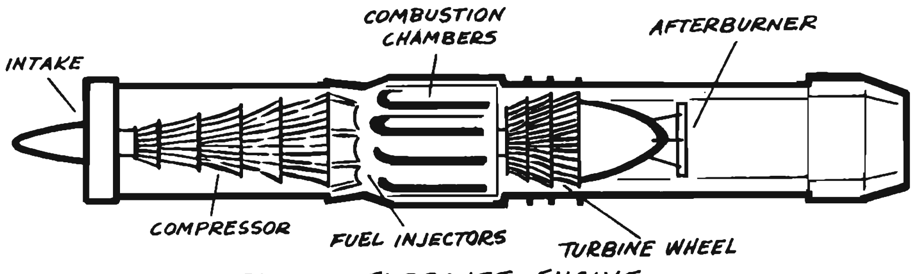
Also during that War, America built its first jet, the Bell Airacomet, using British engines. Our Lockheed F-80 "Shooting Star" was the first operational jet fighter to see wide military service in this country, making its initial appearance not too long after "D" Day.

By now you may be wondering how both a jet and a rocket can be lumped together in this discussion. Are they the same? The answer is both yes and no. They are the same in working principle, in that an escaping exhaust jet creates the reaction which provides the forward thrust. But they are distinctly different in the mechanics of their operation.

And, as a matter of fact, there are various members of the jet engine family, just as there are in the rocket family. But the big, and essential difference, between a rocket and a jet is that, most simply put, the rocket carries within its own fuel the oxygen required for combustion. (It is thus independent of oxygen-bearing outside air and can operate in the near vacuum of space.) The jet engine, or gas turbine, requires the addition of oxygen to its fuel for combustion. The jet may carry tanks of kerosene or other jet fuel, but this fuel must be mixed with air (to obtain oxygen) for it to sustain combustion. Thus, the jet engine is limited to altitudes which provide it with sufficient oxygen to maintain enough thrust from its exhaust of gases to remain aloft.

Actually, there are three principle types of jet engines. First is the turbine (commonly called turbojet). Second is the pulse jet, or resonant jet. Third, is the ramjet. Sometimes combinations are worked up for specific purposes.

The turbojet is found mostly in military aircraft and swift commercial airlines. Here is how it works. On a common revolving shaft are attached, at the front end, perhaps several rows of vanes (rather like a many-bladed fan) and, at the rear end many more rows of similar looking vanes. In between are located the chambers in which the fuel is burned to produce searing hot gases.

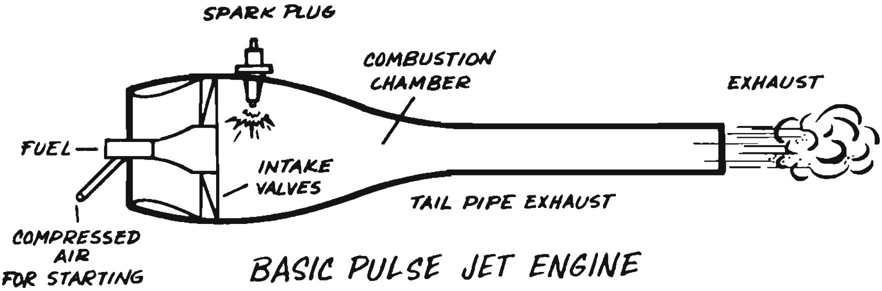


TYPICAL TURBOJET ENGINE

When the engine is brought up to a sufficiently high rpm for starting purposes (from an outside starting source) air is sucked into the open front of the engine by the forward vanes (compressor stage), which then flows into the combustion chambers for burning with fuel, and then exhausts at terrific pressure and heat through the rear rows of vanes and out the tail pipe. In passing over or through the stator stage, the blast of the exhaust causes the shaft to revolve at high speed and this continues the operation until either the fuel is shut off or exhausted. Sometimes, raw fuel is injected into the hot exhaust to the rear of the stator at the tail pipe for additional thrust. This is known as afterburning. By the use of a train of gears, a turbine can be used to drive a propeller (as on the Lockheed Electra) and still impart a measure of direct jet boost thrust.

The ramjet is entirely different in appearance and use. Consider a specially shaped tubelike object, nothing more than a "educated" pipe. At the front end, where the air comes in, is a petal-type valve. Behind this valve is the combustion area. The inrushing air pushes the valve petals open to enter the combustion chamber. Fuel is mixed with this air and ignited—as by a spark plug (we have model pulse jets of this type, too). As the exploding fuel raises the pressure of the burned gas, it forces the petal valve closed. Since the rear end of the "pipe" is open and the front end is closed momentarily, we have again the same idea as that room with the suddenly opened door. Reaction causes the pulse jet to leap forward. The rapidly opening and closing valve, as the cycle is repeated swiftly, creates a characteristic pulsing sound, which was such a dreaded noise in the Nazi V-1 or "Buzz Bombs."

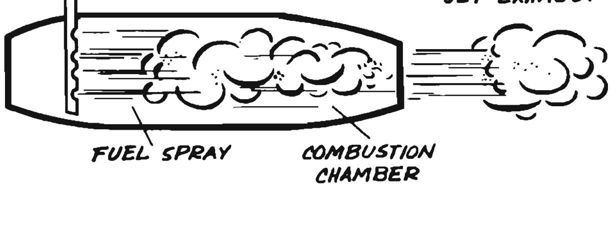
Pulse jets have been used in air-breathing missiles target, drone aircraft.



BASIC PULSE JET ENGINE

A close relative to the pulse jet is the ramjet. This device is open at both front and rear. To work at all it must be launched up to a terrific speed — perhaps by other types of powerplants — to the point where it can sustain it's combustion reaction thrust. In this case, it is the difference in pressure between the air pushing into the open front end, and that at the open rear of the' 'pipe" after fuel is burned that causes the reaction thrust principle to work. The ramjet is used for high-speed air-breathing missiles and may someday be employed on high-flying passenger craft.

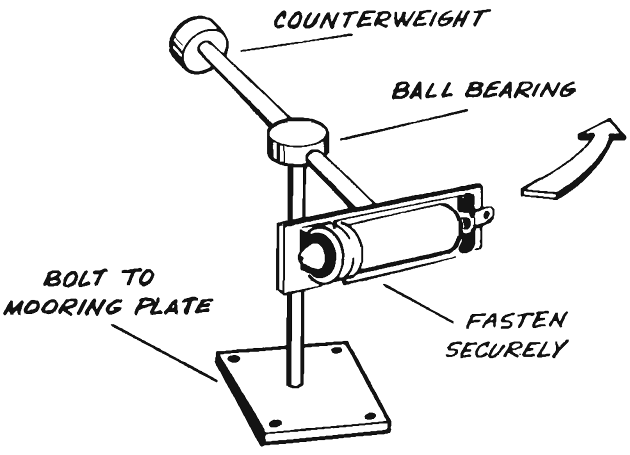
SIMPLE RAMJET LAYOUT



Now where does Jetex fit into this picture? Here, we must point out that much confusion and misunderstanding applies in the case of Jetex. In a practical sense it is a jet. Jetex fuel is compounded to restrict the exhaust velocity to safe and sane operating speeds. Since its burning rate is controlled and slowed down to be perfectly safe, it actually works like a jet engine when used to propel model planes and other vehicles.

When a more rapid burning of the fuel is required, a special variety known as "50-HT" provides a higher ar speed, but still within completely safe conditions. To be strictly accurate, the "50-HT" fuel reaches its peak thrust in a shorter period of time, in about 1½ to 2 seconds. This helps in develop sufficient thrust quickly enough to permit Vertical Take Offs of models. Powder rockets and liquid fuel rockets are in a different field and should be operated only within organized hobby groups with scientific supervision and control. Jetex, definitely is not in that category.

JETEX® ENGINE TEST STAND



FREE FLIGHT JET-POWERED MODELS CONTEST RULES

14.1 GENERAL. An outdoor jet-powered free flight model is propelled by a reaction engine model is propelled by a reaction engine of the Jetex type. The following rules will govern the competition flying of these models.

14.2 POWER UNIT TYPES. Jet-powered free flight models are fitted with one Jet engine of the Jetex type. The following rules will by other than "Jetex" is permissible provided the engine uses the same type and amount of fuel and has equal safety features.

14.3 POWER UNIT SIZE. Any single Jetex type engine up to and including the 150 may be used provided the cylinder length and diameter (inside) are not larger than the original Jetex engine. For example: The size may not exceed the inside dimensions of the Jetex.

14.4 POWER UNIT MODIFICATIONS. The Jetex engines cannot be modified or altered in any way to produce more power or endurance than is provided for in the manufacturer's standard operating instructions. All gaskets must be in place. Engines other than Jetex must have comparable cylinder capacity. An augmenter tube may be used. Maximum length of fuse permitted is six inches.

14.5 MOUNTING. For safety, all units shall be firmly mounted and equipped with a metal tether to effectively prevent the power unit from separating from the model. Violation of this regulation shall be cause for disqualification from the event.

14.6 FUEL. Only solid fuel produced commercially for model rocket engines may be used. Partial charges may be loaded (within standard cylinder capacity) to increase duration. In addition, charges may be scored or dimpled to facilitate ignition, but may not be otherwise modified.

14.7 SIZE OF MODEL. No restriction on size.

14.8 WEIGHT OF MODEL. No restriction on weight.

14.9 LAUNCHING. Rise-off-ground launching is not required. Models may be hand-launched without other assistance from an elevation not greater than the flyer's reach above the ground.

14.10 POWER UNIT VIOLATION. The Contest Director may call for a spot check immediately before or after an official flight to determine if the engine size and fuel charge are legal. If they are not in accordance with the rules, that flight will be voided and lost. Any engine considered dangerous by the Contest Director may be impounded by him until the close of the contest.

14.11 OFFICIAL FLIGHT. An official flight occurs when the model remains in the air for 40 seconds or more. Flights of less than 40 seconds may be declared official at the option of the contestant. The contestant's decision is to be made immediately and cannot be reversed later.

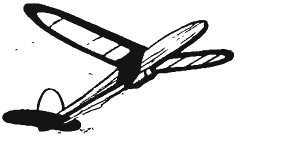
14.12 UNOFFICIAL FLIGHT. An unofficial flight occurs when the flight is of less than 40 seconds duration if the contestant's option described in the preceding paragraph is not exercised. When the model collides with another model after timing begins, the contestant shall have the option of declaring the flight to be unofficial. The contestant's decision is to be made immediately and cannot be reversed later. The time of unofficial flights is not recorded. Flights during which parts are dropped are automatically unofficial, as are flights during which the model is aided by the flyer or by artificial means.

14.13 NUMBER OF FLIGHTS. Each contestant shall be allowed a total of six attempts to make three official flights. If the three official flights total 12 minutes, one additional attempt shall be allowed to make a fourth official flight having no maximum flight duration limit imposed. Only one attempt is permitted for a fourth official flight. All official and unofficial flights as described above are attempts. The Contest Director may, at his discretion, add further definitions because of local conditions, such as a time limit for getting models airborne, so long as adequate notice is given all contestants before competition begins.

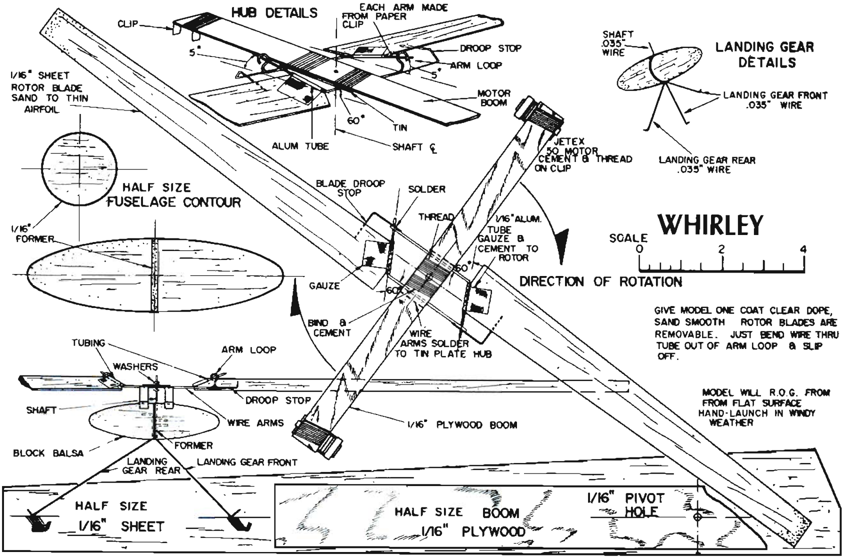
14.14 TIMING OF FLIGHTS. Time starts the instant a model is released for flight and includes the powered flight portion. Time ends when the model touches the ground or water, meets an obstruction which prevents further flight, passes from sight of timer or when flight time exceeds 4 minutes, except for qualified fourth flights described above, which shall be timed for their full flight duration. The timer may move in any direction no more than 200 feet from the launching point in order to keep the model in sight, so long as he remains on the ground.

14.15 OUT OF SIGHT FLIGHTS. Should model pass from the timer's sight, the stop watch shall be permitted to run for an additional 10 seconds. Should the model reappear, timing is continued. Should it fail to reappear within the 10 seconds allotted, the watch shall be stopped, 10 seconds deducted from the time indicated and the result recorded as the flight time.

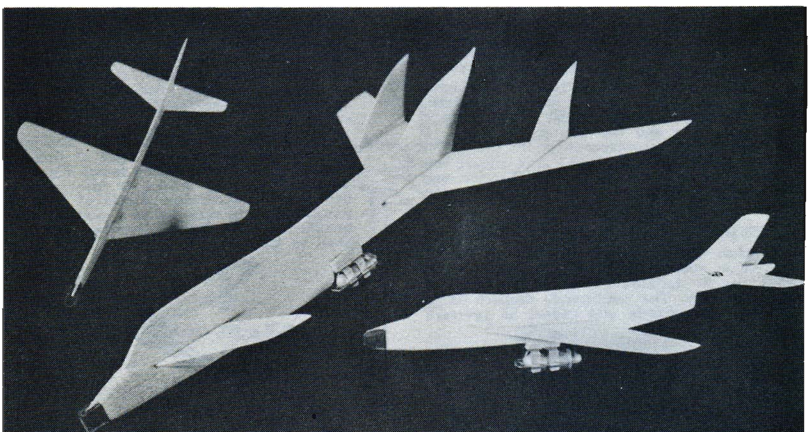
14.16 SCORING OF FLIGHTS. Scoring time shall be the total elapsed time of three official flights plus that of qualified fourth flights. Flight duration shall be scored to the nearest one-fifth second. Individual flights of more than 4 minutes shall be recorded as 4 minutes except for qualified fourth flights described above, which shall be recorded for their full flight duration.



WRITE FOR CONTEST RULES
ACADEMY OF MODEL AERONAUTICS
1025 CONNECTICUT AVE., N.W.
WASHINGTON, D.C. 20036



JET EDUCATION MADE EASY WITH JETEX POWERED OPERATING MODELS



JETEX POWER PERMITS LOW COST AND SPEEDY ASSEMBLY FOR THE EXPERIMENTER. ABOVE PHOTO OF 3 JETEX-50 POWERED PROFILES, LATER VERSIONS ENLARGED AND BUILT UP WITH REVISIONS. LEFT TO RIGHT: DOUGLAS "SKY-HAWK"; EXPERIMENTAL SPACE SHIP (CANARD); McDONNELL "DEMON".

"JETEX"® Model Power Units

FOR ALL MODEL VEHICLES

JETEX OPERATING INSTRUCTIONS

GENERAL

"JETEX" engines are small reaction power plants which have a wide variety of both scientific and recreational uses. Their power is developed by the combustion of solid fuel propellant; the resulting gases are exhausted through a metered nozzle to produce jet-type thrust.

The outstanding features of all "JETEX" engines are:

SIMPLICITY — there being no moving parts or complicated ignition devices.

EFFICIENCY — the use of light, strong alloys plus scientific design to give favorable thrust/weight ratios.

SAFETY — spring-loaded nozzle assembly positively prevents excessive pressure build-up.

CONVENIENCE — solid fuel propellant can be stored and used anywhere, without danger of spilling, staining, or accidental combustion.

"JETEX" engines are made in various sizes, as shown by the specification chart (Figure 1). Although differing in some details, all have the same basic component parts as shown on the drawing of the No. 150 "PAA-Loader" (Figure 2).

The THRUST produced is proportional to the diameter of the main case, and solid fuel charges are made in graduated sizes to fit each engine. The DURATION of thrust is determined by the total length of propellant used. Single or multiple charges may be loaded in all engines, so as to vary the power duration according to the type of flight desired.

SOLID FUEL CHARGES

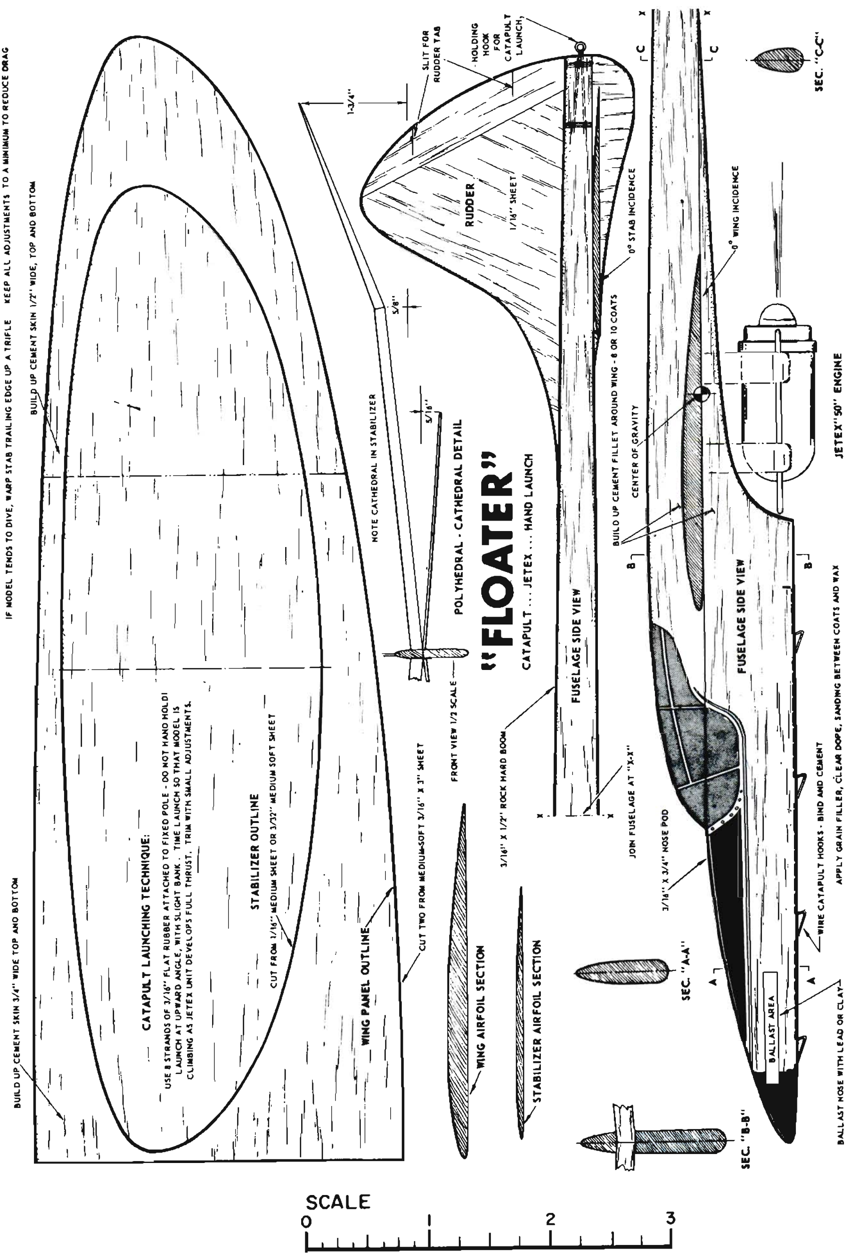
Solid fuel pellets are sold under the Jetex trade name. When used in conjunction with a starter wick, either manuel ignition or remotely controlled electrical ignition are equally feasible. When ignited, these solid fuels decompose at a constant rate. The large volume of gas liberated by this decomposition produces the thrust from which the reaction power is derived.

Specific instructions for using solid fuel charges are included with each package of pellets.

OPERATION

Loading with one pellet:

1. Insert one or more spacers in the main case, leaving room for one fuel charge plus at least ⅛" head space.
2. Insert insulator disk on top of spacer.
3. Insert fuel pellet.
4. Pinch off about 1½" of wick, coil loosely, and place on top of fuel pellet. Fit wire gauze disk firmly in place as shown in Fig. 2.
5. Fit end cap and jet nozzle assembly in position, making sure that it is firmly and evenly seated.


IF MODEL TENDS TO DIVE, WARP STAB TRAILING EDGE UP A TRIFLE   KEEP ALL ADJUSTMENTS TO A MINIMUM TO REDUCE DRAG
BUILD UP CEMENT SKIN 1/2" WIDE, TOP AND BOTTOM
BUILD UP CEMENT SKIN 3/4" WIDE TOP AND BOTTOM
CATAPULT LAUNCHING TECHNIQUE:
USE 8 STRANDS OF 3/16" FLAT RUBBER ATTACHED TO FIXED POLE - DO NOT HAND HOLD! LAUNCH AT UPWARD ANGLE, WITH SLIGHT BANK. TIME LAUNCH SO THAT MODEL IS CLIMBING AS JETEX UNIT DEVELOPS FULL THRUST. TRIM WITH SMALL ADJUSTMENTS.
STABILIZER OUTLINE
CUT FROM 1/16" MEDIUM SHEET OR 3/32" MEDIUM SOFT SHEET
WING PANEL OUTLINE
CUT TWO FROM MEDIUM-SOFT 3/16" X 3" SHEET
WING AIRFOIL SECTION
STABILIZER AIRFOIL SECTION
1-3/4"
5/8"
5/16"
NOTE CATHEDRAL IN STABILIZER
FRONT VIEW 1/2 SCALE
POLYHEDRAL - CATHEDRAL DETAIL
"FLOATER"
CATAPULT ... JETEX ... HAND LAUNCH
SLIT FOR RUDDER TAB
HOLDING HOOK FOR CATAPULT LAUNCH.
RUDDER
1/16" SHEET
0° STAB INCIDENCE
FUSELAGE SIDE VIEW
3/16" X 1/2" ROCK HARD BOOM
JOIN FUSELAGE AT "X-X"
BUILD UP CEMENT FILLET AROUND WING - 8 OR 10 COATS
CENTER OF GRAVITY
0° WING INCIDENCE
SEC. "C-C"
JETEX "50" ENGINE
FUSELAGE SIDE VIEW
3/16" X 3/4" NOSE POD
WIRE CATAPULT HOOKS - BIND AND CEMENT
APPLY GRAIN FILLER, CLEAR DOPE, SANDING BETWEEN COATS AND WAX
BALLAST AREA
BALLAST NOSE WITH LEAD OR CLAY
SEC. "A-A"
SEC. "B-B"
SCALE
0 1 2 3

JETEX OPERATING INSTRUCTIONS

(continued)

6. Close the spring loaded locking mechanism.

7. Place the loaded engine in mounting bracket, and it is ready for use. (Jet nozzle faces to the rear.)

Loading with multiple pellets:

1. Remove spacers to make room for additional fuel to be loaded.

2. Use medium sandpaper to remove varnish coating from the mating faces of the fuel pellets.

3. Load the fuel pellets.

4. Proceed as in paragraphs 4-8 above.

NOTE: The varnish coating on the fuel pellets is necessary to protect them from moisture. This coating should not be removed until immediately before use.

Firing the engine:

1. Be sure the engine is firmly held in its mounting bracket, and that the bracket is securely attached to the vehicle.

2. Pinch off sufficient lead-in wick and insert through the jet nozzle, so that the inner end contacts the wick coiled on top of the fuel pellet.

3. Light the wick.

4. Igniting the fuel pellet will usually blow the wick core out of the nozzle. If it sticks, immediately pluck it free. Wet your thumb and finger before lighting the wick, so that you will be ready to do this if necessary.

5. Wait 2 or 3 seconds until a strong steady hissing indicates that thrust has been developed.

6. Release the model.

RELOADING THE ENGINE

1. Immediately after firing, the engine is HOT. Let it cool before handling.

2. Open the engine and clean all loose ash from the case, using a dull knife blade.

3. Using the straight end of a paper clip, clean out the jet nozzle, and scrape all loose ash from the space between the flame shield and the nozzle opening.

4. If the washer is still in good condition, engine is ready for reloading.

CARE OF THE ENGINE

1. After using 5 or 6 fuel pellets, the cap sealing washer will become soft and should be replaced. This is done by removing the flame shield and the washer, placing a new washer in the cap and replacing the flame shield.

2. When renewing the washer, clean the flame shield and inside of the jet nozzle thoroughly.

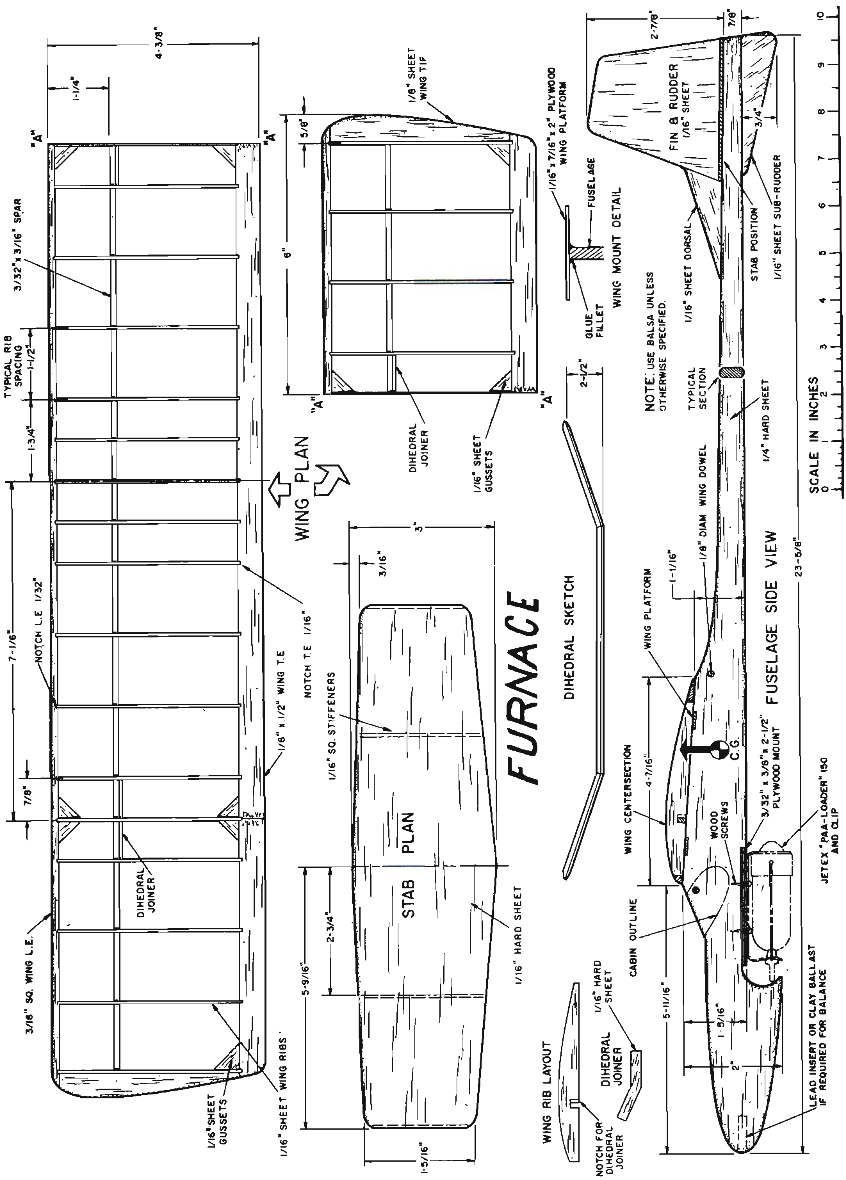
3. After use, the inside of the case will become coated with a sooty deposit. This need not be removed so long as the fuel pellets fit easily.

CAUTION! JETEX FUEL PELLETS ARE HARMFUL OR FATAL IF SWALLOWED! COMBUSTIBLE!

CONTAINS POTASSIUM DICHROMATE. DO NOT STORE NEAR HEAT OR FLAME. IF SWALLOWED INDUCE VOMITING AND CALL PHYSICIAN IMMEDIATELY.

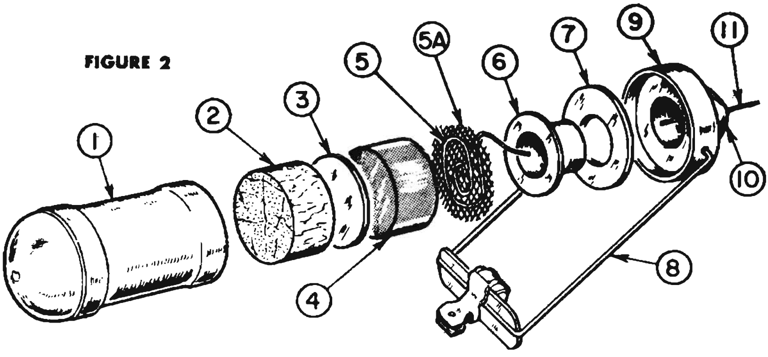
KEEP OUT OF REACH OF CHILDREN.

Jetex Fuel Pellets are intended for use in Jetex Engines only, and for OUT OF DOORS flying. They MUST NOT be used in any confined space without suitable ventilation.



"FURNACE" FREE·FLITE MODEL

FIGURE 2



KEY

1. Main Case
2. Spacer
3. Insulator Disk
4. Solid Fuel Pellet
5. Igniter Wick
5A. Wire Gauze Disk
6. Flame Shield
7. Cap Sealing Washer
8. Spring Safety Clip
9. End Cap
10. Jet Nozzle
11. Lead-in Wick

4. The outside of the engine may be cleaned by rubbing lightly with very fine steel wool.

5. NEVER LEAVE THE ENGINE UNCLEANED OVERNIGHT, or damaging corrosion may result. Also the ash may absorb moisture from damp air and become gummy.

6. It is extremely important to avoid leakage at the cap sealing washer. Hot gases escaping at this point will cause overheating and burning of the lip of the main case, permanently damaging the engine. The cap sealing washer should be replaced IMMEDIATELY when signs of leakage appear. It may also be necessary to retension the spring safety clip, so that maximum sealing pressure is exerted.

ENGINE INSTALLATION

Mounting brackets should be securely attached to the model, and the engine itself firmly held in its bracket, to insure against its coming loose under impact. A free engine under power can travel one hundred feet or more through the air, and may be lost or cause damage.

When externally mounted, at least 1/8 inch clearance should be allowed between the engine and any combustible material. As an additional safeguard, the adjacent structure may also be insulated with metal foil or thin asbestos sheet. Insulation should be attached with water glass or other heat-resistant adhesive.

Internal installations should provide at least 1/4 inch clearance all around, plus the insulating procedure described above. In addition, air venting of the engine compartment is highly desirable.

Augmenter tubes are available for all engines. The use of an augmenter tube can increase thrust by up to 25%. These tubes are very light in weight, and may be used also as a structural part of the model.

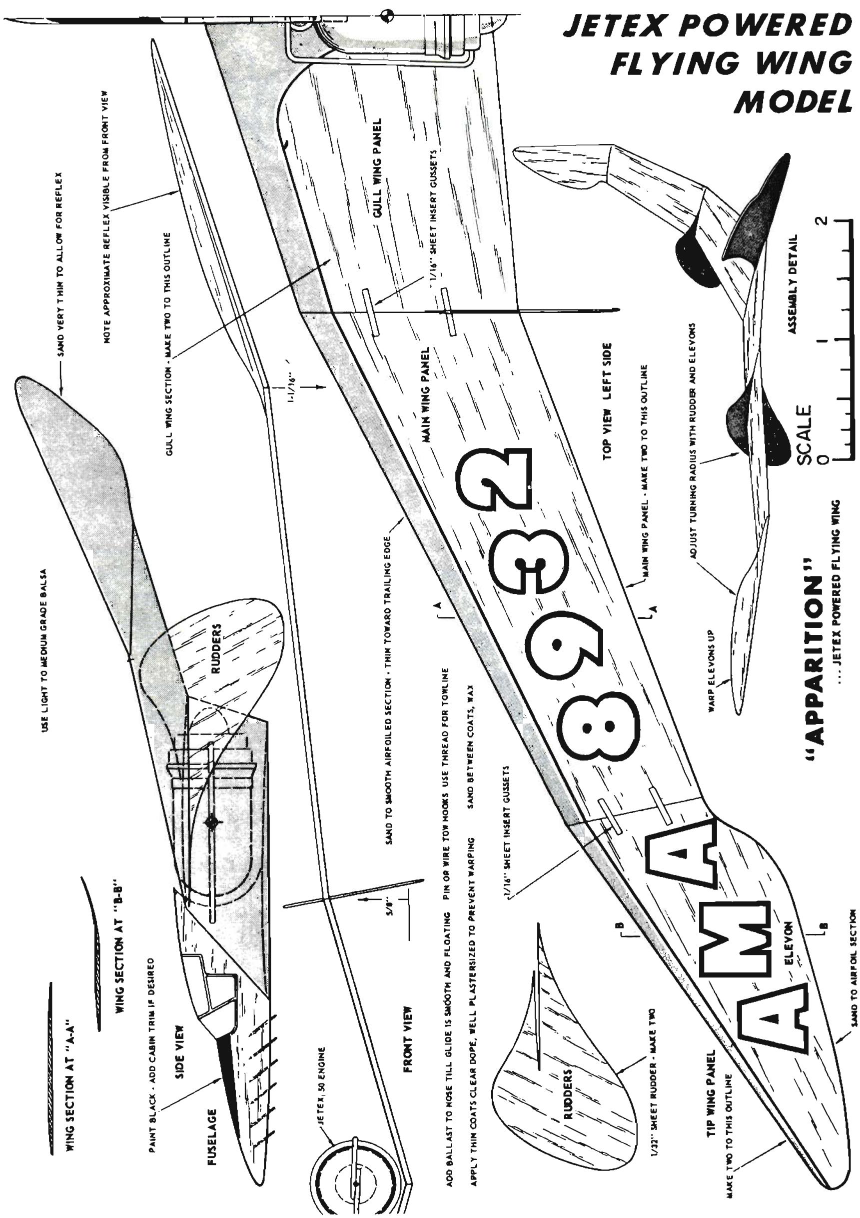
PERFORMANCE

"JETEX" engines are intended to produce jet-type performance. The starting thrust is low, building up to a maximum only after an appreciable time. Thus the total energy of the fuel is used to give a steady, moderate thrust for several seconds, rather than a momentary burst of extremely high power.

In airborne models this results in an aerodynamic rather than a ballistic type of flight; and the models should be designed accordingly. If it is desired to simulate flight with vertical or near-vertical takeoff, some type of mechanical launching assist must be provided.

In land-borne or water-borne vehicles, the steady thrust of "JETEX" engines gives excellent performance. In all cases, greatest efficiency will result only if drag and weight are kept as low as possible. Clean design and construction will produce spectacular results well worth the additional effort and time required.

JETEX POWERED FLYING WING MODEL



"APPARITION"
JETEX® POWERED FLYING WING

HINTS FOR GOOD FLYING

1. Trim and balance the model for a good glide with an empty engine installed, by adding or removing weight at the nose.
2. Mount engine at the center of gravity of the model, so that balance will not be affected as the fuel is burned.
3. Weight and drag waste power and reduce performance. Strive for a clean, smooth finish; avoid excessive decoration and heavy coats of color.
4. A well built model with free-running landing gear will take off from a smooth surface under its own power — but the power used, plus the weight and drag of the landing gear, will reduce the duration of flight.
5. Before launching the model, wait until sufficient thrust has developed to sustain a steady flight.
6. Always go as far as possible to the windward side of the flying area to launch the model. Then it will drift back into the field during its flight.
7. Normally, launching should be directly into or very slightly off the wind. But if a strong, steady wind is blowing, and you have a large field, down-wind launching may be successful.
8. Be wary of flying in gusty winds. You may get some amazing flights, but will probably have a crack-up first!
9. For tether-line flying, attach a few feet of heavy thread to one wing. The best attaching point will be forward of the engine and just behind the wing leading edge. The exact point must be found for each individual model, by experiment.
10. Observe carefully the pattern of each flight your model makes. Then make slight adjustments for any desired correction before the next flight. Remember that jet powered models are very fast, and only slight changes in trim and rig have very large effects on performance.
11. In powering boats and cars, best results are obtained when the engine is mounted at the rear of the model.

THE JETEX AUGMENTER TUBE

INTRODUCTION

The Augmenter Tube is a revolutionary addition to " Jetex " motor technique. It not only provides a very necessary long tail pipe for certain types of model but it actually increases the thrust by half an ounce. Those interested in the science of aerodynamics will find that an entirely new field of model design is now open to them.

Air intake design should be carefully studied bearing in mind that it is necessary to get a greater volume of air into the neck of the tube than the area of the neck less the diameter of the motor. This means that the area of any air intake should not be less than 1.8 square inches. Figs. 1 and 2 give an indication of two typical methods of obtaining an air intake when the tube is built into a model. This follows full sized practice on modern Jets.

Fig. 1

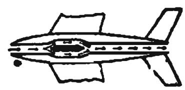
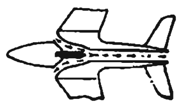
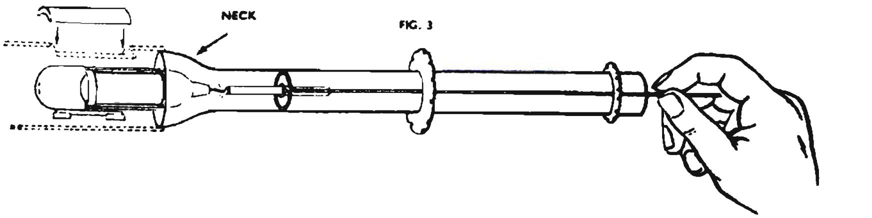


Fig. 2





MOUNTING AUGMENTER TUBE AND JETEX MOTOR IN MODEL

The Augmenter Tube lends itself to structural design of any Jet propelled model as it can be used not only as a tail pipe but as the main structural member of the fuselage. Bulkheads can be slid on to the tube and the framework built round them.

IMPORTANT.

It is necessary to have at least two bulkheads on the tube as these will help to keep the tube circular in shape. The air intake should be built right up to the neck of the tube (see Fig. 3) and a trap door built in so that the motor can be conveniently removed from the machine.

Positioning of motor in relation to Augmenter Tube should be as shown in Fig. 4, i.e. in side elevation, the edge of the End Cap of the motor should be in line with the edge of the neck of the Augmenter Tube. The motor should be absolutely central in relation to the Augmenter Tube.

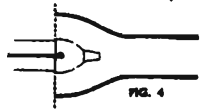
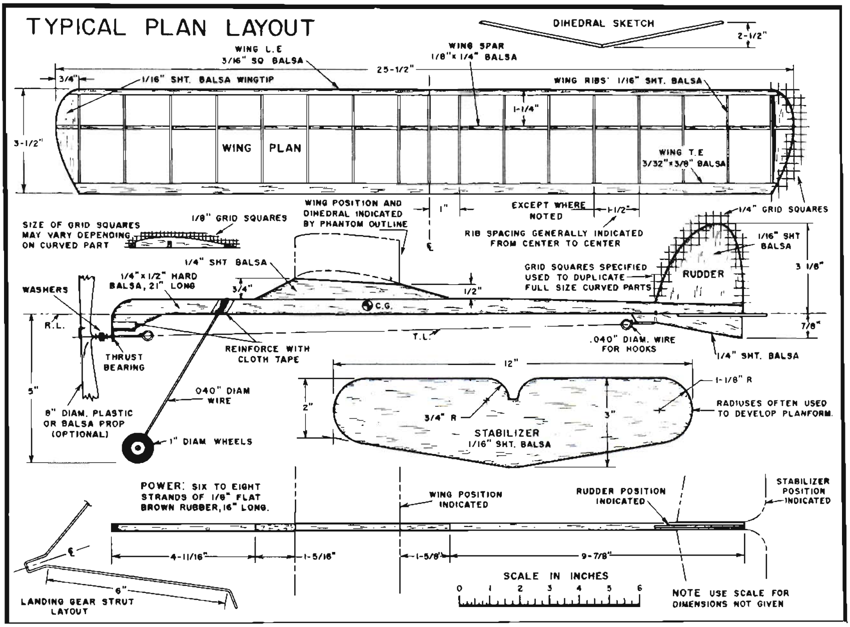
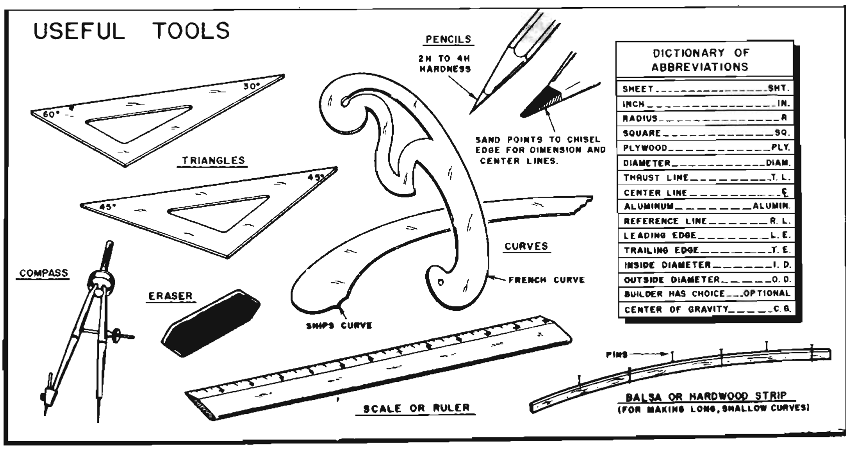


FIG. 4

HOW TO SCALE UP PLANS



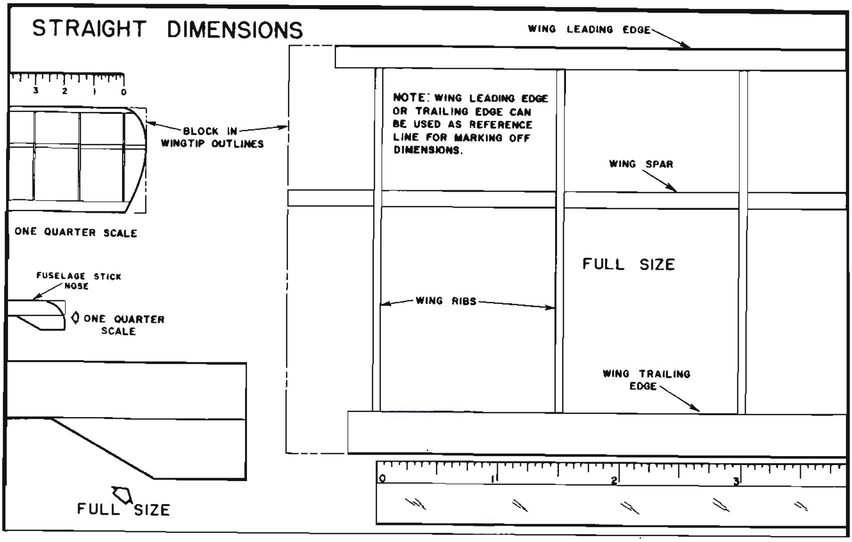


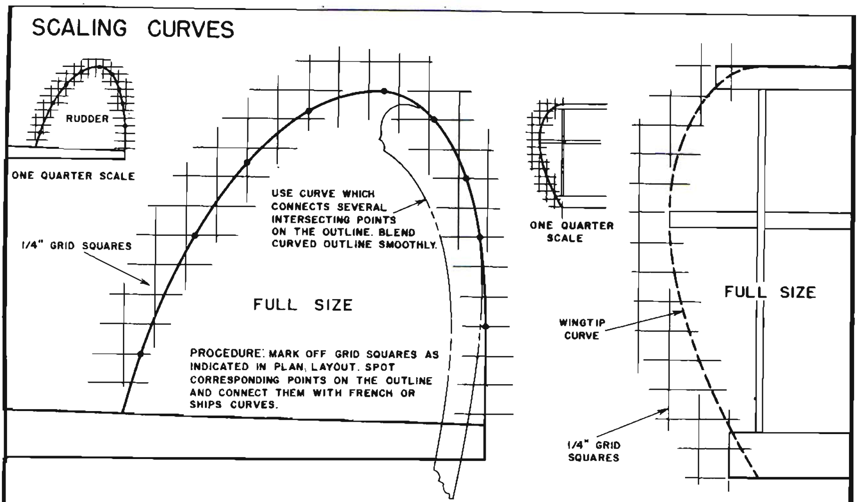
DICTIONARY OF ABBREVIATIONS

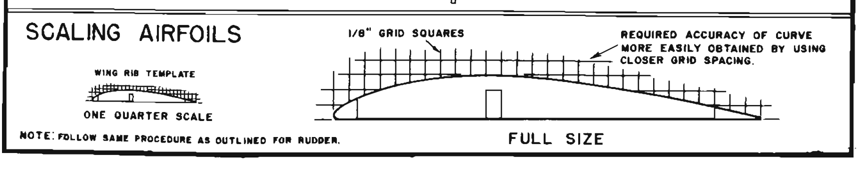
SHEET	SHT.
INCH	IN.
RADIUS	R
SQUARE	SQ.
PLYWOOD	PLY.
DIAMETER	DIAM.
THRUST LINE	T.L.
CENTER LINE	℄
ALUMINUM	ALUMIN.
REFERENCE LINE	R.L.
LEADING EDGE	L.E.
TRAILING EDGE	T.E.
INSIDE DIAMETER	I.D.
OUTSIDE DIAMETER	O.D.
BUILDER HAS CHOICE	OPTIONAL
CENTER OF GRAVITY	C.G.

JETEX® THE JET AGE POWER FOR MODELS

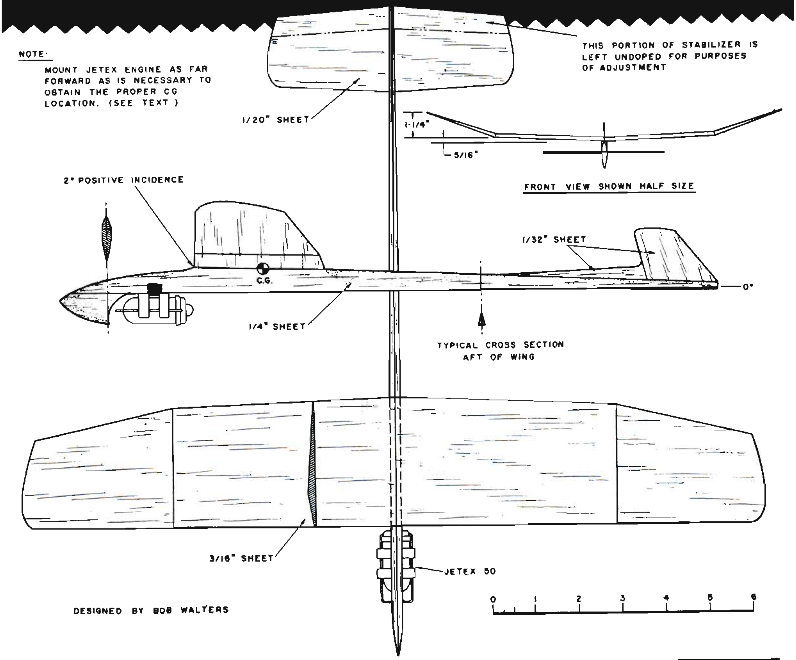
HOW TO SCALE UP PLANS

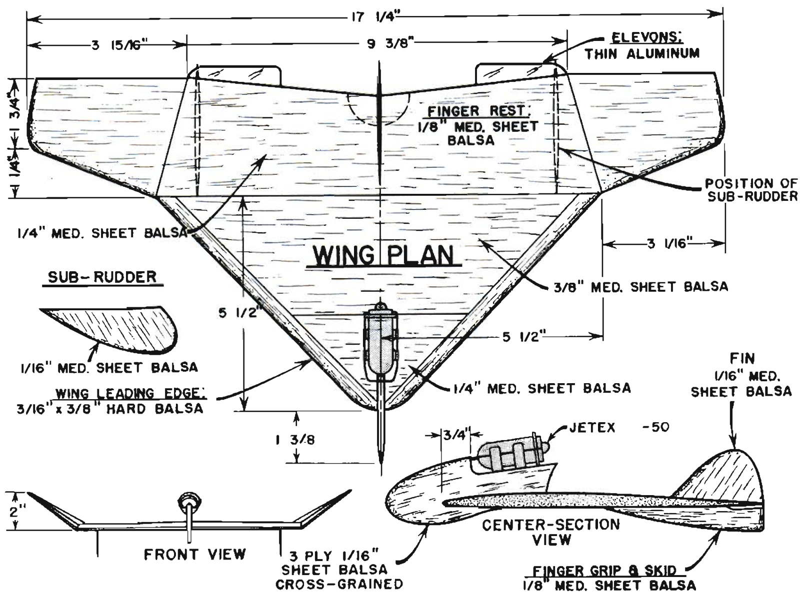






FIZZEL FAZZEL





DESIGNING "JETEX" POWERED SPACE MODELS

As model builders who wish to design and fly space model models, there are three fundamental rules which must be observed. These rules briefly stated are safety, economy of operation and retrievability.

The safety angle is particularly dependent on the engine being used. Jetex engines best fit this situation whether they are in the hands of a novice or an experienced modelbuilder. In the 20 plus years Jetex engines have been sold in this country, there has been no incident in handling or using these engines which involved injury of any sort, despite the fact that well over two million Jetex engines have been sold in that time. This is certainly an impressive record, and one which others must look upon with envy.

Jetex engines have always been among the least expensive to buy, operate and maintain. Improvements are continually being made both in Jetex engines and fuel, with promise of increased efficiency, power at low cost.

The light weight of Jetex engines has made it possible to design and fly models of missile proportions, that will, after the powered phases of a flight, descend in a gentle trajectory eliminating the possibility of the model being demolished or seriously damaged with one flight. This being accomplished without the aid of a parachute or other complicated safety devices.

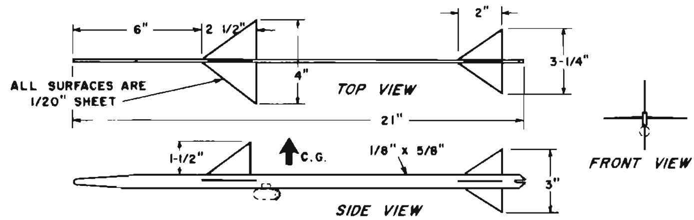
We have done a considerable amount of experimenting with many type of scale space models configurations and with design proportions of our own; and have after much effort been able to evaluate the requirements necessary to the success of a "Jetex" powered model.

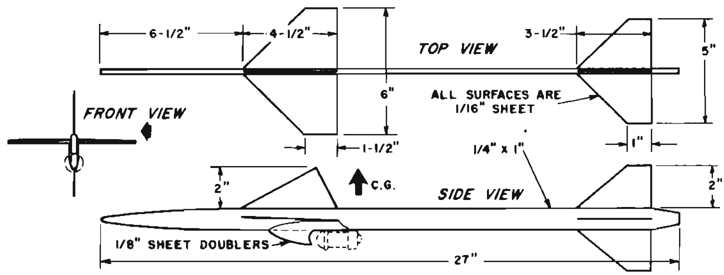
Light weight and stability are the two prime factors which will control the success of any space model project. Beginning with the weight, let's break it down a little, in order to get an accurate picture of the requirements. Since the weight of an engine is a predetermined factor, it can be best used to advantage as a guide for the construction of a space model.

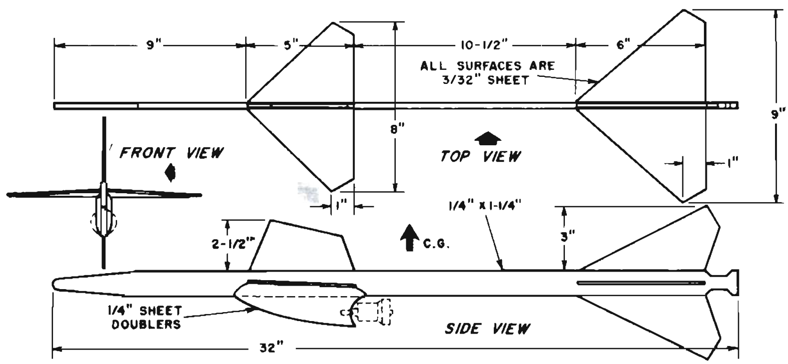
We have been able to establish through flight tests that the optimum minimum weight we should strive for should be no greater than the total weight of the engine used, loaded and ready for use. Take for example the "PAA-Loader" 150 engine, which weighs approximately 1¼ oz. ready-to-go. This would mean the desired empty weight of our space model, should be approximately 1¼ oz. or less, and ready-to-fly, the space model should weigh in at approximately 2½ oz. If a model can be made structurally sound, and the total all up weight less, this would be a definite advantage.

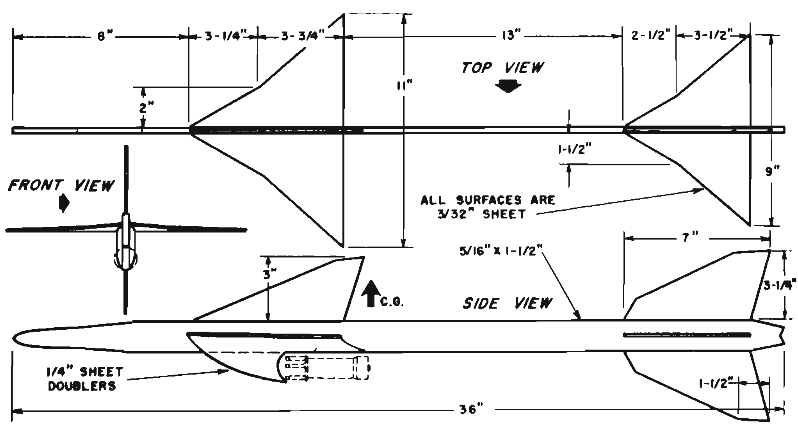
This general rule can serve as a guide for determining the size of the horizontal stabilizing surfaces, which we have determined through testing should be at least twelve square inches of total projected area in both surfaces, to each ounce of the model's weight ready-to-fly; the projected area of the surfaces being the area that projects outward from the sides of the model body. This should only be considered as the recommended minimum area rule. It would be best to use as much as

"STICK" SPACE MODELS









sixteen square inches total area to the ounce, unless of course it detracts from the model's overall proportions, or in the case of a scale type model, deviates considerably. This is why it is so important that we strive for as light and sturdy a structure as is practical. For as the estimated total weight of the model goes up, so must the critical minimum size of the stabilizing surfaces.

To retain model proportions stick to aspect ratios of 4:1 or under, for the horizontal surfaces. Also; to eliminate dihedral, remember to use at least 40° sweepback at least on the main horizontal stabilizing surface. Less than this amount may prove critical. Use of some sweepback on the smaller horizontal surface is also advisable, though it need not be as much.

As for the angular settings of the horizontal stabilizing surfaces, we would recommend that all rear surfaces be set at 0°, and all forward surfaces be set at from 1° to 2°; at least until primary flight tests have been made.

It should be remembered, that the proportions we have established as being practical are being governed by the use of flat sheet surfaces. Should we desire to camber the surfaces or build-up to a streamlined or airfoiled cross-section, our minimum critical surface requirements would vary from 10% less on a model with Jetex "50" engine to 25% less on a Scorpion "600" powered model

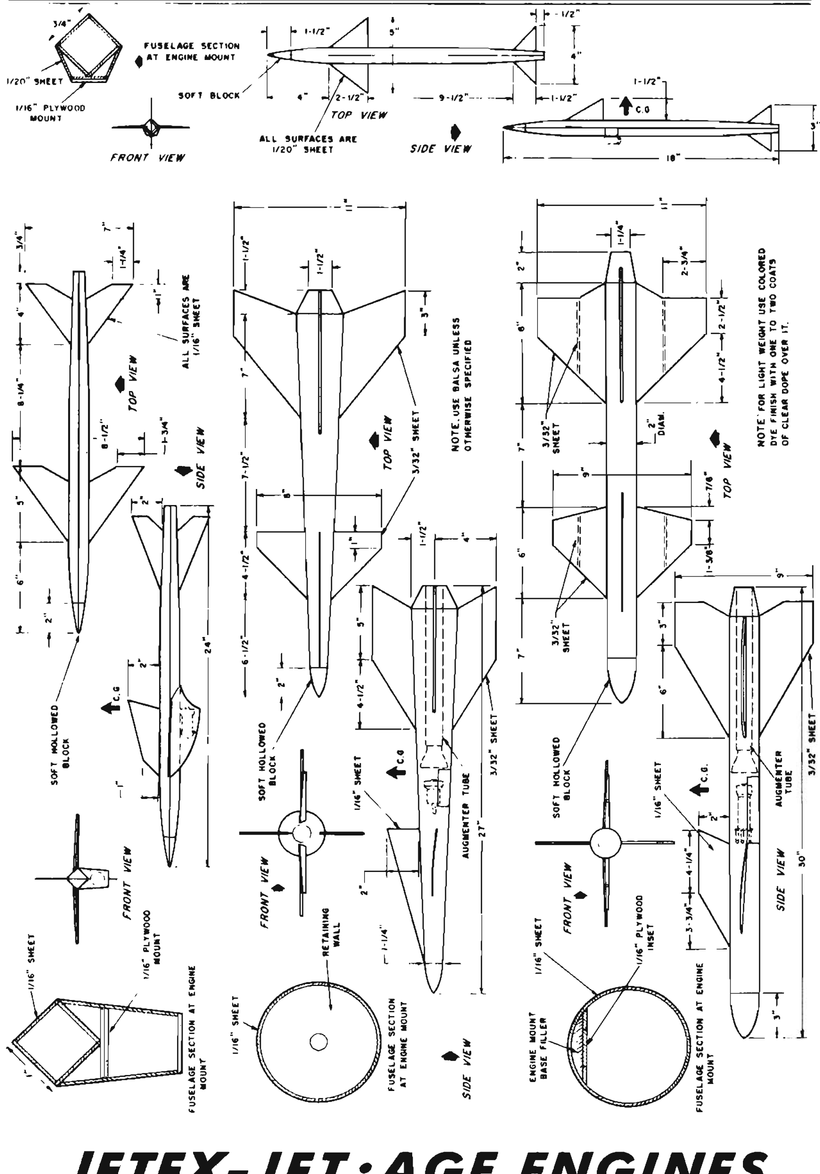
The area of the vertical stabilizing fins can be easily determined once we have established the size of the horizontal surfaces. A safe rule would be to use at least two thirds the combined area of the horizontal surface; with from one fourth to one-third of the total area forward of the center of gravity.

The establishment of the proportions of surface to use, related to the model's weight, has indirectly established our requirements for a stable flight pattern. The remaining considerations for stability depend chiefly on the position of center of gravity and the location of the engine with respect to it. As we shall soon see, variations in the center of gravity position will assist us in controlling the type of flight pattern we want.

The ideal position of the engine as we have been able to determine, is just forward of the center of gravity position. Through considerable flight testing we have found that the most desirable position of the center of gravity for a conventional configuration should be approximately 40%-45% of it's total length, behind the nose of the model. If the proportions of surface are reversed, so that the larger horizontal stabilizer is in the rear (Canard), then the center of gravity will move rearward approximately to midpoint or slightly aft.

Moving the center or gravity rearward, whether by moving the engine back (preferred) or by adding ballast to the tail, may result in a slight decrease in the rate of descent; but at the same time it must be remembered that this might introduce a pitching moment (stall) in the climb, and in the descent pattern. With the introduction of turn in either direction, through the use of a vertical trim tab, this condition can be

"ADVANCED" SPACE MODELS



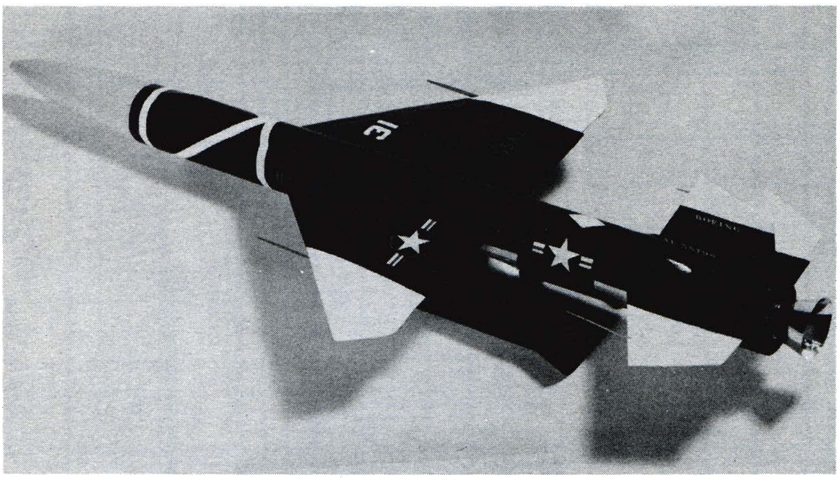
JETEX-JET·AGE ENGINES FOR MODERN MODELS

controlled and the duration of flight might possibly be increased. If the power phase of the flight only, requires control, it would be best to add a deflector tab in the path of the engine's exhaust to properly trim the power phase of the flight.

Moving the engine forward (preferred) or adding ballast to the nose, will help us to establish a flight pattern very much like a true missile, where the trajectory of the missile descent will follow an arc, which can be made as steep as the trajectory in the power phase of the flight. While spectacular to watch, it is hard on the model.

Opening up before us are new horizons in modeling achievements and enjoyment. We feel certain that after a few hours effort on some model types we have outlined you will agree with us, that there is no end to the measure of success and enjoyment than can be derived from them. Once you get started on them you will most surely want to experiment with ideas and proportions of your own.

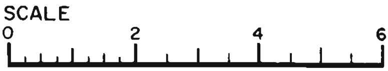
JETEX POWERED "BOMARC"



ORIGINAL SCALE "BOMARC" DESIGN PUBLISHED IN "MODEL AIRPLANE NEWS". POWERED BY TWO "50" AND ONE SCORPION "600" JETEX ENGINES.

JETEX®

Gusty


SCALE
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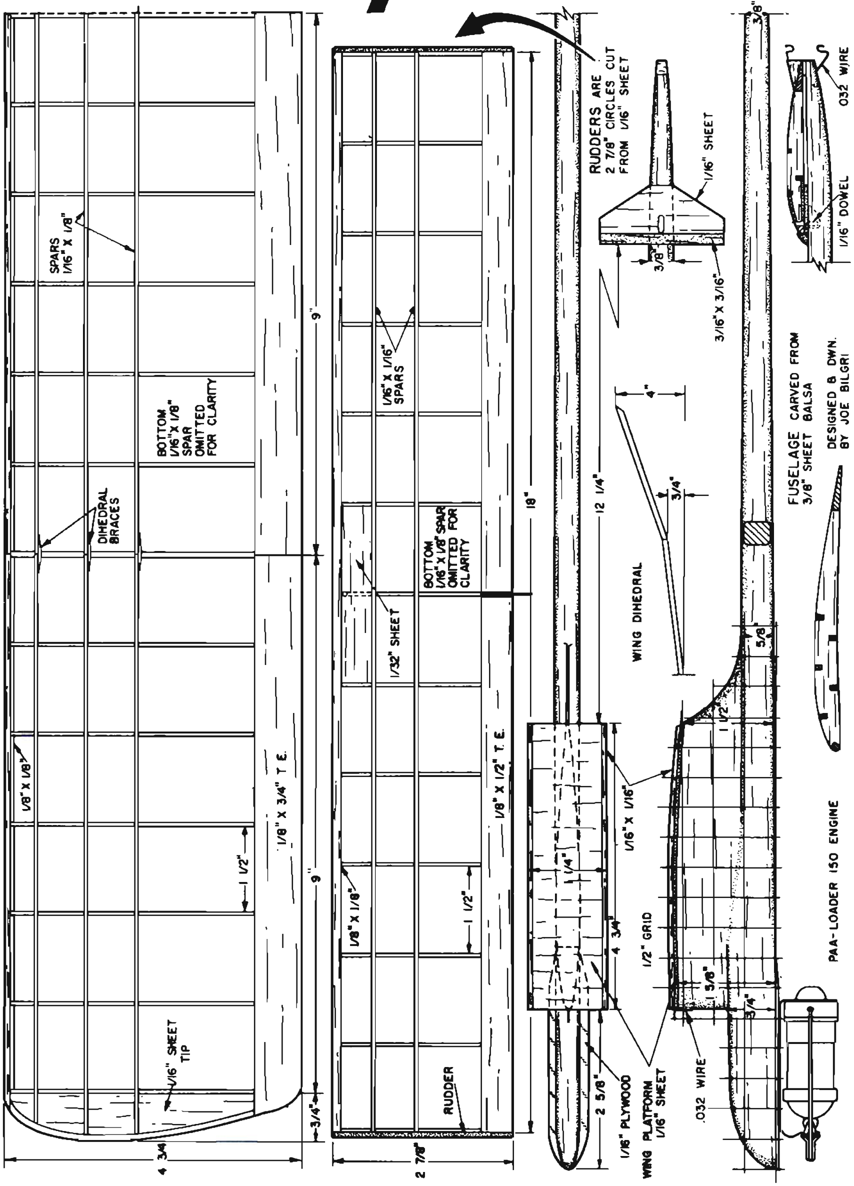

SPARS 1/16" X 1/8"
BOTTOM 1/16" X 1/8" SPAR OMITTED FOR CLARITY
DIHEDRAL BRACES
1/8" X 1/8"
1 1/2"
1/8" X 3/4" T. E.
9"
9"
1/16" SHEET TIP
3/4"
4 3/4
1/16" X 1/16" SPARS
BOTTOM 1/16" X 1/8" SPAR OMITTED FOR CLARITY
1/32" SHEET
1/8" X 1/8"
1 1/2"
1/8" X 1/2" T. E.
18"
RUDDER
2 7/8"
RUDDERS ARE 2 7/8" CIRCLES CUT FROM 1/16" SHEET
1/16" SHEET
3/8"
3/16" X 3/16"
4"
3/4"
WING DIHEDRAL
12 1/4"
1/16" X 1/16"
1/4"
4 3/4
1/2" GRID
2 5/8"
1/16" PLYWOOD
WING PLATFORM 1/16" SHEET
.032 WIRE
5/8"
1 1/2"
1 5/8"
3/4"
3/8"
.032 WIRE
1/16" DOWEL
FUSELAGE CARVED FROM 3/8" SHEET BALSA
DESIGNED & DWN. BY JOE BILGRI
PAA-LOADER 150 ENGINE

DOES A MODELLER NEED EXPERIENCE WHEN...

Buying Balsa?

● An expert model builder doesn't buy balsa when he needs it, he buys it whenever he sees a good stock. In that way, he gets the grades best suited for his needs. After all, it doesn't make sense to spend days building a model, only to have it break on the first flight because of structural failure.

In selecting balsa sheets and strips remember that, as on full-size aircraft, you want high strength with low weight. It is surprising how easily this can be achieved by utilizing special balsa weight and grain-cut characteristics. Did you know that one sheet of

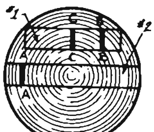


Fig 1

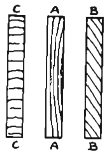


Fig.2

balsa can be three times stronger than another, although both may have been cut from the same log? And that one sheet can be bent into tubing without trouble, while another will crack under comparatively light pressure? Also, that small hard balsa spars will absorb crack-up shock that normally would snap large soft balsa spars?

Balsa, like any other wood, grows by accumulating material around its diameter—each period of growth is like a separate tube. This periodical growth can be seen and is known as annular rings.

Figure 1 illustrates a cross-section of a log, on which plank cuts are shown. Examining planks No. 1 and No. 2, you will note that sheets cut from plank No. 1 along C-C contain material which accumulated in several years, as you can see by the annular rings. Such cuts

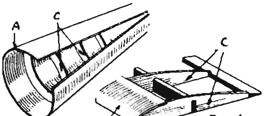


Fig 3 Fig. 4

are known as quarter-grain in lumber circles, or C-Cut in the model world. You can recognize such cuts by their glazed and scale-like surface.

C-Cut sheets are exceptionally stiff and are liable to crack when pressed between thumb and palm. The stiffness is caused by the laminated-like structure of the wood, as sketched in Figure 2-C—and it is this stiffness which can be used to great advantage in model building.

C-Cut balsa is perfect for wing ribs, bulkheads, and any other surface that must not warp but must still be light (see Figures 3 and 4). Ribs made of this type of balsa will hold their shape under the pressure of the paper without buckling—and that pressure is greater than you think. Figure 5 shows a comparison between C-Cut and A-Cut balsa under pressure. Proper strength balsa will help keep the wing lined up, and so prevent warping.

To obtain similar anti-bending

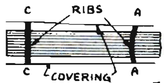


Fig.5

Fig.6

strength from A-Cut balsa, you will need sheet three times as thick. When C-Cut is used on bulkheads, as in Figure 6, it is advisable to cement a small strip across the grain, to keep it in line during assembly. On indoor models, where a rib is nothing else but 1/32" sheet balsa cut to airfoil outline to make it 1/32" square, your balsa *must* be cut from true C-Cut. We could say more about C-Cut, but you will learn more by getting a sheet and actually using it. Look for it every time you go to a hobby store—you will not find it very readily, so it's best to buy it when you see it.

Sheets cut from plank No. 2 along line A-A have just the opposite of C-Cut characteristics. You can recognize A-Cut, illustrated in Figure 2A, by its velvety feel and by the ease with which it can be bent into tubular shapes (note comparison between C-Cut and A-Cut in Figure 7). It will bend without moisture, except when making tubing. It is not advisable to use true A-Cut for ribs, bulkheads or the like—use it where you need considerable bending, like covering round surfaces as in Figure 3.

There is still another cut which is most common on your dealer's shelf . . . cut B-B, illustrated in Figure 2B. This can be recognized by its small speckles, and by the diagonal grain lines at the ends. Always take B-Cut in preference to A-Cut if you cannot obtain C-Cut.

B-Cut comes in handy on shallow bending surfaces, such as the leading edges of a wing, as shown in Figure 4 It is recommended for all ord thick sheet work, like wing tips, wh .c a certain amount of thickness is required for shaping. It will not snap like C-Cut, nor bend or warp like A-Cut.

As for strip balsa, the strength of balsa, like any other wood, depends on its density or weight per cubic foot. Two spars cut to identical size but of different weight will vary in strength according to their weight. That is, a spar cut from twelve pound stock will be twice as strong as the same size cut from six pound balsa. In other words, if two spars weigh the same, regardless of dimension, but have a similar cross-section shape, their strength will be the same. This means that if you follow plans by using the same sizes but lighter balsa, your model will not be as strong as the original.

So, remember—the strength of balsa strips depends on the weight of the balsa from which they are cut. There is, however, a distinction between hard and soft spars or strips which must be considered. As illustrated in Figure 8, a cross-section spar cut from hard balsa will bend at least twice as much as one of the same size cut from light balsa, when under a similar load. So, if we multiply the load by the bending distance, we find that the harder stock will consume shock energy over a greater distance, while the light balsa spar might snap under a sudden shock. This fact is in evidence on the flying field.

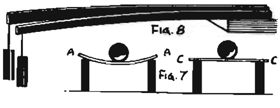


Fig. 8 Fig. 7

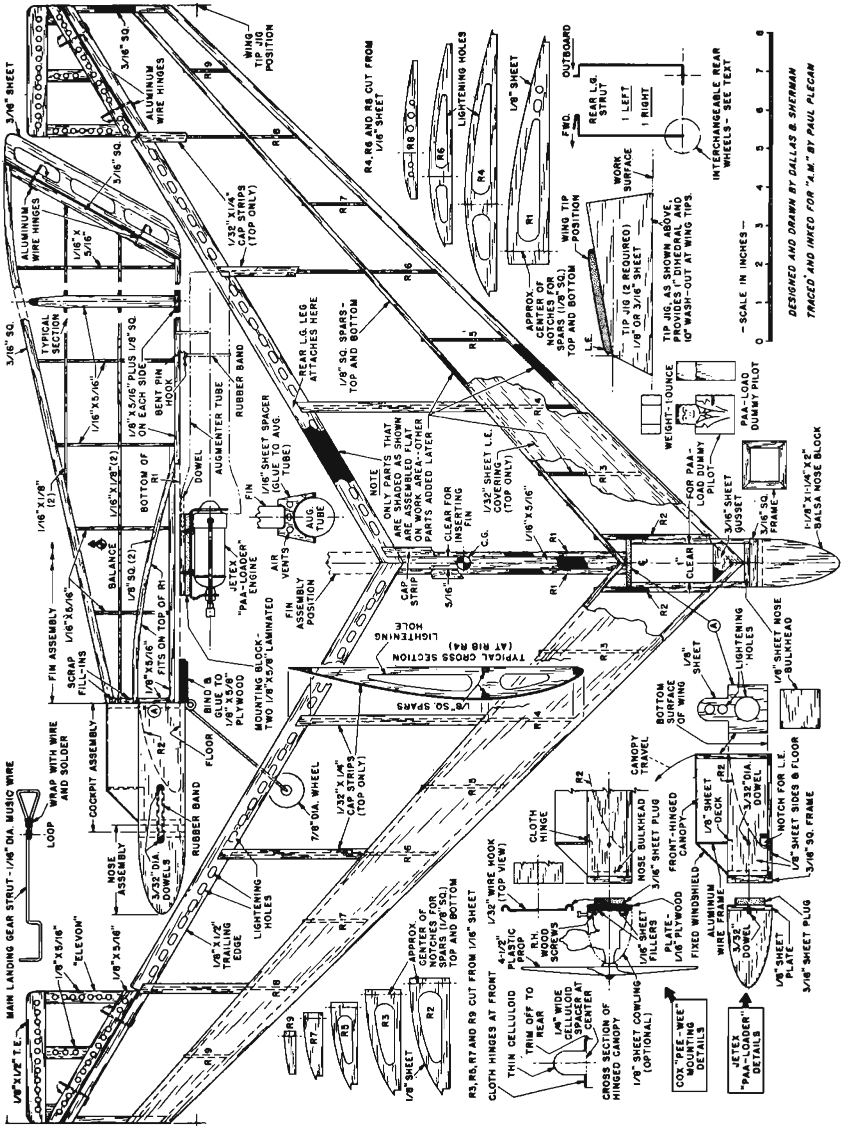
Balsa is strongest under direct compression (Ever wonder how a ⅛" square longeron can take such a load as a fully wound rubber motor?). Therefore, make every effort to have it under full compression at all times. This means generous use of ribs and uprights, to prevent the spars or longerons from getting out of direct compression.

One secret of fine workmanship is to use light and generously sized balsa where shaping is required. This will give you a chance to shape and sand to exact shape and have a smooth-looking surface. Whenever you have to cut ribs or other irregular outlines, use light or medium balsa. On hard stock, the blade will tend to follow the grain line and it will be most difficult to obtain smooth razor cuts.

Don't be tempted to use 1/64" or even 1/32" balsa sheet for covering—you'll be disappointed! In the first place, you will not have much thickness left to sandpaper smooth—and nothing looks as bad as rough balsa. Also, cement will pull the thin sheet down along the bulkheads or ribs. Never use less than 1/20" balsa for covering. It's much better to use thicker but lighter grades, and then sandpaper them smooth. While sanding, the joints will be filled with dust, and so produce a clean-cut appearance.

To summarize: Test the advantages of using quarter grain or C-Cut balsa. Use hard balsa strips and spars to obtain "elastic" strength. Stock up whenever you find good balsa. When selecting, be particular about surfaces. A sheet or strip is as weak as its deepest saw cut. Always sand out saw marks. And always remember that good balsa, properly used, is your cheapest insurance for successful model building.

Dallas Sherman's Unique
JETEX POWERED
PANAM "POLKA"



Jetex POWER

A simple approach to jet-age model projects, properly used Jetex motors can provide fun.

● The Jetex motor, now seen popularly on model fields around the nation, is a simple and safe answer to the current trend of building rockets and missiles. Operating on a solid fuel pellet, the motors function exactly like full-scale rockets and are capable of extreme amounts of thrust in consideration to their size and weight.

The motors are available in a variety of sizes providing many possibilities for design and flight. Most popular today are the small and sporty Jetex 50 units which can be used for craft spanning slightly more than the average handlaunch glider. When greater power is desired, the modeller can choose one of the other three units, the last of which is the super-sized Scorpion motor.

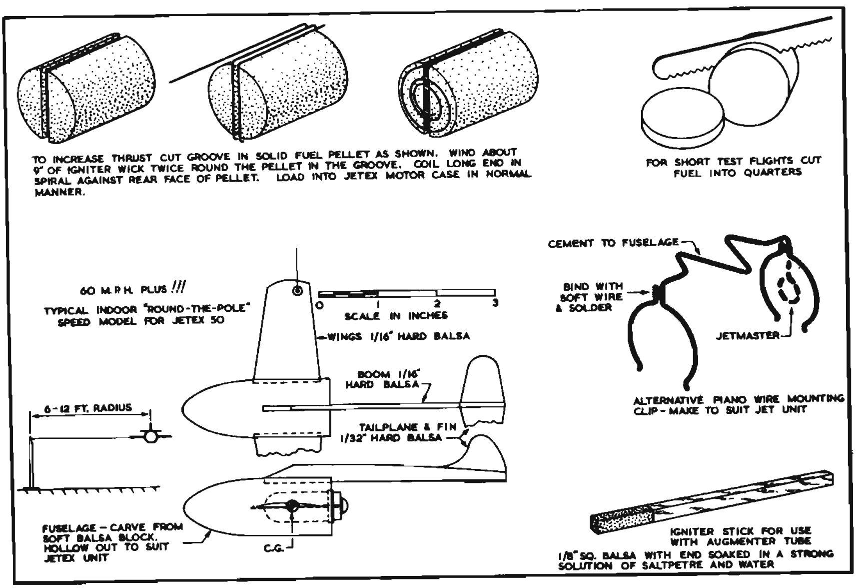
Perhaps the most striking advantage of these motors is the complete absence of torque since there is no propeller. The units operate on Newton's Third Law which specifies that "To every force there is an equal and opposite action." On burning fuel, the pressure at the nozzle expels the gases and the motor moves due to the "opposite" force on the container.

Each motor is a self-contained unit and is attached to the model by a simple mounting clip. A single motor can, consequently, be used on several models of similar size and weight. Although there are no moving parts to wear out, regular cleaning of the motor is a necessity along with occasional replacement of the sealing washers. The purpose of this article is to discuss the use and operation of these motors with the intention of conveying methods for better and more efficient operation.

Because of the simplicity of these motors, they are often handled without due care or consideration for their design. A simple thing like loading is often the cause of unnecessary problems. The charges should fit easily into the motor case. If this is not so, you should clean the interior of the case to assure the removal of all fuel residue and sand the sides of the charge down if binding still persists.

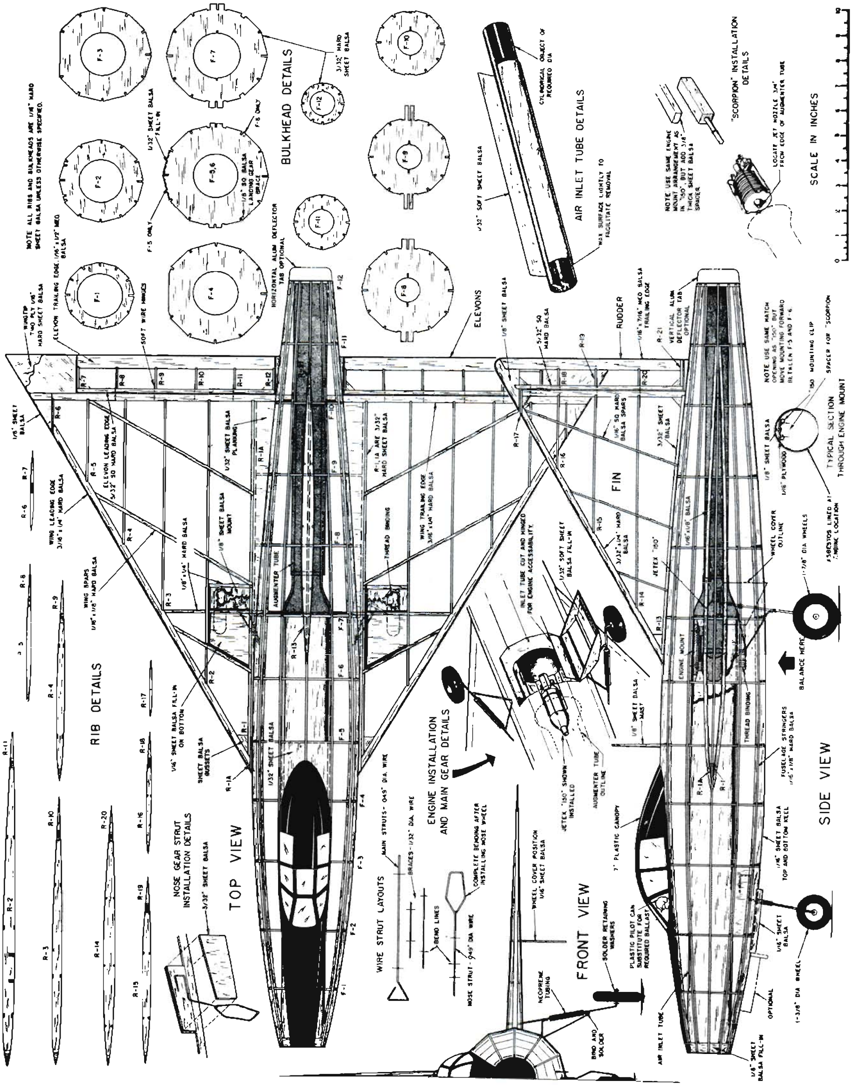
"Keep your power dry," has always been a good axiom and it applies to Jetex fuels too. Damp charges lose power so make sure to store them in a dry container and not on the ground when out flying. Even damp atmosphere causes small beads of condensation to form on the fuel, if they are left exposed for any great period of time.

Proper sealing cannot be over-emphasized. The sealing washers must



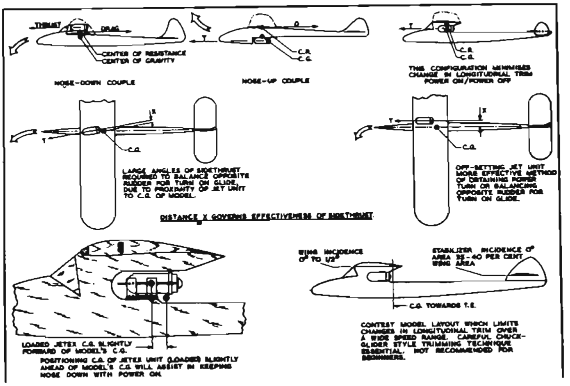
Convair's Delta

"JETEX"® POWERED

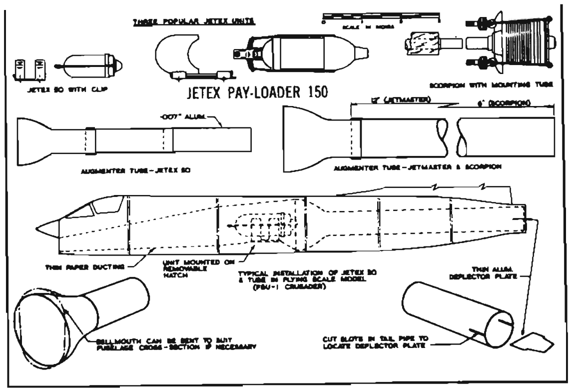


seat securely to get the maximum power from the motors. "Blow by," the loss of gases past the motor cap, can be detected by the formation of brown stains or smears on the side of the motor case. When you see these form, replace the gaskets and clean up the seating edge of the case.

Perhaps the most alarming thing about Jetex is the highly corrosive nature of the hot gases which are generated during burning of the fuel. Only thorough cleaning after use can prevent the container from being permanently damaged, since the corrosive action continues all the time that the aluminum cases are contaminated by the burnt charge. After each day's flying, strip the motor down and give all of the metal parts a kerosene bath, then scrape the corrosion away from the motor with a piece of hardwood. Follow this with a bath in soapy water and a final rinse in clear water. Dry all of the parts thoroughly and then oil all of the ferrous parts with a thin film of oil before reassembly. A Jetex motor, simple as it is, requires the same care and maintenance as other engines.



When re-loading, follow the manufacturer's instructions carefully, making sure that the fuze is tight up against the fuel to prevent a misfire. If your unit fails to eject the wire core of the fuze on igniting, you may have to pull it out of the case using care not to grab the nozzle of the hot engine. This minor blockage will cause loss of power and often tends to cause a turbulent jet flow from the nozzle. The new V-Max fuels can be loaded without using wire screens to hold the fuze in contact with the fuel. Make sure that you use sufficient fuze inside the case to cause ignition but try to keep this near the minimum that it takes to do the job. A straight piece of fuze pushed through the nozzle, and broken off about ¼" from the jet orifice, will light the new fuels and cause the fuze core to blow out on lighting.



Cleaning of the jet orifice is periodically necessary since the burnt fuels tend to cause a caking around the edges. This is noticed when the fuze is loaded and the fine limits of fuze-to-hole are disturbed. Use a wire cleaner that is the same size as the hole—never force larger cleaners as the increased hole size will reduce power.

Although the Jetex craft is a basically simple thing, trimming procedure for flight is almost exactly the opposite of that used on other power models, particularly those powered by rubber. In the latter case, the power dwindles down as the model climbs skyward. Jetex models tend to increase their speed as they go up and generally follow a path of constant accleration all through the power pattern. This is due largely to the fact that efficiency of the model increases as the model's speed builds up—the thrust output stays about constant throughout the entire run.

Because of this power build-up, models often tend to loop, spin, or reverse turn toward the last few seconds of power flight. In general, it is wise to make the model on the larger, or heavier, side to take care of this characteristic.

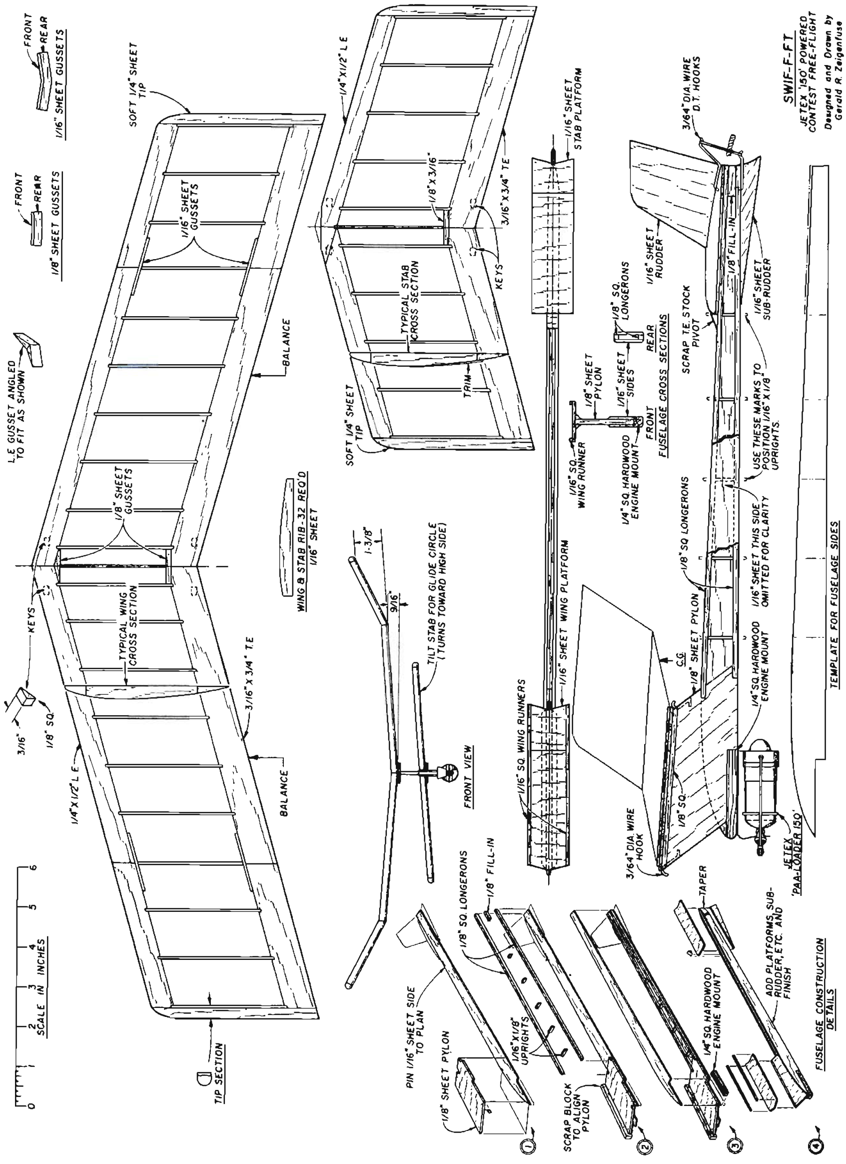
The sketches accompanying this article indicate some of the set-ups which can prove ideal. Power flight should be arranged to obtain a straight, or near straight, climb. Setting the center of gravity (point of balance) of the Jetex unit (loaded) slightly forward of the model's balance point will assist in keeping the nose down under power.

In other words, a model should be trimmed for a slightly "nose heavy" condition until the charge burns away. To maintain a straight climb, it is best to offset the Jetex motor to the side, twisting it with relation to the model's centerline, and compensating this by offsetting the rudder until this side-thrust is neutralized. Due to the motor's proximity to the center of gravity, very little side, or down, thrust can be achieved by swivelling the motor unless angles of about 10° are applied. Positioning the motor to one side of the model often proves more effective.

Tables are included to give approximate sizes for models using Jetex motors. If you have doubts as to size, a safe way is to build the models on the bigger side which produces a model that is virtually underpowered.

For contest flying, where it is necessary to get the utmost out of a model, a smaller and more powerful ship is necessary. Light weight is an important factor too. The smaller and lighter a model is, the faster will be the rate of climb—and the more critical it will be to adjust. Naturally, it is necessary to take chances to get the highest possible altitude.

The limit on minimum size then be-



"SWIF·F·FT"

JETEX® "150" POWERED CONTEST FREE·FLITE MODEL

JETEX UNIT	LOADED WEIGHT IN OZS.	CHARGE WEIGHT IN OZS.	STATIC THRUST IN OZS.	THRUST DURATION IN SECS.	MODEL SPECIFICATIONS WING AREA IN SQ. IN.	APPRX. SPAN IN INS.	MAX. TOTAL WEIGHT IN OZS.
50 HELLCAT	·328	·109	·500 TO ·625	12 TO 15	40 TO 55	12 TO 16	·750 TO 1·250
50 HI-THRUST	·380	·109	3·500 TO 5·000	4 TO 5	/	/	2·250 MAX.
150 PAY-LOADER	·938	·250	1·375 TO ● 2·250	13 TO 15	70 TO 150	20 TO 30	4·500
SCORPION	2·000	·375	5·500 TO ● 7·000	8 TO 10	175 TO 320	35 TO 48	15·000

● WITH AUGMENTER TUBE

comes the amount of wing area required to produce a slow and soaring glide coupled with a design that is capable of maintaining stability under excess power.

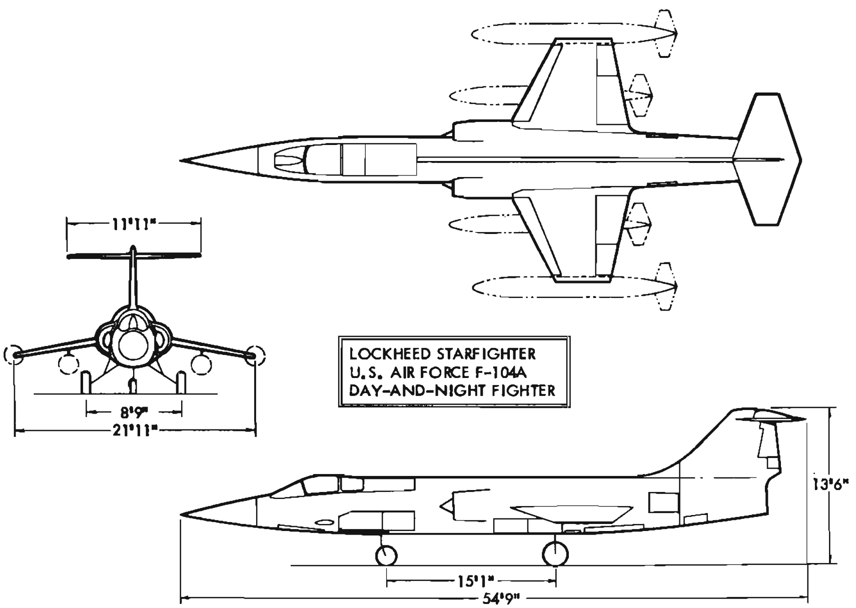
Regarding longitudinal stability, a good contest layout is similar to an all-balsa handlaunch glider where the ship is trimmed with a minimum amount of longitudinal dihedral—the wing and tail being set as close as possible to zero-zero with relation to each other. This setting minimizes the possible changes in longitudinal stability between high-powered and slow-gliding flight. Obviously, this means trimming with the center of gravity well aft, near the trailing edge of the wing, and reduces the "static margin" or inherent stability of the ship. Careful and patient flight adjustment is, therefore, essential for ultimate success.

Flying wing designs are particularly suited to Jetex power. Models of this type, usually sensitive to torque, can be trimmed with relative ease if they are built large enough to handle the power. Note that the overall drag is considerably reduced which means that the models should be built at least twice the size, in wing area, as conventional wing and tail ships. Longitudinal stability on wings is achieved through the use of up-turned elevons or flaps making them sensitive to longitudinal trim because of the high/low speed pattern.

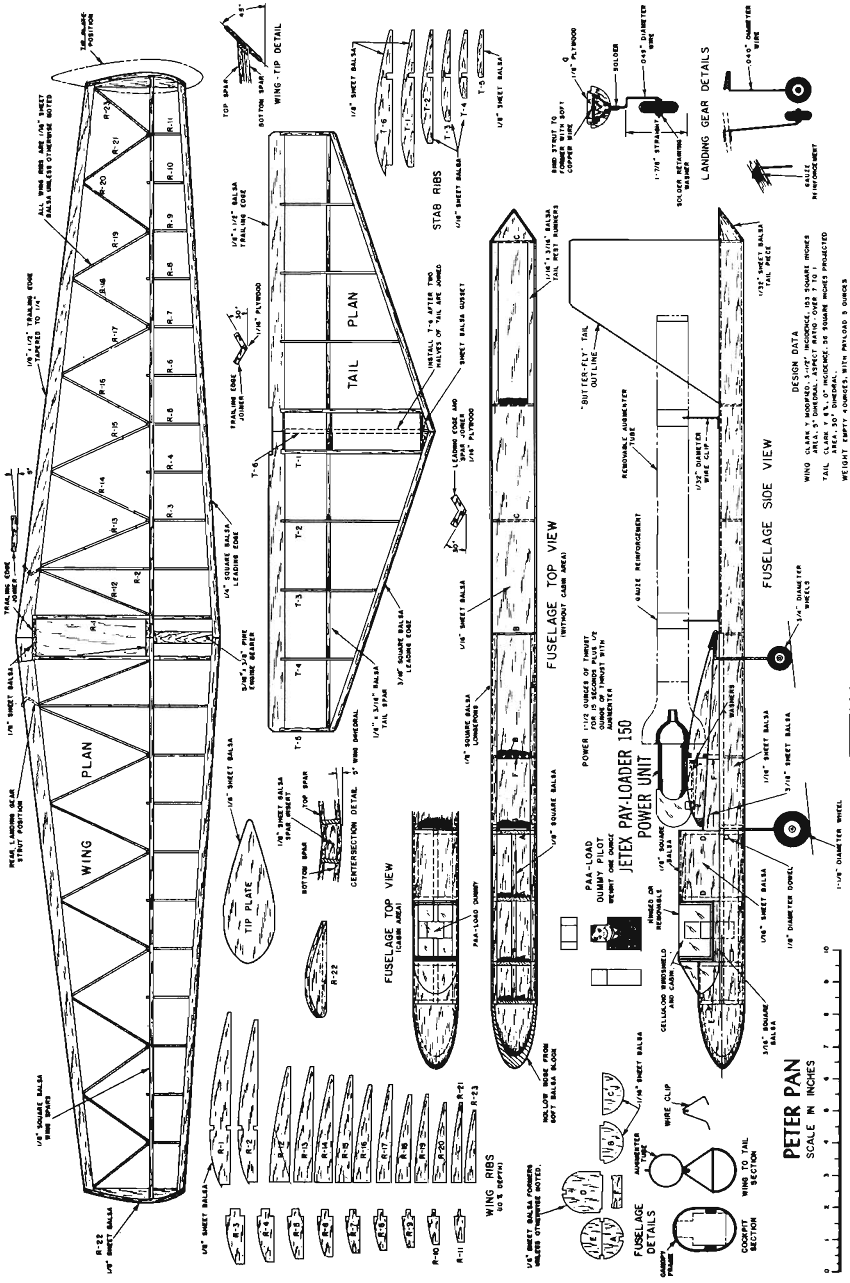
A small highspeed ship, therefore, will require a thrust line mounted fairly high above the wing and the exact amount can only be found by trial and error tests. This again emphasizes the need to build ships very large until the stability problems are solved.

Jetex is reaching the point of general acceptance in all phases of design. Current model designs are centering on VTO with more than limited success. As an example of some of the things which can be, and have been, done we'd like to point to successful helicopters, autogyros and delta wing craft. PAA Load models have shown modellers that rise-off-ground flights can be accomplished with great sporting success.

Though most models are built with the motor hanging out in the breeze to facilitate cooling (providing greater efficiency), this type of power is suited to internal mounting in jet scale models. Structural simplicity and lightweight installation provides many successful models. Use of augmenter tubes provides high thrust and aids internal mounting. Not to be forgotten is the fun that can be had tethering these models for single line speed flying. All in all, here are many possibilities for safely powered space models which can add pleasure to our model building.



WITH A SLIGHTLY ENLARGED WING AND TAIL AND A SMALL AMOUNT OF DIHEDRAL, LOCKHEED'S "STARFIGHTER" CAN BE DEVELOPED INTO A REALISTIC FREE-FLIGHT MODEL.



PETER PAN JETEX
POWERED FREE·FLITE MODEL

JETEX ENGINE DATA

JETEX EN2 50-HT

Weight Empty .... .3 ounces
Weight Loaded .... .5 ounces
Thrust .... 5 ounces
Maximum Engine Run .... 3 to 5 seconds

JETEX EN1 HELLCAT 50

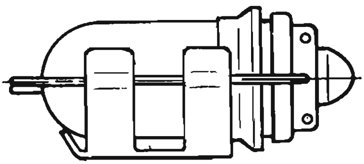
Weight Empty .... .2 ounces
Weight Loaded ....4 ounces
Thrust (without augmenter tube) .... .6 ounces
(with augmenter tube) .... .8 ounces
Maximum Engine Run .... 12 to 16 seconds

EN3 PAY-LOADER "150"

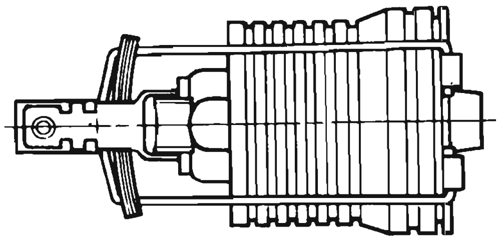
Weight Empty .... .7 ounces
Weight Loaded .... 1.3 ounces
Thrust (without augmenter tube) .... 1.8 to 2 ounces
(with augmenter tube) .... 2 to 2½ ounces
Maximum Engine Run .... 12 to 16 seconds

EN4 SCORPION "600"

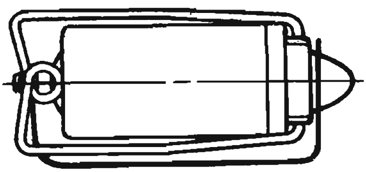
Weight Empty .... 1.6 ounces
Weight Loaded .... 2.0 ounces
Thrust (without augmenter tube) .... 5½ to 6 ounces
(with augmenter tube) .... 7 to 7½ ounces
Maximum Engine Run .... 10 to 12 seconds



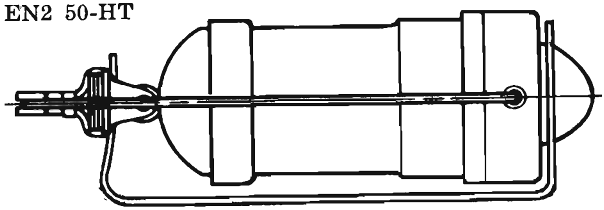
EN1 HELLCAT 50



EN4 SCORPION "600"



JETEX EN2 50-HT



EN3 PAY-LOADER "150"

JETEX® powered Dyna-Soar

■ Dyna-Soar, the manned space glider, is an incredible flying machine. Compared with this Mach 25 terror, even the famous X-15 is a toy. Boosted aloft by a Martin Titan, it will combine the high speed of the ballistic missile with controlled, accurate flight of manned aircraft.

Dyna-Soar's pilot will shorten or lengthen its range by thousands of miles, changing course to reach a landing site. He can choose fields as far apart as Point Barrow, Alaska and San Diego. Able to operate subsonic, transonic, supersonic and hypersonic, Dyna-Soar will be capable of operating like a large, fast aircraft when approaching an airport.

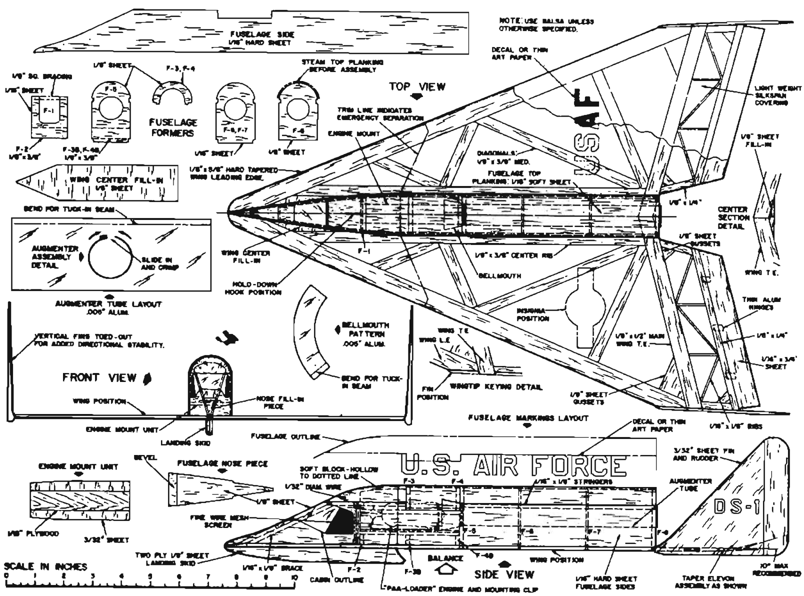
Later developments of Dyna-Soar for weapons-system and escape missions and to circle the moon will take various combinations of Saturn boost stages.

Surprisingly, a model Dyna-Soar is easier to make than many a free-flight design. Deltas like Dyna-Soar long ago demonstrated their performance and stability capabilities. The Jetex Pay-Loader "150" motor with its augmenter tube provides plenty of push and the craft presents no adjustments problems.

Your Dyna-Soar, built as a unit, is practically complete before lifting it from the workbench. Only the fins, part of the elevons and the landing skid —remain to be added.

Since weight and balance are important, the craft should be covered with lightweight Aristo Silray tissue and colored dopes should be used sparingly. Follow the hardnesses of balsa specified.

flite · tested by Paul DelGatto



TO BUILD ANY MODEL IN THIS BOOK WE SUGGEST SCALING UP PLANS (PAGES 18 & 19) OR PHOTOSTAT PLANS UP TO DESIRED SIZE.

JETEX® THEIR WAY TO SUCCESS

• Jetex free-flight and Jet PAA-Load events at the National Contest produced a great number of original designs. Most were functional, both in configuration and structure. There were some radical deltas and flying wings, but while their performances were creditable they were not substantial enough to get into the top brackets.

The favored adjustment technique, used by most winners, began with a right spiral climb, which steepened into a near vertical climb after the second fuel charge cut in. Then the model would roll into a left turn glide pattern.

To obtain such a pattern, slight left rudder was used in conjunction with a tilted stab. Upon launching, the models were usually banked to the rights, and the engine thrust did the rest.

More thought and care went into the design of models for the Jet PAA-Load events than in the rocket F. F. events. Which proved that if imagination and effort are required in design, the American modeler is well qualified to do the rules justice.

Constructionwise, it appeared that a trend had already been developed. The Jetex "50" powered entries leaned heavily towards all-balsa construction, with exceptions in the Junior Jet PAA-Load event, where some built-up designs were in evidence.

One reason for the absence of small built-up free-flight jet designs was the inability of many to "heave" them in launching as is possible with more sturdy all balsa types. However, there were a few ambitious exceptions here, too.

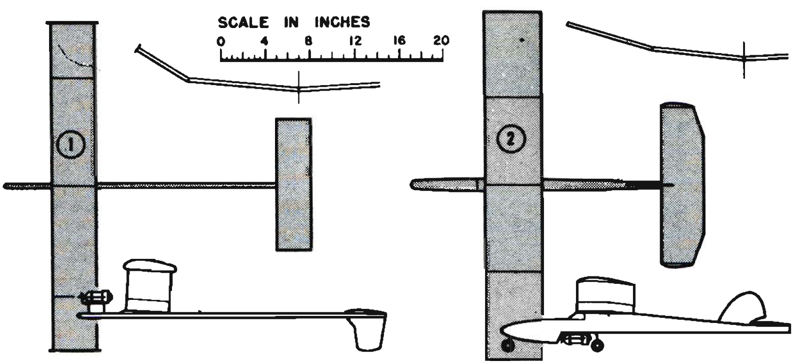
With regard to engines and fuel there were a few interesting steps some of the expert modelers were taking to insure maximum performance. For example, Ted Gonzoph, Philadelphia, Pa., used silica jell to keep the pellets from absorbing moisture. He also used a silica-base compound as a sealing agent for the engines. All this adds to the engine life as well as the power output. Others were inclined to be somewhat secretive about their efforts.

Pay-Load designs ran as high as 180 sq. in., while some free-flight models for the same size engine had only 120 sq. in. An appreciable difference, but one expected in view of the different design and performance qualifications. A few models featured augmentor tubes.

The models as a rule were designed for one event: few combination rocket and PAA-Load jet design showed promise outside of Joe Foster's first place rocket design, which featured a conversion on the fuselage for PAA-Load jet.

Some are currently experimenting with folding wing designs, which are retracted to smaller dimensions with power-on, and snap out to full span after the engine cuts-off. Flaps are another means of getting the best climb and glide combination.

ANALYSES OF 22 DESIGNS



1) Free-flight "Jet" design (1st place, Jr. event) by Steve Benko, Lakewood, Ohio Flite Masters; PAA-Loader "150" engine; spans 30"; 28" long; angular set-up of wing and stab, 2 degrees-zero degrees; dihedral (from fuselage), 1", 4"; center of gravity 70% back from leading edge; 3/8" sq. body.

2) Jet PAA-Load by Jim Breunig, Minneapolis; "150"; spans 32"; 26" long; two-zero; 3/4", 3"; 70%.

3) Jet PAA-Load by Robert Walters, Maspeth, N.Y. (Bklyn. Skyscrapers); "150"; spans 32"; 23" long; two-zero; 1½", 3½"; 75%.

4) Jet PAA-Load by Henry Cole, Palo Alto, Calif.; "150"; spans 36"; 27¾" long, three-zero; 1", 3"; 55%.

5) Jet PAA-Load by George Ostrowski, Whiting, Ind.; "150"; 30½" span; 24" long; two-zero; 2"; 75%.

6) Jet PAA-Load by C. O. Wright, Topeka, Kan.; "150"; spans 36"; 25¼" long; two-zero; 1", 2½"; 50%.

7) F-F Rocket by Albert Lynch, Jr., Chicago Prop Nutz; "150"; spans 26½" 27" long; 2.7 oz loaded; one-zero; 5/8", 2⅞"; 70%; sheet balsa fuselage, triangle cross section back from wing l.e.

8) Junior Jet PAA-Load (5th place) by Stephen Stackhouse, Levittown, Pa.; Jetex "50B"; spans 24"; 15" long; two-zero; 3/4", 3¼"; 75%; canopy from plastic glow plug pkg.

9) F-F Model by Charles Sotich, Chicago Prop Nutz; Jetex "100"; spans 22½"; 27" long; one-zero; ½", 2½"; 75%; good performer, popular club design.

10) F-F Model (4th place) by Joe Morrissey, Ozone Park, N. Y.; "150"; spans 27"; 20" long; one-zero; 2¾"; 60%; Warren truss fuselage silhouette, sheet balsa covered from nose to back of pylon.

11) Junior Jet PAA-Load by John Vikesland, Cedar Rapids, Iowa; "50B"; spans 16½"; 16½" long; two-zero; ½", 1⅝"; 50% root chord; wing, stab swept 15%; canopy from plastic g.p. pkg.

12) F-F Model by Ted Gonzoph, Philadelphia; "150"; 27½" span; 22½" long; two-zero; 1¼", 4"; 60%; built-up sheet balsa fuselage.

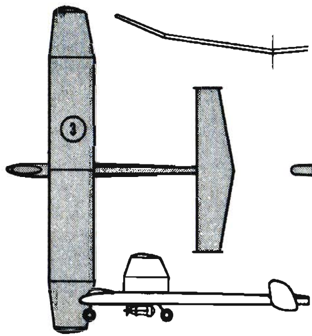
13) Junior Jet PAA-Load by Steven Benko, Lakewood, Ohio, Flite Masters; "50B"; spans 20"; 18" long; zero-zero; 1", 3"; 65%; dummy boxed in, cabin from small plastic blister.

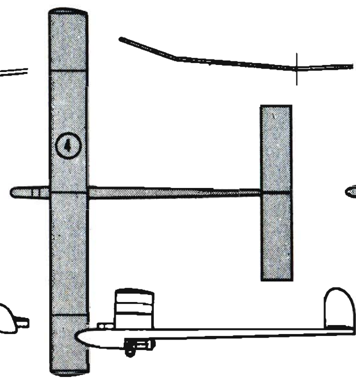
14) F-F Model by Fred Steffens, Jr., Champaign, Ill.; "150"; spans 22"; 25" long; three-zero; 2½"; 60%; Czepa-type wing.

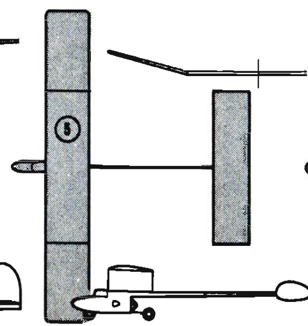
15) Jet PAA-Load (2nd open) by Joseph Pusateri, Bethpage, N.Y., L.I. Gas Monkeys club; "150"; spans 36"; 30½" long; three-zero; 3/4", 2¾"; 60%; 1/16" sheet wing tip plates.

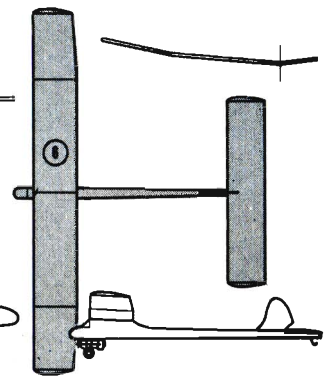
16) Jet PAA-Load (1st open) by Capt. Lee Waldrop, USAF, Wright-Patterson AFB, Ohio; "150"; spans 36½"; 27⅜" long; two-zero; 1", 4"; stab dihedral, 3/4"; 80%.

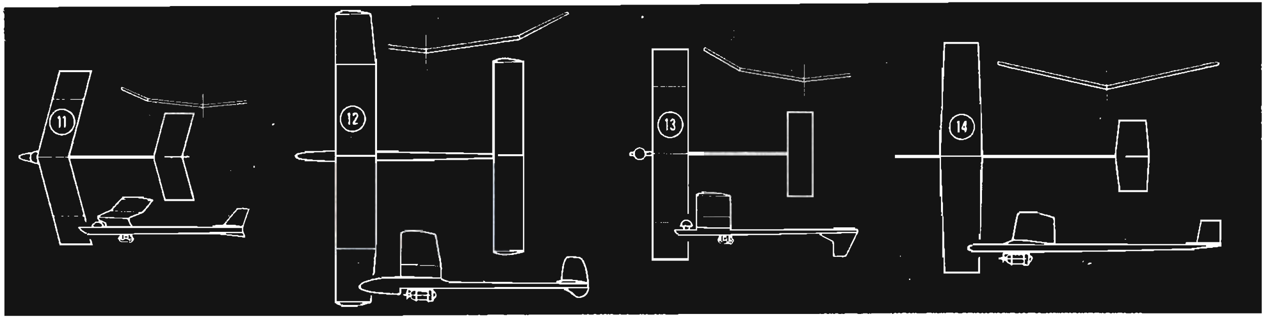
17) Jet PAA-Load by Paul Bartel, Garfield Hts, Ohio; "150"; spans 36"; 28¾" long; two-zero; 3½; 60%.

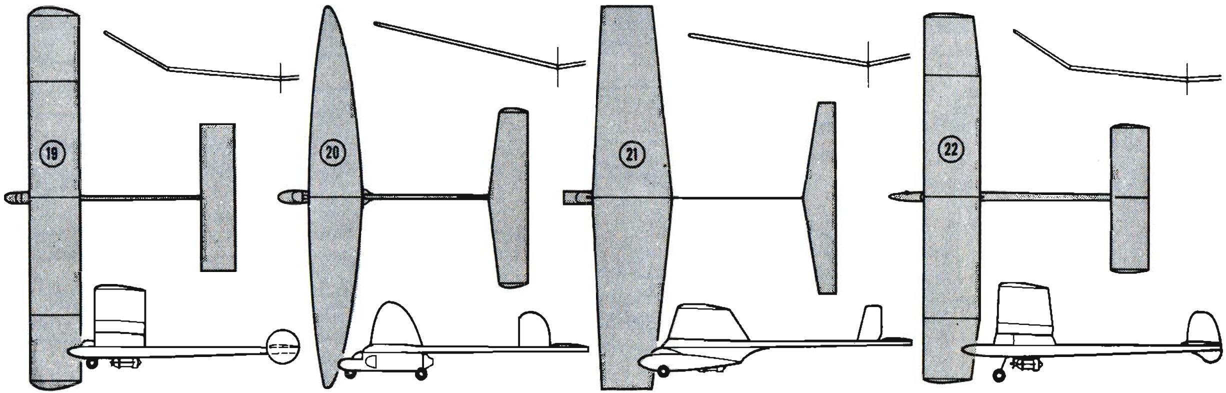












18) Junior Jet PAA-Load by Randy Jones, Decatur, Ga.; "50B"; spans 22½"; 18½" long; 1.5 oz loaded; 1½-zero; 2⅜"; stab dihedral, ¼", 1¼"; 45%; cabin from plastic g.p. pkg.

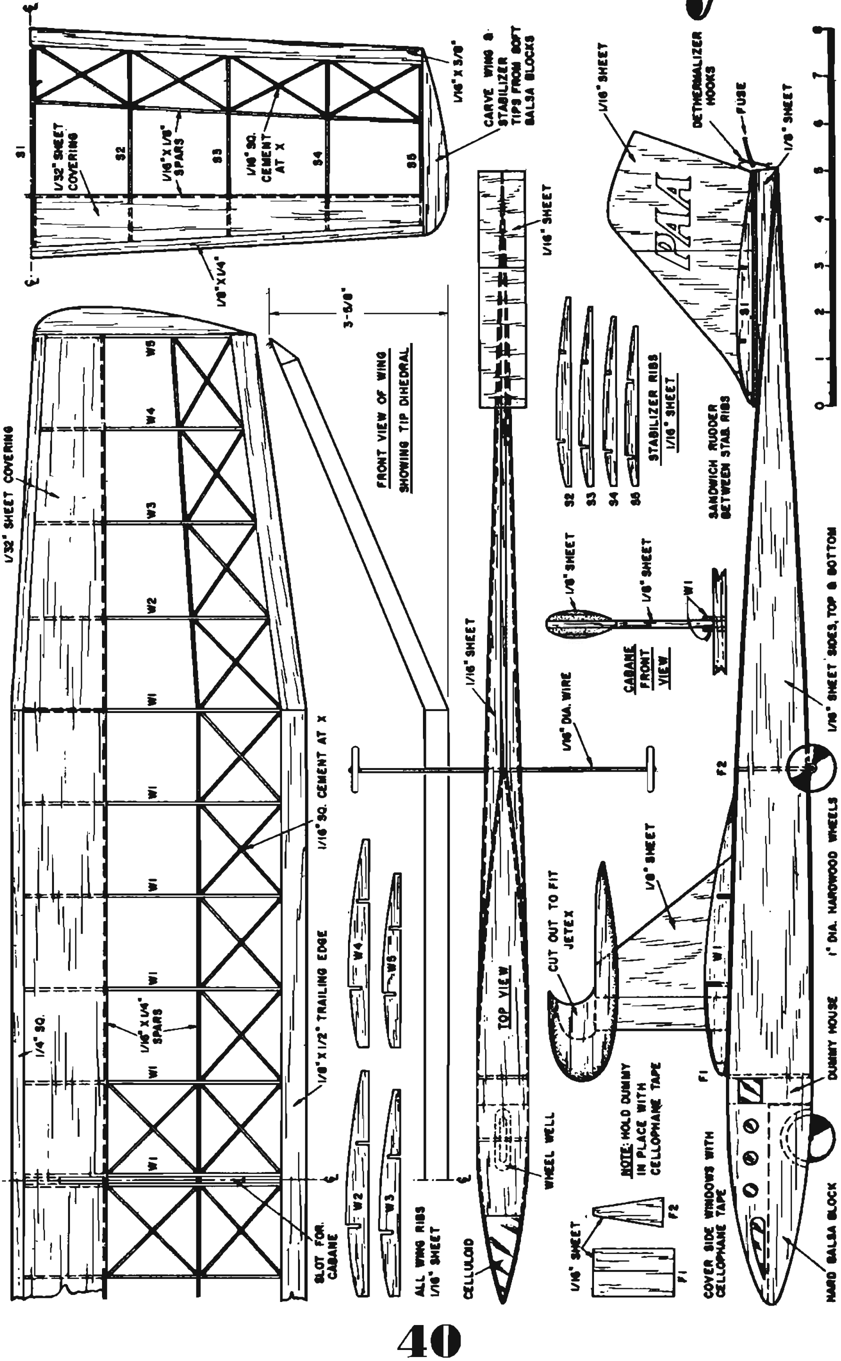
19) Jet PAA-Load by Joe Foster, San Jose, Calif.; "150"; 36" span; 22¾" long; two-zero; 4½"; 50%.

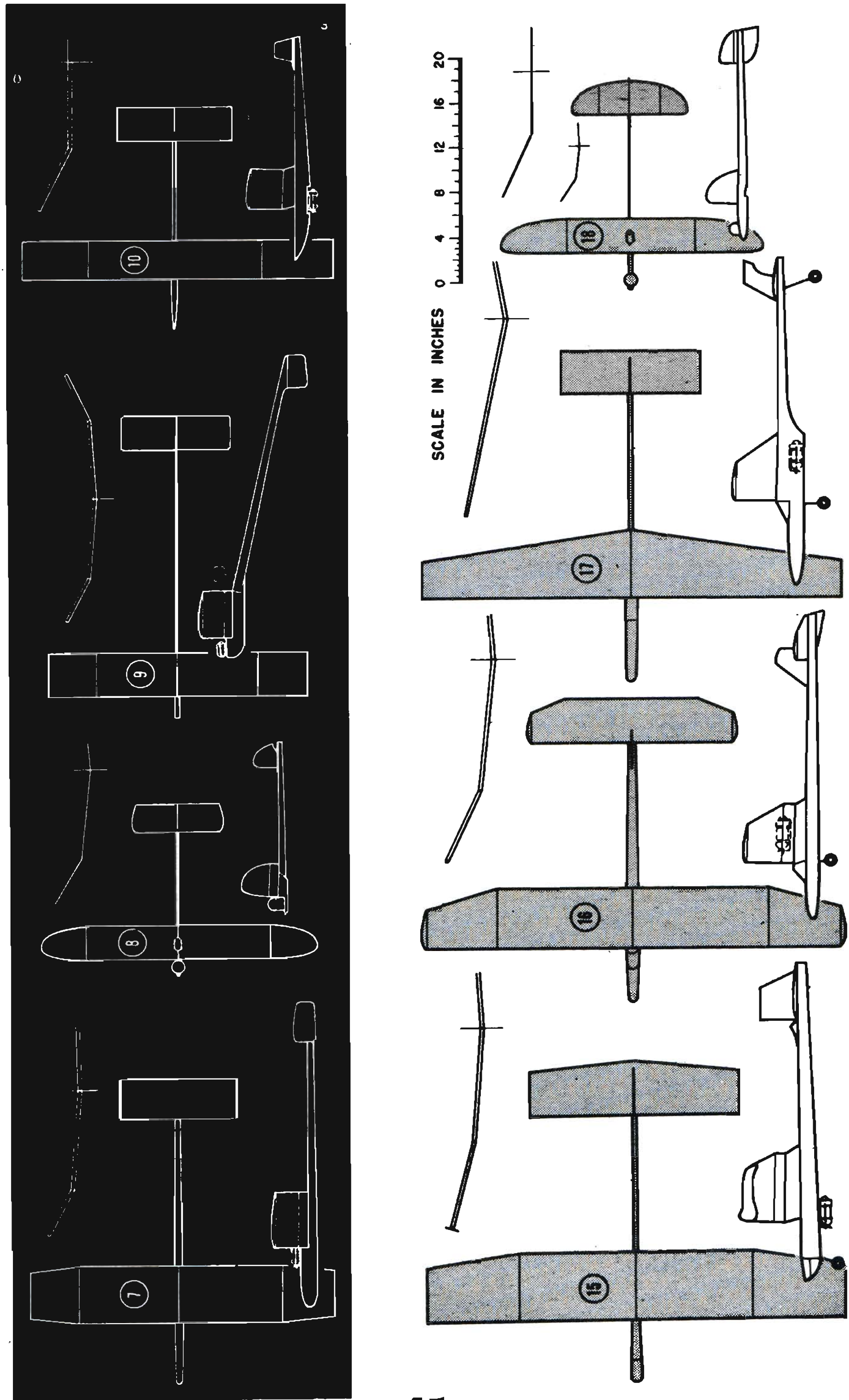
20) Jet PAA-Load by Charles Bedwell, Whiting, Ind.; "150"; spans 36"; 24¼" long; two-zero; 4"; 50%; air scoops on fuselage sides, shortened augmenter tube.

21) Jet PAA-Load by Tom Keister, Duncan, Okla.; "150"; spans 36"; 26½" long; one-zero; 3"; 50%.

22) Jet PAA-Load by Ted Gonzoph, Philadelphia; "150"; spans 36"; 26½" long; two-zero; 1", 4½"; 70%.

Hi Thrusty


1/32" SHEET COVERING
1/16" X 1/8" SPARS
1/16" SQ. CEMENT AT X
1/16" X 3/8"
CARVE WING & STABILIZER TIPS FROM SOFT BALSA BLOCKS
1/8" X 1/4"
3-5/8"
FRONT VIEW OF WING SHOWING TIP DIHEDRAL
1/16" SHEET
STABILIZER RIBS 1/16" SHEET
SANDWICH RUDDER BETWEEN STAB. RIBS
DETHERMALIZER HOOKS
FUSE
1/8" SHEET
PAA
1/16" SHEET SIDES, TOP & BOTTOM
1/16" DIA. WIRE
CABANE FRONT VIEW
1" DIA. HARDWOOD WHEELS
CUT OUT TO FIT JETEX
TOP VIEW
DUMMY HOUSE
NOTE: HOLD DUMMY IN PLACE WITH CELLOPHANE TAPE
WHEEL WELL
CELLULOID
ALL WING RIBS 1/16" SHEET
SLOT FOR CABANE
1/8" X 1/2" TRAILING EDGE
1/4" SQ.
1/16" X 1/4" SPARS
1/16" SQ. CEMENT AT X
COVER SIDE WINDOWS WITH CELLOPHANE TAPE
HARD BALSA BLOCK

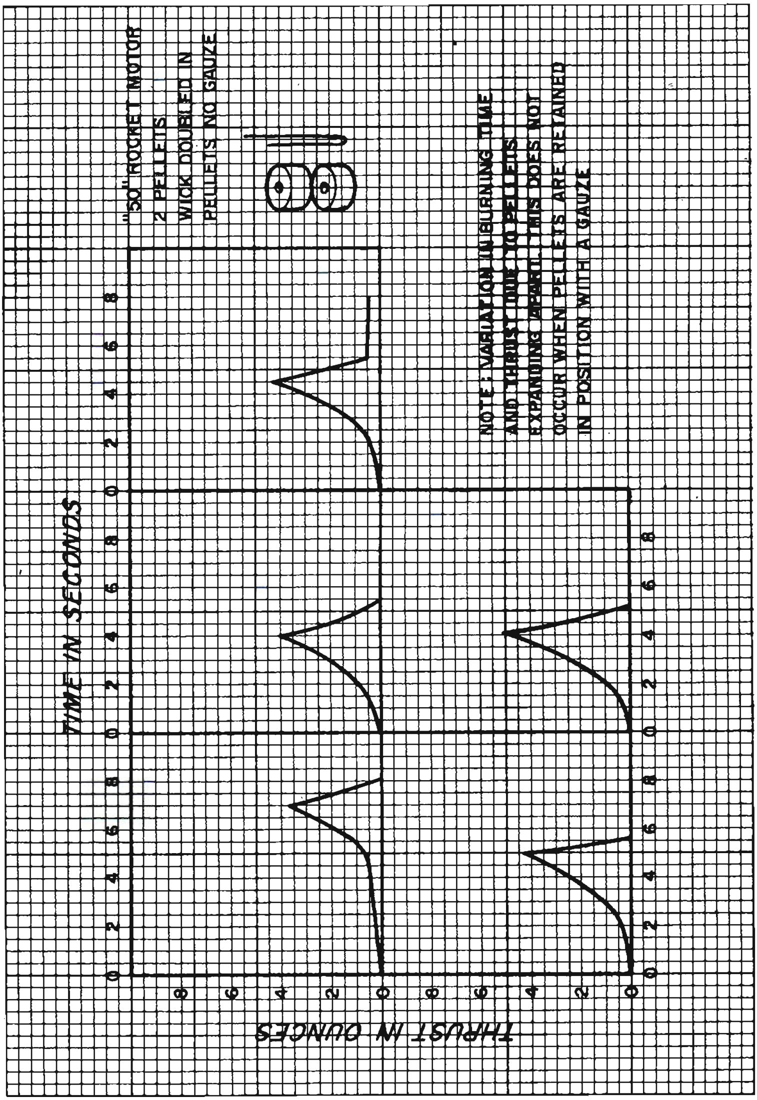

SCALE IN INCHES
0 4 8 12 16 20
7
8
9
10
15
16
17
18

EN2 JETEX® 50 HI·THRUST ENGINE

50 TIMES MORE POWERFUL THAN "50" HELLCAT

GRAPH (A)

THRUST IN OUNCES RELATED TO TIME



GRAPH (A)

JETEX "50·HT" EN2

More than six times as powerful as the standard 50, the new Jetex "50-HT" high-thrust reaction engine makes possible vastly improved model airplanes, space models, model boats and cars.

Static tests of the new engine—and fuel charge—actually measured occasional thrusts approaching 10 times that of the 50, so the "six-times-the-thrust" figure is dependable for designing purposes.

Since the 50 developed a thrust of about ¾ of an ounce, the 50-HT now being released by American Telasco will develop reliably five ounces of thrust.

Five ounces of thrust! Whereas the 50, using the very lightest of models could barely VTO—for most modelers VTO was out of the question—the 50-HT engine can lift vertically, for example, a 3-ounce machine, including the powerplant, with enough power surplus for spectacular acceleration. The lighter the model, of course, the more spectacular the acceleration and over-all performance.

New vistas of design are opened up. Competition model aircraft should show tremendous improvements in performance, attaining heights and flight-time averages heretofore impossible. Space-type craft with stub wings for safe descent and landing will offer new thrills. Scale ships such as the Lockheed F-104, and even the X-15, now are feasible fliers. Scale Atlas, Thor, Titan and other full-scale boosters can be made to lift off their pads and climb to exciting heights, all in complete safety.

Amazing is the fact that both engine and fuel are the same as before —well, not quite the same. There are several important differences. First, there is the difference of a little ⅛-inch diameter hole drilled through the fuel pellet. That a hole can add such power seems hard to believe but the "trick" was borrowed from the full-scale solid-fuel booster makers, who found that hollow charges offered greatly increased thrust figures.

Naturally, the 50 single-spring motor should not be used with the potent 50-HT fuel. Especially designed for 50-HT fuel is the new double-spring chamber-sealer combined with a steel-barreled chamber. It is interesting to note that the new fuel, despite its greater thrust and burning heat, burns cleaner and actually reduces maintenance.

Quick to spot such possibilities as combining a 50-HT charge with one of the lower-thrust 50 charges, one for high acceleration and the other for sustained duration, resourceful model designers can work out many combinations tailored to individual requirements. Additional variations can be achieved by the different wick arrangements now possible with the drilled charges.

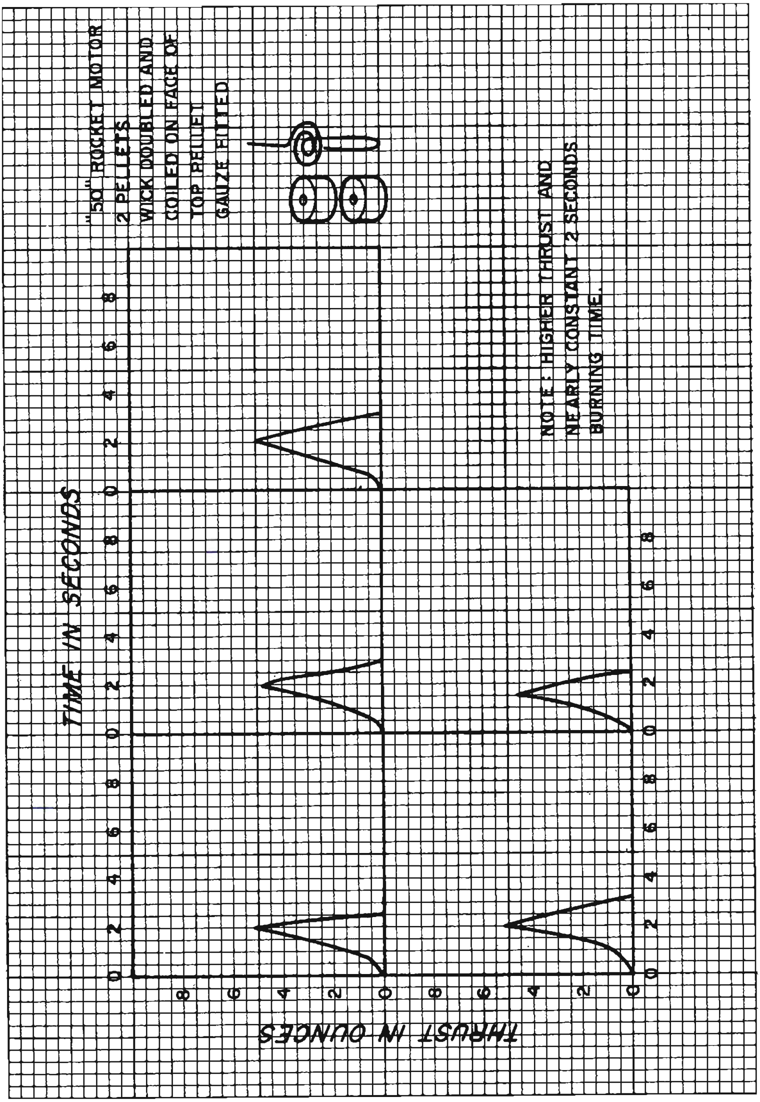
To evaluate basic combinations in terms of performance we have prepared a series of graphs which reveal the thrust in ounces related to time.

JETEX® EN2 HI•THRUST ENGINE

GRAPH (B)

GRAPH (B)

THRUST IN OUNCES RELATED TO TIME

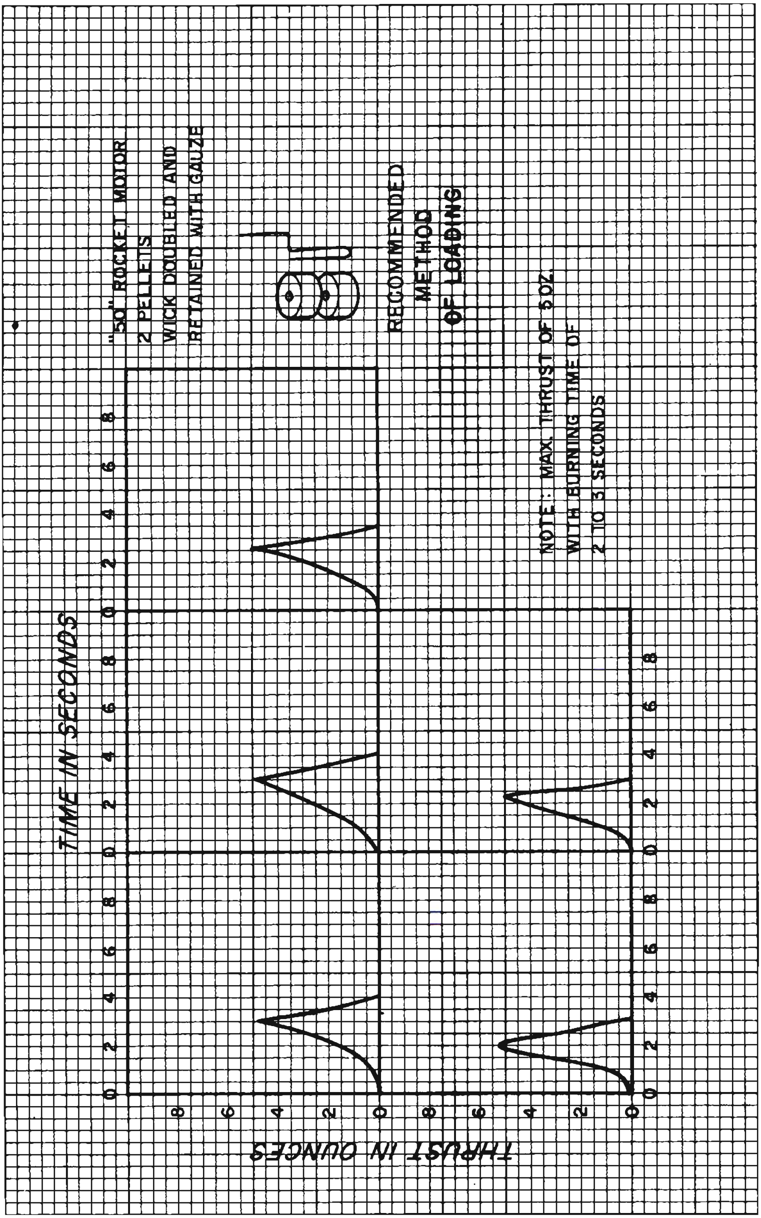


GRAPH (B)

GRAPH (C)

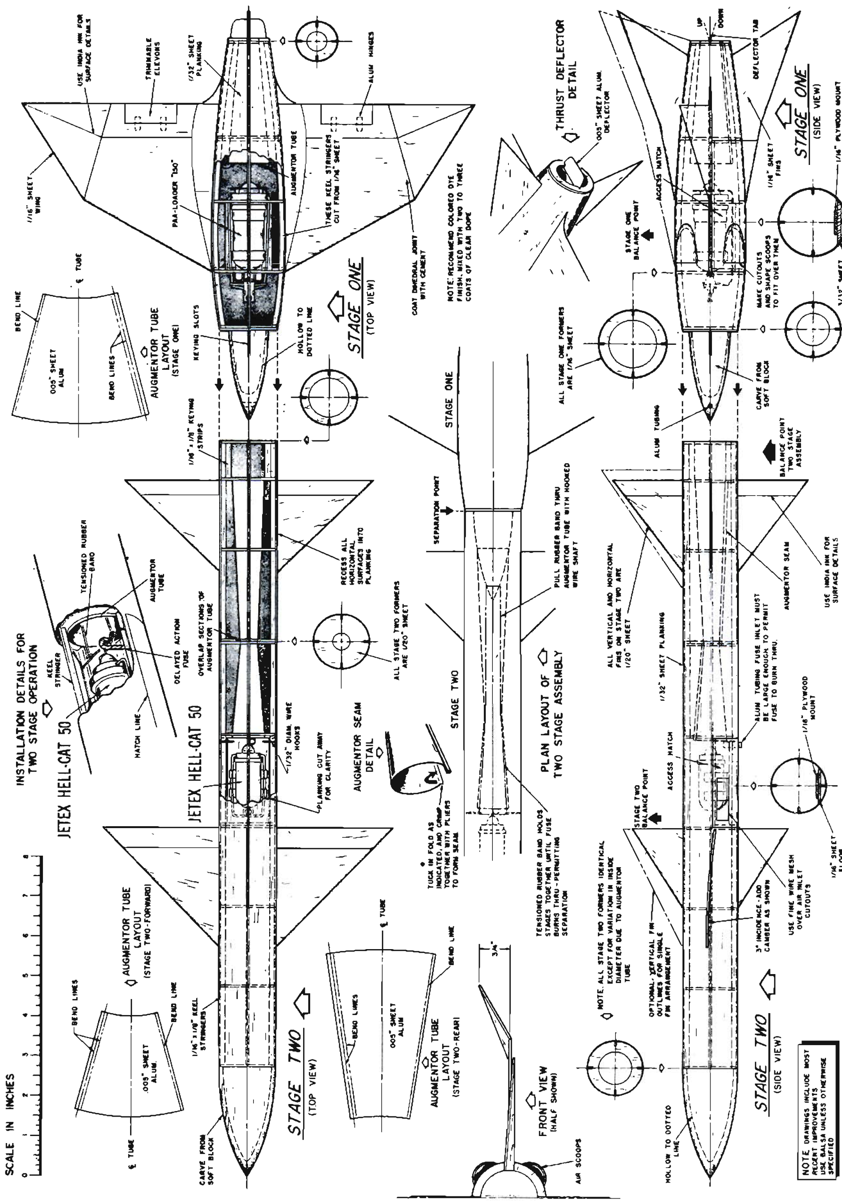
GRAPH (C)

THRUST IN OUNCES RELATED TO TIME



GRAPH (C)

TWO STAGE SPACE SHIP



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Time is read in seconds from left to right at the top of each graph, with thrust in ounces read at the left from the bottom up. Labelled A, B, C, and D, these graphs show test readings for successive trials under varying conditions—as noted with each group of graphs.

When using the recommended method of loading—see Graph C—the wick is doubled in the pellets and retained with gauze, and a maximum thrust of five ounces can be expected with a burning time of two to three seconds, although two firings went four seconds and one went 3½ seconds.

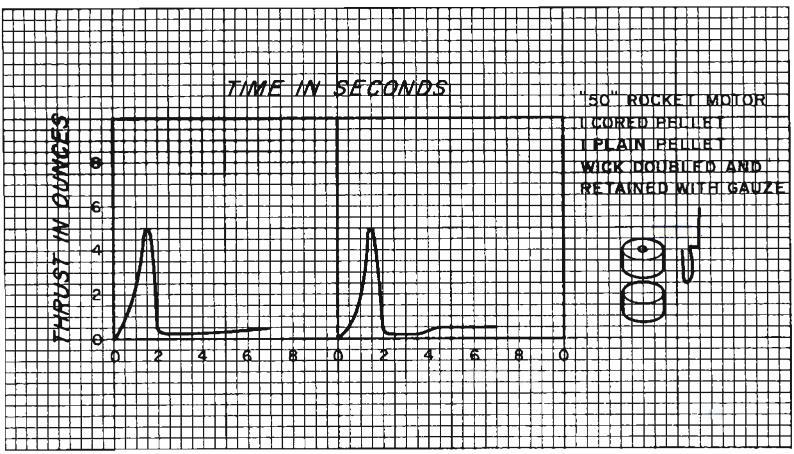
What happens if the gauze is left out? Both thrust and burning time vary widely, with peak thrust being reached more slowly and the run lasting longer but with thrust falling off. (Graph A.)

If you want more thrust at the cost of reduced burning time, the wick can be doubled and coiled on the face of the top pellet, with gauze fitted. Peak thrust in this case is reached in a nearly constant time of two seconds. (Graph B.)

By combining one cored and one plain pellet, Graph D, with wick doubled and retained with gauze, the peak thrust is reached in about 1½ seconds with the sustainer effect of the plain charge extending the total burning time or motor run to about seven seconds.

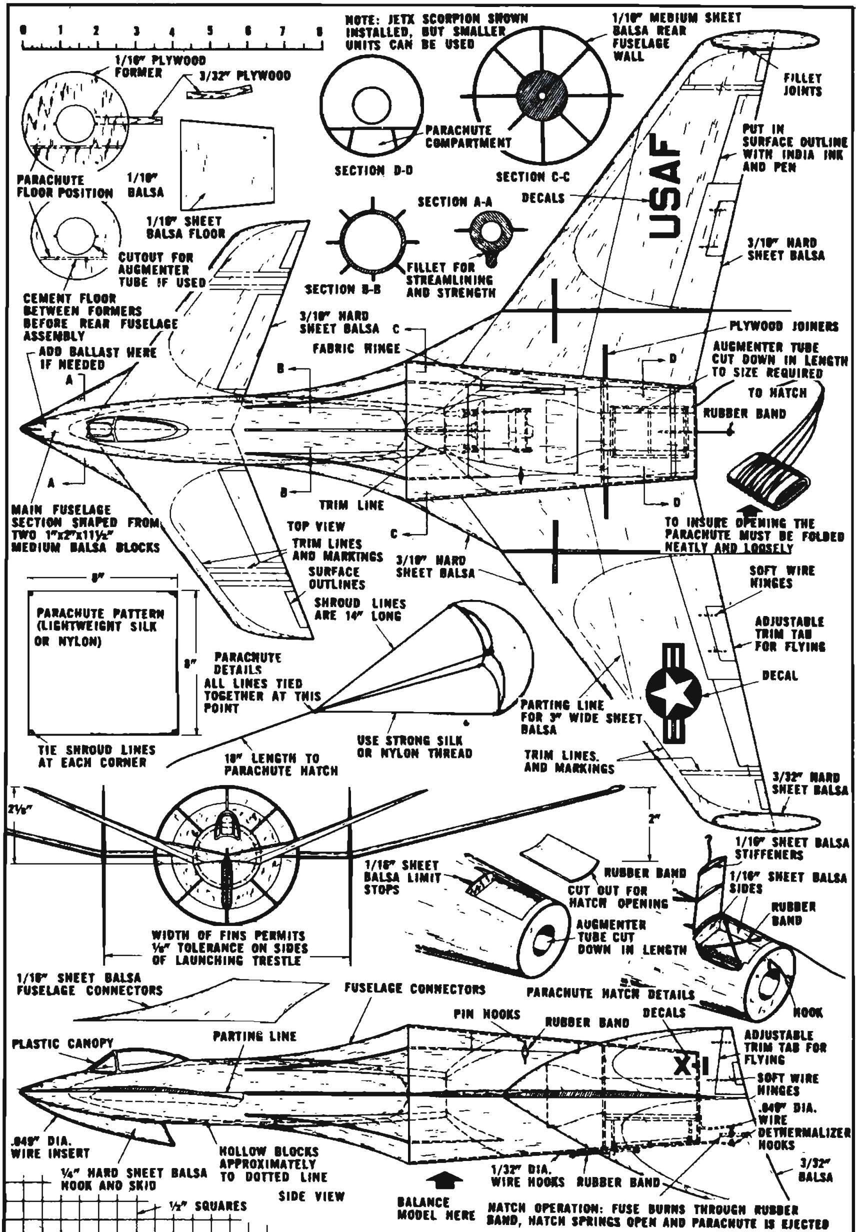
What effect will the 50-HT have on model design? To handle the high thrust, it is probable that longer moment arms and higher thrust lines will be employed, just as they were in free flight gas. Wing sections will be thinner and more double-surfaced wings will be seen. Structures will be sturdier.

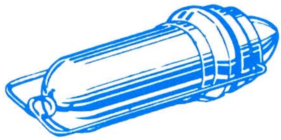
Who really can say what ingenious modelers can do with a 500% increase in thrust? What way-out designs will spring from the drawing boards? With the 50-HT to stir things up we will not have to wait long to see.

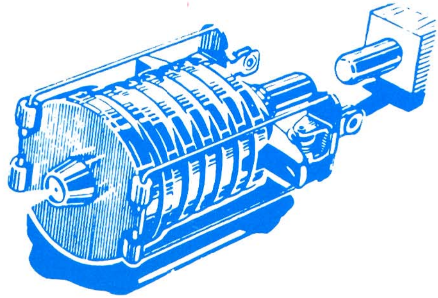


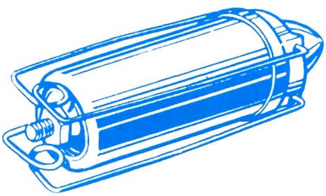
GRAPH (D)

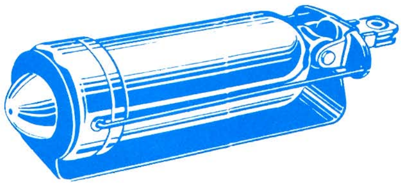
HI·ALTITUDE SPEED MODEL

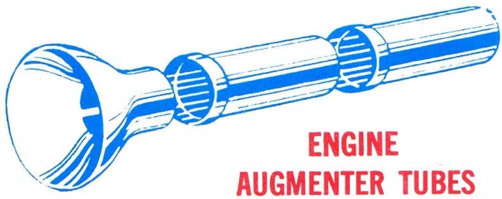












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