



NTSB MEMORANDUM FOR RECORD

Adam Gerhardt
Air Safety Investigator
Eastern Region, Office of Aviation Safety (ERA)
National Transportation Safety Board

Date: October 17, 2019
Person Contacted: Gus Fennell (VP Operations, Van's Aircraft)
NTSB Accident Number: ERA20FA009

Narrative:

The following are excerpts from an email sent from the individual stated above:

“We don’t have any specific data on flying an RV-4 without the canopy – all the in-flight experience has been through inadvertent canopy loss. The idea behind the canopy design was to make it possible to bail out per the requirements of §23.2315.

There have been several cases where an RV-4 canopy was lost inadvertently, but the aircraft were landed safely. So we know that the RV-4 can be flown and controlled without the canopy in place – “if the pilot says on top of the situation”. We know that the drag will increase, so more power will be required for a given airspeed, and deceleration will be more rapid with any power reduction. There is also a possibility of reduced elevator and rudder effectiveness due to disturbed airflow over the tail surfaces. This controllability may also be adversely affected by power reduction. In addition, there is an unknown effect of abnormal airflow over the static ports, which could lead to erroneous pitot static instrument indications.”



VAN'S AIRCRAFT
TOTAL PERFORMANCE

Introducing the Van's RV-3 through RV-9

THE AIRPLANES

Forty years ago Van coined the term "*Total Performance*" to describe his goals in aircraft design. We still haven't come up with a better term. RVs are not simply "go-fast" machines. They are also aerobatic (the RV-9/9A excepted) and have outstanding low speed handling/short-field capability; a rare combination. The controls are light, responsive, and beautifully harmonized. The characteristic that sticks in pilots' minds, though, is how much *fun* they are to fly.

THE REAL WORLD: All the performance and handling in the world doesn't matter if you can't fit in the cabin or take anything with you when you travel. RV cockpits will comfortably accept pilots up to 6'4" (the RV-8/8A will fit even if you're 6'8"). Comfort (and safety) is enhanced by outstanding in-flight visibility. Ground visibility is so good that even tailwheel RVs require little S-turning while taxiing.

Baggage compartments hold useful amounts of camping or traveling gear. Two people can take a realistic amount of baggage to destinations served by either big paved runways or short grass airstrips.

THE ENGINES: Two-seat RVs are designed to use Lycoming-style engines developing between 118 and 200 horsepower. The RV-3 and RV-9/9A take 118-160 hp, the RV-4 accepts 150-180 hp. The RV-7/7A and RV-8/8A use 150-200 hp.

THE PROJECT: Building an RV requires a modest array of tools and a comfortable space about the size of a two-car garage. It does not require any special skill. Most RVs have been completed by people with no aircraft building background at all.

Building an RV does demand attention, commitment and perseverance. It is a large project that will put you through every imaginable emotion. It is unlikely that you will do everything you are doing today and build an airplane, too. It will require some sacrifice, but when you finish, you will have a unique high-performance airplane that you understand completely.



A LITTLE HISTORY...

We've been at this a long time.

Founder Richard (Van) VanGrunsven established Van's Aircraft, Inc. in 1970. The first aircraft kits were offered in 1973. Since then the company has produced the most successful line of kit aircraft — ever. Thousands of RV kits have been completed and flown, with increasing numbers under construction. Obviously many more will be flying soon. Over the last several years, new airplanes have flown at a rate of 1.5 *per day*!

First came the single-seat RV-3. Its outstanding performance and reasonable cost gained it an enthusiastic following.

Customers soon demanded a two-place airplane with similar characteristics so Van's responded with the RV-4. Tandem seating provided lower drag, superior visibility, and better overall sportiness. The RV-4 became an immediate favorite.

In the late 1980s, the market shifted toward touring, rather than pure sport, airplanes. In response, Van's developed the side-by-side RV-6. A tri-gear version, the RV-6A, was soon developed to better fill the needs of the modern pilot.

In 1995, Van's introduced the RV-8 and the tri-gear RV-8A, a new tandem design. Roomier than the RV-4, it had two baggage compartments, more panel space, and the option for more power. With 200 hp, it was the fastest yet, but it still handled like an RV.

In 1999, Van's flew a new airplane emphasizing flying simplicity and efficiency over speed and aerobatics. The side-by-side RV-9A combined an RV-6 cabin with a completely new wing. Intended as a efficient, fun "weekend" flying machine, the RV-9A turned out to be an excellent cross-country airplane as well. A tailwheel version, the RV-9, was introduced in 2002.

In 2001 Van's introduced the side-by-side RV-7/7A — a much easier to build successor to the RV-6. Wing span, useful load, and fuel capacity were all increased. Engine options expanded to include the 200 hp Lycoming. The RV-7/7A flies much like the RV-6 or RV-8, with the same excellent handling and aerobatic capabilities.

In the following years the RV-10, RV-12 and RV-14 were added — airplanes different enough that they are described in their own flyers.



THERE'S A LOT OF HELP OUT THERE

PLANS: A comprehensive plans and construction manual that comes with the kit. RV plans packages consist of two components: "Preview" Plans and Construction Plans. "Preview" Plans include a full set of 11" x 17" drawings, a Builder's Manual, and an Accessories Catalog, all in a loose-leaf binder. Preview Plans give the potential or beginning builder an overview of the entire aircraft. They contain preliminary information that is not repeated in the Construction Plans, so purchase is required before beginning construction.

Construction Plans consist of large 24" x 36" drawings and a Builder's Manual. They are included with each sub-kit, making it possible to include the latest updates.

SUPPORT FROM THE FACTORY: The Builder's Assistance help line is staffed by Van's employees, all of whom have built their own RVs in their own shops. Construction questions via phone, e-mail or letter are answered promptly.

OPTIONAL PARTS: Van's Accessories Catalog offers a wide array of items to help you complete and equip your airplane exactly the way you want it.

BUILDER'S GROUPS: RV builders often band together to provide each other assistance in building and flying their aircraft. Many of these groups are highly organized, with regular meetings, newsletters, tool banks and fly-in events. Contact Van's for a list of RV builders — there is probably somebody building or flying one nearby.

BUILDER'S ASSISTANCE CENTERS: The popularity of RVs has given rise to a number of companion businesses. Several Builder Assistance Centers have been established where new builders can come and build their aircraft under an experienced, watchful eye. Programs run the gamut from one day introductory classes to 7-day build-an-empennage sessions to full assistance throughout the project. They may even include transition flight training. These programs can dramatically reduce building times — and frustrations.

THE INTERNET: The Internet provides a way to communicate with RV builders all over the world. There is a wealth of websites, discussion groups, photo albums and links concerning RVs out there in cyberspace. Managed by RV-6 builder Doug Reeves, www.vansairforce.net has become the premier website in the RV builders world.

Properly used, the net is a wonderful tool, connecting problems and solutions around the world.

SOUND INTERESTING? If it sounds like we are proud of our airplanes, just wait until you experience the excitement and enthusiasm of those who have built and flown them. The "RV Grin" (often seen in the 'First Flights' section of the website) will give you some idea of how they feel.

To learn more:

- Order our comprehensive Info/DVD. The written material includes a thorough explanation of RVs, their background, performance, construction and ordering information. A 35 minute video, *The RV Story*, shows many aspects of RV flying and building.
- Visit our website at www.vansaircraft.com. It includes our complete Accessories Catalog, order forms, current news and links to other sites.
- Join an EAA Chapter or RV Builders Group and meet RV builders and pilots. There is no better source of information than someone who has just built an RV.
- Stop by and pay us a visit. We'll show you our factory, and explain the kits. Weather and time permitting, we'll take you for a demo ride.



RV-9



RV-3



RV-4



RV-7A

On the 'Other' Coast? Our East Coast representative is located in Pennsylvania and can help with questions and demo rides in the RV-10 and RV-14A.

E-mail: zack@vansaircraft.com



STANDARD KITS

Standard kits are divided into four sub-kits. They can be ordered in any combination, but most builders order them one at a time, starting with the empennage. Each kit includes all the necessary rivets, nuts, bolts, washers and other hardware.

- **Empennage:** Contains ribs, spars, and skins for the elevators, rudder, horizontal and vertical stabilizers and trim tab. For the RV-7/8/9 these components are matched-hole punched for all fasteners, so they align with no jiggling or measuring. (RV-3/4 empennages are not matched-hole punched.) Welded control horns and fiberglass tips are included.
- **Wing:** Main wing spars are completely fabricated and anodized for corrosion resistance (pre-fabricated spars are optional on the RV-4). They are fitted, drilled and reamed to exactly match the similarly anodized center section in the fuselage. All ribs, stringers, spars and skins for the wings, ailerons and flaps on the RV-7/8/9 are matched-hole punched so no jiggling is required. Fuel and vent lines, filler caps, control pushrods and fuel drains are provided. Powder-coated steel bellcranks and fiberglass wing tips are supplied.
- **Fuselage:** Contains the bulkheads, ribs, skins, and firewall for the metal fuselage. It also includes controls and pushrods, rudder pedals, seat backs, fuel lines and more. RV-3/4 fuselages must be jigged and drilled by the builder. All RV-7/8/9 fuselage kits are matched-hole punched. No jigs are required.
- **Finishing:** Contains the canopy, canopy frame, engine mount, landing gear legs, new wheels, brakes, master cylinders, pressure lines with fittings, tires and tubes. Also included are the cowlings, spinner, and all the various fairings.

WHAT WE DO

Sheet aluminum parts are vinyl-coated, punched, sheared, bent, heat-treated, rolled, milled and formed in our modern facility on the Aurora, Oregon airport. Steel parts are formed and professionally welded. After all the welding, reaming, drilling and other processes are complete, most steel components are powder coated.

Fiberglass components, canopies, landing gear components, etc. are sub-contracted to expert manufacturers. RV components are usually their primary product. Close communication insures excellent quality and steady supply.

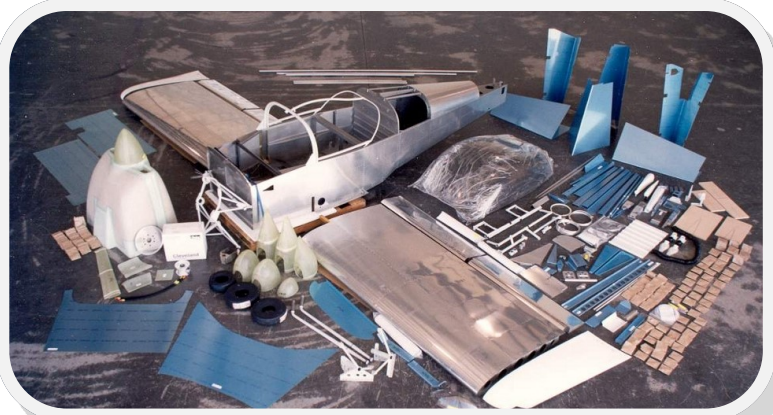
WHAT THE BUILDER DOES

Building an RV from the Standard Kit is a process of assembly, not manufacture. The builder takes the manufactured parts and prepares them for assembly by doing some minor straightening, smoothing edges, deburring holes, etc.

After preparation, the structure is riveted and bolted together.

Paint, upholstery and interior appointments are very personal choices, so these are left to the builder.

Once the basic airframe is complete, the builder installs the engine, the propeller and the instrument panel. There are many choices here, but the beauty of kit aircraft is that builders can optimize the powerplant, propeller and panel to suit themselves.



QUICKBUILD KITS

If you are considering an RV-7/7A, RV-8/8A, or RV-9/9A and you want to be in the air as soon as possible, there is no better value than the QuickBuild Kit.

We estimate the QuickBuild Kit cuts construction time by 35-50%. In fact, when it was first introduced, prospective customers had a difficulty thinking of it as a "kit." It looks more like a completed airframe than a kit—and in many ways, it is. About 75% of the riveting and other airframe assembly work is done.

The QuickBuild Kit may be ordered in several versions:

- The Full QuickBuild Kit contains both wings and the fuselage, partially assembled, with the necessary materials and parts to complete these assemblies.
- The "Wing-Only" QuickBuild Kit contains partially completed wings and the parts necessary to complete them. Builders may choose to continue with the Standard Fuselage Kit or go with...
- The "Fuselage-Only" QuickBuild Kit contains the partially assembled fuselage and parts needed to complete it...

Many QuickBuild kits are now flying, some completed in as little as seven months. When you consider the time saved and the quality of the finished product, the QuickBuild Kit has to rate as one of the best values in aviation today.

WHAT WE DO

Just as in the Standard Kit, Van's manufactures virtually all the components of the airframe. The finished airplane will be the same, regardless of which kit is used to build it.

RV airframe components are sent to an assembly plant, where a crew of highly experienced technicians assemble wings and fuselages to QuickBuild status, then return the completed assemblies to Van's Aurora facility for inspection and shipping to the customer.

Wings are largely complete. The fuel tanks are assembled and pressure checked. Ailerons and flaps are complete. The leading edge and three (of four) main skins are riveted.

Fuselages arrive looking like an aluminum canoe. All bulkheads, firewall, and lower skins and one aft top skin are riveted.

WHAT THE BUILDER DOES

QuickBuild Kits begin exactly the same way Standard Kits begin...the builder builds the empennage from the Standard Empennage Kit.

Things get much simpler after that. The wings go quickly as the builder installs the remaining skin on the wing and installs the control system and wing tip.

On the fuselage, the interior of the cabin and baggage compartment(s) must be finished, and a couple of upper skins installed.

That's it. Then the airplane is ready for the Finishing Kit. By choosing options such as the Firewall Forward Kit, from Van's Accessories Catalog, the momentum built up on the QuickBuild Kit can be maintained until the airplane is ready to fly.

"TOTAL PERFORMANCE" SPECIFICATIONS and PERFORMANCE

SPECIFICATIONS										
	RV-3	RV-4	RV-7	RV-7A	RV-8	RV-8A	RV-9	RV-9A		
Span	19' 11"	23' 0"	25' 0"	25' 0"	23' 0"	23' 0"	28'	28'		
Length	19' 0"	20' 2"	20' 10"	20' 4"	21' 0"	20' 10"	20' 5"	20'5"		
Height	5' 0"	5' 5"	5' 7"	7' 5"	5' 7"	7' 4"	5' 10"	7' 10"		
Wing Area (sq. ft)	90	110	121	121	121	121	124	124		
Empty Weight (lbs.)	750	906	1114	1130	1120	1120	1043	1071		
Gross Weight (lbs.)	1100	1500	1800	1800	1800	1800	1750	1750		
Wing Loading (lb/ sq. ft)	12.22	13.64	15.00	15.00	16.36	16.36	14.1	14.1		
Power Loading (lb/hp)	7.3	9.4	9.0	9.0	9.0	9.0	10.9	10.9		
Engine (hp)	150	160	200	200	200	200	160	160		
Prop type (fixed-pitch or constant speed)	fixed	fixed	c/s	c/s	c/s	c/s	fixed	fixed		
Fuel Capacity (US gallons)	30	32	42	42	42	42	36	36		
Baggage (lbs, approx.)	30	30	100	100	125	125	100	100		
PERFORMANCE (see Van's website or Info Pack for performance data with other engine options.)										
Top Speed (all speeds in statute mph)	207	204	216	213	222	220	196	194		
Cruise (75% @ 8000')	196	192	206	204	212	210	188	186		
Cruise (55% @ 8000')	176	173	186	183	189	187	168	166		
Stall speed (solo weight)	51	52	51	51	51	52	44	44		
Takeoff Distance (ft, solo weight)	—	260	250	250	250	250	300	300		
Takeoff Distance (ft, gross weight)	300	450	500	500	500	500	475	475		
Landing Distance (ft, solo weight)	—	300	350	350	350	350	300	300		
Landing Distance (ft, gross weight)	350	425	500	500	500	550	450	450		
Rate of Climb (ft/min, solo weight)	—	2050	2550	2450	2700	2500	2000	1900		
Rate of Climb (ft/min, gross weight)	2050	1650	1900	1850	1900	1800	1450	1400		
Ceiling (gross weight)	23,500	19,500	22,500	21,500	22,500	21,500	19,000	18,500		
Range (statute miles, 75% @ 8000')	595	640	765	755	780	770	710	700		
Range (statute miles, 55% @ 8000')	715	790	935	925	940	930	860	850		
PRICES										
	RV-3	RV-4	RV-6	RV-6A	RV-7	RV-7A	RV-8	RV-8A	RV-9	RV-9A
PREVIEW PLANS (required with before empennage kit)	\$45	\$50	\$55	\$55	\$55	\$55	\$55	\$55	\$55	\$55
EMPENNAGE KIT	\$1800	\$2000	N/A	N/A	\$2000	\$2000	\$2000	\$2000	\$1995	\$1995
WING KIT	\$7800	\$7950	N/A	N/A	\$8590	\$8590	\$8025	\$8025	\$8850	\$8850
FUSELAGE KIT	\$5700	\$6000	\$7025	\$7200	\$6695	\$7475	\$9050	\$8350	\$6850	\$7485
FINISHING KIT	\$6850	\$7000	\$7395	\$7495	\$7530	\$9395	\$6425	\$7550	\$7515	\$9470
COMPLETE STANDARD KIT	\$22,150	\$22,950	N/A	N/A	\$24,815	\$27,460	\$25,500	\$25,925	\$25,210	\$27,800
COMPLETE QUICKBUILD KIT (includes QB wing & fuselage kits)	N/A	N/A	N/A	N/A	\$36,205	\$38,845	\$36,900	\$37,375	\$36,645	\$39,260
Q/BUILD WING KIT ONLY	Add \$5910 to Wing Kit price for RV-7/8/9. No QB Wing available for RV-3, RV-4 or RV-6.									
Q/BUILD FUSELAGE KIT ONLY	Add \$5900 to Fuselage Kit price for RV-7/8/9 . No QB Fuselage available for RV-3, RV-4 or RV-6.									

PRICES: Prices are *subject to change without notice*. Prices do not include crating or shipping charges. More detailed ordering information, order forms, and current prices are available on request, in the Information Pack, or on the Van's Aircraft, Inc. website. Visa, Discover, or MasterCard accepted. FAX or e-mail orders 24 hours.



VAN'S AIRCRAFT
TOTAL PERFORMANCE

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