

WDL - non-rigid airships

Peter Lobner, 24 August 2021

1. Introduction

German businessman Theodor Wüllenkemper founded the firm West Deutsche Luftherwerbung GmbH (WDL) in 1972 with the goal of



manufacturing modern blimps at the firm's newly established headquarters at the Essen / Mülheim Airport. Since then, WDL has manufactured two WDL-1 and ten WDL-1B blimps that have been

operated worldwide. WDL blimps have been licensed to operate in the US since 1993. Most of the blimps were sold to airship operators. WDL also operates their own airships and offers tourist flights and aerial advertising services.

WDL owns two hangars at the Essen-Mülheim airfield and also owns a large tent hall, which serves as winter quarters for two airships.

The WDL website is here: <https://www.wdl-worldwide.de>

2. The WDL-1 and -1B

The original WDL-1 blimp made its first flight on 12 August 1972. This airship design was essentially an update of the pre-WW II Goodyear L-Type blimp, with various improvements, including:

- Larger envelope with improved envelope fabric. Envelope lifetime is 20 years.
- Improved pressurization system.
- Fuel storage tanks inside the envelope, making more space available inside the gondola.
- Capable of vertical takeoff in low wind, otherwise, it makes short takeoffs and landings (STOL).
- External 2-D lighting system on the envelope for advertising.
- Carries its own mooring mast.

In November 1972, a severe storm did considerable damage to the hangar at Essen / Mülheim Airport and the two WDL-1 airships inside. After everything had been rebuilt, the second WDL-1 was delivered to an airship operator in Japan.

The first WDL-1B was manufactured and flew in 1988.

The WDL airships typically require a ground crew of 15 to 18 persons. A 2013 study by Defence R&D Canada reported:

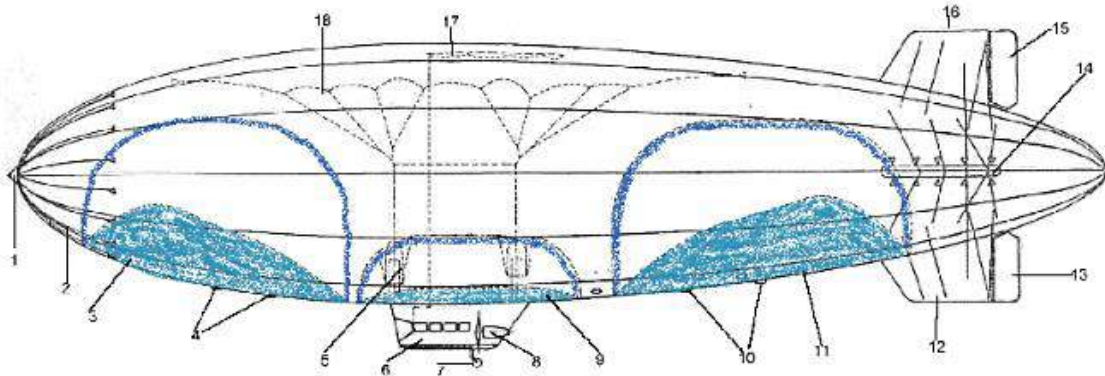
“The typical crew consists of two airship captains, one crew chief, two mechanics and 15 ground crew members who ground-handle the aircraft during take-off and landing. A total of 14 vehicles (vans and cars with caravans, mast truck and fuel truck) are required to support all ground operations and host the crew at an airfield.”



The first WDL-1. Source: Airships for the Future (1976)

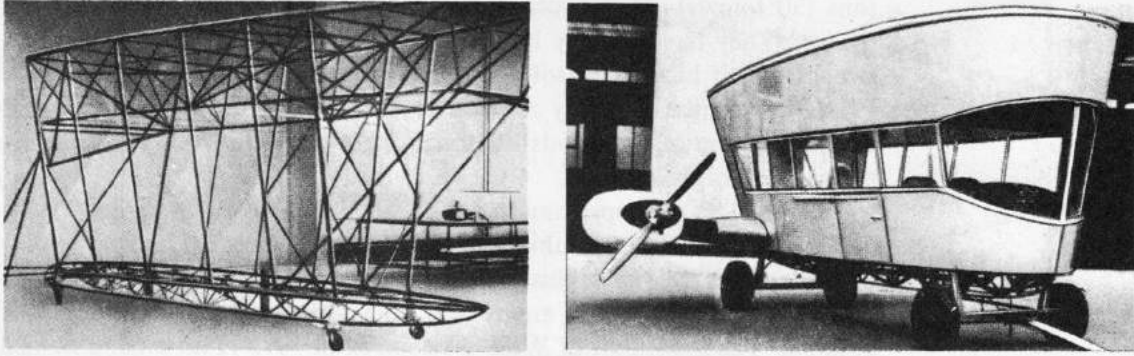
Basic design parameters of the WDL-1 and -1B

Parameter	WDL-1	WDL-1B
Airship type	Non-rigid	Non-rigid
Length	58 m (190.3 ft)	60 m (196.9 ft)
Diameter	14.3 m (46.9 ft)	16.4 m (53.8 ft)
Height	18.4 m (60.4 ft)	19.3 m (63.3)
Volume	6,429 m ³ (227,038 ft ³)	7,200 m ³ (254,266 ft ³)
Ballonet volume		1,975 m ³ (69,746 ft ³), 27%
Gross weight	6,300 kg (13,850 lb)	
Empty weight	4,800 kg (10,582 lb)	
Payload	1,500 kg (3,307 lb)	1,300 kg (2866 lb)
Accommodations	Pilot + 8 passengers	Pilot + 7 passengers
Propulsion system	2 x Continental 6-cylinder engines @ 207 hp (154 kW), driving reversible tractor propellers	Same as WDL-1
Speed	90 kph (56 mph) max, 80 kph (50 mph) cruise	105 kph (65 mph) max, 65 kph (40.4 mph) cruise
Range	1,800 km (1,118 miles)	1,680 km (1,044 miles)
Altitude	1,800 m (5,905 ft)	1,800 m (5,905 ft)
Endurance		22 hours



1 Nose Cone	5 Fuel Tanks	9 Mid. Ballonet	13 Lower Rudder	17 Rip Panel
2 Battens	6 Gondola	10 Rear Valves	14 Horiz. Fins + Elevator	18 Catenary
3 Fwd. Ballonet	7 Landing Gear	11 Rear Ballonet	15 Upper Rudder	
4 Fwd. Valves	8 Engines	12 Lower Fin	16 Upper Fin	

General arrangement of the WDL-1B, including the internal features of the envelope. Source: Defence R&D Canada (2013)



*WDL-1 gondola framework (left) and completed with Continental engines installed on stub wings at the aft end of the gondola (right).
Source: Airships for the Future (1976)*



*WDL-1B gondola, highlighting the installation of the Continental engines.
Source: Martin, via <https://www.flickr.com/photos/martinbitzer/>*



WDL-1B at a truck-mounted mobile mooring mast. Source: WDL



*WDL-1B. Note the stiffening battens highlighted on the nose.
Source: WDL*



WDL-1B in flight. Source: Wikipedia Germany



WDL-1B in its hangar. Source: WDL



WDL-1B interior illumination highlights the internal air ballonets (shadowy areas). Source, both photos: WDL



WDL-1B display system has 30 x 8 meter (98.5 x 26.2 ft) exterior hull-mounted panels (the shaded rectangle around "Sparkasse") with 9,000 lamps. Interior projectors and lighting can display animations on the translucent hull.

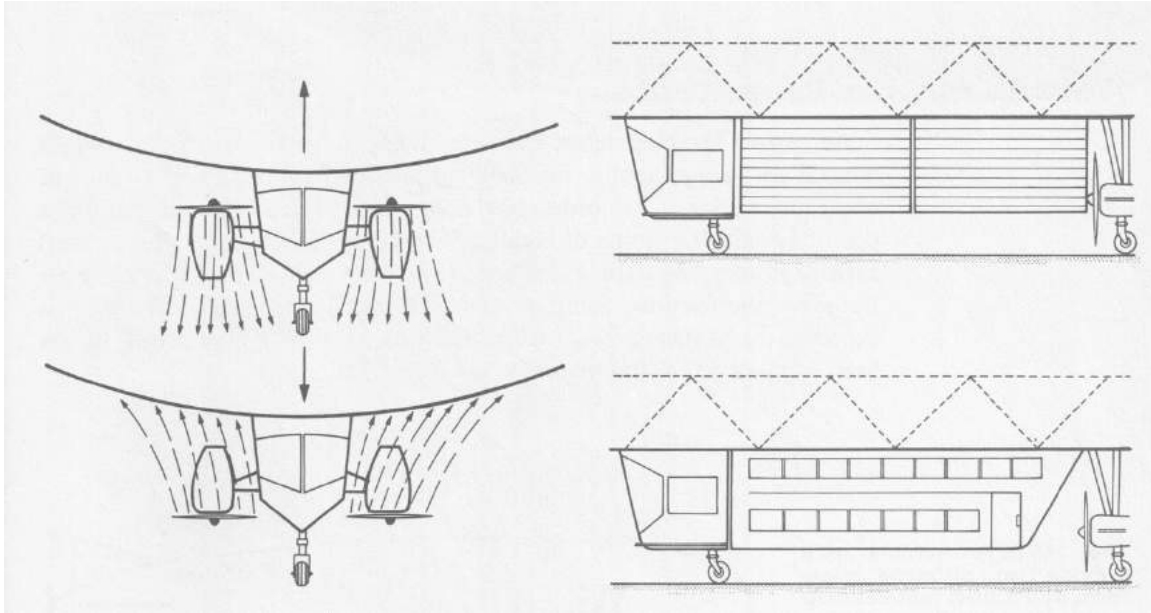
3. The WDL-II and -III design concepts

In the mid-1970s, WDL carried out conceptual designs for two larger non-rigid airships designated WDL-II and WDL-III.

Basic design parameters of the WDL-II and -III concepts

Parameter	WDL-II	WDL-III
Airship type	Non-rigid	Non-rigid
Length	80 m (265 ft)	120 m (400 ft)
Diameter	20 m (65.6 ft)	28 m (91.9 ft)
Volume	20,000 m ³ (700,000 ft ³)	64,000 m ³ (2,240,000 ft ³)
Gross weight	21,000 kg (46,000 lb)	21,000 kg (46,000 lb)
Payload	10,000 kg (22,000 lb), equipped with removable, interchangeable passenger and cargo modules	30,000 kg (66,000 lb), equipped with removable, interchangeable passenger and cargo modules
Propulsion system	2 x 400 hp (298 kW) engines that are vectorable thru 180° (full up to full down)	2 x 700 hp (522 kW) Diesel engines inside the envelope, with vectoring turbines for maneuvering control
Speed	140 kph (87 mph) max	140 kph (87 mph) max
Range	2,400 km (1,500 miles)	8,600 km (5,300 miles)

The advanced design concepts planned for the WDL-II included engines that are vectorable thru 180° (full up to full down) and removable, interchangeable passenger and cargo modules that enabled the airship to rapidly drop off and pickup modules and to be reconfigured quickly for different missions.



*The WDL-II design featured: engines vector 180° (left), and interchangeable passenger and cargo modules (right).
Source: Source: Airships for the Future (1976)*

In the 1990s, the issue of larger airships was revisited in a detailed study on the limits and possibilities of large airship construction. Particular concerns identified at that time for airships larger than the WDL-1 design included:

- Difficult to obtain a permit to fly (lack of modern precedent)
- Only allowed to land on a few areas
- Likely to have significant problems with cross winds.

WDL has not announced any plans to build a larger airship.

4. For more information

- Anthony J. Dolman, “Current and Possible Future Developments in Lighter-Than-Air (LTA) System Technology,” Section 4.5, “West Germany,” United Nations Industrial Development Organization (UNIDO), 1983:
<https://open.unido.org/api/documents/4793600/download/CURRENT%20AND%20POSSIBLE%20FUTURE%20DEVELOPMENTS%20IN%20LIGHTER-THAN-AIR%20>

- William J. White, "Airships for the Future," pp. 115 - 118, Sterling Publishing Co., Inc., New York, ISBN 0-8069-0090-3, 1976
- Ian Glenn, et al., "Survey of COTS-MOTS Lighter Than Air Platforms and Communications Relays," Section 3.2.3, "WDL Luftschiffgesellschaft Mbh WDL 1B", Defence R&D Canada, March 2013: https://zbook.org/read/d154_s-of-cots-mots-li-than-air-p.html
- "WDL Airship Company," Wikipedia, https://de.zxc.wiki/wiki/WDL_Luftschiffgesellschaft

Videos

- "Aushallen vom Luftschiff" (2:36 min), shows ground crew moving airship Theo out of its hangar, 2017: <https://www.youtube.com/watch?v=VvdDB02GAq0>
- "Start WDL Luftschiff" (0:41 min), shows WDL airship takeoff, 2016: <https://www.youtube.com/watch?v=zMpPLr8ARAI>