U.S. Department of Transportation
Federal Aviation Administration

Advisory Circular

Subject: Towbar and Towbarless Movement of Aircraft

Date: 11/8/10

AC No: AC 00-65

Initiated by: AFS-300

Change: 1

1. PURPOSE. This advisory circular (AC) provides guidance for towbar and towbarless movement of aircraft.

2. PRINICIPLE CHANGES. This change incorporates minor changes and updates throughout the AC, and a new appendix to AC 00-65 has been added. Information regarding whom you may contact with questions regarding information in this AC, and where you may obtain a copy, are also included.

PAGE CHANGE CONTROL CHART

Remove Pages	Dated	Insert Pages	Dated
1 thru 9	8/27/09	1 thru 9	11/8/10
		Appendix 1	11/8/10

ORIGINAL SIGNED BY
/s/ Raymond Towles for

John M. Allen
Director, Flight Standards Service

U.S. Department of Transportation
Federal Aviation Administration

Advisory Circular

Subject: Towbar and Towbarless Movement of Aircraft

Date: 8/27/09 **AC No:** AC 00-65

Initiated by: AFS-300 **Change: 1**

1. PURPOSE. This advisory circular (AC) provides guidance for towbar and towbarless movement of aircraft and applies to all operators under Title 14 of the Code of Federal Regulations (14 CFR) parts 91, 91 subpart K (91K), 121, 125, 129, and 135.

2. RELATED CFR REGULATIONS.

- Part 91, General Operating and Flight Rules;
- Part 121, Operating Requirements: Domestic, Flag, and Supplemental Operations; and
- Part 139, Certification of Airports.

3. RELATED READING MATERIAL (current editions).

- AC 91-73, Part 91 and Part 135, Single-Pilot Procedures During Taxi Operations;
- AC 120-57, Surface Movement Guidance and Control System;
- AC 120-74, Parts 91, 121, 125, and 135, Flightcrew Procedures During Taxi Operations;
- AC 150/5200-37, Introduction to Safety Management System (SMS) for Airport Operators;
- AC 150/5210-5, Painting, Marking, and Lighting of Vehicles used on an Airport;
- AC 150/5210-18, Systems for Interactive Training of Airport Personnel;
- AC 150/5210-20, Ground Vehicle Operations on Airports;
- AC 150/5210-21, Announcement of Availability: Airport Surface Safety Training Programs for Mechanics and Ramp Personnel; and
- AC 20-35, Tiedown Sense.

4. BACKGROUND. There are several reported cases (documented and undocumented) of near incursions and mishaps involving tug operators moving aircraft. Specifically, super tugs have had incidents such as jackknifing, uncontrolled movement, and inability to stop the tug and aircraft quickly. There have been several potential ground incursion instances where super tugs were not seen by the aircraft and ground controllers. There have also been reported cases where pilots are not cognizant to the "right of way passage" of these tugs, even when they are cleared for movement in the active areas. Lastly, air traffic control (ATC) specialists have reported that it is very difficult to identify a super tug towing an un-powered aircraft at night, because the aircraft being towed is not illuminated with any lights. For ATC and other pilots in the area, this creates the optical illusion that the low profile super tug is by itself, making the large, dark aircraft being towed nearly invisible.

5. WHERE YOU CAN FIND THIS AC. You can find this AC on the MyFAA employee Web site at https://employees.faa.gov/tool_resources/orders_notices. Inspectors can access this AC through the Flight Standards Information Management System (FSIMS) at http://fsims.avs.faa.gov. Operators and the public may find this information on the Federal Aviation Administration's (FAA) Web site at http://fsims.faa.gov.

6. PREVENTING INJURIES TO PERSONNEL AND DAMAGE TO AIRCRAFT DURING GROUND HANDLING. The aviation industry has found, through experience, that the potential for damage and/or injury if a mishap occurs is high; however, firm safety practices deter accidents. This AC contains generally accepted information and safety practices, which may help prevent injuries to personnel and damage to aircraft during ground handling and reduce runway incursions.

a. Anticipation of Safety Management System (SMS) Requirements. In anticipation of SMS requirements, all managers and supervisors should identify, eliminate, control, and document hazards within the workplace to minimize risks associated with uncertainty in the decision-making process.

b. Identifying Hazards. After identifying hazards, assess the risks associated with each hazard, then determine and take action as needed to reduce the risk by:

(1) Engineering the hazard out or imposing procedural actions (operational limits, frequent inspections, protective equipment, or stopping until corrective action is taken); and/or

(2) Educating and training personnel on the hazards and the safety procedures to follow to reduce the chances of a mishap occurring.

c. On-the-Job Training (OJT). Ensure all personnel receive safety and health OJT upon initial assignment and whenever there is a change in equipment, procedures, processes, or safety and health requirements. Well-trained and educated personnel are the greatest deterrent to mishaps in the workplace. Supervisors should document safety-related training.

d. Proper Towbar and/or Towbar Vehicle Usage. When towing aircraft, use the proper towbar and/or tow vehicle. The wrong type of towbar, or makeshift equipment, can cause damage to the aircraft. Persons performing towing operations should be thoroughly familiar with the procedures that apply to the type of aircraft to be moved and the type of tow vehicle.

e. Proper Auxiliary Power Unit (APU) Operation and the Use of an Approved APU Checklist. When the APU is being operated while the aircraft is being towed, the use of an approved checklist for normal APU start up/shut down and emergency procedures is essential for safe operation.

7. TRAINING.

a. Procedures and Guidance. The following information outlines procedures and guidance regarding training.

(1) Air carriers must establish guidance per 14 CFR part 121, § 121.135, and part 135, § 135.21. Carriers may cover this information in a standard operating procedures (SOP) handbook, which should clearly define duties and responsibilities and employ the use of a checklist (see Appendix 1 for checklist example) covering all items pertaining to the safe movement of the type aircraft being towed.

(2) Operators should ensure aircraft ground handling personnel become thoroughly familiar with all published towing procedures pertaining to the type of aircraft being towed, along with understanding the restrictions and/or limitations on any vehicle authorized to move an aircraft.

(3) Initial and recurrent training should include:

- Speed restrictions both for clear and cluttered ramp conditions;
- Speed restrictions for contaminated pavement conditions;
- The effects of momentum towing various weights and speeds;
- Airport signage and markings;
- Prior to use, vehicle safety inspection;
- Crew Resource Management (CRM);
- Situational awareness (SA);
- Use of written checklists (see Appendix 1 for checklist example);
- Acceleration and deceleration characteristics and techniques;
- Braking in turns;
- ATC communications procedures;
- Tug/aircraft configuration; i.e., lighting;

- Emergency procedures; and
- Recurrent training.

(4) Consideration should be given to the employee's speech and accent, if any, relative to sentence patterns, sentence structure, and in the case of an ATC clearance, use of standard clearance terminology is satisfactory.

(5) Newly assigned aircraft maintenance specialists/ground movement personnel should pass a proficiency test on the types of aircraft towed, after completing supervised OJT.

(6) Wing and tail walkers may not have to be familiar with all published towing procedures or receive annual proficiency training if their duties are restricted to these positions during towing operations. Additionally, recurrent training should include, but not be limited to, airport signage, limitations or restrictions, ATC communications procedures, and radio and light commands, and should be completed before the initial performance of such duties at least once annually.

(7) A high degree of safety is the responsibility of all personnel involved in moving an aircraft.

b. Operational Consideration. Operators that use the towbarless tractor should submit appropriate procedures outlining the towing operations to their certificate-holding district office (CHDO). The procedures should include, but not be limited to, the following:

- Safety instructions;
- Operating procedures (include the differences between day and night operations);
- Initial and recurrent training;
- Radio communication; and
- Towing procedures checklist.

8. TOWBAR AND TOWBARLESS TOWING OF AIRCRAFT.

a. Towbarless Tractor. High speed tugs such as Goldhofer Aircraft System Tractor Models AST-1 and AST-1X, Douglas Equipment, and the FMC Expediter family of towbarless tractors, sometimes referred to as "super tugs," usually move aircraft between the terminal gates to maintenance hangars. The weight of an aircraft and its fuel load is a major consideration during towing because handling characteristics of the tow tractor changes proportionally with the change in aircraft weight. Heavier aircraft put more stress on the vehicle. After movement begins, heavy aircraft can "push" the tug with a greater force than lighter aircraft because of weight and momentum. Tow operators must recognize and understand these characteristics. Heavier weights and too much speed create the potential for disaster. Therefore, reduce towing speeds according to the weight of the aircraft. The braking distance required to stop a large aircraft will be greater than the distance required to stop a smaller aircraft.

b. Towing Vehicles. A few of the many tow vehicles used by operators to move aircraft are as follows:

(1) The Lynco Tugger Corporation's 4 KD4 is a patented fully hydra-static tow vehicle with a 48-inch turning radius. Load capacity of 60,000 pounds with a level drawbar pull of 4,000 pounds.

(2) Harlan currently produces more than seven standard model tractors. These vehicles range from 3,000 to 20,000 pounds drawbar pull. The A/S32A-37 aircraft towing tractor is an inline, 6-cylinder, diesel-powered, liquid-cooled, 4-wheel drive vehicle used to move heavy aircraft. The A/S32A-42 aircraft mid-range tow vehicle is a 4-cylinder, diesel-powered, liquid-cooled, 4-wheel drive vehicle used to move medium aircraft.

(3) Aero Specialties is the exclusive corporate and fixed-base operator distributor of Eagle Tugs. With a towing capacity of up to 180,000 pounds, Eagle Tugs are the only aircraft tractors in their class with available all wheel drive and limited slip differential.

c. Towing Vehicle Inspections. Tow vehicle operators should ensure all towing equipment is serviceable and functioning properly before starting any towing operation. Before connecting the towbar to the aircraft, the tow vehicle operator should inspect the tow vehicle for defects or extraneous material that may interfere with safe operation. An operator should inspect each tow vehicle at least once each shift to verify that the cab and exterior of the vehicle are clear of all extraneous materials and the vehicle is in safe working condition. Additionally, check all radio communications before dispatching a tow vehicle. Inspect towing connections before each use. When tow vehicle operators find mechanical defects affecting safety on tow vehicles, the carrier should take the equipment out of service and send it to vehicle maintenance for repairs.

d. Towing Operations.

(1) Using qualified personnel, following established procedures, and properly planning for weather and local conditions (such as inclined ramps, emergencies, and other limitations), should prevent mishaps.

(2) For maximum safety, towing personnel will not place themselves in the direct path of aircraft wheels nor ride on any external portion of an aircraft or tow vehicle.

(3) The best practice is to use a checklist.

(4) Ensure placards are legible and located inside the tow vehicle cab to identify any restrictions that apply to the tow vehicle.

(5) Observe any other placards that might be of a temporary nature prior to all movements.

(6) When connecting a towbar to any towing vehicle, personnel should stand clear until the backing tow vehicle is in close proximity to the towbar.

(7) When connecting a tow vehicle, personnel should be extremely vigilant to any sudden movement of the tow vehicle or aircraft.

e. Aircraft Lighting. Before movement of any aircraft, part 91, § 91.209 states that no person may:

(1) During the period from sunset to sunrise (or, in Alaska, during the period a prominent unlighted object cannot be seen from a distance of 3 statute miles or the sun is more than 6 degrees below the horizon):

(a) Operate an aircraft unless it has lighted position lights;

(b) Park or move an aircraft in, or in dangerous proximity to, a night flight operations area of an airport unless the aircraft:

1. Is clearly illuminated,

2. Has lighted position lights, or

3. Is in an area that is marked by obstruction lights.

(c) Anchor an aircraft unless the aircraft:

1. Has lighted anchor lights, or

2. Is in an area where anchor lights are not required on vessels.

(2) Operate an aircraft that is equipped with an anti-collision light system, unless it has lighted anti-collision lights. However, the anti-collision lights need not be lighted when the pilot in command (PIC) determines that, because of operating conditions, it would be in the interest of safety to turn the lights off.

NOTE: Clearly illuminated means that the aircraft wingtips and tail can be seen by other means of illumination just as clearly as if the aircraft position lights were turned on.

NOTE: The aircraft position lights may be powered by means of the aircraft battery, APU, or an external power source such as a tow vehicle APU/generator.

NOTE: During any nighttime operation or movement of an aircraft on airport movement/active areas, aircraft position lights should be turned on.

f. Flight Deck/Cockpit Observer. A trained and authorized person should be in the pilot's seat to operate the aircraft's brakes if needed. If the hydraulic pressure that provides braking drops below safe operating limits, the towing operation should be terminated. Additionally, the observer serves as the primary person communicating with the control tower and/or ramp control, and with the tow vehicle operator as a backup. Flight deck/cockpit observer duties

include looking outside the cockpit and warning the tow vehicle operator of possible safety issues. The communication roles of the Towbarless Tow Vehicle (TLTV) driver and observer should be clearly defined and understood before every tow operation.

g. Tow Vehicle Operator. The tow vehicle driver is responsible for operating the vehicle in a safe manner. The vehicle operator should follow all direction from the flight deck as they are directed by the control tower and also obey emergency stop instructions given by any team member. A trained vehicle operator should be at the controls of the towing vehicle at all times during aircraft movement. The vehicle operator should stop the vehicle upon losing communication with the cockpit observer and, unless on an active runway, proceed to safely clear the runway.

h. Wing Walker. Station a wing walker at each wingtip to ensure adequate clearance of any obstruction in the path of the aircraft. The wing walker is responsible for properly signaling the tow vehicle operator as soon as it appears the aircraft is in danger of colliding with an obstruction. In such cases, stop towing until the vehicle operator personally checks the clearance. Wing walkers are not required for helicopters being towed with rotor blades in parallel position. Wing walkers do not require annual proficiency testing and need not be fully qualified in all towing procedures.

i. Tail Walker. Use a tail walker during towing operations when you turn the aircraft sharply or back into position. Avoid backing of aircraft as much as possible. Tail walkers do not require annual proficiency testing and need not be fully qualified in all towing procedures as long as this is their only task.

> **NOTE: When towing small aircraft, you can eliminate the tail walker at the discretion of the tow team lead.**

j. Personnel Riding or Walking. Under no circumstances should personnel walk between the nose wheel of an aircraft and its towing vehicle, nor should they ride on the outside of a moving aircraft, on the towbar, or on the outside of the vehicle unless in an authorized seat. No person should attempt to board or leave a moving aircraft or towing vehicle.

k. Night Crew Signals. Operators should issue two luminous wands to towing team members who require wands. Other tow team members should use wands, as required, to warn any aircraft traffic that may approach. Additionally, before moving any aircraft, ensure compliance with § 91.209.

l. Control Tower Clearance. Before towing an aircraft on or across an established taxiway or runway, the tow vehicle operator will obtain clearance from the control tower via the cockpit observer. At no time should any aircraft be towed on or across runways or taxiways without advance approval of the control tower. The primary means of communication will be the aircraft radio. An alternate method (when conditions restrict aircraft battery operation) is through an escort vehicle in direct radio contact with the control tower. The radio-equipped escort vehicle will accompany the aircraft throughout the towing operation.

m. Towing Speed. Towing speed should not exceed that of walking team members. Towing speed should not exceed the safe operating speed for the conditions or the published speeds established by the TLTV operators published procedures.

n. Aircraft Brakes. To prevent serious mishaps, charge aircraft brake systems before each towing operation and stop towing immediately if brake pressure drops below safe operating limits. Do not tow aircraft with faulty brakes, except to repair facilities, and then only with personnel standing by ready with chocks for emergency use.

o. Towbars. Before moving any aircraft, inspect the towing vehicle, towbar, towbar connections, and other associated equipment for defects. Use only authorized equipment in good condition in towing operations.

p. Chocks. Make chocks immediately available in case of an emergency throughout towing operations. Place them properly before disconnecting the towing vehicle. When towing or parking aircraft with snow, ice, or frost present anywhere on the parking ramp or towing surface, use sand bags and chocks. Use heavier tow vehicles with chains to improve starting and stopping traction during tow operations on ice or snow-covered towing surfaces. Do not place or hang chocks or other support equipment on any part of the aircraft exterior during towing or repositioning.

q. Starts and Stops. When moving aircraft, tow vehicle operators should not stop and start suddenly. Never apply aircraft brakes when an aircraft is being towed, except in emergencies and upon instructions given by any team member. Before disconnecting the towing vehicle from the aircraft, chock the aircraft in place and set the aircraft's brakes.

r. Equipment, Stands, and Similar Materials. Ensure removal and proper storage of all equipment, work stands, loose aircraft parts, and other materials from the vicinity of an aircraft.

s. Entrance Doors, Ladders, and Down Locks. To avoid possible worker injury and aircraft damage during towing operations, close entrance doors, retract or remove ladders, and install landing gear down locks (if required). The only allowable deviations from these requirements are those allowed by specific aircraft manufacturer instructions.

t. Struts and Tires. Before towing any aircraft, towing team members should check nose and main landing gear struts and tires for proper inflation. Unless the applicable manufacturer instructions require a gauge check, a visual check of tires and struts is adequate for towing purposes.

u. Engine Operation. As a general rule, do not tow aircraft with engines operating. The following exceptions apply to aircraft towing operations with engines running: pushing aircraft away from terminal gates used by airlines for dispatch. Develop procedures for personnel so that they keep away from rotating propellers and away from the danger zones of jet engines.

v. TLTV Painting and Marking. Refer to the current edition of AC 150/5210-5.

9. CONTACT. For additional information, please contact the FAA Aircraft Maintenance Division, AFS-300, 800 Independence Ave., SW., Washington, D.C. 20591.

John M. Allen
Director, Flight Standards Service

APPENDIX 1. CHECKLIST EXAMPLE

Qualified and authorized personnel should use the appropriate group of checklist items before performing each operation. Check Logbook and Special Equipment List.

LOGBOOK AND SPECIAL EQUIPMENT LIST
(Prior to engine start, perform the following visual walk-around safety checks)
Check for:

1. Tires	Checked	4. Hydraulic Fluid Quantity	OK
2. Fluid Leaks	No	5. Three (3) Sets of Chocks	Verify
3. Structural Damage	No	6. Aircraft Steering Bypass Pins	Verify

NOTE: If defects are found, complete company form on unserviceable ground equipment.

VEHICLE SAFETY CHECKLIST

1. Manufacture's Safety Check	Complete	12. Seat Belts	On
2. Airport Diagram	Check	13. Seat and Mirrors Position	Checked
3. Cabin Switches	OFF	14. VHF Radios (if applicable)	On
4. Tractor Parking Brake	On	15. Transponder (if equipped)	Standby
5. Fuel Quantity	Verify	16. Nose wheel Cradle	Up
6. Air Tank Pressure (if applicable)	Verify	17. Parking Brake	Released
7. Warning lights test	Complete	18. Travel Direction Selector	As Required
8. Interior Light Operation	Checked	19. Normal Brakes	Checked
9. Exterior Light Operation	Checked	20. Steering	Checked
10. Windows and Windshields	Clean, Free of Obstructions	21. Side View Mirrors	Undamaged
11. Wipers	Good, Working Condition		

NOTE: If defects are found, complete company form on unserviceable ground equipment.

AIRCRAFT SAFETY CHECKS
(Perform prior to connecting tractor to aircraft)

1. Aircraft Logbook for Items that Would Prevent Towing	Checked	6. Aircraft Lights	As Required
2. Perform Aircraft Exterior Safety Checks Per Aircraft Requirements	Complete	7. Aircraft Fuel Quantity	As Required Checked and Balanced
3. Landing Gear Ground Lock Pins as Required	Installed	8. Total Tow Weight	Computed
4. Chocks Both Main Landing Gear	Installed	9. Aircraft Nose Wheels	Straight
5. If APU Inoperative, Brake Accumulator Fully Charged	As Required		

CONNECTING TO AIRCRAFT

1. Position Tractor In Front of and in Line with Aircraft Nose Wheel	Complete	12. Tractor Parking Brake	On
2. Parking Brake	On	13. Press Nose Wheel Pin Button	Complete
3. Rotate Seat To Face Aircraft	Complete	14. Raise Cradle Until Cradle Raised Light Is Illuminated	Complete
4. Select Required Steering Mode	Complete	15. Tractor Parking Brake	On
5. Lower Cradle Until Cradle Down Warning Light is Illuminated	Complete	16. Flight Deck Communication	Established
6. Select Correct Aircraft Wheel Size	Complete	17. Aircraft Towing GHCL (If Aircraft Is Occupied).	Completed
7. Open Gate Until Gate Open Warning Light is Illuminated	Complete	18. Aircraft Chocks	Removed
8. Aircraft Steering Bypass Pin	Installed/Confirmed	19. Aircraft Parking Brake	Released
9. Parking Brake	Released	20. Seat Belts	On
10. Drive To Engage Nose Wheel Centrally In Cradle	Complete	21. Select Appropriate Forward or Reverse Gear	Complete
11. Close Gate Until Gate Closed Light is Illuminated and Safety Bars Contact Nose Wheels	Complete	22. Tractor Parking Brake	Off

AIRCRAFT TOWING

1. Crew Briefing	Complete	7. Wing Walkers	As Required
2. VHF Radios	Set	8. Parking Brake	Off
3. ATC	Contact	9. Accelerator	Smoothly Actuate
4. Clearances	Readback	10. Brakes	Check
5. Transponder (if equipped)	On	11. Aircraft Steering Angle	Monitor
6. Exterior Lights/Strobes	On		

CAUTION: If red oversteer indicator illuminates, notify crew chief, supervisor, or manager. Engineering will determine if documented aircraft nosegear inspection is required.

AIRCRAFT PARKING/UNDOCKING

1. Wing Walkers	As Required	11. Raise Cradle Until Cradle Raised Light is Illuminated	Complete
2. Exterior Lights/Strobes	As Required	12. Rotate Seat To Face Forward	Complete
3. Transponder (if Equipped)	Standby	13. Travel Direction Selector	Neutral
4. Parking Brake	On	14. Parking Brake	On
5. Aircraft Chocks	Installed Both MLG	15. Aircraft Steering Bypass Pin	Removed
6. Parking Brake	Off	16. Aircraft Parking Brake	As Required
7. Lower Cradle Until Cradle Down Warning Light is Illuminated	Complete	17. Perform Parking Checks Per Aircraft GHCL (if Required)	Complete
8. Open Gate Until Gate Open Warning Light is Illuminated	Complete	18. Perform Aircraft Exterior Safety Checks Per Aircraft GHCL	Complete
9. Withdraw Tractor from Aircraft	Complete	19. Inspect Spray Deflector For Damage if Applicable	Complete
10. Close Gate Until Gate Closed Light is Illuminated	Complete		

AIRCRAFT SHUTDOWN

1. Driver Seat	Forward	6. Exterior Lights	Off
2. Nose Wheel Cradle	Up	7. Interior Lights	Off
3. Travel Direction Selector	Neutral	8. Engine Ignition	Off
4. Parking Brake	On	9. Seat Belts	Stowed
5. VHF Radios/Transponder	Off		

ABNORMAL OPERATIONS

APU Inoperative	
1. Aircraft Brake Accumulator	Charged
Oversteer Warning (Red Light)	
1. Tow Operation	Complete
2. Crew Chief, Supervisor, or Manager	Advised

EMERGENCY OPERATIONS

Unclear Radio Transmission	
1. Vehicle	Stop
2. Instructions	Repeat
TLTV/Cockpit Communication Lost	
1. Use Backup Frequency/Radio	Check
ATC Communication Lost	
1. Last Clearance	Complete
2. Await Ground Control Light Gun	Check
Disorientated	
1. Vehicle	Stop
2. Ground Control	Request Progressive
TLTV Disabled	
1. Clear Runway (if possible)	Complete
2. Ground Control	Advised
3. Ramp Control Tower (if applicable)	Advised
TLTV or Aircraft Collision	
1. TLTV/Aircraft (clear runway if possible)	Stop
2. Ground Control	Advised
3. Ramp Control Tower (if applicable)	Advised
4. Provide Assistance	Complete
Aircraft Disabled	
1. Clear Runway (if possible)	Complete
2. Ground Control	Advised
3. Ramp Control Tower (if applicable)	Advised
Aircraft Fire	
1. TLTV/Aircraft (clear runway if possible)	Stop
2. Evacuate Aircraft	Complete
3. Extinguish Fire (if possible)	Complete
4. Ground Control	Advised
5. Ramp Control Tower (if applicable)	Advised
6. Chock Aircraft	Complete
7. Provide Assistance	Complete