

TABLE OF CONTENTS

TABLE OF CONTENTS	3
ABBREVIATIONS AND SYMBOLS	5
INTRODUCTION	7
1. DEFINITION OF RESEARCH PROBLEM	11
1.1. General remarks	11
1.2. Objectives and thesis dissertation	12
2. SUMMARY OF THE AIS FUNCTIONING	14
2.1. Introduction	14
2.2. Idea of AIS introduction	14
2.3. Information transmitted by AIS used in the dissertation	15
2.4. AIS network structure of the Gulf of Gdansk	20
2.5. AIS malfunctions	22
3. REVIEW OF AVAILABILITY AND INTEGRITY METHODS AND TOOLS FOR AIS INFORMATION RESEARCH	25
3.1. Methods and tools for research of AIS information integrity	25
3.1.1. Application of statistic methods to research AIS service information	25
3.1.2. Statistical analysis of AIS information in accordance with N.Bailey theory	26
3.1.3. End-user satisfaction model	27
3.2. Research methods and tools of AIS information availability	28
3.2.1. Research method of AIS information availability by A.Hori	28
3.2.2. Research method (LIC) of AIS availability and coverage area in accordance with Lapinski & Isenor	30
3.2.3. Research method (HPC) of AIS availability and coverage area in accordance with Hammond & Peters	32
4. RESEARCH METHODOLOGY FOR ESTABLISHING THE PROBLEM THROUGH AVAILABLE TOOLS AND MODELS	35
4.1. Preliminary presentation of research models	35
4.1.1. General remarks	35
4.1.2. Option 1 – Method for research of AIS information integrity with the use of Fault Tree Analysis (FTA)	35
4.1.3. Option 2 – Method for research of AIS information availability and integrity with the use of Markov Processes	39
4.1.3.1. Definitions	39
4.1.3.2. Stationary distribution	41
4.2. Remedy research by available models and tools	42
4.2.1. General remarks	42
4.2.2. Developing data - "post-processing"	43
4.2.3. Decoding AIS information	43
4.2.4. Assumption for availability research of AIS information	47
4.2.5. Availability structure of AIS information – determination of the object study	51
4.2.6. Assumption for integrity research of AIS information	51
4.2.7. Evaluation completeness criteria of AIS information	52
4.2.8. Completeness structure of AIS information – determination of the object study	54
4.2.9. Evaluation integrity criteria of AIS information	56
4.2.9.1. Evaluation integrity criteria of AIS message No. 1	57

4.2.9.2. Evaluation integrity criteria of AIS message No. 5	57
4.2.10. Preliminary assumptions of integrity research for AIS information	58
5. RESEARCH SOLUTION	61
5.1. Characteristics of input data	61
5.2. Research outcomes of AIS binary data availability	61
5.3. Research method of AIS information availability	63
5.4. Research outcomes of information completeness concerning true heading	67
5.5. Research method of AIS information completeness concerning true heading	69
5.6. Research outcomes of information completeness concerning rate of turn	72
5.7. Research method of AIS information completeness concerning rate of turn	74
SUMMARY, CONCLUSION, DIRECTION OF FURTHER RESEARCH	78
BIBLIOGRAPHY	84