Explanatory Statement

Civil Aviation Safety Regulations 1998

Conditions and direction concerning certain aircraft fitted with engines manufactured by Jabiru Aircraft Pty Ltd

Purpose
This instrument prescribes operating limitations on aircraft (***Jabiru-powered aircraft***) fitted with engines manufactured by Jabiru Aircraft Pty Ltd (***Jabiru***), to manage risks arising from a high incidence of engine loss-of-power events and other reliability issues. The instrument substantially reproduces limitations on Jabiru-powered aircraft imposed in instrument CASA 102/15 that expires on 30 June 2016 but the limitations now need not be complied with if certain requirements as set out in the instrument are met.

Legislation
Section 98 of the *Civil Aviation Act 1988* (the ***Act***) empowers the Governor-General to make regulations for the Act and the safety of air navigation. Under paragraph 98 (5A) (a) of the Act, such regulations may empower CASA to issue instruments in relation to matters affecting the safe navigation and operation of aircraft.

Regulation 11.068 of the *Civil Aviation Safety Regulation 1998* (***CASR 1998***) empowers CASA to impose conditions on specified classes of 'authorisation', which relevantly includes aircraft certificates of airworthiness.

Regulation 11.245 of CASR 1998 empowers CASA to issue directions, for the purpose of CASA's functions and if necessary in the interests of the safety of air navigation, about any matter affecting:

(a) the safe navigation and operation of aircraft; or
(b) the maintenance of aircraft; or
(c) the airworthiness of aircraft.

Civil Aviation Order 95.55 (***CAO 95.55***) applies to certain ultralight aeroplanes registered with Recreational Aviation Australia Incorporated. It grants an exemption from several provisions of the regulations under the Act, subject to conditions imposed in the interests of aviation safety.

Background to the instrument
In 2014, CASA became aware of a high, and increasingly high, rate of loss-of-power events and other engine reliability issues among Jabiru-powered aircraft. The loss-of-power events and engine reliability problems appeared to:

(a) be the result of several failure modes, including engine through bolt failure, cylinder cracking, flywheel bolt failure and failure of the valve train assembly; and
(b) affect a range of Jabiru engine models, although CASA has only a small sample size for some models; and
(c) occur across the range of different operational activities in which Jabiru-powered aircraft are employed, although a disproportionate number of events appear to occur in flying training activities.

As a precautionary measure, in the absence of determinative evidence as to the specific cause(s) of these problems, and following an appropriate consultation process, CASA first made instrument CASA 292/14 effective from 23 December 2014, which imposed a range of operating limitations on Jabiru-powered aircraft up to 30 June 2015. Those limitations were largely continued by the making of CASA instrument CASA 102/15 on 29 June 2015.

The Australian Transport Safety Bureau (ATSB) conducted an aviation research investigation into these matters. Consistent with the reports of its preliminary investigation findings published in July 2013, August 2014 and December 2014, in its final report, Engine Failures and Malfunctions in Light Aeroplanes (AR-2013-107), which was published on 9 March 2016, the ATSB found:

> Aircraft powered by Jabiru engines were involved in the most engine failures or malfunctions with 130 reported over the six years [from 2009 to 2014]. This represents about one in ten aircraft powered by Jabiru engines in the study having reported an engine failure or malfunction.

In conclusion, the ATSB found:

> When factoring in the hours flown for each of these engine manufacturers, aircraft with Jabiru engines had more than double the rate of engine failure or malfunction than any other of the manufacturers in the study set with 3.21 failures per 10,000 flown.

Progress has been made since June 2015 to identify appropriate corrective actions to mitigate the risk of loss-of-power events of the kind giving rise to CASA's initial precautionary action. CASA is now satisfied that the corrective actions or requirements identified in the instrument will be sufficiently to justify removing the operating limitations, so long as the corrective actions or requirements as described in the instrument are all complied with.

If they are not all complied with, CASA remains of the view that its functions under the Act require it, in the interests of safety, to mitigate the potentially heightened risks associated with Jabiru-powered aircraft, having particular regard to:

(a) people who fly, or fly in, a Jabiru-powered aircraft, without being in a position to make a properly informed choice about whether to expose themselves to the potentially heightened risks; and

(b) people who fly a Jabiru-powered aircraft who may lack sufficient skill and experience to deal competently with a loss-of-power event; and

(c) people who share airspace with Jabiru-powered aircraft, without having the opportunity to minimise or eliminate their exposure to the potentially heightened risks; and

(d) people on the ground, who may be entirely unaware of the potentially heightened risks posed by Jabiru-powered aircraft, and are unable to take steps to minimise or eliminate their exposure to these potentially heightened risks.

In CASA's view, it is necessary and appropriate to limit the exposure of these classes of persons to a heightened potential risks attendant on an inflight failure or malfunction of the aircraft engine. The instrument re-imposes virtually the same operating limitations set out in instruments CASA 292/14 and CASA 102/15 on Jabiru-powered aircraft, but those limitations need not be complied with if all the appropriate mitigating factors or requirements

identified as required to mitigate the risk of loss-of-power events and other reliability issues are met. Schedule 2 of the instrument sets out those factors or requirements as follows:

(a) the aircraft's engine grouping is identified by a review of its engine serial number and maintenance records to confirm configuration based on through bolt and valve lifter type; and
(b) the registered owner of the Jabiru-powered aircraft adopts, and uses, the manufacturer's maintenance schedule for the engine, if that schedule is not already being used; and
(c) the engine's top valve spring washers are inspected in accordance with Jabiru Service Letter JSL008-1 or later issue and any worn washers are replaced with the current washer configuration and installed in accordance with engine overhaul manual JEM0001-7 or later issue, and
(d) the cylinder heads are inspected in accordance with Jabiru Service Letter JSL014-3 or later issue and any requisite corrective action required by the service letter is completed, and
(e) all engine through bolts are replaced in accordance with the technical content in Jabiru Service Bulletin JSB031-3 or later issue, with any replacement parts being current through bolt, nut and washer configuration installed in accordance with engine overhaul manual JEM0001-7 or later issue by the following time: (a) for Group A engines with 3/8" through bolts that have engaged in any flight training prior to reaching 500 hours Hobbs time since last through bolt replacement or for engines which have exceeded 500 hours replace through bolt before further flight, or (b) for all engine groups that have not engaged in flight training, at or before 1 000 hours Hobbs time since last through bolt replacement.

The operational limitations in Schedule 1 will also apply to Jabiru-powered aircraft in respect of which a certificate of airworthiness has been issued under Part 21 of CASR 1998, as well as Jabiru-powered aircraft that operate under the regime in CAO 95.55 — unless all the provisions in Schedule 2 are met.

The legislative instrument

The legislative instrument sets out operating limitations for Jabiru-powered aircraft that mitigates certain risks of loss-of-power events, particularly in relation to those classes of people who are unable to gauge or control those risks, being passengers, trainee pilots, and persons on the ground.

The limitations are expressed to apply to pilots in command of Jabiru-powered aircraft and the chief flying instructor of a school that sends a student on a solo flight in a Jabiru-powered aircraft.

The instrument also sets out when the operating limitations need not be complied with.

Except as expressly stated in the instrument, the operational limitations are intended to displace any inconsistent operational authorisation in regulations and other instruments made for the purpose of the statutory scheme under the Act, for example an authorisation to operate over built-up areas under subregulation 262AP (5) of the *Civil Aviation Regulations 1988*.

The instrument is repealed at the end of 30 June 2019.

Notes on the provisions of the instrument are set out in Appendix 1.

Legislative Instruments Act
Under paragraph 98 (5A) (a) of the Act, regulations made for that provision may empower CASA to issue instruments in relation to matters affecting the safe navigation and operation of aircraft. Under subsection 98 (5AA) of the Act, an instrument issued under paragraph 98 (5A) (a) is a legislative instrument if expressed to apply in relation to a class of persons or aircraft.

The instrument applies to classes of persons and aircraft. The instrument is, therefore, a legislative instrument, subject to registration, and tabling and disallowance in the Parliament, under sections 24, and 38 and 42, of the *Legislation Act 2003*.

Consultation
CASA conducted public consultation on the draft of instruments CASA 292/14 and CASA 102/15, receiving 632 comments. Those comments were taken into account in finalising the instrument.

Without imposing any new or substantially different limitations, the present instrument re-imposes the limitations in instrument CASA 102/15, but the instrument, and in particular Schedule 2 of it, now sets out when the operating limitations need not be complied with. On 20 June 2016, CASA consulted Jabiru Aircraft Pty Limited about the draft instrument. On 21 June 2016, CASA consulted Recreational Aviation Australia Incorporated about the draft instrument. On 22 June 2016, CASA consulted Sport Aircraft Association of Australia about the draft instrument. Those entities supported the making of the instrument.

Office of Best Practice Regulation (*OBPR*)
OBPR considers that the operational limitations are likely to have a minor regulatory impact on business, community organisations and individuals and that no further analysis in the form of a Regulation Impact Statement was required (OBPR ID: 18075).

Statement of Compatibility with Human Rights
The Statement in Appendix 2 is prepared in accordance with Part 3 of the *Human Rights (Parliamentary Scrutiny) Act 2011*. The legislative instrument does not directly engage any of the applicable rights or freedoms, and is compatible with human rights, as it does not directly raise any human rights issues. To the extent that it may indirectly limit certain human rights, those limitations are necessary and proportionate in the interests of aviation safety (see Appendix 2).

Commencement and making
The legislative instrument commences on 1 July 2016. The legislative instrument has been made by the Director of Aviation Safety, on behalf of CASA, in accordance with subsection 73 (2) of the Act.

[Instrument number CASA 65/16]

Appendix 1

Details of the instrument 'Conditions and direction concerning certain aircraft fitted with engines manufactured by Jabiru Aircraft Pty Ltd'

Section 1 – duration

This section states the period in which the instrument will have effect. It will commence on 1 July 2016 and will be repealed at the end of 30 June 2019.

Section 2 – definitions

This section sets out definitions for the instrument. Among other self-explanatory terms, the section defines:

(a) ***engine grouping*** to mean one of the engine group classifications in the table in the instrument. Whilst the table refers to serial numbers, these are a guide only. The engine grouping is to be determined by a verification of what valve lifters and through bolts are used in the engine.

(b) ***flying school*** to cover any provider of flying training services using a Jabiru-powered aircraft, whether it is called a 'flight training facility' or otherwise.

(c) ***flight training*** to mean any operation of the kind described in *Jabiru Service Bulletin JSB031-3* as involving "*the increased number of takeoff and landing events as well as go-arounds, simulated engine failure and stall recovery operations. This subjects the engine to quick changes in throttle setting and relatively fast changes and extremes in temperature.* This means that a flight training activity may extend to things other than strictly in relation to flight training if the aircraft is used in other types of operations that have similar characteristics to flight training.

(d) ***populous area*** to make it clear that it is the pilot's responsibility to ensure that a location is not populous if the pilot intends to use the location as a potential emergency landing site for the purposes of the operating limitations. This will involve pilots making an informed judgment about the use of a location at a particular time.

(e) ***student pilot*** to capture all persons that may fly a Jabiru-powered aircraft that are receiving initial flying training and have not received one of the several pilot qualifications recognised by Australian law and listed in the definition.

Section 3 – application

Subsection 3 (1) describes the classes of authorisation to which the conditions in section 4 will apply. The subsection sets out the various types of certificates of airworthiness under Part 21 of CASR 1998 that have been issued in respect of Jabiru-powered aircraft.

Subsection 3 (2) states that the direction in section 5 applies to each aircraft fitted with an engine manufactured by Jabiru to which CAO 95.55 applies.

Section 4 – conditions

This section states that each Jabiru-powered aircraft to which the section applies must be operated in accordance with the operating limitations set out in Schedule 1 to the instrument, unless the requirements in Schedule 2 have been complied with.

Section 5 – directions

A significant number of aircraft fitted with engines manufactured by or under licence from Jabiru do not require a certificate of airworthiness, and instead operate under the regime in CAO 95.55. Such aircraft are not the subject to an authorisation to which CASR 11.068 condition can apply.

This section of the instrument issues a direction requiring such aircraft to be operated in accordance with the limitations in Schedule 1, unless all the requirements in Schedule 2 are met.

Schedule 1 – Operating limitations for Jabiru-powered aircraft

Clause 1

Clause 1 restricts aircraft affected by the instrument to flight by day under the Visual Flight Rules, unless otherwise approved by CASA. Pilots are at much greater risk if they make an emergency landing in other conditions.

Clause 2

Clause 2 imposes limitations to ensure that aircraft affected by the instrument do not impact people on the ground. Paragraph (a) requires pilots to operate affected aircraft so that they can at all times glide clear of a populous area, in the event of a loss-of-power event, and land at a suitable forced-landing area, as that term is defined in section 2.

Cumulative to paragraph (a), pilots are also required by paragraph (b) to operate affected aircraft at or above 1 000 feet above ground level, except to the extent necessary for the conduct of a safe take-off or landing. Paragraph (b) ensures that flights in aircraft affected by the instrument operate at or above 1 000 feet above ground level as much as possible when over populous areas. That is the height that CASA has assessed as providing the minimum altitude to identify and utilise a suitable location for an emergency landing.

Subject to air traffic control and other air traffic considerations, pilots are expected to exercise judgment to optimise rate of climb on take-off, and to determine the fastest safe rate of descent on landing, to maximise the time spent at or above 1 000 feet.

Clause 3

Clause 3 imposes restrictions on the circumstances in which passengers may be carried in aircraft affected by the instrument.

While CASA is prepared to allow passengers to accept the risk of flight in affected aircraft, clause 3 requires passengers to sign a statement that puts them on notice about the risks of flight in the aircraft. The pilot in command of an affected aircraft may only carry a passenger if the passenger signed the statement not more than 3 calendar months before the day of the flight. For example, if a passenger signs the acknowledgement on 2 April 2015, the passenger would need to sign it again for any flight in a Jabiru-powered aircraft on or after 2 July 2015.

If a passenger is aged under 18, or has a mental impairment, an adult having legal responsibility for the passenger must sign the statement.

The statement must be substantially in the terms of the statement set out in clause 6 of Schedule 1.

Under paragraph (b), the pilot in command is obliged to reach a reasonable satisfaction that a person signing a statement under this clause has understood the terms of the statement. The pilot is obliged to make reasonable enquiries to reach this satisfaction, if necessary. The pilot must be satisfied both as to the signatory's understanding of the substance of the statement and any issues related to the signatory's English comprehension.

Paragraph (c) of clause 3 requires the pilot in command to keep all statements in a secure location, that is not on any aircraft during flight, so that the statements are preserved if the aircraft is involved in an accident.

Paragraph (d) limits passenger-carrying flights in Jabiru-powered aircraft to private operations. The intention is that Jabiru-powered aircraft not be used for any commercial passenger-carrying operations.

Clause 4

Clause 4 sets out how the pilot in command must handle passenger statements at the conclusion of a passenger flight in an aircraft affected by the instrument.

Paragraph (b) permits the pilot in command to dispose of a statement at any time after the passenger has safely disembarked the aircraft after the passenger flight.

The pilot in command may elect not to dispose of the statement of a passenger if the pilot wishes to use the statement in respect of a future flight of the same passenger (but subject to the validity period specified in clause 3). The pilot must obtain a new signed statement from a passenger if he or she has disposed of a previous statement of that passenger.

Paragraph (c) operates if there is a loss-of-power event involving a passenger-carrying operation in an aircraft affected by the instrument. In this situation, the pilot in command must send the signed statements of all the passengers to CASA as soon as practicable after the flight, even if the passengers were not injured. For evidentiary purposes, the statements must be sent to CASA by registered mail.

The obligation in paragraph (c) may also be discharged by the pilot's legal representative, for example if the pilot has died.

Clause 5

Clause 5 imposes restrictions on the circumstances in which student pilots may be carried in aircraft affected by the instrument.

Paragraph (a) requires that, before a student undertakes a first solo flight at any given flying school, the chief flying instructor (***CFI***) (however named) of that school must:

(a) confirm that the student pilot has competently completed engine-failure exercises at the school in the preceding 2 hours of flight time. The 2 hours of flight time may be

completed at any school but the engine-failure exercises must be completed at the school of the confirming CFI; and

(b) note the student's competence in engine-failure exercises in the student pilot's record and obtain the student pilot's countersignature on that record; and

(c) obtain and keep in a secure location, not on any aircraft during flight, a statement signed by the student pilot that is substantially in the form of the statement in clause 6 of Schedule 1 of the instrument. However, the statement must be signed by an adult having legal responsibility for a student pilot who is aged under 18; and

(d) determine on reasonable grounds that a person signing a statement under clause 5 has understood the terms of the statement. The CFI is obliged to make reasonable enquiries to reach this satisfaction if necessary, and must be satisfied both as to the signatory's understanding of the substance of the statement, and any issues related to the signatory's English comprehension.

Paragraph (b) requires that, before a student undertakes any subsequent solo flight at a school, the CFI of that school must confirm that the student has competently performed engine-failure exercises at that school in either the preceding 2 hours of flight time or 7 calendar days, whichever is the more recent. Accordingly, a student who has conducted 3 hours of flight time since their previous engine-failure exercises must re-complete those exercises before flying solo, even if their previous exercises were less than 7 days ago. Conversely, a student may fly solo at any time in the 7 days since their previous engine-failure exercises until they have completed 2 hours of flight time. However, the 7 day/2 hour requirement does not override any more onerous recency requirement for engine-failure exercises before solo flight.

The CFI must again note the competence of the student in the student's pilot record, and the pilot must countersign that note.

The limitations in clause 5 ensure that the CFI is satisfied that the solo pilot is current and competent in their ability to conduct an emergency landing, and has a heightened awareness of the engine's reliability issues.

Clause 6

Clause 6 sets out the statement to be signed by passengers and student pilots before flights in aircraft affected by the instrument. The statement is drafted in the first person and requires the passenger or student pilot (as the case requires) to insert their name, the identifying mark of the aircraft and to sign and date the statement. In addition:

(a) paragraph 1 of the statement acts as a notice to the signatory that CASA is aware of a high rate of reliability problems with the engine in the aircraft to be used for the flight;

(b) paragraph 2 acts as a notice to the signatory that CASA has imposed limitations on the use of the aircraft to protect people on the ground, uninformed passengers and student pilots, and to assist passengers and student pilots to understand and manage risks associated with the aircraft affected by the instrument;

(c) paragraph 3 acts as a notice to the signatory about the extent of risk. While the extent of risk cannot be fully quantified and most Jabiru engines can be expected to operate normally, this paragraph notes that there is an abnormal risk that the engine in the signatory's aircraft will malfunction. The paragraph is intended to heighten the

signatory's awareness of the personal risk involved, allowing him or her to make a better informed judgment about whether to proceed;

(d) paragraph 4 provides an opportunity for the signatory to focus his or her mind on whether to accept the risk of flying in an aircraft affected by the instrument. The paragraph requires the signatory to accept the risks involved if the pilot forced lands the aircraft while avoiding a populous area or otherwise fails to make a safe emergency landing;

(e) paragraph 5 provides a further opportunity for the signatory to focus his or her mind on whether to accept the risk of flying in an affected aircraft, by stating that CASA advises the signatory not to fly in the aircraft if he or she is not prepared to accept the heightened risk;

(f) paragraph 6 requires the signatory to accept the risk in the specific circumstance that the engine reliability problems may be resolved in the near future, as distinct from posing an ever-present risk;

(g) paragraph 7 is a notice to the signatory that the statement must be signed before the pilot is authorised to conduct the flight. While the notice is redundant once signed, it explains to a potential signatory the legal position of pilots in command and CFIs, who have obligations to passengers and student pilots under the instrument.

Schedule 2 – Operating limitations for Jabiru-powered aircraft

The operating limitations in Schedule 1 do not apply if:

(a) the aircraft's engine grouping is identified by a review of its engine serial number and maintenance records to confirm configuration based on through bolt and valve lifter type; and

(b) the registered owner of the Jabiru-powered aircraft adopts, and uses, the manufacturer's maintenance schedule for the engine, if that schedule is not already being used; and

(c) the engine's top valve spring washers are inspected in accordance with Jabiru Service Letter JSL008-1 or later issue and any worn washers are replaced with the current washer configuration and installed in accordance with engine overhaul manual JEM0001-7 or later issue; and

(d) the cylinder heads are inspected in accordance with Jabiru Service Letter JSL014-3 or later issue and any requisite corrective action required by the service letter is completed; and

(e) all engine through bolts are replaced in accordance with the technical content in Jabiru Service Bulletin JSB031-3 or later issue, with any replacement parts being current through bolt, nut and washer configuration installed in accordance with engine overhaul manual JEM0001-7 or later issue by the following time: (a) for Group A engines with 3/8" through bolts that have engaged in any flight training prior to reaching 500 hours Hobbs time since last through bolt replacement or for engines which have exceeded 500 hours replace through bolt before further flight, or (b) for all engine groups that have not engaged in flight training, at or before 1 000 hours Hobbs time since last through bolt replacement.

Appendix 2

Statement of Compatibility with Human Rights

Prepared in accordance with Part 3 of the Human Rights (Parliamentary Scrutiny) Act 2011

Civil Aviation Safety Regulations 1998

Conditions and direction concerning certain aircraft fitted with engines manufactured by Jabiru Aircraft Pty Ltd

This legislative instrument is compatible with the human rights and freedoms recognised or declared in the international instruments listed in section 3 of the *Human Rights (Parliamentary Scrutiny) Act 2011*.

Overview of the legislative instrument

This instrument prescribes operating limitations on aircraft fitted with engines manufactured by, or under licence from or under a contract with, Jabiru Aircraft Pty Ltd (***Jabiru-powered aircraft***), to manage risks arising from a high incidence of engine loss-of-power events and other reliability issues.

The legislative instrument is, therefore, a safety measure designed to mitigate immediate risks to persons flying in Jabiru-powered aircraft.

Human rights implications

To the extent that the instrument prevents Jabiru-powered aircraft from being used for commercial flying training purposes by business, it might be said that the rights to work, equality and non-discrimination under the International Covenant on Civil and Political Rights, the International Covenant on Economic, Social and Cultural Rights are engaged. However, such differential treatment arises from the requirements of aviation safety for the particular types of specialised aircraft involved and is designed to promote the rights to health and life of certain persons that may fly in Jabiru-powered aircraft.

Conclusion

The legislative instrument is compatible with the human rights and freedoms recognised or declared in the international instruments listed in section 3 of the *Human Rights (Parliamentary Scrutiny) Act 2011*. To the extent that it may also limit human rights, those limitations are reasonable and proportionate in the interests of aviation safety. However, the limitations need not be complied with if requirements specified in the instrument have been met.