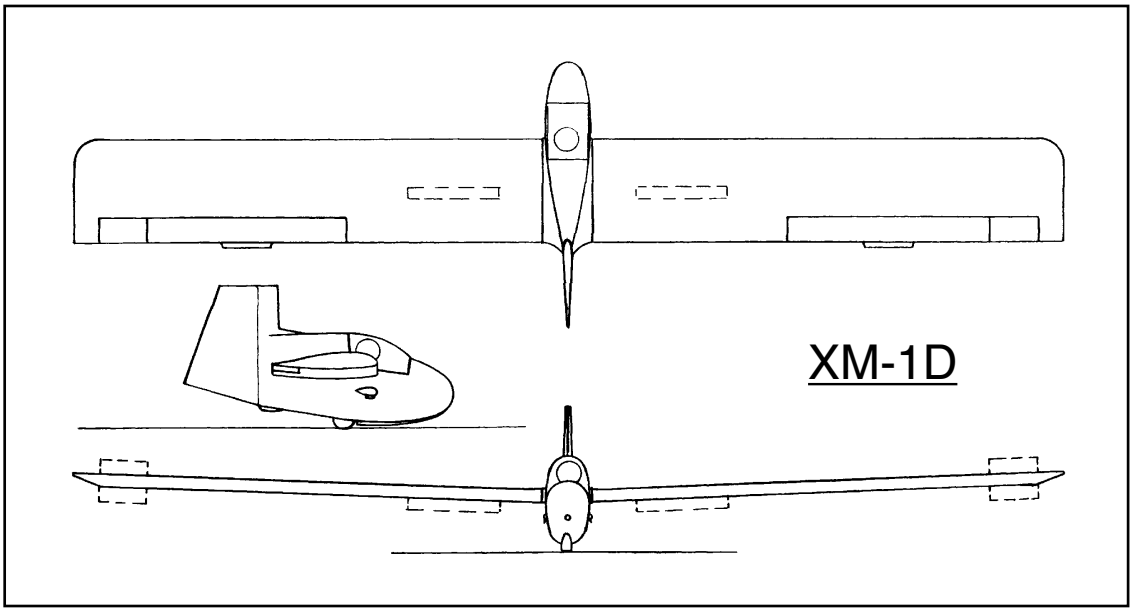
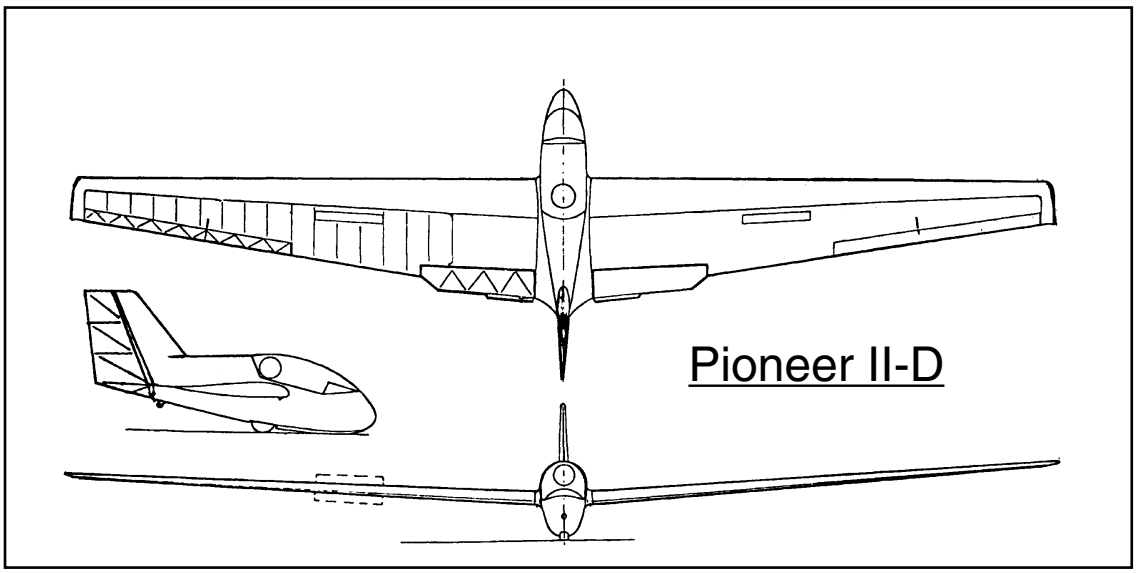
Jim Marske's "Pioneer II-D"

The "Pioneer II-D" story began in 1953 when Jim Marske read an article about Charles Fauvel's AV 36. Fascinated by the report of a successful tailless sailplane, Jim built and flew a model which exhibited the same positive attributes as the full size version. In 1954 Jim read about A1 Backstrom's EPBI-A. A scale model of this Backstrom design performed in equivalent fashion to the Fauvel model. What impressed Jim about the tailless planform was its uncanny ability to recover from pitch upsets with minimum loss of altitude.

Encouraged by his success with the two scale models, Jim began working on his own version of a tailless sailplane, and when an eight foot span model showed excellent performance, construction of a full sized tailless sailplane began in earnest.

Four versions of a constant chord planform were eventually built and flown, designated XM-1, XM-1B, XM-1C, and XM-1D. From an appearance standpoint, the most visible changes which appeared during this evolution were the removal of the two tip fins and placement of a single fin on the rear of the fuselage, and significant streamlining of the fuselage itself. Roll and pitch for the XM-1 series consistently involved use of elevons; but drag





rudders were added outboard of the elevons on the D model. Performance of the XM-1D was exceptional for a sailplane of just 40 foot wing span - it had a glide ratio of 30:1 at 57 mph.

In order to eliminate some of the problems associated with the constant chord wing, Jim adopted a tapered planform for the Pioneer series. Rather than sweep the wing back, however, he swept it forward, resulting in a wing with a straight leading edge. The benefits include a forward CG which increases the elevator moment, an ability to use aileron differential without adverse pitch effects, and an inhibition of spanwise airflow at high angles of attack. In addition, the Fauvel airfoil which had been used up to this time was abandoned in favor of the NACA 23112-75 because of its higher maximum coefficient of lift and lower drag.

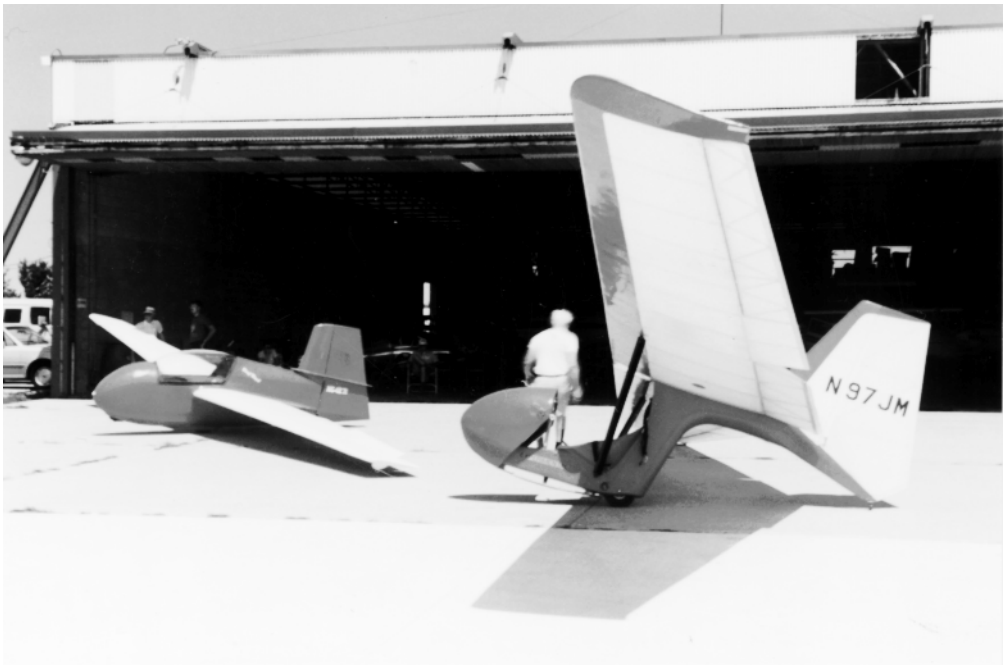
The Pioneer I first flew in March of 1968. Impressed with its performance but seeing needed improvements, modifications were made. The design became the Pioneer IA and flew in August 1968. The Pioneer IA has some striking similarities to the Schweizer 1-26: the total wing and stabilizer area of the 1-26 is equal to the wing area of the Pioneer; the airfoils used in the two 'ships are from the same family; the aspect ratios are about the same; both fuselages are of similar construction and aerodynamics. Despite these similarities, the Pioneer's performance was superior. Minimum airspeed for the Pioneer IA was 32.5 mph, and minimum sink was at 46 mph. The maximum glide ratio was 35:1 at 57.5 mph, and speeds of over 100 mph were easily obtained despite a wing loading of just 3.3 lbs./ft^2. To give an idea of performance potential, consider these achievements... The Pioneer IA flew a goal and return flight of 216 miles in 3 1/2 hours, averaging 62 mph.; it reached an altitude of 31,000 feet in the Pikes Peak wave; it was flown as fast as 162 mph without any indication of flutter.

The adoption of a fiberglass fuselage and installation of ailerons and true air brakes separates the Pioneer II from its predecessors. The "Pioneer II-D", the latest version, spans 13 meters (42.6') and has a wing loading of 4.4 lbs./ft^2 fully loaded. Available as a kit, it can be built and stored in a standard 22' garage.

Scaled to 1/4 of full size, the "Pioneer II-D" has much to offer the modeler. It is of reasonable dimensions and is easily transported. Our own model climbed easily and steadily in a thermal without circling, a characteristic identical to its full sized counterpart. It was also capable of both loops and rolls. Since the controls are identical to conventional sailplanes (ailerons, elevator, rudder and air brakes), there is very little difficulty in making the transition from conventional to tailless flight.

We sold our "Pioneer II-D" to a modeler in Seattle, but have recently considered building another. With dual tow hooks mounted on the CG, winch launches and aero tows should be relatively hassle free. We would very much like to try the latter method of getting to altitude, particularly with an unconventional design like the Pioneer. Who knows, perhaps you'll see us with a new "Pioneer II-D" at a future scale event.

Most of the information for this column came from "Experiment in Flying Wing Sailplanes" by Jim Marske. Copies are available directly from Jim at Marske Aircraft Corporation, 130 Crestwood Drive, Michigan City IN 46360. At least two full sized Pioneer II sailplanes are currently flying in the United States, and one in Canada.



Bernie Gross' Pioneer II-A and Jim Marske's Monarch at Bryan Ohio.

Andrew MacDonald's "screen saver."