

编 号：AC-61-FS-2013-18R1

咨询通告

下发日期：2013 年 10 月 10 日

编制部门：FS

批准人：万向东

关于部分直升机特殊训练和经历要求的说明

1、适用范围

为确保直升机安全运行，参考国外民航当局的要求，对特定型号直升机的训练和经历要求做出补充说明，所有相关机型的驾驶员、飞行教员都应当满足本咨询通告中特殊训练、飞行经历和签注的要求。

本咨询通告当前适用机型为R-22和R-44两种直升机。本咨询通告中有关R-22和R-44直升机特殊训练和经历要求参考了2009年6月29日生效的美国特殊联邦航空条例SFAR73-2《罗宾逊R-22/R44特殊训练和经历要求》和美国联邦航空局罗宾逊R-22/R-44航空器评审组1995年2月15日签发的相应机型的飞行标准化委员会报告。

2、所需特殊训练

2.1、由于R-22或R-44直升机特性，强制要求实施某些气动因素的情景意识的地面理论训练。情景意识的地面理论训练应当至少包括以下知识点：

(1) 能量管理

讨论与空气动力学原理有关的能量管理，具体包括因高度的存在使航空器具有的可用能量(势能)，以及因旋翼转速和航空器空速的存在使航空器具有的可用能量(动能)。

(2) 旋翼轴碰撞

讨论旋翼机上“旋翼轴碰撞”的原因和后果，特别是在R-22直升机上。应讨论与形成旋翼轴碰撞有关的陀螺原理，和碰撞发生后的影响。

(3) 低旋翼转速

讨论低旋翼转速，提供更多关于桨叶在低旋翼转速时形成事实“失速”(不同于“后行桨叶失速”)的信息。遇到低旋翼转速时所采用的改出方法、低旋翼转速的识别和恢复旋翼转速所采取的修正方法，都应予以全面地讨论。

(4) 旋翼转速衰减

讨论在高进气压力设置、高空速飞行时或处于飞行的临界区域(包括起飞阶段)时发动机失效，对旋翼转速所产生的影响。该讨论应与以下情况关联：即在发动机失效时，由于此时桨叶攻角大造成桨叶处于高阻力状态，从而导致旋翼转速会加倍快速衰减。在正常功率设置情况下，驾驶员的可用正常反应时间是满足最低适航审定要求的，但当主旋翼桨叶工作在大攻角状态下时，留给驾驶员改出并修正低旋翼转速状态的可用时间会更少。这种情况下的可用时间是非常短的，以致于可能会超出驾驶员的反应能力。

(5) 低过载的影响

在运行具有跷跷板式旋翼和高尾桨这种特殊构型的轻型直升机（如 R-22、R-44）时，应特别注意低过载的影响。当遭遇低过载情况时，例如突然向前顶杆或气流颠簸所诱发的直升机突然过度下俯，旋翼桨盘上的载荷会降低。这时会出现滚转趋势，而除了那些能够使桨盘载荷重新增加的操作动作外，在任何方向上对操纵系统所采取的其他动作都只会加重这一趋势。在对这种滚转产生的原因和继续安全飞行所需的正确改出措施缺乏了解的情况下，驾驶员的本能反应是通过横向操纵周期变距杆或使用反扭矩脚踏使航空器回到平飞状态，这样就可能会导致旋翼轴碰撞甚至旋翼与直升机分离。应禁止诱发的滚转运动，并且必须在出现非故意偏离正常航迹的最初迹象时立即开始改出。

2.2、非正常和应急程序的飞行训练应当包括以下训练科目：

(1) 自转程序的强化训练

驾驶员应当接受自转程序方面的强化训练，能够熟练演示从可控状态的巡航和进近形态中进入自转。随着熟练程度的增加，在整个正常运行速度范围内驾驶员应能演示进入自转。

(2) 手动控制发动机与旋翼转速

在实施单飞前，驾驶员必须完全熟练掌握手动控制发动机与旋翼转速的技能（不使用调速器）。驾驶员训练应该包含手动操纵油门，以便消除对调速器的自满情绪和过度依赖。

(3) 低旋翼转速的识别和改出

驾驶员必须接受关于低旋翼转速识别和改出技能方面的训练。低旋翼转速改出应在正常飞行包线内的各个典型阶段开展，包括悬停和巡航飞行。

(4) 高功率设置或高高度运行旋翼转速下掉或低旋翼转速状态改出

驾驶员应当接受在高功率设置或高高度运行期间，自旋翼转速“下掉”或低旋翼转速状态改出的训练。认识到在这种情况下必须立即运用改出技巧的这一要求是非常重要的，因为在这种运行过程中旋翼系统的阻力大大增加，并且可用于改出的旋翼转速衰减时间大大减少。

2.3、飞行教员资格和权利

只有满足下列要求并获得相应签注的授权教员，才能在R-22或R-44直升机上实施带飞教学训练和在接受教学的人员飞行记录本上进行签注：

(1) 完成了2.1条所述的情景意识的地面理论训练；

(2) 在R-22或R-44直升机上完成了2.2条所述的非正常和应急程序的飞行训练，并注意以下以下内容：

a. 教员应注意到，自转训练不应局限于悬停自转，或者在固定的功率设置或预先建立的空速下以进近构型进入的自转。随着熟练程度的增加，学员应能在整个正常运行速度范围内演示进入稳定自转。

b. 提供低旋翼转速改出训练的教员应精通和熟悉进行这类机动所需的正确技巧。改出技巧是不允许学员在犯了额外错误时仍继续该机动动作的。在该机动的开始阶段，如果学员的改出动作不正确，或者改出或操纵技巧存在不足，教员应当接管直升机并终止演示。在重新回到稳定飞行状态后，方可再次尝试该机动动作。在训练或检查过程中，在出现了不正确的操作输入后仍尝试继续进行该机动是不明智的。教员必须演示其在高功率设置或高高度运行时发生的低旋翼转速状态下改出方面的熟练性。认识到在这种情况下必须立即运用改出技巧的这一要求是非常重要的，因为在这种运行过程中旋翼系统的阻力大大增加，并且可用于改出的旋翼转速衰

减时间大大减少。

(3) 对于R-22直升机，具有200小时以上直升机飞行时间，其中至少50小时是在R-22直升机上获得的。对于R-44直升机，具有200小时以上直升机飞行时间，其中至少50小时是在R-22或R-44直升机上获得的（其中在R-22直升机上最多承认25小时）。

3、飞行经历

3.1、驾驶员在R-22直升机上担任机长前应当满足下列任一飞行经历要求：

(1) 具有200小时以上直升机飞行经历时间，其中至少50小时是在R-22上获得的；或者

(2) 在R-22上接受了满足2.3资格要求的授权教员实施的带飞教学训练至少10小时，并在其飞行经历记录上获得由该授权教员出具的“我本人已对_____实施了包括AC-61-18第2.1条情景意识地面理论训练和2.2条非正常和应急程序飞行训练在内的__小时带飞训练，并证明其有能力在R-22上担任机长。此签注有效期12个日历月，有效期至____年__月__日”的签注。超过12个日历月后需要重新获得签注，应接受满足2.3资格要求的授权教员在R-22直升机上实施包含CCAR-61.57(b)(1)和(2)、本咨询通告2.1情景意识地面理论训练和2.2非正常和应急程序飞行训练在内的至少1小时理论训练和至少1小时飞行训练，并在其飞行经历记录本上由授权教员出具的再次签注。

3.2、驾驶员在R-44直升机上担任机长前应当满足下列任一规定：

(1) 具有200小时以上直升机飞行时间，其中至少50小时是在R-22或R-44直升机上获得的（其中在R-22直升机上最多承认25小时）；或者

(2) 在R-44上接受了满足2.3资格要求的授权教员实施的带飞教学训

练至少10小时(其中在R-22直升机上最多承认5小时),并在其飞行经历记录上获得由该飞行教员出具的“我本人已对_____实施了包括AC-61-18第2.1条情景意识地面理论训练和2.2条非正常和应急程序飞行训练在内的_____小时带飞训练,并证明其有能力在R-44上担任机长。此签注有效期为12个日历月,有效期至_____年__月__日”的签注。超过12个日历月后需要重新获得签注,应接受满足2.3资格要求的授权教员在R-44直升机上实施包含CCAR-61.57(b)(1)和(2)、本咨询通告2.1情景意识地面理论训练和2.2非正常和应急程序飞行训练在内的至少1小时理论训练和至少1小时飞行训练,并在其飞行经历记录本上由授权教员出具的再次签注。

4、首次单飞

4.1、对于初次申请直升机执照的申请人,在R-22直升机上实施单飞前,应当接受了满足2.3资格要求的授权教员实施的包括本咨询通告2.1条情景意识地面理论训练和2.2条非正常和应急程序飞行训练在内的至少20小时的带飞教学训练,并在飞行经历记录本上获得该飞行教员出具的“我本人已对在R-22直升机上实施了包括AC-61-18第2.1条要求的情景意识地面理论训练和2.2条要求的非正常和应急程序飞行训练在内的__小时带飞教学,并确认其有能力在R-22上实施单飞。此签注有效期为90个日历日,有效期至年__月__日”的签注。超过90个日历日后未实施首次单飞的,应接受满足2.3资格要求的授权教员在R-22直升机上实施本咨询通告2.1情景意识地面理论训练和2.2非正常和应急程序飞行训练,并在其飞行经历记录本上获得由该授权教员出具的再次签注。

4.2、对于初次申请直升机执照的申请人,在R-44直升机上实施单飞前,应当接受了满足2.3资格要求的授权教员实施的包括本咨询通告2.1条情景意

识地面理论训练和2.2条非正常和应急程序飞行训练在内的至少20小时的带飞教学训练，并在飞行经历记录本上获得该授权教员出具的“我本人已对在R-44直升机上实施了包括AC-61-18第2.1条要求的情景意识地面理论训练和2.2条要求的非正常和应急程序飞行训练在内的____小时带飞教学，并确认其有能力在R-44上实施单飞。此签注有效期为90个日历日，有效期至年__月__日”的签注。超过90个日历日后未实施首次单飞的，应接受满足2.3资格要求的授权教员在R-44直升机上实施本咨询通告2.1情景意识地面理论训练和2.2非正常和应急程序飞行训练，并在其飞行经历记录本上获得由该授权教员出具的再次签注。

5、定期检查和熟练检查

5.1、对于在R-22或R-44直升机按照CCAR-61部第61.57条实施定期检查或按照CCAR-61部第61.59条实施熟练检查的，检查科目还应包括本咨询通告第2.1条规定的情景意识地面理论训练和2.2条规定的非正常和应急程序飞行训练的内容。定期检查工作单见附件一，熟练检查工作单见附件二。

5.2、对于在R-22直升机上通过了上述5.1条要求的定期检查或熟练检查的，可以替代3.1(2)的再次签注。对于在R-44直升机上通过了上述5.1条要求的定期检查或熟练检查的，可以替代3.2(2)的再次签注。

6、实践考试

对于自本咨询通告生效后首次申请在R-22或R-44直升机上实施驾驶员执照实践考试的申请人，其飞行经历记录本应具备情景意识地面理论训练和非正常和应急程序飞行训练签注。

7、生效日期

7.1、自本咨询通告下发日起生效。2013年4月12日生效的AC-61-FS-2013-18同时作废。

7.2、自本咨询通告下发之日起申请使用R-22或R-44直升机机型实施训练的训练机构，应当满足此咨询通告要求。

7.3、对于已获得使用R-22或R-44直升机机型实施训练的训练机构，应当按照此咨询通告要求重新获得主任运行监察员的批准。

附件一 R-22 或 R-44 定期检查工作单

档案编号

姓名	执照编号	执照种类 <input type="checkbox"/> 私人 <input type="checkbox"/> 商用 <input type="checkbox"/> 航线	
工作单位	运行基地	运行种类 <input type="checkbox"/> CCAR-91 <input type="checkbox"/> CCAR-141	
检查日期 年 月 日	检查地点	航空器型号 <input type="checkbox"/> R-22 <input type="checkbox"/> R-44	
直升机登记号	旋翼转动时间		
	项目	满意 S 不满意 U	项目
第 I 部分 CCAR-61.57(b) 定期检查		第 II 部分 AC-61-18 2.1 情景意识地面理论训练	
理论检查	1 一般运行和飞行规则		1 能量管理
	2 安全行驶驾驶员执照所赋予权力所应掌握的航空理论知识		2 旋翼轴碰撞
	3 有能力安全行驶其执照权利所需动作和程序		3 低旋翼转速
飞行检查	1 一般运行和飞行规则		4 旋翼转速衰减
	2 安全行驶驾驶员执照所赋予权力所应掌握的航空理论知识		5 低过载的影响
	3 有能力安全行驶其执照权利所需动作和程序		第 III 部分 AC-61-18 2.2 非正常和应急程序飞行训练
			1 自转程序的强化训练
			2 手动控制发动机与旋翼转速
			3 低旋翼转速的识别和改出
			4 高功率设置或高高度运行旋翼转速下掉或低旋翼转速状态改出
<p>结论： 我声明，_____ 圆满地通过了我本人对其实施的包括 AC-61-18 第 2.1 条要求的情景意识地面理论训练和 2.2 条要求的非正常和应急程序飞行训练在内的 CCAR-61.57(b)(1)要求的定期检查，并在其执照记录页填写 FR 相关信息。</p>			
考试员编号		期满日期	
签字		日期 年 月 日	
<p>所在地区管理局 <input type="checkbox"/> 华北 <input type="checkbox"/> 华东 <input type="checkbox"/> 中南 <input type="checkbox"/> 西南 <input type="checkbox"/> 西北 <input type="checkbox"/> 东北 <input type="checkbox"/> 新疆</p>			
监察员审查意见 <input type="checkbox"/> 同意 <input type="checkbox"/> 不同意		监察员签字 日期 年 月 日	

R1(10/2013)

附件二 R-22 或 R-44 熟练检查工作单

档案编号

姓名		执照编号		执照种类 <input type="checkbox"/> 私人 <input type="checkbox"/> 商用 <input type="checkbox"/> 航线		
工作单位		运行基地		运行种类 <input type="checkbox"/> CCAR-91 <input type="checkbox"/> CCAR-141		
检查日期 年 月 日		检查类型 <input type="checkbox"/> 机长熟练检查 PC-PIC			检查地点	
航空器型号 <input type="checkbox"/> R-22 <input type="checkbox"/> R-44		直升机注册号		旋翼转动时间		
项目 注：对于仅限于 VFR 的 R-22 和 R-44 不需要完成“仪表程序”项目。		满意 S 不满意 U	项目		满意 S 不满意 U	
第 I 部分 CCAR-61.59(b) 熟练检查						
飞行前	1 设备检查 (口试)		程序	27 正常和非正常程序		
	2* 飞行前检查			28 应急程序		
	3 滑行			29 决断		
	4 动力装置检查			30 悬停动作		
起飞	5 正常起飞			31 急剧减速		
	6 仪表起飞			32 自转下滑		
	7 侧风起飞					
	8 模拟动力装置失效起飞					
	9* 中断起飞					
仪表程序	10* 区域离场					
	11* 等待					
	12* 区域到达					
	13 仪表着陆系统进近					
	14 VOR 和 NDB 进近					
	15 盘旋进近					
16 复飞		第 II 部分 AC-61-18 2.1 情景意识训练				
空中机动	17* 大坡度盘旋		1 能量管理			
	18* 接近失速		2 旋翼轴碰撞			
	19* 特殊飞行性能		3 低旋翼转速			
	20 动力装置失效		4 旋翼转速衰减			
着陆	21 正常		5 低过载的影响			
	22 仪表着陆系统着陆		第 III 部分 AC-61-18 2.2 非正常和应急程序训练			
	23 侧风		1 自转程序的强化训练			
	24 模拟动力装置		2 手动控制发动机与旋翼转速			
	25 低高度复飞		3 低旋翼转速的识别和改出			
	26 盘旋进近至着陆		4 高功率设置或高高度运行旋翼转速下掉或低旋翼转速状态改出			
<p>结论： 我声明，_____ 圆满地通过了我本人对其实施的包括 AC-61-18 第 2.1 条要求的情景意识地面理论训练和 2.2 条要求的非正常和应急程序飞行训练在内的 CCAR-61.59(b) 要求的熟练检查。</p>						
考试员编号		期满日期				
签字		日期 年 月 日				
<p>所在地区管理局 <input type="checkbox"/> 华北 <input type="checkbox"/> 华东 <input type="checkbox"/> 中南 <input type="checkbox"/> 西南 <input type="checkbox"/> 西北 <input type="checkbox"/> 东北 <input type="checkbox"/> 新疆</p> <p>监察员审查意见 <input type="checkbox"/> 同意 <input type="checkbox"/> 不同意 监察员签字 日期 年 月 日</p>						

附件三 FAA R-22 直升机航空器评审组《R-22 飞行标准委员会报告》(1995 年 2 月 15 日)

附件四 FAA R-44 直升机航空器评审组《R-44 飞行标准委员会报告》(1995 年 2 月 15 日)

FEDERAL AVIATION ADMINISTRATION

ROBINSON R-22
FLIGHT STANDARDIZATION BOARD
REPORT

February 15, 1995

Bryan W. Carpenter - Chairman

MEMBERS

William Wallace
Gilbert Riley
Robert O'Haver

Aircraft Evaluation Group

Fort Worth, Texas
(817) 222-5270

Flight Standardization Board

Robinson R-22

Part 1

Original

APPROVED:

CHAIRMAN _____ Date: 02/09/95
Bryan W. Carpenter

REVIEWED:

_____ Date: 02/15/95
Louis C. Cusimano
Manager, General Aviation and Commercial Division
AFS-800

CONTENTS

SECTION

1.	Purpose and Applicability	5
2.	Pilot "Type Rating" Requirements	6
3.	"Master Common Requirements" (MCRs)	6
4.	"Master Difference Requirements" (MCDs)	6
5.	Acceptable "Operator Difference Requirements" Tables	6
6.	FSB Specifications for Training	7
7.	FSB Specifications for Checking	10
8.	FSB Specifications for Currency	10
9.	Aircraft Regulatory Compliance Checklist	11
10.	FSB Specifications for Devices and Simulators	11
11.	Application of FSB Report	11
12.	Alternate Means of Compliance	11
13.	Miscellaneous	11

REVISION RECORD

REVISION No.	SECTION	PAGE #s	DATE
Original	ALL	ALL	02/15/95

1. PURPOSE AND APPLICABILITY

1.1 The purpose of this report is to specify FAA master training, checking, and currency requirements applicable to airmen operating the Robinson R-22 helicopter under FAR Part 91. One of its primary purposes is to aid Part 61 and Part 141 Air Agencies and FAA Principal Operations Inspectors in the use of applicable training programs.

1.2 Applicability of a Flight Standardization Board is limited due to the fact that the aircraft (R-22) is not designed for scheduled Air Carrier operations.

1.3 The Robinson R-22 is listed in FAA Type certificate Data Sheet H10WE and is hereafter referred to as the "R-22".

1.4 The FSB conducted numerous evaluations of the R-22 in accordance with special detailed information guidelines and the reference material from Advisory Circular 120-53 as applicable, to develop this report. Certain instrument proficiency and training requirements and systems were not evaluated by the FSB because of inapplicability to the training profile or operational use for which the aircraft was intended. The FSB is responsible for evaluating R-22 derivative aircraft and all future changes to the R-22 (such as design modifications or systems changes) when they are made to the aircraft. The FSB then determines the associated impact on training and amends this report accordingly.

1.5 This report also addresses certain issues regarding the operation of the Robinson R-22 other than under FAR Parts 61 and 141. Provisions of the report include:

1.5.1 Describing training program special emphasis items.

1.5.2 Endorsement requirements

1.6 The R-22 is certificated for VFR, day and night operations with a minimum crew of one pilot. It may be used in on-demand operations under FAR Part 135, student training and additional rating instruction, and corporate and private transportation under FAR Part 91. Other possible uses include agricultural operations under Part 137 and external load operations under Part 133.

1.7 The Robinson R-22 Flight Standardization Board met in Torrance, California, on January 8 through 20, 1995. Inspectors Bryan W. Carpenter, William Wallace, Gilbert Riley, and Robert O'Haver were members of the Flight Standardization Board.

1.8 This is the original FSB report relative to the Robinson R-22. Provisions of this report are effective until amended, superseded, or withdrawn by subsequent FSB determinations.

1.9 Terminology

The term "must" is used in this report even though it is recognized that this report and the Advisory Circular AC 120-53 on which it is based, provides one acceptable means, but not necessarily the only means, of compliance with FAR Part 61 Subparts C, D, E, G, and Appendix B requirements. The term "must" acknowledges the need for operators to fully comply with the FSB report provisions of AC 120-53 and is to be used by the operator as its means of complying with the appropriate parts of FAR 61 and 141.

2 PILOT "TYPE RATING" REQUIREMENTS

2.1 The Robinson R-22 has characteristics which makes awareness of certain aerodynamic factors mandatory. The awareness of low "G" operations, rotor blade stall potential, energy management, and low rotor RPM recovery techniques are critical.

2.2 The Robinson R-22 is certificated under Part 27 of the Federal Aviation Regulations with a gross weight less than 12,500 pounds. A type rating is not required to operate this aircraft for purposes for which an Airline Transport Pilot Certificate is not required. The type rating for this aircraft is "R-22" and is listed in Order 8700.1, Volume 2, Chapter 9, Fig 9-3.

3 "MASTER COMMON REQUIREMENTS" (MCRs)

3.1 This section does not apply.

4 "MASTER DIFFERENCE REQUIREMENTS" (MDRs)

4.1 This section does not apply.

5 ACCEPTABLE "OPERATOR DIFFERENCE REQUIREMENTS" (ODRs) TABLES

5.1 This section does not apply.

6 FSB SPECIFICATIONS FOR TRAINING

6.1 General:

6.1.1 The provisions of this section of the report apply to programs for all airmen, experienced or otherwise. This includes airmen beginning initial training, airmen who already hold rotorcraft category and helicopter class ratings on their airman certificates. and flight instructors certificated in rotorcraft-helicopters. Certificated flight schools under FAR Part 141 and operators conducting training under FAR Part 61 are affected. Additional requirements may be necessary for other airmen and will be determined by the operator's POI, the FSB, and AFS-800 as necessary.

6.1.2 There is no manufacturer-provided training program which could be credited toward any FAR Part 135 requirements. Nothing in this version (original) contains requirements for training beyond that which is required by FAR Part 61 for pilot certification.

6.2 Applicability:

6.2.1 Any person wishing to operate a Robinson R-22 should complete a training program designed to enhance awareness of the hazards associated with certain characteristics of light helicopters. Flight conducted in normal operating conditions may cause an encounter with such hazards.

6.3 Awareness Training:

6.3.1 Awareness training can be provided through a ground training program consisting of general subject areas in helicopter operational procedures and aerodynamics. The subject matter should include the development of information in the following areas:

6.3.1.1 Discussion of energy management relative to principles of aerodynamics with references to available energy stored as a result of altitude (potential energy) and reference to available energy developed as a result of rotor RPM and airspeed attained (kinetic energy).

6.3.1.2 Discussions involving the causes and results of "mast bumping" in rotorcraft, and in particular, the R-22. Gyroscopic principles leading to the initiation of mast bumping and the effects of such occurrences are to be discussed.

6.3.1.3 Low rotor RPM (blade stall) discussions to provide additional information regarding the aspect of the actual "stall" condition developed by the blade at low rotor RPM (as opposed to "retreating blade stall"). Aspects of recovery techniques to be used in the event of encountering low rotor RPM, the recognition of

such circumstances, and the corrective actions to be taken to recover RPM should be fully discussed.

6.3.1.4 Discussion of the effects on rotor RPM due to engine failure at high manifold pressure settings, high airspeed operations, or other critical areas of flight including the takeoff profile. The discussion should relate to the enhanced and rapid decay of rotor RPM due to the high drag situation developed as a result of high angles of attack of the blade at the point of engine failure. Where the normal reaction time available to the pilot would meet minimum certification requirements under normal power settings, operating with high angle of attack of the main rotor blades, may leave less time available for recovery and correction of a low rotor RPM condition. Such available time may be of sufficiently short duration as to exceed the pilot's capability to respond.

6.3.1.5 The effects of reduced "G": operations on light helicopters such as the Robinson R-22 in light of the particular characteristics of the teetering rotor system rotor blade system and high tail rotor configuration. When a low "G" situation is encountered, such as an abrupt "pitchover" induced by abrupt forward cyclic motion, or by turbulence, the main rotor disc may become unloaded. A rolling tendency will be encountered which could only be aggravated by the application of controls in any direction other than that which would "load" the disk. The pilots natural tendency to fly the aircraft back to level flight by application of lateral cyclic or anti-torque pedal could lead to mast bumping and subsequent rotor separation without adequate knowledge of the cause of the roll and proper recovery actions necessary for safe continuation of flight.

6.4 Flight Training: Abnormal and Emergency Procedures Flight Training

6.4.1 Emphasis should be placed on the ABNORMAL AND EMERGENCY PROCEDURES FLIGHT TRAINING identified by this FSB report and enhanced flight training should be given in the appropriate subject areas.

6.4.2 All pilots:

6.4.2.1 Pilots should receive enhanced training in autorotation procedures and be able to demonstrate proficiency in autorotations from controlled flight in cruise and approach configurations. As the pilots proficiency level increases, he should be able to demonstrate autorotations from all ranges of normal operational speeds.

6.4.2.2 The pilot must be entirely proficient in the control of engine/rotor RPM without the use of the governor, prior to conducting solo flight operations. Pilot training should

include manual manipulation of the throttle control so as to eliminate complacency and undue reliance on the use of the RPM governor.

6.4.2.3. Additional training is required for pilots in the areas of low rotor RPM recognition and recovery techniques. Low rotor RPM recovery will be initiated from all aspects of the normal flight envelope including hover and cruise flight.

6.4.2.4 Pilots should receive training in recovery from RPM "droop" or low rotor RPM situations during high power settings or high altitude operations. Recognition of the requirement for the immediate application of recovery technique is essential because of the increased drag prevalent on the rotor system during such operations and the reduced RPM decay time available for recovery.

6.4.2.5 Pilots must receive training in the effect of low "G" and the proper use of the controls to effect a safe recovery. The demonstration of such effects will be given by instructors who have demonstrated proficiency in such maneuvers within the limits of the normal envelope of operation. Induced roll maneuvers shall not be permitted and recovery must be initiated at the first sign of unintended divergence from the normal flight path.

6.4.3. Flight Instructors:

6.4.3.1 Instructors should note that autorotation training should not be limited to hover autorotations or autorotations from approach configurations at fixed power settings or pre-established airspeeds. As the student's proficiency level increases, he should be able to demonstrate autorotations from all ranges of normal operational speeds.

6.4.3.2 Instructors providing low rotor RPM recovery training must be proficient in and familiar with the proper techniques for the conduct of demonstrations of such maneuvers. Recovery techniques should not allow the student to continue with the maneuver to the point of making additional mistakes. At the initiation of the maneuver, if the student makes an improper recovery or displays inadequate recovery or control technique, the instructor should take control of the aircraft and abort the demonstration. A second attempt at the maneuver may be made after regaining stable flight. Any attempt to continue the maneuver after improper control input during training or checking is unwise. Instructors will be required to demonstrate proficiency in recovery from low rotor RPM situations during high power settings or high altitude operations. Recognition of the requirement for immediate application of recovery techniques is essential due to the increased drag prevalent on the rotor system during such operations and the reduced RPM decay time available for recovery.

6.4.3.3 Instructors should be able to demonstrate the effects of low "G" and must have demonstrated proficiency in the initiation of the maneuver within the limits of the normal envelope of operation. Instructors must be able to demonstrate proficiency at initiating the proper recovery techniques at the first sign of unintended divergence from the normal flight path.

7 FSB SPECIFICATIONS FOR CHECKING

7.1 Applicability:

7.1.1 FAA Aviation Safety Inspectors (ASI) and Designated Pilot Examiners (DPE) should complete the AWARENESS TRAINING, as outlined above. Following completion of training, DPE's may receive a statement of satisfactory completion of the AWARENESS TRAINING which would include a recommendation for the issuance of a Letter of Authorization. The Flight Standards District Office having geographical responsibility for the DPE may, on the basis of the recommendation, issue a Letter Of Authorization specifically for the Robinson R-22 helicopter to authorize the DPE to conduct pilot certification testing in Robinson aircraft.

7.1.2 Each Certificated Flight Instructor must have an endorsement from a DPE or ASI that the AWARENESS training and ABNORMAL AND EMERGENCY PROCEDURES FLIGHT TRAINING required by this FSB has been successfully completed. The AWARENESS TRAINING should be completed successfully before the CFI will be authorized to act as pilot in command of the aircraft. The ABNORMAL AND EMERGENCY PROCEDURES FLIGHT TRAINING must be completed and proficiency in the maneuvers and procedures must be demonstrated to either an FAA ASI or DPE prior to obtaining an endorsement for authorization to give flight instruction in the Robinson R-22.

7.2 The successful completion of the AWARENESS TRAINING should be determined by means of a written or oral examination with a passing grade of at least 70 percent corrected to 100 percent by oral review.

7.3 The successful completion of the ABNORMAL AND EMERGENCY PROCEDURES FLIGHT TRAINING shall be determined by the standards established in the practical test standards appropriate to the grade of certificate held.

8 FSB SPECIFICATIONS FOR CURRENCY

8.1 All pilots who wish to act as pilot in command of a Robinson R-22 aircraft should complete a flight review as required by FAR Part 61.56 in a Robinson R-22 Model helicopter.

8.2 To meet the currency requirements of FAR Part 61.57, to act as pilot in command of an R-22, the currency requirement must have been accomplished in an R-22 helicopter.

9 AIRCRAFT REGULATORY COMPLIANCE CHECKLIST

With the exception of continued airworthiness, there is no operating rule with which the manufacturer is obligated to show compliance.

10 FSB SPECIFICATIONS FOR DEVICES AND SIMULATORS

This section does not apply.

11 APPLICATION OF FSB REPORT

All relevant parts of this report are applicable to operators on the effective date of this report.

12 ALTERNATE MEANS OF COMPLIANCE

12.1 Approval Level and Criteria:

Alternate means of compliance, other than that specified in this report, must be approved by AFS-800. If an alternate means of compliance is sought, operators will be required to submit a proposed alternate means of approval that provides an equivalent level of safety to the provisions of this FSB report. Analysis, demonstrations, proof of concept testing, differences documentation and/or evidence may be required.

12.2 Interim Programs

In the event of unforeseen circumstances which would not allow an operator to comply with the provisions of this FSB report, the operator may seek an interim program, rather than a permanent alternate means of compliance. Financial arrangements, schedule adjustments, and other similar reasons are not considered "unforeseen circumstances" for the purposes of this provision.

13. MISCELLANEOUS

13.1 The following recommendations of the FSB pertain to the certification of the aircraft and suggested design changes to certain systems as improvements deemed necessary for ensuring safe operations of the R-22.

13.1.1 Carburetor air temperature system should incorporate a relocated probe for accuracy of readings of real time carburetor air temperatures. Application of carburetor heat should be initiated at all low power settings (approaches and autorotations) regardless of atmospheric conditions to preclude engine stoppage due to carburetor ice and reinforce pilot training.

13.1.2 Improved rotor speed governor system for the R-22 to reduce the possibility of rotor speed decay due to pilot inattention.

13.1.3 Longitudinal and lateral dampers in parallel with the R-22 cyclic controls to impede abrupt movement of the cyclic.

13.1.4 Low rotor RPM warning system horn should be made more audible. Wiring through the headphone (ICS) system or audio panel may increase pilot awareness.

13.1.5 Redesign of cyclic system to include incorporation of dual cyclic controls as opposed to single teetering control system so as to increase pilot accessibility at each station.

13.1.6 Modification of Rotor/Engine RPM monitoring system (tachometer) to increase visible marking range for usable rotor RPM range (e.g.; 50% to 116%)

13.1.7 Increase inertia of main rotor system

13.1.8 Revise FAR Part 27 to consider main rotor system inertia in single engine helicopters.

FEDERAL AVIATION ADMINISTRATION

ROBINSON R-44
FLIGHT STANDARDIZATION BOARD
REPORT
February 15, 1995

Bryan W. Carpenter - Chairman

MEMBERS

William Wallace
Gilbert Riley
Robert O'Haver

Aircraft Evaluation Group

Fort Worth, Texas
(817) 222-5270

Flight Standardization Board

Robinson R-44

Part 1

(Revision 1)

APPROVED:

CHAIRMAN

Bryan W. Carpenter

Date: 02/09/95

REVIEWED:

Louis C. Cusimano
Manager, General Aviation and Commercial Division
AFS-800

Date: 02/15/95

CONTENTS

SECTION

1. Purpose and Applicability	5
2. Pilot "Type Rating" Requirements	6
3. "Master Common Requirements" (MCRs)	6
4. "Master Difference Requirements" (MCDs)	6
5. Acceptable "Operator Difference Requirements" Tables	6
6. FSB Specifications for Training	6
7. FSB Specifications for Checking	9
8. FSB Specifications for Currency	10
9. Aircraft Regulatory Compliance Checklist	10
10. FSB Specifications for Devices and Simulators	10
11. Application of FSB Report	10
12. Alternate Means of Compliance	10
13. Miscellaneous	11

REVISION RECORD

REVISION No.	SECTION	PAGE #s	DATE
Original		ALL	12/15/93
Revision 1	ALL	ALL	02/15/95

1 PURPOSE AND APPLICABILITY

1.1 The purpose of this report is to specify FAA master training, checking, and currency requirements applicable to airmen operating the Robinson R-44 helicopter under FAR Part 91. One of its primary purposes is to aid Part 61 and Part 141 Air Agencies and FAA Principal Operations Inspectors in the use of applicable training programs.

1.2 Applicability of a Flight Standardization Board is limited due to the fact that the aircraft (R-44) is not designed for scheduled Air Carrier operations.

1.3 The Robinson R-44 is listed in FAA Type certificate Data Sheet H11NM and is hereafter referred to as the "R-44".

1.4 The FSB conducted numerous evaluations of the R-44 in accordance with special detailed information guidelines and the reference material from Advisory Circular 120-53 as applicable, to develop this report. Certain instrument proficiency and training requirements and systems were not evaluated by the FSB because of inapplicability to the training profile or operational use for which the aircraft was intended. The FSB is responsible for evaluating R-44 derivative aircraft and all future changes to the R-44 (such as design modifications or systems changes) when they are made to the aircraft. The FSB then determines the associated impact on training and amends this report accordingly.

1.5 This report also addresses certain issues regarding the operation of the Robinson R-44 other than under FAR Part 61 and 141. Provisions of the report include:

1.5.1. Describing training program special emphasis items.

1.5.2. Endorsement requirements

1.6 The R-44 is certificated for VFR, day and night operations with a minimum crew of one pilot. It may be used in on-demand operations under FAR Part 135, student training and additional rating instruction, and corporate and private transportation under FAR Part 91. Other possible uses include agricultural operations under Part 137 and external load operations under Part 133.

1.7 The Robinson R-44 Flight Standardization Board met in Torrance, California, on January 8 through 20, 1995. Inspectors Bryan W. Carpenter, William Wallace, Gilbert Riley, and Robert O'Haver were members of the Flight Standardization Board.

1.8 This is the second FSB report relative to the Robinson R-44. Provisions of this report are effective until amended, superseded, or withdrawn by subsequent FSB determinations.

1.9 Terminology

The term "must" is used in this report even though it is recognized that this report and the Advisory Circular AC 120-53 on which it is based, provides one acceptable means, but not necessarily the only means, of compliance with FAR Part 61 Subparts C, D, E, G, and Appendix B requirements. The term "must" acknowledges the need for operators to fully comply with the FSB report provisions of AC 120-53 and is to be used by the operator as its means of complying with the appropriate parts of FAR 61 and 141.

2 PILOT "TYPE RATING" REQUIREMENTS

2.1 The Robinson R-44 has characteristics which makes awareness of certain aerodynamic factors mandatory. The awareness of low "G" operations, and recovery techniques are critical. Rotor blade stall potential, energy management, and low rotor RPM recovery techniques are extremely important.

2.2 The Robinson R-44 is certificated under Part 27 of the Federal Aviation Regulations with a gross weight less than 12,500 pounds. A type rating is not required to operate this aircraft for purposes for which an Airline Transport Pilot Certificate is not required. The type rating for this aircraft is "R-44" and is listed in Order 8700.1, Volume 2, Chapter 9, Fig 9-3.

3 "MASTER COMMON REQUIREMENTS" (MCRs)

3.1 This section does not apply.

4 "MASTER DIFFERENCE REQUIREMENTS" (MDRs)

4.1 This section does not apply.

5 ACCEPTABLE "OPERATOR DIFFERENCE REQUIREMENTS" (ODRs) TABLES

5.1 This section does not apply.

6 FSB SPECIFICATIONS FOR TRAINING

6.1 General:

6.1.1 The provisions of this section of the report apply to programs for all airmen, experienced or otherwise. This includes airmen beginning initial training, airmen who already hold rotorcraft category and helicopter class ratings on their airman certificates, and flight instructors certificated in rotorcraft-helicopters. Certificated flight schools under FAR Part 141 and operators conducting training under FAR Part 61 are affected. Additional requirements may be necessary for other airmen and will be determined by the operator's POI, the FSB, and AFS-800 as necessary.

6.1.2 There is no manufacturer-provided training program which could be credited toward any FAR Part 135 requirements. Nothing in this version (revision #1) contains requirements for training beyond that which is required by FAR Part 61 for pilot certification.

6.2 Applicability:

6.2.1 Any person wishing to operate a Robinson R-44 should complete a training program designed to enhance awareness of the hazards associated with certain characteristics of light helicopters. Flight conducted in normal operating conditions may cause an encounter with such hazards.

6.3 Awareness Training:

6.3.1 Awareness training can be provided through a ground training program consisting of general subject areas in helicopter operational procedures and aerodynamics. The subject matter should consist of development of information in the following areas:

6.3.1.1 Discussion of energy management relative to principles of aerodynamics with references to available energy stored as a result of altitude (potential energy) and reference to available energy developed as a result of rotor RPM and airspeed attained (kinetic energy).

6.3.1.2. Discussions involving the causes and results of "mast bumping" in rotorcraft, and in particular, the R-22. Gyroscopic principles leading to the initiation of mast bumping and the effects of such occurrences are to be discussed.

6.3.1.3 Low rotor RPM (blade stall) discussions to provide additional information regarding the aspect of the actual "stall" condition developed by the blade at low rotor RPM (as opposed to "retreating blade stall"). Aspects of recovery techniques to be used in the event of encountering low rotor RPM, the recognition of such circumstances, and the corrective actions to be taken to recover RPM should be fully discussed.

6.3.1.4 Discussion of the effects on rotor RPM due to engine failure at high manifold pressure settings, high airspeed operations, or other critical areas of flight including the takeoff profile. The discussion should relate to the enhanced and rapid decay of rotor RPM due to the high drag situation developed as a result of high angles of attack of the blade at the point of engine failure. Where the normal reaction time available to the pilot would meet minimum certification requirements under normal power settings, operating with high angle of attack of the main rotor blades may leave less time available for recovery and correction of a low rotor RPM condition. Such available time may be of sufficiently short duration as to exceed the pilot's capability to respond.

6.3.1.5 The effects of reduced "G": operations on light helicopters such as the Robinson R-44 in light of the particular characteristics of the teetering rotor system and high tail rotor configuration. When a low "G" situation is encountered, such as abrupt "pitchover" induced by an abrupt forward cyclic motion, or by turbulence, the main rotor disc may become unloaded. A rolling tendency will be encountered which could only be aggravated by the application of controls in any direction other than that which would "load" the disk. The pilots natural tendency to fly the aircraft back to level flight by application of lateral cyclic or anti-torque pedal could lead to mast bumping and subsequent rotor separation without adequate knowledge of the cause of the roll and proper recovery actions necessary for safe continuation of flight.

6.4 Flight Training: Abnormal and Emergency Procedures Flight Training

6.4.1. Emphasis should be placed on the ABNORMAL AND EMERGENCY PROCEDURES FLIGHT TRAINING identified by this FSB report and enhanced flight training should be given in the appropriate subject areas.

6.4.2. All pilots:

6.4.2.1 Pilots should receive enhanced training in autorotation procedures and be able to demonstrate proficiency in autorotations from controlled flight in cruise and approach configurations. As the pilots proficiency level increases, he should be able to demonstrate autorotations from all ranges of normal operational speeds.

6.4.2.2 The pilot must be entirely proficient in the control of engine/rotor RPM without the use of the governor, prior to conducting solo flight operations. Pilot training should include manual manipulation of the throttle control so as to eliminate complacency and undue reliance on the use of the RPM governor.

6.4.2.3. Additional training is required for pilots in the areas of low rotor RPM recognition and recovery techniques. Low rotor RPM recovery will be initiated from all aspects of the normal flight envelope including hover and cruise flight.

6.4.2.4 Pilots should receive training in recovery from RPM "droop" or low rotor RPM situations during high power settings or high altitude operations. Recognition of the requirement for immediate application of recovery technique is essential because of the increased drag prevalent on the rotor system during such operations and the reduced RPM decay time available for recovery.

6.4.2.5 Pilots must receive training in the effect of low "G" and the proper use of the controls to effect a safe recovery. The demonstration of such effects will be given by instructors who have demonstrated proficiency in such maneuvers within the limits of the

normal envelope of operation. Induced roll maneuvers shall not be permitted and recovery must be initiated at the first sign of unintended divergence from the normal flight path.

6.4.3. Flight Instructors:

6.4.3.1 Instructors should note that autorotation training should not be limited to hover autorotations or autorotations from approach configurations at fixed power settings or pre-established airspeeds. As the student's proficiency level increases, he should be able to demonstrate autorotations from all ranges of normal operational speeds.

6.4.3.2 Instructors providing low rotor RPM recovery training must be proficient in and familiar with the proper techniques for the conduct of demonstrations of such maneuvers. Recovery techniques should not allow the student to continue with the maneuver to the point of making additional mistakes. At the initiation of the maneuver, if the student makes an improper recovery or displays inadequate recovery or control technique, the instructor should take control of the aircraft and abort the demonstration. A second attempt at the maneuver may be made after regaining stable flight. Any attempt to continue the maneuver after improper control input during training or checking is unwise. Instructors will be required to demonstrate proficiency in recovery from low rotor RPM situations during high power settings or high altitude operations. Recognition of the requirement for immediate application of recovery techniques is essential due to the increased drag prevalent on the rotor system during such operations and the reduced RPM decay time available for recovery.

6.4.3.3 Instructors should be able to demonstrate the effects of low "G" and must have demonstrated proficiency in the initiation of the maneuver within the limits of the normal envelope of operation. Instructors must be able to demonstrate proficiency at initiating the proper recovery techniques at the first sign of unintended divergence from the normal flight path.

7 FSB SPECIFICATIONS FOR CHECKING

7.1 Applicability:

7.1.1 FAA Aviation Safety Inspectors (ASI) and Designated Pilot Examiners (DPE) should complete the AWARENESS TRAINING, as outlined above. Following completion of training, DPE's may receive a statement of satisfactory completion of the AWARENESS TRAINING which would include a recommendation for the issuance of a Letter of Authorization. The Flight Standards District Office having geographical responsibility for the DPE may, on the basis of the recommendation, issue a Letter Of Authorization specifically for the Robinson R-44 helicopter to authorize the DPE to conduct pilot certification testing in Robinson aircraft.

7.1.2 Each Certificated Flight Instructors must have an endorsement from a DPE or ASI that the AWARENESS training and ABNORMAL AND EMERGENCY PROCEDURES FLIGHT TRAINING required by this FSB has been successfully completed. The AWARENESS TRAINING should be completed successfully before the CFI will be authorized to act as pilot in command of the aircraft. The ABNORMAL AND EMERGENCY PROCEDURES FLIGHT TRAINING must be completed and proficiency in the maneuvers and procedures must be demonstrated to either an FAA ASI or DPE prior to obtaining an endorsement for authorization to give flight instruction in the Robinson R-44.

7.2 The successful completion of the AWARENESS TRAINING should be determined by means of a written or oral examination with a passing grade of at least 70 percent corrected to 100 percent by oral review.

7.3 The successful completion of the ABNORMAL AND EMERGENCY PROCEDURES FLIGHT TRAINING will be determined by the standards established in the practical test standards appropriate to the grade of certificate held.

8 FSB SPECIFICATIONS FOR CURRENCY

8.1 All pilots who wish to act as pilot in command of a Robinson R-44 aircraft should complete a flight review as required by FAR Part 61.56 in a Robinson R-44 Model helicopter.

8.2 To meet the currency requirements of FAR Part 61.57, to act as pilot in command of an R-44, the currency requirement must have been accomplished in an R-44 helicopter.

9 AIRCRAFT REGULATORY COMPLIANCE CHECKLIST

With the exception of continued airworthiness, there is no operating rule with which the manufacturer is obligated to show compliance.

10 FSB SPECIFICATIONS FOR DEVICES AND SIMULATORS

This section does not apply.

11 APPLICATION OF FSB REPORT

All relevant parts of this report are applicable to operators on the effective date of this report.

12 ALTERNATE MEANS OF COMPLIANCE

12.1 Approval Level and Criteria:

Alternate means of compliance, other than that specified in this report, must be approved by AFS-800. If an alternate means of compliance is sought, operators will be required to submit a proposed alternate means of approval that provides an equivalent level of safety to the

provisions of this FSB report. Analysis, demonstrations, proof of concept testing, differences documentation and/or evidence may be required.

12.2 Interim Programs

In the event of unforeseen circumstances which would not allow an operator to comply with the provisions of this FSB report, the operator may seek an interim program, rather than a permanent alternate means of compliance. Financial arrangements, schedule adjustments, and other similar reasons are not considered "unforeseen circumstances" for the purposes of this provision.

13. MISCELLANEOUS

13.1 The following recommendations of the FSB pertain to the certification of the aircraft and suggested design changes to certain systems as improvements deemed necessary for ensuring safe operations of the R-44.

13.1.1 Low rotor RPM warning system horn should be made more audible. Wiring through the headphone (ICS) system or audio panel may increase pilot awareness.

13.1.2 Redesign of cyclic system to include incorporation of dual cyclic controls as opposed to single teetering control system so as to increase pilot accessibility at each station.

13.1.3 Modification of Rotor/Engine RPM monitoring system (tachometer) to increase visible marking range for usable rotor RPM range (e.g.; 50% to 116%).

13.1.4 Revise FAR Part 27 to consider main rotor system inertia in single engine helicopters.