

DOC. N. : **R-101-10-04**Issue : **A**Customer : **/****TITLE : MGB GEARS STRUCTURAL STRESS ANALYSIS**Summary

This report presents the structural stress analysis calculations performed to substantiate the static and fatigue strength of the gears of the MGB E1.63.001.102 of the ES101 helicopter kit.

FILE : [R-101-10-04_A_MGB_gear_Analysis_002.doc](#)

LINKS : N.A.

NUMBER OF PAGES : **41**Prepared by :
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MODIFICATIONS RECORD

ISSUE	ISSUE DATE	AFFECTED PAGES	REASON OF CHANGE	AUTHOR
A	24/06/2010	ALL	FIRST ISSUE	Aviotecnica

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1 Introduction

This report presents the structural stress analysis calculations performed to substantiate the static and fatigue strength of the MGB gears and gear shaft the ES101 helicopter kit.

2 References

2.1 R-101-10-01

BASIC DESIGN CRITERIA FOR THE ES101 HELICOPTER TRANSMISSION SYSTEM
May 2010
Aviotecnica

2.2 Peterson's Stress Concentration Factors

By W.D. Pilkey
1997 2nd Edition
John Wiley & Sons

2.3 SD 5340D

Allowable Stress Values for Bevel and Hypoid Gears
1982
Gleason Works

2.4 Catalog 5000 E

General Catalogue
June 2003
SKF

2.5 AGMA 911-A94

Design Guideline for Aerospace Gearing
1994
American Gear Manufacturers Association

2.6 Catalog 5000 E

General Catalogue
June 2003
SKF

2.7 R-101-10-02

MAIN ROTOR MAST (P/N E1.63.039.202) STRUCTURAL STRESS ANALYSIS
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3 Acronyms and Abbreviations

FEA	Finite Element Analysis
g	gravity acceleration
MGB	Main Gearbox
MoS	Margin of Safety
MR	Main Rotor
MS	Margin of Safety
N.A.	Not Applicable
P/N	Part Number
RPM	Revolutions Per Minute
TR	Tail Rotor

4 Parts description

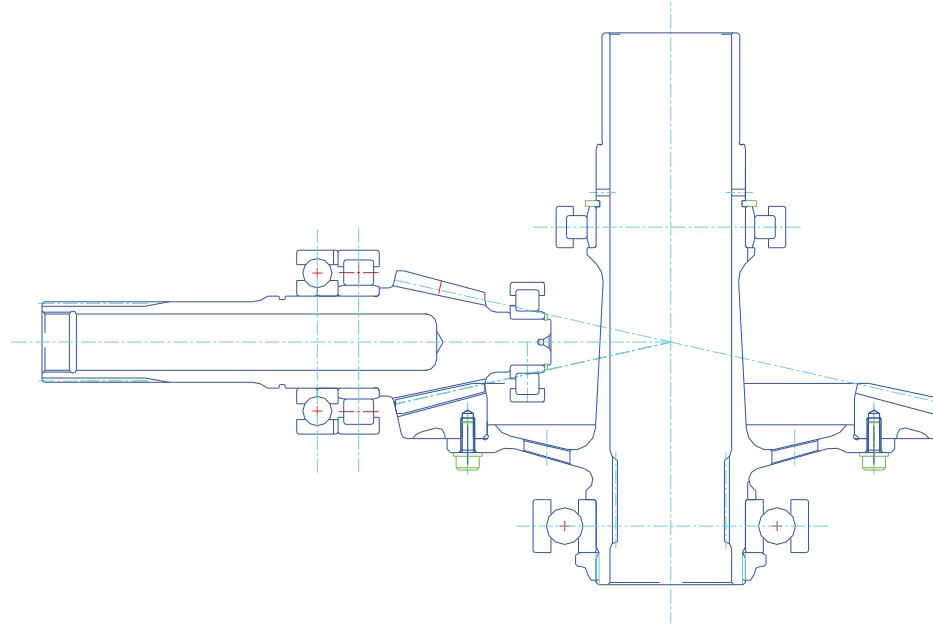


Fig. 1 – Cross Section of MGB Gears

The MGB of the ES101 helicopter has the function to reduce the rotational speed from 2387 rpm to 535 rpm and to change the rotational axis direction by 90°, from horizontal to vertical (Fig. 3).

The MGB receive the motion from the engine-transmission belt drive via a sprag freewheeling clutch and drives the main rotor mast through a spline located in the bottom of the gear shaft (Fig. 3).

The input member is the pinion (P/N E1.63.002.203) and the output member is the gear and gear-shaft assembly (respectively P/N E1.63.003.203 and P/N E1.63.004.203) Ref. Fig1 and Fig. 2.

The gears have the function to transmit the torque and rotation (i.e. mechanical power) from the engine-transmission belt drive to the main rotor mast.

The MGB gears are critical parts since their structural failure will compromise their function (loss of drive) so as to cause a catastrophic failure of the helicopter.

The parts analyzed in this report are the following:

Pinion P/N E1.63.002.203

Gear P/N E1.63.002.203

Gear Shaft P/N E1.63.004.203

Pinion Bearings as depicted in Fig. 1

Gear Bearings as depicted in Fig.1

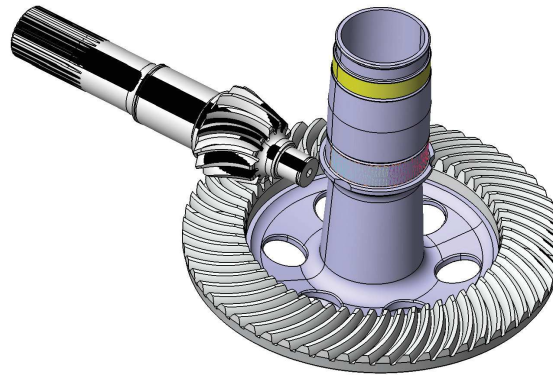


Fig. 2 – 3D View of MGB Gears

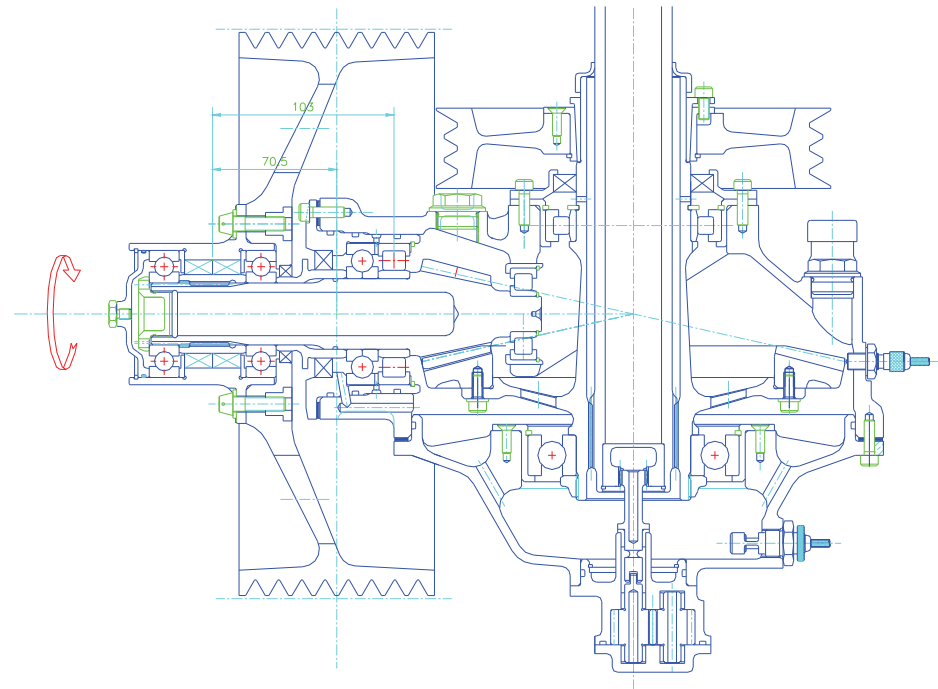


Fig. 3 - MGB Assembly (P/N E1.63.001.102)