

# Diablo Valley Radio Controllers Flight Training Handbook

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## Introduction:

Welcome to Diablo Valley Radio Controllers (DVRC) pilot training program. This program will teach you the basics of flying radio-controlled model aircraft, and are DVRC's best effort to assist you in the process.

There is nothing in this program that guarantees that you will become a successful R/C pilot. Nor are there any expectations on how long it will take to complete this program. Like everything else, your success will all depend on your willingness to spend the time and practice.

## Disclaimer:

### **All DVR Members should remember that they operate and fly at their OWN RISK at the DVRC Flying Field**

Please keep in mind that the DVRC instructors are not responsible for your aircraft. They will, to the best of their abilities, check out your aircraft, radio etc., and instruct you in the safe operation of your aircraft. A "Buddy Box" will be used during your training sessions. It is the safest way to learn how to fly R/C. If for some reason there is a mishap, the repairs and associated costs are up to you.

This program is a series of lessons designed to build on previous lessons, to develop the skill and confidence which will allow you to thoroughly enjoy your new hobby.

Upon completion of these lessons, you will be ready to take your **Solo Flight Evaluation Test**. This test is designed to demonstrate to the instructor's satisfaction that you can control your plane safely. After passing this test, you will be given a yellow Pilots Badge and allowed to fly without an instructor present here at DVRC. Hopefully, the completion of your Solo Flight Evaluation is only the beginning of your learning and will serve as an incentive to get out and fly. Where you go from here is up to you. Good Luck!

Reminder:

**You are not allowed to fly Solo at DVRC without certification (Flight Badge) of your flight abilities by a DVRC flight instructor.**

DVRC strongly recommends that you start your flight instruction on a trainer and then evolve to more advanced planes.

A trainer will enable you to learn easier and will simplify instruction... and your plane will last you longer with less chance of a serious crash.

## Instructor - Student Responsibilities

Your instructor has met the qualifications of DVRC. He/she has accepted the responsibility to teach you to become a responsible and safe pilot who can be proud of their flying abilities. If the instructor ignores their responsibility, you may be a pilot who is a hazard to yourself and others wherever you fly.

You may discontinue your flight instruction at any time if you feel you are ready to fly **Solo**, however; **You cannot fly solo at DVRC field without successfully completing flight training and receiving a Pilot's badge.**

As a student, it is your responsibility to apply yourself diligently to learn and apply the material presented in this course. By doing so, you will learn the minimum amount of information and skills to allow you to safely enjoy radio controlled flight.

Each section of this course deals with a different aspect of flying a radio-controlled model aircraft. Your instructor will explain and demonstrate each element of each lesson. Where applicable he will demonstrate the element in the air using your aircraft. You will have opportunities to perform each element and receive an evaluation from your instructor.

Each lesson will be logged in the Log Book section at the end of this booklet, and your instructor will initial that the material has been reviewed with you. It is important that you keep your training program with you always and ensure that instructors initial elements after they have been covered.

Remember, no instruction will take place at the field without this booklet.

## Lesson 1: Radio and Field Procedures

**Purpose: To familiarize the student with all safety aspects associated with model aircraft both on the ground and in the air.**

### **Objective:**

- At the completion of the lesson the student will be aware of all Diablo Radio Controllers Club safety rules and field procedures. The student shall also be able to perform a pre-flying session and pre-flight check.

### **Elements:**

- Please visit our website at <http://www.dvrc.org/> and download our latest copy of the Field Flight Operating Safety Rules and Regulations. All students are required to familiarize themselves with the rules and regulations of the Diablo Radio Controllers Club.

## Lesson 2: Aircraft Familiarization (some items may not apply to Electric Powered Aircraft, or 2.4Gz transmitters)

**Purpose: To teach the student how to properly pre-flight check their model.**

### **Objective:**

At the completion of the lesson the student should be able to inspect his model and identify any deficiencies that could cause a malfunction or safety hazard. He will be able to start and adjust the engine properly.

### **Elements:**

- Inspection of aircraft structure, center of gravity and longitudinal balance.
- Inspection of radio installation.
- Inspection of all linkages and control surfaces including controls for proper throw, direction and freedom of movement.
- Engine, fuel system installation and security (including props).
- Instructor's demonstration of safe engine starting procedure and starting of engine.
- Instructor teaches student how to identify rich and lean engine settings.
- Instructor teaches student how to adjust the idle mixture to get optimum performance from that type of engine.

### **Evaluation:**

Student should be able to perform lesson objectives.

*This Lesson should be reviewed as necessary at the start of all lessons in the Primary Training Course.*

### Pre-Flight Check List

Before each flying session:

- Radio range check

Before each flight:

- Frequency Board – Instructor's badge is in place
- Receiver battery - voltage check
- Radio antenna - out
- Transmitter - on and checked for interference
- Receiver - on
- Aircraft controls - transmitter operation check
- Throttle set

Starting the Aircraft:

- Aircraft secure
- All clear - ahead (prop) and behind
- Run up - mixture set
- Idle - reliable

Pre-Take-off

- Engine - full power performance OK
- Controls - free and correct
- Rate switches - set
- Trims - set for take-off
- Windsock - checked for wind direction
- Runway - clear
- Announce intention to take-off to other pilots on the flight line

## Lesson 3: Flight Familiarization

**Purpose:** To introduce the student to controlling the model in flight.

**Objective:**

To allow the student to become familiar with his/her model's controls and their use in flight.

**Elements:**

- On the ground, instructor will familiarize the student with the controls (pitch, yaw and power) and the affect they have on the aircraft in flight.
- The buddy box procedures used by the instructor to take control of the aircraft from the student will be explained.
- Instructor flies and lands the student's model to evaluate its performance and air worthiness. This flight determines any changes necessary for control throws and trims. If the instructor can trim the aircraft without landing, control of the aircraft will be passed to the student.
- With the assistance and direction of the instructor, the student will start the process of becoming familiar with the controls.
- The student will strive to keep the model in level flight and follow turning instructions given by the instructor.
- It is the student's responsibility to request the instructor take control of the plane... in time for the instructor to take corrective action to prevent a crash.
- Concentrate on flying within your ability. If you become disoriented or confused, pass control back to the instructor.

**Evaluation:**

The lesson is complete when the instructor has determined that the student is able to determine and execute proper control inputs to achieve a desired change in the model's attitude. Proficiency and accurate control are not critical at this point.

**Note:**

The instructor will make an educated "guess" as to the flight worthiness of an aircraft. Since the instructor did not assemble the aircraft, he/she cannot guarantee that it was assembled correctly or that it will fly properly. The instructor will not be held liable for the loss of an aircraft due to improper assembly or setup.

## Lesson 4: Basic Flight Maneuvers

**Purpose:** To acquaint the student with the basic flight maneuvers.

**Objective:**

To teach the student to properly control the model during basic maneuvering.

**Elements:**

- Level flight and trim (aileron and elevator)
- Banked turns (30 degrees)
- Straight climbs (add power and trim)
- Climbing turns
- Gliding (idle power and trim)
- Disorientation (silhouette and control reversal issues with in-bound aircraft)

**Note:**

An explanation of disorientation issues and the use of trim should precede this lesson. The five maneuvers should be taught in the order listed if possible.

**Evaluation:**

The lesson is complete when the student can perform the maneuvers without assistance from the instructor. Each maneuver should be executed with a reasonable degree of accuracy. For example, turns should be smooth and altitude maintained well.

## Lesson 5: Accuracy Maneuvers

**Purpose: To teach the student to perform the five basic maneuvers to a standard that will develop proficiency in their execution.**

**Objective:**

To develop the skill and ability of the student to control the model in a specific manner.

**Elements:**

- Level flight, maintaining heading and altitude.
- Level flight at reduced power, maintaining heading, altitude and trim.
- Left and right turns to specific headings.
- Climbing turns to specific headings.
- Use of rudder for turns and maintaining straight flight at slower speeds.
- Power off (idle) glides that require the student to maneuver the model to a specific area and approximate altitude.

**Note:**

The object is to develop skill, ability, and an awareness of the model's position relative to directions and altitude. Mechanical precision is not critical at this stage. Review disorientation and control reversal issues as necessary.

**Evaluation:**

The lesson is complete when the student can maneuver the model at the instructor's direction, and can demonstrate an ability to control the model in an accurate manner.

## Lesson 6: Orientation Maneuvers

**Purpose: To develop the judgment, skill and ability necessary for the student to make his first landing.**

**Objective:**

To teach the student to control the model regardless of its heading or direction relative to himself.

**Elements:**

- Figure 8 - the student must fly a figure 8 pattern consisting of two 360 degree turns, one left and one right with little or no loss in altitude. The student must place the maneuver in front of himself at a safe distance and altitude.
- The student must fly a rectangular pattern at a safe altitude, with the upwind leg crossing the landing area. Club policies regarding observance of the traffic pattern will be discussed and explained.
- The student will perform a procedure turn

**Note:**

The instructor will designate the size, altitude, and distance of all three maneuvers.

**Evaluation:**

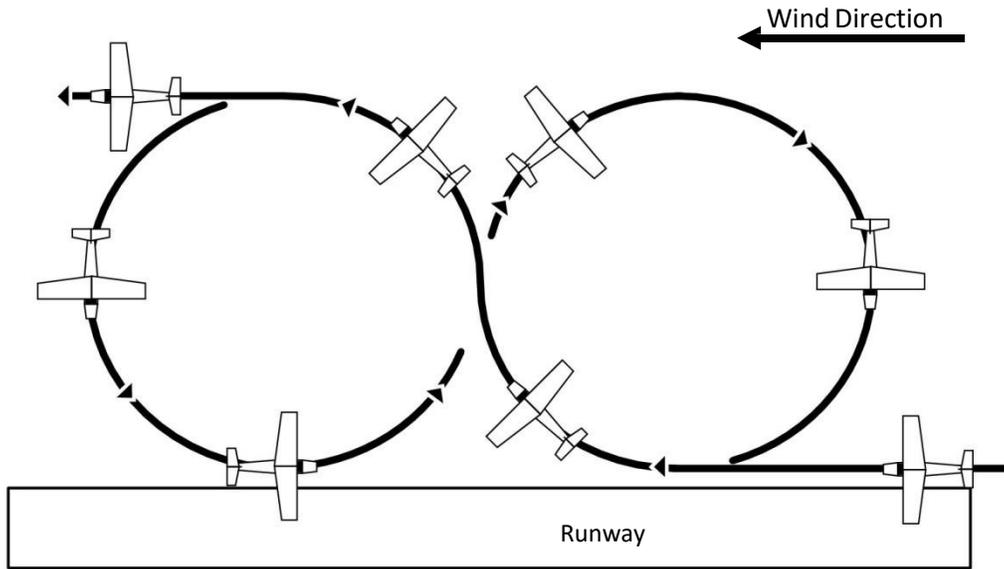
The lesson is complete when the student can fly the Figure 8 without experiencing disorientation and can fly both right and left rectangular patterns and procedure turns consistently and accurately.

## Reference Diagrams:

**Figure Eight:**

The model will attain altitude and must be flown parallel to the runway to a point at the center-line of the runway. Model then makes a 90 degree turn in a direction away from the flight line, starting with level wings, and then makes a 360- d e g r e e banked turn to the right or left. When the model returns to its original heading away from the flight line, it makes a second 360-degree banked turn in the opposite direction to the first 360-degree turn. The maneuver is complete when the model levels its wings after the second 360-degree turn.

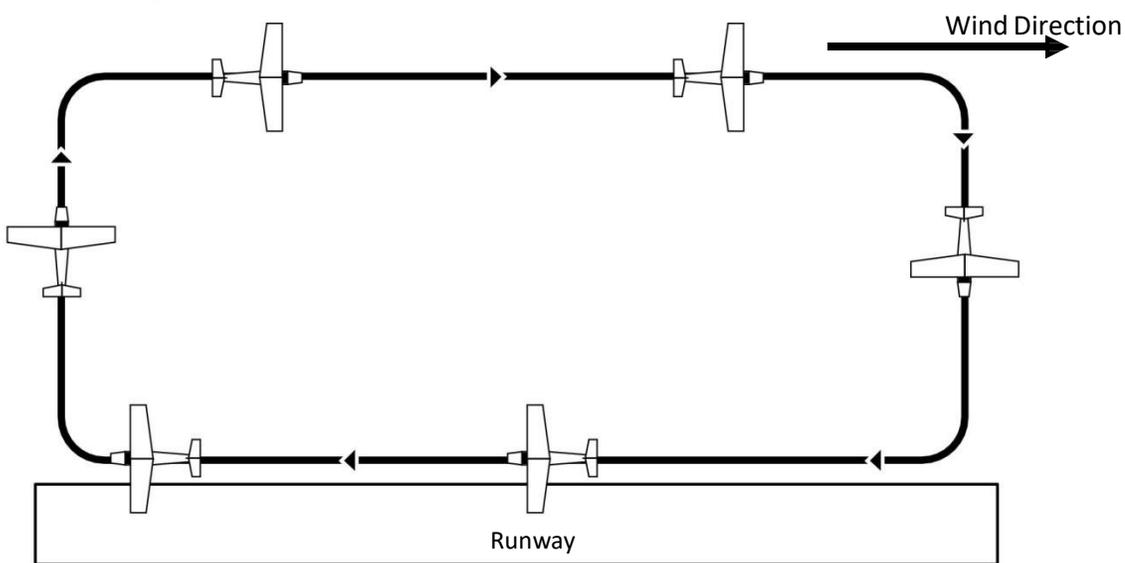
Diagram top view



**Rectangular Pattern:**

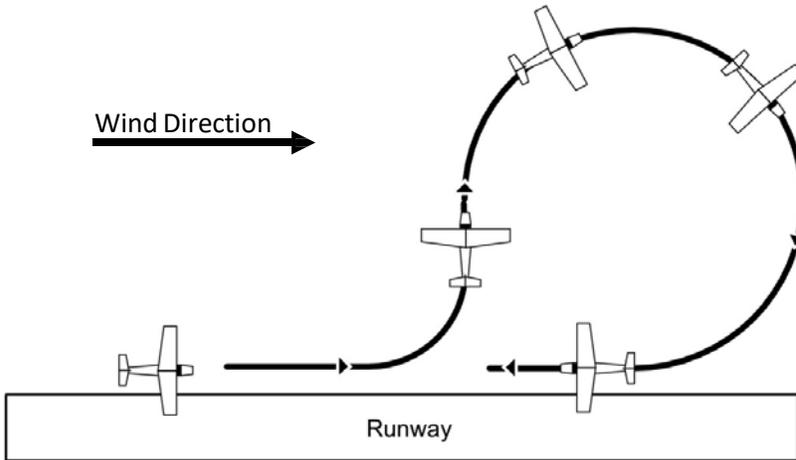
The maneuver begins with the model flying straight and level into the wind parallel to the runway. At the far end of the runway, the model turns 90 degrees away from the flight line for the first cross-wind leg. The model makes a second 90 degree turn into the downwind leg. The model makes a third 90 degree turn into the second cross-wind leg. The model makes a fourth 90 degree turn into the wind and continues to the starting position of the maneuver.

Diagram top view



**Procedure Turn:**

After the Straight Flight Out, model makes a 90 degree turn away from the flight line followed by a 270 degree turn in the opposite direction back to the reverse flight path of the Straight Flight Out.



**Lesson 7: Stalls**

**Purpose:** To develop the student's understanding of stalls, their cause, how to avoid them.

**Objective:**

- To teach the student to recognize and recover from stalls.

**Elements:**

- Pre-flight discussion of stalls. What causes them, and how to recover?
- Practice of stalls by the student, with power and without power.
- Stalls in turns (Take-off, departure stalls)

**Note:**

Take-off and departure stalls are almost impossible to set up with most trainers, but do occur in more advanced models. Therefore, it is recommended that power be reduced to about 1/3 throttle and a steep climbing turn entered. The stall entry will look like a spin entry with the model rolling towards the high wing. During this lesson it should be emphasized to the student that a stall can occur at any airspeed and is a function of angle of attack.

**Evaluation:**

The lesson is complete when the student understands the cause of stalls and has demonstrated the lesson elements and proper recovery.

**Reference: Stalls**

Sufficient airspeed must be maintained in flight to produce enough lift to support the airplane without requiring too large an angle of attack. At a specific angle of attack, called the critical angle of attack, air going over a wing will separate from the wing or "burble" (see Fig. 1), causing the wing to lose its lift (stall). The airspeed at which the wing will not support the airplane without exceeding this critical angle of attack is called the stalling speed.

This speed will vary with changes in wing configuration (flap position). Excessive load factors caused by sudden maneuvers, steep banks, and wind gusts can also cause the aircraft to exceed the critical angle of attack and thus stall at any airspeed and any attitude. Speeds permitting smooth flow of air over the airfoil and control surfaces must be maintained to control the airplane.

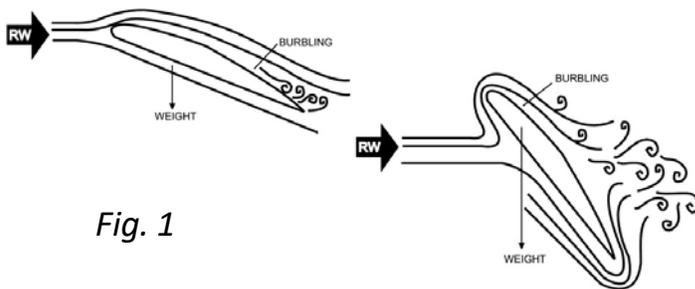


Fig. 1

**Lesson 8: Approaches to Landing**

**Purpose: To prepare the student for their first landing.**

**Objective:**

To develop the student's ability to visualize and perform a stable and controlled approach and landing.

**Elements:**

- Review of Lesson 6. (Slow Flight and Gliding)
- Discussion of proper landing techniques.
- Student flies a rectangular pattern as in Lesson 6, but reduces power and establishes an appropriate glide on the base leg and continues the approach until over the end of the runway, at which point he is to add power and go around. The minimum altitude at the end of the maneuver should be no less than 20 ft.
- As the student becomes comfortable with the maneuver, the altitude should be lowered until the instructor is confident that the model can glide to the runway with the power off (idle).
- Landing. At this point the instructor will tell the student to continue the approach and land.

**Note:**

The chances of a successful landing will be increased if the instructor reminds the student to keep the power at idle. It may be necessary to talk the student through the flare and touchdown.

**Evaluation:**

The lesson is complete when the student has successfully landed the model several times and is comfortable with the maneuver.

**Lesson 9: Take-off**

**Purpose: To teach the student how to make a normal take-off.**

**Objective:**

To teach the student how to control the model during take-off.

**Elements:**

- Discussion of the effects of torque during take-off and initial climb.
- Use of rudder.
- Use of throttle.
- Use of elevator.
- Student makes a normal take-off IN TO WIND.

**Evaluation:**

The lesson is complete when the student has successfully taken off and established a normal climb with adequate airspeed. He must also demonstrate adequate directional control during take-off.

Note:

After student has demonstrated proficiency in normal take-offs, instructor should intentionally de-trim the model at the transmitter to allow the student to practice take-offs with a slightly out of trim model. Re-trimming at altitude must also be taught

**Lesson 10: Emergency Procedures**

**Purpose: To prepare the student for the unexpected**

**Objective:**

To acquaint the student with safe procedures to be used in emergencies.

**Elements:**

- Discussion of possible in-flight problems & how to deal with them
- Unusual altitude training (optional); loops and/or rolls
- Student performs simulated dead stick landing
- Cross wind take-offs and landings (optional)

**Evaluation:**

The elements of this lesson are only suggestions and there is no minimum performance requirement. The objective is to provide the student with insights that will assist him in safely dealing with the unexpected. Experience will teach him the rest.

If the student doesn't learn, the instructor hasn't taught!

### **The Final Step:**

When the instructor has certified that the student has successfully completed the training program, the student may then request to take the Solo Flight Evaluation flight test, according to the manual. When the student passes the Solo Flight Evaluation flight test, he/she is "cleared" as a regular pilot and may fly his aircraft at the club field without supervision.

GOOD LUCK and GOOD FLYING!

## **Lesson 11: Solo Flight Evaluation**

**Purpose: Confidence building exercise**

**Objective:**

The student is to perform a solo flight demonstrating the knowledge and skill objectives of the previous nine lessons to the instructor.

**Elements:**

- Pre-flight discussion to answer questions and resolve any problems that concern the student about the lesson.
- **Student performs a minimum of 3 flights, under the instructor's supervision, starting with a thorough pre-flight and ending with the plane and transmitter turned off in the pit area.**
- **An instructor monitors the student's performance, and is on the buddy box, but assists only if necessary. (Use of buddy box at this stage is at instructor's discretion)**

**Evaluation:**

The lesson is complete when the student has demonstrated a practical knowledge of all course objectives **and** has observed all safety and field operating rules, and has successfully flown his model unassisted.

# SOLO FLIGHT EVALUATION AND CERTIFICATION

Student Pilot's Name \_\_\_\_\_

AMA Number \_\_\_\_\_

1. This checklist will serve as a permanent record of your post-training evaluation and the instructor's certification of your earning your solo wings. This checklist, when signed off, will be turned over to the club secretary, and you will have full flight privileges at DVRC's facilities.
2. Solo certification consists of three separate flights, each with a specific piloting skill to be demonstrated. You will be judged not on how well you perform each requirement, but on your simple ability to safely demonstrate your aptitude in each of these areas.

INSTRUCTORS NOTE: You are to demonstrate each step of the lesson to be learned. Show the student what it looks like. When the student understands the control input sequences and reasons for them, then give him control.

Instructor is to initial and date each lesson segment when the student has shown he/she has mastered it. This list shall be presented to Instructor prior to each day's flight training. The instructor will initial each item as it is successfully completed

**1) Lesson 1 – Radio and Field Procedures**

- a) **Objective:** Familiarize the student with all safety of the field and air.
- b) Instructors signature: \_\_\_\_\_ Date \_\_\_\_\_

**2) Lesson 2 – Aircraft Familiarization**

- a) **Objective:** Teach the student how to properly pre-flight his/her model
- b) Instructors signature: \_\_\_\_\_ Date \_\_\_\_\_

**3) Lesson 3 – Flight Familiarization**

- a) **Objective:** Teach student to control the model in flight
- b) Instructors signature: \_\_\_\_\_ Date \_\_\_\_\_

**4) Lesson 4 – Basic Flight Maneuvers**

- a) **Objective:** Acquaint the student with the basic flight maneuvers
- b) Instructors signature: \_\_\_\_\_ Date \_\_\_\_\_

**5) Lesson 5 – Accuracy Maneuvers**

- a) **Objective:** Teach student to perform a series of maneuvers accurately
- b) Instructors signature: \_\_\_\_\_ Date \_\_\_\_\_

**6) Lesson 6 – Orientation Maneuvers**

- a) **Objective:** Develop the skill and ability to identify their plane in the air
- b) Instructors signature: \_\_\_\_\_ Date \_\_\_\_\_

**7) Lesson 7 - Stalls**

- a) **Objective:** Understand the cause of stalls and how to avoid them
- b) Instructors signature: \_\_\_\_\_ Date \_\_\_\_\_

**8) Lesson 8 – Approaches to Landing**

- a) **Objective:** Prepare the student for their first landing
- b) Instructors signature: \_\_\_\_\_ Date \_\_\_\_\_

**9) Lesson 9 – Take-off**

- a) **Objective:** Teach the student how to make a normal take-off
- b) Instructors signature: \_\_\_\_\_ Date \_\_\_\_\_

**10) Lesson 10 – Solo Flight Evaluation**

- a) **Objective:** Solo flight including take-off, Oval Race-Track Pattern, Landing.
- b) Instructors signature: \_\_\_\_\_ Date \_\_\_\_\_

**11) Lesson 11 – Emergency Procedures**

- a) **Objective:** Teach the student how to deal with the unexpected
- b) Instructors signature: \_\_\_\_\_ Date \_\_\_\_\_

I certify that \_\_\_\_\_ has successfully demonstrated the minimum skills required for safe radio-controlled flight and is hereby designated a solo pilot of the Diablo Valley Radio Controllers Club.

\_\_\_\_\_  
Instructor's Signature Date

# Notes for New Students

All DVR Members should remember that they operate and fly at their OWN RISK at the DVRC Flying Field

The following is intended to maximize the safety and enjoyment of flying RC aircraft at the DVRC Club Flying Field:

1. **Flight Training Agreement.** The Diablo Valley Radio Controllers Club will commit itself to you in completing your flight training in a timely manner. Therefore, we request for you to do the same. You can help by being available to train and not to miss scheduled flight training appointments.

We would also like for you to set a goal to complete your flight training in six months or less. However, we recognize each student is different and may require more time. If you need more time just let us know. But if after six months you have not contacted your instructor, you will be placed on an "Inactive Student" list. While on this list if a new student requests flight training, that student will be placed ahead of you.

Finally, to help you complete your training in a timely manner, your instructor will advise you of other instructors. This service will allow you to contact any of our flight instructors to schedule additional flight training. We hope you will take advantage of this service.

2. Instructors provide their time for free; therefore, students should expect to practice at their instructor's convenience. Instructors do not guarantee or replace planes involved in crashes (crashes are usually caused by mechanical failure rather than instructor error).
3. Students are requested to call their instructor to arrange a practice time convenient to their instructor (instructors may, but are not expected to, call students). Winds much over 15 mph usually prohibit training.
4. Students should make arrangements with their instructor to let him/her inspect their aircraft prior to the first instructional lesson.
5. If you have problems or want to change instructors (e.g., consistent schedule conflicts), call or email the current president of the club and he/she will assist you.
6. Club meetings are on the second Saturday each month from 10:00 to 11:00 A.M. in our clubhouse at Thomas C. Allen Memorial Airfield. Any changes to this normal meeting would be located on our website.
7. To fly at the DVRC Club flying field:
  - a. Your transmitter must be a narrowband transmitter, which meets the new 1991 narrowband frequency requirements. Spread Spectrum radios (i.e. 2.4 GHz radios) are also permitted.
  - b. You must present proof of valid AMA membership.
  - c. You will need some identification on your airplane, usually your name, AMA#, and phone#.
  - d. You must obey the Diablo Valley Radio Controllers Club rules.
  - e. You must have a "safety walk-thru" of the club's flying safety rules at the flying field with one of the club's instructors.
8. The following is a partial checklist for your **first flight in addition to the above rules**:
  - a. Charge your batteries **all night prior to the day of flight** (12 hrs. minimum; 18 hrs. preferred; 24 hrs. maximum).
  - b. Ask your instructor to checkout your airplane prior to going to the flying field.
  - c. **Make certain your radio is turned off and do not turn on your radio at the airfield** until you have accomplished the safety walk-thru with your instructor.
  - d. The transmitter should have **channel number** on antenna near base and should have **red flag** (72 MHz) at top of antenna.
  - e. **Safety first!** – **Never** taxi your airplane in the pits (**always carry, or push/pull**, your airplane to/from the runway). **Always** hold onto (or tie-down/otherwise secure) your airplane while it is in the pits. **Never** leave it sitting un-held or un-secured with the engine running! – An accidental bump of the throttle could result in serious injury.
9. **Students are not permitted to fly at the DVRC R/C Club flying field without the personal assistance of a DVRC Club instructor** prior to receiving their Pilot's Certificate (this is to improve club safety since some new un-graduated students are overconfident and quite dangerous pilots).
10. You **must** have your AMA membership to fly "solo". (Note: Online application with credit card # is faster than mail. You can call AMA to get a **confirmation number** while you are awaiting your AMA card).

# PRE-FLIGHT CHECKLIST

## A. ENGINE AREA

1. Check engine mount, engine, muffler, and carburetor, prop nut, and spinner for security and throttle connections for proper adjustment.
2. Check prop for nicks, cracks, etc.
3. Check nose wheel steering for security (if equipped).
4. Check cowl for security (if equipped).

## B. TANK AREA

1. Fuel tank and fuel tubing for leaks and/or damage.
2. Fuel tank for security.
3. Battery for security and protection (if located in tank compartment).
4. Battery connections for security and damage.

## C. RADIO COMPARTMENT

1. Check to insure fuel has not leaked into radio compartment.
2. Check servo mount, servos, and servo arms for security and proper operation.
3. Check push rods and quick links for security and adjustment.
4. Check wiring for fouling in servo arms or pushrods.
5. Check receiver, switch, and connectors for security and protection.
6. Check receiver antenna for exit clear of obstructions.

## D. TAIL AREA

1. Check vertical fin, hinges, rudder and rudder clevis for operation, security and proper adjustment.
2. Check tail wheel for security and proper adjustment (if equipped).
3. Check horizontal stabilizer, hinges, elevator, and elevator clevis for security and proper adjustment.

## E. WING

1. Check wing for breaks, warps, cracks, hinges, and ailerons for security.
2. Check aileron servo, pushrods, linkages, and clevis for operation, security, and proper adjustment.
3. Check landing gear for security of attachment (if equipped).
4. Check wing attachment points for possible damage. If rubber bands are used, make sure there are enough (about 2 per pound, with last two crossed).
5. With wing attached, check center of balance of model. (CofG)
6. Check wing to fuselage mating.

## F. RADIO

1. ID Badge on Channel Control Board, if not 2.4 GHz.
2. Check for proper operation and control directions.
3. Insure no interference.
4. Range check (50-75 feet) or per manufacturer's instructions.