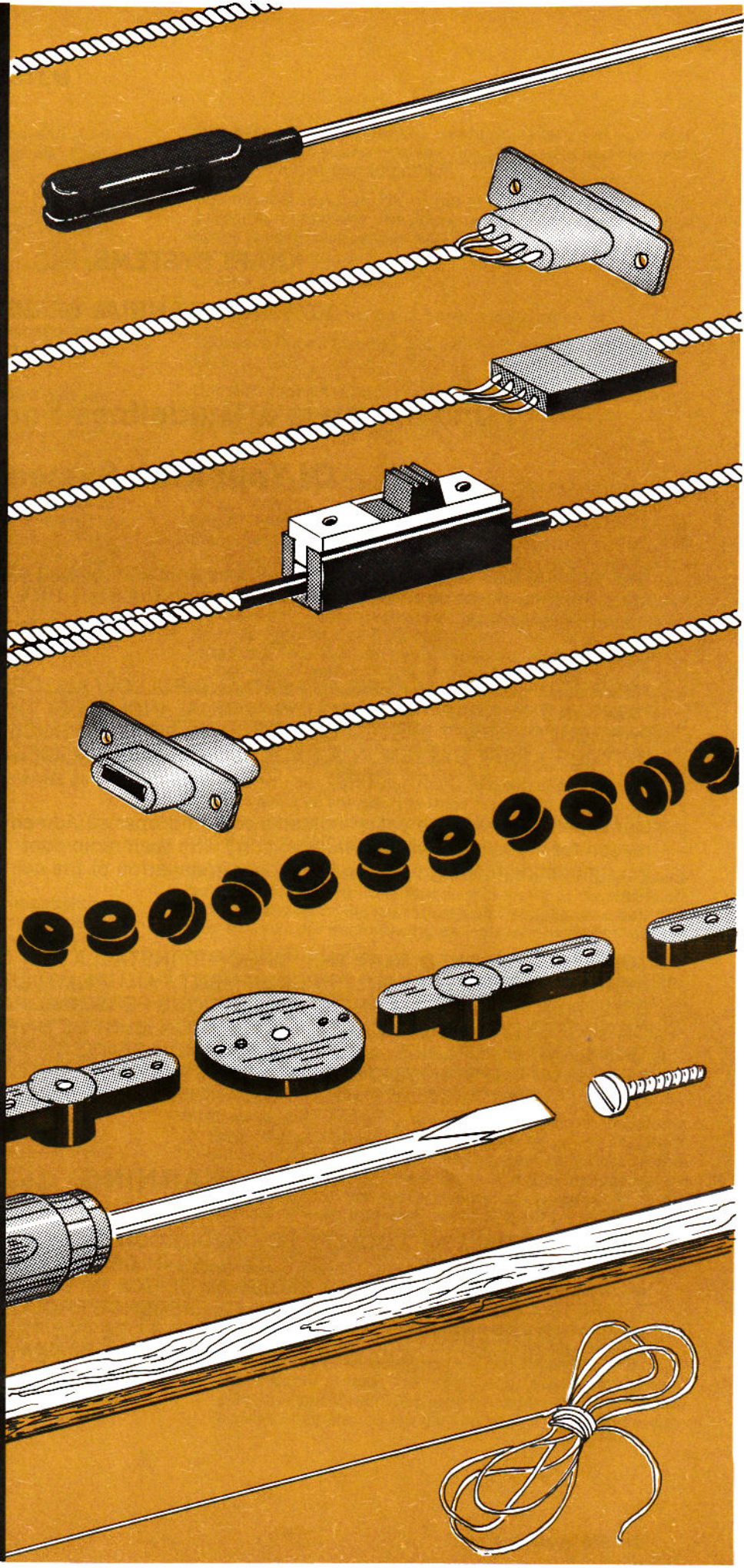


Fundamentals & Guidelines For Installation Of Your Kraft System



KRAFT SYSTEMS, INC.
1976 BICENTENNIAL SERIES

**Fundamentals & Guidelines For Installation
Of Your Kraft System**

This Installation Manual, describing fundamentals and relating guidelines for the installation of your Kraft System, must be used in conjunction with the Kraft 1976 Bicentennial Series Radio Control Instruction Manual.

YOU ARE URGED TO CAREFULLY READ AND FOLLOW ALL OF THE DIRECTIONS AND INSTRUCTIONS IN THE KRAFT INSTRUCTION MANUAL INCLUDING THE SECTIONS DEVOTED TO YOUR PARTICULAR KRAFT SYSTEM COMPONENTS BEFORE PROCEEDING WITH THE INSTALLATION OF YOUR KRAFT SYSTEM IN A RADIO CONTROLLED MODEL.

Our experience over the years indicates that improper equipment installation is the single greatest reason for modelers encountering difficulty with their radio control system; therefore, the success of your model depends greatly on the proper installation of the components of your radio control system.

YOU ARE CAUTIONED THAT THE IMPROPER INSTALLATION OF THE COMPONENTS OF YOUR KRAFT SYSTEM MAY RESULT IN EQUIPMENT FAILURE WHILE OPERATING THE MODEL. SUCH EQUIPMENT FAILURE MAY RESULT IN SERIOUS PERSONAL INJURY TO OTHERS OR YOURSELF OR PROPERTY DAMAGE. CAREFUL ATTENTION MUST BE GIVEN TO ALL INSTRUCTIONS, DIRECTIONS AND GUIDELINES. USE GOOD COMMON SENSE THROUGHOUT THE INSTALLATION OF YOUR KRAFT SYSTEM AND DURING ITS OPERATION. "SAFETY FIRST" IS NOT JUST A "SLOGAN": IT IS AN ABSOLUTE MUST FOR ANYONE UNDERTAKING RADIO CONTROL MODELING.

WARNING

THE FREQUENCIES ALLOCATED FOR RADIO CONTROL USE ARE NOT EXCLUSIVE AND ARE SHARED WITH OTHER TYPES OF RADIO USE IN CERTAIN AREAS. BEFORE OPERATING YOUR MODEL CHECK WITH THE FCC REGIONAL OFFICE IN YOUR AREA TO DETERMINE WHETHER THERE IS A POTENTIAL DANGER OF INTERFERENCE FROM OTHER RADIO USERS. "OUTSIDE" RADIO INTERFERENCE MAY CAUSE YOU TO LOSE CONTROL OF YOUR MODEL, POSSIBLY CAUSING INJURY TO YOURSELF, TO OTHERS, OR PROPERTY DAMAGE.

INSTALLATION OF YOUR KRAFT SYSTEM

WE CAN...AND DO...give you basic instructions and guidance necessary for proper installation of your Kraft Radio Control System.

WE CAN...AND DO...urge you to get the advice and assistance of an experienced radio control model builder to aid you in creating a proper installation. The radio control "fraternity" is the nicest and friendliest group we know and you can most often ask for and get help through:

- A. Your dealer, who can put you in touch with radio control friends as well as being of assistance to you himself; most Kraft R/C dealers are knowledgeable in radio control matters.
- B. A local radio control club; again your dealer can direct you; lists of R/C Clubs are available through the Academy of Model Aeronautics at 815 Fifteenth Street, N.W., Washington, D.C. 20005.
- C. There are a number of books and magazines which can guide you in performing a good installation. Thousands of radio control hobbyists have successfully completed a radio control installation with the plans contained in the kit they are building, the kind of guidance this manual gives and the knowledge gained through reading periodicals and books.

BUT, NO MANUAL can give you exact detailed instructions for the installation of radio control equipment in any particular model because:

- A. The uses of radio control equipment vary so greatly in terms of application, e.g., powered airplanes, gliders, boats, cars, land vehicles, etc.
- B. The precise demands of an installation in any particular model cannot be anticipated to the extent that exact guidance can be given.

COMMENCING AN INSTALLATION

Unless otherwise noted, most of our instructions pertain to the installation of a Kraft Radio Control System in an airplane. The guidance given is, however, fundamental in many respects to any type of R/C model installation.

What you are undertaking in the installation of a Kraft Radio Control System is the placement of the receiver and antenna, the battery, switch harness and servos (or receiver-servo block) in the airplane (these components constitute the "airborne package") to properly, efficiently, and safely, respond to the transmitter signals.

The basic installation considerations are these:

1. Installation of servos (or receiver-servo block) within the frame of the airplane through the use of trays or mounts.
2. Connection of the servos to the moving surfaces by push rod devices of one variety or another.
3. Placement of the battery and receiver pack and installation of the switch harness, all of which involves space and center of gravity considerations as well as proximity (for connecting purposes) between these components.
4. Routing of the receiver antenna out of the aircraft.
5. Protection of all components by using proper cushioning and insulating materials and methods.

All of these basic installation considerations should be met in a careful and workmanlike manner. DON'T RUSH! The time

you spend in the proper and careful installation of your Kraft R/C System in your model is CRUCIAL to safe and enjoyable flying...it's just that important.

As one author put it, "With the reliability of today's digital proportional systems, the prime cause for sets being returned to the factory for repairs is NOT due to equipment failure, but for two basic reasons:

1. Pilot error.
2. Improper equipment and linkage installation."

*(Dewey, Flight Training Course, R/C Modeler Corporation, 1972, p. 108)

Our experience has been that 90% of the customer complaints concerning erratic control response, lack of range, etc., are in fact due to improper equipment installation.

INSTRUCTIONS AND GUIDANCE ON INSTALLATION

Begin with the plans of the model you are building. Those plans, whether part of a kit or a "scratch-built" project, will show suggested location and installation techniques for the placement of components in the model. Follow the plan recommendations as closely as possible, but realize that the plans are only suggestive since they show one type of installation for one type of R/C equipment. The center of gravity (often marked "CG" or symbolized) is a crucial factor for proper model performance. Regardless of the component location and installation technique, the model, with your Kraft System installed, must balance at that center of gravity. You should have already familiarized yourself with your Kraft System by reading the instructions and by following the procedures in the Instruction Manual, including the sections devoted to your particular Kraft System components. You should have also charged the transmitter and airborne battery packs according to the battery charging instructions in Section 5 of the Instruction Manual.

Assuming your model is completed to the point where you are ready for equipment installation, and that you have studied and followed all of the procedures and suggestions outlined thus far, we offer the following as instructions and guidance:

1. Make certain that all moving surfaces (rudder, nose wheel [if any], elevator, ailerons) move freely. Remember that successful operation of your R/C System and its utilization in flight depends on minimizing the strain or load on the servos. Flight adds to the pressures on all moving surfaces; therefore, all surfaces must move very freely and without binding before the installation of your R/C System components and the push rod connectors.
2. Remember to provide a location for the airborne battery pack that will allow the switch harness to be installed either on a servo tray (by removing the plastic back of the switch harness), or through the side of the fuselage opposite the engine exhaust. The switch harness must be mounted in such a manner as to provide protection from exhaust, fuel and oil. Remember that this switch harness leads to the receiver to power the receiver and servos, so the battery and switch harness location have to be within the range of interconnection.
 - a. The battery pack is most frequently located below or to the rear of the fuel tank compartment. For that reason, you not only have to insulate against shock by the use of foam rubber at least 1/2" thick or a foam sleeve wrapping, but you should also seal the battery pack by putting a plastic bag around the pack to keep it dry in the event

that there is a fuel leak or a bursting of the tank. Rubber bands or masking tape should be used to secure the foam rubber in place. Wherever the battery is installed, all other wiring should be kept as far away from the receiver as possible to ensure maximum operating range of your system.

- b. Note that the switch harness has the on-off switch for the receiver and battery pack attached to and leading from the battery; this switch has to be fastened to the servo tray or to the side of the fuselage. When the switch is mounted on a servo tray it is operated by actuation from outside the fuselage. When the switch is installed on the fuselage side a hole must be cut to allow mounting of the switch. We recommend using the switch plate as the cut-out guide. At times it is necessary to hollow out a portion of the inside of the fuselage to make the switch fit. Note that screws are provided for mounting the switch plate.

CAUTION: MOUNT THE SWITCH HARNESS AND CHARGING RECEPTACLE ON THE SIDE OPPOSITE THE ENGINE EXHAUST TO PROVIDE MAXIMUM PROTECTION FROM FUEL AND OIL. LEAVE SUFFICIENT SLACK TO PREVENT POSSIBLE BREAKAGE.

- c. The charge receptacle for charging the airborne pack can be left lying in the fuselage or brought through the fuselage wall near (above, below or the side of) the switch. Here you use the switch plate and screws provided as the guide for cutting and for installation.
- d. **IT IS IMPORTANT NOT TO PUT STRAIN ON ANY OF THE WIRE LEADS. KEEP THIS IN MIND THROUGHOUT YOUR ENTIRE INSTALLATION.**

RECEIVER INSTALLATION

(Models KPR-5C, KPR-7C, AND KPR-7CD)

The receiver is perhaps the easiest of the airborne components to install, yet it is the most crucial for the safe and successful operation of your system. **IT IS ABSOLUTELY ESSENTIAL THAT:**

- a. **THE RECEIVER BE PROPERLY CONNECTED TO ALL SERVOS.**
- b. **THE RECEIVER BE PROPERLY PROTECTED AGAINST VIBRATION, SHOCK, AND FUEL.**

THEREFORE:

1. Select a location that will satisfy the two above essentials. You must be able to connect the receiver to the power plug coming from the switch harness and to all servos and it must be placed in the model in such a manner as to give the receiver maximum protection.
2. Each servo is plugged into the proper receptacle on the receiver. Refer to diagrams provided in the Instruction Manual for correct sequence. You may want to use a small piece of gummed label with the sequence marked on the label and tape it to the side of the receiver so that you have a ready reference to the sequence of proper receptacles for easier identification. Many modelers also take gummed labels and mark the servo usage, e.g., rudder or just "R", on the label and tape it to the lead from the servo for easy identification. This is done **AFTER** you have determined which servo is going to be used for which purpose.

NOTE: The receptacle for the aileron is connected by a short cable coming from the receiver. This is done because extra length is often required to reach the aileron servo. See that all servo plugs are properly seated with the plug latch (the plastic lip whose use was first described under Section 4 of the Instruction Manual) overhanging the inserted servo plugs. Wrap masking tape around the connection after you have connected the aileron servo to the aileron plug leading from the receiver; this is to help protect the connector from accidentally becoming unplugged in flight.

3. To properly insulate the receiver, first wrap the receiver in a plastic bag or plastic wrap and secure same at the end where the servo and aileron servo plugs exit from the receiver; this is to keep the receiver dry and prevent fuel from damaging it. The receiver should be packed **VERY LOOSELY** with a minimum of one-half inch of soft foam rubber on all sides. This is done to absorb engine vibration and cushion in the event of crash. While there are commercial products available for this purpose, we do not recommend the use of so-called "shock protection foam padding" because it does not protect from engine vibration.
4. The receiver antenna (single white wire) must be kept as far away as possible from the servos, metal push rods, etc. In most installations this can be accomplished by running the antenna forward one or two inches, then straight through the top of the model, and back to the top of the vertical stabilizer or fin. Use the internal strain relief supplied on the antenna at the point it exits from the fuselage to prevent it from pulling against the receiver. (Fig. A). In some cases it may be desirable to run the antenna out the side of the fuselage and back to the tip of the stabilizer or to the top of the fin. The primary concern is to keep the antenna as far as possible from the rest of the equipment installation. To provide slight tension and to take up any slack, the antenna should be attached to a rubber band through the antenna connector supplied.

RECEIVER ANTENNA ROUTING

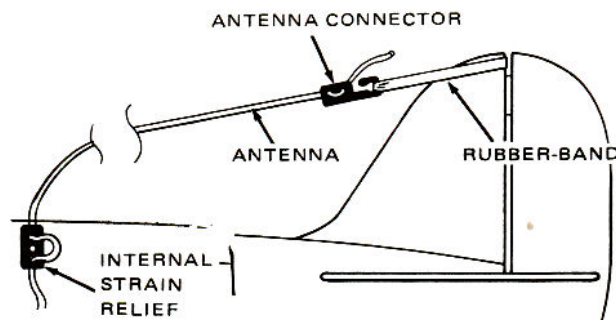


FIGURE A

IMPORTANT: DO NOT SHORTEN (CUT) THE ANTENNA OR FOLD ALONG ITS LENGTH. IF YOU DO NOT FOLLOW THIS WARNING, EQUIPMENT FAILURE MAY RESULT, LEADING TO SERIOUS PERSONAL INJURY OR PROPERTY DAMAGE.

RECEIVER INSTALLATION

(MODEL KPR-3C, Receiver-Servo Block)

Mount the receiver-servo block on 1/4" x 3/8" hardwood rails spaced 3-1/16" apart. Be sure to allow at least 1/16" clearance between the receiver-servo block and other parts of the model. Position the unit and mark the location of the mounting screw holes. Drill 1/16" pilot holes for the No. 4 x 1/2" mounting screws supplied. Install washers between the screw head and grommet and tighten the screw until the washer just touches the grommet; then tighten a half turn more. This provides proper vibration dampening and shock protection. **DO NOT OVER TIGHTEN THE MOUNTING SCREWS OR USE "SERVO MOUNTING TAPE" WHEN INSTALLING THIS UNIT.** This tends to transmit vibration to the receiver. Vibration is a major cause of intermittent loss of control in flying.

The receiver antenna (single white wire) must be kept as far as possible from the servo mechanics, metal push rods, etc. In most installations this can be accomplished by running the antenna forward one or two inches, then straight through the top of the model, and back to the top of the fin. Use the internal strain relief supplied on the antenna at the point it exits from the fuselage to prevent it from pulling against the receiver (Fig. A). In some cases it may be desirable to run the antenna out the side of the fuselage and back to the tip of the stab, or to the top of the fin. The primary concern is to keep the antenna as far as possible from the rest of the equipment installation. To provide slight tension and to take up any slack, the antenna should be attached to a rubberband through the antenna connector supplied.

IMPORTANT: DO NOT SHORTEN (CUT) THE ANTENNA OR FOLD ALONG ITS LENGTH. IF YOU DO NOT FOLLOW THIS WARNING, EQUIPMENT FAILURE MAY RESULT, LEADING TO SERIOUS PERSONAL INJURY OR PROPERTY DAMAGE.

CAUTION: KEEP THE RECEIVER-SERVO BLOCK CLEAR OF THE SWITCH HARNESS, CHARGE RECEPTACLE AND OTHER WIRING.

SPECIAL ANTENNA INSTRUCTIONS FOR BOAT AND CAR USE ONLY

For boat or car use where the range is limited, it is acceptable to coil the first 20 inches or so of the antenna around a piece of 1/4" wood dowel. The remaining antenna should extend upward through the boat hull or car body. This is not satisfactory for model aircraft where the range requirements are greater. Note that the antenna may be cut off and rigid wire antenna substituted for the amount removed.

SERVO INSTALLATION

You should have already familiarized yourself with the operation of the servos by following the instructions contained in Section 4 of the Instruction Manual. Proceed as follows to install the servos:

A. Keep in mind that all servos are the same, that is, they can be used for any function you determine. Note that two of the servos rotate in one direction and two in the other, identified by the presence or lack of a small dot on the top of mounting flange farthest from the output wheel. Having two of the four servos going in opposite directions gives you added installation flexibility.

B. Servos should be mounted in appropriate servo mounting trays which are available through your dealer.

As an alternate method of servo installation, servos may be mounted on 1/4" x 3/8" hardwood rails (maple or beech motor mount stock is recommended), spaced as follows:

- 2-3/32" apart for the KPS-11 servos
- 1-9/16" apart for the KPS-12 servos
- 1-3/4" apart for the KPS-14II servos
- 1-13/16" apart for the KPS-15II, KPS-15HII, and KPS-16

A spacing guide approximately 3" long and the appropriate width for the above servos may be cut from 1/8" sheet balsa and is helpful in maintaining the proper spacing and alignment of servo mounting rails during installation.

Position the mounting rails to permit at least 1/16" clearance between servos, fuselage sides, top, and bottom, etc. After the rails have been securely mounted, position the servos and mark the location of mounting screw holes. With a small rat-tail file, notch one rail approximately 1/8" deep to allow clearance for the servo plug wiring. Drill 1/16" clearance holes for the sheet metal mounting screws supplied. Install washers between the screw head and grommet and tighten the screw until the washer just touches the grommet, then tighten a half turn more. This provides vibration dampening and shock protection. **DO NOT OVER TIGHTEN MOUNTING SCREWS OR USE "SERVO TAPE" WHEN INSTALLING SERVOS. THIS TENDS TO INCREASE VIBRATION WHICH IS A MAJOR CAUSE OF INTERMITTENT LOSS OF CONTROL IN FLYING.**

When installing the arms or wheels use only the 1-72 x 1/8" binder head machine screws furnished. Care should be taken when threading these screws on the gear shaft to avoid cross threading and stripping. If any tension or binding is felt while threading a screw, remove it and try another.

C. If your aircraft uses ailerons, we recommend that you start the installation with the aileron servo. Connect one of the servos to the receiver, hooking it to the aileron plug and noting its direction of rotation. If the servo is moving in the direction you want (looking down to the top of the wing, right aileron should move up and the left aileron down when the aileron control stick on the transmitter is moved to the right), then use that rotation direction servo for the ailerons.

D. Mounting of the remaining three servos is best accomplished by the use of appropriate Kraft Servo Mounting Trays. These come in different configurations for various installation needs and relate to the size of the fuselage.

1. We recommend that you next determine which servo should be used for the throttle control, again in terms of rotation direction. Follow the same sequence, hooking up a servo to the throttle receptacle on the receiver. With the throttle control stick back, the engine carburetor barrel should be closed or nearly so; choose a servo that rotates in the correct direction for your installation so that when the throttle is connected to the servo through a push rod device it will open the carburetor as you advance the throttle stick; determine which of the supplied arms or wheels will do the best job. Follow the directions given with your particular engine.

2. That leaves two servos for the rudder and the elevator and they are mounted and installed appropriately to the moving surfaces. Remember, pulling back on the elevator stick of the transmitter must move the elevator surface UP. Moving the transmitter stick operating the rudder to the right must move the rudder to the right as you stand at the rear of the model. The nose wheel must move in the same direction as the rudder.

PUSH ROD INSTALLATION

As a guide to push rod installation (that is, the use of mechanical connection from the servo to the moving surfaces), we offer the following instructions and guidance:

No two installation problems are alike and part of the challenge of R/C is to create a smooth, efficient and correct in-

stallation. Here again the plans, your reading of books and periodicals, and the advice of an experienced R/C modeler are all important. The following ARE BASIC IN ANY INSTALLATION.

- A. Your objective is to achieve an installation that allows each servo to move the surface with a minimum of strain. This is accomplished by having a surface, e.g., the elevator, move **FREELY** (flap loosely) prior to the installation of the push rod and then remain "firm" after its subsequent connection to the servo at one end and moving surface at the other.
- B. Once connected, the surface must move freely (when driven by the servo) yet not have excessive play or flexing. **EXCESSIVE BINDING WILL CAUSE ABNORMALLY HIGH CURRENT DRAIN ON YOUR AIRBORNE BATTERY PACK WHICH WILL REDUCE FLYING TIME CONSIDERABLY AND COULD CAUSE THE LOSS OF CONTROL OF THE MODEL. SLOPPY LINKAGE OR EXCESSIVE FLEXING, ON THE OTHER HAND, COULD CAUSE CONTROL SURFACES TO FLUTTER RESULTING IN STRUCTURE FAILURE OR DAMAGE DUE TO LOSS OF CONTROL.**
- C. Whatever materials you use for push rods, they should run cleanly, that is, directly or with as few bends as possible through the model. Try for the straightest line possible terminating at the servo at approximately the same height as the output wheel.
- D. Excessive electrical noise generated by metal-to-metal connections may seriously reduce the operating range of the equipment. Therefore, it is suggested, both for convenience and noise prevention, that adjustable nylon clevises be used on push rod ends. This is particularly important at the connection of the engine throttle arm to the push rod, and also at the nose gear steering arm.
- E. Push rods should be stiff enough to prevent flexing and whipping during flight. Fiberglass arrow shafts, hard balsa, and hardwood dowels are generally used for push rods. Figure B shows the manner in which these types of push rods are made. Attaching the push rod ends to the servo output arms or wheels is accomplished by simply putting a 90° bend in the piano wire rod and inserting it into the appropriate servo output arm or wheel. When using the outer hole on the long output arm, such as applications for rudder and throttle, it will be necessary to use a collar on the piano wire rod to prevent the push rod from becoming disconnected at the servo. When the other holes in the output arms are used, the servo case itself should prevent this from happening (see Fig. C).
- F. Remember that in powered aircraft, the engine should be firmly attached to its mounts and the propeller properly balanced to reduce vibration to a minimum. Vibration is a major cause of intermittent loss of control in flying.

When you have completed and carefully checked the installation of all components and all surfaces are operating properly (aileron, rudder, elevator, nose wheel; if your aircraft model has all of these moving surfaces), you are ready to return to the battery charging section of the Instruction Manual. Also review Section 2 and be sure you have complied with the requirements of Section 3 of the Instruction Manual.

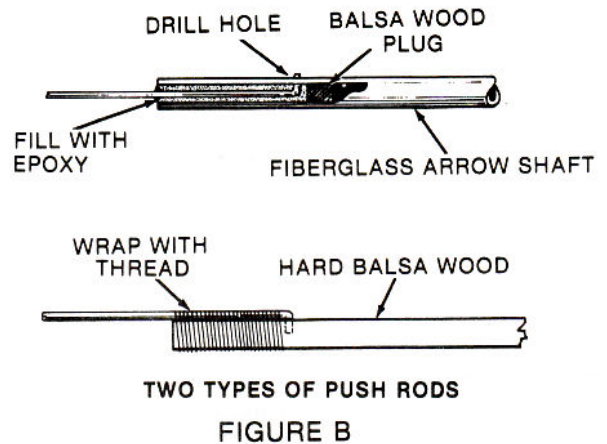
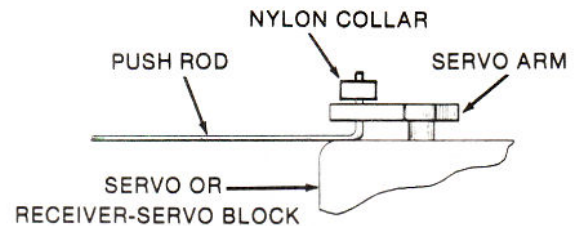


FIGURE B

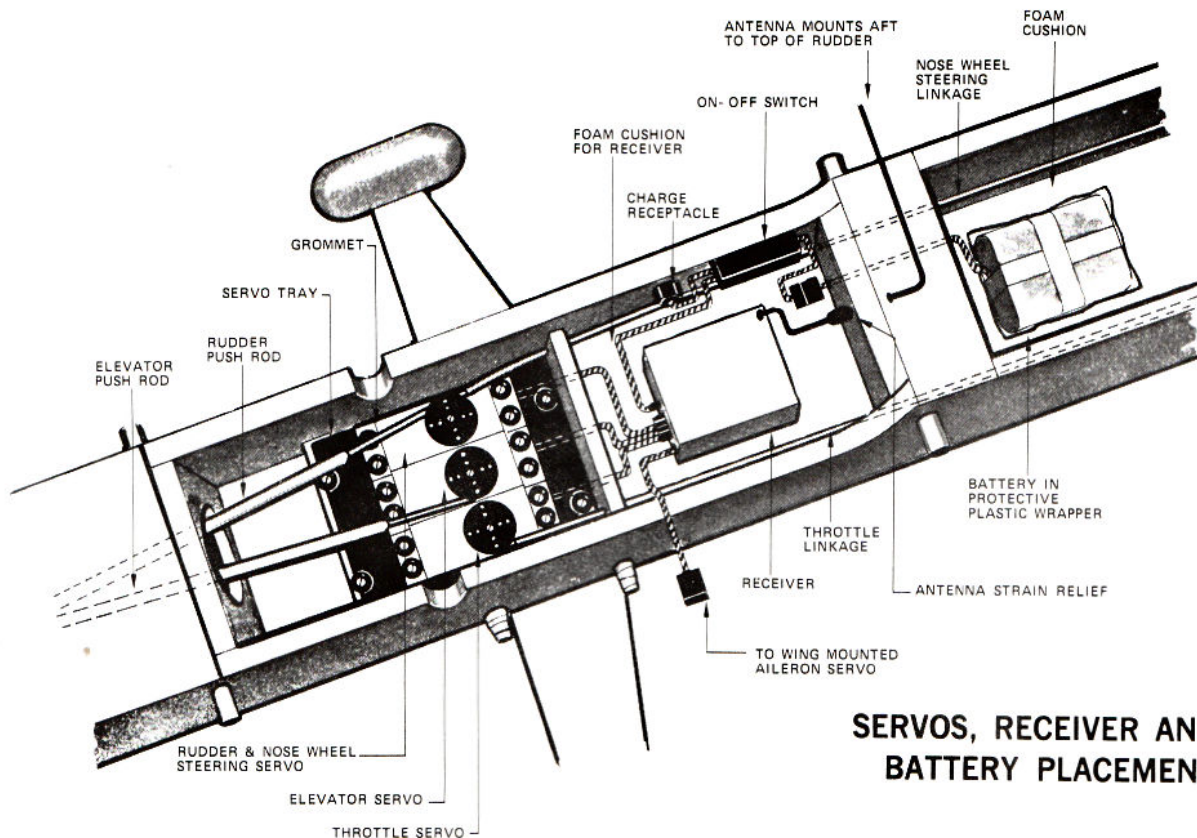


PUSH ROD CONNECTED TO SERVO

FIGURE C

Flying or operation of your radio controlled model can be one of the most pleasurable and satisfying experiences of your life. **REMEMBER, HOWEVER, THAT YOU AND YOU ALONE ARE RESPONSIBLE FOR THE SAFE OPERATION OF YOUR MODEL. GET WELL EXPERIENCED HELP BEFORE OPERATING YOUR MODEL. DO NOT EXPERIMENT OR RUN RISKS. SERIOUS PERSONAL INJURY TO OTHERS AND TO YOURSELF, OR PROPERTY DAMAGE MAY RESULT FROM THE FAILURE TO FOLLOW THE INSTRUCTIONS, DIRECTIONS AND GUIDELINES GIVEN IN THIS MANUAL AS WELL AS THOSE CONTAINED IN THE INSTRUCTION MANUAL.**

WARNING: THE FREQUENCIES ALLOCATED RADIO CONTROL ARE NOT EXCLUSIVE AND ARE SHARED WITH OTHER TYPES OF RADIO USE IN CERTAIN AREAS. BEFORE OPERATING YOUR MODEL, CHECK WITH THE FCC REGIONAL OFFICE IN YOUR AREA TO DETERMINE WHETHER THERE IS A POTENTIAL DANGER OF INTERFERENCE FROM OTHER RADIO USERS. "OUTSIDE" INTERFERENCE MAY CAUSE YOU TO LOSE CONTROL OF YOUR MODEL, THEREBY POSSIBLY CAUSING INJURY TO YOURSELF, TO OTHERS, OR PROPERTY DAMAGE.



SERVOS, RECEIVER AND BATTERY PLACEMENT

TYPICAL R/C INSTALLATION

