RESEARCH AND DEVELOPMENT INSTITUTE
OF FLIGHT TESTS TECHNOLOGIES

Flight Test Record 31

Flight characteristics

Flight tasks

Spinning

Configuration					
Aeroplane: **ALTO 912 TG**	Takeoff weight:	Crew:	Meteorological conditions:	Takeoff time: **06:30 UTC**
Tail number: **OK – TAR 07**	**389** kg CG: **29.3%**	**SERGEY KOVALYOV** **Test-pilot**	**CAVOK, calm** Air pressure: **1016 QNH**	Landing time: **14:45 UTC**
Serial number: **DF–052/2013**	**600** kg CG: **25.0%**	**ballast**	Flight Location: **Ukraine** Flight zone : **UKT-801** Altitude: **245 ft AMSL**	Total flight time: **3:30 hrs**
Engine: **ROTAX 912 ULS**	Propeller: **Woodcomp Propuls 174/3/R**			

Test methodology

Goal: Verify whether the airplane fulfill regulation requirement in accordance with § 4.5.9.1 and § 4.5.9.3. ASTM F2245 – 13b. For airplanes placarded "no intentional spins," the airplane must be able to recover from a one-turn spin or a 3-s spin, whichever takes longer, in not more than one additional turn, with the controls used in the manner normally used for recovery. In addition, for either 4.5.9.1:

(1) For both the flaps-retracted and flaps-extended conditions, the applicable airspeed limit and limit maneuvering load factor may not be exceeded.
(2) There may be no excessive control forces during the spin or recovery.
(3) It must be impossible to obtain uncontrollable spins with any use of the controls.
(4) For the flaps-extended condition, the flaps may be retracted during recovery.

Enter data in the flight manual – input speed V [kph], altitude loss [m], evaluation of behavior [-]

Test conditions:

The test airplane must be equipped by central emergency parachute. The pilot must be equipped by emergency parachute.
Equipment: altitude measurement unit.

Procedure:

1. Train the emergency jump from the aeroplane.
2. Secure or remove all of the unsecured items.
3. Check the function of central emergency parachute.
4. Climb to safe altitude (7000ft–9000ft)
5. Input speed into to the spin is V = 1.05 V_S.
6. Control surfaces during the spin are in usual position for the spin. Enter into a spin (full deflection of rudder and slow pulling the elevator) and after 3 seconds or one–turn make a recover to the horizontal flight.
7. Register the data of altitude loss. The altitude loss is the vertical distance between control actions for recovery from a manoeuvre to the horizontal flight.
8. Do this task for minimum weight and maximum front and aft c.g. position, maximum take-off weight and maximum front and aft c.g. position.
9. Do this task for both the flaps–retracted and flaps–extended position.

Minimum take-off weight, maximum front c.g. position, flaps 0°

input speed	Left one–turn spin			Right one–turn spin		
V	IAS during recovery	Altitude loss	Additional turn	IAS during recovery	Altitude loss	Additional turn
[kph]	[kph]	[m]	[deg]	[kph]	[m]	[deg]
84	160	50	45	160	50	45
85	170	70	45	160	50	45
84	155	60	45	165	60	45
Average	162	70	45	162	54	45
Evaluation	See evaluation below					

Minimum take-off weight, maximum front c.g. position, flaps 12°

input speed	Left one–turn spin			Right one–turn spin		
V	IAS during recovery	Altitude loss	Additional turn	IAS during recovery	Altitude loss	Additional turn
[kph]	[kph]	[m]	[deg]	[kph]	[m]	[deg]
80	160	80	30	160	80	30
80	160	70	30	160	80	30
80	160	80	30	150	80	30
Average	160	77	30	157	80	30
Evaluation	See evaluation below					

Maximum take-off weight, maximum front c.g. position, flaps 0°

input speed	Left one–turn spin			Right one–turn spin		
V	IAS during recovery	Altitude loss	Additional turn	IAS during recovery	Altitude loss	Additional turn
[kph]	[kph]	[m]	[deg]	[kph]	[m]	[deg]
84	170	50	60	160	60	60
85	170	55	60	160	65	60
85	170	45	50	160	55	50
Average	170	50	55	160	60	55
Evaluation	See evaluation below					

Maximum take-off weight, maximum front c.g. position, flaps 12°

input speed	Left one–turn spin			Right one–turn spin		
V	IAS during recovery	Altitude loss	Additional turn	IAS during recovery	Altitude loss	Additional turn
[kph]	[kph]	[m]	[deg]	[kph]	[m]	[deg]
84	160	60	60	160	60	60
84	160	60	60	170	60	60
84	150	55	50	150	60	50
Average	157	58	55	160	60	56
Evaluation	See evaluation below					

Evaluation:

The airplane fulfill requirement § 4.5.9.1 and § 4.5.9.3. ASTM F2245 – 13b for maximum front c.g. position and minimum/maximum takeoff weight.

The airplane was being put into the flight configuration typical for entry into a spin from direct fly. It means slow pulling the control stick to get the nose of the airplane over the horizon about 10° – 15°, speed V = 1.05 V_S, ailerons in neutral position and when the speed reached 85 km/h, gradual rudder deflection to its maximum on the side of assumed spin rotation and pulling the control stick. The airplane feedback during was, as follows:

Decline the nose of the airplane below the horizon.

About 20° change in direction on the side of rudder deflection.

During this time there was a slight control stick vibration.

Entry into the spin.

Airplane entry into the spin slowly and smoothly. To recover the spin it is sufficient to put rudder control into neutral position and elevator to a half position between neutral and fully push. The size of additional turn depends on the weight of airplane (if c.g. is constant) and also flaps configuration. For front c.g. position, maximum additional turn angle was 55 deg. Control forces are proportional to the speed of recovery.

These flights have been done for two weight configurations: maximum front c.g. position and appropriate weights – see the header.

Maximum flight time for 389 kg is set to 20 minutes to keep weight limit tolerance in accordance with 4.1.2.

Maximum flight time for 600 kg is set to 35 minutes to keep weight limit tolerance in accordance with 4.1.2.

Refuelling if needed.

Recorded by: S. KOVALYOV Date: 26. 05. 2014

RESEARCH AND DEVELOPMENT INSTITUTE
OF FLIGHT TESTS TECHNOLOGIES

Flight Test Record 32

Flight characteristics

Flight tasks

Spinning

Configuration					
Aeroplane: **ALTO 912 TG**	Takeoff weight:	Crew:	Meteorological conditions:	Takeoff time: **06:10 UTC**
Tail number: **OK – TAR 07**	**431** kg CG: **35.0%**	**SERGEY KOVALYOV** **Test-pilot**	**CAVOK, calm** Air pressure: **1016 QNH**	Landing time: **16:50 UTC**
Serial number: **DF–052/2013**	**600** kg CG: **35.0%**	**ballast**	Flight Location: **Ukraine** Flight zone : **UKT-801** Altitude: **245 ft AMSL**	Total flight time: **3:25 hrs**
Engine: **ROTAX 912 ULS**	Propeller: **Woodcomp Propuls 174/3/R**			

Test methodology

Goal: Verify whether the airplane fulfill regulation requirement in accordance with § 4.5.9.1 and § 4.5.9.3. ASTM F2245 – 13b. For airplanes placarded "no intentional spins," the airplane must be able to recover from a one-turn spin or a 3-s spin, whichever takes longer, in not more than one additional turn, with the controls used in the manner normally used for recovery. In addition, for either 4.5.9.1:

(1) For both the flaps-retracted and flaps-extended conditions, the applicable airspeed limit and limit maneuvering load factor may not be exceeded.
(2) There may be no excessive control forces during the spin or recovery.
(3) It must be impossible to obtain uncontrollable spins with any use of the controls.
(4) For the flaps-extended condition, the flaps may be retracted during recovery.

Enter data in the flight manual – input speed V [kph], altitude loss [m], evaluation of behavior [-]

Test conditions:

The test airplane must be equipped by central emergency parachute. The pilot must be equipped by emergency parachute.
Equipment: altitude measurement unit.

Procedure:

1. Train the emergency jump from the aeroplane.
2. Secure or remove all of the unsecured items.
3. Check the function of central emergency parachute.
4. Climb to safe altitude (7000ft–9000ft)
5. Input speed into to the spin is V = 1.05 V_S.
6. Control surfaces during the spin are in usual position for the spin. Enter into a spin (full deflection of rudder and slow pulling the elevator) and after 3 seconds or one–turn make a recover to the horizontal flight.
7. Register the data of altitude loss. The altitude loss is the vertical distance between control actions for recovery from a manoeuvre to the horizontal flight.
8. Do this task for minimum weight and maximum front and aft c.g. position, maximum take-off weight and maximum front and aft c.g. position.
9. Do this task for both the flaps–retracted and flaps–extended position.

Minimum take-off weight, maximum aft c.g. position, flaps 0°

input speed	Left one–turn spin			Right one–turn spin		
V	IAS during recovery	Altitude loss	Additional turn	IAS during recovery	Altitude loss	Additional turn
[kph]	[kph]	[m]	[deg]	[kph]	[m]	[deg]
84	160	70	90	160	60	80
83	170	90	120	160	60	90
84	155	80	100	165	60	100
Average	162	80	105	162	60	90
Evaluation	See evaluation below					

Minimum take-off weight, maximum aft c.g. position, flaps 12°

input speed	Left one–turn spin			Right one–turn spin		
V	IAS during recovery	Altitude loss	Additional turn	IAS during recovery	Altitude loss	Additional turn
[kph]	[kph]	[m]	[deg]	[kph]	[m]	[deg]
80	160	70	80	160	75	90
80	160	70	80	160	70	80
80	160	80	70	150	80	80
Average	160	73	77	157	75	84
Evaluation	See evaluation below					

Maximum take-off weight, maximum aft c.g. position, flaps 0°

input speed	Left one–turn spin			Right one–turn spin		
V	IAS during recovery	Altitude loss	Additional turn	IAS during recovery	Altitude loss	Additional turn
[kph]	[kph]	[m]	[deg]	[kph]	[m]	[deg]
82	170	80	130	160	60	140
83	170	90	120	160	65	120
82	170	80	140	160	55	130
Average	170	84	130	160	60	130
Evaluation	See evaluation below					

Maximum take-off weight, maximum aft c.g. position, flaps 12°

input speed	Left one–turn spin			Right one–turn spin		
V	IAS during recovery	Altitude loss	Additional turn	IAS during recovery	Altitude loss	Additional turn
[kph]	[kph]	[m]	[deg]	[kph]	[m]	[deg]
84	170	70	110	160	75	120
83	170	70	120	160	70	120
83	170	80	110	150	80	115
Average	170	73	113	157	75	118
Evaluation	See evaluation below					

Evaluation:

The airplane fulfill requirement § 4.5.9.1 and § 4.5.9.3. ASTM F2245 – 13b for maximum aft c.g. position and minimum/maximum takeoff weight.

The airplane was being put into the flight configuration typical for entry into a spin from direct fly. It means slow pulling the control stick to get the nose of the airplane over the horizon about 10° – 15°, speed V = 1.05 V_S, ailerons in neutral position and when the speed reached 82 km/h, gradual rudder deflection to its maximum on the side of assumed spin rotation and pulling the control stick. The airplane feedback during was, as follows:

Decline the nose of the airplane below the horizon.

About 20° change in direction on the side of rudder deflection.

During this time there was a slight control stick vibration.

Entry into the spin.

Airplane entry into the spin slowly and smoothly. To recover the spin it is sufficient to put rudder control into neutral position and elevator to a two–third position between neutral and fully push. The size of additional turn depends on the weight of airplane (if c.g. is constant) and also flaps configuration. For aft c.g. position, maximum additional turn angle was 130 deg. Control forces are proportional to the speed of recovery.

These flights have been done for two weight configurations: maximum aft c.g. position and appropriate weights – see the header.

Maximum flight time for 431 kg is set to 22 minutes to keep weight limit tolerance in accordance with 4.1.2.

Maximum flight time for 600 kg is set to 35 minutes to keep weight limit tolerance in accordance with 4.1.2.

Refuelling if needed.

Recorded by: S. KOVALYOV Date: 27. 05. 2014

RESEARCH AND DEVELOPMENT INSTITUTE
OF FLIGHT TESTS TECHNOLOGIES

Flight Test Record 33

Flight characteristics

Flight tasks

Spinning

Configuration

Aeroplane: **ALTO 912 TG**	Takeoff weight:	Crew:	Meteorological conditions:	Takeoff time: **07:30 UTC**
Tail number: **OK – TAR 07**	**389** kg CG: **29.3%**	**SERGEY KOVALYOV** **Test-pilot**	**CAVOK, calm** Air pressure: **1016 QNH**	Landing time: **15:13 UTC**
Serial number: **DF–052/2013**	**600** kg CG: **25.0%**	**ballast**	Flight Location: **Ukraine** Flight zone : **UKT-801** Altitude: **245ft AMSL**	Total flight time: **3:30 hrs**
Engine: **ROTAX 912 ULS**	Propeller: **Woodcomp Propuls 174/3/R**			

Test methodology

Goal: Verify whether the airplane fulfill regulation requirement in accordance with § 4.5.9.1 and § 4.5.9.3. ASTM F2245 – 13b. For airplanes placarded "no intentional spins," the airplane must be able to recover from a one-turn spin or a 3-s spin, whichever takes longer, in not more than one additional turn, with the controls used in the manner normally used for recovery. In addition, for either 4.5.9.1:

(1) For both the flaps-retracted and flaps-extended conditions, the applicable airspeed limit and limit maneuvering load factor may not be exceeded.
(2) There may be no excessive control forces during the spin or recovery.
(3) It must be impossible to obtain uncontrollable spins with any use of the controls.
(4) For the flaps-extended condition, the flaps may be retracted during recovery.

Enter data in the flight manual – input speed V [kph], altitude loss [m], evaluation of behavior [-]

Test conditions:

The test airplane must be equipped by central emergency parachute. The pilot must be equipped by emergency parachute.
Equipment: altitude measurement unit.

Procedure:

1. Train the emergency jump from the aeroplane.
2. Secure or remove all of the unsecured items.
3. Check the function of central emergency parachute.
4. Climb to safe altitude (7000ft–9000ft)
5. Input speed into to the spin is V = 1.05 V_S.
6. A) Control surfaces – ailerons and rudder during the spin are in opposite deflection then spin rotation. Enter into a spin (full deflection of rudder and slow pulling the elevator) and after 3 seconds or one–turn make a recover to the horizontal flight.
7. B) Control surfaces – ailerons and rudder during the spin are in same deflection as spin rotation. Enter into a spin (full deflection of rudder and slow pulling the elevator) and after 3 seconds or one–turn make a recover to the horizontal flight.
8. Register the data of altitude loss. The altitude loss is the vertical distance between control actions for recovery from a manoeuvre to the horizontal flight.
9. Do this task for minimum weight and maximum front and aft c.g. position, maximum take-off weight and maximum front and aft c.g. position.

Minimum take-off weight, maximum front c.g. position, ailerons and rudder against spin rotation

input speed	Left one–turn spin			Right one–turn spin		
V	IAS during recovery	Altitude loss	Additional turn	IAS during recovery	Altitude loss	Additional turn
[kph]	[kph]	[m]	[deg]	[kph]	[m]	[deg]
84	170	40	20	170	40	30
85	160	30	30	170	40	30
85	160	35	25	170	40	30
Average	163	35	25	170	40	30
Evaluation	See evaluation below					

Maximum take-off weight, maximum front c.g. position, ailerons and rudder against spin rotation

input speed	Left one–turn spin			Right one–turn spin		
V	IAS during recovery	Altitude loss	Additional turn	IAS during recovery	Altitude loss	Additional turn
[kph]	[kph]	[m]	[deg]	[kph]	[m]	[deg]
84	170	50	25	170	50	25
85	170	40	30	165	50	25
85	160	45	35	170	45	35
Average	168	45	30	168	48	29
Evaluation	See evaluation below					

Minimum take-off weight, maximum front c.g. position, ailerons and rudder in same direction as spin rotation

input speed	Left one–turn spin			Right one–turn spin		
V	IAS during recovery	Altitude loss	Additional turn	IAS during recovery	Altitude loss	Additional turn
[kph]	[kph]	[m]	[deg]	[kph]	[m]	[deg]
84	170	50	50	170	40	50
85	170	50	60	170	50	60
85	170	50	50	170	50	50
Average	170	50	53	170	47	53
Evaluation	See evaluation below					

Maximum take-off weight, maximum front c.g. position, ailerons and rudder in same direction as spin rotation

input speed	Left one–turn spin			Right one–turn spin		
V	IAS during recovery	Altitude loss	Additional turn	IAS during recovery	Altitude loss	Additional turn
[kph]	[kph]	[m]	[deg]	[kph]	[m]	[deg]
84	170	60	60	170	60	60
85	170	50	65	170	55	65
85	160	55	60	160	55	65
Average	168	55	62	168	57	63
Evaluation	See evaluation below					

Evaluation:

The airplane fulfill requirement § 4.5.9.1 and § 4.5.9.3. ASTM F2245 – 13b for both maximum front c.g. position and minimum/maximum takeoff weight.

The airplane was being put into the flight configuration typical for entry into a spin from direct fly. It means slow pulling the control stick to get the nose of the airplane over the horizon about 10° – 15°, speed V = 1.05 V_S, ailerons in neutral position and when the speed reached 85 km/h, gradual rudder deflection to its maximum on the side of assumed spin rotation and pulling the control stick. The airplane feedback during was, as follows:

Decline the nose of the airplane below the horizon.

About 20° change in direction on the side of rudder deflection.

During this time there was a slight control stick vibration.

Entry into the spin.

Airplane entry into the spin slowly and smoothly. Using opposite direction of rudder and ailerons, the spin recovery comes immediately. Using only opposite direction of ailerons, the spin rotation is slower. Using same direction of ailerons, the spin rotation is faster.

These flights have been done for two weight configurations: maximum front c.g. position and appropriate weight – see the header.

Maximum flight time for 389 kg is set to 20 minutes to keep weight limit tolerance in accordance with 4.1.2.

Maximum flight time for 600 kg is set to 35 minutes to keep weight limit tolerance in accordance with 4.1.2.

Refuelling if needed.

Recorded by: S. KOVALYOV Date: 28. 05. 2014

RESEARCH AND DEVELOPMENT INSTITUTE
OF FLIGHT TESTS TECHNOLOGIES

Flight Test Record 34

Flight characteristics

Flight tasks

Spinning

Configuration

Aeroplane: **ALTO 912 TG**	Takeoff weight:	Crew:	Meteorological conditions:	Takeoff time: **07:30 UTC**
Tail number: **OK – TAR 07**	**431** kg CG: **35.0%**	**SERGEY KOVALYOV** **Test-pilot**	**CAVOK, calm** Air pressure: **1016 QNH**	Landing time: **15:13 UTC**
Serial number: **DF–052/2013**	**600** kg CG: **35.0%**	**ballast**	Flight Location: **Ukraine** Flight zone : **UKT-801** Altitude: **245 ft AMSL**	Total flight time: **3:35 hrs**
Engine: **ROTAX 912 ULS**	Propeller: **Woodcomp Propuls 174/3/R**			

Test methodology

Goal: Verify whether the airplane fulfill regulation requirement in accordance with § 4.5.9.1 and § 4.5.9.3. ASTM F2245 – 13b. For airplanes placarded "no intentional spins," the airplane must be able to recover from a one-turn spin or a 3-s spin, whichever takes longer, in not more than one additional turn, with the controls used in the manner normally used for recovery. In addition, for either 4.5.9.1:

(1) For both the flaps-retracted and flaps-extended conditions, the applicable airspeed limit and limit maneuvering load factor may not be exceeded.
(2) There may be no excessive control forces during the spin or recovery.
(3) It must be impossible to obtain uncontrollable spins with any use of the controls.
(4) For the flaps-extended condition, the flaps may be retracted during recovery.

Enter data in the flight manual – input speed V [kph], altitude loss [m], evaluation of behavior [-]

Test conditions:

The test airplane must be equipped by central emergency parachute. The pilot must be equipped by emergency parachute.
Equipment: altitude measurement unit.

Procedure:

10. Train the emergency jump from the aeroplane.
11. Secure or remove all of the unsecured items.
12. Check the function of central emergency parachute.
13. Climb to safe altitude (7000ft–9000ft)
14. Input speed into to the spin is V = 1.05 V_S.
15. A) Control surfaces – ailerons and rudder during the spin are in opposite deflection then spin rotation. Enter into a spin (full deflection of rudder and slow pulling the elevator) and after 3 seconds or one–turn make a recover to the horizontal flight.
16. B) Control surfaces – ailerons and rudder during the spin are in same deflection as spin rotation. Enter into a spin (full deflection of rudder and slow pulling the elevator) and after 3 seconds or one–turn make a recover to the horizontal flight.
17. Register the data of altitude loss. The altitude loss is the vertical distance between control actions for recovery from a manoeuvre to the horizontal flight.
18. Do this task for minimum weight and maximum front and aft c.g. position, maximum take-off weight and maximum front and aft c.g. position.

Minimum take-off weight, maximum front c.g. position, ailerons and rudder against spin rotation

input speed	Left one–turn spin			Right one–turn spin		
V	IAS during recovery	Altitude loss	Additional turn	IAS during recovery	Altitude loss	Additional turn
[kph]	[kph]	[m]	[deg]	[kph]	[m]	[deg]
84	170	40	30	170	40	30
85	160	30	40	170	40	40
85	160	35	40	170	40	30
Average	163	35	38	170	40	33
Evaluation	See evaluation below					

Maximum take-off weight, maximum front c.g. position, ailerons and rudder against spin rotation

input speed	Left one–turn spin			Right one–turn spin		
V	IAS during recovery	Altitude loss	Additional turn	IAS during recovery	Altitude loss	Additional turn
[kph]	[kph]	[m]	[deg]	[kph]	[m]	[deg]
84	170	50	30	170	50	25
85	170	40	30	165	50	30
85	160	45	30	170	45	35
Average	168	45	30	168	48	30
Evaluation	See evaluation below					

Minimum take-off weight, maximum front c.g. position, ailerons and rudder in same direction as spin rotation

input speed	Left one–turn spin			Right one–turn spin		
V	IAS during recovery	Altitude loss	Additional turn	IAS during recovery	Altitude loss	Additional turn
[kph]	[kph]	[m]	[deg]	[kph]	[m]	[deg]
84	170	50	70	170	40	80
85	170	60	80	170	50	60
85	170	60	70	170	50	50
Average	170	57	73	170	47	53
Evaluation	See evaluation below					

Maximum take-off weight, maximum front c.g. position, ailerons and rudder in same direction as spin rotation

input speed	Left one–turn spin			Right one–turn spin		
V	IAS during recovery	Altitude loss	Additional turn	IAS during recovery	Altitude loss	Additional turn
[kph]	[kph]	[m]	[deg]	[kph]	[m]	[deg]
84	170	60	60	170	60	60
85	170	50	65	170	55	65
85	160	55	60	175	55	65
Average	168	55	62	172	57	63
Evaluation	See evaluation below					

Evaluation:

The airplane fulfill requirement § 4.5.9.1 and § 4.5.9.3. ASTM F2245 – 13b for both maximum front c.g. position and minimum/maximum takeoff weight.

The airplane was being put into the flight configuration typical for entry into a spin from direct fly. It means slow pulling the control stick to get the nose of the airplane over the horizon about 10° – 15°, speed V = 1.05 V_S, ailerons in neutral position and when the speed reached 85 km/h, gradual rudder deflection to its maximum on the side of assumed spin rotation and pulling the control stick. The airplane feedback during was, as follows:

Decline the nose of the airplane below the horizon.

About 20° change in direction on the side of rudder deflection.

During this time there was a slight control stick vibration.

Entry into the spin.

Airplane entry into the spin slowly and smoothly. Using opposite direction of rudder and ailerons, the spin recovery comes immediately. Using only opposite direction of ailerons, the spin rotation is slower. Using same direction of ailerons, the spin rotation is faster.

These flights have been done for two weight configurations: maximum front c.g. position and appropriate weight – see the header.

Maximum flight time for 431 kg is set to 22 minutes to keep weight limit tolerance in accordance with 4.1.2.

Maximum flight time for 600 kg is set to 35 minutes to keep weight limit tolerance in accordance with 4.1.2.

Refuelling if needed.

Recorded by: S. KOVALYOV Date: 29. 05. 2014

Recorded by: S. KOVALYOV Date: 29. 05. 2014