# ASLIB

## CRANFIELD RESEARCH PROJECT

## FACTORS DETERMINING THE PERFORMANCE OF INDEXING SYSTEMS

### VOLUME 1. DESIGN

by

Cyril Cleverdon, Jack Mills and Michael Keen

Part 2. Appendices

An investigation supported by a grant to ASLIB
by the National Science Foundation

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Cranfield
1966

CONTENTS

PART 2


| | | Page |
|---|---|---|
| Introduction to Appendices | | |
| Appendix 3A | First letter and enclosures sent to authors of research papers | 121 |
| Appendix 3B | Second letter and enclosures sent to authors of research papers | 126 |
| Appendix 3C | List of 1400 documents in the test collection | 133 |
| Appendix 3D | List of 279 questions used in test | 185 |
| Appendix 3E | Subsets of documents and questions | 201 |
| Appendix 3F | Authors of base documents and question compilers | 204 |
| Appendix 3G | Questions-Relevant documents sets | 208 |
| Appendix 5.1 | List of index terms | 220 |
| Appendix 5.2 | Single term dictionaries | 237 |
| Appendix 5.3 | Single term hierarchies | 251 |
| Appendix 5.4 | Simple concept hierarchies | 291 |
| Appendix 5.5 | Alphabetical index of concepts | 312 |
| Appendix 5.6 | Controlled terms vocabulary | 365 |
| Appendix 6.1 | Examples of various computer print-outs | 372 |
| Name Index | | 375 |
| Subject Index | | 376 |

# INTRODUCTION TO APPENDICES

The appendices which follow provide complete information concerning the collection of documents and the set of questions used in the investigation, and are included with the intention that it should be possible for anyone - if they should wish to do so - to repeat the test. The main elements in this are the list of 1,400 documents (Appendix 3C), the list of 279 questions (Appendix 3D), and the complete relevance assessments of all the documents against all the questions (Appendix 3G). Not included is the indexing for each of the documents, since this would have added some seven hundred pages to this volume. However, to anyone interested, copies of the indexing sheets could be made available, either the complete set or any of the subsets which are given in Appendix 3E.. Alternatively, as the indexing has been put on to magnetic tape, a copy of the tape could be supplied.

The later appendices are mainly concerned with various arrangements of the terms used in the indexing of the documents, and illustrate the problems discussed in Chapters 4 and 5 of this volume.

# APPENDIX 3A

## First letter and enclosures sent to authors of research papers

For some years, with the aid of grants from the National Science Foundation, Washington, work has been undertaken at Cranfield into the efficiency of various techniques for indexing scientific and technical information. This investigation is now moving into a new phase, for which we are seeking the assistance of a number of scientists and engineers, and this letter is addressed to you as the author of a recent research paper.

The basic problem of information retrieval lies in the relationship between the desired recall of relevant documents ("message") and the unwanted recall of non-relevant documents ("noise"). In this respect, we have been able to make rough measurements of the performance of certain existing systems, and in the future work, we shall attempt to refine these measurements and reach a point where systems can be designed to meet given performance and economic requirements.

Before an investigation of this nature can be done, it is necessary to have:

(a) a collection of documents,
(b) a number of questions to be used for searching,
(c) an assessment of the documents in the collection regarding their relevance to each of the search questions.

Briefly, our hope is that we will, with your assistance, be able to meet these requirements in the following way. The collection of documents will consist of the references (apart from books or papers written prior to 1954) contained in approximately 400 recent papers which will be mainly in the field of aerodynamics. We ask you, as author of such a paper, to give us the original problem which

Continued.....

occasioned the research and also some other questions which arose in the course of the work and which might have been responsible for the inclusion of any particular papers in the list of references. We then ask that each reference shall be given an assessment rating for each question.

If you feel that you cannot spare the time to do this, I should be grateful if you would let me know, but I am, of course, hoping that you will be able to assist us and assure you that your help will be most welcome. The preceding paragraph is a general outline of what we wish you to do, but in the enclosed sheets we have given more details and have also included some examples for your guidance. The sheet we ask you to complete and return lists the references in your papers which would be included in the document collection.

As I have said earlier, we hope for and would greatly appreciate your co-operation in helping us to investigate this problem of information retrieval. If it is a subject in which you are interested, I should be pleased to send you a copy of a report that was recently issued on our work so far.

Yours sincerely,

Director,
Aslib Cranfield Project.

## INSTRUCTIONS FOR ENTERING QUESTIONS AND RELEVANCE ASSESSMENT

On the front of the attached sheet is entered the title and reference of a paper which you have published fairly recently. Would you please enter at (A) the basic problem, as closely as possible in the form of a search question, which was the reason for the research being undertaken. In addition would you please list any other questions (up to three in number) which, in the course of the work, you did put or might have put to an information service.

A number of the references which were given in your paper are listed on the reverse of the attached sheet, and it is assumed that they are all, in varying degrees, relevant to at least one of your questions. We would ask you to mark on this page in the appropriate column your assessment (1, 2, 3, 4 or 5) of the relevance of each reference in relation to each of the questions that you have listed.

This assessment of relevance should be based on the following definitions :-

**Mark as (1)** references which are a complete answer to the question. Presumably this would only apply for supplementary questions, i.e. (B), (C) or (D) since if they applied to the main question, there would have been no necessity for the research to be done.

**Mark as (2)** references of a high degree of relevance, the lack of which either would have made the research impracticable or would have resulted in a considerable amount of extra work.

**Mark as (3)** references which were useful, either as general background to the work or as suggesting methods of tackling certain aspects of the work.

**Mark as (4)** references of minimum interest, for example, those that have been included from a historical viewpoint.

**Mark as (5)** references of no interest.

It is appreciated that it is not easy to do this objectively, for personal considerations tend to influence judgement. If you find that in certain cases you are uncertain as to which rating should be used, then we suggest that your doubts should be shown by giving a combined rating. An instance of this occurs in the example which we enclose of a sheet that has been completed by Dr. J. F. Clarke. In relation to his basic question A, he decided that references 1, 2, 3 and 5 were considered of no interest, and were therefore marked with a rating of '5'; reference 4 was assessed as falling between ratings '2' and '3' and this is indicated by his marking of '2-3'. For question B references 1 and 2 were rated at '1' while for question C, references 3 and 4 received this rating. Reference 4, as will be seen, was considered by Dr. Clarke to have varying degrees of relevance to questions A, B and C, but was not relevant to question D.

A. 73

EXAMPLE

ASLIB CRANFIELD INVESTIGATION INTO

PERFORMANCE OF INDEX LANGUAGES

Please complete and return to:

C. W. Cleverdon,
The College of Aeronautics,
Cranfield, Bletchley,
Bucks., England.

---

AUTHOR J. F. Clarke

TITLE Reaction-resisted Shock Fronts.

REFERENCE College of Aeronautics Report No. 150, May 1961.

---

BASIC QUESTION

(A) Has anyone investigated the role of chemical reactions in determining shock wave structure?

---

(B) Papers on acoustic wave propagation in reacting gases.

---

(C) Have other types of 'non-viscous' compression waves been investigated analytically or observed experimentally

---

(D) Is there any simple, but realistic, "model" gas which can be used to expedite analysis?

## LIST OF REFERENCES


Ref. No.

1. Clarke, J.F. Flow of chemically reacting gas mixtures. College of Aeronautics Report 117.

2. Clarke, J.F. Linearized flow of a dissociating gas. Jnl. Fluid Mech., 7, 1960, pp 577-595.

3. Griffith, W.C. and Kenny, A. Jnl. Fluid Mech. 3, 1957, p.268.

4. Lighthill, M.J. Survey in Mechanics, Ed. by G.K. Batchelor and R.M. Davies, Cambridge University Press, 1956.

5. Lighthill, M.J. Dynamics of a dissociating gas. Jnl. Fluid Mech., 2, 1957, pp 1-32.


ASSESSMENT

| Question | | | |
|---|---|---|---|
| A | B | C | D |
| 5 | 1 | 5 | 3 |
| 5 | 1 | 5 | 5 |
| 5 | 5 | 1 | 5 |
| 2-3 | 3 | 1 | 5 |
| 5 | 5 | 5 | 1 |

# APPENDIX 3B

Second letter and enclosures sent to authors of research papers

You may recollect that some months ago you were kind enough to help in our investigation into the efficiency of indexing systems. Since that time we have been engaged in indexing the documents in the collection and preparing for the test programme. In this we shall be using the questions which you, together with some two hundred other authors, compiled for us. You may remember that at that time we also asked you to make a relevance assessment against the questions you gave us, of some of the references included in your paper.

There have been external developments concerning our project during the past few months, and this is largely due to the co-operation which we have received from you and others whose assistance we requested. As you may possibly know, major efforts are being made to develop the use of computers for automatic translation and also for the automatic indexing of documents. The latter work has been proceeding at various levels but a number of groups have been concerned with what is usually known as associative indexing. Briefly, this involves having a computer analyse the key terms used in a collection of documents, and working out, usually by some statistical technique, the most useful associations of terms to be used in searching. For some time the National Science Foundation have been interested in having a collection of documents that can be used as a common corpus by the various groups working in this field, so that a relative assessment can be made of their differing techniques. The collection which we have

compiled has been selected for such a common corpus, with the result that the work which you did for us will be used additionally by groups working at Cambridge and at a number of American Universities or Research Establishments.

In addition, there is a further recently developed technique known as Citation Indexing. This depends on building up an index which allows one to find which papers have quoted an earlier paper. For instance, if one wished to find information on the area rule one might look up the early paper by G. Ward on this subject, and find, from the index, references to all the papers which had quoted it, on the assumption that these papers would have some relevance to the original subject. This is an assumption, the validity of which, we are testing.

As you may have guessed, this preamble is a lead in to ask whether you would be willing to help us further in two ways. In relation to the questions which you provided, you gave a relevance assessment of some or all of the references in your original paper. It is these references which, with those from similar papers, make up our collection of 1,400 documents. The result is that there may be in the total collection additional papers which are relevant to your questions. This could be either because they appeared after your work was published, because you knew of them but did not list them, because you included them in your list of references but we omitted them from our list, or because they did not come to your attention. We have had a number of post-graduate students analysing every document in the collection against each question, with the intention that we should have a matrix which will show the relevance of each document to each question. My instructions to the students were to list anything which might possibly be relevant, so my first request to you is to ask if you will check these assessments that have been done by the students. The papers concerned are listed on the attached sheet, together with the original questions, and I also include abstracts of the papers to help you decide.

The second matter concerns the questions which you prepared for us. Developments in testing indexing systems during the past few months have shown up, in a way not previously recognised, the importance of the actual search programmes. It is usually found that, within a question, certain aspects are more important than others, and this we would like you to indicate as far as possible by giving a "weighting" to each concept, as described in the attached sheets. Finally,

if you can suggest any related terms which you consider could be used as alternatives in searching, we would be grateful if you would give them.

I have set out these additional tasks in the order of their importance. Whilst we would, of course, be pleased if you could supply the answers to all these enquiries, most important is the relevance assessment, and I shall be very grateful if you can find time to deal with this matter.

Director
Aslib Cranfield Project

## ASSESSMENT OF ADDITIONAL DOCUMENTS

The first attached sheet is a copy of the form which you originally completed by entering the questions that arose in the course of your research work. These questions were marked A, B, C, and D. The next sheet lists references to additional documents which we have located in the total collection and consider might be relevant to one or more of your questions. The four-figure file number for each document is followed by a letter or letters and these refer to your questions. It is only in relation to the particular question so indicated that we ask for your assessment of the relevance of the document. To assist you in this task we include abstracts of each paper listed.

The assessment of relevance should be, as before, based on the following definitions :-

| | |
|---|---|
| Mark as (1) | references which are a complete answer to the question. Presumably this would only apply for supplementary questions, i.e. (B), (C) or (D) since if they applied to the main question, there would have been no necessity for the research to be done. |
| Mark as (2) | references of a high degree of relevance, the lack of which either would have made the research impracticable or would have resulted in a considerable amount of extra work. |
| Mark as (3) | references which were useful, either as general background to the work or as suggesting methods of tackling certain aspects of the work. |
| Mark as (4) | references of minimum interest, for example, those that have been included from a historical viewpoint. |
| Mark as (5) | references of no interest. |

## WEIGHTING AND NEW TERMS

On the attached sheets are listed the terms as given in your questions. In the box by the side of each term we would ask you to indicate its relative importance by marking 1, 2, or 3. These figures will indicate :-

1. A paper that did not cover this term would be of no use.
2. It is desirable that this term should be covered by the document.
3. This is a term which is not absolutely essential to the enquiry.

It may well be that you will rate each term as one; this would not be surprising but we would not wish to influence your decision in this respect.

Over the remainder of the sheet space is left for you to insert any alternative terms that you consider might be used in the search programme. In this case, however, it is more likely that you would wish to show alternative concepts rather than single terms, so the terms have been grouped into concepts. As examples of alternative terms or concepts, in the context of a question dealing with "pressure gradient", it might be reasonable to substitute "pressure distribution" or "pressure variation"; the concept "suddenly heated wall" might be changed to "rapidly cooled solid". Alternatively, the complete question might be rephrased, an example of this being where the original question was "has anyone investigated relaxation effects on gaseous heat transfer to a suddenly heated wall". Rephrased the question becomes "has anyone investigated conditions at the wall behind a plain reflected shock front in a real gas by theoretical analysis". If you would wish to rewrite your question in this way space is available on the sheet.

QUESTION 249 Is it possible to estimate the transonic drag-rise and buffet boundaries of aerofoils without recourse to experiment

| Search Terms | Weight | Alternative Terms or Concepts |
|---|---|---|
| Transonic | 1 | Mixed subsonic/supersonic |
| Drag | 2 | |
| Rise | 2 | |
| | | |
| | | |
| | | |
| Buffet | 3 | Onset of shock induced boundary layer separation |
| Boundary | 3 | |
| | | |
| | | |
| | | |
| | | |
| Aerofoil | 1 | Wing section |
| | | |
| | | |
| | | |
| Theoretical | | |
| Estimation | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

Rephrased Question: Is it possible to obtain a theoretical estimate of the transonic drag-rise and onset of shock-induced boundary layer separation Mach numbers for two-dimensional aerofoils

## LIST OF ADDITIONAL DOCUMENTS OF POSSIBLE RELEVANCE

| Doc. No. | | ASSESSMENT Question | | | |
|---|---|---|---|---|---|
| | | A | B | C | D |
| 1313 | SPREITER, J.R. On alternative forms for the basic equations of transonic flow theory J. Aero. Sc. Jan. 1954 | | | | |

# APPENDIX 3C

## LIST OF 1400 DOCUMENTS IN THE TEST COLLECTION

1001 BRENCKMAN,M. Experimental investigation of the aerodynamics of a wing in a slipstream. J. Ae. Scs. 25, 1958, 324.

1002 LI,T.Y. Simple shear flow past a flat plate in an incompressible fluid of small viscosity. J.Ae. Scs. 22, 1955, 651.

1003 GLAUERT,M.B. The boundary layer in simple shear flow past a flat plate. J. Ae. Scs. 24, 1957, 848.

1004 YEN,K.T. Approximate solutions of the incompressible laminar boundary layer equations for a plate in shear flow. J. Ae. Scs. 22, 1955, 728.

1005 WASSERMAN,B. One-dimensional transient heat conduction into a double-layer slab subjected to a linear heat input for a small time internal. J. Ae. Scs. 24, 1957, 924.

1006 CAMPBELL,W.F. One-dimensional transient heat flow in a multilayer slab. J. Ae. Scs. 25, 1958, 340.

1007 Van DRIEST,E.R. and McCAULEY,W.D. The effect of controlled three-dimensional roughness on boundary layer transition at supersonic speeds. J. Ae. Scs. 27, 1960, 261.

1008 KLEBANOFF,P.S. Measurements of the effect of two-dimensional and three-dimensional roughness elements on boundary layer transition. J. Ae. Scs. 22, 1955, 803.

1009 KORKEGI,R.H. Transition studies and skin friction measurements on an insulated flat plate at a Mach number of 5.8. J. Ae. Scs. 23, 1956, 97.

1010 CHAMBRE,P.L. and SCHAAF,S.A. The theory of the impact tube at low pressure. J. Ae. Scs. 15, 1948, 735.

1011 NAPOLITANO,L. Similar solutions in compressible laminar free mixing problems. J. Ae. Scs. 23, 1956, 389.

1012 BISPLINGHOFF,R.L. Some structural and aerelastic considerations of high speed flight. J. Ae. Scs. 23, 1956, 289.

1013 TSIEN,H.S. Similarity laws for stressing heated wings. J. Ae. Scs. 20, 1953, 1.

1014 ASHLEY,H. and ZARTARIAN,G. Piston theory - a new aerodynamic tool for the aeroelastician. J. Ae. Scs. 23, 1956, 1109.

1015 FUNG,Y.C. On two-dimensional panel flutter. J. Ae. Scs. 25, 1958, 145.

1016 MAGER,A. Transformation of the compressible turbulent boundary layer. J. Ae. Scs. 25, 1958, 305.

1017 TING,L. and LIBBY,P.A. Remarks on the eddy viscosity in compressible mixing flows. J. Ae. Scs. 27, 1960, 797.

1018 RHYMING,I.L. The flow field in the diffuser of a radial compressor. J. Ae. Scs. 27, 1960, 798.

1019 ZAKKAY,V. An investigation of the pressure distribution on conical bodies in hypersonic flows. J. Ae. Scs. 26, 1959, 457.

1020 LOVE,E.S. Generalised-Newtonian theory. J. Ae. Scs. 26, 1959, 314.

1021 MASLEN,S.H. On heat transfer in slip flow. J. Ae. Scs. 25, 1958, 400.

1022 OMAN,R.A. and SCHEUING,R.A. On slip-flow heat transfer to a flat plate. J. Ae. Scs. 26, 1959, 126.

1023 SEBAN,R.A. and BOND,R. Skin-friction and heat transfer characteristics of a laminar boundary layer on a cylinder in axial incompressible flow. J. Ae.Scs. 18, 1951, 671.

1024 FAY,J.A. and RIDDELL,F.R. Theory of stagnation point heat transfer in dissociated air. J. Ae. Scs. 25, 1958, 73.

1025 LEES,L. and KUBOTA,T. Inviscid hypersonic flow over blunt-nosed slender bodies. J. Ae. Scs. 24, 1957, 195.

1026 CHENG,H.K. and PALLONE,A.J. Inviscid leading-edge effect in hypersonic flow. J. Ae. Scs. 23, 1956, 700.

1027 COLE,J.D. Newtonian flow theory for slender bodies. J. Ae. Scs. 24, 1957, 448.

1028 FREEMAN,N.C. A note on the explosion solution of Sedov with application to the Newtonian theory of unsteady hypersonic flow. J. Ae. Scs. 27, 1960, 77.

1029 ISAKSON,G. A simple model study of transient temperature and thermal stress distribution due to aerodynamic heating. J. Ae. Scs. 24, 1957, 611.

1030 GERARD,G. and TRAMPOSCH,H. Photo-thermoelastic investigation of transient thermal stresses in a multiweb wing structure. J. Ae. Scs. 26, 1959, 783.

1031 HOFF,N.J. Thermal buckling of supersonic wing panels. J. Ae. Scs. 23, 1956, 1019.

1032 FRIEDRICH,H.R. and DORE,F.J. The dynamic motion of a missile descending through the atmosphere. J. Ae. Scs. 22, 1955, 628.

1033 RESLER,E.J. and SEARS,W.R. The prospects for magneto-aerodynamics. J. Ae. Scs. 25, 1958, 235.

1034 KERREBROCK,J.P. and MARBLE,F.E. Constant-temperature magneto-gasdynamic channel flow. J. Ae. Scs. 27, 1960, 78.

1035 LI,T.Y. and GEIGER,R.E. Stagnation point of a blunt body in hypersonic flow. J. Ae. Scs. 24, 1957, 25.

1036 SERBIN,H. Supersonic flow around blunt bodies. J. Ae. Scs. 25, 1958, 58.

1037 FERRI,A. and LIBBY,P.A. A new technique for investigating heat transfer and surface phenomena under hypersonic flow conditions. J. Ae. Scs. 24, 1957, 464.

1038 SINNOTT,C.S. On the prediction of mixed subsonic/supersonic pressure distributions. J. Ae. Scs. 27, 1960, 767.

1039 SINNOTT,C.S. On the flow of a sonic stream past an airfoil surface. J.Ae.Scs. 26, 1959, 169.

1040 Van DRIEST,E.R. and BOISON,J.C. Experiments on boundary layer transition at supersonic speeds. J. Ae. Scs. 24, 1957, 885.

1041 MORKOVIN,M.V. On transition experiments at moderate supersonic speeds. J. Ae. Scs. 24, 1957, 480.

1042 SCANLAN,R.H. and TRUMAN,J.C. The gyroscopic effect of a rigid rotating propeller on engine and wing vibration modes. J. Ae. Scs. 17, 1950, 653.

1043 POTTER,J.L. and WHITFIELD,J.D. The relation between wall temperature and the effect of roughness on boundary layer transition. J. Ae. Scs. 28, 1961, 663.

1044 BERTRAM,M.H. Tip-bluntness effects on cone pressures at M=6.85. J.Ae.Scs. 23, 1956,898.

1045 CHARWAT,A.F. An investigation of separated flows, Part II: Flow in the ca vity and heat transfer. J. Ae. Scs. 28, 1961, 513.

1046 KLEIN,B. Some comments on the inversion of certain large matrices. J. Ae. Scs. 28, 1961, 432.

1047 SAMSON,S.H. and BERGMANN,H.W. Analysis of low-aspect-ratio aircraft structures. J. Ae. Scs. 27, 1960, 679.

1048 WILLETT,J.E. Supersonic flow at the surface of a circular cone at angle of attack. J. Ae. Scs. 27, 1960, 907.

1049 CHAPMAN,D. and RUBESIN,M. Temperature and velocity profiles in the compressible laminar boundary layer with arbitrary distribution of surface temperature. J. Ae. Scs. 16, 1949, 547.

1050 Van DRIEST,E.R. Investigation of laminar boundary layer in compressible fluids using the Crocco method. NACA TN.2597, 1952.

1051 O'SULLIVAN,W.J. Theory of aircraft structural models subjected to aerodynamic heating and external loads. NACA TN.4115, 1957.

1052 MORGAN,H.G. Procedure for calculating flutter at high supersonic speed including camber deflections, and comparison with experimental results. NACA TN.4335, 1958.

1053 LARSON,H.K. and KEATING,S.J. Transition Reynolds numbers of separated flows at supersonic speeds. NASA TN.D349, 1960.

1054 MORDUCHOW,M. and CLARKE,J.H. Method for calculation of compressible laminar boundary layer characteristics in axial pressure gradient with zero heat transfer. NACA TN.2784, 1952.

1055 MORDUCHOW,M. and GRAPE,R.G. Separation, stability and other properties of compressible laminar boundary layer with pressure gradient and heat transfer. NACA TN.3296, 1955.

1056 EHRET,D.M. An analysis of the applicability of the hypersonic similarity law to the study of the flow about bodies of revolution at zero angle of attack. NACA TN.2250, 1950.

1057 ROSSOW,V.J. Applicability of the hypersonic similarity rule to pressure distributions which include the effects of rotation for bodies of revolution at zero angle of attack. NACA TN.2399, 1951.

1058 AMICK,J.L. Pressure measurements on sharp and blunt 5° and 15° half-angle cones at Mach number 3.86 and angles of attack to 100°. NASA TN.D753, 1961.

1059 BROWN,W.D. and DONOUGHE,P.L. Tables of exact laminar-boundary layer solutions when the wall is porous and fluid properties are variable. NACA TN.2479, 1951.

1060 BOBBITT,P.J. and MALVESTUTO,F.S. Estimation forces and moments due to rolling for several slender tail configurations at supersonic speeds. NACA TN.2955, 1953.

1061 ROSSOW,V.J. On flow of electrically conducting fluids over a flat plate in the presence of a transverse magnetic field. NACA TN.3971, 1957.

1062 COHEN,C.B. and RESHOTKO,E. Similar solutions for the compressible laminar boundary layer with heat transfer and pressure gradient. NACA TN.3325, 1955.

1063 TALBOT,L. Hypersonic viscous flow over slender cones. NACA TN.4327, 1958.

1064 MOORE,F.K. Unsteady oblique interaction of a shock wave with plane disturbances. NACA TN.2879, 1953.

1065 RIBNER,H.S. Convection of a pattern of vorticity through a shock wave. NACA TN.2864, 1953.

1066 GRIFFITH,G.E. and MILTONBERGER,G.H. Some effects of joint conductivity on the temperature and thermal stresses in aerodynamically heated skin-stiffener combinations. NACA TN.3609, 1956.

1067 TOBAK and ALLEN. Dynamic stability of vehicles traversing ascending or descending paths through the atmosphere. NACA TN.4275, 1958.

1068 LOVE,E.S. Some aspects of air-helium simulation and hypersonic approximations. NASA TN.D49, 1959.

1069 KAATTARI,G.E. Predicted shock envelopes about two types of vehicles at large angles of attack. NASA TN.D860, 1961.

1070 NITZBURG,G.E. and CRANDALL,S. A study of flow changes associated with airfoil section drag rise at supercritical speeds. NACA TN.1813, 1949.

1071 MIRELS,H. Laminar boundary layer behind shock advancing into stationary fluid. NACA TN.3401, 1955.

1072 MIRELS,H. Boundary layer behind shock or thin expansion wave moving into stationary fluid. NACA TN.3712, 1956.

1073 LEES,L. and LIN,C.C. Investigation of the stability of the laminar boundary layer in a compressible fluid. NACA TN.1115, 1946.

1074 GOODERUM,P.N. An experimental study of the turbulent boundary layer on a shock tube wall. NACA TN.4243, 1958.

1075 HESS,N.W. Studies of structural failure due to acoustic loading. NACA TN.4050, 1957.

1076 MULL,H.R. and ALGRANTI,J.S. Flight measurement of wall pressure fluctuations and boundary-layer turbulence. NASA TN.D280, 1960.

1077 EGGERS,A.J. A comparative analysis of the performance of long range hypervelocity vehicles. NACA TN.4046, 1957.

1078 REED,W.H. and BLAND,S.R. An analytical treatment of aircraft propeller precession instability. NASA TN.D659, 1961.

1079 JACK,J.R. Effects of extreme surface cooling on boundary layer transition. NACA TN.4094, 1957.

1080 BRASLOW,A.L. Effect of distributed three-dimensional roughness and surface cooling on boundary layer transition and lateral spread of turbulence at supersonic speeds. NASA TN.D53, 1959.

1081 OSTRACH,S. and THORNTON,P. Compressible laminar flow and heat transfer about a rotating isothermal disk. NACA TN.4320, 1958.

1082 ADAMS,E.W. Theoretical investigation of the ablation of a glass-type heat protection shield of varied material properties at the stagnation point of a re-entering IRBM. NASA TN.D564, 1961.

1083 ANDERSON,K. and SINCHTEL,C.D. Discussion of solar proton events and manned space flights. NASA TN.D671, 1961.

1084 LIBBY,PA. and CRESCI,R.J. Experimental investigation of the downstream influence of stagnation point mass transfer. J. Ae. Scs. 28, 1961, 51.

1085 FELDMAN,S. On trails of axisymmetric hypersonic blunt bodies flying through the atmosphere. J. Ae. Scs. 28, 1961, 433.

1086 STRAND,T. Inviscid-incompressible flow theory of static peripheral jets in proximity to the ground. J. Ae. Scs. 1961, 27.

1087 LU, Pau-Chang. Free-convection magnetohydrodynamic flow past a porous flat plate. J. Ae. Scs. 28, 1961, 346.

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## APPENDIX 3D

### List of 279 questions used in the test

Q1 What similarity laws must be obeyed when constructing aeroelastic models of heated high speed aircraft.

Q2 What are the structural and aeroelastic problems associated with flight of high speed aircraft.

Q3 How can one describe the aerodynamic forces and heating rates acting on a high speed aircraft.

Q4 What problems of heat conduction in composite slabs have been solved so far.

Q8 Can a criterion be developed to show empirically the validity of flow solutions for chemically reacting gas mixtures based on the simplifying assumption of instantaneous local chemical equilibrium.

Q9 What chemical kinetic system is applicable to hypersonic aerodynamic problems.

Q10 What theoretical and experimental guides do we have as to turbulent Couette flow behaviour.

Q12 Is it possible to relate the available pressure distributions for an ogive forebody at zero angle of attack to the lower surface pressures of an equivalent ogive forebody at angle of attack.

Q13 What methods - exact or approximate - are presently available for predicting body pressures at angle of attack.

Q14 What would be the effect of a slight gas rarefaction (i.e. velocity and temperature discontinuities at walls) on energy separation in tubes and ducts.

Q15 Papers on internal 'slip flow' heat transfer studies.

Q16 Can the reference enthalpy method be used to predict real-gas laminar-boundary layer skin friction and heat transfer.

Q17 Has the reference enthalpy method been compared with exact calculations for the perfect-gas case over a wide range of free-stream Mach numbers.

Q18 Are real-gas transport properties for air available over a wide range of enthalpies and densities.

Q22 Is it possible to find an analytical, similar solution of the strong blast wave problem in the Newtonian approximation.

Q23 How can the aerodynamic performance of channel flow ground effect machines be calculated.

Q26 What is the basic mechanism of the transonic aileron buzz.

Q27 Papers on shock-sound wave interaction.

Q29 Material properties of photoelastic materials.

Q31 Can the transverse potential flow about a body of revolution be calculated efficiently by an electronic computer.

Q32 Can the three-dimensional problem of a transverse potential flow about a body of revolution be reduced to a two-dimensional problem.

Q33 Are experimental pressure distributions on bodies of revolution at angle of attack available.

Q34 Does there exist a good basic treatment of the dynamics of re-entry, combining consideration of realistic effects with relative simplicity of results.

Q35 Has anyone formally determined the influence of Joule heating, produced by the induced current, in magnetohydrodynamic free convection flows under general conditions.

Q39 Why does the compressibility transformation fail to correlate the high speed data for helium and air.

Q40 Did anyone else discover that the turbulent skin friction is not over sensitive to the nature of the variation of the viscosity with temperature.

Q41 What progress has been made in research on unsteady aerodynamics.

Q49 What are the factors which influence the time required to invert large structural matrices.

Q50 Does a practical flow follow the theoretical concepts for the interaction between adjacent blade rows of a supersonic cascade.

Q51 What is a single approximate formula for the displacement thickness of a laminar boundary layer in compressible flow on a flat plate.

Q52 How is the design of ring or part ring wings by linear theory affected by thickness.

Q53 What application has the linear theory design of curved wings.

Q54 What is the effect of cross sectional shape on the flow over simple delta wings with sharp leading edges.

Q55 Papers on flow visualization on slender conical wings.

Q56 What size of end plate can be safely used to simulate two-dimensional flow conditions over a bluff cylindrical body of finite aspect ratio.

Q57 To find an approximate correction for thickness in slender thin-wing theory.

Q58 How do interference-free longitudinal stability measurements (made using free-flight models) compare with similar measurements made in a low-blockage wind tunnel.

Q59 Have wind tunnel interference effects been investigated on a systematic basis.

Q61 Are there any papers dealing with acoustic wave propagation in reacting gases.

Q62 Has anyone investigated relaxation effects on gaseous heat transfer to a suddenly heated wall.

Q63 Are there any papers which treat heat conduction problems involving gas-phase-excited and surface-excited internal energy modes.

Q64 What is the effect on the base pressure of a body from which a jet issues of varying (a) jet design Mach number, (b) free stream Reynolds number, (c) jet radius/base radius.

Q66 Are there any theoretical methods for predicting base pressure.

Q67 Does transition in the hypersonic wake depend on body geometry and size.

Q68 How can one detect transition phenomena in boundary layers.

Q69 How can one detect transition phenomena in hypersonic wakes.

Q70 What work has been done on estimating forces and moments on cruciform wing-body configurations which are rolling.

Q71 Has anyone investigated and developed a simple model for the vortex wake behind a cruciform wing.

Q72 What is a criterion that the transonic flow around an airfoil with a round leading edge be validly analyzed by the linearized transonic flow theory.

Q74 Can the transonic flow around an arbitrary smooth thin airfoil be analysed in a simple approximate way.

Q79 What are the details of the rigorous kinetic theory of gases. (Chapman-Enskog Theory).

Q80 Has anyone investigated the effect of surface mass transfer on hypersonic viscous interactions.

Q81 What is the combined effect of surface heat and mass transfer on hypersonic flow.

Q82 What are the existing solutions for hypersonic viscous interactions over an insulated flat plate.

Q83 What controls leading-edge attachment at transonic speeds.

Q84 Can the three-point boundary-value problem for the Blasius equation be integrated numerically, using suitable transformations, without iteration on the boundary conditions.

Q85 What are the effects of small amounts of gas rarifaction on the characteristics of the boundary layers on slender bodies of revolution.

Q86 What is the available information pertaining to boundary layers on very slender bodies of revolution in continuum flow (the "transverse curvature" effect).

Q87 What is the available information pertaining to the effect of slight rarifaction on boundary layer flows (the "slip" effect).

Q92 Is there a theory for prediction of aerodynamic force and movement on an oscillating thin airfoil in a real fluid (medium: water and air, angle of attack: small or large.)

Q93 What investigations have been made of the flow field about a body moving through a rarefied, partially ionized gas in the presence of a magnetic field.

Q94 How is the heat transfer downstream of the mass transfer region effected by mass transfer at the nose of a blunted cone.

Q95 To what extent can the available information for incompressible boundary layers be applied to problems involving compressible boundary layers.

Q97 To what extent can readily available steady-state aerodynamic data be utilized to predict lifting-surface flutter characteristics.

Q98 What are the significant steady and non-steady flow characteristics which affect the flutter mechanism.

Q99 Is it possible to determine rates of forced convective heat transfer from heated cylinders of non-circular cross-section, (the fluid flow being along the generators).

Q100 How much is known about boundary layer flows along non-circular cylinders.

Q101 Is there any simple, but practical, method for numerical integration of the mixing problem (i.e. the Blasius problem with three-point boundary conditions.)

Q102 Does there exist a closed-form expression for the local heat transfer around a yawed cylinder.

Q103 How far around a cylinder and under what conditions of flow, if any, is the velocity just outside of the boundary layer a linear function of the distance around the cylinder.

Q104 Where can I find pressure data on surfaces of swept cylinders.

Q105 Can't the static deflection shapes be used in predicting flutter in place of vibrational shapes? If so, can we provide a justification by means of an example.

Q106 Does the boundary layer on a flat plate in a shear flow induce a pressure gradient.

Q107 Can the procedure of matching inner and outer solutions for a viscous flow problem be applied when the main stream is a shear flow.

Q108 Can series expansions be found for the boundary layer on a flat plate in a shear flow.

Q109 What possible techniques are available for computing the injection distribution corresponding to an isothermal transpiration cooled hemisphere.

Q110 What is known regarding asymptotic solutions to the exact boundary layer equations.

Q111 Previous solutions to the boundary layer similarity equations.

Q112 Experimental results on hypersonic viscous interaction.

Q113 What has been done about viscous interactions in relatively low Reynolds number flows, particularly at high Mach numbers.

Q114 What role does the effect of chemical reaction (particularly when out of equilibrium) play in the similitude laws governing hypersonic flows over slender aerodynamic bodies.

Q115 Are there any experimental or exact numerical solution results around that might indicate the significance of nonequilibrium - dissociation effects on small disturbance flow fields.

Q116 How significant is the possible pressure of a dissociated free stream with respect to the realization of hypersonic simulation in high enthalpy wind tunnels.

Q117 Is it possible to use Biot's variational principle for general one dimensional and two dimensional heat conduction problems beyond those treated by Biot.

Q118 Do the discrepancies among current analyses of the vorticity effect on stagnation-point heat transfer result primarily from the differences in the viscosity - temperature law assumed.

Q119 How far can one trust the linear viscosity - temperature solution assumed in some of the analyses of hypersonic shock layer at low Reynolds number.

Q120 How close is the comparison of the shock layer theory with existing experiments in the low Reynolds number (merged-layer) regime.

Q121 Has anyone explained the kink in the surge line of a multi-stage axial compressor.

Q122 Have any aerodynamic derivatives been measured at hypersonic Mach numbers and comparison been made with theoretical work.

Q123 Are methods of measuring aerodynamic derivatives available which could be adopted for use in short running time facilities.

Q124 Can the irrotational-flow pressure distribution, and certain characteristic "sideslip" parameters, be found in closed form in general motion (not symmetrical about vertical plane.)

Q125 What effect has proximity to the ground on the pressure distribution and lift on an aerofoil with flaps.

Q126 What are wind-tunnel corrections for a two-dimensional aerofoil mounted off-centre in a tunnel.

Q127 What is the pressure distribution or load on a split flap on an aerofoil.

Q128 How do Kuchemann's and Multhopp's methods for calculating lift distributions on swept wings in subsonic flow compare with each other and with experiment.

Q129 What experimental measurements exist of span wise and chord wise loadings on swept wings at low subsonic speeds and small incidence.

Q130 What is the present state of the theory of quasi-conical flows.

Q131 References on the methods available for accurately estimating aerodynamic heat transfer to conical bodies for both laminar and turbulent flow.

Q132 What parameters can seriously influence natural transition from laminar to turbulent flow on a model in a wind tunnel.

Q133 Can a satisfactory experimental technique be developed for measuring oscillatory derivatives on slender sting-mounted models in supersonic wind tunnels.

Q134 What are the values of the stability derivatives in pitch and yaw for cambered slender ogee wings.

Q135 What effect has the boundary layer in modifying the basic inviscid flow behind the shock, neglecting effects of leading edge and corner.

Q136 How does a satellite orbit contract under the action of air drag in an atmosphere in which the scale height varies with altitude.

Q137 How is the flow at transonic speeds about a delta wing different from that on a closely-related tapered sweptback wing.

Q138 Recent data on shock-induced boundary-layer separation.

Q139 What interference effects are likely at transonic speeds.

Q140 Given complete freedom in the design of an airplane, what procedure would be used in order to minimize sonic boom intensity, and is there a limit to the degree of minimizing that can be accomplished.

Q141 Can methane-air combustion product be used as a hypersonic test medium and predict, within experimental accuracies, the results obtained in air.

Q142 What is the theoretical heat transfer rate at the stagnation point of a blunt body.

Q143 What is the theoretical heat transfer distribution around a hemisphere.

Q145 Has anyone investigated the unsteady lift distributions on finite wings in subsonic flow.

Q146 What information is available for dynamic response of airplanes to gusts or blasts in the subsonic regime.

Q147 Will forward or apex located controls be effective at low subsonic speeds and how do they compare with conventional trailing-edge flaps.

Q148 Given that an uncontrolled vehicle will tumble as it enters an atmosphere, is it possible to predict when and how it will stop tumbling and its subsequent motion.

Q149 What are the effects of initial imperfections on the elastic buckling of cylindrical shells under axial compression.

Q150 Why does the incremental theory and the deformation theory of plastic stress-strain relationship differ greatly when applied to stability problems.

Q152 Basic dynamic characteristics of structures continuous over many spans.

Q153 Is the information on the buckling of sandwich sphere available.

Q154 Can the load deformation characteristics of a beam be obtained with the material being inelastic and a non uniform temperature being present.

Q155 What is the effect of an internal liquid column on the breathing vibrations of a cylindrical shell.

Q156 Experimental techniques in shell vibration.

Q157 In summarizing theoretical and experimental work on the behaviour of a typical aircraft structure in a noise environment is it possible to develop a design procedure.

Q158 What data is there on the fatique of structures under acoustic loading.

Q159 What are the effects of thermal stress and buckling on the flutter characteristics of elastically restrained nearly square panels.

Q160 What procedures are available for calculating skin temperatures of panels subjected to aerodynamic heating.

Q161 Can increasing the edge loading of a plate beyond the critical value for buckling change the buckling mode.

Q162 Can thermal fatique results, obtained experimentally in engines or laboratory tests, be related to other experimental results, such as creep, mechanical fatigue, plastic deformation.

Q163 Have the effects of an elastic edge restraint been considered in previous papers on panel flutter.

Q164 Has the solution of the clamped plate problem, in the classical theory of bending, been reduced to two successive membrane boundary value problems.

Q165 What data exists on oscillatory aerodynamic forces on control surfaces at transonic Mach numbers.

Q166 What information is there on control surface "buzz" (i.e. single degree of freedom flutter.)

Q167 It is not likely that the airforces on a wing of general planform oscillating in transonic flow can be determined by purely analytical methods. Is it possible to determine the airforces on a single particular planform, such as the rectangular one by such method.

Q168 Is the problem of similarity for representative investigations of aeroelastic effects in heated flow as intractable as previous investigations imply.

Q169 What is the magnitude and distribution of lift over the cone and the cylindrical portion of a cone-cylinder configuration.

Q170 Is there any information on how the addition of a "boat-tail" affects the normal force on the body of various angles of incidence.

Q171 What are the aerodynamic interference effects on the fin lift and body lift of a fin-body combination.

Q173 What is the effect of initial axisymmetric deviations from circularity on the non linear (large-deflection) load-deflection response of cylinders under hydrostatic pressure.

Q175 Are previous analyses of circumferential thermal buckling of circular cylindrical shells unnecessarily involved or even inaccurate due to the assumed forms of buckling mode.

Q176 What papers are there dealing with circumferential buckling either thermal buckling or due to mechanical loading.

Q177 What analytical investigations have been made of the stability of conical shells. How do the results compare with experiment.

Q181 Has any work been done on determining the nature of compressible viscous flow in a straight channel.

Q182 In what areas, other than low density wind tunnel flows, is viscous compressible flow in slender channels a problem.

Q183 Jet interference with supersonic flows - experimental papers.

Q184 Thrust vector control by fluid injection - papers.

Q186 Is there experimental data on base pressure and wake angle for conical bodies in laminar hypersonic flow.

Q187 Is it possible to obtain a reasonably simple analytical solution to the heat equation for an exponential (in time) heat input.

Q189 Has anyone programmed a pump design method for a high-speed digital computer.

Q190 Has anyone derived simplified pump design equation from the fundamental three-dimensional equations for incompressible nonviscous flow.

Q191 Has anyone obtained meridional plane or blade-to-blade plane solutions of pump flow.

Q193 What are the effects of forward facing jets due to pressure ratio, exit mach number, ratio of specific heats, angle of attack, and exit to body diameter ratio.

Q194 What is the static force and moment characteristics and the shape of the bow shock wave on a short blunt 10° semivertex angle cone with a flat base, and also one with a conical afterbody having a semivertex angle of 50° , in helium at M = 15.

Q195 Effects of helium contamination on static pressures on surface of bodies and shock wave shapes in helium at M = 15.

Q196 What are the flutter characteristics of the exposed skin panels of the X-15 vertical stabilizer when subjected to aerodynamic heating.

Q198 What information is available concerning the thermodynamic and transport properties of air for temperature to about 10,000°K and pressures to about 1,000 atmospheres.

Q200 What agreement is found between theoretically predicted instability times and experimentally measured collapse times for compressed columns in creep.

Q201 Theoretical studies of creep buckling.

Q202 Experimental studies of creep buckling.

Q203 Is it possible to correlate the results on the creep buckling of widely different structures within the framework of a single theory.

Q204 What are the experimental results for the creep buckling of columns.

Q205 What are the results for the creep buckling of round tubes under external pressure.

Q206 Have any analytical studies been conducted on the time-to-failure mechanism associated with creep collapse for a long circular cylindrical shell which exhibits both primary and secondary creep as well as elastic deformations under various distributed force systems.

Q207 Which investigations serve to demonstrate the viscoelastic action of creep collapse either by use of different or simplified structural models, or by assuming that the shell material exhibits only certain phases of creep deformations; e.g. steady secondary creep.

Q208 Has the effect of initial stresses, on the frequencies of vibration of circular cylindrical shells, been investigated.

Q209 Has the effect of the change of initial pressure due to deformation, on the frequencies of vibration of circular cylindrical shells been investigated.

Q210 What are the discontinuity stresses at junctions in pressurized structures.

Q211 What analytical solutions are available for stresses in edge-loaded shells of revolution.

Q212 What dome contours minimize discontinuity stresses when used as closures on cylindrical pressure vessels.

Q213 What general solutions for the stresses in pressurized shells of revolution are available.

Q214 Can studies of pure membrane cylinders having no wall bending stiffness but maintaining their shape by virtue of internal pressure provide any insight into the behaviour of pressurized cylinders with finite wall stiffness.

Q215 What are the best experimental data and classical small deflection theory analyses available for pressurized cylinders in bending.

Q216 Does a membrane theory exist by which the behaviour of pressurized membrane cylinders in bending can be predicted.

Q217 What are the equations which define the stability of simply supported corrugated core sandwich cylinders.

Q218 Papers on small deflection theory for buckling of sandwich cylinders.

Q219 Has anyone developed an analysis which accurately establishes the large deflection behaviour of conical shells.

Q223 What is the magnitude of second-order wing-body interference at high supersonic Mach number.

Q224 What is the best theoretical method for calculating pressure on the surface of a wing alone.

Q225 How can the effect of the boundary-layer on wing pressure be calculated, and what is its magnitude.

Q226 How should the Navier-Stokes difference equations be solved.

Q227 Which iterative method for solving linear elliptic difference equations is most rapidly convergent.

Q228 Is there any available information on the aerodynamic loading distribution on wings immersed in high-energy, non-uniform slipstream of the type common to V/STOL aircraft from large scale experimental investigation.

Q229 Items on V/STOL aircraft operating in ground effect.

Q230 Technical report on measurement of ablation during flight.

Q231 What qualitative & quantitative material is available on ablation materials research.

Q232 Have flow fields been calculated for blunt-nosed bodies and compared with experiment for a wide range of free stream conditions and body shapes.

Q233 What are the available properties of high-temperature air.

Q234 What is the magnitude of aerodynamic damping in flexible vibration modes of a slender body of revolution characteristic of launch vehicles.

Q235 Is there any published literature on plastic buckling of orthotropic plates or shells.

Q236 Papers on plastic buckling of isotropic shells and plates.

Q237 How to stabilize thin faces of sandwich construction to carry maximum loads, i.e. stress faces up to yield point of material.

Q238 Has the buckling of orthotropic and stiffened conical shells under external pressure and other loads been investigated.

Q241 Compressive circumferential stresses in a torispherical shell reveal the possibility of buckling under internal pressure. Has anyone investigated for which ranges of shell parameters these stresses are sufficiently large to cause elastic buckling.

Q245 Is there an integral method to give a single and sufficiently accurate method of calculating the laminar separate point for various incompressible and compressible boundary layers with zero heat transfer.

Q246 What accurate or "exact" solutions of the laminar separation point for various incompressible and compressible boundary layers with zero heat transfer are available.

Q247 Can the hypersonic similarity results be applied to the technique of predicting surface pressures of an ogive forebody at angle of attack.

Q249 Is it possible to estimate the transonic drag-rise and buffet boundaries of aerofoils without recourse to experiment.

Q250 What determines the onset of shock-induced boundary-layer separation.

Q251 Are the stable profiles of a compressible boundary layer induced by a moving wave known.

Q252 Are there experimental results on the stability of a compressible boundary layer induced by a moving wave.

Q253 Exact solution methods for calculating the ablative mass loss of a material ablating at high temperatures in a hypersonic flight environment.

Q254 What approximate solutions are known to the direct problem of transonic flow in the throat of a nozzle, i.e. finding the flow in a given nozzle.

Q255 What approximate solutions are known to the indirect problem of transonic flow in the throat of a nozzle, i.e. finding a nozzle which has a given axial velocity distribution.

Q256 Has the problem of self-sustained oscillations of a dynamic system of single degree of freedom with non-linear damping been investigated analytically in a way different from the classical Van der Pol's example. In particular, are any exact solutions known.

Q257 Why do users of orthodox pilot-static tubes often find that the calibrations appear to be:-
(a) significantly different from those formerly specified,
(b) wildly variable at low Reynolds numbers.

Q259 Has a comparison been made between interference-free drag measurements using free-flight models and similar measurements made in a low-blockage wind tunnel.

Q260 Does transonic similarity suggest that leading-edge attachment at transonic speeds is a potential or a viscous flow phenomenon.

Q261 Solution of the Blasius problem with three-point boundary conditions.

Q262 Can the injection of a light weight gas, such as helium into the laminar boundary layer of a high speed flow, reduce the aerodynamic heating encountered during a missile or nose-cone re-entry into the earth's atmosphere.

Q263 What is the process of reflection or absorption of charged particles from the surface of a body moving through a rarefield, partially ionized gas in the presence of a magnetic field.

Q264 References on Lyapunov's method on the stability of linear differential equations with periodic coefficients.

Q265 Obtain all papers and reports that contain shock detachment distance data.

Q266 Work on flow in channels at low Reynolds numbers.

Q267 Some approximate analytical heat conduction solutions using methods other than Biot's principle.

Q268 What mode of stalling can be expected for each stage of an axial compressor.

Q269 Has a criterion been established for determining the axial compressor choking line.

Q270 Do theories exist for predicting the aerodynamic derivatives at hypersonic Mach numbers to include viscous and leading edge bluntness effects.

Q271 Solutions for vortex sheets formed on the trailing and leading edges in the asymmetrical case.

Q272 Has a theory of quasi-conical flows been developed, in supersonic linearised theory, for which the upwash distribution on the lifting surface, apart from being a homogeneous function in the co-ordinate, is permitted to have a quite general functional form.

Q273 How does scale height vary with altitude in an atmosphere.

Q274 Jet interference with supersonic flows - theoretical papers.

Q275 Effects of leading-edge bluntness on the flutter characteristics of some square-planform double-wedge airfoils at Mach numbers less than 15.4.

Q277 What factors have been shown to have a primary influence on sonic boom strength.

Q278 What methods of testing and analysis have been used in investigating the static and dynamic stability characteristics of re-entry bodies in free flight tests.

Q281 Papers on pressure and force distributions on wings.

Q283 Work on small-oscillation re-entry motions.

Q284 Experimental studies on panel flutter.

Q285 How can wing-body, flow field interference effects be approximated rationally.

Q288 Has anyone analytically or experimentally investigated the effects of internal pressure on the buckling of circular-cylindrical shells under bending.

Q289 What basic equations should be used in the analysis of stresses and displacements in oval shells.

Q290 What is the accuracy of certain types of equations used in analysis of stresses and displacements in shells.

Q291 What theoretical and experimental work has been done on the excitation and response of typical structures in a noise environment.

Q292 Is there a design method for calculating thermal fatique endurances of components of various types and sizes in a variety of circumstances.

Q293 Will an analysis of panel flutter based on arbitrarily assumed modes of deformation prove satisfactory, and if so, what is the minimum number of modes that need be considered.

Q294 What is the criterion for true panel flutter, as opposed to small amplitude vibration arising from acoustic disturbances.

Q295 Papers dealing with uniformly loaded sectors.

Q296 General methods of solving clamped plate problems.

Q297 How can the analytical solution of the buckling strength of a uniform circular cylinder loaded in axial compression be refined so as to lower the buckling load.

Q298 In the problem of the buckling strength of uniform circular cylinders loaded in axial compression, does the linear solution help with improving the non-linear one.

Q299 The problem of similarity for representative investigation of aeroelastic effects in a flow with the absence of heating effects.

Q300 How is fatigue damage estimated using the normal long-hand method.

Q301 Is there any information available on the difference in the effects of various edge conditions on the buckling of cylindrical shells.

Q302 What approximate analytical or experimental investigations have been performed relating to the non-linear bending and buckling of conical shells.

Q303 Have non-linear large deflection analyses been conducted for shell shapes other than conical.

Q304 Are asymptotic methods sufficiently accurate in the determination of pre-buckling stresses in torispherical shells, or must we resort to numerical methods.

Q305 What is the effect of an entrance tube on the measurement of pressure and density by a gage placed in a rarefied gas flow.

Q306 What are the nonequilibrium chemical constituents in the viscous shock layer ahead of a blunt re-entry vehicle.

Q310 How is shearing flow between two coaxial cylinders affected by suction or blowing at the cylinder walls.

Q314 How accurate are existing analytical theories in estimating pressure distributions on cones at incidence, at hypersonic speeds.

Q315 Are simple empirical methods of any use for estimating pressure distribution in cones.

Q316 Do viscous effects seriously modify pressure distributions.

Q317 Has anyone investigated theoretically whether surface flexibility can stabilize a laminar boundary layer.

Q318 What is the side force induced on a supersonic nozzle wall when a liquid or gas is ejected from the wall.

Q319 What is the effect of the shape of finite airplane wings on the lift and moment responses to sinisoidal gusts.

Q320 What has been published on the subject of non-steady aerodynamic forces acting on airplane wings due to gusts and/or turbulence.

Q321 How do subsonic and transonic flutter data measured in the new Langley transonic dynamics tunnel compare with similar data obtained in other facilities.

Q322 How do subsonic and transonic flutter data measured in Freon - 12 compare with corresponding data obtained in air.

Q323 How do large changes in new mass ratio quantitatively affect wing-flutter boundaries.

Q327 What is the effect of the shape of the drag polar of a lifting spacecraft on the amount of reduction in maximum deceleration obtainable by continuously varying the aerodynamic coefficients during re-entry.

Q328 What are the differences in range and aerodynamic heating during re-entry which may be associated with the use of different drag polars.

Q330 What are the effects of a highly underexpanded rocket jet exhaust on vehicle static and dynamic stability at hypersonic speeds and high altitudes.

Q331 What are the physical significance and characteristics of separated laminar and turbulent boundary layer flows.

Q332 Has anyone analytically investigated the stabilizing influence of soft elastic cores on the buckling strength of cylindrical shells subjected to non-uniform external pressure.

Q333 What papers are available on the buckling of empty cylindrical shells under non-uniform pressure.

Q335 What effect do thermal stresses have on the compressive buckling strength of ring-stiffened cylinders.

Q336 What is the effect on cylinder buckling of a circumferential stress system that varies in the axial direction.

Q338 Can non-linear shallow shell analysis be reduced to an engineering technique by use of the matrix.

Q339 Is it possible to predict the shape of a shroud which will allow simulation of the nose region flow field for a sphere in hypersonic flow.

Q340 What investigations have been made of the wave system created by a static pressure distribution over a liquid surface.

Q347 Has anyone investigated the effect of shock generated vorticity on heat transfer to a blunt body.

Q348 What is the heat transfer to a blunt body in the absence of vorticity.

Q349 What are the general effects on flow fields when the Reynolds number is small.

Q352 Find a calculation procedure applicable to all incompressible laminar boundary layer flow problems having good accuracy and reasonable computation time.

Q353 Papers applicable to this problem (calculation procedures for laminar incompressible flow with arbitrary pressure gradient).

Q354 What stresses and displacements are found in square plates having two adjacent edges free and the others either clamped or simply supported when they are loaded either by a uniformly distributed load or a concentrated force at the free corner.

Q355 Has anyone investigated the shear buckling of stiffened plates.

Q356 Papers on shear buckling of unstiffened rectangular plates under shear.

Q357 What theoretical methods are available for calculating the pressure distribution and the flow over symmetrical conical bodies with sharp leading edges.

Q358 In what manner does the surface pressure on a supersonic or hypersonic blunted cone approach its asymptotic value.

Q360 In practice, how close to reality are the assumptions that the flow in a hypersonic shock tube using nitrogen is non-viscous and in thermodynamic equilibrium.

Q365 What design factors can be used to control lift-drag ratios at Mach numbers above 5.

# APPENDIX 3E

## SUBSETS OF DOCUMENTS AND QUESTIONS

In the course of the tests, various subsets were used of the 279 questions (as given in Appendix 3D) and of the 1400 documents (as given in Appendix 3C). The main subsets, which have been referred to in the text of this volume, are listed.

### QUESTIONS

SUBSET 1. 35 Questions, each having seven starting terms.

| | | | | |
|---|---|---|---|---|
| 2 | 82 | 142 | 177 | 285 |
| 9 | 87 | 145 | 181 | 292 |
| 34 | 95 | 157 | 189 | 293 |
| 40 | 113 | 160 | 205 | 294 |
| 49 | 122 | 165 | 211 | 299 |
| 67 | 131 | 170 | 219 | 315 |
| 81 | 132 | 171 | 261 | 338 |

SUBSET 2. 42 Questions, all dealing with aerodynamics

| | | | | |
|---|---|---|---|---|
| 79 | 130 | 167 | 225 | 268 |
| 100 | 132 | 170 | 226 | 269 |
| 116 | 136 | 181 | 227 | 272 |
| 118 | 137 | 182 | 230 | 273 |
| 119 | 141 | 189 | 250 | 274 |
| 121 | 145 | 190 | 261 | 317 |
| 122 | 146 | 223 | 264 | 323 |
| 123 | 147 | 224 | 266 | 360 |
| 126 | 148 | | | |

QUESTIONS

SUBSET 3.

| | | | | |
|---|---|---|---|---|
| 1 | 81 | 138 | 205 | 275 |
| 2 | 82 | 139 | 206 | 277 |
| 4 | 83 | 140 | 208 | 283 |
| 8 | 84 | 141 | 209 | 284 |
| 9 | 85 | 142 | 210 | 285 |
| 10 | 86 | 143 | 211 | 288 |
| 12 | 87 | 145 | 212 | 291 |
| 13 | 93 | 148 | 213 | 292 |
| 15 | 94 | 149 | 214 | 293 |
| 18 | 95 | 150 | 215 | 294 |
| 22 | 97 | 152 | 216 | 295 |
| 23 | 98 | 153 | 217 | 296 |
| 26 | 99 | 154 | 218 | 297 |
| 27 | 100 | 155 | 219 | 298 |
| 29 | 101 | 156 | 223 | 299 |
| 31 | 102 | 157 | 226 | 300 |
| 32 | 103 | 158 | 227 | 301 |
| 33 | 104 | 160 | 230 | 303 |
| 34 | 105 | 161 | 231 | 304 |
| 35 | 106 | 163 | 232 | 306 |
| 39 | 107 | 164 | 233 | 314 |
| 40 | 108 | 165 | 234 | 315 |
| 41 | 109 | 167 | 241 | 316 |
| 49 | 110 | 168 | 245 | 317 |
| 50 | 111 | 169 | 246 | 321 |
| 51 | 112 | 170 | 247 | 323 |
| 52 | 113 | 171 | 250 | 327 |
| 53 | 114 | 173 | 251 | 331 |
| 54 | 116 | 175 | 252 | 332 |
| 55 | 118 | 176 | 253 | 333 |
| 56 | 119 | 177 | 254 | 335 |
| 57 | 120 | 181 | 255 | 336 |
| 58 | 121 | 182 | 257 | 338 |
| 59 | 122 | 183 | 259 | 339 |
| 61 | 123 | 184 | 261 | 340 |
| 62 | 126 | 187 | 264 | 347 |
| 66 | 128 | 189 | 265 | 348 |
| 67 | 130 | 190 | 266 | 349 |
| 68 | 131 | 196 | 267 | 352 |
| 69 | 132 | 200 | 268 | 353 |
| 71 | 133 | 201 | 269 | 355 |
| 72 | 135 | 202 | 272 | 356 |
| 74 | 136 | 203 | 273 | 360 |
| 79 | 137 | 204 | 274 | 365 |
| 80 | | | | |

## DOCUMENTS

SUBSET 1. 200 documents, all of which are relevant to at least one question in Question Subset 2.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1302 | 1476 | 1618 | 1695 | 1779 | 1964 | 1994 | 2111 |
| 1311 | 1509 | 1619 | 1696 | 1782 | 1965 | 1995 | 2150 |
| 1316 | 1569 | 1620 | 1697 | 1783 | 1966 | 1997 | 2153 |
| 1317 | 1572 | 1621 | 1698 | 1785 | 1967 | 2001 | 2154 |
| 1320 | 1574 | 1622 | 1699 | 1786 | 1968 | 2002 | 2155 |
| 1321 | 1575 | 1655 | 1700 | 1787 | 1970 | 2061 | 2157 |
| 1322 | 1576 | 1656 | 1701 | 1788 | 1971 | 2074 | 2187 |
| 1324 | 1578 | 1666 | 1702 | 1792 | 1972 | 2075 | 2274 |
| 1335 | 1588 | 1667 | 1703 | 1793 | 1973 | 2076 | 2313 |
| 1351 | 1589 | 1670 | 1704 | 1794 | 1974 | 2077 | 2316 |
| 1360 | 1590 | 1671 | 1705 | 1795 | 1978 | 2078 | 2317 |
| 1367 | 1591 | 1672 | 1706 | 1796 | 1980 | 2080 | 2318 |
| 1378 | 1592 | 1675 | 1707 | 1797 | 1981 | 2081 | 2319 |
| 1383 | 1594 | 1676 | 1708 | 1798 | 1982 | 2082 | 2321 |
| 1399 | 1596 | 1677 | 1709 | 1799 | 1983 | 2083 | 2322 |
| 1406 | 1597 | 1680 | 1710 | 1800 | 1984 | 2084 | 2338 |
| 1409 | 1598 | 1681 | 1711 | 1836 | 1985 | 2085 | 2339 |
| 1415 | 1605 | 1682 | 1712 | 1874 | 1986 | 2087 | 2340 |
| 1416 | 1606 | 1683 | 1713 | 1879 | 1987 | 2088 | 2341 |
| 1420 | 1608 | 1684 | 1717 | 1880 | 1988 | 2099 | 2342 |
| 1436 | 1613 | 1687 | 1719 | 1916 | 1989 | 2100 | 2364 |
| 1437 | 1614 | 1688 | 1728 | 1919 | 1990 | 2101 | 2367 |
| 1443 | 1615 | 1691 | 1729 | 1920 | 1991 | 2102 | 2379 |
| 1451 | 1616 | 1692 | 1748 | 1921 | 1992 | 2103 | 2391 |
| 1467 | 1617 | 1693 | 1772 | 1963 | 1993 | 2104 | 1694 |

SUBSET 2. Consists of Subset 1, plus the following 150 documents

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1014 | 1225 | 1309 | 1439 | 1562 | 1686 | 1811 | 2213 |
| 1016 | 1231 | 1310 | 1440 | 1566 | 1714 | 1922 | 2243 |
| 1021 | 1234 | 1314 | 1446 | 1567 | 1746 | 1923 | 2247 |
| 1022 | 1252 | 1315 | 1447 | 1570 | 1749 | 1924 | 2252 |
| 1023 | 1253 | 1326 | 1448 | 1571 | 1775 | 1925 | 2280 |
| 1025 | 1255 | 1329 | 1449 | 1573 | 1780 | 1927 | 2304 |
| 1033 | 1265 | 1332 | 1460 | 1577 | 1784 | 1969 | 2305 |
| 1062 | 1271 | 1375 | 1464 | 1609 | 1789 | 2062 | 2309 |
| 1068 | 1274 | 1376 | 1466 | 1612 | 1790 | 2096 | 2326 |
| 1082 | 1283 | 1377 | 1468 | 1625 | 1801 | 2097 | 2344 |
| 1094 | 1296 | 1379 | 1469 | 1629 | 1802 | 1098 | 2345 |
| 1101 | 1297 | 1380 | 1470 | 1643 | 1803 | 2108 | 2346 |
| 1160 | 1298 | 1381 | 1475 | 1659 | 1804 | 2110 | 2347 |
| 1161 | 1299 | 1382 | 1478 | 1660 | 1805 | 2112 | 2355 |
| 1163 | 1304 | 1390 | 1492 | 1661 | 1806 | 2114 | 2377 |
| 1164 | 1305 | 1391 | 1502 | 1662 | 1807 | 2115 | 2378 |
| 1180 | 1306 | 1401 | 1514 | 1663 | 1808 | 2185 | 2380 |
| 1187 | 1307 | 1421 | 1527 | 1664 | 1809 | 2198 | 2393 |
| 1208 | 1308 | 1431 | 1553 | 1668 | 1810 | | |

# APPENDIX 3F

## AUTHORS OF BASE DOCUMENTS AND QUESTION COMPILERS

The authors of the base documents are listed according to the country in which they were working at the time the paper was published. Against each author is shown the document number (as given in Appendix 3C) of his paper, and the number or numbers (as given in Appendix 3D) of the questions which he prepared and which were used in the test. Although all the authors prepared search questions, it will be noted that in some cases, none of the questions was used. There were various reasons for this; these are discussed in Chapter 3 of this volume.

| AUSTRALIA | Document | Questions |
|---|---|---|
| G.A. Bird | 1531 | 92, 263 |
| **FRANCE** | | |
| W. Eckhaus | 1496 | 26, 27 |
| **GERMANY** | | |
| E.W. Adams | 1509 | 253 |
| **INDIA** | | |
| D. Tirumalesa | 2142 | |
| **ISRAEL** | | |
| J. Rom | 1487 | |
| J. Singer | 2070 | 238 |
| **JAPAN** | | |
| I. Hosokawa | 1521 | 72, 74 |
| F. Sakao | 1450 | |
| M. Yasuhara | 1494 | |
| **SWITZERLAND** | | |
| E.F. Brocher | 1495 | 22 |

| UNITED KINGDOM | Document | Questions |
|---|---|---|
| J.A. Bagley | 1631 | 125, 126, 127 |
| | 1632 | 128, 129 |
| L. Bernstein | 2286 | 360 |
| D.E. Bourne | 1754 | 99,100 |
| J.W. Britton | 1513 | 54,55 |
| D. Catherall | 1547 | 135 |
| J.F. Clarke | 1517 | 61 |
| | 1518 | 62, 63 |
| B.L. Clarkson | 1640 | 157,158,291 |
| I.T. Cook | 2396 | 355,356 |
| J.C. Coole | 1752 | 57 |
| C.F. Cowdrey | 1751 | 56 |
| A.H. Craven | 1519 | 64, 66 |
| D.E. Davies | 1895 | 167 |
| M.D.C. Doyle | 1543 | 121, 268, 269 |
| N.T. Dunwoody | 2283 | 310 |
| R.A. East | 1544 | 122, 123, 270 |
| D.R. Gaukroger | 1643 | 165, 166 |
| G.H. Greenwood | 1516 | 58, 59, 259 |
| N. Gregory | 2287 | 317 |
| B. Glauert | 1388 | 106,107, 108 |
| I.A. Hall | 1750 | 254, 255 |
| P.W.H. Howe | 1767 | 162, 292 |
| D.J. Johns | 1769 | 175, 176, 301 |
| W.P. Jones | 1892 | 41 |
| D.G. King-Hele | 1548 | 136, 273 |
| D.G. Mabey | 1526 | 83, 260 |
| W.G. Molyneux | 1184 | 168, 299 |
| K.C. Moore | 1512 | 52, 53 |
| L.S.D. Morley | 1641 | 164, 295, 296 |
| J.F. Nash | 1940 | |
| S. Neumark | 1515 | 256 |
| P.C. Parks | 1532 | 264 |
| P.H. Peckham | 2285 | 314, 315, 316 |
| J. Phillips | 1768 | 300 |
| H. Portnoy | 1633 | 130, 272 |
| R.H. Rogers | 2284 | |
| E.W.E. Rogers | 1757 | 137, 138, 139 |
| D.B. Russell | 2063 | 226, 227 |
| C. Salter | 1893 | 257 |
| D.M. Seal | 1896 | 169, 170, 171 |
| C.C.L. Sells | 1545 | 124, 271 |
| C.S. Sinnott | 1503 | 249, 250 |
| G.E. Smith | 1894 | 163, 293, 294 |
| A.J. Sobey | 1642 | 297, 298 |
| L.C. Squire | 1514 | 357 |
| B.S. Stratford | 1511 | 50, 51 |
| J.S. Thompson | 1755 | 133, 134 |
| P.G. Wilby | 2062 | 223, 224, 225 |
| J.G. Woodley | 1546 | 131, 132 |

UNITED STATES


| | | |
|---|---|---|
| A. Ambrosio | 1533 | 265 |
| M.S. Anderson | 2146 | 335, 336 |
| A.E. Armenakas | 1953 | 208, 209 |
| R.R. Berlot | 1939 | |
| E.R. Benton | 1520 | 70, 71 |
| M.A. Biot | 1872 | |
| H.L. Bohon | 1948 | 196, 284 |
| H.E. Brandmeier | 1506 | 340 |
| J.E. Broadwell | 2288 | 318 |
| D O. Brush | 2145 | 332, 333 |
| O.R. Burggraf | 1538 | 95 |
| R.A. Burton | 1491 | 10 |
| H.W. Carlson | 1758 | 140, 277 |
| H.K. Cheng | 1630 | 118, 119, 120 |
| P.R. Choudhury | 2140 | 306 |
| Wen-Hwa Chu | 1530 | 92 |
| L.C. Coltrane | 1759 | 278 |
| K.R. Cramer | 1500 | 35 |
| R.J. Cresci | 1123 | 94 |
| B.E. Cunningham | 2143 | |
| J.H. Cunningham | 2069 | 237 |
| C.F. Dewey | 1540 | 110, 111, 112 |
| M.R. Denison | 1943 | 186 |
| S.C. Dixon | 1766 | 159, 160, 161 |
| J.A. Drischler | 1637 | 145, 146 |
| J. Dugundji | 1486 | 1, 2, 3 |
| R. Dunlap | 1535 | 339 |
| M.J. Fohrman | 1947 | 194, 195 |
| B.E. Gatewood | 1762 | 154 |
| G. Gerard | 2067 | 235, 236 |
| T.P. Goebel | 2188 | 285, 365 |
| H.S. Glick | 1455 | |
| R.C. Goetz | 1634 | 275 |
| A.W. Goldstein | 1507 | |
| A.F. Gollnick | 1628 | 109 |
| S.W. Gouse | 1529 | 262 |
| S.I. Gravitz | 1753 | 97, 98 |
| R.A. Greenberg | 1508 | |
| A.L. Greensite | 1499 | 34 |
| R.M. Gunderson | 1490 | |
| W.L. Haberman | 1669 | |
| P.W. Hanson | 2066 | 234 |
| J.G. Hall | 1401 | |
| L.A. Harris | 1956 | 217, 218 |
| G. Herrmann | 2068 | |
| J.M. Hedgepeth | 2293 | |
| J.L. Hess | 1498 | 31, 32, 33 |
| R.S. Hickman | 2191 | 347, 348, 349 |
| H. Hidalgo | 1536 | 67, 68, 69 |
| W.F. Hinson | 2292 | 330, 331 |
| G.R. Inger | 1541 | 114, 115, 116 |
| R.M. Inman | 1534 | 14, 15 |
| M. Inouye | 2006 | 233, 232 |
| W.E. Jahsman | 1950 | 200, 201, 202 |
| L.H. Jorgensen | 1949 | 198 |
| R.H. Johns | 1954 | 210,211,212,213 |
| E.R. Keener | 1492 | 12, 13, 247 |
| J. Kempner | 1897 | 173 |
| G. Kleinstein | 2372 | |
| R.L. Kosson | 2182 | 352, 353 |
| W. Lansing | 2294 | 338 |
| T.J. Lardner | 1542 | 117, 267 |
| L.H.N. Lee | 1760 | 149, 150 |

UNITED STATES (cont)


| | | |
|---|---|---|
| A. Leiss | 1636 | |
| A.W. Leissa | 1422 | 354 |
| M. Lenard | 488 | 8, 9 |
| L.L. Levy | 2291 | 327, 328 |
| Y.K. Lin | 1729 | 152 |
| U.S. Lindholm | 1764 | 155, 156 |
| E.D. Martin | 1527 | 84, 261 |
| W.C. Lyons | 1505 | |
| S.H. Maslen | 1629 | 113 |
| H.G. McComb | 1955 | 214, 215, 216 |
| J. Mescall | 2071 | 241, 304 |
| M. Morduchow | 1489 | 245, 246 |
| H.N. Murrow | 2289 | 319, 320 |
| M. Newman | 1957 | 219, 302, 303 |
| W.A. Newsom | 2144 | |
| S. Ostrach | 1504 | 251, 252 |
| H.L. Pond | 2139 | 305 |
| M.A. Rahman | 1523 | |
| J.V. Rattayya | 1627 | 105 |
| W.P. Reid | 1485 | 4 |
| H.W. Ridyard | 1501 | |
| D.J. Romeo | 1946 | 193 |
| R.C. Rozycki | 1524 | 79 |
| C.H. Samson | 1756 | 49 |
| P. Seide | 1898 | 177 |
| J.C. Serpico | 1952 | 206, 207 |
| J.M. Solomon | 1528 | 85, 86, 87 |
| B. Spencer | 1638 | 147 |
| M.H. Steiger | 2184 | |
| N.O. Stockman | 1945 | 189, 190, 191 |
| F.J. Stoddard | 1537 | |
| E.Z. Stowell | 1951 | 203, 204, 205 |
| T. Strand | 1624 | 23 |
| R.J. Swigart | 2179 | |
| O.E. Tewfik | 1623 | |
| C.L. Tien | 1525 | 80, 81, 82 |
| K. Toba | 1322 | 101 |
| M. Tobak | 1639 | 148, 283 |
| H. Tramposch | 1497 | 29 |
| S.C. Traugoot | 1626, | 358 |
| W.P. Vafakos | 1765 | 289, 290 |
| J. Vasiliu | 2061 | |
| R.J. Vidal | 1484 | |
| R.E. Walker | 1942 | 183, 184, 274 |
| V.I. Weingarten | 1763 | 288 |
| W.R. Wells | 1944 | 187 |
| I. Weinstein | 1635 | 141, 142, 143 |
| D. Weiss | 1539 | 102, 103, 104 |
| D.C. Weiss | 1510 | |
| R.J. Whalen | 1625 | |
| J.C. Williams | 1941 | 181, 182, 266 |
| R.E. Wilson | 1493 | 16, 17, 18 |
| M.M. Winston | 2064 | 228, 229, 281 |
| C.W. Winters | 2065 | 230, 231 |
| J.C. Yao | 1761 | 153 |
| E.C. Yates | 2290 | 321, 322, 323 |
| V. Zakkay | 1522 | |
| S.L. Zeiberg | 2141 | |

## APPENDIX 3G

## QUESTIONS - RELEVANT DOCUMENTS SETS

This Appendix lists the relevant documents for the 279 questions which are given in Appendix 3D. The document numbers refer to the documents as listed in Appendix 3C.

The questions are divided into the two groups of Basic Questions and Supplementary Questions. The difference in these groups of questions is discussed in Chapter 3; briefly the Basic Question is considered to be representative of the main problem which was the cause of the research being undertaken, while a Supplementary Question is a question which arose in the course of the research.

The Base Document refers to the original paper which was written by the compiler of the question, and as such it would always be expected to have a high relevance to the question. However, in the tests, the Base Document is eliminated in the search or searches to which it applies.

The relevant documents are divided into the four levels of relevance, as given on page 21. The papers are then listed in two groups, the first of which gives the papers which appeared in the list of references of the Base Document. The second group is marked with an asterisk against the document number. These refer to the additional papers which were located by students or by bibliographic coupling, and which were subsequently submitted to the authors for their decisions concerning relevance.

BASIC QUESTIONS

| Question No. | Base Document | Relevance 1 | Relevance 2 | Relevance 3 | Relevance 4 |
|---|---|---|---|---|---|
| 1 | 1486 | | 1184, 1029*, 1031*, 1057*, 1378*, 1859*, 1875* | 1012, 1051, 1102, 1185, 1030*, 1037*, 1056*, 1066*, 1095*, 1497*, 1858*, 1876*, 1879*, 1880* | 1013, 1014, 1015 1052, 1142, 1195* 1462* |
| 8 | 1488 | | | 1236, 1166* | |
| 10 | 1491 | | 1099 | 1115, 1257, 1258 | |
| 12 | 1492 | | 1020 | 1056, 1057, 1058 | 1019 |
| 14 | 1534 | | 1021, 1549 | 1550 | |
| 16 | 1493 | | | 1378* | 1294* |
| 22 | 1495 | | | 1027, 1028, 1262, 1263 | 1160, 1020*, 1654* |
| 23 | 1624 | | 1086, 1194, 1650, 1652 | | 1649 |
| 26 | 1496 | | 1064, 1265 | | 1065, 1311* |
| 31 | 1498 | | 1266 | 1106, 1196 | |
| 34 | 1499 | | 1032, 1067, 1164* | 1639*, 1715*, 1716* 1717* | 1719*, 2379* |
| 35 | 1500 | | | 1087, 1088, 1104, 1267, 1268, 1269, 1270, 1407, 1408 | |
| 39 | 1502 | 1271 | 1016, 1413 | 1414 | |
| 41 | 1892 | 1900, 1902 | 1200, 1201, 1601 1901, 1544*, 1597* 1634*, 1687*, 1698* 1700*, 1704*, 1705* 2109*, 2112*, 2141* 2197*, 2256*, 2259* 2272*, 2289* | 1899, 1903, 1593* 1749*, 1917*, 1919* 2290* | 1199, 1594*, 2333* |
| 49 | 1756 | | 1046, 1047 | 1092 | |
| 50 | 1511 | | 1213 | 1212, 1214, 1215, 1216, 1276, 1277, 1426, 1427 | |
| 52 | 1512 | | 1224 | 1278, 1428 | |
| 54 | 1513 | | 1250*, 1514*, 1609* 1612* | 1225, 1793* | 1464, 1465, 1466 |
| 56 | 1751 | | | | 1776 |
| 57 | 1752 | | 1465 | 1249, 1777, 1778 | 1247, 1250 |
| 58 | 1516 | | | 1252, 1431 | 1141 |
| 62 | 1518 | | 1169 | 1168 | |
| 64 | 1519 | | | 1173, 1174, 1179, 1282 | 1172, 1176 |
| 67 | 1536 | | 1024, 1283, 1552, 1553, 1554, 1555, 1556 | 1272 | 1557, 1558 |
| 72 | | | 1468 | 1467, 1469, 1470 | 1775* |
| 80 | 1525 | | 1305, 1570* | 1308, 1481*, 1338* 2185*, 1629*, 1663* 1798*, 1572* | 2226*, 2355* |

| Question No. | Base Document | Relevance 1 | Relevance 2 | Relevance 3 | Relevance 4 |
|---|---|---|---|---|---|
| 83 | 1526 | | 1439 | 1311, 1316, 1440, 1797*, 1798* | 1187, 1314, 1315 1794*, 1265* |
| 84 | 1527 | | | 1320 | 1478 |
| 85 | 1528 | | 1326, 1629* | | 1021, 1094, 1022*, 1306* |
| 92 | 1530 | | | 1361, 1441, 1442, 1443, 1445, 1748* | 1362, 1363, 1444 1200*,1201*,1593* 1687*,1753*,1919* 2005* |
| 93 | 1531 | | | 1296, 1033* | 1446, 1447, 1448 1449, 1208*,1297* 1298*,1299* |
| 94 | 1123 | | 1084 | 1024, 1101, 1294, 1364, 1365, 1560 | 1628*, 1661* |
| 95 | 1538 | | 1016, 1375, 1460, 1562 | 1378, 1255*, 1271* 1502* | 1376, 1377 |
| 97 | 1753 | | 1380 | 1749*, 2339* | 1014, 1705, 1779 1780, 1379,1643* 1686* |
| 99 | 1754 | | 1788 | 1785, 1786, 1787 | 1023, 1381, 1382 1784, 1789 |
| 101 | 1322 | | 1475 | 1476*, 1527* | 1320*, 1478* |
| 102 | 1539 | | 1565, 1566 | 1564, 2159* | 1661* |
| 106 | 1388 | | 1002, 1003, 1128, 1664*, 1629* | 1180, 1323, 1324, 1393, 1394, 1659, 1004*, 1384*, 2302* | 1418* |
| 113 | 1629 | | 1021, 1324, 1630* | 1094, 1664,1304*, 1570*, 1494* | 1128, 1323, 1663 1305*,1309*,1571* 1655*,1388*,1062* |
| 114 | 1541 | | 1332, 1572, 1578, 1401*, 1625* | 1573, 1574, 1421*, 1160*, 2213*, 2304* 1068*, 1571*, 2252* | 1025, 1317, 1577 2198*,1655*,2355* |
| 117 | 1542 | | 1395, 1579, 1580, 1587, 1873* | | |
| 118 | 1630 | | 1667 | 1324, 1378, 1666, 1670 | |
| 121 | 1543 | | 1588 | 1589, 1590 | |
| 122 | 1544 | | | 1597, 1598 | 1688*,1708*,1713* |
| 124 | 1545 | | 1599 | | 1060, 1782* |
| 125 | 1631 | | | 1652, 1245*, 2094* 2095 | |
| 128 | 1632 | | 1676, 1677 | 1678, 1679, 1205* | |
| 133 | 1755 | | | 1594, 1790 | |
| 135 | 1547 | | 1606, 1611 | 1562 | 1050, 1236, 1609 1612, 1406* |
| 136 | 1548 | | 1613, 1614, 1615 | 1616, 1617 | 1618 |
| 137 | 1757 | | 1793, 1794 | 1797 | 1795, 1796,1420* |
| 140 | 1758 | | 1802, 1803 | 1808, 1809, 1811, 1253*, 2247* | 1804, 1805, 1806 1807, 1810,2243* |
| 141 | 1635 | | | 1691 | |

| Question No. | Base Document | Relevance 1 | Relevance 2 | Relevance 3 | Relevance 4 |
|---|---|---|---|---|---|
| 145 | 1637 | | | 1703, 1704, 1705, 2289*, 1779* | 1698, 1699, 1700 1701, 1702, 1706 1792*, 2339* |
| 147 | 1638 | | 1713 | | 1708, 1709, 1711 1712 |
| 148 | 1639 | | 1717, 1719 | 2001*, 2379* | |
| 149 | 1760 | | 1821, 1822, 1824, 2122* | 1820, 1823, 1825, 2051*, 2121* | |
| 153 | 1761 | | | 1826, 1828 | |
| 154 | 1762 | | | 1833, 1834, 1835, 1836, 1837 | |
| 155 | 1764 | | | 1848 | 1844, 1845, 1846 1847 |
| 157 | 1640 | | 1725, 1728 | 1729, 1911* | 1720, 1075*, 1909* |
| 159 | 1766 | | | 1391, 1864, 1012*, 1015* | 1856, 1857, 1858 1859, 1746*, 1877* |
| 162 | 1767 | | 1865, 1867 | 1395, 1866, 1868, 1869, 1870 | |
| 163 | 1894 | | 1015, 1391, 1864* | 1914, 1392*, 1627*, 1658* | |
| 164 | 1641 | | | 1731 | 1730 |
| 167 | 1895 | 1919 | 1916 | 1920, 1921 | |
| 168 | 1184 | | 1051, 1185 | 1878 | 1874 |
| 175 | 1769 | | 1829, 1887, 1890, 2146* | 1885, 1886, 1888, 1891 | 1889 |
| 177 | 1898 | | 1932, 1936, 1937, 1938 | 1957*, 2131* | 1931, 1934, 1935 |
| 183 | 1942 | | 1969, 1970, 1971, 1972, 1174*, 1997* | 1187, 1973, 1173*, 1176*, 1409*, 1946* 1992*, 1994*, 1995* | 1974, 1177* |
| 187 | 1944 | | 1101, 1164 | 1981 | 1982, 1983 |
| 189 | 1945 | | | 1985, 1990 | |
| 194 | 1947 | | 1069, 2003, 2004, 2005, 2006, 2007 | 1999, 2000, 2001 | 1717 |
| 196 | 1948 | | 1766* | 1858, 1859, 2008, 1012* | |
| 200 | 1950 | | 2014, 2020 | 2013, 2016, 2017, 2018, 2019 | 2012 |
| 203 | 1951 | | 2027 | 2028 | |
| 206 | 1952 | | 2029 | 2034, 1951*, 2021* | |
| 208 | 1953 | 1846, 2036 | | | |
| 210 | 1954 | 2038, 2039 | 2041, 2042 | | 2043, 2044 |
| 214 | 1955 | | 1840, 2045 | 1763, 1838, 1839, 1841 | |
| 217 | 1956 | | | 1889, 2046, 2048, 2050, 1843* | 2047, 2049, 2051 1926*, 1822* |
| 219 | 1957 | | | 2057, 2058, 2059, 1930*, 1931*, 1934* 1936*, 1937*, 1938* 2131* | 2052 |

| Question No. | Base Document | Relevance 1 | Relevance 2 | Relevance 3 | Relevance 4 |
|---|---|---|---|---|---|
| 223 | 2062 | | | 2074, 2075 | |
| 226 | 2063 | | | 2078, 2083, 2084, 2085 | 2080, 2081, 2082 |
| 228 | 2064 | | 2090, 2091, 1001* 2170* | 1453, 2089, 2092, 2144*, 2162*, 2164* 1484* | |
| 232 | 2006 | | 1273, 2105, 2106, 2107, 1556, 1025* 1372*, 1410*, 1456* 1626*, 2151* | 1093, 1161, 1302, 2011, 1019*, 1035* 1036*, 1044*, 1215* 1354*, 1369*, 1370* 1421*, 1471*, 1557* 1605*, 1655*, 1657* 1689*, 2307*, 1318* 1423*, 2304*, 1160* 1482*, 1572* | 1122*, 1666*, 2355* |
| 234 | 2066 | | | 1234, 2108, 2110, 2111, 2112, 1231* | 2114, 2115 |
| 235 | 2067 | | | 1829, 2116, 2117, 2118, 2119, 2120, 2121, 1743*, 2130* | |
| 237 | 2069 | | 1822, 2127, 2128 | 1742, 2050, 2121, 2126, 1826*, 1743* | 2051* |
| 238 | 2070 | | 2131 | 1936, 2129 | 2117, 2118 |
| 241 | | | | 2134, 2137, 2138 | 2135, 2136 |
| 245 | 1489 | | 1054, 2386* | 1562*, 1336* | 1055, 1996 |
| 249 | 1503 | | 1038, 1039 | 1206, 1313* | 1203, 1204, 1205 |
| 256 | 1515 | | | 1130, 1281 | |
| 257 | 1893 | | 1139, 1238 | 1239, 1904, 1906, 1672* | |
| 262 | 1529 | | 1340, 1342, 1646*, 2199* | 1337, 1338, 1339, 1343, 1344, 1480, 1481, 1353*, 1366*, 1565* | |
| 272 | 1633 | | | 1680, 1681, 1682, 1683 | |
| 288 | 1763 | | | 1838, 1839, 1840, 1842, 2045* | 1743* |
| 297 | 1642 | | 1739, 1740, 1742, 1743 | 1744 | 1741 |
| 305 | 2139 | | | | 1010, 1183 |
| 306 | 2140 | | 1552*, 1625*, 2296* | 1093, 2151, 1401* 1541*, 2295*, 1318* | 1110, 2391*, 1423* 2304*, 1160*, 1369* 1482* |
| 310 | 2283 | | | 1385, 1386 | |
| 314 | 2285 | | 2303, 2304, 2309, 2110* | 2306, 2308, 1605* | 1602, 1603, 1604 2305, 2310, 1048* 1232* |
| 318 | 2288 | | 1025, 1654, 2326, 2327, 2328, 1942* | 1262, 1974, 1160* 1332*, 1572* | |
| 319 | 2289 | | 1704, 2331, | 2330, 2332, 2333, 2334, 2341* | 1779, 2329 |
| 321 | 2290 | | 2338, 2341 | 2340 | |

| Question No. | Base Document | Relevance 1 | Relevance 2 | Relevance 3 | Relevance 4 |
|---|---|---|---|---|---|
| 327 | 2291 | | | 1163, 2344, 2345, 2346 | 1164, 2347 |
| 330 | 2292 | 1598* | | 2349, 2350, 2351 2352 | |
| 332 | 2145 | | 2171 | 1891, 2172, 2173, 2174 | 2030* |
| 335 | 2146 | | 1888, 1889, 2178 | 1885, 1887, 1886* 1890*, 1769*, 1891* 2173*, 1843* | 1841, 2176, 2177 |
| 338 | 2294 | | | 1833, 2361, 2362, 2363 | |
| 339 | 1535 | | | | 1037, 1035* |
| 340 | 1506 | 1156 | | | |
| 347 | 2191 | 1666, 1667, 2395 | 2258, 2394 | 1668*, 1670*, 2204* 2300*, 1037*, 1559* 1630*, 2107*, 2213* | 2391 |
| 352 | 2182 | | 2383, 2385 | 1155, 1241, 2382, 2384, 1150*, 1292* 1376*, 1459*, 2365* 1062*, 2366* | 2370, 2386, 1111* 1458*, 1479*,1977* |
| 354 | 1422 | | 1644 | 1647, 1648 | 1424, 1425, 1454 1551 |
| 355 | 2396 | | | 1400, 1419, 2387, 2397, 2400 | 1412, 2392, 2398 2399 |
| 365 | 2188 | | 2379, 2305*, 2304* | 1040, 1293, 2309, 2378, 2381, 1225*, 1448*, 1449*, 2124* 2280*, 1433*, 1923* 1924*, 2062*, 2074* 2075*, 2213* | 1161, 1421, 2377 2380 |
| | | | SUPPLEMENTARY QUESTIONS | | |
| 2 | 1486 | 1012, 1746* | 1015, 1184, 1858* 1859*, 1948* | 1051, 1102, 1202*, 1285*, 1390*, 1391* 1497*, 1643*, 1856* 1857*, 1877*, 1864* 1658* | 1014, 1052,1380* 1442* |
| 3 | 1486 | | 1012, 1014, 1142, 1184, 1606* | 1051, 1052, 1102, 2147*, 1658* | 1015, 1185,1095* |
| 4 | 1485 | | | 1005, 1006, 1090, 1091, 1119, 1144, 1181, 1399 | |
| 9 | 1488 | 1552*, 2296* | | 1401, 2297* | |
| 13 | 1492 | 1048*,1122* 1354*,1360* 2005* | | 1020, 1058, 1196* 1197*, 1999*,2112* | |
| 15 | 1534 | | 1021, 1022, 1550 | | |
| 17 | 1493 | | 1050 | 1260, 1406, 1378* 1606* | |
| 18 | 1493 | | 1259, 1405 | 1302*, 1436*, 1437* 1438*, 1998*, 2011* | |

| Question No. | Base Document | Relevance 1 | Relevance 2 | Relevance 3 | Relevance 4 |
|---|---|---|---|---|---|
| 27 | 1496 | 1064 | | | 1065 |
| 29 | 1497 | 1463 | | 1462 | |
| 32 | 1498 | | 1106 | 1196 | |
| 33 | 1498 | | 1196, 1197, 1198 | | |
| 40 | 1502 | 1068 | | | |
| 51 | 1511 | 1145,1611* | 1376*, 1406*, 1565* 2076* | | |
| 53 | 1512 | | | 1224, 1279 | |
| 55 | 1513 | | 1225, 1464, 1514* | 1466, 1609*, 1612* | 1793 |
| 59 | 1516 | 1252 | | 1431, 1672*, 1714* 1799*, 1800* | |
| 61 | 1517 | 1166,1167 | | 1132 | |
| 63 | 1518 | 1168 | | | 1171 |
| 66 | 1519 | | 1173, 1188* | 1172, 1097*, 1121* 1187*, 1242*, 1409* 1487* | |
| 68 | 1536 | 1272,1555 | 1024, 1283, 1552, 1554, 1556 | 1079*, 1207*, 1418* 1505*, 2257* | 1557 |
| 69 | 1536 | | 1024, 1283, 1552, 1553, 1554, 1555, 1556 | 1272, 1085*, 1976* | 1557, 1558 |
| 70 | 1520 | | 1432 | 1434 | 1287, 1288, 1289 |
| 71 | 1520 | 1288,1289 | 1433 | | |
| 74 | 1521 | 1467,1468 1469 | | 1039*, 1503*, 1775* | |
| 79 | 1524 | | | 1302, 1436 | 1437 |
| 81 | 1525 | | 1305 | 1338*, 1344*, 1481* 1623*, 1570*, 1798* | 1084*,1123*,2185* 2226*,1629*,1663* 1572*,2355* |
| 82 | 1525 | | 1304, 1306, 1307, 1309, 1310, 1570* 1572* | 1305, 1629*, 1663* 1798*, 2185*, 2355* | 1308 |
| 86 | 1528 | 1094 | 1023*, 1105*, 1381* 1494*, 1629* | 1192 | 1326, 1063*, 1261* |
| 87 | 1528 | | 1021, 1022*, 1306* | | 1326 |
| 98 | 1753 | | 1380 | 1593*, 1746*, 1914* | 1014, 1379, 1705 1779, 1780, 1704 1012*,1015*, 1857*, 1859* |
| 100 | 1754 | | 1788 | 1785, 1786, 1787 | |
| 103 | 1539 | 1566 | 1567, 2084* | 2078*, 2081* | |
| 104 | 1539 | 1567 | | 1564, 1566 | |
| 105 | 1627 | 1390 | 1391 | | |
| 107 | 1388 | | 1664*, 1629* | 1180, 1659, 1660 | |
| 108 | 1388 | 1002,1003 1128,1180 | 1664*, 1629* | 1323, 1324, 1393 1394, 1659, 1389* 1004*, 2302* | |
| 109 | 1628 | | 1662 | 1101, 1460, 1661, 1062* | |

| Question No. | Base Document | Relevance 1 | Relevance 2 | Relevance 3 | Relevance 4 |
|---|---|---|---|---|---|
| 110 | 1540 | | 1458, 1570 | 1977*, 1062* | 1336* |
| 111 | 1540 | 1333 | 1568, 1570, 1062* | 1101, 1283, 1565* 1977*, 1307* | 1024 |
| 112 | 1540 | 1569,1571 1572 | 2355* | 1101, 1655*, 2213* | 1798* |
| 115 | 1541 | | 1332, 1574, 1578, 2189*, 1625* | 1317, 1575, 1576, 1110*, 1167*, 2295* 1421*, 1160*, 1068* 2252* | 2210*, 2198* |
| 116 | 1541 | | 1576, 1656* | 1575 | 1317, 1574, 1578 |
| 119 | 1630 | | 1378, 1667 | 1324, 1666, 1670, 2391*, 1329* | |
| 120 | 1630 | | 1668 | 1666, 1667, 1670 | 1329*, 2391* |
| 123 | 1544 | 1594,1597 | | 1596, 1598 | |
| 126 | 1631 | 1672 | | | 1799* |
| 127 | 1631 | | | | |
| 129 | 1632 | 1675,1678 1679 | 1205*, 1794* | | |
| 130 | 1633 | | 1680, 1681, 1682, 1683 | | |
| 131 | 1546 | | 1606, 1406* | 1608, 1142*, 1294* 1962*, 2192*, 2213* | 1354*, 1522*, 1873* |
| 132 | 1546 | 1608 | 1406* | 1606, 1710* | |
| 134 | 1755 | | | 1791, 1792, 1545* | |
| 138 | 1757 | | 1794, 1797, 1798, 1256* | 1793, 1796, 1291* 1311*, 1335*, 2364* | 1800, 2187*, 2367* |
| 139 | 1757 | | 1252, 1801 | 1797, 1799, 1800, 2154* | 1793, 1794, 1672* |
| 142 | 1635 | 1024 | | 1283, 1294*, 1559* 2393* | 1689, 1690, 1101* 1354*, 2104*, 2161*, 2395* |
| 143 | 1635 | 1283 | | | 1662* |
| 146 | 1637 | | | 1699, 1700, 1701, 1702, 1703, 1779* 1681* | 1698, 2289*, 2339* |
| 150 | 1760 | | 1817, 1818, 1819, 1824 | 1820, 1825 | |
| 152 | 1729 | 1728 | 1913 | 1910 | 1911 |
| 156 | 1764 | | 1847 | 1846, 1849 | 1844, 1845 |
| 158 | 1640 | | 1724, 1726, 1727 | 1075*, 1909* | 1720, 1723 |
| 160 | 1766 | 1860,1861 | | 1606*, 1980*, 1012* | |
| 161 | 1766 | 1862,1863 | | 1031* | 2174* |
| 165 | 1643 | | | 1746, 1748, 1749, 1265* | |
| 166 | 1643 | | | 1746, 1748, 1265* | 1014* |
| 169 | 1896 | 1922 | | 1360, 1605*, 1927* | 1492* |
| 170 | 1896 | | 1360 | 1605* | |
| 171 | 1896 | | 1923 | 1924, 1925 | |

| Question No. | Base Document | Relevance 1 | Relevance 2 | Relevance 3 | Relevance 4 |
|---|---|---|---|---|---|
| 173 | 1897 | | | | 1926 |
| 176 | 1769 | 1885,1886 1887,1888 1890,1891 | 2146* | | |
| 181 | 1941 | | 1966 | 1967 | |
| 182 | 1941 | | 1967, 1968 | 1964, 1965 | |
| 184 | 1942 | | 1974, 2326* | 1187, 1969, 1970 1971, 1972, 1973 | |
| 186 | 1943 | 1979 | | 1474 | |
| 190 | 1945 | | 1985, 1987 | 1984, 1988, 1989 1990 | 1986 |
| 191 | 1945 | 1984,1985 1988,1989 1990 | 1987 | | 1986 |
| 193 | 1946 | | | 1991, 1992, 1993 1994, 1995, 1997 | |
| 195 | 1947 | 2003,2004 | | | 1717 |
| 198 | 1949 | 1259,1302 2011 | 1405 | | |
| 201 | 1950 | 2014 | | 2013, 2015, 2016 2017, 1951*, 2023* 2025*, 2026* | 2012, 2018, 2019 2020,1952*,2024* |
| 202 | 1950 | 2020 | 2018, 2019 | 2024* | 2012,2016,2022* |
| 204 | 1951 | 2018 | | | 2017, 2023, 2024 2025,2026,1950* 2016* |
| 205 | 1951 | 2021 | | | 2022, 2034* |
| 207 | 1952 | 2029,2021* 1951* | | | |
| 209 | 1953 | | 2031, 2032, 2035 | | 2037 |
| 211 | 1954 | 2038,2041 | 2043, 2044 | 2039, 2042 | |
| 212 | 1954 | 2042 | | | |
| 213 | 1954 | 2043,2044 | | | |
| 215 | 1955 | | 1763, 1838, 1839 1841 | 2045, 1743* | 1852* |
| 216 | 1955 | 1840 | | 2045 | |
| 218 | 1956 | | 1889, 2048, 2050 | 2046, 2049, 1843* | |
| 224 | 2062 | | 1687, 2076 | 2074 | 2075, 2077 |
| 225 | 2062 | 2076 | | 2077, 1569*,1572* 1655* | 1687 |
| 227 | 2063 | | 2087 | 2088 | |
| 229 | 2064 | 2089,2090 2091,2093 2094,2095 | 2144* | 2164* | |
| 230 | 2065 | 2103 | 2100 | 1983, 2101, 2104 | 2099 |
| 231 | 2065 | 1983,2102 2104 | 2097, 2100, 1274* 1553* | 2096, 2098, 2099 2101, 1082* | 2103, 1982* |
| 233 | 2006 | 1302,2011 | 1552* | 1998*, 2009*, 2010* | 1273, 1556 |

| Question No. | Base Document | Relevance 1 | Relevance 2 | Relevance 3 | Relevance 4 |
|---|---|---|---|---|---|
| 236 | 2067 | | 2119, 2120, 2121 | | 1743*, 1823* |
| 246 | 1489 | 1111,1155 1458,1459 | 1460, 1461 | 1054, 1562* | |
| 247 | 1492 | | | 1020, 1056, 1057 | |
| 250 | 1503 | | 1311* | 1415, 1416, 1798* 2364*, 2367* | 1316*, 1335* |
| 251 | 1504 | 1071,1072 | | | |
| 252 | 1504 | | 1040, 1041, 1074 1207, 1272, 1418 1170*, 2264* | | |
| 253 | 1509 | | 1274 | 1082 | |
| 254 | 1750 | 1217,1774 | | | |
| 255 | 1750 | 1118,1157 1774,1775 | | | |
| 259 | 1516 | 1252,1431 | | | 1141 |
| 260 | 1526 | | 1312, 1313 | | |
| 261 | 1527 | 1320,1321 | | 1322, 1476 | |
| 263 | 1531 | | | 1446, 1447 | 1449 |
| 264 | 1532 | 1367,1451 | | | |
| 265 | 1533 | 1058,1411 1482 | 1036 | | 1423* |
| 266 | 1941 | | 1351, 1966, 1967 | 1964, 1965 | |
| 267 | 1542 | 1582,1583 1586,1982* | | 1584, 1585 | 1978* |
| 268 | 1543 | | 1588, 1589 | 1592, 1772* | 1590 |
| 269 | 1543 | 1591 | | 1590 | 1588, 1589 |
| 270 | 1544 | | 1201, 1572, 1577 1593 | 1025*, 2355*, 1068* | 1569*,2311*,1540* 1332* |
| 271 | 1545 | | 1229* | 1191, 1600, 1601 1433*, 1782* | |
| 273 | 1548 | | 1622 | 1619, 1620, 1621 | 1617,1616,2150* |
| 274 | 1942 | | 1973, 1974, 1409* | 1997*, 2061* | |
| 275 | 1634 | 1685 | | 1686 | |
| 277 | 1758 | 1803,1808 1809 | 1802 | 1807, 1811, 1253* | 1804, 1805, 1806 1810,2243*,2247* |
| 278 | 1759 | 1813 | 1032, 1814 | 2000* | |
| 281 | 2064 | 2090,2091 2092 | | 1453, 1443*, 1675* 1676*, 1677*, 1780* 1783*, 1794*, 1484* | |
| 283 | 1639 | | | 1032, 1067, 1715 1716, 1499*,2379* | 1717 |
| 284 | 1948 | | 1858, 1859, 1857* 1766* | 2008, 1856* | 1015*,1285*,1894* |
| 285 | 2188 | | | 2309, 2378, 1923* 1924*, 2062*, 2074* 2075*, 1225*, 2280* 2305*, 2304* | 1161, 1421, 2377 2379, 2380 |
| 289 | 1765 | 1851 | | 1829, 1852 | |

| Question No. | Base Document | Relevance 1 | Relevance 2 | Relevance 3 | Relevance 4 |
|---|---|---|---|---|---|
| 290 | 1765 | | 1850, 1852, 1853 1854, 1855 | 1829 | 1851 |
| 291 | 1640 | | 1721, 1722, 1723 1725, 1728, 1729 1911* | 1075*, 1909* | 1724, 1726 |
| 292 | 1767 | | 1395, 1866, 1869 | 1865, 1868, 1870 1872, 1873 | 1867 |
| 293 | 1894 | 1015,1391 | 1285* | 1390*, 1864* | |
| 294 | 1894 | 1914,1915 | 1285*, 1857*, 1858* | 1015, 1391, 1856* 1948*, 1864*, 1658* | 1390*, 2008* |
| 295 | 1641 | 1733,1734 1735,1736 | | | |
| 296 | 1641 | | | 1730, 1422*, 1648* 2392* | 1731, 1733, 1734 1735, 1736 |
| 298 | 1642 | | | 1739, 1742, 1743 | |
| 299 | 1184 | | 1051, 1185, 1874 1875, 1876 | 1878, 1879, 1880 1202*, 1746*, 1013* | 1012* |
| 300 | 1768 | | 1881 | 1883, 1884 | |
| 301 | 1769 | | 1887, 1888, 1889 | 1843* | |
| 302 | 1957 | 2052,2057 2058,2059 | | 1743* | |
| 303 | 1957 | 2052,2053 | 2054, 2055, 2056 2060, 1743*, 1744* | | |
| 304 | 2071 | | 2134, 2137, 2138 | | |
| 315 | 2285 | | | 1058, 2305, 2306 2307, 2310, 1019* 1122* | 1602, 1603, 1604 1232*,1323*,1688* 2188* |
| 316 | 2285 | | 1572, 2311 | 1063*, 1540* | 1602, 1603, 1604 2305,2188*,1307* 2213*,1655*,2355* 1068* |
| 317 | 2287 | | 2321, 2322 | | |
| 320 | 2289 | | 1779, 2331 | 2329, 2197*, 1637* 1699* | 1698, 2330 |
| 322 | 2290 | | 2336 | 2338, 2341 | 2335 |
| 323 | 2290 | | 2338, 2339 | 2340, 2341 | 1879 |
| 328 | 2291 | | | 1163, 2344, 2348 2217*, 2219* | 1164, 2345, 2347 |
| 331 | 2292 | | 2351, 2356 | 2350, 1187*, 1487* 2383*,2385* | 1045*,1055*,1316* 2106*,2228* |
| 333 | 2145 | | 1891, 2172 | 2173, 2174, 1763* | 1769*,2030*,2031* 2033*,2052*,2068* |
| 336 | 2146 | 1888 | 1885, 1887, 1889 | 2178, 1769*, 2173* 1886*, 1890*, 1843* | 2177 |
| 348 | 2191 | 1024,1101 2393 | | 1666, 1667, 1093* 1559*, 1630*, 1662* 2104*, 2107*, 2204* 2213*, 2300* | 2258 |

| Question No. | Base Document | Relevance 1 | Relevance 2 | Relevance 3 | Relevance 4 |
|---|---|---|---|---|---|
| 349 | 2191 | 2391 | 1666, 1667, 2258<br>2394, 2395 | 2078*, 2080*, 2081*<br>2214*, 2198*, 2204*<br>2300*, 1559*, 1630*<br>1662*, 2107*, 2213* | |
| 353 | 2182 | | 1155, 2383, 2385 | 2382, 1062*, 1292*<br>1458*, 1459*, 1461*<br>2365*, 2366*, 1111*<br>1150*, 1479* | 1241, 2370, 2384<br>2386 |
| 356 | 2396 | | | 1400, 2387, 2392<br>2398 | |
| 357 | 1514 | 1019,1122<br>1227 | | | |
| 358 | 1626 | 1025,1093<br>1161,1370<br>1372 | 1044, 1371, 1657<br>1423*, 1482* | 1369, 1160*, 1332*<br>1572* | 1318* |
| 360 | 2286 | | | 1656, 2313, 2317<br>2318, 2319, 2157*<br>2274* | 2316 |

## APPENDIX 5.1

## LIST OF INDEX TERMS

This Appendix contains the full list of the single terms used in the indexing of the complete set of 1400 documents. The terms are in alphabetical order; before each term is given a code which relates to the schedules of single terms to be found in Appendix 5.3.

Following each term is given the number of documents in which the term was used for indexing.

It will be noted that several terms do not have a code equivalent; such terms are proper names for which no reasonable place was available in the schedules.

Abel (1)
Z10 Aberration (1)
W35 Ablated (1)
S45 Ablating (6)
S44 Ablating (16)
C70 Able (1)
J5 About (2)
J39 Above (6)
K71 Abrupt (2)
Y39 Absence (1)
X110 Absolute (3)
W40 Absorbed (2)
T8 Absorption (10)
N30 Accelerated (4)
P93 Accelerating (8)
P92 Acceleration (22)
F79 Accelerators (13)
G18 Accelerometer (2)
V109 Acceptance (1)
X14c Accidental (1)
S55 Accommodation (3)
U8 Accumulation (2)
Z3 Accuracy (6)
Z3a Accurate (1)
B33 Acetate (2)
Ackeret (1)
R98 Acoustic (13)
R99 Acoustically (2)
K2d Across (5)
S90a Acting (1)
S90 Action (3)
Q28a Activation (1)
X106 Active (2)
S90b Activity (1)
Y80 Actual (2)
U5 Addition (7)
X65 Additional (2)
S62 Adiabatic (21)
J28 Adjacent (7)
E34b Adjustable (2)
X41 Adjusting (1)
T9 Adsorption (2)
Q12b Advance (2)
Q12c Advancing (2)
X92a Adverse (11)
W5 Aeolotropic (1)
Z13 Aerodynamic (180)
Ob Aerodynamically (1)
Oa Aerodynamics (11)
P30a Aeroelastic (9)
P30 Aeroelasticity (7)
D3 Aerofoil (103)
C36a Aeronautical (1)
C36 Aeroplane (13)
S29 Aerothermochemistry (1)
S24a Aerothermodynamic (1)
P32 Aerothermoelastic (1)
W21a Affected (1)
H34 Aft (2)
N36 After (1)
H32 Afterbody (35)
F75 Afterburner (1)
S79 Afterburning (1)
E84 Aftercooler (1)
P22 Afterflow (1)
J47 Ahead (4)
D12 Aileron (16)
B12 Air (192)
C36 Aircraft (170)
F91 Aircraft-Research-Association (1)
O1a Airflow (1)
D2 Airframe (14)
O84a Airjet (1)
C43 Airliner (1)
R1a Airload (1)
N45 Airspeed (2)
O1b Airstream (1)
Airy (1)
A43 Alclad (2)
A42 Alcoa (1)
Alden (1)
P90 Alfven (1)
V88 Algebraic (4)
V64 Algorithm (1)
M104 Aligned (1)
M105 Alignment (1)
H2a All (1)
X104c Allmovable (4)
X104e Allmoving (1)
R3 Allowable (4)
A39 Alloy (37)
Almen (1)
J25b Alone (1)
K5a Along (13)
T18 Alteration (3)
R112 Alternating (1)
Y196 Alternative (1)
J38 Altitude (41)
A40 Aluminium (42)
J3 Ambient (8)
F90 Ames (1)
B18 Ammonium (2)
M29 Amount (2)
U11 Amplification (6)
L89 Amplitude (17)
Y19a Analogous (1)
V29r Analogue (9)
V29q Analogy (22)
V61a Analyser (2)
V88 Analysis (226)
U89 Analytic (11)
U90 Analytical (17)
G32 Anemometer (6)
J90 Angle (224)
L69a Angled (23)
L69 Angular (10)
L696 Angularly (1)
P60 Anhedral (1)
W4 Anisotropic (1)
W_4a Anisotropy (2)
L33 Annular (8)
L34 Annulus (2)
G43 Antenna (1)
R22 Anticlastic (2)
K34 Antisymmetric (3)
K34 Antisymmetrical (4)
H17 Apex (10)
J24 Apogee (3)
F80 Apparatus (17)
Y79 Apparent (3)
U38 Appearance (2)
X115c Applicability (3)
U81 Application (9)
W21 Applied (15)
N113 Approach (10)
N114 Approaching (4)
Y93a Appropriate (1)
V78 Approximate (94)
V79 Approximating (1)
V79b Approximation (73)
A78 Ar (1)
M72d Arbitrarily (3)
M72c Arbitrary (46)
L64 Arc (19)
L101 Area (32)
A78 Argon (13)
J4 Around (1)
M65z Arrangement (4)
T90 Arrest (1)
L19 Arrow (2)
Y57 Art (2)
X15 Artificial (5)
X15a Artificially (1)
B42 Asbestos (1)
N70 Ascending (1)
N69 Ascent (1)
A.S.M.E. (1)
P53 Aspect (59)
U95 Assessment (3)
X118 Associated (3)
Y79a Assumed (1)
V290a Assuming (1)
V290 Assumption (7)
B45 Astrolite (1)
C1 Astrophysics (1)
K34a Asymmetric (4)
K34 Asymmetrical (2)
M93a Asymptote (1)
M93 Asymptotic (30)
M93b Asymptotically (1)
C77 Atlas (1)
C16 Atmosphere (55)
C16 Atmospheric (21)
A5 Atom (10)
A8b Atomic (5)
W66 Attached (21)
D78 Attachment (9)
J91a Attack (19)
R34 Attenuating (1)
R115 Attenuation (6)
P43 Attitude (5)
R110 Audio (1)
U4 Augmentation (6)
R109 Aural (1)
X416 Auto (1)
V117 Autocorrelation (3)
V118 Autocorrelogram (1)
S84 Autoignition (1)
X40 Automatic (4)
E91 Autopilot (1)
H93 Auxiliary (2)
Y88 Average (10)
V112a Averaging (1)
O48 Avoidance (1)
C51 Avro (1)
J94 Axial (113)
J94a Axially (35)
J56 Axis (36)
K33 Axisymmetric (66)
K33 Axisymmetrical (5)

H31 Back (2)
D100a Backing (1)
K8 Backward (1)
F1 Baffles (1)
Bakanov (1)
B40 Bakelite (1)
P78 Balance (15)
E15 Ball (1)
C83 Ballistic (12)
O58 Ballotini (1)
B2 Balsa (3)
D96 Bands (8)
R111f Bandwidth (1)
D27 Bang-bang (1)
M101 Bank (3)
P47 Banked (1)
D89 Bar (7)
M115 Bare (1)
G7a Barrel (1)
H24 Base (41)
K83a Based (1)
Y91 Basic (9)
Batdorf (8)
D52 Bays (6)
O57 Bead (1)
D101 Beam (26)
Beane (1)
F27 Bearing (3)
R106 Beat (1)
H25 Bed (1)
Bedford (2)
U26 Beginning (2)
S92 Behaviour (39)
J49 Behind (22)
V107 Bei (1)
C63 Bell (1)
F45 Belleville (1)
Belotserkovski (3)
J8 Belt (1)
L68 Bend (3)
R16 Bending (102)
V108 Ber (1)
Bernoulli (2)
Berthelot (1)
Bessel (1)
V51 Bestfit (1)
Beta (1)
J74 Between (13)
K86 Bevelled (1)
Y58a Bibliography (1)
L39 Biconvex (11)
T43 Bifurcation (4)
V90 Biharmonic (3)
O86 Billowing (1)
A39a Bimetallic (1)
A8d Bimolecular (2)
M38 Binary (5)
E35c Binding (1)
Biot (8)
C56 Biplane (2)
Birnbaum (1)
J57 Bisector (1)
X104 Bistable (1)
S54 Black (1)
F21 Blade (38)
F21 Blading (3)
Blasius (13)
O93 Blast (16)
Q58b Bleed (5)
Q58a Bleeding (1)
E3 Block (2)
P12 Blockage (10)
P12a Blocking (1)
F85 Blowdown (8)
E74 Blower (1)
Z16 Blowing (14)
W100 Blown (1)
O44 Blowoff (1)
Q54a Blowout (1)
K75 Bluff (8)
K73 Blunt (44)
K73 Blunted (18)
R37 Blunting (5)
K74 Bluntness (19)
E22 Boattail (1)
K84 Boattailed (1)
K85 Boattailing (2)
E1 Body (288)
S37 Boiloff (1)
F49 Bolt (1)
Boltzmann (2)
R104 Bomb (1)
C45 Bomber (2)
F46a Bond (1)
R102 Boom (13)
N49 Boost (1)
W56 Boosted (1)
E73a Booster (2)
N66 Boosting (2)
L100a Bore (1)
H23 Bottom (3)
C48 Boulton-Paul (1)
J71 Bound (8)
J70 Boundary (512)
M111 Bounded (3)
M112 Bounding (4)
H29 Bow (38)
R20 Bowing (1)
E4 Box (6)
D57a Boxtype (1)
N106 Braking (3)
A48 Brass (5)
O43 Breakdown (28)
T44 Breaking (1)
Q61 Breathing (5)
C30 Bridge (1)
M20 Broad (1)
S76a Btu (1)
B78 Bubble (3)
R52 Buckle (14)
W106 Buckled (13)
R51 Buckling (134)
Budiansky (1)
P40 Buffet (1)
P39 Buffeting (13)
D41 Built (2)
L90 Bulk (1)
D69 Bulkhead (5)
H64 Bump (4)
Y36a Buoyancy (1)
W43 Burned (1)
S78 Burning (4)
J46 Buried (1)
Q60 Burst (2)
O82 Bursting (2)
Busemann (4)
P37 Buzz (10)
D33 Cabin (2)
V31b Calculated (1)
V31a Calculating (1)
V31 Calculation (252)
V99 Calculus (4)
Y100 Calibrated (1)
V29b Calibration (21)
S27 Caloric (4)
S28 Calorically (1)
P69 Camber (19)
L40a Cambered (13)
G37 Camera (1)
F39a Can (1)
C58 Canard (1)
O83 Cancellation (1)
M83 Canted (1)
D102 Cantelever (14)
E41 Cantelevered (6)
F42 Cap (8)
Z4 Capability (2)
S22a Capacitance (2)
Z5 Capacity (10)
P55 Capillary (1)
K83 Capped (1)
C72 Capsule (2)
N74 Capture (1)
C44 Caravelle (3)
A70 Carbon (10)
B14a Carbonate (2)
O56 Carborundum (1)
L12 Caret (2)
T51 Carrying (6)
F4 Cascade (1)
S91c Case (3)
Cassinian (1)
Castiellanos (1)
B55 Castolite (1)
T7 Catalytic (1)
G47 Cathode (1)
Cauchy (1)
X17c Caused (2)
T66a Cavitating (1)
R40 Cavitation (3)
H72 Cavity (4)
G12 Cell (2)
D47 Cellular (3)
B32 Cellulose (2)
C69 Centaur (1)
J51 Central (5)
J51a Centrally (4)
J52 Centre (49)
J51b Centred (1)
J56a Centreline (3)
J99 Centrifugal (8)
J100 Centripetal (1)
B24 Ceramic (3)
U30 Cessation (2)
F38 Chamber (10)
T16 Change (38)
T17 Changing (3)
F64 Channel (22)
Chapman (5)
Y90 Characteristic (72)

S20 Charge (5)
S7 Charged (8)
T5 Charging (1)
Y55 Chart (15)
S96 Chemical (18)
S97 Chemically (10)
T10 Chemisorption (1)
Cheng (1)
M876 Chessboard (3)
Chien (1)
C31 Chimneys (1)
V25b China (1)
B15 Chloride (3)
P11a Choke (1)
P11b Choked (7)
P11 Choking (11)
P65 Chord (25)
K2 Chordwise (34)
T48 Chroming (1)
A56 Chromium (2)
B52 Cincinnati-Testing-Laboratory-Material (1)
N82 Circling (1)
J22 Circuit (2)
G42a Circuitry (1)
L29 Circular (154)
L30 Circularity (1)
Q4a Circulating (1)
0101 Circulation (14)
X32 Circulatory (2)
J60 Circumferential (41)
V79d Circumscribed (1)
C42 Civil (1)
E27 Clamped (35)
T99 Clamping (1)
E42a Clamshell (1)
Y89 Classical (8)
U86 Classification (2)
Clausing (1)
V25a Clay (1)
N71 Climb (1)
K89 Clipped (1)
J102 Clockwise (1)
J33 Close (3)
M109 Closed (23)
J34 Closely (2)
F40 Closures (1)
C21 Cloud (2)
J95 Coaxial (2)
065 Cocurrent (2)
U83 Code (2)
Y17 Coefficient (212)
S68 Cold (12)
Cole (1)
R49 Collapse (16)
R50 Collapsing (12)
U9 Collecting (1)
M55 Collective (1)
031 Collision (1)
M71a Collocation (1)
A61a Columbium (1)
D104 Column (27)
M71 Combination (38)
W28 Combined (45)
X6 Combustible (3)
S78 Combustion (18)
U87 Comparison (4)
V91 Compatibility (3)
S94d Competition (1)
Y5 Complementary (1)
M52 Complete (5)
U30a Completion (1)
W7 Complex (5)
H4 Component (22)
X19a Composed (2)
W8 Composite (13)
W6 Composition (9)
W9 Compound (2)
B54 Compreg (1)
W94 Compressed (10)
P1 Compressibility (28)
040 Compressible (124)
Q38a Compressing (2)
Q38 Compression (64)
X55 Compressive (36)
Q386 Compressively (1)
E74 Compressor (1)
V33 Computation (11)
V34 Computational (1)
V32 Compute (1)
V58 Computer (23)
L37 Concave (7)
W70 Concentrated (8)
T68 Concentration (21)
M117 Concentric (4)
Y43 Concept (7)
Y70a Conceptual (1)
S38 Condensation (6)
B68 Condition (112)
T74 Conducting (30)
T75 Conduction (40)
X48 Conductive (3)
X48a Conductivity (21)
G51 Conductor (1)
E11 Cone (128)
K45 Coned (1)
M66 Configuration (42)
T35 Confluence (1)
V106 Confluent (1)
V97 Conformal (5)
K45 Conical (71)
K45a Conically (1)
M396 Conjugate (1)
X117 Connected (3)
V49 Conservation (7)
Y89a Conservativeness (1)
T156 Considerations (1)
Y24 Consistent (2)
X73 Constant (79)
T93 Constraint (7)
U20 Constriction (1)
U66 Construction (12)
N50 Consumption (2)
J27 Contact (4)
X113 Containment (1)
T39 Contamination (12)
M30 Content (1)
T88a Continuation (1)
X72 Continuity (5)
X70 Continuous (19)
X71 Continuously (1)
030 Continuum (11)
L2 Contour (12)
F71 Contoured (1)
V19 Contracting (2)
V18 Contraction (11)
T15a Contribution (1)
U70 Control (66)
W88 Controlled (7)
U71 Controlling (1)
W61 Convected (1)
T76 Convecting (1)
S50 Convection (27)
X52 Convective (23)
Y89 Conventional (2)
Q15 Convergence (12)
L85 Convergent (15)
Q16 Converging (8)
T29 Conversion (8)
E86 Convertor (1)
L38 Convex (9)
S70 Cool (2)
A30 Coolant (13)
S69 Cooled (21)
E83 Cooler (4)
S42 Cooling (57)
V67 Coordinate (17)
L76 Coplanar (1)
A49 Copper (2)
H46 Core (22)
H74 Corner (22)
E466 Cornered (2)
U73 Correction (18)
X42 Corrective (1)
G23 Corrector (1)
X116 Correlated (1)
V116 Correlation (25)
V60 Correlator (1)
V116a Correlogram (1)
X115b Corresponding (1)
F54 Corridor (8)
L81 Corrugated (7)
H62 Corrugation (2)
U79 Cost (3)
Couette (2)
P8 Coulomb (1)
K11 Counter (4)
S94c Counteraction (1)
V6 Counting (1)
P73 Couple (5)
X119 Coupled (5)
T100 Coupling (9)
D93 Coupon (1)
F32 Cover (1)
V111b Coverage (1)
E47 Covered (1)
D35 Cowling (3)
H68 Crack (2)
R41 Cracking (1)
F30a Crank (1)
R64 Creep (33)
017 Creeping (1)
H20 Crest (1)
Y44 Criterion (14)
M23 Critical (57)
Crocco (2)
M108a Crookedness (1)
K88 Cropped (3)
L28 Cross (72)
M88 Crossed (3)
Q23 Crossing (1)

H21 Crown (1)
L27 Cruciform (11)
N76 Cruise (3)
N75 Cruising (3)
B69a Crystals (1)
H87 Cubic (3)
X58 Cumulative (7)
R21 Curling (1)
S18 Current (10)
088 Curtain (3)
Curtis (1)
C62 Curtiss-Wright (1)
L63 Curvature (55)
L62 Curve (64)
L61 Curved (26)
L28a Curvilinear (3)
089 Cushion (3)
K66 Cusp (1)
K67 Cusped (2)
K87 Cut (2)
H73 Cutout (4)
M95a Cycles (4)
N21 Cyclic (4)
S56a Cycling (3)
G46 Cyclotron (1)
E6 Cylinder (180)
K42 Cylindrical (118)

S19 D-C (1)
R46 Damage (11)
W52 Damped (2)
R116 Damping (63)
G33 Dampometer (2)
G12a Dashpot (1)
Y49 Data (71)
N8 Day (12)
X49 Dead (9)
B67 Debris (1)
Debye (1)
A61 Decarburized (1)
U52 Decay (16)
U53a Decaying (17)
P95 Decelerating (5)
P94 Deceleration (26)
D63 Deck (1)
T1 Decomposition (1)
F26 Decoupling (1)
U14 Decrease (3)
U13 Decreasing (2)
U15 Decrement (2)
U92 Deduction (1)
U45 De-excitation (1)
Z7 Defect (3)
Z6 Deficiency (1)
U16a Deficit (2)
S80 Deflagration (1)
W90 Deflected (12)
R31 Deflecting (3)
R30 Deflection (114)
W103a Deformable (1)
R28 Deformation (50)
R29 Deformed (1)
Deforming (1)
U53 Degeneration (2)
M31 Degree (88)
De-Hoffman (1)
DeLaval (1)

N34 Delay (5)
L11 Delta (46)
M28 Dense (1)
L107 Density (120)
Y9 Dependant (2)
Y7 Dependence (2)
Y8 Dependent (19)
059 Deposit (1)
059a Deposited (1)
H66 Depression (1)
L97 Depth (5)
U32 Derivation (8)
Y17a Derivative (39)
Deryagin (1)
N103 Descending (2)
N104 Descent (9)
Y52a Description (1)
V29hc Descriptive (1)
U64 Design (66)
D101a Destabilising (1)
P16 Destalling (3)
W65 Detached (21)
T63 Detachment (22)
V4 Detection (3)
V98 Determination (68)
095 Detonation (2)
V59a Deuce (1)
X64 Developable (1)
X20 Developed (3)
U48 Development (17)
T84 Deviation (11)
F80b Device (3)
X11 Dewpoint (1)
Y53 Diagram (6)
L100b Diameter (21)
L18 Diamond (9)
F5 Diaphragm (5)
A11 Diatomic (10)
S22 Dielectric (1)
Dietze (1)
Y25 Difference (22)
Y26 Different (1)
Y27 Differential (86)
Y28 Differentially (2)
Y29 Differing (1)
R112b Diffraction (1)
W64a Diffuse (2)
F66 Diffuser (9)
T60 Diffusion (26)
X47 Diffusivity (3)
V59 Digital (16)
P59 Dihedral (4)
L87 Dimension (11)
M1 Dimensional (2)
M2a Dimensionless (3)
R62 Dimpling (1)
R20 Dioxide (6)
Dirac (1)
J88 Direct (15)
W89 Directed (2)
J84 Direction (17)
J86 Directional (8)
B65 Dirt (2)
Q50 Discharge (8)
X82 Discontinuity (14)
X80 Discontinuous (10)
C81 Discover (1)

X81 Discrete (5)
P77 Disequilibrium (1)
E10 Disk (21)
R44 Dislocation (1)
W63 Dispersed (1)
T58 Dispersion (1)
W64 Displaced (2)
R30 Displacement (12)
T59 Dissipation (12)
X44 Dissipative (5)
W44 Dissociated (14)
T3 Dissociating (10)
T2 Dissociation (27)
W39 Dissolved (1)
L93 Distance (76)
J34a Distant (1)
R43 Distorting (1)
R42 Distortion (16)
W62 Distributed (19)
T53 Distribution (442)
P83 Disturbance (42)
W67 Disturbed (3)
T66 Disturbing (1)
N9 Diurnal (2)
P38 Divergence (19)
L86 Divergent (2)
Q19 Diverging (7)
067 Dividing (2)
N90 Diving (3)
T40 Division (1)
C64 Doak (1)
L24 Dodecagonal (1)
J6 Domain (3)
E16 Dome (2)
Donnell (28)
D64 Door (1)
Doppler (1)
Dorodnitzin (2)
M36 Double (26)
071 Doublet (4)
K13 Down (2)
K22 Downstream (36)
K14 Downward (2)
P18 Downwash (26)
P6 Drag (208)
G6 Driers (1)
P9 Drift (1)
L84b Drilled (1)
R40a Drilling (1)
Q49a Drive (1)
W96 Driven (4)
G4 Driver (5)
Q49 Driving (5)
R30a Droop (1)
K92 Drooped (1)
062 Drosophila (1)
E9 Drum (2)
X9 Dry (2)
M37 Dual (4)
F64 Duct (10)
E49 Ducted (4)
F64 Ducting (1)
X17d Due (1)
A41 Duralumin (1)
N2 Duration (2)
N2a During (1)
B66 Dust (2)

Q25 Dynamic (64)
Q25a Dynamically (1)

C14 Earth (19)
M120a Eccentrically (1)
X30 Eccentricity (15)
T85c Echoes (1)
Eckert (2)
U78 Economics (2)
O74 Eddy (11)
H52 Edge (200)
E46c Edged (14)
K5 Edgewise (2)
T15 Effect (136)
Y86 Effective (13)
Z2 Effectiveness (10)
Z1 Efficiency (8)
Z1a Efficient (1)
Q50 Effluxes (1)
Q52 Effusion (1)
V103 Eigenfunctions (2)
V102 Eigenvalue (6)
H90a Eighth (1)
F74 Ejector (2)
R68 Elastic (88)
R69 Elastically (5)
R67 Elasticity (13)
S9 Electric (12)
S8 Electrical (15)
S10 Electrically (24)
A35 Electroformed (2)
S15 Electrogasdynamic (1)
S14 Electrohydrodynamic (1)
S1 Electromagnetic (4)
S2 Electromagnetically (1)
A3 Electron (13)
S12 Electronic (8)
T47a Electroplating (1)
S17 Electrostatic (2)
H5 Element (22)
Y76a Elementary (1)
M22b Elevated (5)
D16 Elevator (5)
D18 Elevon (1)
U23 Elimination (7)
L43 Ellipse (7)
E17 Ellipsoid (3)
K60 Ellipsoidal (6)
L42 Elliptic (41)
L44 Elliptical (7)
L45 Ellipticity (1)
K94 Elongated (2)
Q44 Embedded (1)
X56a Embryonic (1)
X53 Emissivity (5)
Q50 Emission (3)
W101 Emitted (1)
Y68 Empirical (4)
M110 Enclosed (3)
S91b Encounter (1)
H48 End (25)
X23b Ended (3)
R83a Endgrain (1)
D84a Endplate (1)
R64a Endurance (5)
Q28 Energy (104)
Engessor (2)

E69 Engine (18)
E59b Eniac (1)
Enskog (1)
N109 Entering (10)
S58 Enthalpy (62)
M51a Entirely (1)
Z18 Entrainment (2)
F57 Entrance (5)
S60 Entropy (27)
N108 Entry (19)
H41a Envelope (6)
J1 Environment (2)
J2 Environmental (1)
B35 Epoxy (1)
Y3a Equal (2)
Y3b Equality (1)
Y3 Equally (2)
V89 Equation (312)
C17 Equatorial (1)
S74 Equicohesive (1)
L25 Equilateral (1)
T103 Equilibration (2)
P74 Equilibrium (96)
F80 Equipment (17)
Y1 Equivalence (3)
Y2 Equivalent (19)
Erdmann (1)
T12 Erosion (4)
X85 Erratic (1)
Z9 Error (7)
N73 Escape (7)
U94 Estimate (2)
U93 Estimation (26)
A22 Ethylene (3)
Euler (4)
G7 Evacuators (1)
U96 Evaluation (11)
S36 Evaporating (1)
S35 Evaporation (2)
S91 Event (1)
V36 Exact (34)
M55a Excess (2)
T71 Exchange (9)
E82 Exchanger (1)
V42 Excitation (17)
X22 Excited (3)
V44 Exciting (2)
H59 Excrescence (3)
R6 Exerted (2)
Q50 Exhaust (20)
Q51 Exhausting (16)
F63 Exit (24)
Q55 Exiting (2)
S56 Exothermic (1)
O32 Expanded (1)
U7 Expanding (1)
U6 Expansion (80)
N51 Expenditure (1)
V1 Experiment (144)
V2 Experimental (128)
R105 Exploded (1)
C78 Explorer (3)
O94 Explosion (2)
R54 Explosives (1)
V74a Exponent (3)
V104b Exponential (4)
M114 Exposed (5)

Y79b Expressible (1)
V29p Expression (11)
K93 Extended (1)
X63a Extendible (1)
R33a Extending (1)
X63 Extensible (1)
R33b Extension (7)
R33c Extensional (5)
L102a Extensive (1)
G26 Extensometers (1)
L102 Extent (2)
J67 External (38)
J68 Externally (1)
S86 Extinction (1)
V47a Extrapolated (1)
M56 Extreme (3)
W102 Extruded (1)

C47 F (2)
H36 Face (15)
E45 Faced (8)
F80a Facility (2)
M90 Facing (4)
H6 Factor (49)
S76 Fahrenheit (7)
U53d Failing (1)
R4 Failsafe (1)
R66 Failure (27)
C55 Fairchild (1)
D74 Fairing (1)
Falkner (6)
N94 Fall (1)
N93 Falling (4)
E77 Fan (7)
J35 Far (5)
Farnborough (3)
N29 Fast (2)
R65 Fatigue (24)
X92b Favourable (1)
U77 Feedback (2)
O83d Feeding (2)
Fenter (1)
Ferri (2)
A57 Ferrous (1)
B51 Fiberglass (1)
B27 Fibre (4)
B28 Fibrous (1)
J9 Field (136)
H89a Fifth (2)
C46 Fighter (4)
O66 Filament (2)
D58 Filled (3)
D74b Filler (1)
U12a Filling (1)
B77 Film (10)
F6 Filter (2)
W37 Filtered (1)
D29 Fin (16)
H91 Final (4)
V4 Finding (1)
P54 Fineness (9)
M40 Finite (67)
C41 Finned (2)
S82 Fire (1)
S85 Firing (2)
H82 First (29)
E71 Fission (1)

F47 Fit (1)
V48 Fitting (1)
M64 Five (1)
E35 Fixed (42)
T97 Fixing (1)
S81 Flame (11)
D74a Flange (9)
E32 Flanged (1)
D19 Flap (22)
R92a Flapping (7)
K95 Flare (4)
K96 Flared (4)
L73 Flat (208)
R38 Flattening (1)
R67 Flexibility (13)
R73 Flexible (11)
R74 Flexibly (1)
R17 Flexural (20)
R18 Flexure (3)
N52 Flight (74)
E34a Floating (5)
01 Flow (942)
02 Flowing (2)
G30 Flowmeter (3)
T26 Fluctuating (7)
T25 Fluctuation (12)
Flugge (9)
B71 Fluid (144)
W38 Fluidized (1)
B23 Fluorochemicals (1)
P33 Flutter (68)
P34 Fluttering (1)
01 Flux (17)
N53 Flying (1)
F30b Flywheel (1)
B81 Foam (1)
A75 Foamed (1)
V25c Focal (1)
C23 Fog (1)
F1a Foil (1)
R24 Folding (2)
J49a Following (2)
H26a Foot (9)
Q32 Force (184)
W86 Forced (2)
R53 Forcible (1)
V29ga Forcing (3)
H28 Forebody (9)
P7 Foredrag (3)
Y31a Foreign (8)
H28 Forepart (1)
H28 Foreplane (1)
K29 Form (27)
U37 Formation (15)
X19 Formed (1)
B41 Formica (1)
V75 Formula (32)
V34a Formulation (7)
K6 Forward (29)
H26 Foundation (3)
M63 Four (4)
Fourier (17)
H88 Fourth (7)
H8 Fraction (6)
R47 Fracture (1)
D70 Frame (8)
E40b Framed (1)
D70a Framework (1)
J83a France (1)
Y33 Free (64)
E33 Free-free (2)
Y32 Freedom (18)
Y35 Freely (17)
Freeman (1)
T6a Freeze (1)
T6 Freezing (5)
A86 Freon (10)
N26 Frequency (66)
Fresnal (1)
Friction (144)
X24 Frictional (9)
O14 Frictionless (1)
J60a Fringe (5)
H27 Front (14)
W48 Frozen (20)
061 Fruitfly (1)
E12 Frustum (4)
A20 Fuel (12)
C75 Fuelling (1)
M50 Full (7)
Fuller (1)
M49 Fully (9)
V104 Function (79)
Y91 Fundamental (4)
A73 Fused (3)
D32 Fuselage (28)
L41 Fusiform (1)
E72 Fusion (1)

Q35b G (3)
U5a Gain (1)
Galcit (1)
Galerkin (12)
A58a Gamma (1)
H71 Gap (2)
B73 Gas (164)
Z12 Gasdynamic (4)
B73 Gaseous (7)
G25 Gauge (11)
Gauss (1)
Gaussian (2)
F24 Gear (1)
D17 Geared (1)
Y86b General (18)
V29i Generalized (7)
X18 Generated (7)
U36a Generating (1)
U36 Generation (14)
E85 Generators (9)
D57b Geodsic (1)
M2 Geometric (3)
K28a Geometrical (2)
K28b Geometrically (1)
K28 Geometry (15)
Gerard (1)
Y79a Given (2)
Q47a Glancing (1)
B25 Glass (7)
B26 Glassy (1)
Glauert (1)
N105 Glide (6)
C66a Glider (6)
B8 Glycerin (1)
X92c Good (1)
Goodman (2)
Gortler (1)
L45b Gothic (1)
W89a Governed (1)
M72b Graded (1)
J92 Gradient (104)
N28a Gradual (1)
Graham (1)
B85 Grain (2)
V43 Graphical (2)
A71 Graphite (5)
Grasshof (2)
B64 Gravel (3)
Gravelos (1)
X28 Gravitional (2)
Q35a Gravity (13)
N107 Graze (2)
Green (4)
Gregg (1)
F3 Grid (1)
H68a Groove (1)
M65b Gross (3)
C24 Ground (35)
Y42 Group (1)
V46 Growth (24)
N120 Guidance (4)
F21a Guide (5)
C84 Guided (3)
F88 Gun (4)
C20 Gust (19)
Q6 Gyration (1)
E88 Gyroscope (1)
Q11 Gyroscopic (2)

H (2)
E25 Haack (1)
H9 Half (28)
Hall (4)
Hamel (1)
K78 Hammerhead (1)
D86 Handley-Page (1)
N44 Handling (3)
R83 Hard (1)
T46 Hardening (2)
R93 Harmonic (11)
R93a Harmonically (5)
Hartmann (3)
Hartree (1)
B56 Haveg (1)
N128 Hazard (1)
A77 He (1)
H19 Head (23)
K83 Headed (1)
H62a Heaps (1)
S23 Heat (304)
S73 Heated (25)
G5 Heater (2)
S40 Heating (80)
N97 Heave (1)
N96 Heaving (1)
M28b Heavy (4)
L96 Height (26)
Heisenberg (1)
K50 Helical (1)
C59 Helicopter (4)
M118 Heliocentric (1)

A77 Helium (45)
K49 Helix (2)
Helmholtz (4)
E16 Hemisphere (34)
K58a Hemispheric (3)
K58 Hemispherical (11)
K58b Hemispherically (2)
W16 Heterogeneous (1)
B9 Hexachlorethane (1)
L22 Hexagonal (2)
Hiemenz (1)
M21 High (136)
M22a Higher (1)
M22 Highly (24)
C66 Hiller (2)
F50 Hinge (9)
E30 Hinged (5)
N3a Historical (2)
N3 History (12)
Y61 Hodograph (5)
Hoff (2)
R23 Hogging (1)
Hohmann (1)
N43 Holding (1)
H69 Hole (7)
D58 Hollow (5)
Homas (1)
C85 Homing (1)
W13 Homogenous (13)
P28 Homologous (1)
A9 Homonuclear (1)
D45 Honeycomb (3)
Hookean (1)
D97 Hoop (5)
E40a Hooped (1)
M73a Horizontal (10)
D22 Horn (1)
L36 Horseshoe (6)
S73 Hot (23)
063 Housefly (1)
N79 Hover (2)
C34 Hovercraft (3)
N78 Hovering (6)
Howarth (3)
F19 Hub (7)
Hugoniot (2)
N123 Human (2)
X10 Humidity (3)
Hurwitz (1)
Z23 Hydroballistic (1)
A23 Hydrocarbon (1)
Z19 Hydrodynamic (10)
A76 Hydrogen (17)
S13 Hydromagnetic (2)
X26 Hydrostatic (21)
L48 Hyperbola (1)
L49 Hyperbolic (11)
V105 Hypergeometric (1)
L50 Hyperliptic (3)
010 Hypersonic (264)
011 Hypervelocity (5)
V29n Hypothesis (2)
Y70 Hypothetical (1)
B57 Hysol (1)
R120 Hysteresis (6)
R118 Hysteretic (1)
L52 I (3)
IBM (3)
C87 ICBM (1)
C23a Ice (1)
Iconel (1)
Y71 Ideal (22)
V92b Idealization (3)
Y72 Idealized (4)
W42 Ignited (1)
S83 Ignition (4)
V68 Ignorable (1)
Illingworth (2)
C44a Ilushin (1)
079 Image (1)
N32 Immediately (1)
X99 Immobile (1)
X104d Immovable (1)
Q43 Impact (16)
R113 Impedance (12)
W53 Impeded (1)
F15 Impeller (8)
Y82 Imperfect (5)
Z8 Imperfection (27)
R90 Impermeable (4)
Q46 Impingement (3)
Q45 Impinging (5)
W70a Imposed (2)
W26 Improved (2)
T21 Improvement (1)
Q42 Impulse (6)
Q42a Impulsive (1)
Q42b Impulsively (1)
J65a In (2)
J59 Inboard (2)
L92a Inch (5)
J91 Incidence (64)
Y9a Incident (11)
X56 Incipient (5)
M78 Inclination (8)
M77 Inclined (7)
Z8a Inclusion (1)
K14a Incoming (1)
039 Incompressible (28)
A45 Inconel (3)
U2 Increase (7)
W55 Increased (2)
U1 Increasing (5)
U3 Increment (1)
X65 Incremental (3)
Y32 Independence (1)
Y33 Independent (4)
Y59 Index (2)
G22 Indicator (2)
P5 Indicial (8)
J89 Indirect (1)
Y37a Individual (1)
X21 Induced (74)
S21 Inductance (1)
U35 Induction (7)
E36 Inelastic (8)
Y31 Inequality (2)
X102 Inert (3)
Q26 Inertia (12)
G36a Inexorable (1)
M43 Infinite (33)
M43b Infinitely (14)
M43c Infinitesimal (3)
M43d Infinitesimally (1)
M43a Infinity (2)
W92 Inflected (1)
R19 Inflection (2)
072 Inflow (2)
T14 Influence (15)
049 Inhibition (1)
W14 Inhomogeneous (2)
H82 Initial (62)
X18a Initialed (1)
H82a Initially (8)
045a Initiation (1)
A19a Injectant (3)
W99 Injected (6)
Z17 Injection (54)
F74 Injector (2)
A19 Ink (1)
F57 Inlet (19)
J65 Inner (18)
B9a Inorganic (2)
Y48a Input (10)
V79c Inscribed (1)
060 Insect (2)
P82 Instability (44)
N33 Instantaneous (5)
G17a Instrumentation (18)
G17 Instruments (4)
S72 Insulated (22)
S41d Insulating (2)
S41c Insulation (3)
F60 Intake (3)
V82 Integrable (1)
W19 Integral (60)
W29 Integrated (1)
V83 Integrating (1)
V57 Integration (28)
V83d Integrative (1)
M28d Intense (4)
M28c Intensity (18)
S94 Interacting (2)
S93 Interaction (104)
J75a Interangular (1)
F65 Interblade (2)
R41a Intercrystalline (1)
H39 Interface (12)
P9a Interference (20)
V25 Interferential (1)
V21 Interferogram (3)
G41 Interferometer (2)
V20 Interferometric (1)
V19 Interferometry (1)
H45 Interior (7)
H94 Intermediate (14)
N19 Intermittent (2)
J75c Intermolecular (1)
J65 Internal (42)
J66 Internally (2)
C3 Interplanetary (2)
V46 Interpolating (1)
V47 Interpolative (1)
Q14 Intersecting (2)
J76 Intersection (7)
J75 Interstage (1)
N13b Interval (2)
K16 Into (1)
J75d Intramolecular (1)
X17a Introduced (1)

X75 Invariant (1)
V37 Inverse (3)
T88 Inversion (7)
M85 Inverted (3)
V85 Investigation (32)
O15 Inviscid (90)
K15 Inward (1)
B16 Iodide (1)
A81 Iodine (1)
A7 Ion (12)
T4 Ionization (12)
W47 Ionized (10)
C18 Ionosphere (7)
C86 IREM (1)
A58 Iron (1)
X43 Irregularity (1)
X60 Irreversible (1)
O24 Irrotational (4)
O27 Isentropic (17)
Y62 Isobar (3)
O28 Isobaric (2)
N20a Isochrome (1)
N20 Isochronous (2)
T34 Isoenergetic (1)
Q28b Isoerg (1)
Y64 Isogon (1)
J25a Isolated (3)
R117 Isolation (1)
V22 Isopycnal (1)
L26 Isosceles (1)
S63 Isothermal (11)
A6 Isotope (1)
W2 Isotropic (19)
P23a Isovel (4)
Q51 Issuing (3)
V52 Iteration (8)
V53 Iterative (15)

V29f Jacking (1)
G15 Jacks (1)
Janzen (1)
Jeffrey (1)
O84 Jet (108)
Q41a Jogs (1)
Johannesen (1)
T98 Joining (2)
F46 Joint (8)
E27a Jointed (2)
Jones (1)
Jouguet (1)
Joukowski (7)
S41 Joule (1)
F28 Journal (1)
E75 Jumo (1)
V2a Jump (9)
J77 Junction (9)
C10 Jupiter (3)

Kaminsky (1)
Karman (27)
Kelley (1)
S75 Kelvin (7)
Kendrick (1)
H47 Kernel (5)
G34a Kinetheodolite (1)
Q28c Kinetic (17)
H77 Kink (1)
R63 Kinking (1)
Kirchhoff (5)
Kirk (1)
H80 Knee (2)
F53 Knuckle (2)
Knudsen (3)
A79 Krypton (2)
Kuo (1)
Kussner (2)
Kutta (3)

R107 L (2)
F81 Laboratory (1)
A17 Lacquer (1)
N35 Lag (7)
T66 Lagging (1)
Lagrange (2)
Lagrangian (9)
L56 Lambda (1)
O18 Laminar (288)
O41 Laminarization (1)
D43 Laminate (1)
D43a Lamination (1)
Landahl (2)
N115 Landing (2)
Langhaar (1)
Langley (4)
P13 Lap (3)
Laplace (2)
M10 Large (48)
Laszlo (1)
Lateral (44)
K2b Laterally (3)
J80 Latitude (2)
M86 Lattice (2)
C73 Launch (4)
W98 Launched (4)
F70 Laval (4)
V29m Law (42)
H43 Layer (512)
D43b Layered (2)
M67 Layout (1)
A52 Lead (2)
J48 Leading (124)
M47 Least (2)
Q51 Leaving (2)
Lees (4)
K23 Leeward (4)
H55 Leg (2)
Legendre (1)
Leggett (1)
L92 Length (55)
K3 Lengthwise (2)
L40 Lenticular (2)
M47a Less than (12)
J37 Level (18)
Lewis (1)
B58 Lexan (1)
R95 Libration (1)
Liebmann (2)
N4 Life (8)
N5 Lifetime (7)
P3 Lift (88)
P4 Lifting (46)
Light (5)
Lighthill (4)
V29c Lighting (1)
M28a Lightly (1)
M28g Lightweight (1)
J73 Limit (18)
U24 Limitation (1)
M41 Limited (1)
U25 Limiting (2)
J16 Line (45)
M3 Linear (54)
V291 Linearization (8)
V28k Linearized (49)
M3a Linearly (5)
G9 Liners (1)
H54 Lip (1)
S31a Liquefaction (2)
B71a Liquid (17)
Y58b Literature (1)
R1 Load (132)
W85 Loaded (24)
R1 Loading (86)
H65 Lobe (2)
E44a Lobed (1)
J12 Local (65)
J13 Locally (48)
J11a Located (1)
J11 Location (50)
B59 Lockfoam (1)
V27 Lockheed (1)
V104a Logarithmic (5)
M13 Long (37)
K3 Longitudinal (57)
K4 Longitudinally (3)
D82 Loop (2)
E34 Loose (1)
Q33 Lorenz (2)
S53 Losing (1)
V16b Loss (20)
Love (4)
M25 Low (96)
J42 Lower (15)
J42a Lowest (1)
A31 Lubricant (2)
V51 Lubrication (2)
B48 Lucite (2)
R122 Luminosity (2)
R123 Luminous (2)
W72a Lumped (1)
C15 Lunar (1)
C4 Luni-solar (1)
Lyapunov (3)

Maccoll (2)
O102 Mach (344)
E56 Machine (9)
M12 Macroscopic (1)
Mager (1)
A52 Magnesium (2)
S11 Magnetic (34)
S15 Magneto-aerodynamic (4)
S13 Magneto fluid mechanics (1)
S15 Magneto-gasdynamic (3)
S13 Magneto-hydrodynamics (3)
E69 Magneto-Plasma (2)
S22b Magnetostriction (1)
V12 Magnification (2)
L88 Magnitude (5)
Magnus (3)
E23 Maikapar (1)

H83 Main (16)
V58 Maintenance (4)
H83 Major (5)
T54 Maldistribution (1)
Mangler (2)
C68 Manned (6)
N77 Manoeuvre (10)
N77a Manoeuvring (2)
G27 Manometer (3)
Y54 Map (5)
V98 Mapping (3)
J72 Margin (3)
C33 Maritime (1)
C9 Mars (5)
C9 Martian (2)
L104 Mass (70)
D31a Massbalanced (1)
V65 Matching (7)
A15 Material (38)
V30 Mathematical (2)
Mathieu (1)
Matric (1)
V94 Matrix (15)
M46a Maxima (1)
M46 Maximum (49)
Maxwell (18)
Maxwellian (1)
Mayer (1)
M45 Mean (30)
Y99 Measured (5)
V102 Measurement (188)
G24 Measuring (1)
X25 Mechanical (8)
P70 Mechanics (5)
E57 Mechanism (7)
J1c Media (1)
J58 Median (3)
M9 Medium (9)
B31 Melamine (1)
S31 Melting (4)
Y42d Member (2)
H41 Membrane (30)
A66 Mercury (6)
W32 Merged (4)
T37 Merger (1)
T36 Merging (1)
J81 Meridian (3)
J81a Meridional (7)
M87 Mesh (1)
A38 Metal (2)
C12 Meteor (1)
C13 Meteorite (1)
C13 Meteoroid (1)
G25 Meter (1)
A21 Methane (3)
A24 Methanol (1)
U62 Method (180)
Meyer (9)
G45 Microphone (1)
S5 Microwave (1)
J52a Mid (1)
C76 Midas (1)
P66 Midchord (2)
E64 Mid-course (2)
J32 Middle (14)
J54 Midplane (7)
J53 Midpoint (1)
P63 Midspan (1)
A60 Mild (1)
Millikan (1)
N7 Milliseconds (1)
U21 Minimisation (4)
U22 Minimizing (1)
M44 Minimum (31)
H84a Minor (5)
Mirels (1)
M106 Misaligned (1)
M107 Misalignment (3)
Mises (6)
N117a Miss (2)
C82 Missile (29)
N55 Mission (1)
Mit (2)
W30 Mixed (11)
T33 Mixing (54)
W11 Mixture (26)
R96 Modal (1)
K29a Mode (54)
F83 Model (137)
M8a Moderate (10)
T19 Modification (9)
W24 Modified (34)
T20 Modifying (1)
W23 Modulated (4)
T28 Modulating (1)
T27 Modulation (3)
Y14 Modulus (19)
B72 Moisture (1)
A8a Mol (1)
A8c Molecular (19)
A8 Molecule (13)
A54 Molybdenum (2)
P71 Moment (160)
N15a Momentary (1)
Q27 Momentum (54)
A10 Monatomic (3)
R55 Monocell (1)
D56 Monocoque (2)
D75 Monolithic (2)
C53 Monoplane (2)
R125a Monotonic (2)
B19 Monoxide (1)
Morley (1)
P84 Motion (88)
X99a Motionless (1)
E60 Motor (8)
O28b Mound (1)
E40 Mounted (7)
D76 Mounting (2)
X104b Movable (3)
P85 Movement (8)
P86 Moving (18)
F76 Muffler (2)
M35 Multi (2)
J97 Multiaxial (1)
D53 Multibay (1)
F22a Multiblade (1)
D48 Multicell (1)
W10 Multicomponent (1)
D43 Multilayer (8)
D43c Multilayered (1)
W17 Multiphase (1)
M35 Multiple (13)
V87 Multiplication (1)
G53 Multiplier (2)
D44 Multiply (1)
F12a Multipropeller (1)
D54 Multirib (1)
W20a Multisectional (1)
D55 Multispar (1)
E76 Multistage (4)
D50 Multiweb (3)
Y6 Mutual (1)
D51 MW-1 (1)
B37 Mylar (3)

O91 N (1)
NACA (14)
D34 Nacelle (5)
M16 Narrow (2)
Nash (1)
X16 Natural (15)
X16a Nature (1)
Navier (15)
M118 Navigation (1)
J30 Near (16)
J31 Nearest (1)
J32 Nearly (7)
H78 Neck (1)
X90 Negative (8)
X89 Negatively (2)
M47b Negligible (4)
M65a Net (6)
M87a Network (1)
Neumann (1)
X92 Neutral (8)
J83 New Mexico (1)
Newton (2)
Newtonian (39)
V59e NGTE (1)
Nicholson (1)
A44 Nickel (5)
N10 Night (2)
A46 Nimonic (4)
Niordson (1)
A83 Nitric (2)
A82 Nitrogen (23)
A84 Nitrous (1)
X89a No (2)
N11 Nocturnal (1)
J79 Nodal (5)
J78 Node (3)
R101 Noise (37)
M43e Nominal (1)
W36 Non-ablating (1)
M108 Non-aligned (1)
K34b Nonaxisymmetric (1)
K34c Nonaxisymmetrical (1)
T7a Noncatalytic (3)
L32 Non-circular (7)
X33 Non-circulatory (3)
T39a Non-concurrence (1)
X51 Non-conducting (5)
S62 Non-conductive (1)
M8 Non-dimensional (3)
J89a Non-direct (1)
N59a Non-dissipating (1)
X45 Non-dissipative (2)
E36e Non-elastic (1)
P76 Non-equilibrium (21)
X7 Non-flammable (1)

W15 Non-homogeneous (3)
M74 Non-inclined (1)
S64 Non-isothermal (1)
C38 Non-lifting (15)
M4 Non-linear (41)
M5 Non-linearity (4)
X88 Nonmonotonic (2)
X90a Non-negative (1)
R95b Non-oscillatory (1)
M94a Non-parallel (1)
Y83 Non-perfect (1)
L77 Non-planar (1)
R90a Non-porous (2)
S52 Non-radiating (1)
X101a Non-reacting (1)
X101 Non-reactive (1)
D31 Non-recoverable (1)
097 Non-relativistic (1)
Q3 Non-rotating (2)
K35 Non-rotational (1)
F83b Non-separating (1)
X31b Non-similar (2)
M18 Non-slender (2)
B70 Non-solid (1)
B87 Non-stationary (7)
X79 Non-steady (8)
K34 Non-symmetric (1)
X8 Non toxic (1)
K91 Non truncated (1)
019 Non turbulent (1)
T24 Non-uniform (20)
X75b Non-uniformity (1)
X75a Non-uniformly (1)
075a Non-vanishing (1)
015 Non-viscous (7)
D6 Nonweiler (1)
N87 Non-yawing (1)
M57b Non-zero (1)
Y76b Normal (8)
Y86b Normally (2)
H30 Nose (98)
X83b Nosed (42)
X89b Not (2)
H67 Notch (2)
F68 Nozzle (82)
F89 NPL (1)
E73 Nuclear (2)
V44 Numerical (74)
0104 Nusselt (9)
B30 Nylon (4)

C29a Object (2)
K55 Oblate (4)
K56 Oblateness (1)
M79 Oblique (19)
W54 Obliterated (1)
V3 Observation (4)
H65a Obstacle (3)
X17b Obtained (1)
S91a Occurences (1)
K35a Octahedral (1)
L23 Octogonal (1)
J36 Off (2)
L45a Ogee (4)
K62 Ogival (1)
E19 Ogive (18)
B6 Oil (15)
Oliver (1)
F52 Omega (1)
V23a Omission (1)
M58 One (11)
M3 Onedimensional (15)
ONERA (1)
J28a Onset (12)
K17a Onto (1)
M113 Open (10)
F58 Opening (3)
U61 Operating (2)
U60 Operation (8)
V100a Operational (1)
N124a Operator (1)
M91 Opposed (1)
M90 Opposite (2)
G35 Optical (4)
M46b Optimal (1)
U72 Optimization (1)
Y78 Optimum (19)
J20 Orbit (20)
N56 Orbital (8)
N57 Orbiting (1)
H81 Order (50)
M72 Ordered (1)
Y86a Ordinary (7)
V68a Ordinate (3)
J85 Orientation (1)
F59 Orifice (5)
H82b Originally (1)
U33 Originating (3)
Orr (1)
L70 Orthogonal (2)
L72 Orthogonality (2)
L71 Orthogonally (1)
W3 Orthotropic (15)
R92 Oscillating (35)
R91 Oscillation (50)
E96 Oscillator (2)
X36 Oscillatory (23)
G49 Oscillograph (1)
G48 Oscilloscope (1)
Oseen (10)
Osgood (2)
J61 Outboard (4)
J67 Outer (23)
J62 Outermost (1)
P25 Outflow (1)
F63 Outlet (5)
K81 Out-of-roundness (1)
L60 Out-of-straightness (1)
Y84b Output (1)
J68a Outside (2)
K17 Outward (2)
L42 Oval (7)
J38a Over (4)
M54 Overall (7)
033 Overexpanded (2)
F69 Overexpanding (1)
033a Overexpansion (5)
F20 Overhang (1)
Q40 Overpressure (3)
V55 Overrelaxation (1)
N116 Overshoot (5)
P81 Overstability (1)
Q10 Overswing (1)
S77 Oxidation (1)
B18a Oxide (4)
A32a Oxidizer (1)
A85 Oxygen (17)

V59d Pace (1)
Packard (1)
Painleve (1)
A16a Paint (1)
M39 Pair (1)
D65a Pane (1)
D85 Panel (49)
R100 Panting (1)
B66 Paper (1)
B53 Papreg (1)
L46 Parabola (2)
L47 Parabolic (23)
E21 Paraboloid (2)
K64 Paraboloidal (3)
M92 Parallel (45)
V66 Parameter (38)
B38 Paraplex P43 (2)
V43 Parasitic (1)
C54 Parasol (1)
H3 Part (9)
M48a Partial (19)
M48 Partially (4)
A1 Particle (12)
Y98a Particular (1)
T42 Partition (3)
M48 Partly (1)
Q24a Pass (2)
F54 Passage (5)
Q24 Passing (2)
X100 Passive (1)
J20 Path (29)
M68 Pattern (61)
N46 Pay (1)
N46 Payload (1)
H22 Peak (15)
Peak-to-peak (1)
P68 Peaky (1)
Peclet (2)
V79a Penalty (1)
G41a Pendulum (1)
Q18 Penetrating (4)
Q17 Penetration (7)
Y73 Perfect (26)
Y73a Perfectly (4)
L84 Perforated (5)
H70 Perforation (1)
N40 Performance (55)
J25 Perigee (12)
L98 Perimeter (2)
N6 Period (13)
N16 Periodic (5)
N17 Periodically (2)
N18 Periodicity (2)
J60 Peripheral (4)
N14 Permanent (1)
R89 Permeable (2)
R3a Permissible (2)
M76 Perpendicular (9)
M76a Perpendicularly (2)
B46 Perspex (1)
P83 Perturbation (30)
W68 Perturbed (1)
B68a Phase (12)

B39 Phenolic (3)
Y40 Phenomena (12)
Y40a Phenomenological (2)
V29 Philosophy (1)
A18 Phospherescent (1)
S16a Photoelastic (1)
S16 Photoelectric (1)
G36a Photograph (13)
G36 Photographic (2)
V14 Photography (6)
G38 Photomultiplier (3)
V16 Photorecording (1)
S56d Photothermoelastic (4)
S56e Photothermoelasticity (1)
S95 Physical (10)
R119 Phugoid (1)
Pibal (1)
G52a Pickup (1)
G40 Picture (1)
H5c Piece (1)
G28 Piezometer (1)
A16 Pigment (1)
W72 Piled (1)
N124 Pilot (3)
N119 Piloting (1)
H60 Pimple (1)
G49a Pin (5)
B5 Pine (1)
E28 Pinned (2)
E7 Pipe (8)
F8 Piston (18)
N88 Pitch (30)
N89 Pitching (88)
G31 Pitometer (1)
G30a Pitot (18)
F30 Pivot (1)
V74 Pivotal (2)
Y91a Plain (1)
L75 Planar (5)
Planck (1)
J17 Plane (63)
C6 Planet (2)
C6 Planetary (12)
M119 Planetocentric (1)
P49 Planform (28)
E58 Plant (2)
Plaskon (1)
B87 Plasma (7)
R79 Plastic (34)
R78 Plasticity (7)
D84 Plate (278)
J18 Plateau (1)
T47 Plating (1)
F39 Plenum (1)
B47 Plexiglass (1)
PLK (1)
V50 Plot (2)
V49 Plotting (4)
F41 Plug (4)
O87 Plume (2)
N91 Plunging (8)
B3 Plywood (1)
X26a Pneumatic (1)
O73a Pocket (1)
Poggi (1)
Pohle (1)
Pohlhausen (15)
Poincare (2)
J11 Point (136)
K65 Pointed (12)
Poiseuille (6)
Poisson (4)
Y60a Polar (9)
S22c Pole (1)
R87 Polished (1)
A12 Polyatomic (3)
J97a Polyaxial (1)
A14 Polycrystalline (2)
B36 Polyester (1)
L20 Polygon (3)
L21 Polygonal (1)
A13 Polymer (1)
V93 Polynomial (6)
B50 Polystyrene (1)
Pondermotive (1)
R88 Porous (32)
H1 Portion (4)
J11 Position (46)
J14 Positioning (1)
X91 Positive (5)
Possio (1)
N37 Post (3)
R59 Postbuckling (12)
A67 Potassium (1)
O25 Potential (74)
G32a Potentiometer (1)
L106a Pound (6)
Powell (1)
Q31 Power (46)
N62 Powered (3)
E59 Powerplant (1)
Y81 Practical (1)
O103 Prandtl (38)
M94 Preasymptotic (1)
W108 Pre-buckled (1)
Q58 Pre-buckling (4)
Q12 Precession (1)
P34a Precipitation (1)
V97 Prediction (10)
Y95 Preferential (1)
H81a Preliminary (1)
R7 Preloading (1)
W31 Premixed (1)
Q4 Pre-rotation (1)
E36d Prescribed (7)
J1a Presence (2)
Q36 Pressure (720)
Q40a Pressurisation (1)
D60 Pressurized (15)
Preston (2)
W78a Prevented (1)
V74 Prevention (4)
Q9 Prewhirl (2)
H83 Primary (3)
V29m Principle (13)
N38 Prior (1)
K36 Prismatic (1)
V111a Probability (4)
C89 Probe (15)
V65 Problem (46)
Probstein (2)
V65a Procedure (20)
V59 Process (16)
W21b Processed (1)
Y49a Product (5)
U36 Production (3)
L1 Profile (140)
V63 Programme (3)
D21a Programmed (2)
V62 Programming (1)
X57 Progressive (3)
W98a Projected (1)
C82 Projectile (8)
H57 Projection (1)
K57 Prolate (3)
O54 Promoter (2)
O51 Promotion (6)
U106 Proof (3)
U41 Propagating (2)
U40 Propagation (20)
A26 Propellants (10)
W97 Propelled (1)
F12 Propeller (30)
Wa Property (45)
Y11 Proportion (3)
Y10 Proportional (5)
N47 Propulsion (7)
E62 Propulsive (6)
U51a Protection (5)
A4 Proton (1)
H58 Protuberance (1)
P27a Proturbulence (1)
U31a Providing (1)
J26 Proximity (8)
P.S.I. (1)
Y23 Pseudo (1)
R95a Pulse (2)
E79 Pump (4)
Y77 Pure (18)
K37 Pyramidal (1)

V76 Quadrature (1)
R105a Quadrupole (1)
U104 Qualitative (1)
W6 Quality (2)
U103 Quantitative (4)
M29 Quantity (2)
H10 Quarter (1)
H89 Quartic (1)
A74 Quartz (4)
Y22 Quasi (1)
L29a Quasi-circular (1)
K46 Quasi-conical (3)
K6a Quasi-cylinder (3)
K44 Quasi-cylindrical (1)
P75 Quasi-equilibrium (1)
M36 Quasi-onedimensional (2)
X69 Quasi-steady (10)
X76a Quasi-unsteady (1)
S87 Quenching (1)
N29 Quick (1)

Rabotnov (1)
G44 Radar (1)
J98 Radial (44)
J98a Radially (2)
S51 Radiant (2)
T79 Radiating (1)
T78 Radiation (33)
X52a Radiative (10)
G20 Radiator (1)

S6 Radioactive (1)
G51a Radiotrajectograph (1)
L100 Radius (38)
RAE (16)
M102 Rakes (1)
Ramberg (2)
D80 Ramp (2)
M73 Random (21)
N41 Range (32)
Rankine (3)
Raphson (1)
N29 Rapid (4)
T61 Rarefaction (3)
B75 Rarefied (15)
N25 Rate (118)
Y13 Ratio (288)
S3 Ray (5)
B43 Raybestos (1)
Rayleigh (16)
S99 Reacting (12)
S98 Reaction (26)
X107 Reactive (2)
E70 Reactor (1)
V7 Reading (3)
Y85 Real (22)
H33 Rear (10)
K9 Rearward (2)
036a Reattached (1)
046a Reattaching (2)
046b Reattachment (15)
F34 Receiver (1)
Y66 Reciprocal (4)
Y6a Reciprocity (1)
Q46 Recirculating (1)
T31 Recombination (13)
Q39 Recompression (3)
Y52 Record (4)
V5 Recording (2)
D30 Recoverable (1)
U55 Recovery (35)
L13a Rectangle (1)
L13 Rectangular (66)
L4 Rectilinear (3)
T81a Redirecting (1)
T54a Redistribution (2)
W51 Reduced (12)
U16 Reduction (37)
X66 Redundant (5)
N111 Re-entering (2)
T83a Re-entrant (2)
N110 Re-entry (39)
053 Re-Establishment (1)
Y45 Reference (7)
T22 Refinement (2)
W76 Reflected (15)
T86 Reflecting (1)
T85 Reflection (22)
R112a Refraction (2)
A32 Refractory (2)
B44 Refrasil (1)
J6 Regime (20)
J9 Region (106)
S48 Regression (2)
X74c Regular (1)
U71a Regulation (1)
Q47 Reimpingement (1)
D42 Reinforced (11)
Reissner (3)
V116 Relation (47)
V116 Relationship (13)
X111 Relative (16)
X112a Relatively (1)
X112 Relativistic (1)
T104 Relaxation (26)
V54 Relaxational (1)
T105 Relaxing (4)
E90 Relay (1)
T80 Release (4)
N42 Reliability (2)
X67a Remain (1)
T52 Removal (4)
W59 Removed (1)
N58 Re-orbit (1)
V69 Replacement (1)
S39 Replenishment (1)
V9 Representation (3)
Y93 Required (5)
Y94 Requirement (10)
V85 Research (12)
F36 Reservoir (2)
X67 Residual (2)
S61 Residue (1)
B34 Resin (4)
P83a Resistance (13)
W84 Resisted (1)
P83b Resisting (1)
S32 Re-solidification (1)
V101 Resolution (1)
R114 Resonance (9)
R94 Resonant (6)
U76 Response (23)
X93 Rest (4)
U29 Restart (1)
X93a Resting (2)
Q35 Restoring (2)
W79 Restrained (7)
T94a Restraining (1)
T94 Restraint (8)
W79a Restricted (2)
Y50 Result (45)
Y51 Resultant (11)
Y51a Resulting (1)
050 Retardation (1)
N28 Retarded (4)
T91 Retarding (2)
E65 Retrorocket (2)
N102 Return (1)
Reuss (1)
T87 Reversal (16)
K10 Reverse (5)
W77 Reversed (1)
X59 Reversibility (1)
Y58 Review (4)
W25 Revised (1)
K39 Revolution (96)
A47 Rex (1)
0105 Reynolds (132)
R108 RF (1)
R27 Rheological (2)
L15 Rhombic (3)
D72 Rib (1)
D95 Ribbon (1)
Riccatti (1)
Richardson (2)
H61 Ridge (3)
099 Riemann (1)
M76c Right (6)
E36 Rigid (21)
R76 Rigidity (11)
E36b Rigidly (1)
H53 Rim (1)
L35 Ring (28)
P35 Ripple (2)
U1a Rise (40)
Ritz (8)
F48 Rivet (1)
RMS (1)
E63 Rocket (43)
B56 Rocketon (2)
D92 Rod (9)
N83 Roll (11)
W111a Rolled (7)
N84 Rolling (30)
D66 Roof (1)
P67 Rooftop (2)
S67 Room (2)
V72 Root (11)
J101 Rotary (5)
Q2 Rotating (20)
K39 Rotation (22)
022 Rotational (18)
K41 Rotationally (9)
X32a Rotatory (1)
F10 Rotor (14)
L79 Rough (1)
L80 Roughness (26)
K79 Round (4)
K80 Rounded (4)
U30b Rounding (1)
K79a Roundness (1)
U63 Routine (1)
Routt (1)
M100 Row (8)
B6a Rubber (1)
D15 Rudder (4)
V29m Rule (5)
N26 Running (1)
R48 Rupture (4)

A65 SAE (1)
N129 Safety (2)
E68 Sail (1)
B14 Salt (3)
H5a Sample (1)
V113 Sampling (1)
B63 Sand (2)
055 Sandpaper (1)
D43 Sandwich (17)
C74 Satellite (31)
T11 Saturation (2)
C11 Saturn (1)
C35 Saunders-Roe (1)
U80 Saving (2)
L91 Scale (36)
V86 Scaling (2)
T57 Scattering (2)
Q57a Scavenging (1)
Schindel (1)
Schlichting (4)
V17 Schlieren (20)
Schmidt (2)

Schubauer (5)
F61 Scoop (1)
W57 Scooped (1)
U10 Scooping (1)
F2 Screen (4)
F49b Screw (1)
C25 Sea (1)
Seal (1)
U51c Sealing (2)
E25 Sears (1)
N12 Season (2)
N13 Seasonal (1)
Y15 Secant (3)
H85 Second (37)
H85a Secondary (17)
H11 Section (110)
W20 Sectional (14)
H13 Sector (5)
E44 Sectorial (3)
Sedov (1)
B13 Seeded (4)
H14 Segment (11)
U91 Segmentation (1)
E43 Segmented (3)
Seide (1)
Y96 Selected (1)
X41a Self (10)
M31b Semi (3)
V42 Semianalytical (1)
H18 Semiapex (2)
N59 Semiballistic (1)
L51 Semicircular (4)
E18 Semi-ellipsoid (1)
K61 Semi-ellipsoidal (1)
Y68a Semi-empirical (3)
M42 Semi-infinite (19)
V38 Semi-inverse (1)
H84 Semi-major (3)
V45 Semi-numerical (1)
B75a Semi-rarefied (1)
E37 Semi-rigid (2)
P64 Semispan (4)
H18a Semivertex (9)
R125 Sensitivity (1)
G22a Sensor (2)
035 Separated (26)
T62 Separating (5)
046 Separation (132)
M103 Sequential (1)
M95 Series (32)
E89 Servo (1)
Y42c Set (3)
J93 Setting (3)
G2 Settling (5)
H90 Seventh (2)
M28e Severe (2)
M28f Severely (1)
L16 Sextic (1)
V13 Shadowgraph (6)
F13a Shaft (1)
T105a Shakedown (1)
M27 Shallow (20)
M27a Shallowness (1)
F13 Shank (1)
Shanley (1)
K27 Shape (238)
K30 Shaped (10)
K70 Sharp (48)
K70a Sharpness (1)
R11 Shear (124)
W91 Sheared (1)
R12 Shearing (14)
F32b Sheath (1)
081 Shedding (2)
D83 Sheet (25)
D88 Shell (114)
Shesterikov (1)
D37 Shield (6)
E48 Shielded (1)
U51d Shielding (2)
V23 Shift (2)
C33 Ship (1)
096 Shock (296)
R5 Shocking (1)
098a Shockless (1)
M14 Short (21)
R35 Shortening (5)
F32a Shroud (10)
F83a Shrouded (2)
T72 Shuffle (1)
A62 Sicromoz (1)
H35 Side (21)
G46a Sided (1)
H35a Sidedness (1)
P19a Sideforce (1)
N99 Sideslip (12)
G8 Sidewall (2)
P20 Sidewash (8)
R101a Signals (3)
F76 Silencer (1)
A72 Silica (4)
B21 Silicate (1)
V80 Similar (24)
V81 Similarity (26)
V19 Similtude (7)
Y76 Simple (22)
U92c Simplification (4)
Y74 Simplified (4)
Y75 Simply (44)
X23 Simulated (10)
V7a Simulating (1)
V8 Simulation (21)
V61 Simulator (1)
N23 Simultaneous (4)
N24 Simultaneously (1)
V106a Sine (1)
M32 Single (31)
M33 Singly (1)
M34 Singular (4)
Y37 Singularity (8)
070 Sink (4)
N95 Sinking (8)
L66 Sinusoidal (20)
L66a Sinusoidally (2)
R103 Siren (1)
J1b Situation (1)
M65 Six (1)
H89b Sixth (1)
L88 Size (30)
Skan (6)
M81 Skewed (1)
H40 Skin (164)
N60 Skip (4)
N61 Skipping (1)
K97 Skirt (4)
K98 Skirted (1)
D87 Slab (20)
D8 Slab-tail (1)
D23 Slat (1)
M15 Slender (90)
L94 Slenderness (2)
H12 Slices (1)
F29 Slider (1)
M47a Slightly (8)
029 Slip (19)
P24a Sliplines (1)
P24 Slipstream (16)
J92 Slope (42)
M82 Sloped (1)
P36 Sloshing (1)
D24 Slot (6)
L83 Slotted (9)
N27 Slow (1)
N27a Slowly (2)
028a Slug (1)
M25 Small (98)
B83 Smoke (2)
L78 Smooth (19)
V56 Smoothing (1)
R85 Smoothness (1)
R56 Snap (2)
R60 Snapping (2)
C22 Snow (1)
S57 Soaked (1)
Z22 Soaking (1)
B60 Sod (1)
A68 Sodium (5)
R82 Soft (4)
C5 Solar (7)
B69 Solid (46)
V77 Solution (296)
Sommerfield (1)
05 Sonic (52)
S43 Soret (1)
R98 Sound (29)
E66 Sounding (1)
U31 Source (15)
Southwell (2)
C2 Space (23)
C67 Spacecraft (4)
M96 Spaced (7)
C67 Spaceship (1)
M97 Spacing (11)
P61 Span (30)
K2a Spanning (1)
K3 Spanwise (42)
D71 Spar (2)
V18 Spark (1)
Sparrow (1)
H95 Spatial (1)
Y42b Species (1)
Y98 Specific (31)
H56 Specimen (5)
R111a Spectra (9)
R111c Spectral (7)
V11 Spectrography (1)
R111b Spectrum (8)
T85b Specular (3)
P89 Speed (168)
Sphere (44)
K52 Spherical (34)

K53 Spherically (4)
K54 Spheroid (1)
E13 Spike (2)
K47 Spiked (1)
N98 Spin (3)
D36 Spinner (3)
Q7 Spinning (1)
K51 Spiral (4)
O77 Spiralling (1)
D20 Split (4)
F22 Splitter (1)
D26 Spoiler (2)
J15 Spot (2)
Z20 Spray (1)
T56 Spread (7)
T55 Spreading (2)
F44 Spring (14)
B4 Spruce (1)
C79 Sputnik (3)
L14 Square (28)
Squires (1)
SRN 1 (1)
P79 Stability (144)
T102 Stabilization (2)
W81 Stabilized (4)
D28 Stabilizer (4)
T101 Stabilizing (2)
X103 Stable (8)
F17 Stacking (3)
F16 Stage (13)
M98 Stagger (1)
M99 Staggered (1)
M99a Staggering (1)
X94 Stagnant (2)
P10 Stagnation (176)
A64 Stainless (7)
P14 Stall (17)
O37 Stalled (2)
P15 Stalling (8)
Stalmach (1)
D77 Stand (2)
Y87 Standard (3)
O92 Standing (2)
O98 Standoff (20)
Stanton (7)
U28 Start (2)
U27 Starting (8)
B68 State (31)
X98 Static (96)
X98a Statically (7)
J11 Station (2)
X95 Stationary (25)
V112 Statistical (5)
V111 Statistics (2)
F7 Stator (4)
X68 Steady (94)
B11 Steam (1)
A59 Steel (15)
M84 Steep (1)
M84a Steepest (3)
Stefan (1)
H56 Stem (2)
D81 Step (16)
V53 Step-by-step (4)
P55 Stepdown (1)
M99b Stepwise (1)
Stewartson (6)
E38 Stiffened (36)
D100 Stiffener (20)
D99 Stiffening (4)
R77 Stiffness (50)
X97 Still (1)
G13 Sting (9)
V119 Stochastic (1)
W12 Stoichiometric (2)
Stokes (14)
C60 STOL (4)
Stone (1)
Stopping (2)
U67 Storage (4)
D38 Stores (2)
U68 Storing (1)
L57 Straight (18)
L58 Straightness (3)
R28 Strain (64)
R64b Straintime (1)
Stratford (2)
D43 Stratiform (1)
O1 Stream (156)
O64 Streamline (40)
F56 Streamtube (6)
K20 Streamwise (15)
O80 Street (2)
R81 Strength (41)
R1 Stress (196)
E51 Stressed (2)
E2 Stressing (1)
K99 Stretched (1)
R33 Stretching (5)
Q41 Striking (2)
D68 Stringer (14)
V24 Strioscopy (1)
D94 Strip (18)
V12 Stroboscopic (1)
X14 Strong (21)
Strouhal (2)
W1 Structural (28)
D40 Structure (61)
D103 Strut (5)
U85 Study (12)
St. Venant (1)
L65 Subarc (1)
R111 Sub audio (1)
O4 Subcritical (1)
S94b Subject (3)
W87 Subjected (3)
H44 Sublayer (6)
S33 Sublimation (4)
J44 Submerged (1)
O3 Subsonic (106)
Y19c Substitutes (1)
N22 Successive (6)
Z15a Sucking (1)
Z15 Suction (27)
N31 Sudden (7)
F62 Sugar (1)
C5 Sun (1)
Z14 Superaerodynamic (3)
L31 Supercircular (2)
M24 Supercritical (3)
O13 Superfast (1)
W71 Superimposed (2)
V115 Superposition (7)
O12 Super-satellite (2)
O7 Supersonic (352)
O8 Supersonically (1)
O69 Supply (2)
U69 Supplying (1)
D75 Support (17)
E40 Supported (50)
V29e Supporting (5)
U75 Suppression (1)
H37 Surface (300)
E46 Surfaced (1)
P29 Surge (5)
J4 Surrounding (3)
Y57 Survey (15)
B82 Suspension (2)
X72a Sustained (2)
U49a Sustaining (1)
Sutherland (1)
Q62 Swallowing (1)
S47 Sweat (4)
P50 Sweep (15)
P51 Sweepback (13)
P52 Sweepforward (1)
L5 Swept (29)
L6 Sweptback (28)
L8 Sweptforward (3)
O76 Swirl (4)
T82 Switching (1)
K31 Symmetric (54)
K31 Symmetrical (30)
K32 Symmetrically (1)
K30a Symmetry (5)
U92a Synthesis (1)
Y41 System (29)
M72a Systematic (2)

L52a T (1)
D25 Tab (5)
Y55a Table (13)
Y55b Tabulation (1)
D7 Tail (29)
C57 Tailless (1)
F87 Tailored (1)
T22a Tailoring (1)
D9 Tailplane (9)
N65 Take-off (3)
J27a Tangency (1)
Y16 Tangent (18)
K19 Tangential (13)
F33 Tank (7)
V29g Tap (1)
K68 Taper (10)
K65 Tapered (13)
W101a Tapped (1)
Q58 Tapping (1)
Y48d Target (1)
N64 Taxiing (1)
Taylor (12)
V62 Techniques (47)
H63 Teeth (1)
B49 Teflon (7)
V92 Telegraph (1)
N122 Telemetering (1)
N121 Telemetry (3)
G39 Television (1)
Teller (1)
S66 Temperature (272)
V79a Tending (2)

R10 Tensile (10)
R9 Tension (9)
V100 Tensor (1)
V70 Term (6)
H92 Terminal (5)
X23a Terminated (3)
V71 Termwise (1)
F82 Test (236)
F82 Testing (24)
B17 Tetrachloride (2)
Theodorsen (3)
V84 Theorem (10)
V29ha Theoretical (152)
V29h Theory (406)
S24 Thermal (86)
S26 Thermally (5)
P31 Thermo-aeroelastic (1)
T13 Thermo-chemical (1)
G29 Thermocouple (3)
S24 Thermodynamic (23)
S56c Thermoelastic (2)
B45a Thermold (1)
S56b Thermo-mechanical (1)
L56a Theta (1)
M18 Thick (20)
X1 Thickened (1)
O47 Thickening (2)
L95 Thickness (174)
M15 Thin (140)
H86 Third (3)
E24 Thor-Able (1)
M61 Three (9)
M7 Three-dimensional (62)
M7a Three-dimensionality (1)
R57 Threshold (1)
H79 Throat (20)
F78 Throttle (1)
K18 Through (5)
N48 Thrust (45)
D21 Thwaites (3)
P42 Tilt (9)
E31a Tilting (1)
N1 Time (72)
N1 Timewise (1)
A63 Timken (1)
Timken Roller Bearing Co.(1)
H50 Tip (39)
C88 Titan (1)
A51 Titanium (3)
A28 TNT (1)
N127 Tolerance (1)
Tollmien (5)
H16 Top (2)
Torda (2)
K48 Toriconical (2)
K59 Torispherical (4)
K63 Toroidal (5)
P72 Torque (6)
R13 Torsion (25)
R14 Torsional (27)
E20 Torus (4)
M53 Total (59)
K7 Towards (1)
Y60 Traces (1)
U99 Tracing (1)
R32 Tractions (1)
P26 Trail (4)
J50 Trailing (46)
J20 Trajectory (25)
V100b Transcendant (1)
V91a Transcendental (2)
G52 Transducers (1)
T70 Transfer (228)
W60 Transferred (1)
V96 Transform (2)
V95 Transformation (34)
W27 Transformed (3)
N15 Transient (41)
Q22 Transit (1)
O42 Transition (104)
O20 Transitional (10)
P96 Translation (4)
X35 Translational (3)
P97 Translatory (2)
T73 Transmission (5)
O6 Transonic (72)
R124 Transparent (1)
S46 Transpiration (4)
T50 Transport (15)
P80 Transtability (4)
V98a Transversality (1)
K1 Transverse (56)
K2c Transversely (1)
L17 Trapezoidal (1)
P88 Travelling (4)
N67 Traversal (1)
U100 Traverse (3)
N68 Traversing (3)
U62a Treatment (4)
Trefftz (1)
L11a Triangle (2)
L11 Triangular (23)
V110 Trigonometric (7)
P45 Trim (8)
P46a Trimmed (2)
P46 Trimming (2)
O52 Trip (5)
O45 Tripped (1)
O52a Tripping (1)
Y24b True (1)
K90 Truncated (13)
D105 Truss (3)
Tsien (1)
E7 Tube (70)
E7 Tubing
K43 Tubular (3)
V28 Tuft (1)
N92 Tumbling (4)
A55 Tungsten (16)
F84 Tunnel (296)
E80 Turbine (14)
E61 Turbojet (8)
E74 Turbomachine (1)
P27 Turbulence (30)
O21 Turbulent (132)
N80 Turn (1)
T83 Turning (8)
M39a Twin (1)
P57 Twist (10)
W93 Twisted (5)
R15 Twisting (7)
M60 Two (14)
M6 Two-dimensional (168)
M6a Two-dimensions (1)
Y42a Type (23)

J83b U.K. (1)
Y47 Ultimate (2)
M22c Ultra-high (1)
S4 Ultra-violet (1)
J97b Unaxial (1)
P48 Unbanked (1)
K77 Unblunted (1)
M116 Unbounded (2)
W107 Unbuckled (2)
L40b Uncambered (4)
W52a Unchanged (1)
S71 Uncooled (1)
Y33 Uncoupled (5)
J43 Under (4)
O34 Underexpanded (1)
O34a Underexpansion (2)
S94a Undergoing (1)
N117 Undershoot (4)
H38 Undersurface (1)
J45 Underwater (1)
W46 Undissociated (3)
W69 Undisturbed (3)
R75 Unelastic (1)
Y30 Unequal (3)
X84 Unevenness (1)
F37 Unfired (2)
E32a Unflanged (1)
R26 Unfolding (1)
S72 Unheated (1)
J96 Uniaxial (4)
J87 Unidirectional (1)
V29j Unified (2)
X74 Uniform (106)
X74a Uniformity (2)
X74b Uniformly (17)
R97 Unimodal (1)
M59 Unit (11)
M59a Unity (5)
V59c Univac (3)
E33a Unloaded (1)
R26a Unloading (1)
X74d Unperturbed (1)
N63 Unpowered (1)
D61 Unpressurized (1)
W83 Unretarded (1)
O36 Unseparated (1)
O38 Unstalled (1)
P17 Unstalling (1)
X77 Unsteadily (1)
X78 Unsteadiness (3)
X76 Unsteady (41)
E39 Unstiffened (10)
Y33a Unsupported (1)
L10 Unswept (12)
K34a Unsymmetrical (2)
K76 Untapered (4)
L82b Unwrinkled (1)
W74 Unyawed (8)
K12
P19 Upflow (1)
P18a Upload (1)
J40 Upper (28)
F18 Uprating (1)
K21 Upstream (21)
P19 Upwash (9)

Y65 U.R. (1)
U82 Use (1)

L54 V (3)
B76 Vacuum (5)
Y24a Valid (3)
V73 Value (39)
Y99a Valued (1)
F43 Valve (1)
Vandriest (1)
Van Dyke (4)
F21 Vane (9)
F67 Vaneless (1)
C80 Vanguard (1)
Q20 Vanishing (5)
M47c Vanishingly (1)
B74 Vapour (10)
S34 Vapourisation (4)
X86 Variable (30)
T23 Variation (18)
V41 Variational (17)
T24 Varying (12)
Y63 Vector (13)
C32 Vehicle (66)
P89 Velocity (360)
Q57b Venting (1)
F72 Venturis (1)
C8 Venus (3)
U105 Verification (2)
H17 Vertex (1)
M75 Vertical (34)
C65 Vertol (2)
M516 Very (4)
F35 Vessels (9)
R92 Vibrating (4)
R91 Vibration (49)
X37 Vibrational (10)
X38 Vibrationally (3)
X36 Vibratory (5)
J29 Vicinity (3)
Q30 Virtual (2)
O16 Viscid (2)
R71 Viscoelastic (3)
R70 Viscoelasticity (1)
R80 Viscoplastic (1)
P2 Viscosity (44)
O16 Viscous (116)
N126 Visibility (1)
N125 Vision (1)
V9a Visual (1)
V10 Visualisation (9)
Volterra (1)
L103 Volume (15)
L103a Volumetric (1)
O74 Vortex (59)
O75 Vortical (2)
O100 Vorticity (47)
N54 Voyage (1)
C61 VTOL (20)

L55 W (1)
Wagner (2)
H80a Waists (1)
P22 Wake (60)
P23 Wakelike (2)
Walkden (1)
H42 Wall (172)
E48a Walled (11)
Walles (1)
Ward (1)
E94 Warhead (1)
P58 Warp (1)
R15a Warpage (1)
W105 Warped (1)
Warren (1)
W68a Washed (1)
B10 Water (17)
U51b Waterproofing (1)
O90 Wave (244)
R111e Waveform (1)
R111d Wavelength (5)
L82c Waviness (1)
L82 Wavy (2)
X14b Weak (11)
U53b Weakening (1)
E92 Weapon (2)
D73 Web (7)
K38 Wedge (63)
Weierstrass (1)
L105 Weight (33)
V114 Weighting (1)
Weinstein (1)
Weissinger (4)
J28a Wetted (1)
Z21 Wetting (1)
Q8 Whirl (2)
Whitham (3)
H2 Whole (1)
M19 Wide (4)
M19a Widely (1)
L100c Width (19)
C19 Wind (266)
D65 Window (4)
K24 Windward (4)
D4 Wing (252)
C39 Winged (4)
C40 Wingless (1)
D90 Wire (12)
X115a With (1)
I66a Within (1)
Y38 Without (1)
B1 Wood (4)
Q29 Work (5)
Y84 Working (14)
D91 Woven (1)
L82a Wrinkled (1)
R61 Wrinkling (6)

C49 X (1)
A80 Xenon (1)

N85 Yaw (32)
W73 Yawed (17)
N86 Yawing (13)
Y48c Yield (10)
U53c Yielding (1)
Young (3)
E26 Yo-Yo (1)

L55a Z (2)
M57a Zero (73)
O80 Zinc (2)
J10 Zone (8)
N72 Zoom (1)

# APPENDIX 5.2

## SINGLE-TERM DICTIONARIES

This Appendix lists the 723 search starting terms which occurred in the set of 361 questions. These are shown, in the first column, in the form used by the questioner, and following each starting term are the terms in the three groups of Synonyms, Word-Endings and Quasi-Synonyms, these being denoted by the numbers (1), (2) and (3) respectively. These dictionaries are discussed on pages 66 to 68.

| | |
|---|---|
| ABLATING | (2) Ablated, Ablation (3) Ablation, Melting |
| ABLATION | (2) Ablated, Ablating (3) Ablating, Melting |
| ABOVE | (3) Higher |
| ABSENCE | (3) Without |
| ABSORPTION | (2) Absorbed |
| ACCURACY | (2) Accurate (3) Accurate |
| ACCURATE | (2) Accuracy (3) Exact, Perfect, Accuracy, True |
| ACOUSTIC | (1) Sound, (2) Acoustically, (3) Sonic |
| ACTION | (3) Behaviour, Process |
| ADJACENT | (3) Near, Close, Proximity |
| AERODYNAMIC | (2) Aerodynamically, Aerodynamics |
| AERODYNAMICS | (2) Aerodynamic, Aerodynamically |
| AEROELASTIC | (2) Aeroelasticity |
| AEROFOIL | (3) Profile, Lifting x Element, Lifting x Surface |
| AEROPLANE | (1) Aircraft (3) Air x Vehicle, Flight x Vehicle, Aerodynamic x Body |
| AEROTHERMODYNAMIC | |
| AFTERBODY | |
| AFTERBURNING | (2) Afterburner |
| AHEAD | (3) Forward, Upstream |
| AILERON | |
| AIR | (3) Atmosphere, Atmospheric |
| AIRCRAFT | (1) Aeroplane, (3) Air x Vehicle, Flight x Vehicle, Aerodynamic x Body |
| ALTITUDE | (3) Height |
| AMOUNT | (1) Quantity (3) Magnitude, Size, Total, Dimension |
| ANALYSIS | (2) Analyser, Analytic, Analytical (3) Analytical x Investigation |
| ANALYTICAL | (2) Analyser, Analysis, Analytic (3) Analysis |
| ANGLE | (2) Angled, Angular, Angularly |
| ANTISYMMETRIC | (1) Antisymmetric, Asymmetric, Asymmetrical, Nonsymmetric (2) Antisymmetric |
| ANTISYMMETRICAL | (1) Antisymmetric, Asymmetric, Asymmetrical, Non-symmetric (2) Antisymmetric |
| APEX | (1) Vertex, (3) Top, Head, Crest, Crown, Cap, Semiapex, Semivertex |
| APPLICATION | (2) Applicability, Applied (3) Use |
| APPLIED | (2) Applicability, Application |
| APPROPRIATE | (3) Optimum, Ideal, Perfect |
| APPROXIMATE | (2) Approximating, Approximation (3) Generalized, Approximation, Simple, Simplified, Simplification, Idealized, Near x Perfect, Imperfect |
| APPROXIMATION | (2) Approximate, Approximating (3) Simplification |
| ARBITRARILY | (2) Arbitrary |
| ARBITRARY | (2) Arbitrarily |
| AROUND | (3) Circumferential, Adjacent, Peripheral, Bounding, Ambient, Surrounding |
| ASPECT | |
| ASSUMED | (1) Given, (2) Assuming, Assumption (3) Prescribed, Imposed |
| ASSUMPTION | (2) Assumed, Assuming (3) Theory, Theoretical, Hypothesis, Prediction, Principle, Law, Rule |
| ASYMMETRICAL | (1) Antisymmetric, Antisymmetrical, Asymmetric, Non-symmetric, (2) Asymmetric |
| ASYMPTOTIC | (2) Asymptote, Asymptotically |
| ATMOSPHERE | (2) Atmospheric, (3) Air |
| ATTACHMENT | (2) Attached, (3) Reattachment, Reattaching, Reattached |
| ATTACK | (3) Incidence |
| AXIAL | (2) Axially, Axis (3) Parallel |
| AXISYMMETRIC | (1) Axisymmetrical (2) Axisymmetrical, (3) Axial x Symmetric, Axial x Symmetrical, Axially x Symmetric, Axially x Symmetrical |
| BASE | (2) Based, Basic (3) Bottom, Undersurface, End |
| BASIC | (1) Fundamental (2) Base, Based |
| BEAM | |
| BEHAVIOUR | (3) Process, Action |
| BEHIND | (3) Back, Rearward |
| BENDING | (1) Flexure (2) Bend (3) Deflection |
| BETWEEN | (3) Mid |
| BIOT | |
| BLADE | (1) Vane (2) Blading |
| BLASIUS | |
| BLAST | (3) Explosion, Detonation, Gust |
| BLOCKAGE | (2) Block, Blocking (3) Choking, Stagnation |
| BLOWING | (2) Blower, Blown |
| BLUFF | (3) Blunt |

| | |
|---|---|
| BLUNT | (1) Blunted (2) Blunted, Blunting, Bluntness (3) Blunted, Bluff, Rounded |
| BLUNTED | (1) Blunt (2) Blunt, Blunting, Bluntness (3) Rounded, Bluff |
| BLUNTNESS | (2) Blunt, Blunted, Blunting (3) Blunt, Blunted, Blunting, Bluff, Round, Rounded, Roundness |
| BOATTAIL | (2) Boattailed, Boattailing |
| BODY | (3) Surface, Structure, Fuselage |
| BOOM | |
| BOUNDARY | (2) Bound, Bounded, Bounding (3) Threshold, Bound, Limit, Limiting, Onset, Start, Starting, Appearance, Beginning |
| BOW | (2) Bowing (3) Ahead, Front, Forward, Forebody |
| BREATHING | (3) Pulse |
| BUCKLING | (2) Buckle, Buckled |
| BUFFET | (2) Buffeting (3) Buffeting, Oscillation |
| BUZZ | (3) Single x Degree x Freedom x Flutter |
| CALCULATED | (2) Calculating, Calculation, Calculus (3) Estimate, Estimation, Prediction, Assessment |
| CALCULATING | (2) Calculated, Calculation, Calculus (3) Computation, Determination, Solution, Quantitative x Measurement, Formula , Estimate, Estimation, Prediction, Assessment |
| CALCULATION | (1) Computation (2) Calculated, Calculating, Calculus (3) Determination, Solution, Quantitative x Measurement, Formula , Estimate, Estimation, Prediction, Assessment |
| CALIBRATION | (2) Calibrated |
| CAMBERED | (2) Camber (3) Camber |
| CAPACITY | (2) Capacitance |
| CARRYING | (1) Supporting (3) Loaded, Exposed, Subjected |
| CASCADE | (3) Lattice |
| CENTRE | (1) Middle (2) Central, Centrally, Centred (3) Central |
| CESSATION | (1) Stopping (3) Completion, Terminated, Braking, Arrest |
| CHANGE | (1) Alteration (2) Changing (3) Transition |
| CHANNEL | (1) Duct (3) Passage, Ducting |
| CHAPMAN | |
| CHARACTERISTIC | (1) Property (3) Quality, Nature |
| CHARGED | (1) Ionized (2) Charge, Charging (3) Dielectric |
| CHEMICAL | (2) Chemically |
| CHEMICALLY | (2) Chemical |
| CHOKED | (2) Choke, Choking |
| CHOKING | (2) Choke, Choked |
| CHORDWISE | (2) Chord, (3) Chord |
| CIRCULAR | (2) Circularity, Circling (3) Round |
| CIRCULARITY | (2) Circular, Circling (3) Roundness |
| CIRCUMFERENTIAL | (1) Peripheral |
| CLAMPED | (2) Clamping |
| CLASSICAL | (1) Conventional |
| CLOSED | (2) Closure |
| CLOSURE | (1) Seal (2) Closed |
| COAXIAL | (3) Concentric |
| COEFFICIENT | (3) Factor |
| COLLAPSE | (2) Collapsing |
| COLUMN | |
| COMBINATION | (2) Combined (3) System |
| COMBUSTION | (1) Burning (2) Combustible |
| COMPARISON | |
| COMPONENT | (3) Element, Part |
| COMPOSITE | (2) Composed, Composition (3) Complex |
| COMPRESSED | (2) Compressibility, Compressible, Compressing, Compression, Compressive, Compressor, Compressively |
| COMPRESSIBILITY | (2) Compressed, Compressible, Compressing, Compression, Compressive, Compressor, Compressively |
| COMPRESSIBLE | (2) Compressed, Compressibility, Compressing, Compression, Compressive, Compressor, Compressively (3) Subsonic, Transonic, Supersonic, Hypersonic |
| COMPRESSION | (2) Compressed, Compressibility, Compressible, Compressing, Compressive, Compressor, Compressively (3) External x Pressure, External x Load |
| COMPRESSIVE | (2) Compressed, Compressibility, Compressible, Compressing, Compression, Compressor, Compressively |

| | |
|---|---|
| COMPRESSOR | (1) Blower, Turbomachine (2) Compressed, Compressibility, Compressible, Compressing, Compression, Compressive, Compressively (3) Impeller, Pump |
| COMPUTATION | (1) Calculation (2) Computational, Compute, Computer (3) Derivation, Mathematical x Technique, Determination |
| COMPUTER | (2) Computation, Computational, Compute |
| CONCENTRATED | (2) Concentration |
| CONDITION | (1) State (3) Problem, Concept |
| CONDUCTION | (2) Conducting, Conductive, Conductivity, Conductor (3) Heat x Flow |
| CONDUCTIVITY | (2) Conducting, Conduction, Conductive, Conductor |
| CONE | (2) Coned, Conical, Conically (3) Conical x Body |
| CONFIGURATION | (3) Arrangement, System, Shape, Contour, Spatial x Distribution |
| CONICAL | (2) Cone, Coned, Conically (3) Quasi-Conical, Cone x Shaped |
| CONSTRUCTION | (3) Surface, Structure, Body |
| CONTAMINATION | (3) Foreign x Gas x Injection |
| CONTINUOUS | (2) Continuation, Continuity, Continuously, Continuum (3) Steady, Quasi-Steady |
| CONTINUOUSLY | (2) Continuation, Continuity, Continuous, Continuum (3) Constant, Steady, Continuous |
| CONTINUUM | (2) Continuation, Continuity, Continuous, Continuously (3) Steady x State |
| CONTOUR | (2) Contoured (3) Configuration, Profile, Geometry, Form, Shape |
| CONTRACTION | (2) Contracting (3) Reduction |
| CONTROL | (2) Controlled, Controlling (3) Guidance, Reduction, Limitation, Decreasing, Reduced, Decrement, Fall, Limiting, Minimisation, Minimising |
| CONVECTION | (2) Convected, Convecting, Convective |
| CONVECTIVE | (2) Convected, Convecting, Convection (3) Convection, Non-Radiating |
| CONVERGENT | (2) Convergence, Converging |
| COOLED | (2) Cool, Coolant, Cooler, Cooling (3) Insulated |
| COOLING | (2) Cool, Coolant, Cooled, Cooler (3) Insulation, Heat x Protection, Heat x Dissipation |
| COORDINATE | |
| CORE | (3) Kernal, Centre, Middle |
| CORNER | (2) Cornered |
| CORRECTION | (2) Corrective, Corrector (3) Modified, Revised, Evaluation, Assessment, Analysis |
| CORRELATION | (1) Relation, Relationship (2) Correlated, Correlator, Correlogram (3) Similarity, Similitude, Analogy, Analogue, Coupling. |
| CORRESPONDING | (3) Similar |
| CORRIDOR | (1) Passage (3) Path |
| CORRUGATED | (2) Corrugation |
| COUETTE | |
| COUPLED | (2) Couple, Coupling |
| CREEP | (2) Creeping (3) Plastic x Flow |
| CRITERION | (3) Parameter, Value, Factor, Requirement, Principle |
| CRITICAL | (3) Maximum |
| CROCCO | |
| CROSS | (2) Crossed, Crossing |
| CRUCIFORM | (3) Crossing, Crossed, Intersecting, Cross |
| CURRENT | |
| CURVATURE | (2) Curve, Curved (3) Arc, Subarc, Curve, Curved |
| CURVED | (2) Curvature, Curve (3) Arc, Round |
| CYLINDER | (2) Cylindrical (3) Drum, Cylindrical x Body, Cylindrical x Shell |
| CYLINDRICAL | (2) Cylinder (3) Tubular, Quasi-Cylindrical, Quasi-Cylinder |
| DAMAGE | |
| DAMPING | (2) Damped (3) Reduction, Decrease, Decreasing, Decrement, Reduced |
| DATA | (3) Result, Output, Statistics, Valve |
| DECELERATION | (2) Decelerating, (3) Decelerating, Braking, Speed x Reduction, Motion x Arrest |
| DEFLECTION | (1) Displacement (2) Deflect, Deflected, Deflecting (3) Deviation |
| DEFORMATION | (1) Strain (2) Deformable, Deformed, Deforming (3) Failure |
| DEGREE | |
| DELTA | (1) Triangular (3) Isosceles, Caret |
| DENSITY | (2) Dense |
| DERIVATION | (2) Derivative (3) Transformation |
| DERIVATIVE | (2) Derivation |
| DESIGN | |
| DETACHMENT | (2) Detached (3) Separation |

| | |
|---|---|
| DETECTION | (1) Finding (3) Determination, Deduction, Prediction, Observation, Investigation |
| DETERMINATION | (3) Estimation, Prediction, Finding |
| DEVELOPMENT | (2) Developable, Developed (3) Formation, Generation, Production, Growth |
| DEVIATION | (3) Variation, Fluctuation, Change, Deflection |
| DIAMETER | |
| DIFFERENCE | (1) Differential (2) Different, Differential, Differentially (3) Differing |
| DIFFERENT | (2) Difference, Differential, Differentially, Differing (3) Variable, Variation, Varying, Alteration, Change, Deviation |
| DIFFERENTIAL | (1) Difference (2) Difference, Different, Differentially (3) Differing |
| DIFFUSION | (2) Diffuse, Diffuser, Diffusivity (3) Joining, Merging, Merger, Merged, Exchange, Impinging, Impingement |
| DIGITAL | |
| DIMENSION | (2) Dimensional, Dimensionless |
| DIRECTION | (2) Direct, Directed, Directional (3) Inclination |
| DISCONTINUITY | (2) Discontinuous (3) Irregularity |
| DISPLACEMENT | (1) Deflection (2) Displaced |
| DISSOCIATED | (2) Dissociating, Dissociation |
| DISSOCIATION | (2) Dissociated, Dissociating (3) Breakdown, Decomposition |
| DISTANCE | (2) Distant |
| DISTRIBUTED | (1) Spread (2) Distribution |
| DISTRIBUTION | (2) Distributed (3) Field, Gradient, Differential, Fluctuation, Variation, Divergence, Profile, Slope, Load x Input |
| DISTURBANCE | (1) Perturbation (2) Disturbed, Disturbing (3) Instability, Unsteadiness, Nonequilibrium, Alteration, Change, Interference |
| DIVERGENCE | (2) Divergent, Diverging (3) Expansion |
| DOME | (1) Hemisphere |
| DOUBLE | |
| DOWNSTREAM | (3 Behind |
| DRAG | (3) Resistance |
| DRIVEN | (2) Drive, Driver, Driving (3) Forced |
| DUCT | (1) Channel (2) Ducted, Ducting (3) Passage, Ducting |
| DURATION | (2) During (3) Period, Time |
| DURING | (2) Duration |
| DYNAMIC | (2) Dynamically |
| EARTH | |
| EDGE | (2) Edged, Edgewise (3) Lip, Surface, End, Boundary |
| EFFECT | (2) Effective, Effectiveness (3) Influence, Phenomena, Action |
| ELASTIC | (1) Flexible (2) Elastically, Elasticity |
| ELASTICALLY | (1) Flexibly (2) Elastic, Elasticity |
| ELECTRON | (2) Electronic |
| ELECTRONIC | (2) Electron |
| ELEMENT | |
| ELLIPTIC | (1) Oval (2) Elliptical, Ellipticity |
| EMPIRICAL | (3) Experimental, Semi-Empirical, Measured |
| END | (2) Ended (3) Tip, Edge, Boundary |
| END PLATE | |
| ENDURANCE | (3) Strength, Load x Carrying x Capacity, Fatigue x Resistance |
| ENERGY | |
| ENGINE | (1) Motor (3) Power x Plant, Propulsion x System, Power Plant |
| ENSKOG | |
| ENTHALPY | (3) Heat x Content |
| ENTRANCE | (1) Inlet (2) Entering, Entry (3) Orifice, Intake |
| ENTRY | (2) Entering, Entrance (3) Re-entry, Re-entering, Entering, Entrance |
| ENVIRONMENT | (2) Environmental (3) Surrounding, Condition |
| EQUATION | (3) Expression, Operator |
| EQUILIBRIUM | (2) Equilibration, (3) Stability, Quasi-Equilibrium |
| ESTIMATE | (2) Estimation (3) Prediction, Assessment |
| ESTIMATION | (2) Estimate (3) Prediction, Assessment |
| EXACT | (3) Accurate |
| EXCITATION | (2) Excited, Exciting (3) Exciting, Generation, Production |
| EXCITED | (2) Excitation, Exciting (3) Generated |
| EXHAUST | (1) Discharge, Efflux, Emission (2) Exhausting (3) Outflow, Issuing, Leaving, Plume, Exhausting |
| EXIT | (1) Outlet (2) Exiting |
| EXPANSION | (2) Expanded, Expanding |
| EXPERIMENT | (2) Experimental (3) Measuring, Measurement, Test, Investigation, Testing |

EXPERIMENTAL (2) Experiment (3) Empirical, Semi-empirical, Measured
EXPONENT (2) Exponential
EXPONENTIAL (2) Exponent
EXPOSED (3) Bare, Open, Loaded, Subjected
EXPRESSION (2) Expressible (3) Equation, Operator
EXTERNAL (1) Outer (2) Externally (3) Outboard, Peripheral
FACE (2) Faced, Facing (3) Surface
FACING (1) Opposite (2) Face, Faced
FACTOR (3) Constant, Variable, Criterion, Value, Function, Parameter
FAILING (2) Failure (3) Defect
FAILURE (2) Failing (3) Instability
FAST (1) Quick, Rapid
FATIGUE
FIELD (1) Region (3) Area, Domain, Regime
FIN (2) Finned (3) Stabilizer
FINDING (1) Detection (3) Estimation, Determination, Prediction
FINITE
FLAP (2) Flapping
FLAT (2) Flattening (3) Plane, Planar
FLEXIBILITY (1) Elasticity (2) Flexible, Flexibly, Flexural, Flexure
FLEXIBLE (1) Elastic (2) Flexibility, Flexibly, Flexural, Flexure (3) Flexural
FLIGHT (2) Flying (3) Flying, Fall, Falling
FLOW (1) Flux, Stream (2) Flowing (3) Motion, Lovement, Moving, Flowing
FLUID (2) Fluidized
FLUTTER (2) Fluttering
FLUX (1) Flow, Stream (3) Transfer
FLYING (2) Flight (3) Flight, Fall, Falling
FORCE (2) Forced, Forcible, Forcing (3) Load, Stress, Pressure, Loading
FORCED (2) Force, Forcible, Forcing
FOREBODY (1) Forepart, Foreplane (3) Nose, Cap, Bow, Head, Front, Leading x Edge
FORM (2) Formation, Formed (3) Shape
FORMULA (2) Formulation (3) Solution, Theory, Principle
FORWARD (3) Leading, Ahead
FREE (1) Independent, Uncoupled (2) Freedom, Freely (3) Without, Negative, Negatively, Ideal, Independence
FREEDOM (1) Independence (2) Free, Freely
FREON
FREQUENCY
FRICTION (2) Frictional (3) Resistance
FUNCTION
GAS (2) Gaseous
GASEOUS (2) Gas
GAUGE (1) Meter (3) Measurement
GENERAL (2) Generalized
GENERATED (1) Formed (2) Generating, Generation, Generator (3) Excited
GENERATORS (2) Generated, Generating, Generation
GEOMETRY (2) Geometric, Geometrical, Geometrically (3) Shape, Profile, Contour, Geometrical, Form, Proportion, Configuration
GIVEN (1) Assumed (3) Prescribed, Imposed
GRADIENT (1) Slope (2) Graded (3) Load, Input, Distribution, Field, Differential, Fluctuation, Exchange, Variation, Divergence, Profile
GRAPHICAL (3) Diagram
GROUND (3) Surface
GROWTH (3) Spread, Increase, Increased, Increasing, Increment, Rise, Jump, Amplification, Spreading,Expansion
GUIDANCE (2) Guide, Guided (3) Control
GUST (3) Air x Current, Air x Blast
HEAT (2) Heated, Heating, Heater, Hot (3) Thermal
HEATED (1) Hot (2) Heat, Heating, Heater, Hot (3) High x Temperature, Elevated x Temperature
HEATING (2) Heat, Heated, Heater, Hot (3) Heat x Input, Heat x Addition, Temperature x Rise
HEIGHT (2) High, Higher, Highly (3) Altitude
HELIUM
HEMISPHERE (1) Dome (2) Hemispheric, Hemispherical, Hemispherically
HIGH (2) Higher, Highly, Height (3) Large

| | |
|---|---|
| HIGHLY | (2) High, Higher, Height (3) Fully, Entirely |
| HOMOGENOUS | |
| HOT | (1) Heated, (2) Heat, Heated, Heating, Heater (3) High x Temperature, Elevated x Temperature |
| HYDROSTATIC | (3) Stagnant, Stationary x Fluid, Static x Fluid, Dead x Air, Still x Air |
| HYPERSONIC | (3) Hypervelocity |
| HYPERVELOCITY | (3) Hypersonic x Flight, Hypersonic x Flow, Hypersonic x Speed, Ultra-High x Mach |
| IMPERFECTION | (1) Defect (2) Imperfect |
| INCIDENCE | (2) Incident (3) Attack |
| INCOMPRESSIBLE | (3) Subsonic, Subcritical |
| INCREASE | (2) Increased, Increasing (3) Increased, Increasing, Increment, Rise, Spread, Spreading, Growth, Jump, Amplification, Expansion |
| INCREMENTAL | (1) Additional (2) Increment (3) Increasing |
| INDUCED | (2) Inductance, Induction (3) Generated, Caused |
| INELASTIC | (1) Rigid, Unelastic |
| INFINITE | (2) Infinitely, Infinitesimal, Infinitesimally (3) Unbounded |
| INFLUENCE | (2) Effect, Phenomena, Action |
| INITIAL | (1) First (2) Initialed, Initially, Initiation (3) Starting |
| INJECTION | (2) Injectant, Injected, Injector (3) Addition |
| INNER | (1) Internal (3) Interior |
| INPUT | |
| INSTABILITY | (3) Failure |
| INSTANTANEOUS | (3) Sudden |
| INSTRUMENT | (2) Instrumentation (3) Device, Machine, Mechanism, Equipment, Apparatus |
| INSULATED | (1) Adiabatic, Nonconductive (2) Insulating, Insulation (3) Unheated, Recovery x Temperature x Distribution, Zero x Heat x Transfer |
| INTEGRAL | (2) Integrated, Integrating, Integration, Integrative |
| INTEGRATION | (2) Integral, Integrated, Integrating, Integrative, (3) Integral x Method |
| INTENSITY | (2) Intense (3) Strength, Level, Volume |
| INTERACTION | (2) Interacting (3) Interference, Interferential, Disturbance, Perturbation |
| INTERBLADE | |
| INTERFERENCE | (2) Interferential (3) Interaction, Interacting, Disturbance |
| INTERNAL | (1) Inner (2) Internally, (3) Interior |
| INTERVAL | (3) Gap |
| INVERSION | (2) Inverse, Inverted |
| INVESTIGATION | (1) Research, Study |
| INVISCID | (1) Non-viscous (3) Viscosity x Zero |
| IONIZED | (1) Charged (2) Ion, Ionization, Ionosphere |
| IRROTATIONAL | (1) Non-rotating (3) Potential |
| ISENTROPIC | (3) Constant x Entropy |
| ISOTHERMAL | (3) Constant x Temperature |
| ISOTROPIC | |
| ISSUING | (1) Exhausting, Leaving (3) Discharge, Emission, Efflux, Outflow |
| ITERATION | (2) Iterative (3) Iterative x Process, Finite x Difference x Method, Finite x Difference x Procedure, Finite x Difference x Solution |
| ITERATIVE | (1) Step-by-step (2) Iteration (3) Finite x Difference |
| JET | (3) Stream |
| JOULE | |
| JUNCTION | (3) Joint, Intersection |
| KELVIN | |
| KINETIC | (3) Dynamic, Motion |
| KINK | (2) Kinking (3) Deviation, Disturbance, Perturbation, Displacement, Deflection, Divergence |
| LABORATORY | |
| LAMINAR | (2) Laminarization (3) Smooth |
| LANGLEY | |
| LARGE | (3) High, Extensive, Large x Order, Large x Size |
| LAUNCH | (2) Launched (3) Takeoff, Propelled |
| LAW | (1) Rule, Principle (3) Hypothesis, Assumption |
| LAYER | (2) Layered (3) Flow, Stream, Region, Regime |
| LEADING | (2) Lead (3) Front |
| LEES | |
| LENGTH | (2) Lengthwise, Long (3) Span, Extent |
| LIFT | (2) Lifting |
| LIGHTWEIGHT | (1) Light |
| LINE | (2) Linear, Linearization, Linearized, Linearly, Liners (3) Point, Limit, Boundary |
| LIFTING | (2) Lift (3) Inclined |

| | |
|---|---|
| LINEAR | (1) One-Dimensional (2) Line, Linearization, Linearized, Linearly |
| LINEARIZED | (2) Line, Linear, Linearization, Linearly, Liners (3) One-Dimensional, Quasi-One-Dimensional |
| LIQUID | (2) Liquefaction (3) Fluid |
| LOAD | (1) Loading, Stress (2) Loaded (3) Airload, Force, Pressure |
| LOADED | (2) Load, Loading (3) Exposed, Subjected, Supporting, Carrying |
| LOADING | (1) Load, Stress (2) Loaded, Load (3) Airload, Force, Pressure |
| LOCAL | (2) Locally, Located, Location (3) Ambient, Surrounding, Area, Proximity, Vicinity |
| LOCATED | (2) Local, Locally, Location (3) Location, Position |
| LOCATION | (1) Position, Point, Station (2) Local, Locally, Located |
| LONG | (2) Length, Lengthwise (3) Elongated, Extended |
| LONGITUDINAL | (1) Lengthwise, Spanwise (2) Longitudinally |
| LOSS | (2) Losing (3) Transfer, Emission, Removal |
| LOW | (1) Reduced, Small (2) Lower, Lowest |
| LOWER | (2) Low, Lowest (3) Base, Bottom, Under |
| LUNAR | |
| LYAPUNOV | |
| MACH | |
| MACHINE | (3) Vehicle |
| MAGNETIC | |
| MAGNETOGASDYNAMIC | (1) Magnetoaerodynamic, Electrogasdynamic, (3) Magnetohydrodynamic, Magnetofluidmechanic, Hydromagnetic, Conducting x Magnetic x Fluid, Conducting x Magnetic x Flow |
| MAGNETOHYDRODYNAMIC | (1) Hydromagnetic, Magnetofluidmechanic (3) Magnetogasdynamic, Magnetoaerodynamic, Electrogasdynamic, Conducting x Magnetic, x Fluid, Conducting x Magnetic x Flow |
| MAGNITUDE | (1) Size (3) Amount, Quantity, Total Dimension |
| MAIN | (1) Major, Primary (3) First |
| MAINTENANCE | |
| MASS | (3) Inertia, Weight |
| MATCHING | (3) Integrating, Integration, Correlation |
| MATERIAL | (3) Medium |
| MATHEMATICAL | (3) Computational, Algebraic |
| MATRIX | (2) Matric |
| MAXIMUM | (2) Maxima (3) Complete, Extreme, Peak, Total |
| MAXWELL | (2) Maxwellian |
| MEASURED | (2) Measurement, Measuring (3) Measurement, Experiment, Experimental, Determination, Exact, Test, Testing |
| MEASURING | (2) Measured, Measurement (3) Measurement, Determination, Experiment, Test, Testing |
| MEASUREMENT | (2) Measured, Measuring (3) Measuring, Determination, Experiment, Test, Testing |
| MECHANICAL | (2) Mechanics, Mechanism |
| MECHANISM | (2) Mechanical, Mechanics (3) Action, Characteristic, Nature, Problem, Structure |
| MEDIUM | (3) Environment, Surrounding, Region, Atmosphere, Material |
| MEMBRANE | (3) Skin, Surface, Shell |
| MERGED | (1) Combined (2) Merger, Merging (3) Mixed, Integrated, Interacting |
| MERIDIONAL | (2) Meridian (3) Central, Centre, Centred, Midplane, Median, Axis, Bisector, Midpoint |
| METHANE | |
| METHOD | (1) Technique (3) Procedure, Treatment |
| MINIMISATION | (2) Minimizing, Minimum (3) Minimizing,Reduction, Limitation, Limiting, Removal |
| MISSILE | (1) Projectile (3) Rocket, Warhead |
| MIXING | (2) Mixed, Mixture (3) Diffusion, Joining, Merged, Merging, Merger, Exchange, Impinging, Impingement |
| MIXTURE | (2) Mixed, Mixing |
| MODE | (2) Modal (3) Type, Form, Shape, Method |
| MODEL | (3) Specimen, Idealized x Structure, Experiment, Test, Analysis, Theory, Hypothesis, Solution |
| MODERATE | (3) Low, Small, Reduced |
| MOLECULAR | (2) Mol, Molecule |
| MOMENT | (2) Momentary, Momentum (3) Aerodynamic x Influence x Coefficient |
| MOTION | (3) Moving, Movement, Travelling, Reaction, Reacting, Non-stationary |
| MOUNTED | (1) Supported (2) Mounting, (3) Support, Suspension, Supporting, Resting, Mounting |

| | |
|---|---|
| MOVING | (1) Non-Stationary, Travelling (2) Movable, Movement |
| MULTI | (1) Multiple |
| MULTISTAGE | (3) Multi, Multiple |
| NATURAL | (2) Nature (3) Self x Induced |
| NATURE | (2) Natural (3) Property, Characteristic, Quality |
| NAVIER | |
| NEARLY | (2) Near, Nearest (3) Near, Quasi, Semi |
| NEUTRAL | |
| NEWTONIAN | (2) Newton |
| NITROGEN | |
| NOISE | (3) Pressure x Fluctuation, Random x Pressure x Load, Acoustic x Disturbance |
| NON-CIRCULAR | (2) Non-Circulatory |
| NON-EQUILIBRIUM | (3) Frozen, Freezing, Instability, Unsteadiness |
| NON-LINEAR | (2) Non-Linearity |
| NON-STEADY | (1) Unsteady (3) Quasi-Unsteady, Variable, Varying, Fluctuating, Fluctuation, Variation, Discontinuous, Unsteadiness, Unsteadily, Time x Dependent, Alternating, Sinsusoidal |
| NON-UNIFORM | (1) Varying (2) Non-Uniformity, Non-Uniformly (3) Non-Linear, Variable, Differential |
| NON-VISCOUS | (1) Inviscid (3) Viscosity x Zero |
| NON-ZERO | (3) Non-Negative, Positive |
| NOSE | (2) Nosed (3) Cap, Head, Front, Forebody, Bow, Forepart, Foreplane, Leading x Edge |
| NOSED | (1) Headed, Capped (2) Nose |
| NOZZLE | (3) Duct, Tube, Pipe, Venturi, Orifice, Wind x Tunnel x Contraction |
| NORMAL | (2) Normally (3) Vertical, Perpendicular, Average, Mean |
| NUMERICAL | (2) Number |
| OFF | |
| OGEE | (2) Ogival, Ogive |
| OGIVE | (2) Ogee, Ogival (3) Gothic |
| ONE-DIMENSIONAL | (1) Linear (3) Linearized, Quasi-Onedimensional |
| ONSET | (3) Beginning, Appearance, Start |
| OPERATING | (2) Operation, Operational, Operator (3) Operation, Performance |
| OPTICAL | (3) Visual |
| OPTIMUM | (2) Optimal, Optimization (3) Ideal, Perfect, Appropriate |
| ORBIT | (1) Trajectory, Path (2) Orbital, Orbiting |
| ORDER | (2) Ordered |
| ORTHOTROPIC | |
| OSCILLATING | (1) Vibrating (2) Oscillation, Oscillator, Oscillatory (3) Vibrational, Oscillatory |
| OSCILLATION | (1) Vibration (2) Oscillating, Oscillator, Oscillatory |
| OSCILLATORY | (1) Vibratory (2) Oscillating, Oscillation, Oscillator, (3) Wavy, Sinsusoidal, |
| OUTER | (1) External (2) Outermost (3) Outboard, Peripheral, Outlet, Output, Outward |
| OUTSIDE | (3) External, Peripheral |
| OVAL | (1) Elliptic |
| PANEL | (3) Plate |
| PARAMETER | (3) Constant, Variable, Criterion, Value, Factor, Function |
| PART | (2) Partial, Partially, Partly (3) Component, Element |
| PARTIALLY | (1) Partly (2) Partial, Part (3) Part, Semi |
| PARTICLE | |
| PERFECT | (2) Perfectly (3) Simple, Ideal, Idealized, Simplified, Approximate, Model, Hypothetical, Pure |
| PERFORMANCE | (3) Operation, Operating |
| PERIODIC | (2) Period, Periodically, Periodicity |
| PERIPHERAL | (1) Circumferential |
| PHASE | (3) State |
| PHENOMENA | (2) Phenomenological (3) Effect, Characteristic |
| PHOTOELASTIC | |
| PITCH | (2) Pitching |
| PITOT | |
| PLANE | (2) Planar (3) Direction, Axis |
| PLANFORM | (3) Shape |
| PLASTIC | (2) Plasticity (3) Soft |
| PLATE | (2) Plating (3) Panel |
| POINT | (1) Location, Position, Station (2) Pointed, (3) Area |
| POLAR | (3) Curve |

| | |
|---|---|
| POSITION | (1) Location, Point, Station (2) Positioning |
| POTENTIAL | (3 Irrotational, Non-Rotating |
| PRACTICAL | (3) Real, Working, Imperfect, Non-Perfect |
| PREBUCKLING | (2) Prebuckled |
| PREDICTION | (3) Estimate, Estimation, Assessment, Determination, Calculation, Deduction |
| PRESENCE | (3) Ambient, Environment, Environmental, Surrounding, Proximity, Vicinity |
| PRESSURE | (2) Pressurisation, Pressurized (3) Load, Stress, Force, Loading |
| PRESSURIZED | (2) Pressure, Pressurization |
| PRIMARY | (1) Main, Major |
| PRINCIPLE | (1) Law, Rule (3) Theory, Theoretical, Hypothesis, Prediction, Assumption |
| PROBLEM | (3) Concept, Condition |
| PROCEDURE | (3) Method, Technique, Treatment |
| PRODUCT | (2) Production (3) Result |
| PRODUCTION | (1) Generation (2) Product (3) Propagation |
| PROFILE | (3) Distribution, Field, Gradient, Differential, Fluctuation, Variation, Divergence, Slope, Load x Input |
| PROGRAMME | (2) Programmed, Programming (3) Algorithm |
| PROPAGATION | (2) Propagating (3) Generation, Production, Originating, Source, Development, Spread, Radiation, Emission, Excitation |
| PROPELLER | (2) Propellant, Propelled |
| PROPERTY | (1) Characteristic (3) Quality, Nature |
| PROXIMITY | (3) Near, Close, Adjacent |
| PUMP | (3) Blower, Compressor |
| PURE | (3) Simple, Simplified, Ideal, Idealized, Approximate, Perfect, Model, Hypothetical |
| QUANTITATIVE | (2) Quantity |
| QUASI-CONICAL | |
| RADIUS | (2) Radial, Radially |
| RANGE | (3) Distance |
| RAREFACTION | (2) Rarefied (3) Free x Molecular x Flow, Rarefied x Fas x Flow, Semi-Rarefied x Gas x Flow, High x Altitude x Flow, Low x Density x Flow, Wall x Discontinuity x Velocity, Wall x Discontinuity x Temperature |
| RAREFIED | (2) Rarefaction (3) Semi-Rarefied, Free x Molecule, Free x Molecular |
| RATE | (3) Speed, Velocity |
| RATIO | |
| REACTING | (2) Reaction, Reactive, Reactor (3) Reactive, Active, Action, Activation, Activity |
| REACTION | (2) Reacting, Reactive, Reactor (3) Energy, Force, Action, Behaviour, Kinetic, Response |
| REAL | (3) Non-Perfect, Imperfect, True |
| RECTANGULAR | (2) Rectangle |
| REDUCTION | (2) Reduced (3) Reduced, Limitation, Limiting, Decreasing, Decrement, Fall, Control, Minimisation, Minimising |
| RE-ENTRY | (2) Re-entering, Re-Entrant (3) Re-Entering, Entry, Entering, Entrance |
| REFERENCE | (3) Characteristic |
| REFINEMENT | (3) Improvement |
| REFLECTION | (2) Reflected, Reflecting (3) Deflection |
| REGIME | (1) Domain |
| REGION | (1) Field (3) Area, Ambient, Regime, Local, Locally, Environment, Presence, Surrounding |
| REINFORCED | (3) Stiffened |
| RELATION | (1) Relationship, Correlation (2) Relative, Relatively, Relativistic, (3) Coupling |
| RELATIONSHIP | (1) Relation, Correlation (2) Relative, Relatively, Relativistic, Coupling |
| RELAXATION | (2) Relaxational, Relaxing |
| REQUIRED | (2) Requirement |
| RESEARCH | (1) Investigation, Study |
| RESERVOIR | (3) Storage x Vessel |
| RESPONSE | (3) Reaction |
| RESTRAINED | (2) Restraining, Restraint (3) Retarded, Controlled |
| RESTRAINT | (2) Restrained, Restraining (3) Constraint |
| RESULT | (2) Resultant, Resulting (3) Data, Output, Statistics, Value |
| RETURN | (3) Descent, Descending, Deceleration, Approach, Homing |
| REVOLUTION | (1) Rotation |
| REYNOLDS | |
| RING | (3) Annular, Round, Rounded |

RISE (3) Increase, Increment
ROCKET (3) Missile, Projectile
ROLLING (2) Roll, Rolled
ROUGHNESS (2) Rough (3) Irregularity
ROUND (2) Rounded, Rounding, Roundness (3) Rounded, Blunt, Convex, Semi-circular, Circular, Circularity, Curved, Curvature
ROW (3) Series
RUNNING (3) Operation
SANDWICH (1) Multilayer, Laminate, Stratiform, (3) Lamination
SATELLITE
SCALE (2) Scaling (3) Size, Dimension, Area
SECOND (2) Secondary (3) Two
SECTION (2) Sectional, Sector, Sectorial (3) Segment, Plane, Sector
SECTOR (2) Section, Sectional, Sectorial (3) Section, Plane, Segment
SELF
SEMIVERTEX (3) Top, Head, Crest, Apex, Crown, Cap, Semi-Vertex, Vertex
SENSITIVITY (2) Sensor
SEPARATED (2) Separating, Separation (3) Free, Detached
SEPARATION (2) Separated, Separating (3) Detachment
SERIES (3) Row, Line, Bank
SHALLOW (2) Shallowness
SHAPE (2) Shaped (3) Configuration, Profile, Contour, Geometry, Form
SHARP (2) Sharpness (3) Intermediate
SHEAR (2) Sheared, Shearing (3) Shearing, Longitudinal x Velocity x Gradient
SHEARING (2) Shear, Sheared (3) Shear, Longitudinal x Velocity x Gradient
SHEET (3) Layer, Path, Core, Line, Trail, Field, Street
SHELL
SHOCK (2) Shocking (3) Blast
SHORT (2) Shortening
SHROUD (2) Shrouded
SIDE (2) Sided, Sidedness
SIDESLIP (3) Cross x Load
SIMILAR (2) Similarity, Similitude
SIMILARITY (2) Similar, Similitude (3) Similitude, Correlation, Analogy, Analogue
SIMILITUDE (2) Similar, Similarity (3) Similarity, Correlation, Analogue, Analogy
SIMPLE (1) Simplified, Simplification (2) Simply, Simplified (3) Idealised, Approximate, Perfect, Model, Hypothetical, Ideal, Pure
SIMPLIFIED (1) Simple (2) Simplification, Simply, Simple (3) Idealised, Approximate, Perfect, Model, Hypothetical, Ideal, Pure
SIMPLY (2) Simple, Simplification, Simplified
SIMULATION (2) Simulated, Simulating, Simulator (3) Analogy
SINGLE (2) Singly, Singular, Singularity (3) One
SINUSOIDAL (2) Sinsusoidally, Sine
SIZE (1) Magnitude (3) Dimension
SKIN (3) Membrane, Surface, Shell
SLAB
SLENDER (1) Thin (2) Slenderness (3) Narrow
SLIP
SLIPSTREAM (3) Downwash, Wake, Vortex, Trail, Afterflow
SMALL (1) Low, Reduced (3) Infinitesimal, Infinitesimally, Vanishing, Minimum, Slightly, Negligible
SMOOTH (2) Smoothing, Smoothness (3) Polished
SOFT (3) Plastic
SOLID
SOLUTION (3) Result, Equation, Procedure, Expression
SONIC (2) Sound, Sounding (3) Sound x Speed, Sound x Velocity
SOUND (1) Acoustic (2) Sounding, Sonic
SPACECRAFT (1) Spaceship (3) Space x Vehicle
SPAN (2) Spanning, Spanwise (3) Length, Extent
SPANWISE (1) Longitudinal, Lengthwise (2) Span, Spanning, (3) Longitudinally
SPECIES (2) Specific
SPECIFIC (2) Species (3) Exact, Particular
SPEED (1) Velocity (3) Flow, Flight, Stream, Mach
SPHERE (2) Spherical, Spherically, Spheroid (3) Spheroid, Spherical x Body
SPHERICAL (2) Sphere, Spherically, Spheroid
SPLIT (2) Splitter
SQUARE

STABILITY (2) Stabilization, Stabilized, Stabilizer, Stabilizing, Stable (3) Equilibrium, Quasi-Equilibrium

STABILIZATION (2) Stability, Stabilized, Stabilizer, Stabilizing, Stable (3) Stability, Stabilizing, Control, Equilibrium

STABILIZER (2) Stability, Stabilization, Stabilized, Stabilizing, Stable (3) Fin

STABILIZING (2) Stability, Stabilization, Stabilized, Stabilizer, Stable (3) Stability, Stabilization, Control, Equilibrium

STABLE (2) Stability, Stabilization, Stabilized, Stabilizer, Stabilizing (3) Equilibrium, Steady

STAGE (3) Blading, Blade x Row, Blade x Set

STAGNATION (2) Stagnant (3) Stationary x Flow, Zero x Velocity

STALLING (2) Stall, Stalled (3) Flow x Reversal

STANDARD (3) Normal

STANDOFF (3) Detachment

STATE (1) Condition (3) Problem, Concept

STATIC (2) Statically

STATISTICS (2) Statistical (3) Result, Data, Output, Value

STEADY (3) Quasi-Steady, Continuous, Stable, Invariant, Time x Independent

STIFFENED (2) Stiffener, Stiffening, Stiffness (3) Reinforced

STIFFENER (2) Stiffened, Stiffening, Stiffness (3) Stiffening

STIFFNESS (2) Stiffened, Stiffener, Stiffening (3) Rigidity

STING

STOKES

STOL (3) Vtol

STRAIGHT (2) Straightness (3) Rectilinear

STRAIN (1) Deformation

STREAM (1) Flow, Flux

STRENGTH (2) Strong (3) Intensity, Endurance, Load x Carrying x Capacity, Fatigue x Resistance

STRESS (1) Load, Loading (2) Stressed, Stressing (3) Strain, Concentrated x Force

STRONG (2) Strength (3) Intense, Severe

STRUCTURAL (2) Structure

STRUCTURE (2) Structural (3) System, Nature, Construction, State, Body, Surface

STUDY (1) Investigation, Research

SUBJECTED (2) Subject (3) Bare, Open, Loaded, Exposed

SUBSONIC (3) Subcritical, Incompressible

SUCTION

SUDDEN (3) Rapid, Instantaneous, Fast, Quick

SUPERSONIC (2) Supersonically (3) Supercritical, High x Speed

SUPPORTED (1) Mounted (2) Support, Supporting

SURFACE (2) Surfaced (3) Face, Structure, Body

SURGE (3) Instability, Unsteadiness, Pressure x Rise

SUSTAINED (2) Sustaining (3) Supported

SWEPT (2) Sweep (3) Sweptback

SWEPTBACK (2) Sweepback (3) Swept

SYMMETRIC (1) Symmetrical (2) Symmetrical, Symmetrically, Symmetry (3) Regular, Uniform, Steady

SYMMETRICAL (1) Symmetric (2) Symmetrically, Symmetry, (3) Regular x Shape

SYSTEM (2) Systematic

TABLE (3) Chart, Tabulation

TAPERED (1) Pointed (2) Taper

TECHNIQUE (1) Method (3) Process, Operation, Procedure

TEMPERATURE (3) Heat

TEST (2) Testing (3) Experiment, Measurement

THEORETICAL (2) Theory (3) Perfect, Ideal, Model

THEORY (2) Theoretical (3) Theoretical, Hypothesis, Prediction, Assumption, Principle, Law, Rule

THERMAL (1) Thermodynamic (2) Thermally, (3) Heat

THERMOCHEMICAL

THERMODYNAMIC (1) Thermal (3) Heat

THICK (1) Nonslender (2) Thickened, Thickening, Thickness (3) Broad, Not x Slender, Not x Thin

THICKNESS (2) Thick, Thickened, Thickening

THIN (1) Slender (3) Narrow

THREE

THREE-DIMENSIONAL (2) Three-Dimensionality

THROAT (3) Contraction, Contracting x Section, Convergent x Duct

| | |
|---|---|
| THRUST | (3) Boost, Resultant x Jet x Force |
| TILT | (2) Tilting |
| TIME | (2) Timewise (3) Period, Duration |
| TORISPHERICAL | |
| TRAILING | (2) Trail (3) Rear, Aft |
| TRANSFER | (2) Transferred (3) Flow, Flux, Exchange, Transport |
| TRANSFORMATION | (2) Transform, Transformed (3) Transform, Transformed, Conversion |
| TRANSIENT | (3) Discontinuous, Random |
| TRANSITION | (2) Transit, Transitional (3) Change, Breakdown x Laminar x Flow |
| TRANSITIONAL | (2) Transit, Transition (3) Changing, Breakdown x Laminar x Flow |
| TRANSONIC | (3) High x Subsonic |
| TRANSPIRATION | (3) Sweat |
| TRANSPORT | (3) Distribution, Carrying |
| TRANSVERSE | (1) Lateral (2) Transversality, Transversely, (3) Chord,Chordwise |
| TREATMENT | (3) Method, Technique, Procedure |
| TRIANGULAR | (1) Delta (2) Triangle (3) Isosceles, Caret |
| TRUE | (3) Accurate, Exact, Real, Perfect, Accuracy |
| TUBE | (1) Pipe, Tubing (2) Tubular, (3) Head, Probe, Hollow x Cylinder, Hollow x Body, Tubular x Body |
| TUMBLING | (3) Falling, Plunging, Sinking, Diving |
| TUNNEL | (3) Tube |
| TURBULENCE | (2) Turbulent (3) Mixing, Eddy, Velocity x Fluctuation |
| TURBULENT | (2) Turbulence |
| TWO-DIMENSIONAL | (2) Two-Dimension (3) Two-Dimension |
| UNDEREXPANDED | (2) Underexpansion (3) Expanded |
| UNIFORM | (2) Uniformity, Uniformly (3) Regular |
| UNIFORMLY | (2) Uniform, Uniformity |
| UNSTEADY | (1) Non-Steady (2) Unsteadily, Unsteadiness, (3) Alternating, Sinusoidal, Time x Dependent, Quasi-Unsteady, Variable, Varying, Fluctuating, Fluctuation, Variation, Discontinuous, Unsteadily, Unsteadiness |
| UNSTIFFENED | (3) Flexible, Elastic, Stiffener x Zero, Stiffness x Zero |
| UPWASH | (1) Upflow (3) Upload |
| USE | (3) Value, Applicability, Application |
| VALUE | (2) Valued (3) Data, Output, Result, Statistics |
| VARIABLE | (2) Variation, Variational, Varying (3) Variation, Varying, Different, Alteration, Change, Deviation |
| VARIATION | (2) Variable, Variational, Varying (3) Variable, Varying, Different, Differing, Change, Changing, Alteration, Fluctuation, Fluctuating, Deviation |
| VARIATIONAL | (2) Variable, Variation, Varying |
| VARYING | (1) Non-Uniform (2) Variable, Variation, Variational |
| VECTOR | (3) Direction |
| VEHICLE | (3) Machine, Ship |
| VELOCITY | (1) Speed (3) Flow, Flight, Stream, Mach |
| VERTICAL | (2) Vertex (3) Perpendicular, Normal |
| VERY | (3) Highly |
| VESSEL | |
| VIBRATION | (1) Oscillation (2) Vibrating, Vibrational, Vibrationally, Vibratory |
| VIBRATIONAL | (2) Vibrating, Vibration, Vibrationally, Vibratory (3) Vibrating, Oscillating, Oscillatory |
| VISCOELASTIC | (2 Viscoelasticity |
| VISCOSITY | (2) Viscous, Viscid (3) Internal x Friction |
| VISCOUS | (1) Viscid (2) Viscosity |
| VISUALISATION | (2) Visual (3) Flow x Survey, Visual x Flow x Investigation |
| VORTEX | (1) Eddy (2) Vortical, Vorticity (3) Swirl, Spiral, Spiralling x Fluid, Vorticity x Layer, Rotational x Flow, Rotational x Fluid |
| VORTICITY | (2) Vortex, Vortical (3) Rotation, Spiral, Swirl |
| VTOL | (3) Stol |
| WAKE | (1) Afterflow, (3) Trail |
| WALL | (2) Walled (3) Boundary, Bound, Limit |
| WALLED | (2) Wall (3) Bounded, Enclosed |
| WATER | |
| WAVE | (2) Waviness, Wavy |
| WEDGE | (3) Triangular, Ramp |
| WEIGHT | (2) Weighting |
| WIDTH | (2) Wide, Widely (3) Thickness |

| | |
|---|---|
| WIND | (2) Windward |
| WING | (2) Winged |
| WITHOUT | (3) Absence |
| YAW | (2) Yawed, Yawing |
| YAWED | (2) Yaw, Yawing |
| YIELD | (2) Yielding |
| ZERO | (3) Negative, Negligible, Without, Absence |

# APPENDIX 5.3

## SINGLE TERM HIERARCHIES

The schedules list single terms only, and include all the terms used in indexing the 1,400 documents, with the exception of the proper names.
The single terms are in natural uncontrolled language, and different verbal forms of a word often appear in different places.
Notation is purely ordinal and in no way reflects the relations between the terms represented.
Plus signs indicate synonyms.
Superordinate, subordinate and coordinate relations are shown by indentation.
These hierarchies represent an attempt to interpret hierarchical linkage as an obligatory recall device, that is, an original vocabulary is reduced by condensing species into containing genera, and no option is left in searching. Three stages of reduction are shown in the columns on the right of each page.
Further information on these hierarchies is given on pages 69-73

Summary of main sections

A1 Particles
A15 Materials; fuels, metals, non-metals, aggregates.
B68 State and form of matter
C1 Astronomical and geophysical phenomena
C30 Constructs and structures
C32 Vehicle: aircraft, missiles
D2 Parts: aerofoils, control surfaces.
D40 Structural systems, parts and elements
E1 By shape: bodies
E56 Machines, engines, auxiliary systems
F1 Machine components
F80 Apparatus, equipment: wind tunnels, instruments
H1 Spatial relations; portion, position, direction, shape, dimension, arrangement
N1 Temporal relations: duration, periodicity, rate.
N40 Flying operations, processes, properties.
Oa Aerodynamics
O1 Flow; types, by speed etc.
O64 Flow elements and phenomena, streamlines, vortices, jets, waves.
Q100 Flow attributes: viscosity, forces, loads, stagnation, wake.
P30 Aeroelasticity
P42 Aerodynamic reference parameters; attitude, planform, section etc.
P70 Mechanics
P84 Kinematics
Q32 Force
R1 Behaviour of deformable bodies
R91 Vibration, wave phenomena
S23 Thermodynamic behaviour and properties
S77 Physical-chemical processes
T14 General processes, activities, operations, change (of composition, state, location, direction, dimension, etc.)
U59 Technical operations and processes
U85 Research
V1 Experiment
V30 Mathematical operations
Wa Common properties
X30 Properties of processes (e.g. incipient, continuous, erratic)
X108 General relations
Y40 Abstract concepts, form.

| | | First Reduction | Second Reduction | Third Reduction |
|---|---|---|---|---|
| A1 | Particles | 1 | 1/8a | 1/8a |
| A3 | Electron + Beta | 3/4 | | |
| A4 | Proton | | | |
| A5 | Atom | 5/6 | | |
| A6 | Isotope | | | |
| A7 | Ion | 7 | | |
| A8 | Molecule | 8/8a | | |
| A8a | Mol | | | |
| | (Structure) | | | |
| A8b | Atomic | 8b/14 | 8b/14 | 8b/14 |
| A8c | Molecular | | | |
| A8d | Bimolecular | | | |
| A9 | Homonuclear | | | |
| A9a | Nuclear | | | |
| A10 | Monatomic | | | |
| A11 | Diatomic | | | |
| A12 | Polyatomic | | | |
| A13 | Polymer | | | |
| A14 | Polycrystalline | | | |
| A15 | Matter + Material | 15 | 15 | 15/19a |
| | (By use) | | | |
| A16 | Pigment | 16 | 16 + 19 | + 27/35 |
| A17 | Lacquer | 17/18 | 17/18 | |
| A18 | Phosphorescent | | | |
| A19 | Ink | 19 | | |
| A19a | Injectant | 19a | 19a | |
| A20 | Fuel | 20/24 | 20/24 | 20/26 |
| A21 | Methane | | | |
| A22 | Ethylene | | | |
| A23 | Hydrocarbon | | | |
| A24 | Methanol | | | |
| A26 | Propellant | 26 | 26 | |
| A27 | Explosive | 27/28 | 27/28 | |
| A28 | TNT | | | |
| A30 | Coolant | 30 | 30 | |
| A31 | Lubricant | 31 | 31 | |
| A32 | Refractory | 32 | 32 | |
| A32a | Oxidizer | 32a | 32a | |
| | (By origin) | | | |
| A34 | Electrodeposit | 34/35 | 34/35 | |
| A35 | Electroformed | | | |
| | (By constitution) | 38/39a | 38/39a | 38/56 |
| A38 | Metal | | +48/56 | +66/68 |
| A39 | Alloy | | | |
| A39a | Bimetallic | | | |
| A40 | Aluminium | 40/43 | 40/43 | |
| A41 | Duralumin | | | |
| A42 | Alcoa | | | |
| A43 | Alclad | | | |
| A44 | Nickel | 44/47 | 44/47 | |
| A45 | Inconel | | | |
| A46 | Nimonic | | | |
| A47 | Rex | | | |
| A48 | Brass | 48 | | |
| A49 | Copper | 49 | | |
| A50 | Zinc | 50 | | |
| A51 | Titanium | 51 | | |
| A52 | Lead | 52 | | |
| A53 | Magnesium | 53 | | |
| A54 | Molybdenum | 54 | | |
| A55 | Tungsten | 55 | | |
| A56 | Chromium | 56 | | |
| A57 | Ferrous | 57 | 57/65 | 57/65 |
| A58 | Iron | 58 | | |
| A58a | Gamma | 58a | | |
| A59 | Steel | 59/65 | | |
| A60 | Mild | | | |
| A61 | Decarburized | | | |
| A61a | Columbium | | | |
| A62 | Sicromo 2 | | | |
| A63 | Timken | | | |
| A64 | Stainless | | | |
| A65 | SAE | | | |
| A66 | Mercury | 66 | 66/68 | |
| A67 | Potassium | 67 | | |
| A68 | Sodium | 68 | | |

| | | First Reduction | Second Reduction | Third Reduction |
|---|---|---|---|---|
| | [Metal] | | | |
| | [Sodium] | | | |
| | (Non-metal) | | | |
| A70 | Carbon | 70 | 70/71 | 70/75 |
| A71 | Graphite | 71 | | |
| A72 | Silica | 72/75 | 72/75 | |
| A73 | Fused | | | |
| A74 | Quartz | | | |
| A75 | Foamed | | | |
| | (Gas) | | | |
| A76 | Hydrogen | 76 | 76 + 81/84 | 76/87 |
| A77 | Helium | 77/80 | + 87 | |
| A78 | Argon | | 77/80 | |
| A79 | Krypton | | | |
| A80 | Xenon | | | |
| A81 | Iodine | 81 | | |
| A82 | Nitrogen | 82/84 | | |
| A83 | Nitric (oxide) | | | |
| A84 | Nitrons (oxide) | | | |
| A85 | Oxygen | 85 | 85 | |
| A86 | Freon | 86 | 86 | |
| | (Natural materials) | | | |
| B1 | Wood | 1/5 | 1/5 | 1/6b |
| B2 | Balsa | | | |
| B3 | Plywood | | | |
| B4 | Spruce | | | |
| B5 | Pine | | | |
| B6 | Oil | 6 | 6/6b | |
| B6a | Rubber | 6a | | |
| B6b | Paper | 6b | | |
| B8 | Glycerine | 8 | 8/9 | 8/23 |
| B9 | Hexachlorethane | 9 | | |
| B9a | Inorganic (compounds) | 9a | 9a + 18/23 | |
| B10 | Water | 10 | 10/11 | |
| B11 | Steam | 11 | | |
| B12 | Air | 12/13 | 12/13 | |
| B13 | Seeded | | | |
| B14 | Salt | 14/17 | 14/17 | |
| B14a | Carbonate | | | |
| B15 | Chloride | | | |
| B16 | Iodide | | | |
| B17 | Tetrachloride | | | |
| B18 | Amonium | 18 | | |
| B19 | Monoxide | 19 | | |
| B20 | Dioxide | 20 | | |
| B21 | Silicate | 21 | | |
| B23 | Fluorochemical | 23 | | |
| B24 | Ceramic | 24 | 24 | 24/28 |
| B25 | Glass | 25/26 | 25/26 | |
| B26 | Glassy | | | |
| B27 | Fibre | 27/28 | 27/28 | |
| B28 | Fibrous | | | |
| | (Plastics) | | | |
| B30 | Nylon | 30 | 30/33+37/38 | 30/59 |
| B31 | Melamine | 31 | +46/50+55/59 | |
| B32 | Cellulose | 32/33 | | |
| B33 | Acetate | | | |
| B34 | Resin | 34 | 34/36 | |
| B35 | Epoxy | 35 | +39/45a | |
| B36 | Polyester | 36 | | |
| | (Polyester (plastics)) | | | |
| B37 | Mylar | 37 | | |
| B38 | Paraplex | 38 | | |
| B39 | Phenolic (resins) | 39/45a | | |
| B40 | Bakelite | | | |
| B41 | Formica | | | |
| B42 | Asbestos | | | |
| B43 | Raybestos | | | |
| B44 | Refrasil | | | |
| B45 | Astrolite | | | |
| B45a | Thermold J. | | | |
| | (Methyl methacrylates) | | | |
| B46 | Perspex | 46/48 | | |
| B47 | Plexiglass | | | |
| B48 | Lucite | | | |
| B49 | Teflon | 49 | | |
| B50 | Polystyrene | 50 | | |
| | (Reinforced plastics) | | | |
| B51 | Fibreglass | 51/54 | 51/54 | |
| B52 | Cincinnati Testing Laboratory Material | | | |

| | | First Reduction | Second Reduction | Third Reduction |
|---|---|---|---|---|
| | [Resin] | | | |
| | [Reinforced plastics] | | | |
| | [Cincinnati-Testing-Laboratory-Material] | | | |
| B53 | Papreg | | | |
| B54 | Compreg | | | |
| B55 | Castolite | 55 | | |
| B56 | Haveg-Rocketon | 56 | | |
| B57 | Hysol | 57 | | |
| B58 | Lexam | 58 | | |
| B59 | Lockfoam | 59 | | |
| | (Ground: aggregates by particle size) | | | |
| B60 | Sod | 60/67 | 60/67 | 60/67 |
| B63 | Sand | | | |
| B64 | Gravel | | | |
| B65 | Dirt | | | |
| B66 | Dust | | | |
| B67 | Debris | | | |
| | (State and form of matter) | | | |
| B68 | State + Condition | 68/68a | 68/68a | 68/87 |
| B68a | Phase | | | |
| B69 | Solid | 69/69a | 69/69a | |
| B69a | Crystal | | | |
| B70 | Non solid | 70 | 70 | |
| B71 | Fluid | 71/72 | 71/72 | |
| B71a | Liquid | | | |
| B72 | Moisture | | | |
| B73 | Gas + Gaseous | 73/74 | 73/74 | |
| B74 | Vapour | | | |
| B75 | Rarified | 75 | 75/76 | |
| B75a | Semi-rarified | 75a | | |
| B76 | Vacuum | 76 | | |
| B77 | Film | 77 | 77 | |
| B78 | Bubble | 78 | 78 | |
| B81 | Foam | 81/83 | 81/83 | |
| B82 | Suspension | | | |
| B83 | Smoke | | | |
| B85 | Grain | 85 | 85 | |
| B87 | Plasma | 87 | 87 | |
| | (Astronomical and Geophysical phenomena) | | | |
| C1 | Astrophysics | 1/2 | 1/4 | 1/4 |
| C2 | Space | | | |
| C3 | Interplanetary | 3 | | |
| C4 | Luni-solar | 4 | | |
| C5 | Sun + Solar | 5 | 5 | 5 |
| C6 | Planet+Planetary (Non-terrestrial) | 6/11 | 6/13 | 6/13 |
| C8 | Venus | | | |
| C9 | Mars + Martian | | | |
| C10 | Jupiter | | | |
| C11 | Saturn | | | |
| C12 | Meteor | 12/13 | | |
| C13 | Meteorite + Meteroid | | | |
| C14 | Earth | 14 | 14 | 14/15 |
| C15 | Moon + Lunar | 15 | 15 | |
| C16 | Atmosphere + Atmospheric | 16/17 | 16/18+21/23a | 16/23a |
| C17 | Equational | | | |
| C18 | Ionosphere | 18 | | |
| | (Atmospheric phenomena) | | | |
| C19 | Wind | 19/20 | 19/20 | |
| C20 | Gust | | | |
| C21 | Cloud | 21/23a | | |
| C22 | Snow | | | |
| C23 | Fog | | | |
| C23a | Ice | | | |
| C24 | Ground | 24 | | |
| C25 | Sea | 25 | | |
| | (Constructs and Structures) | | | |
| C30 | Bridge | 30 | 30/31 | 30/31 |
| C31 | Chimney | 31 | | |
| C32 | Vehicle | 32 | 32 | 32 |
| C33 | Ship + Marine + Maritime | 33 | 33 | 33 |
| C34 | Hovercraft | 34/35 | 34/35 | 34/35 |
| C35 | Saunders-Roe SRN1 | | | |
| C36 | Aircraft + Airplane | 36/36a | 36/36a | 36/41+53/58 |
| C36a | Aeronautical (vehicle) | | | |
| C38 | Non-lifting | 38 | 38 | |
| C39 | Winged | 39 | 39/40 | |
| C40 | Wingless | 40 | | |
| C41 | Finned | 41 | 41 | |
| C42 | Civil | 42/44a | 42/44a | 42/52 |

| | | First Reduction | Second Reduction | Third Reduction |
|---|---|---|---|---|
| | [Vehicle] | | | |
| | [Aircraft] | | | |
| | [Civil] | | | |
| C43 | Airliner | | | |
| C44 | Caracelle | | | |
| | (Military) | | | |
| C45 | Bomber | | | |
| C46 | Fighter | | | |
| C47 | F-100 | | | |
| C48 | Boulton-Paul (Delta PIII) | | | |
| C49 | X-15 | | | |
| C50 | B47A | | | |
| C51 | Avro (707A) | | | |
| C52 | P8U3 | | | |
| | (Winged) | | | |
| C53 | Monoplane | 53/55 | 53/56 | |
| C54 | Parasol | | | |
| C55 | Fairchild 22 | | | |
| C56 | Biplane | 56 | | |
| C57 | Tailless | 57 | 57/58 | |
| C58 | Canard | 58 | | |
| | (Aircraft) | | | |
| C59 | Helicopter | 59 | 59 | 59 |
| C60 | STOL | 60 | 60 | 60/66 |
| C61 | VTOL | 61/66 | 61/66 | |
| C62 | Curtiss-Wright | | | |
| C63 | Bell | | | |
| C64 | Doak | | | |
| C65 | Vertol | | | |
| C66 | Hiller | | | |
| C66a | Glider | 66a | 66a | 66a |
| C67 | Spacecraft + Spaceship | 67+69/71 | 67+69/72 | 67/89 |
| C68 | Manned | 68 | 68 | |
| C69 | Centaur | | | |
| C70 | Able | | | |
| C71 | X-15 | | | |
| C72 | Capsule | 72 | | |
| C73 | Launch (vehicle) | 73 | 73 | |
| C74 | Satellite | 74/81 | 74/81 | |
| C75 | Fuelling | | | |
| C76 | Midas | | | |
| C77 | Atlas | | | |
| C78 | Explorer | | | |
| C79 | Sputnik | | | |
| C80 | Vanguard | | | |
| C81 | Discoverer | | | |
| C82 | Missile + Projectile | 82/83 | 82/89 | |
| C83 | Ballistic | | | |
| C84 | Guided | 84/85 | | |
| C85 | Homing | | | |
| C86 | IRBM | 86 | | |
| C87 | ICBM | 87 | | |
| C88 | Titan | 88 | | |
| C89 | Probe | 89 | | |
| | (Parts of aircraft) | | | |
| D2 | Airframe | 2 | 2 | 2+32/38 |
| D3 | Airfoil | 3 | 3 + 11 | 3/11 |
| D4 | Wing | 4/6 | 4/6 | |
| D5 | Winglike | | | |
| D6 | Nonweiler | | | |
| D7 | Tail | 7/9 | 7/9 | |
| D8 | Slabtail | | | |
| D9 | Tailplane | | | |
| D11 | Foreplane | 11 | | |
| | (Control surfaces) | | | |
| D12 | Aileron | 12 | 12 | 12/13a |
| D15 | Rudder | 15 | 15 | |
| D16 | Elevator | 16/17 | 16/17 | |
| D17 | Geared | | | |
| D18 | Elevon | 18 | 18+22 | |
| D19 | Flap | 19/21a | 19/21a | |
| D20 | Split | | | |
| D21 | Thwaites | | | |
| D21a | Programmed (flap) | | | |

| | | First Reduction | Second Reduction | Third Reduction |
|---|---|---|---|---|
| | [Programmed (flap)] | | | |
| D22 | Horn | 22 | | |
| D23 | Slat | 23/24 | 23/24 | |
| D24 | Slot | | | |
| D25 | Tab | 25 | 25 | |
| D26 | Spoiler | 26/27 | 26/27 | |
| D27 | Bang-bang | | | |
| D28 | Stabilizer | 28+30/31 | 28/31a | |
| D29 | Fin | 29 | | |
| D30 | Recoverable | | | |
| D31 | Non-recoverable | 31a | | |
| D31a | Mass balanced | | | |
| D32 | Fuselage | 32/33 | 32/33+38 | |
| D33 | Cabin | | | |
| D34 | Nacelle | 34 | 34 | |
| D35 | Cowling | 35/36 | 35/36 | |
| D36 | Spinner | | | |
| D37 | Shield | 37 | 37 | |
| D38 | Store | 38 | | |
| | (Structural systems, parts and elements) | | | |
| | (System) | | | |
| D40 | Structure | 40+57a | 40/42 | 40/57b |
| D41 | Built-up | 41 | +45/46 | |
| D42 | Reinforced | 42 | +54/57b | |
| D43 | Stratiform + Laminate + Sandwich | 43/44 | 43/44 | |
| D43a | Lamination +Multilayer | | | |
| D43b | Layered | | | |
| D43c | Multilayered | | | |
| D44 | Multiply | | | |
| D45 | Honeycomb | 45 | | |
| D47 | Cellular | 47/48 | 47/48 | |
| D48 | Multicell | | | |
| D50 | Multiweb | 50/51 | 50/51 | |
| D51 | MW-1 | | | |
| D52 | Bay | 52/53 | 52/53 | |
| D53 | Multibay | | | |
| D54 | Multirib | 54 | | |
| D55 | Multispar | 55 | | |
| D56 | Monocoque | 56 | | |
| D57 | Monolithic | 57 | | |
| D57a | Boxtype 1 | 57a | | |
| D57b | Geodetic | 57b | | |
| | (By core condition) | | | |
| D58 | Hollow | 58/61 | 58/61 | 58/61 |
| D59 | Filled | | | |
| D60 | Pressurized | | | |
| D61 | Unpressurized | | | |
| | (Structural Parts) | | | |
| D63 | Deck | 63 | 63 | 63/74a |
| D64 | Doors | 64/65a | 64/66 | |
| D65 | Windows | | | |
| D65a | Pane | | | |
| D66 | Roof | 66 | | |
| D67 | Stringer | 68/70a | 68/73 | |
| D69 | Bulkhead | | | |
| D70 | Frame | | | |
| D70a | Framework | | | |
| D71 | Spar | 71/72 | | |
| D71a | Shaft | | | |
| D72 | Rib | | | |
| D73 | Web | 73 | | |
| D74 | Fairing | 74 | 74 | |
| D74a | Flange 9 | 74a | 74a | |
| | (Structural elements) | | | |
| D74b | Filler | 74b | 74b/77 | 74b/82 |
| D75 | Support | 75/77 | +80/82 | |
| D76 | Mounting | | | |
| D77 | Stand | | | |
| D78 | Attachment | 78 | 78 | |
| D80 | Ramp | 80 | | |
| D81 | Step | 81 | | |
| D82 | Loop | 82 | | |
| D83 | Sheet | 83 | 83 | 83/88 |
| D84 | Plate | | | |
| D84a | Endplate | 84/84a | 84/84a | |
| D85 | Panel | 85/86 | 85/87 | |
| D86 | Handley-Page | | | |
| D87 | Slab | 87 | | |
| D88 | Shell | 88 | 88 | |

| | | First Reduction | Second Reduction | Third Reduction |
|---|---|---|---|---|
| | [Shell] | | | |
| D89 | Bar | 89/93 | 89/96 | 89/96 |
| D90 | Wire | | | |
| D91 | Woven | | | |
| D92 | Rod | | | |
| D93 | Coupon | | | |
| D94 | Strip | 94/96 | | |
| D95 | Ribbon | | | |
| D96 | Band | | | |
| D97 | Hoop | 97 | 97/100 | 97/100 |
| D99 | Stiffening (ring) | 99 | | |
| D100 | Stiffener | 100/100a | | |
| D100a | Backing | | | |
| D101 | Beam | 101/102 | 101/102 | 101/105 |
| D102 | Cantilever | | | |
| D103 | Strut | 103/104 | 103/104 | |
| D104 | Column | 105 | 105 | |
| D105 | Truss | | | |
| | (Structures characterized mainly by shape) | | | |
| E1 | Bodies | 1/4+23/26 | 1/4+23/26 | 1/4+22/26 |
| E3 | Block | | | |
| E4 | Box | | | |
| | (Body of revolution) | | | |
| E6 | Cylinder | 6/6a+9 | 6/6a+10 | 6/21 |
| E6a | Quasi-cylinder | | | |
| E7 | Tube + Pipe + Tubing | 7/8 | 7/8 | |
| E9 | Drum | | | |
| E10 | Disc | 10 | | |
| E11 | Cone | 11/13 | 11/13 | |
| E12 | Frustum | | | |
| E13 | Spike | | | |
| E14 | Sphere | 14/15 | 14/16 | |
| E15 | Ball | | | |
| E16 | Hemisphere + Dome | 16 | | |
| E17 | Ellipsoid | 17/18 | 17/18 | |
| E18 | Semi-ellipsoid | | | |
| E19 | Ogive | 19 | 19 | |
| E20 | Torus | 20 | 20 | |
| E21 | Paraboloid | 21 | 21 | |
| E22 | Boattail | 22 | 22 | |
| E23 | Maikapar | | | |
| E24 | Thor-Able | | | |
| E25 | Sears-Haack | | | |
| E26 | Yo-Yo | | | |
| | (Structures by edge, support and junction) | | | |
| E27 | Clamped | 27 | 27/29 | 27/42 |
| E27a | Jointed | 27a/29 | | |
| E28 | Pinned | | | |
| E29 | Pinjointed | | | |
| E30 | Hinged | 30 | 30/31 | |
| E31 | Tilting | 31 | | |
| E32 | Flanged | 32/32a | 32/32a | |
| E32a | Unflanged | | | |
| E33 | Free-free | 33/34b | 33/34a | |
| E33a | Unloaded | | | |
| E34 | Loose | | | |
| E34a | Floating | | | |
| E34b | Adjustable | | | |
| E35 | Fixed | 35 | 35/38 | |
| E36 | Rigid + Inelastic + Unelastic | 36/38 | +42 | |
| E36a | Inexorable | | | |
| E36b | Rigidly | | | |
| E36c | Binding | | | |
| E36d | Prescribed | | | |
| E36e | Non-elastic | | | |
| E37 | Semi-rigid | | | |
| E38 | Stiffened | | | |
| E39 | Unstiffened | 39 | 39 | |
| E40 | Supported + Mounted | 40/41 | 40/41 | |
| E40a | Hooped | | | |
| E40b | Framed | | | |
| E41 | Cantilevered | | | |
| E42 | Clamshell | 42 | | |
| | (Structures by various other principles) | | | |
| E43 | Segmented | 43/44a | 43/44a | 43/51 |
| E44 | Sectorial | | | |
| E44a | Lobed | | | |
| E45 | Faced | 45/46b | 45/46a | |
| E46 | Surfaced | | | |

| | | First Reduction | Second Reduction | Third Reduction |
|---|---|---|---|---|
| | [Surfaced] | | | |
| E46a | Sided | | | |
| E46b | Cornered | | | |
| E46c | Edged | 46c | | |
| E47 | Covered | 47/49 | 47/49 | |
| E48 | Shielded | | | |
| E48a | Walled | | | |
| E49 | Ducted | | | |
| E51 | Stressed | 51 | 51 | |
| E56 | Machine + Mechanism* + Plant* | 56/57 | 56/59 | 56/73a |
| E57 | Mechanism | | | |
| E58 | Plant | 58/59 | | |
| E59 | Power Plant | | | |
| E60 | Engine + Motor | 60 | 60 | |
| | (Gas turbine) | | | |
| E61 | Turbojet | 61/62 | 61/62 | |
| E62 | Propulsive (jet) | | | |
| | (Direct combustion) | | | |
| E63 | Rocket | 63/69 | 63/69+73a | |
| E64 | Midcourse | | | |
| E65 | Retrorocket | | | |
| E66 | Sounding (rocket) | | | |
| E68 | Sail (i.e. solar sail) | | | |
| E69 | Magnetoplasma | | | |
| E70 | Reactor | 70/73 | 70/73 | |
| E71 | Fission | | | |
| E72 | Fusion | | | |
| E73 | Nuclear | | | |
| E73a | Booster 2 | 73a | | |
| | (Auxiliary systems) | | | |
| E74 | Compressor + Blower + Turbomachine | 74/76 | 74/76+79 | 74/80 |
| E75 | Jumo | | | |
| E76 | Multistage | | | |
| E77 | Fan | 77 | 77 | |
| E79 | Pump | 79 | | |
| E80 | Turbine | 80 | 80 | |
| E82 | Exchanger (i.e. Heat exchanger) | 82 | 82/84 | 82/88+96 |
| E83 | Cooler | 83/84 | | |
| E84 | Aftercooler | | | |
| E85 | Generator | 85 | 85 | |
| E86 | Convertor | 86 | 86 | |
| E88 | Gyroscope | 88 | 88 | |
| | (Control systems) | | | |
| E89 | Servo | 89/91 | 89/91 | 89/91 |
| E90 | Relay | | | |
| E91 | Autopilot | | | |
| E92 | Weapon | 93/94 | 92/94 | 92/94 |
| E94 | Warhead | | | |
| E96 | Oscillator | 96 | | |
| | [Machine components] | | | |
| | (Fixed) | | | |
| F1 | Baffle | 1/3 | 1/3+5/6 | 1/7 |
| F1a | Foil | | | |
| F2 | Screen | | | |
| F3 | Grid | | | |
| F4 | Cascade | 4 | 4 | |
| F5 | Diaphragm | 5 | | |
| F6 | Filter | 6 | | |
| F7 | Stator | 7 | 7 | |
| | (Reciprocating) | | | |
| F8 | Piston | 8 | 8 | 8/13a |
| | (Rotating) | | | |
| F10 | Rotor | 10/13a | 10/13a | |
| F12 | Propeller | | | |
| F12a | Multipropeller | | | |
| F13 | Shank | | | |
| F13a | Shaft | | | |
| | (Parts of compressor) | | | |
| F15 | Impeller | 15 | 15 | 15/22a |
| F16 | Stage | 16/18 | 16/18 | |
| F17 | Stacking | | | |
| F18 | Uprating | | | |
| F19 | Hub | 19 | 19 | |
| F20 | Overhang (Section) | 20 | 20 | |
| F21 | Blade + Blading + Vane | 21/22a | 21/22a | |
| F21a | Guide | | | |
| F22 | Splitter | | | |
| F22a | Multiblade | | | |
| F24 | Gear | 24 | 24+27/30 | 24/30b |
| F26 | Decoupling | 26 | 26 | |
| F27 | Bearing | 27/29 | | |

| | | First Reduction | Second Reduction | Third Reduction |
|---|---|---|---|---|
| | [Bearing] | | | |
| F28 | Journal | | | |
| F29 | Slider | | | |
| F30 | Pivot | 30 | 30 | |
| F30a | Crank | 30a/30b | 30a/30b | |
| F30b | Flywheel | | | |
| | (Container) | | | |
| F32 | Cover | 32/32b | 32/39a | 32/39a |
| F32a | Shroud | | | |
| F32b | Sheath | | | |
| F33 | Tank | 33/37 | | |
| F34 | Receiver | | | |
| F35 | Vessel | | | |
| F36 | Reservoir | | | |
| F37 | Unfired | | | |
| F38 | Chamber | 38/39a | | |
| F39 | Plenum | | | |
| F39a | Can | | | |
| F40 | Seal + Closure | 40/42 | 40/42 | 40/45 |
| F41 | Plug | | | |
| F42 | Cap | | | |
| F43 | Valve | 43 | 43/43a | |
| F44 | Spring | 44/45 | 44/45 | |
| F45 | Belleville | | | |
| F46 | Joint | 46/47 | 46/53 | 46/53 |
| F46a | Bond | | | |
| F47 | Fit | | | |
| F48 | Rivet | 48/49b | | |
| F49 | Bolt | | | |
| F49a | Pin | | | |
| F49b | Screw | | | |
| | Flexible | | | |
| F50 | Hinge | 50 | | |
| F51 | Bellows (Joint) | 51/52 | | |
| F52 | Omega (Expansion joint) | | | |
| F53 | Knuckle | 53 | | |
| F54 | Passage + Corridor | 54 | 54 | 54/72 |
| F55 | Capillary | 55 | 55 | |
| F57 | Entrance + Inlet | 57/60 | 57/62 | |
| F58 | Opening | | | |
| F59 | Orifice | | | |
| F60 | Intake | | | |
| F61 | Scoop | 61/62 | | |
| F62 | Sugar | | | |
| F63 | Outlet + Exit | 63 | 63 | |
| F64 | Channel + Duct + Ducting | 64/65 | 64/65 | |
| F65 | Interblade | | | |
| F66 | Diffuser | 66/67 | 66/67 | |
| F67 | Vaneless | | | |
| F68 | Nozzle | 68/71a | 68/71a | |
| F69 | Overexpanding | | | |
| F70 | Laval | | | |
| F71 | Contoured | | | |
| F72 | Venturi | 72 | 72 | |
| F73 | Injector | 73 | 73 | 73/79 |
| F74 | Ejector | 74 | 74 | |
| F75 | Afterburner | 75 | 75 | |
| F76 | Muffler + Silencer | 76/77 | 76/77 | |
| F77 | Wideangle | | | |
| F78 | Throttle | 78/79 | 78/79 | |
| F79 | Accelerator | | | |
| F80 | Apparatus + Equipment + Facility* + Device* | 80/81 | 80/81 | 80/81+83/83b |
| F80a | Facility | | | |
| F80b | Device | | | |
| F81 | Laboratory | | | |
| F82 | Test + Testing (equipment) | 82 | 82 | 82+84/91 |
| F83 | Model | 83/83b | 83/83b | |
| F83a | Shrouded | | | |
| F83b | Non-separating (model) | | | |
| F84 | (Wind) Tunnel | 84+89/91 | 84/91 | |
| F85 | Blowdown | 85 | | |
| F87 | Tailored | 87 | | |
| F88 | Gun | | | |
| F89 | NPL | | | |
| F90 | Ames | | | |
| F91 | ARA | | | |
| | (Parts and components of wind tunnel) | | | |
| G2 | Settling (chamber) | 2 | 2/7a+12/12a | 1/15 |
| G4 | Driver (gas) + Driving (gas) | 4 | | |

| | | First Reduction | Second Reduction | Third Reduction |
|---|---|---|---|---|
| | [Driver (gas) + Driving (gas)] | 4 | | |
| G5 | Heater | 5/6 | | |
| G6 | Drier | | | |
| G7 | Evacuator | 7 | | |
| G7a | Barrel | 7a | | |
| | (Wall) | | | |
| G8 | Sidewall | 8/9 | 8/9 | |
| G9 | Liner | | | |
| G12 | Cell | 12/12a | | |
| G12a | Dashpots | | | |
| | (Model support) | | | |
| G13 | Sting | 13/15 | 13/15 | |
| G15 | Jack | | | |
| G17 | Instrument + Instrumentation* | 17/18+22/22a | 17/18+22/22a | 17/23 |
| G17a | Instrumentation | +41a+52/53 | +41a+52/53 | +41a |
| G18 | Accelerometer | | | +52/53 |
| G20 | Radiator | 20 | 20 | |
| G21 | Ribbon (Vibrating) | 21 | 21 | |
| G22 | Indicator | | | |
| G22a | Sensor | | | |
| G23 | Corrector | 23 | 23 | |
| G24 | Measuring | 24 | 24 | 24/34a |
| G25 | Gauge + Meter | 25/29a | 25/34a | +41 |
| G26 | Extensometer | | | |
| G27 | Manometer | | | |
| G28 | Piezometer | | | |
| G29 | Thermocouple | | | |
| G29a | Pickup | | | |
| G30 | Flowmeter | 30/32a | | |
| G30a | Pitot (tubes) | | | |
| G31 | Pitometer | | | |
| G32 | Anenometer | | | |
| G32a | Potentiometer | | | |
| G33 | Dampometer | | | |
| G34 | Theodolite | 34/34a | | |
| G34a | Kinetheodolite | | | |
| G35 | Optical | 35 | 35/40 | 35/40 |
| G36 | Photographic | 36/40 | | |
| G36a | Photograph | | | |
| G37 | Camera | | | |
| G38 | Photomultiplier | | | |
| G39 | Television | | | |
| G40 | (Motion) Picture | | | |
| G41 | Interferometer | 41 | 41 | |
| G41a | Pendulum | 41a | | |
| | [Electric, Electronic equipment] | | | |
| G42a | Circuitry | 42a + 51 | 42/46 | 42/51a |
| G43 | Antenna | 43 | +51/51a | |
| G44 | Radar | 44 | | |
| G45 | Microphone | 45 | | |
| G46 | Cyclotron | 46 | | |
| G47 | Cathode (ray tube) | 47 | | |
| G48 | Oscilloscope | 48/49 | | |
| G49 | Oscillograph | | | |
| G51 | Conductor | | | |
| G51a | Radiotrajectograph | | | |
| G52 | Transducer | | | |
| G52a | Pickup | | | |
| G53 | Multiplier | | | |
| | (Spatial relations of parts) | | | |
| H1 | Portion | 1/2a | 1/2a | 1/10 |
| H2 | Whole | | | |
| H2a | All | | | |
| H3 | Part | 3/6 | 3/6+8/10 | |
| H4 | Component | | | |
| H5 | Element | | | |
| H5a | Sample | | | |
| H5b | Specimen | | | |
| H5c | Piece | | | |
| H6 | Factor | | | |
| H8 | Fraction | 8/10 | | |
| H9 | Half | | | |
| H10 | Quarter | | | |
| H11 | Section | 11/12 | 11/12 | 11/14 |
| H12 | Slice | | | |
| H13 | Sector | 13 | 13/14 | |
| H14 | Segment | 14 | | |
| | (By Position) | | | |
| | (Vertical plane) | | | |
| H16 | Top | 16+19/22 | 16/22 | 16/26a |
| H17 | Apex + Vortex | 17/18a | | |
| H18 | Semi apex | | | |

| | | First Reduction | Second Reduction | Third Reduction |
|---|---|---|---|---|
| | [Semi apex] | | | |
| H18a | Semi vertex | | | |
| H19 | Head | | | |
| H20 | Crest | | | |
| H21 | Crown | | | |
| H22 | Peak | | | |
| H23 | Bottom | 23+25/26a | 23+25/26a | |
| H24 | Base | 24 | 24 | |
| H25 | Bed | | | |
| H26 | Foundation | | | |
| H26a | Foot | | | |
| | (Longitudinal plane) | | | |
| H27 | Front | 27 | 27/29 | 27/35a |
| H28 | Forepart + Forebody + Foreplane | 28 | | |
| H29 | Bow | 29 | | |
| H30 | Nose | 30 | 30 | |
| H31 | Back | 31+33/34 | 31/34 | |
| H32 | Afterbody | 32 | | |
| H33 | Rear | | | |
| H34 | Aft | | | |
| | (Lateral plane) | | | |
| H35 | Side | 35/35a | 35/35a | |
| H35a | Sidedress | | | |
| | (Outer) | | | |
| H36 | Face | 36 | 36 + 39 | 36/42 |
| H37 | Surface | 37/38 | 37/38 | |
| H38 | Undersurface | | | |
| H39 | Interface | 39 | | |
| H40 | Skin | 40 | 40/41a | |
| H41 | Membrane | 41/41a | | |
| H41a | Envelope | | | |
| H42 | Wall | 42 | 42 | |
| H43 | Layer | 43 | 43/42 | 43/47 |
| H44 | Sublayer | 44 | | |
| | (Inner) | | | |
| H45 | Interior | 45/47 | 45/47 | |
| H46 | Core | | | |
| H47 | Kernel | | | |
| | (Extremity) | | | |
| H48 | End | 48 | 48 | 48/56 |
| H50 | Tip | 50 | 50 | |
| H52 | Edge | 52/54 | 52/54 | |
| H53 | Rim | | | |
| H54 | Lip | | | |
| H55 | Leg | 55 | 55/56 | |
| H56 | Stem | 56 | | |
| | (Prominence) | | | |
| H57 | Projection | 57 | 57/65 | 57/65 |
| H58 | Protuberance | 58/65 | | |
| H59 | Excrescence | | | |
| H60 | Pimple | | | |
| H61 | Ridge | | | |
| H62 | Corrugation | | | |
| H62a | Heap | | | |
| H63 | Teeth | | | |
| H64 | Bump | | | |
| H65 | Lobe | | | |
| H65a | Obstacle | | | |
| H66 | Depression | 66/68 | 66/68 | |
| H67 | Notch | | | |
| H68 | Crack | | | |
| H68a | Groove | | | |
| H69 | Hole + Perforation* | 69/73 | 69/73 | |
| H70 | Perforation | | | |
| H71 | Gap | | | |
| H72 | Cavity | | | |
| H73 | Cutout | | | |
| | (Connections) | | | |
| H74 | Corner | 74/77+80a | 74/77+80a | 74/80a |
| H77 | Kink | | | |
| H78 | Neck | 78 | 78/79 | |
| H79 | Throat | 79 | 80 | |
| H80 | Knee | 80/80a | | |
| H80a | Waist | | | |

| | | First Reduction | Second Reduction | Third Reduction |
|---|---|---|---|---|
| | [Spatial relations] | | | |
| H95 | Spatial | 95+1/5 | 95 + 15 | 95 + 1/10 |
| J1 | Environment | | | |
| J1a | Presence | | | |
| J1b | Situation | | | |
| J2 | Environmental | | | |
| J3 | Ambient | | | |
| J4 | Surrounding | | | |
| J5 | About | | | |
| | (With similar conditions) | | | |
| J6 | Regime + Domain | 6+9/10 | 6/10 | |
| J8 | Belt | 8 | | |
| J9 | Region + Field | | | |
| J10 | Zone | | | |
| J11 | Position + Location + Point + Station | 11/11a +83/83b | 11/15 +83/83b | 11/18 +80/83b |
| J11a | Located | | | |
| J12 | Local | | | |
| J13 | Locally | | | |
| J14 | Positioning | | | |
| J15 | Spot | 15 | | |
| J16 | Line | 16 | 16 | |
| J17 | Plane | 17/18 | 17/18 | |
| J18 | Plateau | | | |
| J20 | Path + Orbit + Trajectory | 20/21+23 | 20/21+23 | 20/25 |
| J22 | Circuit | 22 | 22 | |
| J23 | Course | | | |
| J24 | Apogee | 24 | 24/25 | |
| J25 | Perigee | 25 | | |
| | (By proximity, distance) | | | |
| J25a | Isolated | 25a | 25a | 25a/3b |
| J25b | Alone | | | |
| J26 | Proximity | 26 | 26+29 | |
| J27 | Contact | 27/28a | 27/28a | |
| J27a | Tangency | | | |
| J28 | Adjacent | | | |
| J28a | Wetted | | | |
| J29 | Vicinity | 29 | | |
| J30 | Near | 30/34 | 30/34 | |
| J31 | Nearest | | | |
| J32 | Nearly | | | |
| J33 | Close | | | |
| J34 | Closely | | | |
| J34a | Distant | 34a/35 | 34a/35 | |
| J35 | Far | | | |
| J36 | Off | 36 | 36 | |
| | (In vertical plane) | | | |
| J37 | Level | 37 | 37 | 37/46 |
| J38 | Altitude | 38 | 38 | |
| J38a | Over | 38a/40 | 38a/40 | |
| J39 | Above | | | |
| J40 | Upper | | | |
| J41 | Below | 41/42a | 41/42a | |
| J42 | Lower | | | |
| J42a | Lowest | | | |
| J43 | Under | 43/46 | 43/46 | |
| J44 | Submerged | | | |
| J45 | Underwater | | | |
| J46 | Buried | | | |
| | (In horizontal plane) | | | |
| J47 | Ahead | 47 | 47/48 | 47/50 |
| J48 | Leading | 48 | | |
| J49 | Behind | 49/49a | 49/50 | |
| J49a | Following | | | |

| | | First Reduction | Second Reduction | Third Reduction |
|---|---|---|---|---|
| | [Following] | | | |
| J50 | Trailing | 50 | | |
| | (By Centrality) | | | |
| J51 | Central | 51/54 | 51/55 | 51/73 |
| J51a | Centrally | | | |
| J51b | Centred | | | |
| J52 | Middle + Centre | | | |
| J52a | Mid | | | |
| J53 | Midpoint | | | |
| J54 | Midplane | | | |
| J56 | Axis | 56/56a | | |
| J56a | Centreline | | | |
| J57 | Bisector | 57 | | |
| J58 | Median | 58 | | |
| J59 | Inboard | 59 | 59+61 | |
| J60 | Peripheral + Circumferential | 60/60a | 60/60a | |
| J60a | Fringe | | | |
| J61 | Outboard | 61 | | |
| J62 | Outermost | 62/64 | 62/64 | |
| J63 | Extremal | | | |
| J64 | Beyond | | | |
| J65 | Inner + Internal | 65/66a | 65/66a | |
| J65a | In | | | |
| J66 | Internally | | | |
| J66a | Within | | | |
| J67 | External + Outer | 67/68a | 67/68a | |
| J68 | Externally | | | |
| J68a | Outside | | | |
| J70 | Boundary | 70 | 70 | |
| J71 | Bound | 71/73 | 71/73 | |
| J72 | Margin | | | |
| J73 | Limit | | | |
| J74 | Between | 74/75d | 74/75d | 74/79 |
| J75 | Interstage | | | |
| J75a | Interangular | | | |
| J75c | Intermolecular | | | |
| J75d | Intramolecular | | | |
| J76 | Intersection | 76/77 | 76/79 | |
| J77 | Junction | | | |
| J78 | Node | 78/79 | | |
| J79 | Nodal | | | |
| | [Terrestrial] | | | |
| J80 | Latitude | 80 | 80 | |
| J81 | Meridian | 81/81a | 81/81a | |
| J81a | Meridional | | | |
| J83 | New Mexico | | | |
| J83a | France | | | |
| J83b | U.K. | | | |
| | (Directional relations) | | | |
| J84 | Direction | 84/85 | 84/89a | 84/89a |
| J85 | Orientation | | | |
| J86 | Directional | 86/89a | | |
| J87 | Unidirectional | | | |
| J88 | Direct | | | |
| J89 | Indirect | | | |
| J89a | Non-direct | | | |
| J90 | Angle | 90/91a+93 | 90/91a+93 | 90/93 |
| J91 | Incidence | | | |
| J91a | Attack | | | |
| J92 | Slope + Gradient | 92 | | |
| J93 | Setting | | | |
| J94 | Axial + Axially* | 94/94a | 94/97b | 94/102 |
| J94a | Axially | | | |
| J95 | Coaxial | 95/97a | | |
| J96 | Uniaxial | | | |
| J97 | Multi axial | | | |
| J97a | Polyaxial | | | |
| J97b | Unaxial | 97b | | |
| J98 | Radial | 98/98a | 98/98a | |
| J98a | Radially | | | |
| J99 | Centrifugal | 99 | 99/100 | |
| J100 | Centripetal | 100 | | |
| J101 | Rotary | 101/102 | 101/102 | |
| J102 | Clockwise | | | |
| K1 | Lateral + Transverse + Laterally* | 1/2d | 1/2d | 1/5d |
| K2 | Chordwise + Transversely* | | | |
| K2a | Spanning | | | |

| | | First Reduction | Second Reduction | Third Reduction |
|---|---|---|---|---|
| | [Spanning] | | | |
| K2b | Laterally | | | |
| K2c | Transversely | | | |
| K2d | Across | | | |
| K3 | Longitudinal + Lengthwise + Spanwise | 3/4 | 3/4 | |
| K4 | Longitudinally | | | |
| K5 | Edgewise | 5/5a | 5/5a | |
| K5a | Along | | | |
| K6 | Forward | 6/7 | 6/7 | 6/11 |
| K7 | Towards | | | |
| K8 | Backward | 8/9 | 8/9 | |
| K9 | Rearward | | | |
| K10 | Reverse | 10/11 | 10/11 | |
| K11 | Counter | | | |
| K12 | Up | 12 | 12/14 | 12/24 |
| K13 | Down | 13/14 | | |
| K14 | Incoming | 14/16 | 14/17a | |
| K15 | Inward | | | |
| K16 | Into | | | |
| K17 | Outward | 17/17a | | |
| K17a | Onto | | | |
| K18 | Through | 18 | 18 | |
| K19 | Tangential | 19 | 19 | |
| K20 | Streamwise | 20 | 20/22 | |
| K21 | Upstream | 21 | | |
| K22 | Downstream | 22 | | |
| K23 | Leeward | 23/24 | 23/24 | |
| K24 | Windward | | | |
| K27 | Shape | 27/30 | 27/30 | 27/30 |
| K28 | Geometry+Geometrical*+Geometrically* | | | |
| K28a | Geometrical | | | |
| K28b | Geometrically | | | |
| K29 | Form | | | |
| K29a | Mode | | | |
| K30 | Shaped | | | |
| K30a | Symmetry | 30a/32 | 30a/32 | 30a/34b |
| K31 | Symmetrical + Symmetric | | | |
| K32 | Symmetrically | | | |
| K33 | Axisymmetric + Axisymmetrical | 33 | 33 | |
| K34 | Antisymmetric + Antisymmetrical + Asymmetric + Asymmetrical + Non-Symmetric | 34/34a | 34/34b | |
| K34a | Unsymmetrical | | | |
| K34b | Non-axisymmetric+Non-axisymmetrical | 34b | | |
| | (3-dimensional) | | | |
| K35 | Non-rotational | 35/37 | 35/37 | 35/38 |
| K35a | Octahedral | | | |
| K36 | Prismatic | | | |
| K37 | Pryamidal | | | |
| K38 | Wedge | 38 | 38 | |
| K39 | Revolution + Rotation | 39 | 39/41 | 39/64 |
| K41 | Rotationally | 41 | | |
| K42 | Cylindrical | 42/43 | 42/44 | |
| K43 | Tubular | | | |
| K44 | Quasi-cylindrical | 44 | | |
| K45 | Conical + Coned + Conically* | 45/45a | 45/45b | |
| K45a | Conically | | | |
| K46 | Quasi-conical | 46 | | |
| K47 | Spiked | 47 | 47 | |
| K48 | Toriconical | 48 | 48+59+63 | |
| K49 | Helix | 49/51 | 49/51 | |
| K50 | Helical | | | |
| K51 | Spiral | | | |
| K52 | Spherical | 52/53 | 52/53 | |
| K53 | Spherically | | | |
| K54 | Spheroid | 54/57 | 54/57 | |
| K55 | Oblate | | | |
| K56 | Oblateness | | | |
| K57 | Prolate | | | |
| K58 | Hemispherical + Hemispheric | 58/58b | 58/58b | |
| K58b | Hemispherically | | | |
| K59 | Torispherical | 59 | | |
| K60 | Ellipsoidal | 60/61 | 60/61 | |
| K61 | Semi-ellipsoidal | | | |
| K62 | Ogival | 62 | 62 | |
| K63 | Toroidal | 63 | | |
| K64 | Paraboloidal | 64 | 64 | |
| | (By extremities, edge condition) | | | |
| K65 | Pointed + Tapered | | | |

| | | First Reduction | Second Reduction | Third Reduction |
|---|---|---|---|---|
| | [Pointed + Tapered] | 65+68/69 | 65+68/69 | 65/86 |
| K66 | Crisp | 66/67 | 66/67 | |
| K67 | Crisped | | | |
| K68 | Taper | | | |
| K69 | Tapering | | | |
| K70 | Sharp + Sharpness* | 70/71 | 70/71 | |
| K70a | Sharpness | | | |
| K71 | Abrupt | | | |
| K73 | Blunt + Blunted + Bluntness* | 73/75 | 73/75 | |
| K74 | Bluntness | | | |
| K75 | Bluff | | | |
| K76 | Untapered | 76/77 | 76/77 | |
| K77 | Unblunted | | | |
| K78 | Hammerhead | 78 | 78+83 | |
| K79 | Round | 79/80 | 79/80 | |
| K79a | Roundness | | | |
| K80 | Rounded | | | |
| K81 | Out-of-roundness | 81 | 81 | |
| K83 | Headed + Nosed + Capped | 82 | 82 | |
| K83a | Based | 83 | | |
| K84 | Boattailed | 83a | 83a | |
| K85 | Boattailing | 84/85 | 84/85 | |
| K86 | Bevelled | 86 | 86 | |
| K87 | Cut | 87/90 | 87/90 | 87/99 |
| K88 | Cropped | | | |
| K89 | Clipped | | | |
| K90 | Truncated | | | |
| K91 | Non-truncated | 91 | 91 | |
| K92 | Drooped | 92 | 92 | |
| K93 | Extended | 93/99 | 93/99 | |
| K94 | Elongated | | | |
| K95 | Flare | | | |
| K96 | Flared | | | |
| K97 | Skirt | | | |
| K98 | Skirted | | | |
| K99 | Stretched | | | |
| | (2-dimensional) | | | |
| L1 | Profile | 1/3 | 1/3 | 1/3 |
| L2 | Contour | | | |
| L4 | Rectilinear | 4 | 4+15/19 | 4/28 |
| L5 | Swept | 5 | 5/9 | |
| L6 | Sweptback | 6/7 | | |
| L8 | Sweptforward | 8/9 | | |
| L10 | Unswept | 10 | 10 | |
| L11 | Triangular + Delta + Triangle* | 11/12 | 11/12 | |
| L11a | Triangle | | | |
| L12 | Caret | | | |
| L13 | Rectangular | 13/14 | 13/14 | |
| L13a | Rectangle | | | |
| L14 | Square | | | |
| L15 | Rhombic | 15 | | |
| L16 | Sextic | 16 | | |
| L17 | Trapezoidal | 17 | | |
| L18 | Diamond | 18 | | |
| L19 | Arrow | 19 | | |
| L20 | Polygon | 20"24 | 20/24 | |
| L21 | Polygonal | | | |
| L22 | Hexagonal | | | |
| L23 | Octagonal | | | |
| L24 | Dodecagonal | | | |
| L25 | Equilateral | 25/26 | 25/26 | |
| L26 | Isosceles | | | |
| L27 | Cruciform | 27/28 | 27/28 | |
| L28 | Cross | | | |
| L28a | Curvilinear | 28a/31 | 28a/31 | 28a/51 |
| L29 | Circular | | | |
| L29a | Quasi-circular | | | |
| L30 | Circularity | | | |
| L31 | Supercircular | | | |
| L32 | Non-circular | 32 | 32 | |
| L33 | Annular | 33/35 | 33/35 | |
| L34 | Annulus | | | |
| L35 | Ring | | | |
| L36 | Horseshoe | 36 | 36/37 | |
| L37 | Concave | 37 | | |
| L38 | Convex | 38/40b | 38/40b | |
| L39 | Biconvex | | | |
| L40 | Lenticular | | | |
| L40a | Cambered | | | |
| L40b | Uncambered | | | |
| L41 | Fusiform | 41 | 41 | |
| L42 | Oval + Elliptic | 42/45 | 42/45 | |
| L43 | Ellipse | | | |

| | | First Reduction | Second Reduction | Third Reduction |
|---|---|---|---|---|
| | [2-dimensional] | | | |
| | [Curvilinear] | | | |
| | [Ellipse] | | | |
| L44 | Elliptical | | | |
| L45 | Ellipticity | | | |
| L45a | Ogee | 45a/45b | 45a/45b | |
| L45b | Gothic | | | |
| L46 | Parabola | 46/47 | 46/47 | |
| L47 | Parabolic | | | |
| L48 | Hyperbola | 48/49 | 48/49 | |
| L49 | Hyperbolic | | | |
| L50 | Hypelliptic | 50 | 50 | |
| L51 | Semi-circular | 51 | 51 | |
| | [Letter] | | | |
| L52 | I | 52/56 | 52/56 | 52/56 |
| L52a | T | | | |
| L54 | V | | | |
| L55 | W | | | |
| L55a | Z | | | |
| L56 | Lamda | | | |
| L56a | Theta | | | |
| | [One-dimensional] | | | |
| L57 | Straight | 57/58 | 57/60 | 57/72 |
| L58 | Straightness | | | |
| L60 | Out-of-straightness | 60 | | |
| L61 | Curved + Curve* + Curvature* | 61/63 | 61/66a | |
| L62 | Curve | | | |
| L63 | Curvative | | | |
| L64 | Arc | 64/65 | | |
| L65 | Subarc | | | |
| L66 | Sinusoidal | 66/66a | | |
| L66a | Sinusoidally | | | |
| L67 | Bent + Bend* | 67/68 | 67/72 | |
| L68 | Bend | | | |
| L69 | Angular | 69/72 | | |
| L69a | Angled | | | |
| L69b | Angularly | | | |
| L70 | Orthogonal | | | |
| L71 | Orthogonally | | | |
| L72 | Orthogonality | | | |
| | (Surface features) | | | |
| L73 | Flat | 73/76 | 73/76 | 73/84a |
| L75 | Planar | | | |
| L76 | Co-planar | | | |
| L77 | Non-planar | 77 | 77 | |
| L78 | Smooth | 78 | 78 | |
| L79 | Rough + Roughness* | 79/80 | 79/80 | |
| L80 | Roughness | | | |
| L81 | Corrugated | 81/82c | 81/82c | |
| L82 | Wavy | | | |
| L82a | Wrinkled | | | |
| L82b | Unwrinkled | | | |
| L82c | Waviness | | | |
| L83 | Slotted | 83/84a | 83/84a | |
| L84 | Perforated | | | |
| L84a | Drilled | | | |
| | (Cross section area) | | | |
| L85 | Convergent | 85 | 85 | 85/86 |
| L86 | Divergent | 86 | 86 | |
| | (Dimension) | | | |
| L87 | Dimension | 87 | 87/91 | 87/91 |
| L88 | Magnitude + Size | 88/91 | | |
| L89 | Amplitude | | | |
| L90 | Bulk | | | |
| L91 | Scale | | | |
| L92 | Length | 92/93 | 92/93 | 92/100c |
| L92a | Inch | | | |
| L93 | Distance | | | |
| L94 | Slenderness | 94 | 94/95+100c | |
| L95 | Thickness | 95+100c | | |
| L96 | Height | 96 | 96/97 | |
| L97 | Depth | 97 | | |
| L98 | Perimeter | 98/99 | 98/99 | |
| L99 | Circumference | | | |
| L100 | Radius | 100/100b | 100/100b | |
| L100a | Bore | | | |
| L100b | Diameter | | | |
| L100c | Width | | | |
| L101 | Area | 101/102a | 101/102a | 101/102a |
| L102 | Extent | | | |

| | | First Reduction | Second Reduction | Third Reduction |
|---|---|---|---|---|
| | [Extent] | | | |
| L102a | Extensive | | | |
| L103 | Volume | 103/103a | 103/103a | 103/103a |
| L103a | Volumetric | | | |
| L104 | Mass | 104 | 104/106a | 104/107 |
| L105 | Weight | 105/106a | | |
| L106a | Pound | | | |
| L107 | Density | 107 | 107 | |
| | [Dimensions (spatial)] | | | |
| M8a | Moderate | 8a/9 | 8a/9 | 8a/12 |
| M9 | Medium | 10/11 | 10/12 | |
| M10 | Large | | | |
| M11 | Super | | | |
| M12 | Macroscopic | 12 | | |
| M13 | Long | 13 | 13 | 13/14 |
| M14 | Short | 14 | 14 | |
| M15 | Slender + Thin | 15/16 | 15/17 | 15/20 |
| M16 | Narrow | | | |
| M17 | Not-so-thin + Not-so-slender | 17 | | |
| M18 | Thick + Non-Slender | 18 | 18/20 | |
| M19 | Wide | 19/20 | | |
| M19a | Widely | | | |
| M20 | Broad | | | |
| | [Dimensions] | | | |
| M26 | Deep | 26 | 26 | |
| M27 | Shallow | 27/27a | 27/27a | |
| M27a | Shallowness | | | |
| | [Spatial relations] | | | |
| | [Arrangement] | | | |
| M73a | Horizontal | 73a | 73a | 73a/85 |
| M74 | Non-inclined | 74 | 74 | |
| M75 | Vertical | 75/76c | 75/76c | |
| M76 | Perpendicular | | | |
| M76a | Perpendicularly | | | |
| M76b | Normal | | | |
| M76c | Right | | | |
| M77 | Inclined + Inclination* | 77/78 | 77/78+82/84a | |
| M78 | Inclination | | | |
| M79 | Oblique | 79/81 | 79/81 | |
| M80 | Skew | | | |
| M81 | Skewed | | | |
| M82 | Sloped | 82/84a | | |
| M83 | Canted | | | |
| M84 | Steep | | | |
| M84a | Steepest | | | |
| M85 | Inverted | 85 | 85 | |
| M86 | Lattice | 86/87b | 86/87b | 86/88 |
| M87 | Mesh | | | |
| M87a | Network | | | |
| M87b | Chessboard | | | |
| M88 | Crossed | 88 | 88 | |
| M90 | Opposite + Facing | 90/91 | 90/91 | 90/94a |
| M91 | Opposed | | | |
| M92 | Parallel | 92 | 92 | |
| M93 | Asymptotic | 93/94 | 93/94a | |
| M93a | Asymptote | | | |
| M93b | Asymptotically | | | |

| | | First Reduction | Second Reduction | Third Reduction |
|---|---|---|---|---|
| | [Spatial relations] | | | |
| | [Arrangement] | | | |
| | [Asymptotically] | | | |
| M94 | Pre-asymptotic | | | |
| M94a | Non-parallel | 94a | | |
| M95 | Series | 95/95a | 95/95a | 95/108 |
| M95a | Cycle | | +100/102 | |
| M96 | Spaced | 96/97 | 96/97 | |
| M97 | Spacing | | | |
| M98 | Stagger | 98/99b | 98/99b | |
| M99 | Staggered | | | |
| M99a | Staggering | | | |
| M99b | Stepwise | | | |
| M100 | Row | 100/102 | | |
| M101 | Bank | | | |
| M102 | Rake | | | |
| M103 | Sequential | 103 | 103 | |
| M104 | Aligned | 104/105 | 104/108a | |
| M105 | Alignment | | | |
| M106 | Misaligned | 106/107 | | |
| M107 | Misalignment | | | |
| M108 | Non-aligned | 108/108a | | |
| M108a | Crookedness | | | |
| M109 | Closed | 109/110 | 109/110 | 109/116 |
| M110 | Enclosed | | | |
| M111 | Bounded | 111/112 | 111/112 | |
| M112 | Bounding | | | |
| M113 | Open | 113/115 | 113/116 | |
| M114 | Exposed | | | |
| M115 | Bare | | | |
| M116 | Unbounded | 116 | | |
| M117 | Concentric | 117 | 117 | 117/120a |
| M118 | Heliocentric | 118/119 | 118/119 | |
| M119 | Planetcentric | | | |
| M120 | Eccentric | 120/120a | 120/120a | |
| M120a | Eccentrically | | | |
| | (Temporal relations) | | | |
| N1 | Time + Timewise | 1 | 1/5 | 1/15 |
| N2 | Duration | 2/5 | | |
| N2a | During | | | |
| N2b | Running | | | |
| N3 | History | | | |
| N3a | Historical | | | |
| N4 | Life | | | |
| N5 | Lifetime | | | |
| N6 | Period | 6 | 6/13b | 6/15a |
| N7 | Millesecond | 7 | | |
| N8 | Day | 8/9 | | |
| N9 | Diurnal | | | |
| N10 | Night | 10/11 | | |
| N11 | Nocturnal | | | |
| N12 | Season | 12/13 | | |
| N13 | Seasonal | | | |
| N13b | Interval | 13b | | |
| N14 | Permanent | 14 | 14 | |
| N15 | Transient | | | |
| N15a | Momentary | 15/15a | 15/15a | |
| N16 | Periodic | 16/19 | 16/22 | 16/24 |
| N17 | Periodically | | | |
| N18 | Periodicity | | | |
| N19 | Intermittent | | | |
| N20 | Isochronous | 20/20a | | |
| N20a | Isochrone | | | |
| N21 | Cyclic | 21 | | |
| N22 | Successive | 22 | | |
| N23 | Simultaneous | 23/24 | 23/24 | |
| N24 | Simultaneously | | | |
| N25 | Rate | 25 | 25 | 25/33 |
| N26 | Frequency | 26 | 26 | |
| N27 | Slow | 27/28a | 27/33 | |
| N27a | Slowly | | | |
| N28 | Retarded | | | |
| N28a | Gradual | | | |
| N29 | Fast + Quick + Rapid | 29/30 | | |
| N30 | Accelerated | | | |
| N31 | Sudden | 31/33 | | |
| N32 | Immediately | | | |
| N33 | Instantaneous | | | |
| N34 | Delay | 34/35 | 34/35 | 34/35 |
| N35 | Lag | | | |
| N36 | After | 36/37 | 36/38 | 36/38 |

| | | First Reduction | Second Reduction | Third Reduction |
|---|---|---|---|---|
| | [After] | | | |
| N37 | Post | | | |
| N38 | Prior | 38 | | |
| | [Flying operations] | | | |
| N40 | Performance | 40+42/46 | 40/46 | 40/51 |
| N41 | Range | +50/51 | +50/51 | +62/63 |
| N42 | Reliability | 41 | | |
| N43 | Holding | | | |
| N44 | Handling | | | |
| N45 | Airspeed | | | |
| N46 | Payload | | | |
| N47 | Propulsion | | 47/49 | |
| N48 | Thrust | 48 | +62/63 | |
| N49 | Boost | | | |
| N50 | Consumption (of fuel) | | | |
| N51 | Expenditure (of power) | | | |
| | [Flying operations, processes] | | | |
| N52 | Flight + Flying | 52/55 | 52/55 | 52/55 |
| N54 | Voyage | | | |
| N55 | Mission | | | |
| N56 | Orbital (trajectory) | 56/58 | 56/61 | 56/61 |
| N57 | Orbiting | | | |
| N58 | Re-orbit | | | |
| N59 | Semi-ballistic (trajectory) | 59 | | |
| N60 | Skip (trajectory) | 60/61 | | |
| N61 | Skipping | | | |
| N62 | Powered | | | |
| N63 | Unpowered | | | |
| N64 | Taxiing | 64/68 | 64/68 | 64/74 |
| N65 | Take-off | | | |
| N66 | Boosting | | | |
| N67 | Traversal | | | |
| N68 | Traversing | | | |
| N69 | Ascent | 69/71 | 69/72 | |
| N70 | Ascending | | | |
| N71 | Climb | | | |
| N72 | Zoom | | | |
| N73 | Escape (from a force field, e.g. gravity) | 73/74 | 73/74 | |
| N74 | Capture (by a force field, e.g. gravity) | | | |
| N75 | Cruising | 75/76 | 75/76 | 75/99 |
| N76 | Cruise | | | |
| N77 | Manoeuvres + Manoeuvring* | 77/77a | 77/82+87 | |
| N77a | Manoeuvring | +80/82 | +98/101 | |
| N78 | Hovering | 78/79 | | |
| N79 | Hover | | | |
| N80 | Turn | | | |
| N82 | Circling | | | |
| N83 | Roll | 83/84 | 83/84 | |
| N84 | Rolling | | | |
| N85 | Yaw | 85/86 | 85/86 | |
| N86 | Yawing | | | |
| N87 | Non-yawing | 87 | | |
| N88 | Pitch | 88/89 | 88/89 | |
| N89 | Pitching | | | |
| N90 | Diving | 90/95 | 90/97 | |
| N91 | Plunging | | | |
| N92 | Tumbling | | | |
| N93 | Falling | | | |
| N94 | Fall | | | |
| N95 | Sinking | | | |
| N96 | Heaving | 96/97 | | |
| N97 | Heave | | | |
| N98 | Spin | 98 | | |
| N99 | Sideslip | 99 | | |
| N102 | Return | 102 | 102+113/117a | 102/117a |
| N103 | Descending | 103/105 | 103/107 | |
| N104 | Descent | | | |
| N105 | Glide | | | |
| N106 | Braking | 106/107 | | |
| N107 | Graze | | | |
| N108 | Entry | 108/112 | 108/112 | |
| N109 | Entering | | | |
| N110 | Re-entry | | | |
| N111 | Re-entering | | | |
| N113 | Approach | 113/114 | | |
| N114 | Approaching | | | |
| N115 | Landing | 115/117a | | |

| | | First Reduction | Second Reduction | Third Reduction |
|---|---|---|---|---|
| | [Landing] | 115/117a | | |
| N116 | Overshoot | | | |
| N117 | Undershoot | | | |
| N117a | Miss | | | |
| | (Miscellaneous activities) | | | |
| N118 | Navigation | 118/119 | 118/119 | 118/119 |
| N119 | Piloting | | | |
| N120 | Guidance (of space vehicles) | 120/122 | 120/122 | 120/122 |
| N121 | Telemetry | | | |
| N122 | Telemetering | | | |
| | (Agents) | | | |
| N123 | Human | 123/124a | 123/124a | 123/124a |
| N124 | Pilot | | | |
| N124a | Operator | | | |
| | (Properties of flight, agents of flight) | | | |
| N125 | Vision | 125/126 | 125/129 | 125/129 |
| N126 | Visibility | | | |
| N127 | Tolerance (to acceleration) | 127/129 | | |
| N128 | Hazard | | | |
| N129 | Safety | | | |
| 0a | Aerodynamics | 0a/0b | 0a/0b | 0a/02 |
| 0b | Aerodynamically | | | +28/28b |
| 01 | Flow + Stream + Flux +Airflow* + Airstream* + Flowing* | 1/2+28a/28b | 1/2+28a/28b | +32/34a |
| 01a | Airflow | | | |
| 01b | Airstream | | | |
| 02 | Flowing | | | |
| | (By speed) | | | |
| 03 | Subsonic | 3/4 | 3/4 | 3/4 |
| 04 | Subcritical | | | |
| 05 | Sonic | 5 | 5 | 5/13 |
| 06 | Transonic | 6 | 6 | |
| 07 | Supersonic | 7/9 | 7/9 | |
| 08 | Supersonically | | | |
| 010 | Hypersonic | 10/13 | 10/13 | |
| 011 | Hypervelocity | | | |
| 012 | Supersatellite | | | |
| 013 | Superfast | | | |
| | (By viscosity effects) | | | |
| 014 | Frictionless | 14/15 | 14/15 | 14/15 |
| 015 | Inviscid + Non-viscous | | | +24/25 |
| 016 | Viscous + Viscid | 16/17 | 16/17 | 16/21 |
| 017 | Creeping (motion regime) | | | |
| 018 | Laminar | 18/19 | 18/19 | |
| 019 | Non-turbulent | | | |
| 020 | Transitional | 20 | 20 | |
| 021 | Turbulent | 21 | 21 | |
| | (By degree of vorticity) | | | |
| 022 | Rotational | 22 | 22 | 22 |
| 024 | Irrotational + Non-rotating | 24/25 | 24/25 | |
| 025 | Potential | | | |
| 028 | Isobaric | 28/28b | 28/28b | |
| 028 | Slug | | | |
| 028b | Mound | | | |
| | (Regimes - by density conditions, etc.) | | | |
| 029 | Slip | 29 | 29/31 | 29/31 |
| 030 | Continuum | 30 | | |
| 031 | Collision | 31 | | |
| 032 | Expanded | 32/34a | 32/34a | |
| 033 | Overexpanded | | | |
| 033a | Over-expansion | | | |
| 034 | Under expanded | | | |
| 034a | Underexpansion | | | |
| 035 | Separated | 35 + 37 | 35/38 | 35/38 |
| 036 | Unseparated | 36 + 38 | | |
| 036a | Reattached | | | |
| 037 | Stalled | | | |
| 038 | Unstalled | | | |
| 039 | Incompressible | 39 | 39 | 39/40 |
| 040 | Compressible | 40 | 40 | |

[Flow elements and phenomena]
[Boundary layer - Processes and operations]

| | | First Reduction | Second Reduction | Third Reduction |
|---|---|---|---|---|
| | [Boundary layer - Processes and operations] | | | |
| 041 | Laminarization | 41+43/45a | 41+43/45a | 41/46a |
| 042 | Transition | 42 | 42 | |
| 043 | Breakdown | | | |
| 044 | Bloweff | | | |
| 045 | Tripped | | | |
| 045a | Initiation | | | |
| 046 | Separation | 46 | 46 | |
| 046a | Reattaching | 46a/46b | 46a/46b | |
| 046b | Reattachment (B.L. Control) | | | |
| 047 | Thickening | 47/50+53 | 47/53 | 47/53 |
| 048 | Avoidance | | | |
| 049 | Inhibition | | | |
| 050 | Retardation | | | |
| 051 | Promotion | 51/52a | | |
| 052 | Trip | | | |
| 052a | Tripping | | | |
| 053 | Re-establishment | | | |
| 054 | Promoters (of transition) | 54/63 | 54/63 | 54/63 |
| 055 | Sandpaper | | | |
| 056 | Carborundum | | | |
| 057 | Bead | | | |
| 058 | Ballotini | | | |
| 059 | Deposit | | | |
| 059a | Deposited (dirt, etc.) | | | |
| 060 | Insect | | | |
| 061 | Fruitfly | | | |
| 062 | Drosophila | | | |
| 063 | Housefly | | | |
| | [Flow elements] | | | |
| 064 | Streamline | 64/67 | 64/68 | 64/68 |
| 065 | Cocurrent | | | |
| 066 | Filament | | | |
| 067 | Dividing | | | |
| 068 | Streamtube | 68 | | |
| 069 | Supply (stream) | 69+72/73a | 69+72/73a | 69/73a |
| 070 | Sink | | | |
| 071 | Doublet | | | |
| 072 | Inflow | | | |
| 073a | Pocket | | | |
| 074 | Vortex + Eddy | 74 | 74/79 | 74/79 |
| 075 | Vortical | 75/79 | | |
| 076 | Swirl | | | |
| 077 | Spiralling (fluid) | | | |
| 078 | Co-rotating [vortex] | | | |
| 079 | Image [vortex] | | | |
| 080 | Street | 80 | 80/83a | 80/83a |
| 081 | Shedding | 81/83a | | |
| 082 | Bursting | | | |
| 083 | Cancellation | | | |
| 083a | Feeding | | | |
| 084 | Jet | 84/84a | 84/84a | 84/89 |
| 084a | Airjet | | | |
| 085 | Jetlike | 85/88 | | |
| 086 | Billowing | | | |
| 087 | Plume | | | |
| 088 | Curtain | | | |
| 089 | Cushion | 89 | | |
| 090 | Wave | 90 | 90 | 90/99 |
| 091 | N(-wave) | 91/92+99 | 91/92+99 | |
| 092 | Standing | | | |
| 093 | Blast | 93/95 | 93/95+97/98a | |
| 094 | Explosion | | | |
| 095 | Detonation | | | |
| 096 | Shock | 96 | 96 | |
| 097 | Non-relativistic | 97/98a | | |
| 098 | Standoff | | | |
| 098a | Shockless | | | |
| 099 | Riemann | | | |
| | (Flow attributes) | | | |
| 0100 | Vorticity | 100 | 100 | 100/101 |
| 0101 | Circulation | 101 | 101 | |
| | [Similarity parameters] | | | |
| 0102 | Mach (number) | 102 | 102 | 102 |
| 0103 | Prandtl (number) | 103 | 103 | 103 |
| 0104 | Nusselt (number) | 104 | 104 | 104 |
| 0105 | Reynolds (number) | 105 | 105 | 105 |
| | (Fluid attributes) | | | |
| P1 | Compressibility | 1 | 1 | 1/2 |
| P2 | Viscosity | 2 | 2 | |

| | | First Reduction | Second Reduction | Third Reduction |
|---|---|---|---|---|
| | [Viscosity] | | | |
| | (Aerodynamic characteristics) | | | |
| | (Loads) | | | |
| P3 | Lift + Lifting* | 3 | 3/5 | 3/5 |
| P4 | Lifting | 4 | | |
| P5 | Indicial | 5 | | |
| P6 | Drag | 6 | 6 | 6/9 |
| P7 | Foredrag | 7/9 | 7/9 | |
| P8 | Coulomb | | | |
| P9 | Drift | | | |
| P9a | Interference | 9a | 9a | 9a/17 |
| P10 | Stagnation | 10 | 10 | +27/29 |
| P11 | Choking | 11/12a | 11/13 | |
| P11a | Choke | | | |
| P11b | Choked | | | |
| P12 | Blockage | | | |
| P12a | Blocking | | | |
| P13 | Lap | 13 | | |
| P14 | Stall | 14/17 | 14/17 | |
| P15 | Stalling | | | |
| P16 | Destalling | | | |
| P17 | Unstalling | | | |
| P18 | Downwash | 18 | 18/21 | 18/26 |
| P18a | Upload | 18a/19 | | |
| P19 | Upwash + Upflow | | | |
| P19a | Sideforce | 19a/21 | | |
| P20 | Sidewash | | | |
| P21 | Crossflow | | | |
| P22 | Wake + Afterflow | 22/23a | 22/26 | |
| P23 | Wakelike | | | |
| P23a | Isovel | | | |
| P24 | Slipstream | 24/25 | | |
| P24a | Sliplines | | | |
| P25 | Outflow | | | |
| P26 | Trail | 26 | | |
| P27 | Turbulence | 27/28 | 27/29 | |
| P27a | Proturbulence | | | |
| P28 | Homologous | | | |
| P29 | Surge | 29 | | |
| | (Aerodynamic properties and processes) | | | |
| Z12 | Gasdynamic | 12/14 | 12/14 | 12/18 |
| Z13 | Aerodynamic | | | |
| Z14 | Superaerodynamic | | | |
| Z15 | Suction | 15/15a | 15/16+18 | |
| Z15a | Sucking | | | |
| Z16 | Blowing | 16 | | |
| Z17 | Injection | 17 | 17 | |
| Z18 | Entrainment | 18 | | |
| Z19 | Hydrodynamic | 19/23 | 19/23 | 19/23 |
| Z20 | Spray | | | |
| Z21 | Wetting | | | |
| Z22 | Soaking | | | |
| Z23 | Hydroballistic | | | |
| P30 | Aeroelasticity | 30/32+35/36 | 30/32 | 30/40 |
| P30a | Aeroelastic | | +35/40 | |
| P31 | Thermoaeroelastic | | | |
| P32 | Aerothermoelastic | | | |
| P33 | Flutter | 33/34a | 33/34a | |
| P34 | Fluttering | | | |
| P34a | Precipitation | | | |
| P35 | Ripple | | | |
| P36 | Sloshing | | | |
| P37 | Buzz | 37 | | |
| P38 | Divergence | 38 | | |
| P39 | Buffeting | 39/40 | | |
| P40 | Buffet | | | |
| | (Aerodynamic reference parameter) | | | |
| P42 | Tilt | 42 | 42 | 42/48 |
| P43 | Attitude | 43 | 43/48 | |
| P45 | Trim | 45/46a | | |
| P46 | Trimming | | | |
| P46a | Trimmed | | | |
| P47 | Banked | 47/48 | | |
| P48 | Unbanked | | | |
| P49 | Planform | 49 | 49/52+54 | 49/69 |
| P50 | Sweep | 50/52 | | |
| P51 | Sweepback | | | |
| P52 | Sweepforward | | | |
| P53 | Aspect (ratio) | 53 | 53 | |
| P54 | Fineness (ratio) | 54 | | |

| | | First Reduction | Second Reduction | Third Reduction |
|---|---|---|---|---|
| | [Fineness (ratio)] | | | |
| P55 | Stepdown (height) | 55/58 | | |
| P57 | Twist | | | |
| P58 | Warp | | | |
| P59 | Dihedral | 59 | | |
| P60 | Anhedral | 60 | | |
| P61 | Span | 61/64 | 61/64 | |
| P63 | Midspan | | | |
| P64 | Semispan | | | |
| P65 | Chord | 65/66 | 65/66 | |
| P66 | Midchord | | | |
| | (Airfoil section) | | | |
| P67 | Rooftop | | | |
| P68 | Peaky | | | |
| P69 | Camber | | | |
| P70 | Mechanics (phenomena) | 70 | 70 | |
| | (Statics) | | | |
| P71 | Moment | 71/72 | 71/72 | 71/73 |
| P72 | Torque | | | |
| P73 | Couple | 73 | 73 | |
| P74 | Equilibrium | 74/77 | 74/78 | 74/83b |
| P75 | Quasi-equilibrium | | | |
| P75a | Non-vanishing | | | |
| P76 | Non-equilibrium | | | |
| P77 | Disequilibrium | | | |
| P78 | Balance | 78 | | |
| P79 | Stability | 79 | 79 | |
| P80 | Transtability | 80/83 | 80/83 | |
| P81 | Overstability | | | |
| P82 | Instability | | | |
| P83 | Disturbance + Perturbation | | | |
| P83a | Resistance | 83a/83b | 83a/83b | |
| P83b | Resisting | | | |
| | (Kinematics) | | | |
| P84 | Motion + Movement* + Moving* + Non-stationary* + Travelling* | 84/88 | 84/88 | 84/88 |
| P85 | Movement | | | |
| P86 | Moving | | | |
| P87 | Non-stationary | | | |
| P88 | Travelling | | | |
| P89 | Velocity + Speed | 89/90 | 89/90 | 89/90 |
| P90 | Alfven (speed) | | | |
| P92 | Acceleration | 92/93 | 92/95 | 92/95 |
| P93 | Accelerating | | | |
| P94 | Deceleration | 94/95 | | |
| P95 | Decelerating | | | |
| P96 | Translation | 96/97 | 96/97 | 96/Q12 |
| P97 | Translating | | | |
| Q2 | Rotating | 2/4b | 2/4b | |
| Q4 | Pre-rotation | | +6/10 | |
| Q4a | Circulating | | | |
| Q4b | Recirculating | 5 | 5 | |
| Q6 | Gyration | 6/10 | | |
| Q7 | Spinning | | | |
| Q8 | Whirl | | | |
| Q9 | Prewhirl | | | |
| Q10 | Overswing | | | |
| Q11 | Gyroscopic | 11/12 | 11/12 | |
| Q12 | Precession | | | |
| | (Kinds of motion by direction) | | | |
| Q12b | Advance | 12b/12c | 12b/12c | 12b/12c |
| Q12c | Advancing | | | |
| | (Inwardly) | | | |
| Q14 | Intersecting | 14 | 14 | 14/18 |
| Q15 | Convergence | 15/16 | 15/16 | |
| Q16 | Converging | | | |
| Q17 | Penetration | 17/18 | 17/18 | |
| Q18 | Penetrating | | | |
| | (Outwardly) | | | |
| Q19 | Diverging | 19 | 19/20 | 19/20 |
| Q20 | Vanishing | 20 | | |
| | (Across, past) | | | |
| Q22 | Transit | 22/23 | 22/24a | 22/24a |
| Q23 | Crossing | | | |
| Q24 | Passing | 24/24a | | |
| Q24a | Pass | | | |
| Q25 | Dynamic + Dynamically* | 25/26 | 25/26 | 25/31 |
| Q25a | Dynamically | | | |
| Q26 | Inertia | | | |
| Q27 | Momentum | 27 | 27 | |
| Q28 | Energy | 28 | | |
| Q28a | Activation (Energy) | 28a/28c | 28/28c | |
| Q28b | Isoerg | | | |
| Q28c | Kinetic | | | |
| Q29 | Work | 29/30 | 29/31 | |
| Q30 | Virtual | 31 | | |
| Q31 | Power | | | |
| Q32 | Force | 32/35 | 32/35a | 32/40a |

| | | First Reduction | Second Reduction | Third Reduction |
|---|---|---|---|---|
| | [Force] | 32/35 | 32/35a | |
| Q33 | Lorenz (force) | | | |
| Q34 | Pondero (force) | | | |
| Q35 | Restoring (force) | | | |
| Q35a | Gravity | 35a | | |
| Q36 | Pressure | 36/37 | 36/37 | |
| Q38 | Compression | 38/39 | 38/39 | |
| Q38a | Compressing | | | |
| Q38b | Compressively | | | |
| Q39 | Recompression | | | |
| Q40 | Overpressure | 40/40a | 40/40a | |
| Q40a | Pressurization | | | |
| Q41 | Striking | 41+48 | 41/47a | 41/49a |
| Q41a | Jog | 41a/44 | | |
| Q42 | Impulse | | | |
| Q42a | Impulsive | | | |
| Q42b | Impulsively | | | |
| Q43 | Impact | | | |
| Q44 | Embedded | | | |
| Q45 | Impinging | 45/47a | | |
| Q46 | Impingement | | | |
| Q47 | Re-impingement | | | |
| Q47a | Glancing | | | |
| Q49 | Driving | 49/49a | 49/49a | |
| Q49a | Drive | | | |
| Q50 | Emission | 50 | 50/58b | 50/60 |
| Q51 | Issuing | 51/53 | | |
| Q52 | Effusion | | | |
| Q53 | Efflux | | | |
| Q54 | Discharge | 54/57b | | |
| Q54a | Blowout | | | |
| Q55 | Exiting | | | |
| Q56 | Exhaust | | | |
| Q57 | Exhausting | | | |
| Q57a | Scavenging | | | |
| Q57b | Venting | | | |
| Q58 | Tapping | 58/58b | | |
| Q58a | Bleeding | | | |
| Q58b | Bleed | | | |
| Q60 | Burst | 60 | 60 | |
| Q61 | Breathing | 61/62 | 61/62 | 61/62 |
| Q62 | Swallowing | | | |
| | (Behaviour of deformable bodies) | | | |
| R1 | Load + Loading + Stress | 1/2+5+26a | 1 + 26a | 1/26a |
| R1a | Airload | | | |
| R2 | Stressing | | | |
| R3 | Allowable | 3/4 | | |
| R3a | Permissible | | | |
| R4 | Failsafe | | | |
| R5 | Shocking | | | |
| R6 | Exerted | 6/7 | | |
| R7 | Pre-loading | | | |
| R9 | Tension | 9/10 | 9/10 | |
| R10 | Tensile | | | |
| R11 | Shear | 11/12 | 11/12 | |
| R12 | Shearing | | | |
| R13 | Torsion + Torsional* | 13/14 | 13/15a | |
| R14 | Torsional | | | |
| R15 | Twisting | 15/15a | | |
| R15a | Warpage | | | |
| R16 | Bending | 16/18 | 16/23 | |
| R17 | Flexural | | | |
| R18 | Flexure | | | |
| R19 | Inflection | 19/23 | | |
| R20 | Bowing | | | |
| R21 | Curling | | | |
| R22 | Anti-elastic (effect) | | | |
| R23 | Hogging | | | |
| R24 | Folding | 24/26 | 24/26 | |
| R26 | Unfolding | | | |
| R26a | Unloading | | | |
| R27 | Rheological (behaviour) | 27/29 | 27/29+60/63 | 27/66 |
| R28 | Deformation + Strain | | | |
| R29 | Deforming | | | |
| R30 | Deflection + Displacement | 30/30a | 30/32 | |
| R30a | Droop | | | |
| R31 | Deflecting | 31/32 | | |
| R31a | Deflect | | | |
| R32 | Traction + [edge traction] | | | |
| R33 | Stretching | 33/34 | 33/34 | |
| R33a | Extending | | | |
| R33b | Extension | | | |
| R33c | Extensional | | | |

| | | First Reduction | Second Reduction | Third Reduction |
|---|---|---|---|---|
| | [Extensional] | | | |
| R34 | Attenuating | | | |
| R35 | Shortening | 35/36 | 35/36 | |
| R36 | Truncation | | | |
| R37 | Blunting | 37/38 | 37/38 | |
| R38 | Flattening | | | |
| R40 | Cavitation | 40/41a | 40/41a | |
| R40a | Drilling | | | |
| R41 | Cracking | | | |
| R41a | Intercrystalline | | | |
| R42 | Distortion | 42/43 | 42/43 | |
| R43 | Distorting | | | |
| R44 | Dislocation | 44 | 44/50 | |
| R46 | Damage | 46/48 | | |
| R47 | Fracture | | | |
| R48 | Rupture | | | |
| R49 | Collapse | 49/50 | | |
| R50 | Collapsing | | | |
| R51 | Buckling + Buckle* | 51/52 | 51/52 | |
| R52 | Buckle | | | |
| R53 | Forcible | 53/59 | 53/59 | |
| R54 | Explosive | | | |
| R55 | Monocell | | | |
| R56 | Snap | | | |
| R57 | Threshold | | | |
| R58 | Pre-buckling | | | |
| R59 | Post-buckling | | | |
| R60 | Snapping | | | |
| R61 | Wrinkling | | | |
| R62 | Dimpling | | | |
| R63 | Kinking | | | |
| R64 | Creep | 64 | 64 | |
| R64a | Endurance | 64a/65 | 64a/65 | |
| R64b | Straintime | | | |
| R65 | Fatigue | | | |
| R66 | Failure | 66 | 66 | |
| | (Mechanical properties) [Flexibility] | | | |
| R67 | Elasticity + Elastic* +Elastically* | 67/69+73/74 | 67/74 | 67/77 |
| R68 | Elastic + Flexibility*+Flexible*+Flexibly* | | | |
| R69 | Elastically | | | |
| R70 | Viscoelasticity | 70/71 | | |
| R71 | Viscoelastic | | | |
| R73 | Flexible | | | |
| R74 | Flexibly | | | |
| R76 | Rigidity | 76/77 | 76/77 | |
| R77 | Stiffness | | | |
| R78 | Plasticity | 78/80 | 78/80 | 78/83a |
| R79 | Plastic | | | |
| R80 | Viscoplastic | | | |
| R81 | Strength | 81+83a | 81+83a | |
| R82 | Soft | 82/83 | 82/83 | |
| R83 | Hard | | | |
| R83a | Endgrain | 83a | | |
| | (Surface condition) | | | |
| R85 | Smoothness | 85/87 | 85/87 | 85/87 |
| R87 | Polished | | | |
| R88 | Porous | 88/89 | 88/90a | 88/90a |
| R89 | Permeable | 90/90a | | |
| R90 | Impermeable | | | |
| R90a | Non-porous | | | |
| | (Processes) | | | |
| R91 | Vibration + Oscillation +Vibrating*+Oscillating* | | | |
| R92 | Vibrating + Oscillating | 91/92a | 91/92a | 91/97 |
| R92a | Flapping | | | |
| R93 | Harmonic | 93/95 | 93/97 | |
| R93a | Harmonically | | | |
| R94 | Resonant | | | |
| R95 | Libration | | | |
| R95a | Pulse | 95a | | |
| R95b | Non-oscillatory | 95b | | |
| R96 | Modal | 96/97 | | |
| R97 | Unimodal | | | |
| R98 | Sound + Acoustic + Acoustically* | 98/100 | 98/100 | 98/105a |
| R99 | Acoustically | | | |
| R100 | Panting | | | |
| R101 | Noise | 101/105a | 101/105a | |
| R101a | Signals | | | |
| R102 | Boom | | | |

| | | First Reduction | Second Reduction | Third Reduction |
|---|---|---|---|---|
| | [Boom] | | | |
| R103 | Siren | | | |
| R104 | Bomb | | | |
| R105 | Exploded | | | |
| R105a | Quadrupole | | | |
| | (Properties and processes of vibration) | | | |
| | (Frequencies) | | | |
| R106 | Beat | 106/108 | 106/111 | 106/111 |
| R107 | L(=band) | | | |
| R108 | RF | | | |
| R109 | Aural | 109/111 | | |
| R110 | Audio | | | |
| R111 | Subaudio | | | |
| R111a | Spectra | 111a/111c | 111a/111f | 111a/111f |
| R111b | Spectrum | | | |
| R111c | Spectral | | | |
| R111d | Wavelength | 111d/111f | | |
| R111e | Waveform | | | |
| R111f | Bandwidth | | | |
| R112 | Alternating | 112 | 112 | 112/120 |
| R112a | Refraction | 112a/112b | 112a/112b | |
| R112b | Diffraction | | | |
| R113 | Impedance | 113 | | |
| | (Amplification) | | | |
| R114 | Resonance | 114 | 114 | |
| R115 | Attenuation | 115 | 115 | |
| R116 | Damping | 116/119 | 116/119 | |
| R117 | Isolation | | | |
| R118 | Hysteretic | | | |
| R119 | Phugoid | | | |
| R120 | Hysteresis | 120 | 120 | |
| R122 | Luminosity | 122/124 | 122/125 | 122/125a |
| R123 | Luminous | | | |
| R124 | Transparent | | | |
| R125 | Sensitivity | 125 | | |
| R125a | Monotonic | 125a | 125a | |
| S1 | Electromagnetic (wave)+Electromagnetically* | | | |
| S2 | Electromagnetically | 1/2 | 1/5 | 1/5 |
| S3 | Ray | 3/5 | | |
| S4 | Ultraviolet | | | |
| S5 | Microwave | | | |
| S6 | Radioactive | 6 | 6 | 6/22c |
| | (Electric and magnetic phenomena) | | | |
| S8 | Electrical | 8/10+16a+21/22c | 8/10+12+ | |
| S9 | Electric | | 16/17+21/22c | |
| S10 | Electrically | | | |
| S11 | Magnetic | 11 | | |
| S12 | Electronic | | | |
| S13 | Magnetofluid mechanics + Magnetohydrodynamics + Hydromagnetics | 13/15 | 13/15 | |
| S14 | Electrohydrodynamics | | | |
| S15 | Magnetogasdynamics + Magnetoaerodynamic + Electrogasdynamics | | | |
| S16 | Photoelectric | 16 | | |
| S16a | Photoelastic | 16a | | |
| S17 | Electrostatic | 17 | | |
| S18 | Current | 18/19 | 18/19 | |
| S19 | D-C | | | |
| S20 | Charge | 20 | 20 | |
| S21 | Inductance | | | |
| S22 | Dielectric | | | |
| S22a | Capacitance | | | |
| S22b | Magnetostriction | | | |
| S22c | Pole | | | |
| | [Thermodynamic behaviour, properties] | | | |
| S23 | Heat | 23 | 23/29 | 23/29 |
| S24 | Thermodynamic | 24/29 | | |
| S24a | Aerothermodynamic | | | |
| S25 | Thermodynamically | | | |
| S26 | Thermally | | | |
| S27 | Caloric | | | |
| S28 | Calorically | | | |
| S29 | Aerothermochemistry | | | |
| | (Change of state) | | | |
| S31 | Melting | 31/31a | 31/38 | 31/38 |
| S31a | Liquefaction | | | |
| S32 | Resolidification | 32/33+38 | | |
| S33 | Sublimation | | | |
| S34 | Vaporisation | 34/37 | | |
| S35 | Evaporation | | | |

| | | First Reduction | Second Reduction | Third Reduction |
|---|---|---|---|---|
| | [Evaporation] | | | |
| S36 | Evaporating | | | |
| S37 | Boiloff | | | |
| S38 | Condensation | | | |
| | (Heat transfer processes) | | | |
| S39 | Replenishment | 39+56a | 39+51/56a | 39/56a |
| S40 | Heating | 40/41 | 40/41 | |
| S41 | Joule | | | |
| S41c | Insulation | 41c/41d | 41c/41d | |
| S41d | Insulating | | | |
| S42 | Cooling | 42+48/49 | 42/49 | |
| | (By mass transfer) | | | |
| S43 | Soret (effect) | 43/45 | | |
| S44 | Ablation | | | |
| S45 | Ablating | | | |
| S46 | Transpiration | 46/47 | | |
| S47 | Sweat | | | |
| S48 | Regression (of surface) | | | |
| S50 | Convection | 50 | 50 | |
| S51 | Radiant (heat transfer) | 51/54 | | |
| S52 | Non-radiating | | | |
| S53 | Losing | | | |
| S54 | Black (body radiation) | | | |
| S55 | Accommodation | 55 | | |
| S56 | Exothermic (reaction) | 56 | | |
| S56a | Cycling | | | |
| | (Thermal properties and processes) | | | |
| S56b | Thermomechanical | 56b/56e | 56b/56e | 56b/65 |
| S56c | Thermoelastic | | | |
| S56d | Photothermoelastic | | | |
| S56e | Photothermoelasticity | | | |
| S57 | Soaked | 57 | 57+62/65 | |
| S58 | Enthalpy | 58 | | |
| S60 | Entropy | 60/61 | 60/61 | |
| S61 | Residue (of heat energy) | | | |
| S62 | Adiabatic + Non-conductive + Insulated | | | |
| S63 | Isothermal | 62 | | |
| S64 | Non-isothermal | 63/64 | | |
| S65 | Isentropic | 65 | | |
| S66 | Temperature | 66/67+74 | 66/76a | 66/76a |
| S67 | Room | | | |
| S68 | Cold | 68/70 | | |
| S69 | Cooled | | | |
| S70 | Cool | | | |
| S71 | Uncooled | 71/72 | | |
| S72 | Unheated | | | |
| S73 | Heated | 73 | | |
| S74 | Equicohesive | | | |
| | (Measures) | | | |
| S75 | Kelvin | 75/76a | | |
| S76 | Fahrenheit | | | |
| S76a | BTU | | | |
| S77 | Oxidation | 77/80 | | 77/87 |
| S78 | Combustion + Burning | | | |
| S79 | Afterburning | | | |
| S80 | Deflagration | | | |
| S81 | Flame | 81/82 | | |
| S82 | Fire | | | |
| S83 | Ignition | 83/85 | 83/87 | |
| S84 | Autoignition | | | |
| S85 | Firing | | | |
| S86 | Extinction | 86/87 | | |
| S87 | Quenching | | | |
| | (General processes, physical-chemical processes) | | | |
| S90 | Action | 90/92 | 90/92 | 90/94d |
| S90a | Acting | | | |
| S90b | Activity | | | |
| S91 | Event | | | |
| S91a | Occurrence | | | |
| S91b | Encounter | | | |
| S91c | Case | | | |
| S92 | Behaviour | | | |
| S93 | Interaction | 93/94 | 93/94d | |
| S94 | Interacting | | | |
| S94a | Undergoing | | | |

| | | First Reduction | Second Reduction | Third Reduction |
|---|---|---|---|---|
| | [Undergoing] | | | |
| S94b | Subject (to) | 94a/94b | | |
| S94c | Counteraction | 94c/94d | | |
| S94d | Competition | | | |
| S95 | Physical | 95 | 95 | 96/99 |
| S96 | Chemical + Chemically* | 96/97+T13 | 96/97+7/7a +13 | +1/13 |
| S97 | Chemically | | | |
| S98 | Reaction + Reacting* | 98/99 | 98/99+12 | |
| S99 | Reacting | | | |
| T1 | Decomposition | 1 | 1/6b | |
| T2 | Dissociation | 2/3 | | |
| T3 | Dissociating | | | |
| T4 | Ionization | 4/6a | | |
| T5 | Charging | | | |
| T6 | Freezing | | | |
| T6a | Freeze | | | |
| T6b | Lagging | 6b | | |
| T7 | Catalytic | 7/7a | | |
| T7a | Non-catalytic | | | |
| T8 | Absorption | 8/10 | 8/11 | |
| T9 | Adsorption | | | |
| T10 | Chemisorption | | | |
| T11 | Saturation | 11 | | |
| T12 | Erosion | 12 | | |
| T13 | Thermochemical | 13 | | |
| | (General processes, activities, operations) | | | |
| T14 | Influence +Effect*+Contribution* | 14 | 14+16/22a | 14/29 |
| T15 | Effect +Consideration* | 15/15b | 15/15b+29 | |
| T15a | Contribution | | | |
| T15b | Consideration | | | |
| T16 | Change | 16/18+29 | | |
| T17 | Changing | | | |
| T18 | Alteration | | | |
| T19 | Modification | 19/20 | | |
| T20 | Modifying | | | |
| T21 | Improvement | 21/22a | | |
| T22 | Refinement | | | |
| T22a | Tailoring | | | |
| T23 | Variation | 23/24 | 23/28 | |
| T24 | Varying | | | |
| T25 | Fluctuation | 25/26 | | |
| | Peak to peak | | | |
| T26 | Fluctuating | | | |
| T27 | Modulation | 27/28 | | |
| T28 | Modulating | | | |
| T29 | Conversion | | | |
| | (Altering composition) | | | |
| T31 | Recombination | 31 | 31+35/38 | 31/39a |
| T33 | Mixing | 33/34 | | |
| T34 | Isoenergetic | | | |
| T35 | Confluence | 35/38 | | |
| T36 | Merging | | | |
| T37 | Merger | | | |
| T39 | Contamination | 39 | | |
| T39a | Non-concurrence | 39a | | |
| | (Altering state) | | | |
| T40 | Division | 40/44 | 40/44 | 40/44 |
| T42 | Partition | | | |
| T43 | Bifurcation | | | |
| T44 | Breaking | | | |
| | (Altering state) | | | |
| T46 | Hardening | 46 | 46 | 46/48 |
| T47 | Plating | 47/48 | 47/48 | |
| T47a | Electroplating | | | |
| T48 | Chroming | | | |
| | (Altering location) | | | |
| T50 | Transport + Removal* | 50/52 | 50/52 | 50/52 +70/80 |
| T52 | Removal | | | |
| T53 | Distribution | 53/54a | 53/54a | 53/66a |
| T54 | Maldistribution | | | |
| T54a | Redistribution | | | |
| T55 | Spreading | 55/58+61 | 55/61 | |
| T57 | Scattering | | | |

| | | First Reduction | Second Reduction | Third Reduction |
|---|---|---|---|---|
| | [Scattering] | | | |
| T58 | Dispersion | | | |
| T59 | Dissipation | 59/59a | | |
| T59a | Non-dissipation | | | |
| T60 | Diffusion | 60 | | |
| T61 | Rarefaction | | | |
| T62 | Separating | 62/63 | 62/63 | |
| T63 | Detachment | | | |
| T66 | Disturbing | 66/66a | 66/66a | |
| T66a | Cavitating | | | |
| T68 | Concentration | 68 | 68 | 68 |
| T70 | Transfer | 70 | 70 | |
| T71 | Exchange | 71/72+80 | 71/72+80 | |
| T72 | Shuffle | | | |
| T73 | Transmission | 73 | 73/79 | |
| T74 | Conducting | 74/75 | | |
| T75 | Conduction | | | |
| T76 | Convecting | 76 | | |
| T78 | Radiation | 78/79 | | |
| T79 | Radiating | | | |
| T80 | Release | | | |
| | (Changing direction) | | | |
| T81 | Redirection + Redirecting* | 81/84 | 81/88 | 81/88 |
| T81a | Redirecting | | | |
| T82 | Switching | | | |
| T83 | Turning | | | |
| T83a | Re-entrant | | | |
| T84 | Deviation | | | |
| T85 | Reflection | 85/86 | | |
| T85b | Specular | | | |
| T85c | Echoes | | | |
| T86 | Reflecting | | | |
| T87 | Reversal | 87 | | |
| T88 | Inversion | 88 | | |
| | (Retaining) | | | |
| T88a | Continuation | 88a+89/92 | 88a/94a | 88a/105a |
| T89 | Holding | | | |
| T90 | Arrest | | | |
| T91 | Retarding | | | |
| T93 | Constraint | 93/94a | | |
| T94 | Restraint | | | |
| T94a | Restraining | | | |
| T97 | Fixing | 97 | 97/100 | |
| T98 | Joining | 98/100 | | |
| T99 | Clamping | | | |
| T100 | Coupling | | | |
| T101 | Stabilizing | 101/103 | 101/105a | |
| T101a | Destabilizing | | | |
| T102 | Stabilization | | | |
| T103 | Equilibration | | | |
| T104 | Relaxation | 104/105a | | |
| T105 | Relaxing | | | |
| T105a | Shakedown | | | |
| | (Influencing dimension) | | | |
| U1 | Increasing | 1/5a | 1/5a+8/12a | 1/12 |
| U1a | Rise | | | |
| U2 | Increase | | | |
| U2a | Jump | | | |
| U3 | Increment | | | |
| U4 | Augmentation | | | |
| U5 | Addition | | | |
| U5a | Gain | | | |
| U6 | Expansion | 6/7 | 6/7 | |
| U7 | Expanding | | | |
| U8 | Accumulation | 8/10 | | |
| U9 | Collecting | | | |
| U10 | Scooping | | | |
| U11 | Amplification | 11/12a | | |
| U12 | Magnification | | | |
| U12a | Filling | | | |
| U13 | Decreasing | 13/15a+20 | 13/23a | 13/23a |
| U14 | Decrease | | | |
| U15 | Decrement | | | |
| U15a | Drop | | | |
| U16 | Reduction | 16 | | |
| U16a | Deficit | 16a/16b | | |
| U16b | Loss | | | |
| U18 | Contraction | 18/19 | | |
| U19 | Contracting | | | |

| | | First Reduction | Second Reduction | Third Reduction |
|---|---|---|---|---|
| | [Contracting] | | | |
| U20 | Constriction | | | |
| U21 | Minimisation | 21/22 | | |
| U22 | Minimising | | | |
| U23 | Elimination | 23/23a | | |
| U23a | Omission | | | |
| U24 | Limitation | 24/25 | 24/25 | 24/25 |
| U25 | Limiting | | | |
| | (Development) | | | |
| U26 | Beginning | 26/29 | 26/29 | 26/30b |
| U27 | Starting + Start* | | | |
| U28 | Start | | | |
| U28a | Onset | | | |
| U29 | Re-start | | | |
| U30 | Stopping + Cessation | 30/30b | 30/30b | |
| U30a | Completion | | | |
| U30b | Rounding (off) | | | |
| U31 | Source | 31/31a | 31/31a | 31/46 |
| U31a | Providing | | | |
| U32 | Derivation | 32/34+38 | 32/38 | |
| U33 | Originating | | | |
| U34 | Initiating | | | |
| U35 | Induction | 35 | | |
| U36 | Generation | 36/37 | | |
| U36a | Generating | | | |
| U37 | Formation | | | |
| U38 | Appearance | | | |
| U40 | Propagation | 40/41 | 40/45 | |
| U41 | Propagating | | | |
| U42 | Excitation | 42/45 | | |
| U43 | Parasitic | | | |
| U44 | Exciting | | | |
| U45 | De-excitation | | | |
| U46 | Growth | 46/48 | 46/48 | 46/51d +55 |
| U48 | Development | | | |
| U49 | Conservation | 49/51 | 49/51 | |
| U49a | Sustaining | | | |
| U50 | Maintenance | | | |
| U51 | Lubrication | 51a/51d | 51a/51d | |
| U51a | Protection | | | |
| U51b | Waterproofing | | | |
| U51c | Sealing | | | |
| U51d | Shielding | | | |
| U52 | Decay | 51/53d | 51/53d | 52/53d |
| U53 | Degeneration | | | |
| U53a | Decaying | | | |
| U53b | Weakening | | | |
| U53c | Yielding | | | |
| U53d | Failing | | | |
| U55 | Recovery | 55 | 55 | |
| | (Technical operations and processes (general)) | | | |
| U59 | Process | 59/61 | 59/61+67/69 | 59/63a +67/69 |
| U60 | Operation + Operating* | | | |
| U61 | Operating | | | |
| U62 | Method + Technique | 62/63a | 62/63a | |
| U62a | Treatment | | | |
| U63 | Routine | | | |
| U63a | Procedure | | | |
| U64 | Design | 64/65 | 64/65 | 64/66a |
| U65 | Matching | | | |
| U66 | Construction | 66/66a | 66/66a | |
| U66a | Output | | | |
| U67 | Storage | 67/68 | | |
| U68 | Storing | | | |
| U69 | Supplying | 69 | | |
| U70 | Control | 70/72 | 70/72+74/75 | 70/77 |
| U71 | Controlling | | | |
| U71a | Regulation | | | |
| U72 | Optimisation | | | |
| U73 | Correction | 73 | 73 | |
| U74 | Prevention | 74/75 | | |
| U75 | Suppression | | | |
| U76 | Response | 76/77 | 76/77 | |
| U77 | Feedback | | | |
| U78 | Economics | 78/80 | 78/82 | 78/83 |
| U79 | Cost | | | |
| U79a | Penalty | | | |

| | | First Reduction | Second Reduction | Third Reduction |
|---|---|---|---|---|
| | [Penalty] | | | |
| U80 | Saving | | | |
| U81 | Application | | | |
| U82 | Use | | | |
| U83 | Code | | | |
| U85 | Research + Investigation + Study (Operations) | 85 | 85 | 85 |
| U86 | Classification | 86/87+92/92a +96 | 86/87+92/92c +96 | 86/92c |
| U87 | Comparison | | | |
| U88 | Analysis | 88/91 | 88/91 | |
| U89 | Analytic [operations] | | | |
| U90 | Analytical | | | |
| U91 | Segmentation | | | |
| U92 | Deduction | | | |
| U92a | Synthesis | | | |
| U92b | Idealization | 92b/92c | | |
| U92c | Simplification | | | |
| U93 | Estimation | 93/95 | 93/95 | 93/97 |
| U94 | Estimate | | | |
| U95 | Assessment | | | |
| U96 | Evaluation | | | |
| U97 | Prediction | 97 | 97 | |
| U98 | Determination | 98/101 | 98/101 | 98/106 |
| U99 | Tracing | | | |
| U100 | Traverse | | | |
| U101 | Resolution | | | |
| U102 | Measurement | 102/104 | 102/104 | |
| U103 | Quantitative | | | |
| U104 | Qualitative | | | |
| U105 | Verification | 105/106 | 105/106 | |
| U106 | Proof (test) | | | |
| V1 | Experiment + Experimental* | 1/2 | 1/2 | 1/9 |
| V2 | Experimental | | | |
| V3 | Observation | 3/7 | 3/9 | |
| V4 | Detection | | | |
| V5 | Recording | | | |
| V6 | Counting | | | |
| V7 | Reading | | | |
| V7a | Simulating | 7a/9 | | |
| V8 | Simulation | | | |
| V9 | Representation | | | |
| V9a | Visual (methods) +Visualization* | 9a/13 +25a/25b | 9a/25b | 9a/25b |
| V10 | Visualization | | | |
| V11 | Spectrography | | | |
| V12 | Stroboscopic | | | |
| V13 | Shadowgraph | | | |
| V14 | Photography | 14/16 | | |
| V16 | Photorecording | | | |
| V17 | Schlieren | 17/18 | | |
| V18 | Spark | | | |
| V19 | Interferometry | 19/25 | | |
| V20 | Interferometric | | | |
| V21 | Interferogram | | | |
| V22 | Isopycral (chart) | | | |
| V23 | (fringe) Shift | | | |
| V24 | Strioscopy | | | |
| V25 | Interferential | | | |
| V25a | Clay | | | |
| V25b | China | | | |
| | (Model tests) | | | |
| V25c | Focal (point method) | 25c/28 | 25c/28 | 25c/28 |
| V27 | Lockheed | | | |
| V28 | Tuft | | | |
| | (Operations) | | | |
| V29B | Calibration | 29b/29ga | 29b/29ga | 29b/29ga |
| V29C | Lighting | | | |
| V29E | Supporting + Carrying | | | |
| V29F | Jacking | | | |
| V29G | Tap | | | |
| V29GA | Forcing | | | |
| V29H | Theory +Theoretical*+Philosophy*+Descriptive* | 29h/29hc | 29h/29hc | 29h/29r |
| V29HA | Theoretical | | | |
| V29HB | Philosophy | | | |
| V29HC | Descriptive | | | |
| V29I | Generalized | 29i/291 | 29i/291 | |
| V29J | Unified | | | |
| V29K | Linearized | | | |
| V29L | Linearization | | | |

| | | First Reduction | Second Reduction | Third Reduction |
|---|---|---|---|---|
| | [Linearization] | | | |
| V29M | Rule + Law + Principle | 29M/29R | 29M/29R | 30/57 |
| V29N | Hypothesis | | | +87 |
| V29O | Assumption | | | |
| V29OA | Assuming | | | |
| V29P | Expression | | | |
| V29Q | Analogy | | | |
| V29R | Analogue | | | |
| V30 | Mathematical (operations) | 30/34a+43 | 30/34a+43 | |
| V31 | Calculation | +87 | +46/51 | |
| V31a | Calculating | | +54/56 | |
| V31b | Calculated | | +87 | |
| V32 | Compute | | | |
| V33 | Computation | | | |
| V34 | Computational | | | |
| V34a | Formulation | | | |
| | (Methods) | | | |
| | (Analytical) | | | |
| V36 | Exact | 36/38+42 | 36/38+42 | |
| V37 | Inverse | | | |
| V38 | Semi-inverse | | | |
| | (Approximate) | | | |
| V41 | Variational | 41 | 41 | |
| V42 | Semi-analytical | | | |
| V43 | Graphical | | | |
| V44 | Numerical | 44/45 | 44/45 | |
| V45 | Semi-numerical | | | |
| V46 | Interpolation | 46/48+51+56 | | |
| V47 | Interpolative | | | |
| V47a | Extrapolated | | | |
| V48 | (Curve) Fitting | | | |
| V49 | Plotting | 49/50 | | |
| V50 | Plot | | | |
| V51 | Bestfit (curve) | | | |
| V52 | Iteration | 52/53 | 52/53 | |
| V53 | Iterative + Step-by-step | | | |
| V54 | Relaxational | 54/55 | | |
| V55 | Over-relaxational | | | |
| V56 | Smoothing | | | |
| V57 | Integration | 57 | 57 | |
| | [Agents in mathematical operations] | | | |
| V58 | Computer | 58/61a | 58/64 | 58/64 |
| V59 | Digital | | | |
| V59a | Dence | | | |
| V59b | Eniac | | | |
| V59c | Univac | | | |
| V59d | Pace | | | |
| V59e | NGTE | | | |
| | (Analogue) | | | |
| V60 | Correlator | | | |
| V61 | Simulator | | | |
| V61a | Analyzer | | | |
| | (Operations) | | | |
| V62 | Programming | 62/64 | | |
| V63 | Programme | | | |
| V64 | Algorithm | | | |
| | (Elements, etc. in mathematics) | | | |
| V65 | Problem | 65 | 65 | 65/84 |
| V66 | Parameter | 66 | 66/72+74/76 | |
| V67 | Co-ordinate | 67/68a | | |
| V68 | Ignorable | | | |
| V68a | Ordinate | | | |
| V69 | Replacement | 69/72+74/76 | | |
| V70 | Term | | | |
| V71 | Termwise | | | |
| V72 | Root | | | |
| V73 | Value | 73 | 73 | |
| V74 | Pivotal (point) | | | |
| V74a | Exponent | | | |
| V75 | Formula | | | |
| V76 | Quadrature | | | |
| V77 | Solution | 77+82/83 | 77+82/83a | |
| V78 | Approximate | 78/79d | 78/79d | |
| V79 | Approximating | | | |
| V79a | Tending | | | |
| V79b | Approximation | | | |
| V79c | Inscribed | | | |
| V79d | Circumscribed | | | |
| V80 | Similar | 80/81 | 80/81 | |

| | | First Reduction | Second Reduction | Third Reduction |
|---|---|---|---|---|
| | [Similar] | | | |
| V81 | Similarity | | | |
| V82 | Integrable | | | |
| V83 | Integrating | | | |
| V83a | Integrative | | | |
| V84 | Theorem | 84 | 84 | |
| V85 | Dimensional (analysis) | 85/86 | 85/86 | 85/86 |
| V86 | Scaling (law) | | | |
| V87 | Multiplication | | | |
| V88 | Algebraic | 88+90/92 | 88+90/94 | 88/98a |
| V89 | Equation | 89 | 89 | |
| V90 | Biharmonic | | | |
| V91 | Compatibility | | | |
| V91a | Transcendental | | | |
| V92 | Telegraph | | | |
| V93 | Polynomial | 93 | | |
| V94 | Matrix | 94 | | |
| V95 | Transformation | 95/98a | 95/98a | |
| V96 | Transform | | | |
| V97 | Conformal | | | |
| V98 | Mapping | | | |
| V98a | Transversality (condition) | | | |
| | (Analysis) | | | |
| V99 | Calculus | 99/103 | 99/103 | 99/103 |
| V100 | Tensor | | | |
| V100a | Operational | | | |
| V100b | Transcendant | | | |
| V102 | Eigenvalue | | | |
| V103 | Eigenfunction | | | |
| V104 | Function | 104/109 | 104/109 | 104/109 |
| V104a | Logarithmic | | | |
| V104b | Exponential | | | |
| V105 | Hypergeometric | | | |
| V106 | Confluent | | | |
| V106a | Sine (law) | | | |
| V107 | Bei | | | |
| V108 | Ber | | | |
| V109 | (Joint) Acceptance | | | |
| V110 | Trigonometric | 110 | 110 | 110 |
| V111 | Statistics | 111/115+119 | 111/115+119 | 111/119 |
| V111a | Probability | | | |
| V111b | Coverage | | | |
| V112 | Statistical | | | |
| V112a | Averaging | | | |
| V113 | Sampling | | | |
| V114 | Weighting | | | |
| V115 | Superposition | 116/118 | 116/118 | |
| V116 | Correlation + Relation + Relationship | | | |
| V116a | Correlogram | | | |
| V117 | Autocorrelation | | | |
| V118 | Autocorrelogram | | | |
| V119 | Stochastic | | | |
| | (Common properties) | | | |
| Wa | Property + characteristic + Quality* | a/b | a/b | a/20a |
| Wb | Quality | | | |
| W1 | Structural | 1 | 1 | |
| W2 | Isotropic | 2/5 | 2/5 | |
| W3 | Orthotropic | | | |
| W4 | Anisotropic | | | |
| W4a | Anisotropy | | | |
| W5 | Aelotropic | | | |
| W6 | Composition | 6+7 | 6/10+13/17 | |
| W7 | Complex | 7/10 | | |
| W8 | Composite | | | |
| W9 | Compound | | | |
| W10 | Multi-component | | | |
| W11 | Mixture | 11/12 | 11/12 | |
| W12 | Stoichiometric | | | |
| W13 | Homogeneous | 13 | | |
| W14 | Inhomogeneous | 14/16 | | |
| W15 | Non-homogeneous | | | |
| W16 | Heterogeneous | | | |
| W17 | Multiphase | | | |
| W19 | Integral | 19 | 19 | |
| W20 | Sectional | 20/20a | 20/20a | |
| W20a | Multi-sectional | | | |

| | | First Reduction | Second Reduction | Third Reduction |
|---|---|---|---|---|
| | [Multi-sectional] | | | |
| | (Results of action) | | | |
| | (Influenced, altered) | | | |
| W21 | Applied | 21/21b | 21/21b | 21/37 |
| W21a | Affected | | | |
| W21b | Processed | | | |
| W23 | Modulated | | | |
| W24 | Modified | | | |
| W25 | Revised | 25/26 | | |
| W26 | Improved | | | |
| W27 | Transformed | 27 | 27/32a | |
| W28 | Combined + Merged | 28/29 | | |
| W29 | Integrated | | | |
| W30 | Mixed | 30/32a | | |
| W31 | Premixed | | | |
| W32a | Unchanged | | | |
| W33 | Bifurcated | 33 | 33+37 | |
| W35 | Ablated | 35/36 | 35/36 | |
| W36 | Non-ablating | | | |
| W37 | Filtered | 37 | | |
| | (State altered) | | | |
| W38 | Fluidized | 38/40 | 38/40 | 38/48 |
| W39 | Dissolved | | | |
| W40 | Absorbed | | | |
| W42 | Ignited | 42/43 | 42/43 | |
| W43 | Burned | | | |
| W44 | Dissociated | 44 | 44/48 | |
| W46 | Undissociated | 46 | | |
| W47 | Ionized + Changed | 47 | | |
| W48 | Frozen | 48 | | |
| | (Dimensions altered) | | | |
| W52 | Damped | 52/54 | 52/54 | 52/58 |
| W53 | Impeded | | | |
| W54 | Obliterated | | | |
| W55 | Increased | 55/57 | 55/57 | |
| W56 | Boosted | | | |
| W57 | Scooped | | | |
| | (Position, etc., altered) | | | |
| W59 | Removed | 59/61 | 59/69 | 59/72a |
| W60 | Transferred | | | |
| W61 | Convected | | | |
| W62 | Distributed + Spread | 62/64a | | |
| W63 | Dispersed | | | |
| W64 | Displaced | | | |
| W64a | Diffuse | | | |
| W65 | Detached | 65 | | |
| W66 | Attached | 66 | | |
| W67 | Disturbed | 67/68a | | |
| W68 | Perturbed | | | |
| W68a | Washed | | | |
| W69 | Undisturbed | 69 | | |
| W70 | Concentrated | 70/72a | 70/72a | |
| W70a | Imposed | | | |
| W71 | Superimposed | | | |
| W72 | Piled | | | |
| W72a | Lumped | | | |
| | (Direction altered) | | | |
| W73 | Yawed | 73 | 73/78 | 73/78 |
| W74 | Unyawed | 74 | | |
| W76 | Reflected | 76 | | |
| W77 | Reversed | 77 | | |
| | (Held, retained) | | | |
| W78a | Prevented | 78a/84 | 78a/84 | 78a/84 |
| W79 | Restrained | | | |
| W79a | Restricted | | | |
| W81 | Stabilized | | | |
| W83 | Unretarded | | | |
| W84 | Resisted | | | |
| | (Result of various forces) | | | |
| W85 | Loaded | 85/89a | 85/89a | 85/89a |
| W86 | Forced | | | |
| W87 | Subjected | | | |
| W88 | Controlled | | | |
| W89 | Directed | | | |
| W89a | Governed | | | |
| | (By direction) | | | |

| | | First Reduction | Second Reduction | Third Reduction |
|---|---|---|---|---|
| | [(By direction)] | | | |
| W90 | Deflected | 90/93 | 90/93 | 90/93 |
| W91 | Sheared | | | |
| W92 | Inflected | | | |
| W93 | Twisted | | | |
| W94 | Compressed | 94 | 94 | 94/102 |
| W96 | Driven | 96/98a | 96/102 | |
| W97 | Propelled | | | |
| W98 | Launched | | | |
| W98a | Projected | | | |
| W99 | Injected | 99/100 | | |
| W100 | Blown | | | |
| W101 | Emitted | 101/102 | | |
| W101a | Tapped | | | |
| W102 | Extruded | | | |
| | (Shape altered) | | | |
| W103a | Deformable | 103a/105 | 103a/109 | 103a/X1 |
| W104 | Deformed | | | |
| W105 | Warped | | | |
| W106 | Buckled | 106/108 | | |
| W107 | Unbuckled | | | |
| W108 | Prebuckled | | | |
| W111a | Rolled | 111a | 111a | |
| X1 | Thickened | 1 | 1 | |
| | (Chemical/Physical properties) | | | |
| X6 | Combustible | 6/8 | 6/11 | 6/11 |
| X7 | Non-flammable | | | |
| X8 | Non-toxic | | | |
| X9 | Dry | 9/11 | | |
| X10 | Humidity | | | |
| X11 | Dewpoint | | | |
| X14 | Strong | 14/14b | 14/14b | 14/14b |
| X14b | Weak | | | |
| | (Origin, source) | | | |
| X14c | Accidental | 14c/16a | 14c/16a | 14c/16a |
| X15 | Artificial | | | |
| X15a | Artificially | | | |
| X16 | Natural | | | |
| X16a | Nature | | | |
| X17a | Introduced | 17a/20+23a/23b | 17a/20 +22/23b | 18/23b |
| X17b | Obtained | | | |
| X17c | Caused | | | |
| X17d | Due | | | |
| X18 | Generated | | | |
| X18a | Initiated | | | |
| X19 | Formed | | | |
| X19a | Composed | | | |
| X20 | Developed | | | |
| X21 | Induced | 21 | 21 | |
| X22 | Excited | 22 | | |
| X23 | Simulated | 23 | | |
| X23a | Terminated | | | |
| X23b | Ended | | | |
| X24 | Frictional | 24 | 24 | 24/28 |
| X25 | Mechanical | 25/26a | 25/26a | |
| X26 | Hydrostatic | | | |
| X26a | Pneumatic | | | |
| X28 | Gravitational | 28 | 28 | |
| | (Properties of processes) | | | |
| X30 | Eccentricity | 30 | 30 | 30/35 |
| X32 | Circulatory | 32/32a | 32/35 | |
| X32a | Rotatory | | | |
| X33 | Non-circulatory | 33/35 | | |
| X35 | Translational | 36 | 36/39 | 36/39 |
| X36 | Oscillatory | | | |
| X37 | Vibrational | 37/39 | | |
| X38 | Vibrationally | | | |
| X39 | Vibratory | | | |
| X40 | Automatic | 40/41b | 40/42 | 40/42 |
| X41 | Self-adjusting | | | |
| X41a | Self | | | |
| X41b | Auto | | | |
| X42 | Corrective | 42 | | |

| | [Corrective] | First Reduction | Second Reduction | Third Reduction |
|---|---|---|---|---|
| X44 | Dissipative | 44/45+53 | 44/47+53 | 44/53 |
| X45 | Non-dissipative | | | |
| X47 | Diffusivity | 47 | | |
| X48 | Conductive | 48/51+52a | 48/52a | |
| X48a | Conductivity | | | |
| X51 | Non-conducting | | | |
| X52 | Convective | 52 | | |
| X52a | Radiative | | | |
| X53 | Emissivity | | | |
| X55 | Compressive | 55 | 55 | 55 |
| X56 | Incipient | 56/56a | 56 | 56/67a |
| X56a | Embryonic | | | |
| X57 | Progressive | 57/58 | 57/58+63/65 | |
| X58 | Cumulative | | | |
| X59 | Reversibility | 59/60 | 59/60 | |
| X60 | Irreversible | | | |
| X63 | Extensible | 63/64 | | |
| X63a | Extendible | | | |
| X64 | Developable | | | |
| X65 | Incremental | 65 | | |
| X66 | Redundant | 66/67a | 66/67a | |
| X67 | Residual | | | |
| X67a | Remain | | | |
| X68 | Steady | 68/69 | 68/75 | 68/75 |
| X69 | Quasi-steady | | | |
| X70 | Continuous | 70/72a | | |
| X71 | Continuously | | | |
| X72 | Continuity | | | |
| X72a | Sustained | | | |
| X73 | Constant | 73+75 | | |
| X74 | Uniform | 74/74d | | |
| X74a | Uniformity | | | |
| X74b | Uniformly | | | |
| X74c | Regular | | | |
| X74d | Unperturbed | | | |
| X75 | Invariant | | | |
| X75a | Non-uniformly | 75a/79 | 75a/88 | 75a/88 |
| X75b | Non-uniformity | | | |
| X76 | Unsteady | | | |
| X76a | Quasi-unsteady | | | |
| X77 | Unsteadily | | | |
| X78 | Unsteadiness | | | |
| X79 | Nonsteady | | | |
| X80 | Discontinuous | 80/82 | | |
| X81 | Discrete | | | |
| X82 | Discontinuity | | | |
| X83 | Irregularity | 83/85 | | |
| X84 | Uneveness | | | |
| X85 | Erratic | | | |
| X86 | Variable | 86 | | |
| X88 | Non-monotonic | 86 | | |
| X89 | Negatively | 89/90 | 89/92 | 89/92 |
| X89a | No | | | |
| X89b | Not | | | |
| X90 | Negative | | | |
| X90a | Non-negative | 90a/91 | | |
| X91 | Positive | | | |
| X92 | Neutral | 92/92c | | |
| X92a | Adverse | | | |
| X92b | Favourable | | | |
| X92c | Good | | | |
| X93 | Rest | 93/94+96/97 | 93/97 | 93/107 |
| X93a | Resting | | | |
| X94 | Stagnant | | | |
| X95 | Stationary | 95 | | |
| X96 | Dead | | | |
| X97 | Still | | | |
| X98 | Static | 98/98a | 98/98a | |
| X98a | Statically | | | |
| X99 | Immobile | 99/102 | 99/102 | |
| X99a | Motionless | | | |
| X100 | Passive | | | |
| X101 | Non-reactive | | | |
| X101a | Non-reacting | | | |
| X102 | Inert | | | |

| | | First Reduction | Second Reduction | Third Reduction |
|---|---|---|---|---|
| | [Inert] | | | |
| X103 | Stable | 103/104a | 103/104a | |
| X104 | Bistable | 104b/104e | 104b/104e | |
| X104b | Movable | | | |
| X104c | Allmovable | | | |
| X104d | Immovable | | | |
| X104e | Allmoving | | | |
| | [Active] | | | |
| X106 | Active | 106/107 | 106/107 | |
| X107 | Reactive | 106/107 | 106/107 | |
| | [General relations] | | | |
| X110 | Absolute | 110 | 110/112a | 110/119 |
| X111 | Relative | 111/112a | | |
| X112 | Relativistic | | | |
| X112a | Relatively | | | |
| X113 | Containment | 113 | 113/119 | |
| X115 | Correlation | 115/119 | | |
| X115a | With | | | |
| X115b | Corresponding | | | |
| X115c | Applicability | | | |
| X116 | Correlated | | | |
| X117 | Connected | | | |
| X118 | Associated | | | |
| X119 | Coupled | | | |
| | [Sequence and Rank (General relations)] | | | |
| H81 | Order | 81 | 81+84a/90 | 81/92 |
| H81a | Preliminary | 81a/84 | 81a/84 | |
| H82 | First + Initial | | | |
| H82a | Initially | | | |
| H82b | Originally | | | |
| H83 | Primary + Major + Main | | | |
| H84 | Semi-major | | | |
| H84a | Minor | 84a/85a | | |
| H85 | Second + Secondary | | | |
| H86 | Third | 86/87 | | |
| H87 | Cubic | | | |
| H88 | Fourth | 88/9 | | |
| H89 | Quartic | | | |
| H89a | Fifth | 89a | | |
| H89b | Sixth | 89b | | |
| H90 | Seventh | 90 | | |
| H90a | Eighth | 90a | | |
| H91 | Final | 91/92 | 91/92 | |
| H92 | Terminal | | | |
| H93 | Auxiliary | 93 | 93 | 93/94 |
| H94 | Intermediate | 94 | 94 | |
| | (Dimensional properties) | | | |
| M1 | Dimensional | 1/2a | 1/2a+8 | 1/8 |
| M2 | Geometric | | | |
| M2a | Dimensionless | | | |
| M3 | One-dimensional + Linear | 3/3b | 3/3b | |
| M3a | Linearly | | | |
| M3b | Quasi-one-dimensional | | | |
| M4 | Non-linear | 4/5 | 4/5 | |
| M5 | Non-linearly | | | |
| M6 | Two-dimensional | 6/6a | 6/6a | |
| M6a | Two-dimensions | | | |
| M7 | Three-dimensional | 7/7a | 7/7a | |
| M7a | Three-dimensionality | | | |
| M8 | Non-dimensional | 8 | 8 | |
| M21 | High + Highly*+Higher*+Elevated* | 21/22c | 21/24 | 21/27a |
| M22 | Highly | | | |
| M22a | Higher | | | |
| M22b | Elevated | | | |
| M22c | Ultrahigh | 23/24 | | |
| M23 | Critical | | | |
| M24 | Supercritical | | | |
| M25 | Low + Small + Reduced | 25 | 25 | |
| | [Magnitude] | | | |
| M28 | Dense | 28 | 28/28b | 28/28b |
| M28a | Lightly | 28a/28g | +28g | +28g |
| M28b | Heavy | 28b | | |
| M28c | Intensity | 28c/28d | 28c/28f | 28c/28f |
| M28d | Intense | | | |
| M28e | Severe | 28e/28f | | |
| M28f | Severely | | | |
| M28g | Light + Lightweight | | | |
| M29 | Quantity + Amount | 29/30 | 29/30 | 29/31b |
| M30 | Content | | | +65a/65b |

| | | First Reduction | Second Reduction | Third Reduction |
|---|---|---|---|---|
| | [General relations] | | | |
| | [Magnitude] | | | |
| | [Content] | | | |
| M31 | Degree | 31/31b | 31/31b | |
| M31a | Percentage | | | |
| M31b | Semi | | | |
| M32 | Single | 32/34 | 32/34 | 32/29b |
| M33 | Singly | | | +57/65 |
| M34 | Singular | | | |
| M35 | Multi + Multiple | 35 | 35/39b | |
| M36 | Double | 36/39b | | |
| M37 | Dual | | | |
| M38 | Binary | | | |
| M39 | Pair | | | |
| M39a | Twin | | | |
| M39b | Conjugate | | | |
| M40 | Finite | 40/41 | 40/41 | 40/43d |
| M41 | Limited | | | |
| M42 | Semi-infinite | 42 | 42 | |
| M43 | Infinite | 43/43d | 43/43d | |
| M43a | Infinity | | | |
| M43b | Infinitely | | | |
| M43c | Infinitesimal | | | |
| M43d | Infinitesimally | | | |
| M44 | Minimum | 44 | 44 | 44/56 |
| M45 | Mean | 45 | 45 | |
| M46 | Maximum + Maxima | 46 | 46/46b | |
| M46b | Optimal | 46b | | |
| M47 | Least | 47/47d | 47/47d | |
| M47a | Less-than | | | |
| M47b | Negligible | | | |
| M47c | Vanishingly | | | |
| M47d | Slightly | | | |
| M48 | Partially + Partly | 48/48a | 48/48a | |
| M48a | Partial | | | |
| M49 | Fully | 49/52 | 49/56 | |
| M50 | Full | | | |
| M51 | Completely | | | |
| M51a | Entirely | | | |
| M51b | Very | | | |
| M52 | Complete | | | |
| M53 | Total | 53/55a | | |
| M54 | Overall | | | |
| M55 | Collective | | | |
| M55a | Excess | | | |
| M56 | Extreme | 56 | | |
| M57 | Number | 57/57b | 57/65 | |
| M57a | Zero | +60/65 | | |
| M57b | Non-zero | | | |
| M58 | One | 58/59a | | |
| M59 | Unit | | | |
| M58a | Unity | | | |
| M60 | Two | | | |
| M61 | Three | | | |
| M63 | Four | | | |
| M64 | Five | | | |
| M65 | Six | | | |
| M65a | Net | 65a/65b | 65a/65b | |
| M65b | Gross | | | |
| M65c | Arrangement | 65c/68 | 65c/68 | 65c/71a |
| M66 | Configuration | | | |
| M67 | Layout | | | |
| M68 | Pattern | | | |
| M71 | Combination | 71/71a | 71/71a | |
| M71a | Collocation | | | |
| M72 | Ordered | 72/72b | 72/72b | 72/73 |
| M72a | Systematic | | | |
| M72b | Graded | | | |
| M72c | Arbitrary | 72c/73 | 72c/73 | |
| M72d | Arbitrarily | | | |
| M73 | Random | | | |

| | | First Reduction | Second Reduction | Third Reduction |
|---|---|---|---|---|
| | [Random] | | | |
| Y1 | Equivalence | 1/3b | 1/3b | 1/3b |
| Y2 | Equivalent | | | |
| Y3 | Equally | | | |
| Y3a | Equal | | | |
| Y3b | Equality | | | |
| Y5 | Complementary | 5/6b | 5/6b | 5/17a |
| Y6 | Mutual | | | |
| Y6a | Reciprocity | | | |
| Y6b | Reciprocal | | | |
| Y7 | Dependence | 7/9 | 7/9b | |
| Y8 | Dependent | | | |
| Y9 | Dependant | | | |
| Y9a | Incident | 9a/9b | | |
| Y9b | Coincident | | | |
| Y10 | Proportional | 10/11 | 10/11+14/16 | |
| Y11 | Proportion | | | |
| Y13 | Ratio | 13 | 13 | |
| Y14 | Modulus | 14/16 | | |
| Y15 | Secant | | | |
| Y16 | Tangent | | | |
| Y17 | Coefficient | 17 | 17/17a | |
| Y17a | Derivative | 17a | | |
| Y19 | Similitude | 19/23 | 19/24b | 19/24b |
| Y19a | Analogous | | | |
| Y19b | Alternative | | | |
| Y19c | Substitute | | | |
| Y22 | Quasi | | | |
| Y23 | Pseudo | | | |
| Y24 | Consistent | 24/24b | | |
| Y24a | Valid | | | |
| Y24b | True | | | |
| Y25 | Difference | 25/26+28/29 | 25/26+28/31 | 25/31b |
| Y26 | Different | | | |
| Y27 | Differential | 27 | 27 | |
| Y28 | Differentially | | | |
| Y29 | Differing | | | |
| Y30 | Unequal | 30/31 | | |
| Y31 | Inequality | | | |
| Y31a | Foreign | 31a/31b | 31a/31b | |
| Y31b | Non-similar | | | |
| Y32 | Independence | 32/33a | 32/33a+37/37a | 32/39 |
| Y33 | Independent + Free + Uncoupled | | | |
| Y33a | Unsupported | | | |
| Y35 | Freely | 35/36a | 35/36a | |
| Y36 | Freedom | | | |
| Y36a | Buoyancy | | | |
| Y37 | Singularity | 37/37a | | |
| Y37a | Individual | | | |
| Y38 | Without | 38/39 | 38/39 | |
| Y39 | Absence | | | |
| | (Abstract concepts) | | | |
| Y40 | Phenomena | 40/40a | 40/40a | 40/40a +43/48 |
| Y40a | Phenomenological | | | |
| Y41 | System | 41/42d | 41/42d | 41/42d |
| Y42 | Group | | | |
| Y42a | Type | | | |
| Y42b | Species | | | |
| Y42c | Set | | | |
| Y42d | Member | | | |
| Y43 | Concept | 43 | | |
| Y44 | Criterion | 44/47 | 44/47 | |
| Y45 | Reference | | | |
| Y47 | Ultimate | | | |
| Y48 | Best | 48 | 48 | |
| Y48a | Input | 48a/48d | 48a/48d | 48a/48d |
| Y48b | Output | | | |
| Y48c | Yield | | | |
| Y48d | Target | | | |
| Y49 | Data | 49/52 | 49/52 | 49/52 |
| Y49a | Product | | | |
| Y50 | Result | | | |
| Y51 | Resultant | | | |
| Y51a | Resulting | | | |

| | | First Reduction | Second Reduction | Third Reduction |
|---|---|---|---|---|
| | [Resulting] (Form of information) | | | |
| Y52 | Record | | | |
| Y52a | Description | 52a+53/58b | 52a/58b | 52a/60 |
| Y53 | Diagram | | | |
| Y55 | Chart | | | |
| Y55a | Table | | | |
| Y55b | Tabulation | | | |
| Y57 | Survey | | | |
| Y57a | Art (state of) | | | |
| Y58 | Review | | | |
| Y58a | Bibliography | | | |
| Y58b | Literature | | | |
| Y59 | Index | 59 | 59/60 | |
| Y60 | Trace | 60 | | |
| | (Curves, etc.) | | | |
| Y60a | Polar | 60a | 60a/65 | 60a/65 |
| Y61 | Hodograph | 61/65 | | |
| Y62 | Isobar | | | |
| Y63 | Vector | | | |
| Y64 | Isogon | | | |
| Y65 | U-R (velocity-distance) | | | |
| | [Abstract concepts] | | | |
| Y68 | Empirical | 68/68a | 68/68a | 68/68a +80/86a |
| Y68a | Semi-empirical | | | |
| Y70 | Hypothetical | 70/73a+79/79b | 70/79b | 70/79b |
| Y71 | Ideal | | | |
| Y72 | Idealized | | | |
| Y73 | Perfect | | | |
| Y73a | Perfectly | | | |
| Y74 | Simplified | 74/76a | | |
| Y75 | Simply | | | |
| Y76 | Simple | | | |
| Y76a | Elementary | | | |
| Y77 | Pure | 77 | | |
| Y78 | Optimum | 78 | | |
| Y79 | Apparent | | | |
| Y79a | Assumed + Given | | | |
| Y79b | Expressible | | | |
| Y80 | Actual | 80/83 | 80/86a | |
| Y81 | Practical | | | |
| Y82 | Imperfect | | | |
| Y83 | Non-perfect | | | |
| Y84 | Working | 84/85 | | |
| Y85 | Real | | | |
| Y86 | Effective | 86/86a | | |
| Y86a | Ordinary | | | |
| Y86b | General | 86b/88 | 86b/91a | 86b/99 |
| Y86c | Normally | | | |
| Y87 | Standard | | | |
| Y88 | Average | | | |
| Y89 | Classical | 89/89a | | |
| Y89a | Conservativeness | | | |
| Y91 | Basic | 91/91a | | |
| Y91a | Plain | | | |
| Y93 | Required | 93/94 | 93/94 | |
| Y93a | Appropriate | | | |
| Y94 | Requirement | | | |
| Y95 | Preferential | 95/96 | 95/96 | |
| Y96 | Selected | | | |
| Y98 | Specific | 98/98a | 98/98a | 98/100 |
| Y98a | Particular | | | |
| Y99 | Measured | 99/100 | 99/100 | |
| Y99a | Valued | | | |
| Y100 | Calibrated | | | |
| Z1 | Efficiency | 1/2 | | |
| Z1a | Efficient | | | |
| Z2 | Effectiveness | | | |
| Z3 | Accuracy | 3/3a | | |
| Z3a | Accurate | | | |
| Z4 | Capability | 4/5 | | |
| Z5 | Capacity | | | |
| Z6 | Deficiency | 6/8a | | |
| Z7 | Defect | | | |
| Z8 | Imperfection | | | |
| Z8a | Inclusion [in crystal] | | | |
| Z9 | Error | 9/10 | | |
| Z10 | Aberration | | | |

# APPENDIX 5.4

## SIMPLE CONCEPT HIERARCHIES

The schedules include the concepts used in the indexing of the sub-set of 200 documents as given in Appendix 3E.
The concepts are in natural uncontrolled language.
Notation is purely ordinal, and in no way reflects the relations between the concepts represented.
Plus signs indicate synonyms.
Certain concepts appeared in the sub-set of test questions, but did not occur in the indexing of the documents. Such concepts have been included and are followed by the letter 'Q'.

Summary of the main sections

| | |
|---|---|
| | [Bodies, Structures] |
| A2 | Aircraft types |
| | [Parts of Aircraft] |
| A79 | Airfoils; control surfaces |
| C57 | Other parts: Fuselage, panels, skin, forebody, etc. |
| E61 | Propulsion systems, etc. |
| E64 | Compressors |
| G5 | Ducts: pipes, nozzles |
| H17x | Bodies |
| H43 | By shape, etc. |
| J35 | Non aerodynamic structures: pivots, beams, etc. |
| J46 | Flight |
| J48 | Interplanetary flight |
| K6 | Performance |
| K43 | Flying operations |
| L5 | Fluids |
| L25 | Gases |
| L86 | Atmosphere |
| M34 | Flow |
| M42 | By speed |
| M69 | By various other characteristics |
| N64 | Boundary layer |
| O64 | Flow elements: streamline, vortices, jets, etc. |
| P27 | Jets |
| Q33 | Waves, shock waves |
| R22 | Aerodynamic forces and loads: lift, drag, moments, pressure, etc. |
| T27 | Aerodynamic processes and properties: control, stability, interference, wake, velocity, flow parameters |
| U77 | Fluid properties: density, viscosity, etc. |
| U90 | Aeroelasticity, flutter |
| V94 | Aerodynamic reference parameters: angle of attack, planform, aspect ratio, section, camber, etc. |
| W50 | Mechanics: motion, force, stress-strain phenomena |
| X4 | Heat |
| X80 | Heat transfer |
| Y35p | Kinetic theory: dissociation |
| Y76 | Research and investigation |
| Y82 | Experiment |
| Z1 | Wind tunnel |
| Z98 | Theory |
| ZA9 | Mathematics |
| ZB27 | Automatic control theory |
| ZB45 | General properties |
| ZB73 | General processes |

A1 Bodies
A2 [Airplane] Q
A3 High speed aircraft
A4 Avro-707A
A5 Aircraft structures
A6 Models of complete aircraft
A7 Tailless a.
A8 Tail-boom a.
A9 Aircraft shapes
A10 Vehicles
A11 Ballistic v. + B. Missile
A12 Winged missile
A13 Long range m.
A14 Missile oscillating in roll
A15 Space v.
A16 Satellite + S.v. + Artificial s.
A17 Earth satellite
A18 Atlas
A19 Discoverer s.
A20 Explorer 1
A22 Explorer 3
A23 Explorer 4
A24 Midas 2
A25 Sputnik 1
A26 Sputnik II
A27 Sputnik III
A28 Sputnik V
A29 Vanguard I
A30 Re-entry v. + R. body
A31 Highly cooled body
A32 Graphite r.e. body
A33 Lifting r.e. configuration
A34 Delta wing r.e. configuration
A35 Sweptback w. r.e. configuration
A36 Blunt r.e.v. + Blunted r.e. configuration
A37 Re-entry glider + R.e. glider configuration + Glide v. + Glider r.e. configuration + Glider v.
A38 Winged r.e.g. configuration
A39 [with] Wing tip panel
A40 Folding
A41 Unfolding
A42 Lifting r.e.g. configuration
A43 [Uncontrolled v.] Q
A44 Skip v.
A45 R.e.v. surfaces
A46 Test v.
A47 Probe v. + P.v. configuration + Space p.
A48 Short p.v.
A49 Sounding p. + S. rocket system
A50 Supersonic v.
A51 'S.' model
A52 Hypersonic v. + H. body

[Vehicle shapes]
A53 Arrowing v.
A54 Blunt body of revolution v.
A55 Blunt nose v.
A56 10° blunted cone v.
A57 Conical afterbody v.
A58 Flat base v.
A59 Propulsion systems
A60 Airbreathing v.
A61 Rocket p. + R.p. system + R. propelled v. + R.v.
A62 Multiple r. engine
A63 Five stage r.s.
A64 Chemical r.
A65 Liquid propellant
A66 Solid propellant + Solid fuel r.e.
A67 Electrical r.
A68 Nuclear energy source
A69 Fusion
A70 Fission
A71 Radioactive isotope
A72 Decay
A73 Arc-heating r.
A74 Magnetoplasma [r.p.]
A75 Ion [r.p.]
A76 Solar heating r.
A77 Midcourse r.
A78 Light wave propulsion + Solar sail

A79 Airfoil
A80 Lifting element
A81 Non-l. airfoil + Non-l. body
A82 Airfoil equation
A83 Two-dimensional a.
A84 Three-d. a.
A85 A. shape
A86 Wedge a.
A87 Single w.a.
A88 Double w.a.
A89 Circular arc a. + C.arc profile
A89a Biconvex a.
A90 Straightline a.
A91 Blunt nosed a.
A92 Blunt trailing edge a.
A93 Symmetrical a.
A94 Rigid a.
A95 NACA 4412 a.
A95a NACA 64A008 a.
A96 Semi-infinite plane
A97 Wing body combination + W.b. arrangement
A98 W.b. interference + W.fuselage i.
A99 [Effect of] Small span curvature of flowfield

B1 Airplane wing + W. + W.body
B2 Linearized w. theory
B3 W. model
B4 W. shapes + Arbitrary planform w. + W.p.
B5 [Simple planform w.] Q
B6 Swept w.
B7 Highly s.w.
B8 W. sweep small
B9 Sweptback w.
B10 S.w. model
B10a 45° sweptback w.
B10b S.w. 50°
B11 60° sweepback w.
B12 S. delta w.
B13 Sweptforward w.
B14 Sweptforward w. tip
B15 Unswept w. + Straight w.
B16 Triangular w. + Delta w.
B17 Near t.w.
B18 Flat t.w.
B19 Clipped d.w.
B20 T.w. with twist
B21 Rectangular w. + R.planform w.
B22 Slender r.w.
B23 Circular planform w.
B24 Curved tip planform w.
B24a Biconvex section w.
B25 Elliptical w. + Elliptic w.
B26 [with] Major/minor axis ratio 5.1
B27 Symmetrical w.
B28 S.w. thickness
B29 Tapered w.
B30 T.w. model
B31 Untapered w.
B32 Cambered w.
B33 Uncambered w.
B34 Twisted w.
B35 W. with parabolic twist
B36 Warren 12 planform
B37 Rigid w.
B38 Elastic w.
B39 Arbitrary stiffness w.
B40 Solid construction w.
B41 Cantilevered w.
B42 C.w. flutter

B43 Cropped w.
B44 Perforated w. + Hole drilled w.
B45 Sharp edge w.
B46 Sharp leading edge w.
B47 Subsonic edged w.
B48 Supersonic edged w.
B49 Two-dimensional w.
B50 Three-d. wing
B51 Long w.
B52 Wide w.
B53 Narrow w.
B54 Slender w. + Thin w.
B55 S.w. theory
B56 Not so slender w. theory
B57 Thick w.
B58 Low aspect ratio w. + L.a.r.
B59 Vanishing l.a.r.w.
B60 W. of very small a.r.
B61 High a.r.w.
B62 Finite a.r.w.
B63 Infinite a.r.w.
B64 Finite w.
B65 Finite span w.
B66 Infinite w.
B67 Infinite s.w.
B68 W. with concentrated weights
B69 W. with flaps
B70 Flat w.
B71 F. plate w.
B72 F. surface w.
B73 Flat w. surface
B74 Model w.
B75 Half w.
B76 H.w. model
[By state]
B77 Oscillating w.
B78 Harmonically o.w.
B79 Slowly o.w.
B80 Fluttering w.
B81 Pitching w.
B82 Rolling w.
B83 Rotating w.
B84 Sinking w.
B85 Lifting w.
B86 Nonlifting w.
B87 Yawed w.
B88 Loaded w.
B89 Inclined w.
B90 Laminar w.
B91 Steady w.
B92 Differentially deflected w.
B93 Spanning [a wind tunnel]
B94 Wing flow pattern + W.f. study
B95 Wing pressure distribution
B96 [Study using] Tangent wedge method
B97 Wing lift
[Characteristics]
B99 W. Chord
C1 W. thickness
C2 W. slope
C3 Plane of w.
[Parts]
C4 W. surface
C8 W. tip
C9 W.t. deflection
C10 Size [of w.t. panel]
C11 Central section + Middle s.
C12 Rear
C13 Root section
C14 R. bending moment
C15 Tail
C16 All movable t.
C17 Horizontal t.
C18 Vertical t.
C19 45° sweptback t.
C20 Unswept t. surface
C21 T. surface
C22 Tailplane [i.e. horizontal stabilizing surface]
C23 T. setting
C24 T. spanload
C25 Control surface
C26 All movable c.s.
C27 [Apex located c.] Q
C28 [Forward located c.] Q
[Rudder]
C29 R. deflection
C30 Differential r.d.
Aileron
C31 Oscillatory a. coefficients
[Elevon]
C32 E. deflection
C33 Differential e.d.
C34 Control flap
C35 Hinged f.
C36 Blowing f.
C37 Jet f.
C38 Thwaites j.f.
C39 Leading edge f.
C40 Trailing edge f.
[Slot]
C41 Slot blowing + High velocity blowing
C42 S. configuration
C43 Control surface tabs
C44 Oscillatory t. coefficient
C45 Trailing edge spoiler
[Vortex generators]
C47 Airjet v.g.
C48 Ramp type v.g.
C49 Twisted strip type v.g.
C50 Wedge type v.g.
C51 Wing type v.g.
C52 Biplane type v.g.
C53 Vane v.g.
[V.g. characteristics]
C54 Generator scale
C55 Blade design
C56 Multiple rows
C56a Control surface buzz

[Other parts]
C57 Fuselage
C58 F. sizes
C59 Panels
C60 F. panels
C61 Stringer p.
C62 Supporting stringers
C63 Stiffener p.
[Skins]
C64 Continuous s.
C65 C. fuselage s.
C66 Fused silica s.
C67 Mild steel s.
C68 Thick s. structure
C69 Thin s. structure
C70 S. thickness
C71 S. temperature
C72 S. flexibility

[Nacelle]
C73 Turbojet nacelle exit
C74 Simulated turbojet n.
[see also Choked convergent nozzle]
C75 External stores
C76 E.s. matrices
C77 Balance chamber
C78 Rocket chamber
[Forebody]
C79 F. length
C80 F. interference
C81 F. drag
C82 Bow
C83 B. shock wave + B. shock
C84 B. s. geometry
C85 Nose

C86 N. region
C87 Body n.
C88 Teflon n. piece
C89 Graphite n.
C90 Concave n.
C91 Spherical segment n.
C92 Modified s.s.n.
C93 Hemispherically nosed body + Hemispherical nose piece
C94 N. bluntness + N. blunting
C95 Blunt n. shapes
C96 Slightly blunted n.
C97 N. incidence
C98 N. drag
[Afterbody]
C99 Conical base a.
D1 Boattail
D2 B. angles
D3 Cylinder a. + Cylindrical a.
D4 Truncated a.
D5 A. surface
D6 A. drag
D7 Flat base
[Face]
D8 Forward flat f.
D9 Surface
D10 Isotropic s.
D11 Homogeneous s.
D12 Flat s.
D13 Adjacent f.s.
D14 Curved s.
D15 Flexible s. + F. boundary + Elastic surface + [S. flexibility] Q
D17 Response coefficient
D18 Elastic constant
D19 Material stiffness
D20 Dissipative f.s.
D21 Nondissipative f.s.
D22 Non dissipating s.
D23 Non-ablating s.
D24 Contact s.
D25 Surface exposed [to fluid]
D26 S. subjected to heat transfer
D27 Insulated s.
D28 S. free of stress
D29 Non catalytic body s.
D30 S. of uniform thickness
D31 Thin s.
D32 Upper s.
D33 Interior s. See also D87 Inner boundary
D34 Intersecting s.
D35 Leeward s. contribution
D36 S. of revolution
D37 Smooth s. of r.
D38 [with] Vertical axis
D39 Motion of particles
D40 [by] Influence of s. reaction
D41 Two dimensional s.
D43 S. conditions [should follow Characteristics after D73]
D44 Lifting s.
D45 L.s. theory
D46 Subsonic l.s.t.
D47 L.s. shape
D48 Upper l.s.
[Characteristics]
D49 S. flow
D50 S.f. pattern
D51 S.wave
D52 S. stresses
D53 S. shear stress
D54 S. drag
D55 S. downwash
D56 S. pressure
D57 S. isobars
D58 S.p. distribution [predicted by]
D59 Impact (Newtonian) theory prediction
D60 Local s.p.
D61 S. temperature
D62 Wall t.
D63 Adiabatic w.t. + A. surface t.
D64 Equilibrium s.t.
D65 Maximum s.t.
D66 S. combustion See also Ablation
D67 S. heat transfer distribution
D68 S. h.t. rate
D69 S. radiation
D70 Surface curvature
D71 Body s. slope
D72 S. material see also D43
S. conditions
D73 Wall
D74 Composite w. + C. slab
D75 Homogeneous w.
D76 W. thickness
D77 Finite thickness w.
D78 Plane w.
D79 Non-parallel w.
D80 Thermally thick w.
D81 Thermally thin w.
D82 Inconel w.
D83 Copper w.
D84 Boundaries
D85 Fixed b.
D86 Moving b.
D87 Inner b.
D89 Mixing b.
D90 Supersonic interface
D91 Wall conditions
D92 Boundary motion
D93 Wall interference
D94 Wind tunnel i. effects
D95 Boundary constraint + Wall c. + Tunnel c.
D96 Zero b.c.
[Effect of]
D97 Moisture condensation + Humidity
D98 Saturation vapour pressure
D99 Constant w. temperature
E1 W. temperature gradient
E2 Heat transfer at the wall
E3 W. heat flux history
[Connecting portions]
Edges
E7 Leeward e.
E8 Windward e.
E9 Leading e.
E10 L.e. shape + L.e. contour + L.e.profile
E11 Blunt l.e. + Bluntness [of l.e.] + L.e. bluntness + Bluntness effects
E12 Tip bluntness [of l.e.]
E13 Sharp l.e.
E14 Sharp nosed l.e.
E15 Elliptic l.e. contours
E16 Parabolic l.e. contours
E17 L.e. sweep 53.5°
E17a L.e. sweepback 53.5°
E18 Subsonic l.e.
E19 Nearly sonic l.e.
E20

E21 Transonic l.e.
E22 Supersonic l.e.
E23 Heat sustaining l.e.
[L.e. characteristics]
E24 L.e. diameter + L.e. radius
E25 L.e. droop
E26 L.e. roughness
E27 L.e. separation
E28 Inboard
E30 L.e. stall
E31 L.e. suction
[L.e. vortices]
E32 Location of l.e.v.
[Proximity to]
E33 Distance from l.e.
E34 Near l.e.
E35 Trailing e.
E36 Blunt t.e.
E37 Thick t.e.
E38 Thickened t.e.
E39 Supersonic t.e.
E40 T.e. pressures
E41 T.e. suction
E42 Sharp edged
E43 Corners
E44 Number and angles of c.
E45 Separation [in] corners
E46 Pivotal point
[Hole]
E47 H. pattern
E48 Spanwise h.p.
E49 Square h.p.
E50 Staggered h.p.
E51 H. diameter
E52 Orifice size
E53 H. drilling
E54 H. filling
E55 Material removed [in hole drilling]
E56 Amount
E57 Soft material [filling up hole]
[Tip]
E58 T. shock wave
E59 Initial t. [s.w.]
E60 T. vortex
E61 Propeller
E62 Models with p.
E63 P. stall flutter
E64 Compressor
E65 Centrifugal c. + Radial flow c. + Radial flow turbomachine
E66 Axial flow c. + Axial c. + A.f. turbomachine
E67 Drum construction
E68 Disk construction
E69 A.f.c. blade
E70 Naca 65(12)10 Blower b.
E71 Jumo 004
E72 Single stage c.
E73 Multi s.c.
E74 Subsonic turbomachines + S.c.
E75 Supersonic turbomachines
E76 Mixed flow c. + M.f. turbomachine
E77 Isentropic c.
E78 High pressure ratio c.
E79 Idealized c.
E80 Pump impeller
E81 Centrifugal i. + Impeller + Pump rotor + Impeller rotor
E82 Mixed flow i. + M.f. pump + M.f. rotor
E83 Axial inlet i. + A.i. pump + A.i. rotor
E84 Rocket propellant i. + R.p. pump + R.p. rotor
E85 Isentropic impeller
E86 [Pump design method] q
E87 [Simplified p. design equation] q
E88 Generalized design curve
E89 [Stage] q
E90 S. characteristics
E91 S. efficiency +
S. performance
Cascade losses
E92 S. matching
E93 Double-valued performance curves
E94 S. stacking
E95 S.s. analysis
E96 Uprating stage one
E97 Uprating stage two
E98 S. temperature rise
E99 T. coefficient
F1 S. flow coefficient
F2 High f.c.
F3 S. interaction
F4 S. stall
F5 Type of s.s.
F6 Front s. unstalled
F7 First s. stalled
F8 Root to tip
F9 [between] Adjacent main blades
F10 Single s.s.
Inlet s.
F11 Inlet conditions
F12 S. loading
F13 Division of l.
F14 Meridional plane force + Forces in m.p.
F15 Rotational forces
F16 Blade bending stress
[Blade]
F17 Rotor b.
F18 Stator b.
Impulse blading
F19 Reaction blading
F20 Adjustable blading
F21 Main b.
F22 B. row
F23 Rotating b.r.
F24 Inlet of b.r.
F25 Vane
F26 Splitter v. + s.
F27 S.v. surfaces
F28 Inlet guide v.
F29 I.g.v. stagger
F30 Adjustable i.g.v.
F31
F32 [Blade characteristics]
F33 Number of b.
B. shape
Arbitrary b.s.
B. curvature
Circular blading
Parabolic shaped b. +
P. blading
Skewed p. blading
F34 Constant reaction b. form
F35 Free vortex b. form
F36 Half vortex b.f.
F37 B. stagger
F38 B. failure
F39 Section characteristics
Air outlet angle
Outlet flow angle
Inlet blade angle
Turning angle
[Angle of attack]
F40 Positive a. of a.
F41 Blade surface velocity
F42 Maximum relative b.s.v.
F43 Trailing surface velocity
F44 Pitchline blade speed
F48
F49
F50
F51
F52
F53
F55
F56
F57
F58
F59

F60 Blowing air jet [effects]

[Location of compressor processes]
F61 Blade to blade
F62 Inlet to outlet
F63 Along hub
F64 Between hub and shroud
F65 Blade tip
F66 Main b. surface
F67 Propeller b. surface
F68 Impeller b. surface
F69 B. driving face + Driving f.
F72 Impeller inlet
F74 Meridional plane

[Other parts]
F75 Hub
F76 H. profile
F77 H. surface
F78 Hub-Shroud profiles
F79 Arbitrary h.s. contour
[Shroud]
F80 S. shape
F81 Improved s. design
F82 S. surface
F83 S. pressure
F84 Vaneless diffuser
[See also Ducts]
F85 Impeller tip
F86 I.t. speed
F87 Annulus area
F89 Inlet baffles

[Flow phenomena]
F90 Absolute flow
F91 Irrotational f.
[Rotational f.]
F92 Inlet whirl
F93 Prewhirl
F94 Upstream f. whirl
F95 Potential f. eddy
F96 P.f.e. formation
F97 Formation of eddy
F98 Mass f.
F99 Weight f.
G1 Maximum w.f.
G2 Overall w.f.
G3 Equivalent w.f. characteristics
G4 W.f. range
G5 W.f. variation
G6 Choked f.
G7 Choking f. coefficient
G8 Choke line + [choking line]
G9 Sonic throat velocity
[Unsteady f.]
G10 Radial maldistribution of f.
G11 Circumferential m. of f.
G12 Flow division
G13 Compressor air bleed
G14 Basic aerothermodynamic relations
G15 Stalling
G16 [Mode of stalling] Q
G17 Part speed operation
G18 Progressive stall
G19 Rotating stall
G20 Progressive r.s.
G21 Abrupt stall
G22 Complete compressor stall

[Phenomena]
G23 Stalling point
G24 Stall limit line
G25 Hysteresis effect
G26 Unstalling h.
G27 Compressor surge See also Rotating stall
G28 S. line
G29 Change in slope + Knee
[Kink] Q
G30 Flow rate
G31 Constant f. angles
G33 [F. streamlines]
G35 Relative stream surface
G35a Streamline spacing
G35b Maximum s.s.
G35c Meridional s.s.

[Performance]
G36 Prescribed velocity distribution
G37 Severe v. gradient
G38 Relative upstream v.
G39 Exit relative v.
G40 Inlet flow speed
G41 Rotational speed
G42 Percentage of design speed
G43 Low speed efficiency
G44 Intermediate speed performance characteristics
G45 Range of operation + Operation
G46 Wide range
G47 Discontinuities in performance + Discontinuity [See also Stall and surge]
G48 Slip [See also Stall and range]
G49 S. factor

[Pressure characteristics]
G50 Pressure ratio characteristics
G51 Peak p.r.
[P. rise]
G52 Head rise
G53 H.r. parameter
G54 Maximum adiabatic temp. rise

[Ducts]
[Pipe]
G55 Circular p.
[P. flow]
G56 Accelerated
G57 [BY] Magnetic field
G58 [" ] Electric field
[Channel, Ducts]
G59 [Slender c.] Q
G60 [Straight c.] Q
G61 Converging c.
G62 Diverging c.
G63 Channel walls
G64 C. flow + [Flow in channels] Q
G65 Variation across c.
G66 Large Peclet number
G67 [Nozzles]
G68 Rocket n.
G69 Shock tube n.
[Jet n.]
G70 Sonic j.n.
G71 Supersonic j.n.
G72 Exhaust n.
G73 Compression n.

[Shapes]
G74 Conical n.
G75 Nearly c.n.
G76 Converging n. + Convergent n.
G77 Sonic c.n.
G78 Choked c.n.
G79 Divergent n.
G80 Conically d.n.

G81 Convergent-Divergent n. + Converging-Diverging n.
G82 Supersonic c. - d.n.

G83 Sonic n.
G84 Supersonic n.
G85 S.n. ordinates
G86 Hypersonic n.
G87 Overexpanded n.
G88 Flow regimes

G89 Rounded entry flowmeter
G90 Rounded entry venturis

[Nozzle characteristics]
G91 N. location
G92 N. geometry
G93 N. diameter + Diameter
G94 [Ratio to] Equivalent frictional length
G95 [Ratio to] Total equivalent length
G96 D. Reynolds number
G97 Pipe entry length
G98 Optimum n. shape
G99 Pressure taps
H1 N. entry
H2 Contracting section
H3 Contraction shape
H4 Throat of flow n.
H5 N. throat diameter
H6 Vertical n. position
H7 N. divergence angle
H8 N. exit angle

[Nozzle flow characteristics]
H9 N. flow + F. through a.n.
H10 N. pressure
H11 N. total p.
H12 N. p. ratio
H13 N. expansion of heated air
H14 Rate of flow of fluid
H15 Discharge coefficient
H16 Relaxation effects + Relaxation phenomena
H17 N. stagnation temperature

[Plate]
H18 Flat p.
H19 F.p. model
H20 Local f.p.
H21 Finite f.p.
H22 [F.p. of] Infinite width
H23 Tumbling f.p.
H24 F.p. surface
H25 Perforated plate + Hole drilled plates
H26 Insulated p.
H27 Parallel p.
H28 Semi-infinite p.
H29 Triangular p.
H30 Long plates
H31 Simply supported p.
H32 Differentially deflected p.
H33 Elastic sheet
H34 Rigidly attached sheet
H35 Uniform thickness sheet
H36 Plate thickness ratio
H37 Solid + S. body
H38 Finite s.
H39 Constant material properties
H40 Displacement of s.
H41 Body geometry
H42 B. slope
H43 Symmetrical body
H44 Axisymmetrical b.
H45 Three-dimensional b.
H46 B. of revolution
H47 Elliptical b.o.r.
H48 Semiellipsoid b.o.r.
H49 Slender b.o.r.
H51 Tumbling b.o.r.
H52 Yawed b.o.r.
H55 Cone
H56 Circular c.
H57 C.c. segment
H58 Elliptic c.
H59 E.c. segment
H60 10 degree semivertex angle c.
H61 Blunted c.
H62 Blunt nose c.
H63 Sharp nosed c.
H64 Sphere + Spherical body
H65 S.b. segment
H66 Spheroid model
H67 Prolate m.
H68 Hemisphere
H69 Cone h.
H69a $50^{\circ}$ c.h.
H70 Hemispherical segments
H71 Blunted rod
H72 Cylinder
H73 Inconel c.
H74 Circular c.
H75 [Non-circular c.] Q
H76 Cone c. + C.c.bodies
H77 Elliptic c.
H78 E.c. of eccentricity $\frac{1}{2}\sqrt{3}$
H79 Hemispherical c.
H80 C. with h.nose
H81 Ogive c. model
H82 Flat faced c.
H83 C. without corners
H84 Long c.
H85 Infinite c.
H86 [I.c.] moving
H87 Semi-infinite c.
H88 C. of finite thickness
H89 Joukowski profile c.
H90 Polygon cross section [c.]
H91 Locally concave cross section [c.]
H92 Convex cross section [c.]

[By state]
H93 Stationary c.
H94 C. moving
H95 With uniform velocity
H96 Parallel with length
H97 Parallel to length
H98 Duration of time of motion
H99 Oscillating c.
J1 [with] Re-entrant angle greater than $\frac{1}{2}\pi$

[C. characteristics]
J2 C. cross section
J3 Shape
J4 C. surface
J5 Radius of curvature
J6 Downstream portion [of c.]
J7 Displacement area [of c.]
J8 Cylindrical coordinates
J9 Frictional drag on c.
J10 Ogive
J11 Two-dimensional body

[Wedge]
J12 Blunted w.
J13 W. angle
J14 W. shock a.
J15 Rectangular model
J16 Parabolic body arc
J17 Slender cone-cylinder flare
J18 Bluff body
J19 Blunt b.
J20 B. model
J21 Interaction b.b.
J22 Blunt nosed b.
J23 Flat faced b.
J24 Pointed b.
J25 Sharp edged b.
J26 Spiked b.
J27 Spike length
J28 Rigid b.
J29 Slab b.

J30 Slender b. + Thin b.
J31 S.b. theory (see also S.wing theory)
J32 Ward extension
J33 Leeward b.
J34 Windward b.
[Structures - non-aerodynamic]
J35 Fixed s.
J36 Pivot
J37 Crossed flexure p. + Crossed spring p.
J38 Properties
J39 Displaced p.
J40 Strips
J41 Strips crossing point
J42 Centre of rotation
J43 Continuous beams
J44 Single span beams
J45 Aluminium alloy 2024 T4

[Flight]
J46 Supersonic f.
J47 Hypersonic f.
J48 Interplanetary f. + I. missions
J49 Escape from Earth's gravity field
J50 Target planet approach
J51 Capture manoeuvre
J52 Motion prediction
[Entry into planetary atmosphere]
J53 Entering + Entry into p.a. + Re-entry into p.a. + Planetary re-entry
J54 Tumbling entry
J55 Transition from tumbling body motion
J56 Tumbling cessation
J57 Libration onset
J58 Entering Martian atmosphere
J59 Entering Earth's atmosphere + Re-entering E.a. + a. re-entry
J60 Hypersonic re-entry
J61 Terminal phase
J62 Trajectory + Flight t.
J63 Transfer t.
J64 Interplanetary orbit transfer
J65 Change of plane
J66 Generalized trajectory
J67 Flight path angle
J68 Orbit
J69 Satellite o.
J70 Elliptic o.
J71 Circular o.
J72 O. eccentricity
J73 O. High e.
J74 Small e.o. + O.Small e.

[Characteristics]
J75 Velocity vector
J76 Rate of contraction
J77 At perigee
J78 Rate of change with time + Time variation
J79 Rate of decay
J80 Orbital period + Period of revolution
J81 Satellite p.
J82 Rate of change
J83 S. orbital period of revolution decrease
J84 Lifetime
J85 Orbital eccentricity + Eccentricity
J86 Perigee height
J87 P.h. decrease
J88 P.h. oscillation
J89 [By] Solar radiation pressure
J90 [By] Luni-solar gravitational perturbation
J91 Perigee distance
J92 P.d. change
J93 Variation of p.d. with time
J94 Perigee air density + Air d. at p.
J95 Apogee height
J96 Apogee distance change
J97 Semimajor axis
J98 S.a. change
J99 Inclination
K1 Angle between sun and perigee
[Processes]
K2 Satellite o. changes
K3 Contraction + Orbital c.
K4 Motion of s.o. perigee
K5 Node line regression
[Interplanetary flight conditions] see K98/L4
[Flight performance]
K6 Aerodynamic characteristics
K7 Aerodynamic problems
K8 [Dynamic response] Q
K9 Efficiency
K10 Vehicle requirements
K11 Volume
K12 Design flexibility
K13 Growth flexibility
K14 Reliability
K15 Structural requirements
K16 Weight ratio
K17 Payload
K17a 25 lb. p.
K18 Cruising performance
K19 Handling qualities
K20 Manoeuvre margin
[Engine performance]
K21 E. p. requirements
K22 Rocket e. performance
K23 Supersonic e. intake [p.]
K24 E. reliability
K25 E. weight
K26 Duration of power
K27 Restart capability
K28 Maximum velocity
K29 Trajectory velocity requirements
K30 Mass ratio
K31 Thrust
K32 Gross t.
K33 Jet t.
K34 J.t. coefficient
K35 Rocket j.t.
K36 T. vector control
K37 [By] Fluid injection
K38 Gas i.
K39 Liquid i.
K40 Thrust augmentation
K41 T. loss
K42 T. coefficient

[Flight operations]
K43 Low speed problems
K44 Airspeed + Flight velocity
K45 Speed control
K46 Airspeed holding
K47 Speed stability
K48 Acceleration
K49 Variations in a.
K50 A. during boost
K51 Deceleration
K52 [By] Retrorocket
K53 Piloting
K54 Glide path holding
K55 Trajectory correction
[Flight attitude]
K57 Vehicle attitude + V. orientation
K58 Attitude control
K59 Trim attitude
K60 Nose forward a.
K61 Base forward a.
K62 Statically stable a.
K63 Body angle
K64 Pitch

K65 Pitching
K66 P. oscillating
K67 Pitchup
K68 Arbitrary p. rate
K69 Pitch stability
K70 Damping in pitch
K71 Pitch damping coefficient
K72 D. in pitch moment
K73 Rolling oscillation
K74 Bang bang roll control + Non-linear roll c.
K75 Steady roll
K76 Rolling derivative
K77 $0^{o}$ Yaw
K78 $30^{o}$ Yaw
K79 Yaw stability
K80 Yawing derivatives
K81 Yaw control
K82 Plunging oscillation
K83 Sinking + S. motion
K84 Indicial s.m.
K85 S. speed and S. velocity
K86 Sudden change
K87 Spin rate
K88 Sideslip
K89 Mode of rotation of satellite
K90 R. about axis

[Flight conditions]

K91 Altitude
K92 Flight a.
K93 High a. condition
K94 High a. flight
K95 A. of 300 nautical miles
K96 A. of 525 " "
K97 Maximum a.

[Interplanetary flight conditions]

K98 Environmental characteristic
K99 Zero gravity
L1 Radiation
L2 Meteorites
L3 Meteoroids
L4 High vacuum requirements

L5 Fluid
L6 Perfect f.
L7 Compressible f.
L8 Incompressible f.
L9 Viscous f.
L10 Nonviscous f.
L11 Heavy f.
L12 Light f.
L13 F. layer
L14 At rest

[Liquid]

L15 Hydrodynamic problem
L16 Hydrodynamic
L17 Water flow
L18 H. stability
L19 Instability + Wave i.
L20 Buoyancy
L21 Underwater
L22 Oil flow
L23 Surface oil
L24 Flow pattern
L25 [Gases] Q
L26 Ambient g.
L27 Ideal g.
L28 Diatomic model gas
L29 ARDC 1956 Model atmosphere
L30 Real g.
L31 R.g. effect

[By condition]

L32 High temperature g.
L33 Rarefied g. condition
L34 Dissociating g.
L34a Dissociated g.
L35 Ionized g.
L36 Electrically conducting g.
L37 Seeded g.
L38 Initially undissociated g.
L39 Equilibrium g.
L40 Reacting gases + Chemically active g. + Chemically reacting g.
L41 Gas particles
L43 Gas flow
L44 Initiated by strong shock
L45 Low density f.
L46 Rarefied g.f.
L47 First collision regime
L48 Merged layer r.
L49 Incipient m.l.r.
L50 Viscous layer r.
L51 Navier Stokes r.
L52 Dissociated stream
L53 Gas expansion
L54 Air
L55 Compressed a.
L56 Still a.
L57 Heated a.
L58 High temperature a.
L59 500-15000 Degrees Kelvin
L60 Dissociated air
L61 Fully ionized air
L62 Air components
L63 Mol fractions
L64 Energy of a.
L65 [Airflow] Q
L66 Airstream + Air current
L67 Wind speed
L68 Cold air expansion
L69 [Hot air flow] Q
L70 Equilibrium a.f.
L71 Correlated non-s. airflow

[Other gases]

L72 Nitrogen
L73 Atomic n.
L74 Oxygen
L75 Atomic o.
L76 Gas mixture
L77 Nitrogen-oxygen m.

[Fuels]

L78 Ethylene
L79 Methane
L80 Mixed hydrocarbon compound f.
L81 [Fuel] Burned in air
L82 Combustion product gas
L84 Equivalence ratio
L85 Flow properties
L86 [Atmosphere] Q + Atmospheres
L87 Oblate a.
L88 O. rotating a.
L89 Spherically symmetrical a.
L90 Planetary a.
L91 Earth a.
L92 Upper a.
L93 Extreme u.a.
L94 F.I. layer
L96 150-230 Km. attitude
L97 210-660 " "
L98 190-280 " "

[Study of atmosphere]

L99 [By] Satellite observation
M1 Atmospheric model investigation
M2 Rocket measurement
M3 Altitude results

[Atmosphere properties, characteristics]

M4 Scale height
M5 Atmospheric oblateness
M6 Atmospheric rotation
M7 Atmospheric drag + A. resistance + Air drag
M8 [Effect of] Equatorial belt
M9 [ " " ] Earth rotation
M9d Air drag around orbit
M9x [Pressure] .0001-100 atmospheres
M12 Air density + Atmospheric d.
M13 Air d. profile

M14 D. scale height
M15 Logarithmic curve + L.d.c.
M16 Density results
M17 Variation of d.
M18 Seasonal d.v. + V. with season
M19 V. from day to night
M20 Daytime d.
M21 Diurnal d.v. + Diurnal v.
M22 [effect of] Ultra-violet radiation absorption + Electromagnetic radiation
M23 Nighttime d.
M24 Latitude variations + V. of latitude
M25 Relative variation with height
M26 Solar activity [effect on a.d.]
M27 Standard flux [ " " " ]
M28 Solar 20 c.m. radiation [ " ]

[Study of air density]
M29 Gauge on satellite
M30 Singly mounted gauge
M31 Gauge errors

[Influences on atmosphere]
M32 Latitude
M33 Season

M34 Fluid mechanics
M35 Flow + Fluid f.
M36 Flow surveys
M37 F. pattern
M38 F. field
M39 Body f.f.
M40 B.f.f. gradient
M41 Local f.

M42 Low speed f. [<M.0.3]
M43 Mach 0.
M44 Subsonic f. + S. speeds
M45 [S. regime] Q
M46 S. Mach no. + Subcritical M.n.
M47 [Low s. speeds] Q + Low s.f.
M48 High s.s. + High s.f.
M49 Mach 0.5 - 0.6.
M50 M.0.5
M51 M.0.6
M52 M.0.7
M53 Transonic speed + T.f. [M.0.8-1.2]
M53a T.s. range
M53b M.0.6-1.20
M53c M.0.65-2.20
M53d M.0.7-1.1
M53e M.0.8-1.15
M53f M.0.8
M53g M.1
M53h T.f. theory
M53i High speed
M53j Sonic s. + s.f.
M53k Speed of sound
M54 Supersonic s. + S.f.
M54b Low s.s. + Low s.f.
M54c Mach 1.39
M54d M.1.62
M54e M.1.75
M54f M.1.8
M54h [High s.M.no.] Q + High s.f.
M54i M.2
M54j M.2.02
M54k M.2.47
M54m M.2.49
M54n M.2.91
M54p M.3
M54q M. nos. above 3
M54s M.3.3
M54t M.4
M54v S. stream
M54w Ambient s.s.
M54x Local s.f.
M55 Hypersonic speed + Hypervelocity + H. flow [>Mach 5] + [H.Mach no.] Q + High flight M. nos.
M55b Mach 5.8
M55c M.6
M55d M.6.2
M55e M.6.8
M55f M.6.86
M55g M.9.6
M55h M.10
M55i M.12
M55j M.n. up to 14
M55k M.14
M55m M.19.6
M55n M.n. range 16.7-25.4
M55p Escape speed + E. velocity
M55q Re-entry v.
M55s Super satellite speed

M60 [Hypersonic layer] Q
M61 H. approximation
M63 [H. simulation] Q
M64 H. similitude
M65 H. experimental data

M69 Free stream + F.s. flow
M70 F.s. Mach no.
M71 Subsonic f.s.
M72 F.s. with Mach nos. near unity

M73 F.s. pressure ratio
M74 F.s. static pressure
M75 Main stream f.
M76 Supersonic m.s.
M77 M.s. Mach no.
M77a External flow
M77b E.f. conditions

[Boundary layer]
Boundary layer (N64/063)

M78 Laminar f.
M79 Natural l.f.
M80 Turbulent f.
M81 T.f. field

M82 Steady f.
M83 F. past parallel walls
M84 S.f. theory
M85 Potential equations
M86 S. motion characteristics
M87 Uniform f.
M88 U.f. duration
M89 Unsteady f.
M90 Non-steady f.
M91 Kirchoff discontinuities f. theory
M92 Separation induced unsteady effects

M93 Adiabatic f.
M94 Isentropic f.

M95 Equilibrium f.
M96 Non-equilibrium f.
M97 Non-E. stream
M98 Slip f.
M99 Free molecule f. regime

N1 Shear f.
N2 Unbounded f.
N3 Poiseuille f.
N4 Couette f.
N5 Fully developed f.

N6 Accelerating f.
N7 Decelerating f.
N8 Separated f.
N9 Severely s.f.
N10 Intersecting f. fields
N11 Isobaric f.

N12 One-dimensional f.
N13 Quasi one-d.f.
N14 Q. one-d. f. equations
N15 Two-d. f. + Plane f.
N16 Two-d. f. field
N17 Two-d. f. theory
N18 Three-d. f.
N19 Three-d. motion
N20 Three-d. f. theory

N21 Symmetrical f.
N22 Axisymmetric f. [= 3-d. f.]

N23 Perpendicular f. field
N24 F. curvature + Curvature
N25 Conical f. field
N26 C. f. theory
N27 Generalized theory [of conical f.]
N28 [Quasi-c. f.] Q
N29 Q-c.f. field
N30 [Q-c.f. theory] Q
N31 Parabolic f.

N32 Non-viscous f. + Inviscid f.
N33 Frictionless f.
N34 Inviscid f. model
N35 Outer [i.f.m.]
N36 Viscous f. + Viscous + Viscid f.
N37 V. fluid motion + V.m.

N38 Incompressible f. + I. fluid f.
N39 I. fluid motion
N40 I. + theory
N41 Compressible f.
N42 C.f. analysis

N43 Continuum f. field development
N44 C.f. model
N45 C.f. theory

N46 Undirectional motion
N47 Flow parallel to generators + In stream + Parallel to generators
N48 Forward f.
N49 Reversed f.

N50 Pure translational motion + Potential f.
N51 Potential f. theory
N52 Vertical translation
N53 Rotational f.

N54 Non stationary f. + Transient f.
N55 T. electrical f. [analogy]

N56 Low Reynolds no. f.
N57 High " " f.
N58 Newtonian f.
N59 Slug f.
N60 Forced f.
N61 High temperature f.
N62 [Hot f.] Q
N63 Linearized f. analysis
N64 Boundary layer + B.l. flow [should follow M77b]

N65 B.l. theory (see also T57/58)
N68 Polhausen solution
N69 Wall b.l.

N70 Laminar b.l. + L.b.l.f.
N71 Inner l.b.l.
N72 L.b.l. thickness
N73 Turbulent b.l. + T.b.l.f.

N74 Compressible b.l.
N75 Incompressible b.l.

N76 Fully attached f.
N77 Stagnation b.l.
N78 3-dimensional b.l.
N79 Ionized b.l.

N80 Behaviour
N81 F. attachment see also R62
N82 A. line
N83 B.l. growth
N85 Thickening of b.l.
N86 B.l. traverses
N87 B.l. transition + Transitional b.l.
N88 [Natural t.] Q
N89 B.l.t. position
N90 B.l. separation + Flow separation + F. with s. + S. + B.l.f.s.
N91 Stalledf.
N92 Low speed b.l.s.
N93 Shockwave induced b.ls. + S.i.b.l.s. + S.i. + S.i.s.
N94 Forward [s.i.b.l.s.]
N95 Outboard
N96 Laminar b.f.s.
N97 Separation of forward f.
N98 Rearward turbulent s.
N99 Transitional b.l. separation + T. layer regime

01 Turbulent b.l.s.
02 Vortex type b.l.s.

03 Separation onset
04 B.l.s. delay
05 B.l.s. position + Separation positions
06 Separated region
06a Extent [of s.r.]
07 S. point
08 Spanwise position of s.
09 S. pressure

010 B.l. reattachment + R
011 B.l. viscosity effects
012 B.l. displacement + D.
013 B.l.d. effect
014 B.l. interference
015 B.l. shock wave interaction + With s.w.
016 Generated externally
017 Generated internally
018 [By] Wedge
019 Wedge Generated s.w.
020 Upstream influence
021 B.l. heat transfer
022 Laminar b.l. heating

[B.l. Properties]
023 B.l. profile
024 B.l. thickness
025 [Thick b.l.] Q
026 B.l. momentum t.
027 M.t. [of laminar b.l.]
028 Artificial thickening
029 Displacement t. + B.l.d.t.
030 B.l. form parameter
031 Divergence boundary
032 B.l. stability
033 Tollmien Schlichting theory
034 Shear wave resonances

035 B.l. control
035a Blowing
036 Blowing at knee
037 Slot blowing + High velocity b.
037f/s Blowing etc. (from U66/76)
038 Distributed suction
039 Suction at knee
040 Transition promotion
041 [By] Surface roughness
042 Two dimensional wire
044 Three dimensional disc
045 Spanwise wire
046 Sandpaper
047 Distributed roughness bands + R. band techniques
048 R. band materials
049 B. width
050 Carborundum
051 Ballotini glass bead
052 Sublimation indicator
053 Hexachloromethane

[Properties of roughness elements]
054 Critical r. height
055 R. Reynolds number
056 Degree of tunnel turbulence
057 R. location
058 R. shape
059 Grain size + Particle size

060 Spacing between grains
[B.l. control research in wind tunnels]
061 Complete aerofoil technique
062 Half aerofoil technique + Bump t.
063 Lockheed bump
[Flow elements]
064 Cocurrent streams
065 Streamtube
066 Streamline + Flow s.
067 Filament line
068 Stagnation streamline
069 S. position
070 Normal s. slope
071 Induced by crossflow
072 Induced by change [in] Mass flow density
073
077 S. walls
078 Stream filament theory
079 Stream functions
080 Stokes stream function variable
[Sources, sinks, doublets]
081 Source sink methods
082 Von Karman s.s.m.
083 Doublet superposition
084 Supersonic d. equation
085 Source distribution
086 Doublet distribution
087 Vortices
088 Bound vortex
089 Trailing vortices
090 Horseshoe vortex
091 Elementary h. vortex distribution
092 Vortex system
094 Individual v.
095 Eddy region
097 Stationary vortex pair
098 Karman street
099 Main vortex
P1 Secondary vortex
P2 Chordwise v.
P3 Spanwise v.
P4 Rectangular vortex
P5 Co-rotating v.
P6 Counter rotating v.
[Processes and properties]
P7 Vortex flow
P8 Vortex formation
P11 Vortex growth
P12 Vortex movement
P13 Main vortex displacement
P14 Eddy separation
P15 Vorticity interaction domain
P16 Vorticity interaction theory
P17 Vortex distribution
P18 Eddy frequency
P19 Location of part span vortices
P20 Vortex paths
P21 V. p. location
P22 Vortex sheet position
P23 Vorticity variable
P24 Vorticity contours
P25 Vortex strength
P26 Main v.s.

P27 Jet
P28 J. stream
P29 Free j.
P30 Axisymmetric f.j.
P31 J. exhaust + E.j.
P32 Hot e.j. + Hot j.e.
P33 Hydrogen burned in air
P34 Rocket e.j. + R.e.
P35 Supersonic rocket
P36 Propulsive j.e.
P37 Rocket j. + Rocket [producing j.]
P39 Supersonic retrorocket
P40 Simulated r.
P41 Jet engine [producing j.]
P42 Propulsive j.
P43 Sonic p.j.
P44 Hot p.j.
P45 Reaction j.
P46 Air j.
P47 Subsonic a.j.
P48 Supersonic a.j.
P49 High energy a.j.
P50 Small a.j.
P51 Cold a.j.
P52 Airblowing j.
P53 Cold helium j.
P54 Mixture of cold gases
P55 Hydrogen and carbon dioxide
P56 Two dimensional j.
P57 Axially symmetric nozzle j.
P58 Two-d. nozzle j.
P59 Sonic nozzle j.
P60 Supersonic nozzle j.
P61 High temperature j.
P62 Ehtylene heated j.
P63 Sonic j.
P64 Supersonic j.
P65 Side j.
P66 [Forward facing j.] Q
[see also Direction of emission Q1/7]
P67 [Exit] Q + Jet exit
P68 Propulsive j. exit
P69 Jet exit diameter
P70 [Exit position] Q
P71 J. location
P72 Rocket j.l.
P73 Upstream exhaust
P74 Downstream exhaust
[Location of effects]
P75 Ahead of j.
P76 Downstream of exit
P77 Location within j.
P78 J. energy
P79 J. force
P80 J. Mach no.
P81 J. Reynolds no.
P82 J. total pressure
P83 J. static pressure
P84 J. stagnation pressure + J. stagnation
P85 J. pressure ratio
P86 J. structure
P87 J. wavelength
P88 J. boundary
P89 J.b. curvature
P90 Initial inclination [to exit shock]
P91 J.b. shape
P92 J. size
P93 J. diameter ratio
P94 J. slot width
P95 Specific heat of j.
P96 Exhaust ratio of s.h.
P97 Exhaust density
P98 Exhaust velocity
P99 Jet noise
[Direction of emission]
see also P66
Q1 Exhausting + Issuing
Q2 E. normal + Exiting n. +
E. perpendicularly
Q3 E. laterally
Q4 E. countercurrent
Q5 Spanwise direction
Q6 Beneath wing
Q7 Forward from nose
Q8 Rocket j. firing
Q9 J. viscous scavenging phenomena
Q10 J. interference + J.i.phenomena
Q11 Rocket j.i.
Q12 Jet exhaust i.
Q13 J.i. effects
Q14 Exit shock
Q15 E.s. wave angle

Q16 J.s.w. angle
Q17 J.s.w. apex location
Q18 J. wake
Q19 Propulsive j.w.
Q20 J. mixing
Q21 Compressible j.m.
Q22 Isoenergetic j.m.
Q23 Turbulent j.m.
Q24 Production of species [in reacting gases]
Q25 Net mass rate
Q26 Continuity of species
Q27 Chemical reaction
Q28 Concentration profiles
Q29 [Effect of] Rocket thrust [Study]
Q30 [Use of] Sting balance measurement
Q31 Jet simulation
Q32 [By] Helium s.

[Waves]
Q33 Kelvin Helmholtz w.
Q34 Riemann w.
Q35 Tollmien Schlichting w.
Q36 Reflected w. + Waves reflected
Q37 Reflected from contact surface
Q38 Wave reflection interference
Q39 Flexural w.
Q40 Longitudinal w.
Q42 Compression w.
Q43 C.w. resonances
Q44 Expansion w.
Q45 Reflected head
Q46 Originating
Q47 [at] Main diaphragm [of shock tunnel]
Q48 Shock w. + S.
Q49 Strong s.w.
Q50 Mach w. + M. line
Q51 Infinitesimally thin s.w.
Q52 Forward s.w.
Q53 Rear s.w.
Q54 Terminal s.w.
Q55 Rate of movement
Q56 Outboard s.w.
Q57 Normal s.w.
Q58 Oblique s.w. + O.s.w.system
Q59 Detached s.w.
Q60 Attached s.w. system
Q61 Hypersonic s.w.
Q62 Incident s.
Q63 Oxygen s.w.
Q64 O.s. front
Q65 Nitrogen s.w.
Q66 N.s. front
Q67 Argon s.w.
Q68 Spherical s.
Q69 Cylindrical s.
Q69a Mach cone
Q70 Primary s.
Q71 Reflected s.

[Shock wave phenomena]
Q72 Rankine-Hugoniot s. relations
Q73 Mach angle
Q74 Deflexion angle
Q75 Expansion zone + E. region
Q76 Supersonic e.r.
Q77 Initial e.r. + Prandtl-Meyer region
Q78 Flow behind a.s.w. + Flowfield behind + Region behind shock + Upstream of s.w.
Q79 Behind normal s.
Q80 Ahead of s.w.
Q81 S.w. pattern
Q82 S.w. structure
Q83 S.w. shape
Q84 S. curvature
Q85 S.w. thickness
Q86 S.w. strength + S.s.
Q87 S.w. location + S. positions
Q88 Terminal position
Q89 S.w. position divergence
Q90 Sonic point location + Location of s.p. + Sonic p. + Position
Q91 Stand-off distance + s.s-o.d. + S.detachment distance
Q92 Shock Mach no.
Q93 Range of primary s.m.n.
Q94 High s.m.no.
Q95 Low s.m.no.
Q96 Air s. velocity
Q97 S. equilibrium temperature
Q98 [Shock layer] Q
Q99 Entropy layer
R1 Detached s.l.
R2 Thin s.l.
R3 Thin s.l. theory
R4 Shock wave surface [Properties]
R5 S. layer luminosity
R6 S.l. luminous gas region
R7 Equilibrium s.l.property

[Processes]
R8 S.w. formation
R9 Time of appearance
R10 S.w. development
R11 S.w. movement
R12 S. reflection
R13 R. of primary s.
R14 Attenuation of reflected s.
R15 Attenuation of s.w.
R16 [Analysis by] Conservation of mass equation
R17 Transonic flow attachment
R18 S. displacement
R19 Conical s. separation
R20 S. transition zone
R21 S.w. interaction
R22 Aerodynamic forces + [Airforces] Q
R24 Aerodynamic inertia
R25 A. normal f. + Normal f.
R26 Reaction n.f.
R27 Incremental n.f.
R28 Spanwise coordinate
R29 Axial f.
R30 A. body f.
R31 Centrifugal f.
R33 Side f.
R34 Tangential f.
R35 Retarding f.
R36 Deceleration f.
R37 Newtonian impact f.
R39 Body f.
R40 F. coefficient
R41 Static aerodynamic characteristics
R42 Longitudinal aerodynamic characteristics + Longitudinal aerodynamic coefficients
R43 Axial f.c.
R44 Chord f.c.
R45 Normal f.c.
R46 Incremental n.f.c.
R47 Force determination
R48 Force measurement
R49 Loading + Aerodynamic load + A. loading
R50 Chordwise load + C.loading
R51 Spanwise loading
R52 Uniform s.l.
R53 Subsonic span loads
R54 Total span loads
R55 Symmetrical loading
R56 Model loading
R57 Induced load
R58 Continuous load + C. loading
R59 Representation [by]
R60 Patterns of horseshoe vortices

R61 Unsteady loads
R62 Vanishing load [see also Flow attachment]
R63 Load distributions
R65 Lift
R66 Starting l.
R67 Transient l.
R68 Final l.
R69 Maximum l.
R70 Zero l.
R71 Unsteady l.
R72 [U.l. distribution] Q
R73 Indicial l.
R74 Non-linear l.
R75 Circulatory l.
R76 Compressible l.
R77 Incompressible l.
R78 Induced l.
R79 Incremental l.
R80 Body l.
R81 Section l.

[Lift phenomena]
R82 Lift effect [see also Vortex system 092]
R83 L. slope
R84 Sectional l.s. + Section l. curve
R85 Distribution of s.
R86 Lift-curve slope
R87 Lift-drag ratio
R88 Maximum l.d.r.
R89 L. vector
R90 Phase angle
R91 Magnitude
R92 L. distribution
R93 [Calculation by] Rounding off rule
R94 Spanwise l.d.
R95 D. of pivoted points
R96 L. interference
R97 Total l. response
R98 Frequency response in l.
R99 Indicial response in l.
S1 Apparent mass effects
S1a Vertical acceleration
S2 Lift coefficient + Lifting c. + C. of l.
S3 L.c. divergence
S4 Oscillatory l.c.
S5 Asymptotic behaviour
S6 Total l.c. + Coefficient of t.l.
S7 Trim l.c.
S8 No-lift moment coefficient
S9 Indicial l. function + Unsteady l.f.
S10 Wagner i.l.f.
S11 Theodorsen alternating l.f.
S12 Kussner function [Determination, etc.]
S13 Downwash integral equation
S14 Classical wave equation solution
S15 Kirchoff formula
S16 Drag + Retarding force
S17 Friction effects
S18 Model d.
S19 Total d.
S20 Total d. coefficient
S21 Profile d. coefficient
S22 Form d.
S23 Skin friction + S.f.d.
S24 Average s.f. coefficient
S25 Distribution
S26 Viscous d. + V. force
S27 Pressure d. (see also Form d.)
S28 Normal p.d.
S29 Wave d.
S30 Lift dependent d. + Induced d.
S31 L.d.d. component
S32 Induced d. correction
S33 Resultant d.
S34 D. penalty
S35 Excess d.

S36 [Drag phenomena]
S37 D. coefficient
S38 Profile d.c.
S39 Total d.c.
S40 D. reduction
S41 Minimum-d.design
S42 D. rise
D. reversibility theorem

[Other loads]
S44 [Blast + Gust] Q
S45 Sinusoidal gust
S46 Gust penetration
S47 P. of sharp edged g.
S48 P. of s.e. normal g.
S49 Moments + Aerodynamic m.
S50 Pitching m.
S51 Aerodynamic centre
S52 A.c. characteristics
S52a Local s.c.
S53 P.m. coefficients
S54 P.m. curves
S55 P.m. derivatives
S56 P.m. reversal
S57 Rolling m.
S58 Frequency response in moment
Indicial response in moment
S59 M. function
S60 Indicial m.f.
S61 M. vector
S62 M. coefficient
S63 Aerodynamic balance
S64 Pressure + P. load
S65 Total p.
S66 T. head measurement
S67 T.p. ratio
S68 Static p.
S69 S.p. survey
S70 S.p. ratio
S71 S.p. measurements
S72 S.p. gradient
S73 S.p. distribution
S74 Dynamic p.
S75 Impact p. survey
S76 Base p.
S77 Two-dimensional
S78 B.p. measurement
S79 Kink p.
S80 Stagnation p. + S. point p.
S81 S. pressure coefficient
S82 Flight s.p.
S83 Centre of p. ) see
S84 Spanwise c.o.p. ) P. char-
S85 Chordwise location ) acteristics (S92)
S86
S87 Induced p.
S88 Constant p.
S89 Oscillating p. field
S90 Oscillatory p. decay
S91 Oscillatory p. plotting
[Pressure characteristics] see also S85/86
S92 P. field
S93 P. coefficient
S94 P. ratio
S97 P. distribution + P.profile
S98 P. gradient
S99 Self-induced
T1 Streamwise
T2 Body p.d.
T3 Chordwise p.d.
T4 Longitudinal p.d.
T5 Radial p.d.
T6 Sinusoidal p.d.
T7 Deflexion
T8 Travelling p.d.
T9 Prescribed p.d.
T10 Tangential p. gradient
T11 Vanishing p.gradient
T12 Zero p. gradient

T13 P. variation + P. Fluctuation + P. difference
T14 P. divergence
T15 P. reduction + Fall of p.
T16 Base bleed
T17 P. recovery
T18 P.r. reduction
T19 P. rise
T20 Pressure determination
T21 P. measurement
T22 P. plotting
T23 P.p. model
T24 P. tappings
T25 Photorecording manometer
T26 Multiple tube manometer
[Aerodynamic processes and properties]
T27 Flow development
T28 Control
T29 Longitudinal c.
T30 Vertical plane c.
T31 Lateral c.
T32 Directional c.
[Agents]
T33 Projection of jet
T34 Jet reaction control + Reaction type j.c.
T35 Stability + Aerodynamic s.
T36 Flow s.
T37 Static s.
T38 S.s. characteristics
T39 S.s. derivatives
[Dynamic s.]
T40 D.s. characteristics
T41 D.s. derivatives
T42 Longitudinal s.
T43 Lateral s.
T44 Directional s.
T45 [Aerodynamic derivatives] Q
+ Stability d.
T46 Direct a.d.
T47 Indirect a.d.
T48 Rotary d.
T49 S. control
T49a [Stabilization] Q
T50 Destabilizing effect
T51 Disturbance + D. to flow
T52 Distortion
T53 Downstream d.
T54 Small flow d.
T55 Infinitely small d.
T56 Small d. theory + Small perturbation theory
T57 Inviscid s.d.t. see also B.L. theory N65
T58 Hypersonic s.d.t. see also B.L. theory N65
T59 Interference + Interaction
T60 Interference load
T61 Aerodynamic interaction effect + Interaction effects + Interference effects
T62 Second order interference
T63 Wake interference effects
T64 Viscous interaction
T65 Support system interference
T66 [Interaction between] Parallel streams
T67 Blockage interference
T68 B. effects
T69 Solid b.
T70 Wake b.
T71 B. ratios
T72 B. correction
T73 Mass flow method
T74 Reflection + Reflected
T75 Multiple reflection
T76 Ground effect + Proximity to ground
T77 Adverse g.e.
[Methods of determination, etc., of interference]
T78 Discrete horseshoe vortex [method] + Finite step
T79 Shock expansion method
T79a Blasius equation
[Interference parameters]
T80 Nonsteady perturbation potential
T81 Perturbation velocity potential
T82 Relaxation time effects
T83 Interaction force
T84 I.f. ratio
T85 Mixing flow + Fluid m. + M. process
T86 Constant pressure m.
T87 Laminar m.
T88 Turbulent m.
T89 Stagnation flow
T90 S. air f.
T91 S. region
T92 Axisymmetric s.r.
T93 S.r. regime I
T93a S.r. regime II
T94 S. point + S.p. flow
T95 Rear s.p.
T96 S. conditions
T97 S. gas state
T98 S. temperature
T99 High s.t.
T99a S.t. from 2400-3800°F
T100 S.p. heating
T101 Flight s. enthalpy
T102 Choking
U1 Choking Mach no.
U4 [Choked tunnel] Q
U5 C. wind t.
U6 C.w.t. tests
U7 Downwash
U8 Induced d.
U9 Total d.
U10 Centre line d.
U11 Steady d. conditions
U12 D. distribution
U13 Periodic d.d.
[Upwash]
U15 U. field
U16 U. distribution
U17 Sidewash
U18 Spanwise outflow
U19 Wake + W. flow
U20 W. width divergence
U21 Development of circulating w.
U22 External slipstream
U23 Turbulent
U24 Surge

[Flow attributes]
U25 Velocity
U27 Induced v.
U28 Vertical i.v.
U29 Vertical v.
U32 Gas flow v.
U33 V. potential
U34 Symmetric v.p.
U35 Anti-s.v.p.
U36 Acceleration p.
U37 V. distribution + V. variation
U38 V. gradient
U39 V. profile
U40 Linear v.p.
U40a Jeffery-Hamel solution
U41 Quasi-conical v. field
U42 V. measurement
U44 M.f. fluctuation [see also Sound waves]
U45 Mass flow profile
U46 Flow parameters
U47 Mach number
U48 Stream M.n.
U49 Local M.n.
U50 Increasing M.n.
U53 M.n. profile

U54 Prandtl number
U55 Reynolds number
U56 Low R.n.
U56a R.n. less than 40
U56b R.n. 40
U56c R.n. 44
U57 Local mesh R.n.
U58 Hartmann number
U59 Flow coefficient
[Circulation]
U60 C. function
U61 C. control
U62 [by] Laminarization
U63 Reduction of c.
U64 Vorticity
[Injection]
[Characteristics]
U66 Blowing pressure 037f
U67 Injected gas + Injected gas stream 037g
U68 Molecular weight 037h
U69 Specific heat ratio 037i
U70 Accommodation height 037j
U71 Injected liquid 037k
U72 Primary gas 037m
U73 Exothermic reaction 037n
U74 Magnification factor 037p
U75 Small rate of heat addition 037q
U76 Specific impulse 037s
[Fluid properties]
U77 Density
U78 D. distribution
U79 D. variation + Change of d.
U80 D. ratio
U81 Low d.
U82 Compressibility
U83 C. effects
U84 Viscosity
[Characteristics]
U85 [V.-Temperature law] Q
U86 [Linear v.-t. solution] Q
U87 Viscous effects
U88 Shear
U89 Coefficient of v.
[Aeroelasticity]
U90 Static a.
U91 Oscillatory motion + Oscillating
[see also] W50
U92 Electrical excitation + Electrically excited oscillations
U93 [at] Phase resonance
U94 Electrical self-excitation
U95 [with] Coupled freedoms
U96 Elastic excitation
U97 Slowly propagating o.
U98 Fast propagating o.
U99 Decaying o.
V1 Sinusoidal sinking o.
V2 Continuous o.
V3 Oscillating harmonically
V4 Sinusoidal vertical o.
V5 Asymmetrical o.
V6 Flapping o.
V7 Torsional o.
V8 Bending o.
V9 Sinusoidal o. displacement
V10 Neutral o.
V11 Free o. + Free vibration
V12 Angle of attack o.
V13 Resonant vibration
V14 Inexorable forcing
V15 External rigid drive
V16 Internal rigid drive
[Flutter]
V17 F. oscillations + Flutter
V18 Bending type f.
V19 High speed f.
[Characteristics]
V20 F. coefficients
V21 Aerodynamic f. derivatives
V22 Two-dimensional f.d.
V23 Subsonic f.d.
V24 F. frequency
V25 F. speed
V26 Critical f.s.
V27 F. boundaries
V28 Margins of safety
V29 F. calculation
V30 F. testing + F. tests
V31 Variable medium
V32 F. model
V33 Construction
V34 M. density ratio
V35 M. stiffness [=bending s.]
V36 M. weight ratio
V37 Reduction m. elasticity
V38 Mass loading
V39 Increased
V40 Modal analysis
V41 F. precipitation
V42 Static testing
V43 Modified strip analysis + Rayleigh type a.
V44 Dietze's method
V45 Vibrational modes + Oscillation m.
V46 Uncoupled v.m.
V47 Normal m. + N.m. of v.
V48 Oscillating in elastic m.
V49 Oscillating in rigid m.
V50 Body m.
V51 Rayleigh oscillation m.
V52 Selected m.
V53 Sound waves see also Mass flow fluctuation
V54 Aerodynamic noise
V55 Subjected to + Exposed to + Engine noise
V56 Jet e.n.
V57 Sound propagation
V58 Acoustic radiator

[Vibration characteristics]
[see also Stability]
V59 Oscillatory coefficients
V60 O. aerodynamic derivatives
V61 Measurement of reaction
V62 [Measurement by] Logarithmic circuit
V63 Aerodynamic stiffness derivatives + S.d.
V64 Degrees of freedom
[Frequency]
V65 Natural frequencies
V66 Reduced frequency
V67 Frequency parameters
V67a F.p. less than .02
V68 F. measurement
[Phase]
V69 P. measurement
[Amplitude]
V70 A. measurement
V71 Excitation
V72 Damping
V73 Internal d.
V74 Structural d.
V75 Aerodynamic d.
V76 Phugoid d.
V77 A.d. coefficient
V78 A.d. derivatives + D.d.
V79 Buzz
[Divergence]
V81 D. dynamic pressure
V82 Buffeting
V83 B. boundary
[Research]
V84 Systematic procedure
V85 Kernel function
V86 Piston theory
V87 Reciprocal relations [method]
V88 V. testing + V. tests
V89 Reference material

V90 Dampometer
V91 Displacement pickups
V92 Force pickups
V93 Pressure pickups

[Aerodynamic reference parameters]
V94 [Angle of incidence] Q + Angle of attack + Arbitrary a.of.a + Incidence
V95 A. of a. correction + A.of i.c.
V96 Zero a. of a.
V97 Zero model incidence
V98 Moderate a. of a.
V98a Angle of a. range $0^{o}$ - $65^{o}$
V99 Incidence range $0^{o}$ - $10^{o}$
V99a A. of a. range 4 - $18^{o}$
W1 High a. of a. + High incidences + Large a. o. a. see also F54
W2 Uniform a. of a.
W3 Increasing i.
W4 A. of a. distribution
W5 Vertical position [of tail]
W6 Planform
W7 Sweep angle + Sweep
W8 Angle of sweep range of 0-75 degrees
W9 Angle of sweepback
W9a S. a. $55^{o}$
W10 S. a. $60^{o}$
W11 $79.5^{o}$ s.
W12 Aspect ratio
W13 Zero a.r.
W13a Aspect ratio 1
W13b " " 2
W13c " " 2.823
W13d " " 2.828
W13e " " 6.1
W14 Taper ratio
W14a T.r. .333
W15 Thickness
W16 Thickness/chord ratio
W16c T.c.ratio about 5%
W16d " 6%
W16e " 16%
W16f " 24%
W17 Thickness distribution
W18 Twist
W19 Dihedral angle
W20 A. of d. range 0 - 30 degrees
W20a $4.5^{o}$ d.a.
[Span]
W21 Spanwise
W22 Finite s.
W23 Half-s. model
W24 Part s.
W25 Body size
W26 B. diameter
W27 B.d. ratio
[Chord]
W28 Chordwise
W29 C.coordinate
W30 Model c.
W31 C. ratio
W32 Camber
W33 Conical c.
W34 C. correction
W35 C. distribution
W36 Centre of gravity location
[Section]
W38 Aerodynamic design
W39 Cross section + Body c.s. + Arbitrary c.s.
W40 Percentage of solid c.s.
W41 Peaky s.
W42 Rooftop s.
W43 Midspan s.
W44 Sectional shape + S. shape
W45 S. thickness
W46 R.A.E. 101 s.
W46a 10% RAE 101 s.
W47 9% RAE 101 streamwise s.
W48 5% RAE 101 streamwise s.
W49 NACA 65A 004 s.

[Mechanics]
W50 Motion
W51 Transient m.
W52 Translation
W53 Rotation
W54 Rotational modes
[Oscillation, vibration see U91]
W56 Momentum deficiency profile
W57 Gravity
W57a Influence of gravity
W58 Forces
W59 Load + Applied f.
[Pressure]
W60 Random p. loading
W61 Compression + C. load
W62 Tension + T. load
W63 Bending + B. load
W64 Thermal stress
W65 Elastic range
W66 Plastic range
W67 Maximum stresses
W68 Loads, Longitudinal
W69 Loads, Concentric axial
W70 Loads, One-dimensional
[Stress-strain phenomena]
W71 Weakening
W72 Compression buckling
W73 Post-buckling
W74 Torque
W75 Rotational stiffness
W76 Bending stiffness
W77 Torsional stiffness
W78 Torsional rigidity
W79 Modules of elasticity
W80 Time dependent
W81 Mode shapes
W82 Stress distribution
W83 S. frequency d.
W84 Spanload d.
W85 Steady state d.
[Method of determining s.d.]
W86 Weissinger method
W87 Downwash matrix
W88 Elasticity matrices
W89 Aerodynamic twist matrices
W90 Structural twist matrices
W91 Plastic analysis
W92 Stress power spectra
[Prediction by]
W93 Model response
W94 Statistical superposition
W95 Powell theory
W96 Test specimens
W97 Instrumentation
W98 Material control
W99 Coupon test
X1 Magneto-fluid mechanics
X2 Electric body force
X3 Electro-magnetical induced forces
[Thermal phenomena]
X4 [Heat equation] Q
X5 Thermal equilibrium
X6 Temperature
X7 Ambient t. + Local stream t.
X8 Flame t.
X9 Room t.
X10 Transient t.
X11 Constant t. + T. uniform
X12 Recovery t.
X13 Elevated t.
X14 Maximum t.
X15 Reduced t.
X16 T. dependent values
X17 T. inversion
X18 T. variation
X19 Unit triangle v.

X20 T. distribution + T.profiles + T. history
X21 Transient t.d.
X22 One-dimensional t. gradient
X23 Zero t. gradient
X24 T. gradients, Transverse
X25 T. Linear gradient
X26 Equilibrium t.
X27 T. measurement
X28 Spectrum line reversal
X29 Double light beam
X30 Single light beam
X31 Carbon arc
X32 Sodium line reversal + S.l.r. method
X33 Oscillograph
X34 Interference filters
X35 Sodium chloride + Salt
X36 Sodium iodide
X37 Specific heat
X38 S.h. ratio parameters 1.10-1.67
X40 S.h. variation
X41 Conductivity + Thermal c.
X42 Variable c.
X43 Coefficient of t.c.
X44 Emissivity
X45 High radiative c.

[Thermal processes]
[Expansion]
X46 Coefficient of t. expansion
[Change of state]
X47 Combustion erosion
X48 Sublimation erosion
X49 S. rate
X51 Ablation + Surface a.
X52 A. rate + Rate of removal
X53 A. r. sensor
X54 Variable capacitance sensor
X55 Effective heat of a.
X56 Ablating materials
X57 Evaporation + Vaporization
X58 Evaporating into main stream
X59 Thermal distributions

[Thermodynamic phenomena]
X60 Thermodynamic problem
X61 Thermodynamic properties
X62 [Thermodynamic equilibrium] Q
X63 Enthalpy
X64 Total e.
X65 Intermediate e.
X66 I.e. approximation
X67 Newtonian intermediate e.a.
X68 Mean e.
X69 E. functions
X70 Recovery e.
X71 Stream e.

X72 E. layer
X73 Recovery factor
X74 Effective heat capacity

X75 Entropy
X76 E. gradient

X77 Isentropic exponent
X78 Specific gas constant
X79 Heat transfer
X80 [Heat input] Q
X81 Cooling
X82 Strong surface c.
X83 Radiation c.
X84 Back r.
X85 R. effects
X86 Transpiration c.
X87 T.c. results
X88 Ablation c.
X89 Downstream cooling effects
[Cooling agents]
X90 Shielding mechanism
X91 Polymers (Teflon type)
X92 Teflon material
X93 T. heat shield
X94 Quartz protection shield
X95 Heat sink
X96 Thicker outer skin
X97 Copper
X98 Graphite
X99 Molybdenum
Y1 Tungsten
[Heating]
Y2 Convection h. + Convective h. + Convection + C. of heat + Convective heat transfer
Y3 Forced c.h.
Y4 Convective heat transfer rate
Y5 Frictional h.
Y6 Aerodynamic h.
Y7 A. laminar h.
Y8 A.h. rate + H.r.
Y9 Laminar a.h.r.
Y9a Green function [integration with]
Y10 H. at edge
Y11 Local h. rate
Y12 Conduction + Heatflux + Heat flow + Heat Conduction
Y14 Average h. flow
Y15 One-dimensional h.c.
Y16 Transient c.
Y17 Heat flux distribution
Y18 H.c. equations
Y19 Transient h.c.e.
Y20 Diffusion
Y21 [effect of] Charged particles
Y22 Radiation h. transfer
Y23 Heat release
Y24 Total h. transfer
Y25 Transient h.t.
Y26 Steady h.t.
Y27 Frozen h.t.
Y28 H.t. coefficient
Y29 H.t. rate
Y30 Large gross h.t.r.
Y31 Small net h.t.r.
Y33 Local h. flow rates
Y34 Laminar [local heating r.]
Y35 Laminar h.t. distribution

Y35p Kinetic theory
Y35q K.t. solution
Y35r Energy equations
Y35s Equations of motion
Y35t Momentum e.
Y35u E. of continuity
Y35v Perfect gas theory
Y35w Equations of state
Y35x [Chapman-Enskog theory] Q

Y36 Dissociation
Y37 Dissociating fraction + Dissociation f.
Y38 Ambient atom mass fraction
Y39 Amount of d.
Y40 Freestream d.
Y41 D. energy
Y42 Rate of d.
Y43 R. constant
Y44 D. profiles
Y45 D. scaling law
Y46 Model scaling
Y47 D. equilibrium
Y48 E. composition
Y49 Complete e.
Y50 Molecular d.
Y51 Ionization
Y52 I. effect
Y53 I gauge
Y59 Non equilibrium d.
Y60 Deviation from chemical e.
Y61 Non-e. effects
Y62 Frozen flow + F.f. conditions
Y63 Freezing of flow + Freezing of a flow of gas

Y64 Chemically f.f.
Y65 Approaching c.f.f.
Y66 Approaching vibrationally f.f.
Y67 Across bow shock
Y68 Radiative disequilibrium

[Recombination]
Y54 Atomic r.
Y55 Molecular r.
Y56 Chemical r.
Y57 Rate of r.
Y58 Rate of reaction

[Collision phenomena]
Y69 Collision
Y70 Local mean free path
Y71 Free molecule limits
Y72 Emitted molecular density distribution
Y73 Transport properties
Y74 Transport processes
Y75 Transport coefficients

Y76 Research and investigation
Y77 Evaluation
Y78 Determination
Y79 Measurement
Y80 [Measured] Q
Y81 [Measuring method] Q

Y82 Experiment + Experimental investigation + Experimental test + Test
Y83 Experimental determination + Experimental measurement
Y86 Flight test + [During flight] Q + Experimental f.t.
Y87 Simulated f.t.
Y88 Continuous measurements
Y89 Telemetering system
Y90 Prediction in flight
Y92 Ground testing
Y93 Model test
Y94 Simulation

Y95 Experimental data + E. results + Results + Test data
Y96 Wind tunnel data
Y97 Tables of results
Y98 Flight test data

Y99 [Facilities] Q
Z1 Wind tunnel
Z2 W.t. tests + W.t. experiment + W.t. investigation
Z3 W.t. determination + W.t. measurement
Z4 Transonic w.t.
Z5 T.w.t. results
Z6 N.P.L: 18 x 14 w.t.
Z7 Supersonic w.t.
Z8 Hypersonic w.t. + Hypervelocity w.t.
Z9 Hypersonic shock t. + H.s.tube
Z10 H.s.tunnel tests
Z11 Driven
Z12 [by] Ignited mixture
Z13 Stoichiometric m.
Z14 Oxygen and hydrogen m.
Z15 M. with excess of helium
Z16 Hypersonic gun tunnel
Z17 Shock tube + Tube
Z18 S.t. experiment + S. tunnel experiment
Z19 Straight through s. tunnel
Z20 Reflected s. tunnel
Z21 [driven by] Unheated hydrogen driving air
Z22 Constant diameter s.t.
Z23 [High enthalpy w.t.] Q
Z24 Blowdown tunnel tests
Z25 Arc discharge w.t.
Z26 Cascade t. test

Z27 Circular t.
Z28 Closed octagonal t.
Z29 Closed rectangular t.
Z30 [Solid wall t.] Q + S.w.w.t. + S.w.w.t. tests
Z31 Slotted wall w.t. test

Z32 Variable density w.t.
Z33 [Low density w.t.] Q

[Parts]
Z34 Working section + Test section
Z35 W.s. with open jet
Z36 Closed throat w.s. + Closed tunnel w.s.
Z37 Slotted w.s.
Z38 W.s. size
Z39 Test section wall
Z40 W.t. walls + T.w. + Wall of tube
Z41 [Wall divergence] Q
Z42 Slotted liners
Z43 Modified liners

[Nozzle] see Ducts in general
Z44 Driving tube
Z45 Upstream of nozzle entry
Z46 Piston
Z47 Test gas
Z47h [Hypersonic test medium] Q
Z48 [Methane air combustion] Q
Z49 Loss
Z50 Behind interface

Z51 Non perfect gas
Z52 Dry air
Z53 Liquefaction point
Z54 Freon gas
Z55 Apparatus + Equipment
Z56 Support gear
Z57 Driers
Z58 Models
Z59 Rigid m.
Z60 Compreg wood m.
Z61 Pine Balsa m.
Z62 Magnesium m.

[Model characteristics]
Z63 Model flexibility effects
Z64 Model dimensions + M. size
Z65 [Mounted off-centre] Q

[Location in tunnel]
Z66 End of tube
Z67 Open area of walls
Z68 Near model base
Z69 Along model

[Characteristics]
Z70 Cross sectional size
Z71 Cross sectional shape
Z72 Length of tube
Z73 Tunnel weight
Z74 Tunnel speed
Z75 Power requirements
Z76 Running time + Flow duration
Z77 [Short running time] Q
Z78 Experimental testing time + Testing time
Z79 Theoretical t.t. + Ideal time
Z80 Actual time
Z81 Tunnel wall pressures
Z82 Bursting pressure ratio
Z83 [with] Removal of damping plate
Z84 Reservoir temperature

[W.T. interference etc. see Walls...]
Z85 Corrections

[Visualisation methods]
Z86 Oil flow study
Z87 Oil flow pattern
Z88 Surface o.f.p.
Z89 Photographs + Photographic record + Photographic study
Z90 Photomultiplier
Z91 Schlieren phtographs
Z92 Shadowgraph study
Z93 S. measurement
Z94 Hot wire measurement + H.w. anemometer

Z95 Blunt nosed Pitot tube
Z96 Spherical pendulum
Z97 Gyroscopic pendulum

Z98 [Theoretical work] Q + T.study + T. investigation + Theory
Z99 [Assumption] Q
ZA1 [Comparison] Q + Analogy
ZA2 Prediction + Theoretical p.
ZA3 [Criterion] Q

ZA3x Linearized theory
ZA3y Approximate theory
ZA4 Zero order theory
ZA5 Second order t.
ZA6 [Rigorous t.] Q
ZA7 Potential t.
ZA8 Modified Newtonian t.

[Mathematics]
ZA9 Tables + Tabulation
ZA10 Table of values

ZA11 Calculation + C. method + [Calculated] Q + [Calculating] Q + Methods for calculating + Computation
ZA12 Routine method
ZA13 Practical calculation
ZA14 Theoretical c.
ZA15 Estimate + Estimation
ZA16 Approximate c.
ZA17 Formula
ZA18 Asymptotic expansion f.
ZA19 General f.
ZA20 Solution
ZA21 Method of s.
ZA22 Simple s.
ZA23 Approximate s.
ZA24 Accurate s.
ZA25 Exact s.
ZA26 Theoretical s.
ZA27 Second order s.
ZA28 Simularity s.
ZA29 Asymptotic s.
ZA30 Analytical s.
ZA31 Approximate a.s.

[Dimensional analysis]
ZA32 Dimensionless form
ZA33 Scale effects

[Algebra]
ZA34 Equations
ZA35 Approximate e.
ZA36 Linear e.
ZA37 Non-l. e.
ZA38 [Three dimensional e.] Q
ZA39 Singular e.
ZA40 Six degrees of freedom e.
ZA41 Elliptic e.
ZA42 Navier Stokes e.
ZA42a [with] No-surface slip
[Transformation]
ZA43 Fourier t.
ZA44 Lorenz t.

[Analysis]
ZA45 Newtonian a.
[Calculus]
ZA47 Complete elliptic integral
ZA48 Integration + I. methods + Integrating solution
ZA49 Asymptotic i. method
ZA50 Differential equations
ZA51 Linear d.e.
ZA52 L.d.e. with constant coefficients
ZA53 L.d.e. with periodic coefficients + [Periodic coefficient] Q
ZA54 [Lyapunov's method] Q

[Stability]
ZA55 Asymptotic stability
ZA56 Routh-Hurwitz criterion
ZA57 Phase space + State space
ZA58 Partial d.e.
ZA59 [Difference equation] Q
ZA60 [Navier Stokes d.e.] Q
ZA61 Finite d.e.
ZA62 F.d. methods
ZA63 F.d. approximation
ZA65 Eigenvalue problems
ZA66 Integral equations
ZA67 Generalized i.e.
ZA68 Abel i.e.
ZA69 Birbaum i.e.
ZA70 Possio i.e.
ZA71 Prandtl i.e.
ZA72 Finite part
[Series]
ZA73 Time series
ZA75 Convergence
ZA76 C. rates
ZA77 Asymptotic s.
[Boundary values]
ZA78 B.v. problems
ZA79 Blasius problem
ZA80 Rayleigh's problem
ZA81 Boundary conditions + Given b.c.
ZA82 Three point b.c.
ZA83 Time dependent b.c.
ZA84 Function
ZA85 Partition f.

[Methods, techniques, operations]
ZA86 Method + [Theoretical m.] Q
ZA87 Generalized m.
ZA88 Analysis + Analytical m. Q + Analytical study + Theoretical a. + Analytic determination + Determination by a.
ZA89 Analytical estimation
ZA90 Analytical results
ZA92 Approximation
ZA94 Successive a.
ZA95 Closed form
ZA96 Newtonian a.
ZA97 Variational principle
ZA98 V.p. of Biot
ZA99 Perturbation method
ZA99a Orthogonal functions expansion method
ZB1 Graphical a.
ZB2 Numerical determination + N. calculation + N.solution
ZB3 [Iterative method] Q + Iterative solution + Iterative numerical solution
ZB4 [Convergent] Q
ZB4a Finite difference numerical s.
ZB5 Richardson method
ZB6 Second order R.m.
ZB7 Liebmann m.
ZB8 Extrapolated L.m.
ZB9 Relaxation methods
ZB10 [with] Spherical polar coordinate
ZB11 Modified
ZB12 Successive overrelaxation m.
ZB12a Analytic continuation
ZB12b [by] Taylor's series
ZB14 Inversion
ZB15 Linearization
ZB17 Method of characteristics
ZB18 Johannsen and Meyer method
ZB19 Polhausen m.
ZB20 Extension of Stratford m.
ZB21 Newtonian closed-form expression
ZB22 Newtonian coefficient

ZB23 Computer
ZB24 [High speed computer] Q
ZB25 [Digital computer] Q
ZB26 [Programme] Q

[Automatic control]
ZB27 Automatic control theory
[See also Stability]
ZB28 Dynamic systems
ZB29 Linear s.
ZB30 Non-linear s.
ZB31 Non-linear mechanics
ZB32 Stationary s.
ZB33 Non-stationary s.

ZB34 Lyapunov's theory
ZB35 Second method of L.

ZB36 Stable regions
ZB37 Transient behaviour
ZB38 Limit cycles
ZB39 Random disturbances

ZB40 Relay servos
ZB41 Nonlinear autopilot
ZB42 Autopilot with feedback

ZB43 Control system optimization
ZB44 Time-optimum control

[General properties]
ZB45 [General form] Q
ZB46 [Nature] Q
ZB47 Characteristic
ZB48 [Parameters]
ZB49 Variable properties

ZB50 Material properties
ZB51 Configuration
ZB52 Arbitrary shape
ZB53 Length
ZB54 L. changes

ZB55 Thickness effect
ZB55c Stability [non-aerodynamic]
ZB55e Effective
ZB56 Combined + Combination
ZB57 Combined effect
ZB58 Attached
ZB59 Associated
ZB60 Carry
ZB61 Relationship
ZB62 Non-linear relation
ZB63 Ratio
ZB64 Finite rate
ZB65 [Quantitative] Q

[Location, position]
ZB66 Location
ZB67 Streamwise
ZB68 Ahead of body
ZB69 Behind
ZB70 Passing through
ZB71 Downstream influence
ZB72 Far downstream

[General processes]
ZB73 [Effect] Q + [Influence] Q
ZB74 Design
ZB75 Controlling

ZB76 Elimination
ZB77 Variation
ZB78 Arbitrary v.
ZB79 [Large change] Q
ZB80 Transition
ZB81 Onset
ZB82 Deviation

ZB84 [Production] Q
ZB85 Derivation
ZB86 Performance
ZB87 Dynamic behaviour

ZB88 Expansion
ZB89 Reduction

# APPENDIX 5.5

## ALPHABETICAL INDEX OF CONCEPTS

This Appendix lists all the concept terms used in the indexing of the 200 documents comprising Subset 1, as given in Appendix 3E. For each term in its natural form is given the appropriate notation for its location in the concept term schedules, which appear as Appendix 5.4.

Each concept appears under each key term, so that, for instance, the following entries will be found:

Abel integral equation
Integral equation, Abel
Equation, Abel integral

In addition, this list includes terms which occurred in the set of search questions but which did not appear in the indexing. All such terms are marked by an asterisk.

Abel Integral Equation ZA68
Ablating Materials X56
Ablation X51
Cooling X88
Effective Heat of
-Rate Sensor X53
Rates X52
Surface
Abrupt Stall G21
Absolute Flow F90
Absorption Ultra-Violet
Radiation G56
Accelerated G56
Accelerating Flow N6
Acceleration K48
During Boost K50
Potential U36
Variations in
Vertical
Accommodation Height 037j
Accurate Solution ZA24
Acoustic Radiator V58
Across Bow Shock Y67
Active Gas Chemically
Activity Solar
Actual Time Z80
Addition Small Rate of Heat
Adiabatic Flow M93
Surface Temperature D63
Temperature Rise Maximum
Wall Temperature D63
Adjacent Flat Surface D13
Main Blade F10
Adjustable Blading F23
Inlet Guide Vanes F33
Adverse Ground Effect T77
Aerodynamic Balance S64
Centre S51
Centre Characteristics S52
Centre Local
Characteristics K6
" Longitudinal
" Static
Coefficients Longitudinal
Damping V75
Damping Coefficient V77
" Derivatives V78
Derivatives* T45
" Direct
" Indirect
" Oscillatory
Design W38
Flutter Derivatives V21
Forces R22
Heating Y6
Heating Rate Y8
" " Laminar
Inertia R24
Interaction Effect T61
Laminar Heating Y7
Load R49
Loading R49
Moments S49
Noise V54
Normal Forces R25
Problems K7
Aerodynamic Stability T35
Stiffness Derivatives V63
Twist Matrices W89
Aeroelasticity Static
Aerofoils Blunt-Nosed
Single Wedge
Straight Line
Technique Complete
Technique Half
Three Dimensional
Aerothermodynamic Relations Basic
Afterbody Conical Base
Cylinder
Cylindrical
Drag D6
Surface D5
Truncated
Vehicle Conical
Ahead of Body ZB68
Jet P75
Shock Wave Q80
Aileron Coefficients Oscillatory
Air L54
Bleed Compressor
Blowing Jet P52
Breathing Vehicle A60
Burned In
Combustion, methane*
Components L62
Compressed
Current L66
Density M12
Density at Perigee J94
" Perigee
" Profile M13
Dissociated
Drag M7
Drag around Orbit M9d
Dry
Energy of
Expansion Cold
Flow* L65
" Correlated Non-Equilibrium
" Equilibrium
" Hot*
" Stagnation
Fully Ionized
Heated
High Temperature
Hydrogen Burned
Jet P46
" Blowing
" Cold
" High Energy
" Small
" Subsonic
" Vortex Generators C47
Outlet Angle F50
Shock Velocity Q96
Still
Stream L66
Unheated Hydrogen Driving
Aircraft High Speed
Models Complete
Shapes A9
Structures A5

Airfoil A79
Blunt Trailing Edge
Circular Arc
Double Wedge
Equation A82
NACA 4412
Nonlifting
Rigid
Shape A85
Symmetrical
Two-Dimensional
Wedge
Airforces* R22
Airplane* A2
Airplane Wing B1
Tail-Boom
Tailless
Airspeed Holding K46
All Movable Control Surface C26
Tail C16
Alloy 2024 T4 Aluminium
Along Hub F63
Model Z69
Alternating Lift Function Theodorsen
Altitude K91
Various heights in KM-L 96/L98
Condition High
Flight
Flight High
Maximum
of 300 Nautical Miles K95
of 525 Nautical Miles K96
Results M3
Aluminium Alloy 2024 T4 J45
Ambient Atom Mass Fraction Y38
Gas L26
Supersonic Stream M54w
Temperature X7
Amount E56
Amount of Dissociation Y39
Amplitude Measurement V70
Analogy ZA1
Analysis ZA88
Compressible Flow
Determination
Linearized Flow
Modal
Modified Strip
Newtonian
Plastic
Rayleigh Type
Stage-Stacking
Theoretical
Analytic Continuation ZB12a
Determination ZA88
Solutions Approximate
Analytical Estimation ZA89
Method* ZA88
Results ZA90
Solution ZA30
Study ZA88
Anemometer Hot Wire
Angle Air Outlet
of Attack V94
of Attack Range 0-65 degree V98a
" " " 4-18 " V99a
Angle of Attack Arbitrary
" " Correction V95
" " Distribution W4
" " High
" " Large
" " Moderate
" " Oscillation V12
" " Positive
" " Uniform
" " Zero
Between Sun and Perigee K1
Boattail
Body
Cone 10 Degree Semivertex
Constant Flow
of Corners Number and
Deflexion
Dihedral
of Dihedral Range of 30 Degrees W20
Exit Shock Wave
Flight Path
Greater than $\frac{1}{2}\pi$ Re-Entrant
of Incidence* V94
of Incidence Correction V95
Inlet Blade
Jet Shock Wave
Mach
Nozzle Divergence
Nozzle Exit
Outlet Flow
Phase
Sweep
of Sweep Range 0-75 Degrees W8
of Sweepback W9
Turning
Wedge
Wedge Shock
$60^{\circ}$ Sweepback
Annulus Area F87
Anti-Symmetric Velocity Potential U35
Apex Located Controls* C27
Location Jet Shock Wave
Apogee Distance Change J96
Apparatus Z55
Apparent Mass Effects S1
Appearance Time of
Applied Forces (=Load) W59
Approach Target Planet
Approaching Chemically Frozen Flow Y65
Vibrationally Frozen Flow Y66
Approximate Analytic Solutions ZA31
Calculation ZA16
Equation ZA35
Solution ZA23
Theory ZA3y
Approximation ZA92
Finite Difference
Graphical
Hypersonic
Intermediate Enthalpy
Newtonian
Successive
Arbitrary Angle of Attack V94
Blade Shape F36
Cross-Section W39
Hub Shroud Contour F79

Arbitrary Pitching Rate K68
Planform Wing B4
Shape ZB52
Stiffness Wing B39
Variation ZB78
Arc Airfoil Circular
Carbon
Discharge Wind Tunnel Z25
Heating Rockets A73
Parabolic Body
Profile Circular
Ardc 1956 Model Atmosphere L29
Area Annulus
Argon Shock Waves Q67
Around Orbit Air Drag
Arrangement Wing Body
Arrow Wing Vehicle A53
Artificial Satellite A16
Thickening O28
Aspect Ratio W12
" " for numbered concepts see W13a - W13e
Aspect Ratio Low
Wing Finite
" High
" Infinite
" Low
" Vanishing Low
" of Very Small
Zero
Associated ZB59
Assumption* Z99
Asymmetric Oscillation V5
Asymptotic Behaviour S5
Expansion Formulae ZA18
Integration Method ZA49
Series ZA77
Solution ZA29
Stability ZA55
At Perigee J77
At Rest L14
Atlas A18
Atom Mass Fraction Ambient
Atmosphere .0001-100 M9x
Ardc 1956 Model
Earth
Entering Earth
Entering Martian
Extreme Upper
Entry into Planetary
Oblate
Oblate Rotating
Planetary
Re-Entry Earth
Upper
Atmospheric Density M12
Drag M7
Model Investigation M1
Oblateness M5
Re-Entry J59
Resistance M7
Rotation M6
Atomic Nitrogen L73
Oxygen L75
Recombination Y54
Attached ZB58
Attached Flow Fully
Sheet Rigidly
Shock-Wave System Q60
Attachment Flow
Line N82
Transonic Flow
Attack of Angle
Arbitrary Angle of
Correction Angle of
Distribution Angle of
High Angle
Large Angle
Moderate Angle
Oscillation Angle of
Positive Angle of
Uniform Angle of
Zero Angle of
Attenuation of Reflected Shock R14
of Shock Wave R15
Attitude Base Forward
Control K58
Statically Stable
Trim
Vehicle
Nose Forward
Augmentation Thrust
Automatic Control Theory ZB27
Autopilot Non-Linear
with Feedback
Average Heat Flow Y14
Skin Friction Coefficient S24
Avro - 707A A4
Axial Body Force R30
Compressor E66
Flow Compressor E66
Flow Compressor Blade E69
Flow Turbomachine E66
Force R29
Force Coefficient R43
Inlet Impeller E83
Inlet Pump E83
Inlet Rotor E83
Load Concentric
Axially Symmetric Nozzle Jet P57
Back Radiation X84
Baffles Inlet
Balance Aerodynamic
Chamber C77
Ballistic Missile A11
Vehicle A11
Ballotini Glass Bead O51
Band Distributed Roughness
Materials Roughness
Width O49
Bang-Bang Roll Control K74
Base Afterbody Conical
Bleed T16
Flat
Forward Attitude K61
Pressure S77
Pressure Two-Dimensional
Near Model
Pressure Measurement S79
Vehicle Flat
Basic Aerothermodynamic Relations G14
Bead Ballotini Glass
Beam Continuous

Beam Double Light
Single Light
Single Span
Behaviour N80
Asymptotic
Dynamic
Transient
Behind ZB69
Interface Z50
Normal Shock Q79
Shock Flow Field
a Shock Wave Flow
Belt Equatorial
Beneath Wing Q6
Bending W63
Load W63
Moment Root
Oscillation V8
Stiffness W76
Stress Blade
Type Flutter V18
Between Hub and Shroud F84
Sun Perigee Angle
Biconvex Airfoil A89a
Section Wing B24a
Biplane Type Vortex Generators C52
Birnbaum Integral Equation ZA69
Blade Adjacent Main
Angles Inlet
Axial Flow Compressor
Bending Stress F18
Curvature F37
Design C55
Driving Face F69
Failure F48
Form Constant Reaction
Form Free Vortex
Form Half Vortex
Main
NACA 65(12)10 Blower
Number
Parabolic Shaped
Rotor
Rows F25
Row Inlet
Row Rotating
Shape F35
Shape Arbitrary
Speed Pitch-Line
Stagger F44
Stator
Surfaces Impeller
Surfaces Main
Surface Velocity F56
Surface Velocity Maximum Relative
Tip F65
-to-Blade F61
Blading Adjustable
Circular
Impulse
Parabolic
Reaction
Skewed Parabolic
Blasius Equation T79a
Problems ZA79
Blast* S44
Bleed Base
Compressor Air
Blockage Correction T72
Effects T68
Interference T67
Ratios T71
Solid
Wake
Blowdown Tunnel Test Z24
Blower Blade NACA 65(12)10
Blowing O35a
Air Jet F60
At Knee O36
Flap C36
High Velocity
Pressure O37f
Slot
Bluff Body J18
Blunt Body J19
Interaction
of Revolution H50
of Revolution Vehicle A54
Blunted Cone Vehicle 10°
Blunt Leading Edge E12
Model J20
Nose Cone H62
Shapes C95
Vehicle A55
Nosed Aerofoils A91
Body J22
Pitot Tube Z95
Re-Entry Vehicle A36
Trailing Edge E36
Aerofoil A92
Blunted Cone H61
10° Blunted Cone Vehicle A56
Blunted Nose Slightly
Re-Entry Configuration A36
Rod H71
Wedge J12
Blunting Nose
Bluntness E12
Effects E12
Leading Edge
Tip
Boattail D1
Angles D2
Body H17x
Ahead of
Angle K63
Arc Parabolic
Arrangement Wing
Axisymmetric
Bluff
Blunt
Blunt Nosed
Combination Wing
Cone-Cylinder
Cross Section W39
Diameter W26
Diameter Ratio W27
Flat Faces
Flow Field M39
Flow Field Gradient M40
Forces R39
Force Axial

Body Force Electric
Geometry H41
Graphite Re-Entry
Hemispherically Nosed
Highly Cooled
Hypersonic
Interaction Blunt
Interference Wing
Leeward
Lift R80
Modes V50
Motion Transition From Tumbling
Nonlifting
Nose C87
Pointed
Pressure Distribution T2
Re-Entry
of Revolution H46
" " Elliptical
" " Slender
" " Tumbling
" " Vehicle Blunt
" " Yawed
Rigid
Sharp Edged
Size W25
Slab
Slender
Slope H42
Solid
Spiked
Surface Non-Catalytic
Surface Slope D71
Symmetrical
Theory Slender
Thin
Three-Dimensional
Two-Dimensional
Windward
Wing
Boost Acceleration During
Bound Vortex 088
Boundary D84
Buffet
Conditions ZA81
" Given
" Three-Point
" Time-Dependent
Constraint D95
" Zero
Curvature Jet
Divergence
Fixed
Flexible
Flutter
Inner
Ionized
Jet
Layer N64
" Compressible
" Control 035
" Displacement 012
" " Effect 013
" " Thickness 029
" Flow N64
" " Laminar
" " Separation N90
" " Turbulent
Boundary Layer Form Parameter 030
" Growth N83
" Heat Transfer 021
" Heating Laminar
" Incompressible
" Interference
" Laminar
" Momentum Thickness 026
" Profile 023
" Reattachment 010
" Separation N90
" Separation Delay 04
" " Laminar
" " Low Speed
" " Position 05
" " Shock Induced
" " Shock Wave Induced
" " Shock Wave Interaction 015
" " Transitional
" " Turbulent
" " Vortex Type
" Stability 032
" Stagnation
" Theory N65
" Thick*
" Thickening of
" Thickness 024
" Thickness Laminar
" Three-Dimensional
" Transition N87
" Transition Position N89
" Transitional
" Traverses N86
" Turbulent
" Viscosity Effects 011
" Wall
Mixing
Motion D92
Moving
Shape Jet
Value Problems ZA78
Working Section with Rigid
Bow C82
Bow Shock C83
" Across
" Geometry C84
" Wave C83
Breathing Vehicle Air
Buckling Compression
Buffet Boundaries V83
Buffeting V82
Bump Lockheed
Technique 062
Buoyancy L20
Burned in Air L81
Burned in Air Hydrogen
Bursting Pressure Ratio Z82
Buzz V79
Calculated* ZA11
Calculating* ZA11
Calculating Methods
Calculation ZA11
Approximate
Flutter
Method ZA11
Numerical

Calculation Practical
Theoretical
Camber W32
Conical
Correction W34
Distribution W35
Wing B82
Cantilever Wing Flutter B42
Cantilevered Wing B41
Capability Restart
Capacitance Sensor Variable
Capacity Effective Heat
Capture Maneuver J51
Carbon Arc X31
Carbon-Dioxide and Hydrogen
Carborundum 050
Carry ZB60
Cascade Losses E92
Cascade Tunnel Test Z26
Central Section C11
Centre Aerodynamic
Characteristics Aerodynamic
of Gravity Location W36
Line Downwash V10
Local Aerodynamic
of Pressure S84
of Pressure Spanwise
of Rotation J42
Centrifugal Compressor E65
Forces R31
Impeller E81
Cessation Tumbling
Chamber Balance
Rocket
Change Apogee Distance
Induced by
Large*
Length
Perigee Distance
of Plane J65
Rate
Satellite Orbit
Semimajor Axis
in Slope G29
of Density U79
Sudden
Channel Converging
Diverging
Flow G64
Slender*
Straight*
Variation
Walls G63
Chapman-Enskog Theory* Y35x
Characteristic ZB47
Aerodynamic
Centre Aerodynamic
Dynamic Stability
Environmental
Equivalent Weight Flow
Intermediate Speed
Performance
Longitudinal Aerodynamic
Method
Pressure Ratio
Section
Characteristic Stage
Static Aerodynamic
Static Stability
Steady Motion
Charged Particles Y21
Chemical Equilibrium Deviation
Reaction Q27
Recombination Y56
Rocket A64
Chemically Active Gas L40
Frozen Flow Y64
Frozen Flow Approaching
Reacting Gas L40
Chloride Sodium
Choke Line G8
Choked Convergent Nozzle G78
Flow G6
Tunnel* U4
Wind Tunnel U5
Wind Tunnel Tests U6
Choking T102
Flow Coefficient G7
Line* G8
Mach Number U1
Chord Force Coefficient R44
Model
Ratio W31
Ratio Thickness
Wing
Chordwise W28
Coordinate W29
Load R50
Loading R50
Location S86
Pressure Distribution T3
Vortices P2
Circuit Logarithmic
Circular Arc Airfoil A89
Arc Profile A89
Blading F38
Cone H56
Cone Segment H57
Cylinder H74
Orbit J71
Pipe G55
Planform Wing B23
Tunnel Z27
Circulating Wake Development
Circulation Control U61
Function U60
Reduction of
Circulatory Lift R75
Circumferential Maldistribution of Flow G11
Classical Wave Equation Solution S14
Clipped Delta Wing B19
Closed Form ZA95
Form Expressions Newtonian
Octagonal Tunnel Z28
Rectangular Tunnel Z29
Throat Working Section Z36
Tunnel Working Section Z36
Cocurrent Streams 064
Coefficient Aerodynamic Damping
Average Skin Friction
Axial Force
Choking Flow

Coefficient Chord Force
Discharge
Divergence Lift
Drag
Flow
Flutter
Force
Heat Transfer
High Flow
Incremental Normal Force
Jet Thrust
of Lift S2
Lift
Lifting
Linear Differential Equations with Constant
Linear Differential Equations with Periodic
Longitudinal Aerodynamic
Moment
Newtonian
Normal Force
Oscillatory
Oscillatory Aileron
Oscillatory Lift
Oscillatory Tab
Periodic*
Pitch Damping
Pitching Moment
Pressure
Profile Drag
Response
Stage Flow
Temperature
of Thermal Conductivity X43
Thermal Expansion X46
Thrust
Total Drag
Total Lift S6
of Total Lift S6
Transport
Trim Lift
Viscosity U89
Cold Air Expansion L68
Air Jet P51
Gases Mixture
Helium Jet P53
Collision
Regime First
Combination ZB56
Wing-Body
Combined ZB56
Effect ZB57
Combustion Erosion X47
Methane Air*
Product Gas L82
Surface
Comparison* ZA1
Complete Aircraft Models
Airfoil Technique 061
Compressor Stall G22
Elliptic Integral ZA47
Equilibrium Y49
Component Air
Lift Dependent Drag
Composite Slab D74
Wall D74
Composition Equilibrium
Compound Fuel Mixed Hydrocarbon
Compreg Wood Model Z60
Compressed Air L55
Compressibility U82
Effects U83
Compressible Boundary Layer N74
Flow N41
Flow Analysis N42
Fluid L7
Jet Mixing Q21
Lift R76
Compression W61
Buckling W72
Nozzle G73
Load W61
Wave Resonances Q43
(As) Compression and Waves Q42
Compressor E64
Air Bleed G13
Axial
Axial Flow
Blade Axial Flow
Centrifugal
High Pressure Ratio
Idealized
Isentropic
Mixed Flow
Multistage
Radial Flow
Single Stage
Stall Complete
Subsonic
Surge G27
Computation ZA11
Computer ZB23
Digital*
High Speed*
Concave Cross-Section Locally
Nose C90
Concentrated Weights Wing With
Concentration Profiles Q28
Concentric Axial Load
Condensation Moisture
Condition Boundary
External Flow
Frozen Flow
Given Boundary
Inlet
High Altitude
Stagnation
Steady Downwash
Surface
Three-Point Boundary
Wall
Conduction Gas Electrically
Conduction Y12
Equations Heat
Equation Transient Heat
Heat
One-Dimensional Heat
Transient
Conductivity X41
Coefficient of Thermal
Thermal
Variable
Cone H55

Cone Blunt Nose
Blunted
Circular
Cylinder H76
Cylinder Bodies H76
Elliptic
Hemisphere H69
50° Hemisphere H69a
Segment Circular
Segment Elliptic
10° Semivertex Angle
Sharp Nosed
Vehicle 10° Blunted
Cylinder Flare Slender
Configuration ZB51
Blunted Re-Entry
Delta Wing Re-Entry
Glider Re-Entry
Lifting Re-Entry
Re-Entry Glider
Slot
Winged Re-Entry Glider
Conical Afterbody Vehicle A57
Base Afterbody C99
Camber W33
Flow Field N25
Flow Theory N26
Nozzle G74
Nozzle Nearly
Shock Separation R19
Conically Divergent Nozzles G80
Conservation of Mass Equation R16
Constant Coefficient Linear
Differential Equations
Diameter Shock Tube Z22
Elastic
Flow Angles G33
Material Properties H39
Pressure S88
Pressure Mixing T86
Rate
Reaction Blade Form F41
Specific Gas
Temperature X11
Wall Temperature D99
Constraint Boundary
Tunnel
Wall
Zero Boundary
Construction V33
Disc
Drum
Wing Solid
Contact Surface D24
" Reflected From
Continuation Analytic
Continuity Equations of
of Species Q26
Continuous Beams J43
Fuselage Skin C65
Load R58
Loading R58
Measurements Y88
Oscillation V2
Skin C64
Continuum Flow Field Development N43
Continuum Flow Model N44
Flow Theory N45
Contour Arbitrary Hub Shroud
Elliptic Leading Edge
Leading Edge
Parabolic Leading Edge Vorticity
Contracting Section H2
Contraction K3
Orbital
Rate of
Shape H3
Contribution Leeward Surface
Control T28
Apex Located*
Attitude
Bang-Bang Roll
Boundary Layer
Circulation
Directional
Flap
Forward Located*
Jet Reaction
Lateral
Longitudinal
Material
Non-Linear Roll
Speed
Stability
Surface X25
Surface All Movable
Surface Buzz C56a
Surface Tabs C43
System Optimization ZB43
Theory Automatic
Thrust Vector
Time-Optimum
Vertical Plane
Yaw
Controlling ZB75
Convection Y2
Heating Y2
of Heat Y2
Heating Forced
Convective Heat Transfer Y2
Heat Transfer Rate Y4
Heating Y2
Convergence ZA75
Rates ZA76
Convergent* ZB4
-Divergent Nozzle G81
-Divergent Nozzle Supersonic
Nozzle G76
" Choked
" Sonic
Converging Channels G61
Diverging Nozzle G81
Nozzle G76
Convex Cross Section H92
Cooled Body Highly
Cooling X81
Ablation
Effects Downstream
Radiation
Results Transpiration
Strong Surface
Transpiration

Coordinate Chordwise
Cylindrical
Spanwise
Copper X97
Copper Wall D83
Corner Cylinder Without
Number and Angles of
Separation
Co-Rotating Vortices P5
Correction Z85
Angle of Attack
Angle of Incidence V95
Blockage
Camber
Induced Drag
Trajectory
Correlated Nonequilibrium Airflow L71
Couette Flow N4
Countercurrent Exhausting
Counter-Rotating Vortices P6
Coupled Freedoms V95
Coupon Test W99
Criterion* ZA3
Routt-Hurwitz
Critical Flutter Speed V26
Roughness Height 054
Cropped Wing B43
Cross Section W39
Cross Sectional Shape Z71
Size Z70
Crossed Flexure Pivot J37
Spring Pivot J37
Crossflow Induced By
Crossing Point Strips
Cross-Section Arbitrary
Body
Convex
Cylinder
Locally Concave
Polygon
Cruising Performance K18
Current Air
Curvature N24
Blade
Flow
Jet Boundary
Radius
Shock
Surface
Curve Double-Valued Performance
Generalized Design
Logarithmic
Logarithmic Density
Pitching Moment
Section Lift
Slope Lift
Curved Surface D14
Tip Planform Wing B24
Cycles Limit
Cylinder H72
Afterbody D3
Circular
Cone
Cross-Section J2
Of Eccentricity $\frac{1}{2}\sqrt{3}$
Elliptic
Flat Faced
Cylinder Frictional Drag On
Hemispherical
Inconel
Infinite
Joukowski Profile
Long
Model Ogive
Moving H94
Non-Circular*
Oscillating
Stationary
Surface J4
Without Corners H83
Of Finite Thickness H88
With Hemispherical Nose H80
Cylindrical Afterbody D3
Coordinates J8
Shock Q69
Damping V72
Aerodynamic
Coefficient Aerodynamic
Coefficient Pitch
Derivatives V78
Derivatives Aerodynamic
Internal
In Pitch K70
In Pitch Moment K72
Phugoid
Plate Removal of
Structural
Dampometer V90
Data Experimental
Flight Test
Hypersonic Experimental
Wind Tunnel
Day to Night Variation of
Day-Time Density M20
Decay A72
Oscillatory Pressure
Rate of
Decaying Oscillations U99
Decelerating Flow N7
Deceleration K51
Force R36
Decrease Perigee Height
Satellite Orbital Period
Deficiency Profile Momentum
Deflected Plate Differentially
Wing Differentially
Deflection Differential Elevon
Differential Rudder
Elevon
Rudder
Wing Tip
Deflexion T7
Angle Q74
Degree of Freedom V64
Equation Six
of Tunnel Turbulence 056
Delay Boundary Layer Separation
Delta Wing B16
Clipped
Re-Entry Configuration A34
Sweptback
Density U77
Air
Atmospheric

Density Change
Curve Logarithmic
Day-Time
Distribution U78
Distribution Emitted Molecular
Exhaust
Low
Night-Time
Perigee Air
Profile Air
Ratio U80
Ratio Model
Results M16
Scale Height M14
Variation U79
Variations Diurnal
Variation of
Variations Seasonal
Wind Tunnel, Low*
Wind Tunnel Variable
Dependent Drag Component Lift
Time
Values Temperature
Derivation ZB85
Derivative Aerodynamic*
" Damping
" Flutter
" Stiffness
Damping
Direct Aerodynamic
Dynamic Stability
Indirect Aerodynamic
Oscillatory Aerodynamic
Pitching Moment
Rolling
Rotary
Stability
Static Stability
Two-Dimensional Flutter
Yawing
Design ZB74
Aerodynamic
Blade
Curve Generalized
Equation, Simplified Pump*
Flexibility K12
Improved Shroud
Method, Pump*
Percentage
Destabilising Effect T50
Detached Shock Layer R1
Shock Wave Q59
Detachment Distance Q91
Distance Shock
Determination Y78
by Analysis ZA88
Analytic
Experimental
Force
Pressure
Numerical
Wind Tunnel
Developed Flow Fully
Development of Circulating Wake U21
Continuum Flow Field
Flow
Shock Wave
Deviation ZB82
From Chemical Equilibrium Y60
Diameter G93
Body
Hole
Jet Exit
Leading Edge
Nozzle
Nozzle Throat
Ratio Body
Ratio Jet
Reynolds Number G96
Diatomic Model Gas L28
Dietzes Method V44
Difference Approximation Finite
Equation* ZA59
Finite
Navier-Stokes*
Method Finite
Numerical Solution Finite
Pressure
Differential Elevon Deflection C33
Equations ZA50
Equations Linear
Partial
with Constant
Coefficients Linear
with Periodic
Coefficients Linear
Rudder Deflection C30
Differentially Deflected Plate H32
Deflected Wing B92
Diffuser Vaneless
Diffusion Y20
Digital Computer* ZB25
Dihedral Angle W19
" " $4.5^{\circ}$ W20a
Dihedral Range 0 - 30 Degree Angle
Dimensionless Form ZA32
Dimension Model
Direct Aerodynamic Derivatives T46
Direction Spanwise
Directional Control T32
Stability T44
Disc Three-Dimensional
Discharge Coefficient H15
Wind Tunnel Arc
Discontinuities in Performance G47
Discontinuity G47
Discontinuous Flow Theory Kirchoff
Discoverer Satellite A19
Discrete Horseshoe Vortex T78
Disequilibrium Radiative
Disc Construction E68
Displaced Pivot J39
Displacement 012
Boundary Layer
Effect Boundary Layer
Main Vortex
Pickups V91
Ratio J7
Shock
of Solid H40
Sinusoidal Oscillation
Thickness 029
Thickness Boundary Layer
Dissipative Flexible Surface D20

Dissociated Air L60
Gas L34a
Stream L52
Dissociating Fraction Y37
Gas L34
Dissociation Y36
Amount of
Energy Y41
Equilibrium Y47
Fraction Y37
Free Stream
Molecular
Nonequilibrium
Profiles Y44
Rate of
Scaling Law Y45
Distance Change Apogee
Change Perigee
Detachment
Leading Edge E33
Perigee
Shock Detachment
Stand-Off
With Time Variation of Perigee
Distortion T52
Distributed Roughness Bands 047
Suction 038
Distribution S25
Angle of Attack
Body Pressure
Camber
Chordwise Pressure
Density
Doublet
Downwash
Elementary Horseshoe Vortex
Emitted Molecular Density
Heat Flux
Laminar Heat Transfer
Lift
Load
Longitudinal Pressure
Periodic
of Pivotal Points R95
Prescribed Pressure
Prescribed Velocity
Pressure
Sinusoidal Pressure
of Slope R85
Source
Spanload
Spanwise Lift
Static Pressure
Steady State
Surface Heat Transfer
Surface Pressure
Temperature
Thickness
Travelling Pressure
Velocity
Vorticity
Wing Pressure
Disturbance T51
Downstream
Flow
Infinitely Small
Random
Disturbance Theory Hypersonic Small
Inviscid Small
Small
Diurnal Density Variations M21
Variations M21
Divergence Angle Nozzle
Boundary 031
Dynamic Pressure V81
Lift Coefficient
Pressure
Shock Wave Position
Wake Width
Wall*
Divergent Nozzle G79
Diverging Channels G62
Division Flow
Division of Loading F15
Domain Vorticity Interaction
Double Light Beam X29
Double-Valued Performance Curves E94
Double Wedge Airfoil A88
Doublet Distribution 086
Equation Supersonic
Superposition 083
Downstream Cooling Effects X89
Disturbances T53
Exhaust P74
of Exit P76
Far
Influence ZB71
Portion J6
Downwash
Centre Line
Conditions Steady
Distribution U12
Distribution Periodic
Induced
Integral Equation S13
Matrix W87
Surface
Total
Drag S16
Afterbody
Air
Around Orbit Air
Atmospheric
Coefficient S36
" Profile
" Total
Component Lift Dependent
Correction Induced
On Cylinder Frictional
- Design Minimum
Excess
Forebody
Form
Induced
Lift-Dependent
Model
Normal Pressure
Nose
Penalty S34
Pressure
Ratio Lift
Ratio Maximum Lift
Reduction S39
Resultant

Drag Reversibility Theorem S42
Rise S41
Skin Friction
Surface
Total
Viscous
Wave
Driers Z57
Drilled Plates Hole
Wing Hole
Drilling Hole
Drive External Rigid
Internal Rigid
Driven Z11
Driving Face F69
Face Blade
Tube Z44
Droop Leading Edge
Drum Construction E67
Dry Air Z52
Duration Flow
of Power K26
of Time of Motion H98
Uniform Flow
During Boost Acceleration
During Flight* Y86
Dynamic Behaviour ZB87
Pressure S75
Pressure Divergence
Response* K8
Stability Characteristics T40
Stability Derivatives T41
Systems ZB28
190 - 280 Altitude
210 - 660 KM Altitude
9% RAE 101 Streamwise Section
5% RAE 101 Streamwise Section
60° Sweepback Wing
0° Yaw
30° Yaw
Earth Atmosphere L91
" Entering
" Re-Entry
Gravity Field Escape
Rotation M9
Satellites A17
Eccentricity J85
Orbit
Orbit High
Orbit Small
Orbital
$\frac{1}{2}\sqrt{3}$ Elliptic Cylinder of
Eddy Formation
" Potential Flow
Frequency P18
Potential Flow
Region U95
Separation P14
Edge E7
Airfoil Blunt Trailing
Blunt Leading
Trailing
Bluntness Leading
Contours Elliptic Leading
Contour Leading
Contours Parabolic Leading
Edge Diameter Leading
Distance Leading
Droop Leading
Flap Leading
Flap Trailing
Heat Sustaining Leading
Heating
Leading
Leeward
Near Leading
Nearly Sonic Leading
Pressures Trailing
Profiles Leading
Radius Leading
Roughness Leading
Separation Leading
Shape Leading
Sharp Leading
Sharp Nosed Leading
Spoiler Trailing
Stall Leading
Subsonic Leading
Suction Leading
Suction Trailing
Supersonic Trailing
Sweepback 53.5° Leading
Thick Trailing
Thickened Trailing
Trailing
Transonic Leading
Vortices Location of Leading
Windward
Wing Sharp
Wing Sharp Leading
Edged Supersonic
Body Sharp
Gust Penetration of Sharp
Normal Gust Penetration of Sharp
Sharp
Wing Subsonic
Effect* ZB73
Adverse Ground
Aerodynamic Interaction
Apparent Mass
Blockage
Bluntness
Boundary Layer Displacement
" " Viscosity
Combined
Compressibility
Detstabilizing
Downstream Cooling
Friction
Ground
Hysteresis
Interaction
Interference
Ionization
Jet Interference
Lift
Model Flexibility
Nonequilibrium
Real Gas
Relaxation
Relaxation Time
Scale

Effect Thickness
Viscous
Wake Interference
Wind Tunnel Interference
Effective ZB55e
Heat of Ablation X55
Heat Capacity X74
Efficiency K9
Low-Speed
Stage
Eigenvalue Problems ZA65
Elastic Constant D18
Excitation U96
Modes Oscillating in
Range W65
Sheet H33
Surface D15
Wing B38
Elasticity Matrices W88
Modulus
Reduction F Model
Electric Body Force X2
Field G58
Electrical Excitation U92
Flow Transient
Rockets A67
Self Excitation U94
Electrically Conducting Gas L36
Excited Oscillation U92
Electromagnetic Radiation M22
Electro-Magnetically Induced Force X3
Element Lifting
Roughness
Elementary Horseshoe Vortex
Distribution 091
Elevated Temperature X13
Elevon Deflection C32
Differential
Elimination ZB76
Elliptic Cone H58
Segment H59
Cylinder H77
Cylinder of Eccentricity $\frac{1}{2}\sqrt{3}$ H78
Equations ZA41
Leading Edge Contours E16
Orbit J70
Wing B25
Elliptical Body of Revolution H47
Wing B25
Emissivity X44
High Radiative
Emitted Molecular Density Distribution Y72
End of Tube Z66
Energy of Air L64
Air Jet High
Dissociation
Equations Y352
Jet
Source Nuclear
Engine Intake Supersonic
Jet
Multiple Rocket
Noise V55
Noise Jet
Performance Requirements K21
Performance Rocket
Engine Reliability K24
Weight K25
Entering J53
Earth Atmosphere J59
Martian Atmosphere J58
Enthalpy X63
Approximation Intermediate
Flight Stagnation
Functions X69
Intermediate
Layer X72
Mean
Recovery
Stream
Total
Wind Tunnel, High*
Entropy X75
Gradient X76
Layer Q99
Entry Length Pipe
Nozzle
Into Planetary Atmosphere J53
Tumbling
Environmental Characteristic K98
Equation ZA34
Abel Integral
Airfoil
Approximate
Birnbaum Integral
Blasius
Conservation of Mass
of Continuity Y35u
Difference*
Differential
Downwash Integral
Elliptic
Energy
Finite Difference
Generalized Integral
Heat*
Heat Conduction
Linear
Linear Differential
of Motion
Navier Stokes
Navier Stokes Difference*
Non-Linear
Partial Differential
With Periodic Coefficients
Linear Differential
With Constant Coefficients
Linear Differential
Possio Integral
Potential
Prandtl Integral
Quasi-One-Dimensional Flow
Simplified Pump Design*
Singular
Six Degrees of Freedom
of State
Supersonic Doublet
Three-Dimensional*
Transient Heat Conduction
Equatorial Belt M8
Equilibrium Air Flow L70
Complete

Equilibrium Composition Y48
Deviation Chemical
Flow M95
Gas L39
Shock Layer Property R7
Surface Temperature D64
Temperature X26
Temperature Shock
Thermal
Thermodynamic*
Equipment Z55
Equivalence Ratio L84
Equivalent Frictional Length G94
Length Total
Weight Flow Characteristic G3
Erosion Combustion
Sublimation
Errors Gauge
Escape From Earth Gravity Field J49
Speed M55p
Velocity M55p
Estimate ZA15
Estimation ZA15
Analytical
Ethylene L78
Heated Jet P62
Evaluation Y77
Evaporating into Main Stream X58
Evaporation X57
Exact Solution ZA25
Excess Drag S35
of Helium Mixture with
Excitation V71
Elastic
Electrical
Electrical Self
Excited Oscillations Electrically
Exhaust Density P97
Downstream
Interference Jet
Jet P31
Jet Hot
Jet Rocket
Nozzle G72
Propulsive Jet
Ratio of Specific Heats P96
Rocket
Upstream
Velocity P98
Exhausting Q1
Countercurrent Q4
Laterally Q3
Normal Q2
Perpendicularly Q2
Exit* P67
Angle Nozzle
Diameter Jet
Downstream
Position* P70
Propulsive Jet
Relative Velocity G39
Shock Q14
Shock Wave Angle Q15
Turbojet Nacelle
Exiting Normal Q2
Exothermic Reaction 037n
Expansion ZB88
Coefficient Thermal
Cold Air
Formulae Asymptotic
Gas
Method Orthogonal Functions
Nozzle
Region Q75
Region Initial
Region Supersonic
Wave Q44
Zone Q75
Experiment Y82
Wind Tunnel
Experimental Data Y95
Data Hypersonic
Determination Y83
Flight Tests Y86
Investigations Y82
Measurement Y83
Results Y95
Testing Time Z78
Tests Y82
Explorer 1 A20
Explorer 3 A22
Explorer 4 A23
Exponent Izentropic
Exposed V55
Expression Newtonian Closed-Form
Extension of Stratford Method ZB20
Extent 06a
External Flow M77a
Flow Condition M77b
Rigid Drive V16
Slipstream U22
Stores C75
Store Matrices C76
Externally Generated
Extrapolated Liebmann Method ZB8
Extreme Upper Atmosphere L93
F.I. Layer L94
Face Blade Driving
Driving
Forward Flat
Faced Body Flat
Cylinder Flat
Facility* Y99
Facing Jet Forward*
Factor Magnification
Recovery
Slip
Failure Blade
Fall of Pressure T15
Far Downstream ZB72
Fast Propagating Oscillations U98
Feedback Autopilot with
Field Behind Shock Flow
Body Flow
Conical Flow
Development Continuum Flow
Electric
Escape Earth Gravity
Flow
Gradient Body Flow
Intersecting Flow
Magnetic

Field Oscillating Pressure
Perpendicular Flow
Pressure
Quasi-Conical Flow
Quasi-Conical Velocity
Turbulent Flow
Two-Dimensional Flow
Upwash
Filament Lines 067
Theory Stream
Filling Hole
Filters Interference
Final Lift R68
Finite Aspect Ratio Wing B72
Difference Approximation ZA63
Difference Equation ZA61
Difference Methods ZA62
Difference Numerical Solution ZB4a
Flat Plate H21
Part ZA72
Rate ZB64
Solid H38
Span W22
Span Wings B64
Step T78
Thickness Cylinder of
Thickness Wall D77
Wing B66
Firing Rocket Jet
First Collision Regime L47
Stage Stalled F8
Fission A70
Five-Stage Rocket System A63
Fixed Boundaries D85
Structure J35
Flame Temperature X8
Flap Blowing
Control
Hinged
Jet
Leading Edge
Trailing Edge
Thwaites Jet
Wings With
Flapping Oscillation V6
Flare Slender Cone-Cylinder
Flat Base D7
Base Vehicle A58
Faced Body J23
Faced Cylinder H82
Face Forward
Plate H18
Plate Finite
Plate Local
Plate Model H19
Plate Surface H24
Plate Tumbling
Plate Wing B71
Surface * D12
Surface Wing B72
Surface Adjacent
Triangular Wing B18
Wing B70
Wing Surface B73
Flexibility Design
Effects Model
Growth
Skin
Flexibility Surface*
Flexible Boundary D15
Surface D15
Surface Dissipative
Surface Nondissipative
Flexure Pivot Crossed
Flexural Waves Q39
Flight Altitude K92
High Altitude
Hypersonic
Interplanetary
Mach Nos. High
Path Angle J67
During*
Prediction in
Stagnation Enthalpy T101
Stagnation Pressure S83
Supersonic
Tests Y86
Test Data Y98
Tests Experimental
Tests Simulated
Trajectory J62
Velocity K44
M35
Flow
Absolute
Accelerating
Adiabatic
Air*
Analysis Compressible
Analysis Linearized
Angles Constant
Angle Outlet
Approaching Chemically Frozen
Approaching Vibrationally Frozen
Attachment N81
Attachment Transonic
Average Heat
Axisymmetric
Behind a Shock Wave Q78
Boundary Layer
In Channels
Channel
Characteristic Equivalent Weight
Chemically Frozen
Choked
Circumferential Maldistribution
Coefficient U59
Coefficient Choking
Coefficient High
Coefficients Stage
Compressible
Compressor Axial
Compressor Blade Axial
Compressor Mixed
Compressor Radial
Conditions External
Frozen
Couette
Curvature N24
Decelerating
Density Mass
Development T27
Disturbance Small
Disturbance To
Division G12
Duration Z76

Flow Duration Uniform
Eddy Formation Potential
Eddy Potential
Equations Quasi-One-Dimensional
Equilibrium
Equilibrium Air
External
Field M38
" Behind Shock Q78
" Body
" Conical
" Development Continuum
" Gradient Body
" Intersecting
" Perpendicular
" Quasi-Conical
" Turbulent
" Two-Dimensional
Fluctuation Mass
Fluid
of Fluid Rate of
Forced
Forward
Free Stream
Freezing
Frictionless
Frozen
Fully Attached
Fully Developed
Gas
Gas Freezing
Heat
High Reynolds Number
High Subsonic
High Supersonic
High Temperature
Hot*
Hot Air*
Hypersonic
Incompressible
Incompressible Fluid
Impeller Mixed
Inviscid
Irrotational
Isentropic
Isobaric
Laminar
Laminar Boundary Layer
Local
Local Supersonic
Low Density
Low Reynolds Number
Low Speed
Low Subsonic
Main Stream
Mass
Maximum Weight
Method Mass
Mixing
Model Continuum
Model Inviscid
Natural Laminar
Newtonian
Nonequilibrium
Nonviscous
Nonstationary
Non-Steady

Flow Nozzle
Nozzle Throat of
Oil
One-Dimensional
Overall Weight
Parabolic
Parallel to Generators N47
Parameters U46
Past Parallel Walls M83
Pattern M37
Pattern Oil
Pattern Surface
Pattern Surface Oil
Pattern Wing
Plane
Poiseville
Potential
Profile Mass
Properties L85
Quasi-Conical*
Quasi-One-Dimensional
Radial Maldistribution of
Range Weight
Rarefied Gas
Rate G31
Rates Local Heat
Regimes G88
Regime Free Molecule
Reversed
Rotational
Rotor Mixed
Separated
Separation N90
Separation Boundary Layer
Separation of Forward
Severely Separated
Shear
Slip
Slug
Sonic
Speed Inlet
Stability T36
Stagnation
Stagnation Air
Stagnation Point
Stalled
Steady
Streamlines 066
Study Oil
Study Wing
Subsonic
Supersonic
Surface
Surveys M36
Symmetrical
Theory Conical
Theory Continuum
Theory Kirchoff Discontinuous
Through a Nozzle H9
Theory Potential
Theory Quasi-Conical
Theory Steady
Theory Three-Dimensional
Theory Transonic
Theory Two-Dimensional
Three Dimensional
Transient

Flow Transient Electrical
Transonic
Turbomachines Axial
Turbomachines Mixed
Turbomachines Radial
Turbulent
Turbulent Boundary Layer
Two-Dimensional
Unbounded
Uniform
Unsteady
Variation Weight
Velocity Gas
Viscous
Vortex
Wake
Water
Weight
Whirl Upstream
With Separation N90
Flowmeter Rounded-Entrance
Fluctuation Mass Flow
Pressure
Fluid L5
Compressible
Flow
Flow Incompressible
Heavy
Incompressible
Injection K37
Layer L13
Light
Mechanics M34
Mixing T85
Motion Incompressible
Motion Viscous
Nonviscous
Perfect
Rate of Flow
Viscous
Flutter V17
Bending Type
Boundaries V27
Calculation V29
Cantilever Wing
Coefficients V20
Derivatives Aerodynamic
Derivatives Subsonic
Derivatives Two-Dimensional
Frequency V24
High Speed
Model V32
Oscillations V17
Precipitation V41
Propeller Stall
Speed V25
Speed Critical
Testing V30
Tests V30
Fluttering Wing B80
Flux Distribution Heat
Heat
History Wall Heat
Standard
Folding A40
Force W58
Aerodynamic
Aerodynamic Normal
Applied
Axial
Axial Body
Body
Centrifugal
Coefficients R40
Coefficient Axial
Coefficient Chord
Coefficient Incremental Normal
Coefficient Normal
Deceleration
Determination R47
Electric Body
Electro-Magnetically Induced
Incremental Normal
Interaction
Jet
Measurement R48
In Meridional Plane F16
Newtonian Impact
Normal
Pickups V92
Ratio Interaction
Reaction Normal
Retarding
Rotational
Side
Tangential
Viscous
Forced Convection Heating Y3
Flow
Forcing Inexorable
Forebody Drag C81
Interference C80
Length C79
Form Closed
Constant Reaction Blade
Dimensionless
Drag S22
Free Vortex Blade
General*
Half Vortex Blade
Parameter Boundary Layer
Formation of Eddy F97
Potential Eddy Flow
Shock Wave
Vortex
Formula ZA17
Asymptotic Expansion
General
Kirchoff
Forward N94
Attitude Base
Attitude Nose
Facing Jet* P66
Flat Face D8
Flow N48
Flow Separation of
From Nose Q7
Located Controls* X28
Shock Wave Q52
Fourier Transformation ZA43

Fraction Ambient Atom Mass
Dissociating
Mol
Free Jet P29
" Axisymmetric
Molecule Flow Regime M99
Molecule Limits Y71
Oscillations V11
Path Local Mean
Stream M69
Stream Dissociation Y40
Stream Flow M69
Stream Mach Number M70
Stream Pressure Ratio M73
Stream Static Pressure M74
Stream with Mach Numbers Near Unity M72
Stream Subsonic
Of Stress Surface
Vibration V11
Vortex Blade Form F42
Freedom Coupled
Degrees of
Equation Six Degrees of
Freezing of Flow Y63
of a Flow of Gas Y63
Freon Gas Z54
Frequency Distribution Stress
Eddy
Flutter
Measurement V68
Natural
Parameters V67
" Less than .02 V67a
Reduced
Response in Lift R98
" in Moment S58
Friction Coefficient Average Skin
Drag Skin
Effects S17
Skin
Frictional Drag on Cylinder J9
Heating Y5
Length Equivalent
Frictionless Flow N33
Front Nitrogen Shock
Oxygen Shock
Stages Unstalled F7
Frozen Flow Y62
" Approaching Chemically
" Approaching Vibrationally
" Chemically
" Conditions Y62
Heat Transfer Y27
Fuel Mixed Hydrocarbon Compound
Fully Attached Flow N76
Developed Flow N5
Ionized Air L61
Function ZA84
Circulation
Enthalpy
Expansion Method Orthogonal
Green
Indicial Lift
Indicial Moment
Kernel
Kussner
Moment
Function Partition
Stream
Theodorsen Alternating Lift
Unsteady Lift
Variable Stokes Stream
Wagner Indicial Lift
Fused Silica Skin C66
Fuselage C57
Interference Wing
Panels C60
Sizes C58
Skin Continuous
Fusion A69
Gas* L25
Ambient
Chemically Active
Chemically Reacting
Combustion Product
Condition Rarefied
Constant Specific
Diatomic Model
Dissociated
Dissociating
Effect Real
Electrically Conducting
Equilibrium
Expansion L53
Flow L43
Flow Rarefied
Flow Velocity U32
Freezing Flow
Freon
High Temperature
Ideal
Initially Undissociated
Injected
Injection K38
Ionized
Mixture L76
Mixture Cold
Non-Perfect
Particles L41
Primary
Reacting
Real
Region Shock Layer Luminous
Seeded
State Stagnation
Test
Theory Perfect
Gauge Errors M31
Ionization
On Satellite M29
Singly Mounted
Gear Support
General Form* ZB45
Formula ZA19
Generalized Design Curve E88
Integral Equation ZA67
Method ZA87
Theory N27
Trajectory J66
Generated Externally 016
Internally 017
Shock Wave 019
Generator Air-Jet Vortex
Flow Parallel to

Generator Parallel to
Ramp-Type Vortex
Scale C54
Twisted Strip Type Vortex
Vane Vortex
Wedge-Type Vortex
Wing-Type Vortex
Geometry Body
Bow Shock
Nozzle
Given Boundary Conditions ZA81
Glass Bead Ballotini
Glide Path Holding K54
Vehicle A37
Glider Configuration Lifting Re-Entry
Configuration Re-Entry
Configuration Winged Re-Entry
Re-Entry
Re-Entry Configuration A37
Vehicle A37
Gradient Body Flow Field
Entropy
One-Dimensional Temperature
Pressure
Severe Velocity
Static Pressure
Tangential Pressure
Temperature Linear
Transverse Temperature
Vanishing Pressure
Velocity
Wall Temperature
Zero Pressure
Zero Temperature
Grain Size O59
Spacing
Graphical Approximation ZB1
Graphite X98
Nose C89
Re-Entry Body A32
Gravitational Perturbation Luni-Solar
Gravity W57
Field Escape Earth
Influence
Location Centre of
Zero
Greater than $\frac{1}{2}\pi$ Re-Entrant Angles
Green Function Y9a
Gross Heat Transfer Rate Large
Thrust K32
Ground Effect T76
Effect Adverse
Proximity to
Testing Y92
Growth Boundary Layer
Flexibility K13
Vortex
Guide Vane Adjustable Inlet
" Stagger Inlet
Gun Tunnel Hypersonic
Gust* S44
Penetration S46
Penetration of Sharp Edged Normal
Penetration of Sharp Edged
Sinusoidal
Gyroscopic Pendulum Z97
Half Aerofoil Technique O62
Span Model W23
Vortex Blade Form F43
Wing B75
Wing Model B76
Handling Qualities K19
Harmonically Oscillating
Oscillating Wing B78
Hartmann Number U58
Head Measurement Total
Reflected
Rise J52
Rise Parameter G53
Heat of Ablation Effective
Addition Small Rate of
Capacity Effective
Conduction Y12
Conduction Equations Y18
Conduction One-Dimensional
Conduction Equations Transient
Convection
Equation* X4
Exhaust Ratio Specific
Flow Y12
Flow Average
Flow Rates Local
Flux Y12
Flux Distribution Y17
Flux History Wall
Input* X80
of Jet Specific
Ratio Parameters 1.10 - 1.67 Specific
Ratio Specific
Release Y23
Shield Teflon
Sink Z95
Specific
Sustaining Leading Edge E23
Transfer X79
Transfer at the Wall E2
Transfer Boundary Layer
Transfer Coefficient Y28
Transfer Convective
Transfer Frozen
Transfer Distribution Laminar
Transfer Distribution Surface
Transfer Radiation
Transfer Rate Y29
Transfer Rate Convective
Transfer Rate Large Gross
Transfer Rate Small Net
Transfer Rate Surface
Transfer Steady
Transfer Surface Subjected to
Transfer Total
Transfer Transient
Variation Specific
Heated Air L57
Jet Ethylene
Heating Aerodynamic
Aerodynamic Laminar
At Edge Y10
Convection
Convective
Forced Convection
Frictional

Heating Laminar Boundary Layer
Rate Y8
Rate Aerodynamic
Rate Laminar Aerodynamic
Rate Local
Rockets Arc
Rockets Solar
Stagnation Point
Heavy Fluid L11
Height Accommodation
Apogee
Critical Roughness
Decrease Perigee
Density Scale
Oscillation Perigee
Perigee
Relative Variation
Scale
Helium Mixture with Excess of
Jet Cold
Simulation Q32
Helmholtz Wave Kelvin
Hemisphere H68
Cone
Hemispherical Cylinder H79
Nose Cylinder
Nose Piece C93
Segment H70
Hemispherically Nosed Body C93
Hexachlorethane O53
High Altitude Condition K93
High Altitude Flight K94
High Angle of Attack W1
Aspect Ratio Wing B61
Eccentricity Orbits
Energy Air Jet P49
Enthalpy Wind Tunnels* Z23
Flight Mach Numbers M55
Flow Coefficient F3
Incidences W1
Mach Numbers M55
Pressure Ratio Compressor E78
Radiative Emissivity X45
Reynolds Number Flow N57
Shock Mach Number Q94
Speed M53i
Speed Aircraft A3
Speed Computer* ZB24
Speed Flutter V19
Stagnation Temperatures T99
Subsonic Flow M48
Supersonic Flow M54h
Supersonic Mach Number* M54h
Temperature Air L58
Temperature Flow N61
Temperature Gas L32
Temperature Jet P61
Vacuum Requirements L4
Velocity Blowing O37
Highly Swept Wing B7
Cooled Body A31
Hinged Flaps C35
History Temperature
Wall Heat Flux
Holding Airspeed
Glide Path
Hole Diameter E51
Drilled Plates H25
Drilled Wing B44
Drilling E53
Filling E54
Pattern E47
Pattern Spanwise
Pattern Square
Pattern Staggered
Homogeneous Surface D11
Wall D75
Horizontal Tail C17
Horseshoe Vortex O90
Vortex Discrete
Vortex Distribution Elementary
Vortices Patterns Of
Hot Air Flow* L69
Exhaust Jet P32
Flow* N62
Jet Exhaust P32
Propulsive Jet P44
Wire Anemometer Z94
Wire Measurement Z94
Hub
Along
and Shroud Between
Profile F76
Shroud Contour Arbitrary
Shroud Profiles F78
Surface F77
Humidity D97
Hydrocarbon Compound Fuel Mixed
Hydrodynamic L16
Hydrodynamic Problem L15
Hydrodynamic Stability L18
Hydrogen and Carbon Dioxide P55
Burned in Air P33
Driving Air Unheated
Mixture Oxygen
Hypersonic Approximation M61
Body A52
Experimental Data M65
Flight J47
Flow M55
Gun Tunnel Z16
Layer* M60
Mach Number* M55
Nozzle G86
Re-Entry J60
Shock Tubes Z9
Shock Tunnel Z9
Shock Tunnel Tests Z10
Shock Waves Q61
Similitude M64
Simulation* M63
Small Disturbance Theory T58
Speed M55
Test Medium* Z47h
Vehicle A52
Wind Tunnels Z8
Hypervelocity M55
Wind Tunnel Z8
Hysteresis Effect G25
Unstalling
Ideal Gas L27
Time Z79
Idealized Compressor E79

Ignited Mixture Z12
Impact Forces Newtonian
(Newtonian) Theory Prediction D59
Pressure Survey S76
Impeller E81
Axial Inlet
Blade Surfaces F68
Centrifugal
Inlet F72
Isentropic
Mixed Flow
Pump
Rocket Propellant E81
Rotor
Tip F85
Tip Speed F86
Improved Shroud Design F81
Impulse Blading F21
Specific
Instream
Inboard E28
Incidence V94
Angle of*
Correction of Angle
High
Increasing
Nose
Range $0^{o}$ - 10 Degree V99
Zero Model
Incident Shock Q62
Incipient Merged Layer Regime L49
Inclination J99
Initial
Inclined Wing B89
Incompressible Boundary Layer N75
Flow N38
Flow Theory N40
Fluid L8
Fluid Flow N38
Fluid Motion N39
Lift R77
Inconel Cylinders H73
Wall D82
Increased V39
Increasing Incidence W3
Mach Number V50
Incremental Lift R79
Normal Force R27
Normal Force Coefficient R46
Indicator Sublimation
Indicial Lift R73
Lift Functions S9
Lift Function Wagner
Moment Functions S61
Response in Lift R99
Response in Moment S59
Sinking Motion K84
Indirect Aerodynamic Derivatives T47
Individual Vortices O94
Induced Boundary Layer Separation Shock
Induced Boundary Layer Separation Shock Wave
By Change O72
By Crossflow O71
Downwash U8
Drag S30
Drag Correction S32
Induced Force Electro-Magnetically
Lift R78
Loads R57
Pressure S87
Separation Shock
Shock
Unsteady Effects Separation
Velocity U27
Velocity Vertical
Inertia Aerodynamic
Inexorable Forcing V14
Infinite Aspect Ratio Wing B63
Cylinders H85
Span Wing B65
Width H22
Wing B67
Infinitely Small Disturbance T55
Infinitesimally Thin Shock Wave Q51
Influence* ZB73
Downstream
of Gravity W57a
of Surface Reaction D40
Upstream
Initial Expansion Region Q77
Inclination P90
Tip E59
Initially Undissociated Gas L38
Initiated by Strong Shock L44
Injected Gas 037g
Gas Stream 037g
Liquid 037k
Injection Fluid
Gas
Liquid
Inlet Baffles F89
Blade Angles F52
Conditions F13
Flow Speed G40
Guide Vane F31
Guide Vane Adjustable
Guide Vane Stagger F32
Impeller
Impeller Axial
of Blade Row F27
Rotor Axial
Stage F12
to Outlet F62
Whirl F92
Inner N71
Boundary D87
Input, Heat* L19
Instability
Wave
Instrumentation W97
Insulated Plate H26
Surface D27
Intake Supersonic Engine
Integral Complete Elliptic ZA66
Equation
Equation Abel
Equation Birbaum
Equation Downwash
Equation Generalized
Equation Possio
Equation Prandtl
Integrating Solution ZA48
Integration ZA48

Integration Methods ZA48
Method Asymptotic
Interaction T59
Blunt Body J21
Boundary Layer Shock Wave
Domain Vorticity
Effects T61
Effect Aerodynamic
Force T83
Force Ratio T84
Shock Wave
Stage
Viscous
Interface Behind
Supersonic
Interference T59
Blockage
Boundary Layer
Effects T61
Effects Jet
Effects Wake
Effects Wind Tunnel
Filters X34
Forebody
Jet
Jet Exhaust
Lift
Load T60
Phenomena Jet
Rocket Jet
Second-Order
Support System
Wall
Wave Reflection
Wing Body
Wing Fuselage
Interior Surface D33
Intermediate Enthalpy X65
Enthalpy Approximation X66
Speed Performance
Characteristics G44
Internal Damping V73
Rigid Drive V16
Internally Generated
Interplanetary Flight J48
Missions J48
Orbit Transfer J64
Intersecting Flow Field N10
Surfaces D34
Inversion ZB14
Temperature
Investigation Y76
Atmospherical Model
Experimental
Theoretical
Wind Tunnel
Inviscid Flow N32
Flow Model N34
Small Disturbance Theory T57
Iodide Sodium
Ion A75
Ionization Effect Y52
Ionization Y51
Gauge Y53
Ionized Air Fully
Boundary Layer N79
Gas L35
Irrotational Flow F91
Isentropic Compressor E77
Exponent X77
Flow M94
Impeller E85
Isobaric Flow N11
Isobars Surface
Isoenergetic Jet Mixing Q22
Isotope Radioactive
Isotropic Surface D10
Issuing Q1
Iterative Method* ZB3
Numerical Solution ZB3
Solution ZB3
Jeffery-Hamel Solution U40a
Jet P27
Ahead of
Air
Axially Symmetric Nozzle
Axisymmetric Free
Blowing Air
Boundary P88
Boundary Curvature P89
Boundary Shape P91
Cold Air
Cold Helium
Controls Reaction Type
Diameter Ratio P93
Energy P78
Engine P41
Engine Noise V56
Ethylene Heated
Exhaust P31
Exhaust Interference Q12
Exit P67
Exit Diameter P69
Exit Propulsive
Firing Rocket
Flap C37
Flap Thwaites
Force P79
Forward Facing*
Free
High Energy Air
Hot Exhaust
Hot Propulsive
High Temperature
Interference Q10
Interference Effects Q13
Interference Phenomena Q10
Interference Rocket
Location P71
Location Rocket
Location Within
Mach Number P80
Mixing Q20
Mixing Compressible
Mixing Isoenergetic
Mixing Turbulent
Noise P99
Nozzle Sonic
Nozzle Supersonic
Pressure Ratio P85
Projection of
Propulsive
Reaction
Reaction Controls T34

Jet Reynolds Number P81
Rocket
Rocket Exhaust
Shock Wave Angle Q46
Shock Wave Apex Location Q47
Side
Simulations Q31
Size P92
Slot Width P94
Small Air
Sonic
Sonic Nozzle
Sonic Propulsive
Specific Heat of
Stagnation P84
Stagnation Pressure P84
Static Pressure P83
Stream P28
Structure P86
Subsonic Air
Supersonic
Supersonic Nozzle
Thrust
Thrust Coefficient K35
Thrust Rocket K34
Total Pressure
Two-Dimensional
Two-Dimensional Nozzle
Viscous Scavenging Phenomena P82
Wake Q9
Wake Propulsive Q18
Wavelength
Working Section With Open P87
Johannesen and Meyer Method ZB18
Joukowski Profile Cylinder H89
Jumo 004 E71
Karman Street Q90
500 - 15,000 Degrees Kelvin L59
Kelvin Helmholtz Wave Q33
Kernel Function V85
Kinetic Theory Y35p
Theory Solution Y35q
Kink* Q30
Pressure B80
Kirchoff Discontinuous Flow Theory M91
Formula S15
Knee Q29
Blowing
Suction
Kussner Function S12
Laminar Y34
Aerodynamic Heating Rate K9
Boundary Layer N70
Boundary Layer Heating Q22
Boundary Layer Separation N96
Boundary Layer Thickness N72
Flow N78
Flow Natural
Heat Transfer Distribution Y35
Heating Aerodynamic
Mixing T67
Wing B90
Laminarization U62
Large Angle of Attack W1
Change* ZB79
Gross Heat Transfer Rate Y30
Peclet Number G66
Lateral Control T51
Stability T43
Laterally Exhausting
Latitude M32
Latitude Variations M24
Variation of
Lav Dissociation Scaling
Viscosity, Temperature*
Layer Boundary
Compressible Boundary
Control Boundary
Detached Shock
Displacement Boundary
Displacement Effect Boundary
Displacement Thickness Boundary
Entropy
F.F.
Flow Boundary
Flow Laminar Boundary
Flow Separation Boundary
Flow Turbulent Boundary
Fluid
Form Parameter Boundary
Growth Boundary
Heat Transfer Boundary
Heating Laminar Boundary
Hypersonic*
Incompressible Boundary
Interference Boundary
Laminar Boundary
Luminosity Shock
Luminous Gas Region Shock
Momentum Thickness Boundary
Profile Boundary
Property Equilibrium Shock
Reattachment Boundary
Regime Incipient-Merged
Regime Merged
Regime Transitional
Regime Viscous
Separation Boundary
Delay Boundary
Laminar Boundary
Low Speed Boundary
Position Boundary
Shock Induced Boundary
Shock Wave Induced Boundary
Transitional Boundary
Turbulent Boundary
Vortex Type Boundary
Shock*
Shock Wave Interaction Boundary
Stability Boundary
Stagnation Boundary
Theory Boundary
Theory Thin Shock
Wake Boundary*
Thickening of Boundary
Thickness Boundary
Thickness Laminar Boundary
Thin Shock
Three-Dimensional Boundary
Transition Boundary
Transition Position Boundary
Transitional Boundary
Traverses Boundary
Turbulent Boundary

Layer Viscosity Effects Boundary
Wall Boundary
Leading Edge E10
Blunt
Bluntness E12
Contour E11
Contours Elliptic
Contours Parabolic
Diameter E24
Distance
Droop E25
Flap C39
Heat Sustaining
Near
Nearly Sonic
Profiles E11
Radius E24
Roughness E26
Separation E27
Shape E11
Sharp
Sharp Nosed
Stall E30
Subsonic
Suction E31
Supersonic
Sweep 53.5° E17a
Sweepback 53.5° E18
Transonic
Vortices Location
Wing Sharp
Leeward Body J33
Edge E8
Surface Contributions D35
Length ZB53
Changes ZB54
Equivalent Frictional
Forebody
to Parallel
Pipe Entry
Spike
Total Equivalent
of Tube Z72
Less than .02 Frequency Parameters
Libration Onset J57
Liebmann Method ZB7
Liebamnn Method Extrapolated
Lifetime J84
Lift R65
Body
Circulatory
Coefficient S2
Divergence S3
Oscillatory
Total
Trim
Compressible
Curve Section
Curve Slope R86
Dependent Drag S30
Dependent Drag Component S31
Distribution R92
Distribution Spanwise
Distribution Unsteady*
Drag Ratio R87
Drag Ratio Maximum
Lift Effect R82
Final
Frequency Response in
Functions Indicial
Function Theodorsen Alternating
Unsteady
Wagner Indicial
Incremental
Incompressible
Indicial
Indicial Response in
Induced
Interference R96
Maximum
Non-Linear
Response Total
Section
Slope R83
Slope Sectional
Starting
Transient
Unsteady
Vector R89
Wing
Zero
Lifting Coefficient S2
Element A80
Re-Entry Configuration A33
Re-Entry Glider Configuration A42
Surface D44
Surface Shape D47
Surface Theory D45
Surface Upper
Surface Theory Subsonic
Wing B85
Light Beam Double
Beam Single
Fluid L12
Wave Propulsion A78
Limit Cycles ZB38
Free Molecule
Line Stall
Line Attachment
Choke
Choking*
Downwash Centre
Filament
Regression Node
Reversal Method Sodium
Sodium
Spectrum
Stall Limit
Surge
Linear Differential Equations ZA51
Differential Equations with
Periodic Coefficients ZA52
Differential Equations with
Constant Coefficients ZA52
Equations ZA36
Gradient Temperature
Systems ZB29
Velocity Profile U40
Viscosity, Temperature Solution* U86
Linearization ZB15
Linearized Flow Analysis N63
Theory ZA3x
Wing Theory B2

Liners Modified
Slotted
Liquefaction Point Z53
Liquid Injected
Injection K39
Propellant A65
Load W59
Aerodynamic
Bending
Chordwise
Compression
Concentric Axial W69
Continuous
Distribution R63
Induced
Interference
Longitudinal W68
Onedimensional W70
Pressure
Subsonic Span
Tension
Total Span
Unsteady
Vanishing
Loaded Wing B88
Loading R49
Aerodynamic
Chordwise
Continuous
Division
Mass
Model
Random Pressure
Spanwise
Stage
Symmetrical
Uniform Spanwise
Local Aerodynamic Centre S52a
Flat Plate H20
Flow M41
Heat Flow Rate Y33
Heating Rate Y11
Mach Number U49
Mean Free Path Y70
Mesh Reynolds Number U57
Stream Temperature X7
of Supersonic Flow M54x
Surface Pressure D60
Locally Concave Cross-Section H91
Located Controls Apex*
Forward*
Location ZB66
Centre of Gravity
Chordwise
Jet
Jet Shock Wave Apex
of Leading Edge Vortices E32
Nozzle
of Part Span Vortices, P19
Rocket Jet
Roughness
Shock Wave
Sonic Point
of Sonic Point Q90
Vortex Path
Within Jet P77
Lockheed Bump O63
Logarithmic Circuit V62
Curve M15
Density Curve M15
Long Cylinder H84
Plates
Range Missile A13
Wing B51
Longitudinal Aerodynamic Characteristic R42
Aerodynamic Coefficient R42
Control T29
Loads
Pressure Distribution T4
Stability T42
Waves Q40
Lorentz Transformation ZA44
Loss Z49
Cascade
Thrust
Low Aspect Ratio B58
Ratio Wing B58
Ratio Wing Vanishing
Density U81
Density Flow L45
Density Wind Tunnel* Z33
Reynolds Number U56
Reynolds Number Flow N56
Shock Mach Number Q95
Speed Boundary Layer Separation N92
Efficiency G43
Flow M42
Problem K43
Subsonic Flow M47
Subsonic Speed* M47
Supersonic Flow M54b
Speed M54b
Luminosity Shock Layer
Luminous Gas Region Shock Layer
Luni-Solar Gravitational Purturbation J90
Lyapunov's Method* ZA54
Theory ZB34
Second Method ZB34
Mach Angle Q73
Cone Q69a
Line Q50
Number U47
(For individual numbered concepts see M43 to M55n)
Number Choking
Free Stream
High
High Flight
High Shock
High Supersonic*
Hypersonic*
Jet
Local
Low Shock
Main Stream
Near Unity Free Stream
Increasing
Profile U53
Range of Primary Shock
Shock
Stream
Structural

Mach Number Subsonic
Waves Q50
Magnesium Model Z62
Magnetic Field G57
Magneto-Fluidmechanics X1
Magnetoplasma A74
Magnification Factor 037p
Magnitude R91
Main Blade F24
Blade Surface F66
Blade Adjacent
Diaphragm Q47
Stream Evaporating
Stream Flow M75
Stream Mach Number M77
Stream Supersonic
Vortex 099
Vortex Displacement P13
Vortex Strength P26
Major-Minor Axis Ratio 5-1 B26
Maldistribution of Flow Circumferential
of Flow Radial
Maneuver Captive
Manoeuvre Margin K20
Manometer Multiple Tube
Photo Recording
Margin Manoeuvre
of Safety V28
Martian Atmosphere Entering
Mass Effect Apparent
Equation Conservation of
Flow F98
Density 073
Fluctuation U44
Method T73
Profile U45
Fraction Ambient Atom
Loading V38
Rate Net
Ratio K30
Matching Stage
Material Ablating
Control W98
Properties ZB50
Properties Constant
Reference
Removed E55
Roughness Band
Soft
Stiffness D19
Surface
Teflon
Matrix Aerodynamic Twist
Downwash
Elasticity
External Store
Maximum Adiabatic Temperature Rise G54
Altitude K97
Lift R69
Lift Drag Ratio R88
Relative Blade Surface Velocity F57
Streamline Spacing G35b
Stresses W67
Surface Temperature D65
Temperature X14
Velocity K28
Weight Flows G1
Mean Enthalpy
Free Path Local
Measured* Y80
Measurement Y79
Amplitude
Base Pressure
Continuous
Experimental
Force
Frequency
Hot Wire
Phase
Pressure
of Reaction V61
Rocket
Shadowgraph
Static Pressure
Sting Balance
Temperature
Total Head
Velocity
Wind Tunnel
Measuring Method* Y81
Mechanic Fluid
Non-Linear
Mechanism Shielding
Medium Hypersonic Test*
Variable
Merged Layer Regime L48
Layer Regime Incipient
Meridional Plane F74
Plane Force F16
Streamline Spacing G35c
Mesh Plane Force
Meteorite L2
Meteoroid L3
Methane L79
Air Combustion* Z48
Method ZA86
Analytical*
Asymptotic Integration
for Calculating ZA11
Calculation
of Characteristics ZB17
Dietzes
Extension of Stratford
Extrapolated Liebmann
Finite Difference
Generalized
Integration
Iterative*
Johannesen and Meyer
Liebmann
Lyapunov
of Lyapunov Second
Mass Flow
Measuring*
Orthogonal Function Expansion
Perturbation
Polhausen
Pump Design*
Relaxation
Richardson
Routine
Second-Order Richardson
Shock Expansion
Sodium Line Reversal

of Source Sink
Successive Overrelaxation
Tangent Wedge
Theoretical*
Von Karman Source-Sink
Weinbinger
Meyer Method Johannsen
Mid Range Rocket
Middle Section
Midspan Section
Mild Steel Skin
Miles Altitude of 300 Nautical
Altitude of 525 Nautical
Minimum Drag-Design
Missile Ballistic
Long Range
Oscillating in Roll
Winged
Mission Interplanetary
Mixed Flow Compressor
Impeller
Pump
Rotor
Turbomachine
Hydrocarbon Compound
Mixing Boundary
Compressible Jet
Constant Pressure
Flow
Fluid
Isoenergetic Jet
Jet
Laminar
Process
Turbulent
Turbulent Jet
Mixture of Cold Gases
Gas
Ignited
Nitrogen-Oxygen
Oxygen and Hydrogen
Stoichiometric
With Excess of Helium
Modal Analysis
Mode Body
Normal
Oscillating in Rigid
Oscillating in Elastic
Oscillation
Rayleigh Oscillation
of Rotation of Satellite
Rotational
Selected
Shapes
of Stalling*
Uncoupled Vibration
Vibration Normal
Vibrational
Model
Along
Atmosphere ARDC 1956
Base Near
Blunt
Chord
of Complete Aircraft
Drag Body
Continuum Flow
Density Ratio
Dimensions
Drag
Elasticity Reduction
Flat Plate
Flexibility Effects
Flutter
Gas Diatomic
Half Span
Incidence Zero
Investigation Atmospheric
Inviscid Flow
Loading
Magnesium
Ogive Cylinder
Pine-Balsa
Pressure-Plotting
Prolate
with Propellers
Rectangular
Response
Rigid
Scaling
Size
Spheroid
Stiffness
Supersonic
Sweptback Wing
Tapered Wing
Test
Weight Ratio
Wing
Mounted Angle of Attack
Modified
Liners
Newtonian Theory
Spherical Segment Nose
Strip Analysis
Modulus of Elasticity
Moisture Condensation
Mol. Fraction
Molecular Density Distribution Emitted
Dissociation
Recombination
Weight
Molecule Flow Regime Free
Limits Free
Molybdenum
Moment
Aerodynamic
Coefficient
Coefficient Pitching
Curves Pitching
Damping Pitch
Derivatives Pitching
Frequency Response in
Functions
Functions Indicial
Indicial Response in
Pitching
Reversal Pitching
Rolling
Root Bending

Moment Vector S62
Momentum Deficiency Profile W56
Equations Y35b
Thickness 027
Thickness Boundary Layer
Motion W50
Boundary
Characteristic Steady
Duration of Time
Equations
Incompressible, Fluid
Indicial Sinking
Oscillatory
of Particle D39
of Satellite Orbit Perigee K4
Prediction J52
Sinking
Three-Dimensional
Pure Translational
Transient
Transition from Tumbling Body
Undirectional
Viscous
Viscous Fluid
Mounted Gauge Single
Off-Centre* Z65
Movement Rate of
Shock Wave
Vortex
Moving H86
Boundary D86
Cylinder
Multiple Reflection T75
Rocket Engine A62
Rows C56
Tube Manometer T26
Multistage Compressor E73
NACA 4412 Airfoil A95
NACA 64A 008 Airfoil A95a
NACA 65A 004 Section W49
NACA 65 (12) 10 Blower Blade E70
Nacelle Exit Turbojet
Simulated Turbojet
Narrow Wing B53
Natural Frequencies V65
Laminar Flow M79
Transition* N87
Nature* ZB46
Nautical Miles Altitude of 300
Miles Altitude of 525
Navier Stokes Equations ZA42
Regime L51
Difference Equation* ZA60
Near Leading Edge E34
Model Base Z68
Triangular Wing B17
Nearly Conical Nozzle G75
Sonic Leading Edge E20
Net Heat Transfer Rate Small
Mass Rate Q25
Neutral Oscillations V10
Newtonian Analysis ZA45
Approximation ZA96
Closed-Form Expressions ZB21
Coefficient ZB22
Flow N58
Impact Forces R37
Newtonian Intermediate Enthalpy
Approximation X67
Theory Modified
Theory Prediction Impact
Night-Time Density M23
Night Variation to Day
Nitrogen L72
Atomic
Oxygen Mixture L77
Shock Front Q66
Shock Waves Q65
Node Line Regression K5
Noise Aerodynamic
Engine
Jet
Jet Engine
No-Lift Moment Coefficient S8
No-Surface Slip ZA42a
Non Ablating Surface D23
Catalytic Body Surface D29
Circular Cylinder* H75
Dissipative Flexible Surface D21
Dissipating Surface D22
Equilibrium Airflow Correlated
Dissociation Y59
Effects Y61
Flow M96
Stream M97
Lifting Airfoil A81
Body A81
Wing B86
Linear Autopilot ZR41
Equation ZA37
Lift R74
Mechanics ZB31
Relation ZB62
Roll Control K74
Systems ZB3a
Parallel Walls D79
Perfect Gas Z51
Stationary Flow N54
Stationary System ZB33
Steady Flow M90
Steady Perturbation Potential T80
Viscous Flow N32
Viscous Fluid L10
Normal Exiting
Exhausting
Force R25
Force Aerodynamic
Force Coefficient R45
Force Coefficient Incremental
Force Incremental
Force Reaction
Gust Penetration of Sharp Edged
Mode V47
Mode of Vibration V47
Shock Behind
Pressure Drag J28
Shock Wave Q57
Streamline Slope O70
Nose C85
Blunting C94
Bluntness C94
Body
Concave
Cone Blunt

Nose Cone Sharp
Cylinder Hemispherical
Drag C98
Forward
Forward Attitude K60
Graphite
Incidence C97
Modified Spherical Segment
Piece Hemispherical
Piece Teflon
Region C86
Shapes Blunt
Slightly Blunted
Spherical Segment
Vehicle Blunt
Nosed Body Hemispherically
Body Blunt
Leading Edge Sharp
Pitot Tube Blunt
"Not-So-Slender" Wing Theories B56 G67
Nozzle
Choked Convergent
Compression
Conical
Convergent
Convergent-Divergent
Converging
Converging-Diverging
Diameter G93
Divergence Angle H7
Divergent
Entry H1
Entry Upstream of
Exhaust
Exit Angle H8
Expansion H13
Flow H9
Flow Through
Geometry G92
Hypersonic
Jet Axially Symmetric
Jet Sonic
Jet Supersonic
Jet Two-Dimensional
Location G91
Nearly Conical
Ordinates Supersonic
Over Expanded
Position Vertical
Pressure H10
Pressure Ratio H12
Rocket
Shape Optimum
Shock Tube
Sonic
Sonic Convergent
Sonic Jet
Stagnation Temperature H17
Supersonic
Supersonic Convergent-Divergent
Supersonic Jet
Throat of Flow
Throat Diameter H5
Total Pressure H11
NPL Wind Tunnel 18" x 14" Z6
Nuclear Energy Source A68
Number and Angles of Corners E44
Number of Blades F34
Diameter Reynolds
Flow High Reynolds
Hartmann
Increasing Mach
Prandtl
Roughness Reynolds
Numerical Calculation ZB2
Determination ZB2
Solution ZB2
Solution Finite Difference
Solution Iterative
Oblate Atmosphere L87
Rotating Atmosphere L88
Oblateness Atmospheric
Oblique Shock Wave Q58
Wave System Q58
Observation Satellite
Octagonal Tunnel Closed
Off-Centre Mounted*
Ogive J10
Ogive Cylinder Model H81
Oil Flow L22
Oil Flow Pattern Z87
Surfaced
Study Z86
Surface
One-Dimensional Flow N12
Heat Conduction Y15
Load
Temperature Gradients X22 ZB81
Onset
Libration
Separation
of Open Area of Walls Z67
Open Jet Working Section With
Operation G45
Range of
Optimization Control System
Optimum Nozzle Shape G98 J68
Orbit
Air Drag Around
Change Satellite
Circular
Eccentricity J72
Elliptic
High Eccentricity J73
Perigee Motion of Satellite
Processes K2
Satellite
Small Eccentricity J74
Transfer interplanetary
Orbital Contraction K3
Eccentricity J85
Period J80
Period of Revolution Decrease
Satellite
Order Theory Zero
Ordinate Supersonic Nozzle
Orientation Vehicle
Orifice Size E52
Originating Q46
Orthogonal Functions Expansion Method ZA99a
Oscillating U91
Angle of Attack
Asymmetric
Bending

Oscillating Continuous
Cylinders H99
in Elastic Modes V48
Harmonically V3
Pressure Field S89
in Rigid Modes V49
Roll Missile
Wing B77
Wing Harmonically
Wing Slowly
Oscillation Decaying
Displacement Sinusoidal
Electrically Excited
Fast Propagating
Flapping
Free
Modes V45
Mode Rayleigh
Neutral
Perigee Height
Pitching
Plunging
Rolling
Sinusoidal Sinking
Sinusoidal Vertical
Slowly Propagating
Torsional
Oscillatory Aerodynamic Derivative V60
Aileron Coefficients C31
Coefficients V59
Lift Coefficients S4
Motion U91
Pressure Decay S90
Pressure Plotting S91
Tab Coefficients C44
Oscillograph X33
Outboard N95
Shock Wave Q56
Outer N35
Skin Thick
Outflow Spanwise
Outlet Angle Air
Outlet Flow Angle F51
to Inlet
Overall Weight Flow G2
Overexpanded Nozzle G87
Overrelaxation Method Successive
Oxygen L74
Atomic
And Hydrogen Mixture Z14
Shock Front Q64
Shock Waves Q63
Pair Stationary Vortex
Panel C59
Fuselage
Stiffener
Stringer
Unfolding Wing Tip
Parabolic Blading F39
Blading Skewed
Body Arc J16
Flow N31
Leading Edge Contours E17
Shaped Blade F39
Twist Wing With
Parallel to Generators N47
to Generators Flow
to Length H97
with Length H96
Plates H27
Streams T66
Walls Flow Past
Parameter* ZB48
Boundary Layer Form
Flow
Head Rise
Less than .02 Frequency
1.10 - 1.67 Specific Heat Ratio
Part Finite
Span W24
Span Vortices Location
Speed Operation G17
Partial Differential Equation ZA58
Particle Charged
Gas
Motion
Size 059
Partition Functions ZA85
Passing Through ZB70
Past Parallel Walls Flow
Path Angle Flight
Holding Glide
Local Mean Free
Location Vortex
Vortex
Pattern Flow
Hole
of Horseshoe Vortices R60
of Oil Flow
Shock Wave
Spanwise Hole
Square Hole
Staggered Hole
Surface Flow
Surface Oil Flow
Wing Flow
Payload K17/ K17a
Peak Pressure Ratio G51
Peaky Section W41
Peclet Number Large
Penalty Drag
Pendulum Gyroscope
Pendulum Spherical
Penetration Gust
of Sharp Edged Gust S47
of Sharp Edged Normal Gust S48
Percentage of Design G42
of Solid Cross Section W40
Perfect Fluid L6
Gas Theory Y35v
Perforated Plates H25
Wing B44
Performance ZB86
Characteristics Intermediate Speed
Cruising
Curves Double-Valued
Discontinuities
Requirements Engine

Performance Rocket Engine
Stage
at Perigee J77
Perigee Air Density J94
Angle Between Sun
At
Distance J91
Distance Change J92
Distance with Time Variation
Height J86
Height Decrease J87
Height Oscillation J88
Motion of Satellite Orbit
Period Orbital
of Revolution J80
of Revolution Decrease Satellite
Orbital
Satellite
Periodic Coefficient ZA53
Coefficient Linear Differential
Equation
Downwash Distribution U13
Perpendicular Flow Field N23
Perpendicularly Exhausting
Perturbation Luni-Solar Gravitational
Method ZA99
Potential Nonsteady
Theory Small
Velocity Potential T81
Phase Angle R90
Measurement V69
Resonance U93
Space ZA57
Terminal
Phenomena Jet Interference
Viscous Scavenging
Relaxation
Photograph Z89
Schlieren
Photographic Record Z89
Study Z89
Photo Multiplier Z90
Recording Manometer T25
Phugoid Damping V76
Pickup Displacement
Force
Pressure
Piece Hemispherical Nose
Teflon Nose
Piloting K53
Pine-Balsa Model Z61
Pipe Circular
Entry Length G87
Piston Z46
Theory V86
Pitch K64
Damping
Damping Coefficient K71
Line Blade Speed F59
Moment Damping
Stability K69
-Up K67
Pitching K65
Moment S50
Moment Coefficient S53
Moment Curves S54
Pitching Moment Derivatives S55
Reversal S56
Oscillation K66
Rate Arbitrary
Wing B81
Pitot Tube Blunt Nosed
Pivot J36
Crossed Flexure
Crossed Spring
Displaced
Pivotal Point B46
Point Distribution
Plane Change of
Control Vertical
Flow N15
Force Meridional
Meridional
Semi-Infinite
Walls D78
of Wing
Planet Approach Target
Planetary Atmosphere
Atmosphere Entry Into
Re-Entry J57
W6
Planform
Warren 12
Wing
Arbitrary
Circular
Curved Tip
Rectangular
Simple*
Plastic Analysis W91
Range W66
Plate Differentially Deflected
Finite Flat H18
Flat H18
Hole Drilled
Insulated
Local Flat
Long H30
Model Flat
Parallel
Perforated
Removal of Damping
Semi-Infinite
Simply Supported
Surface Flat
Thickness Ratio H36
Triangular
Tumbling Flat
Wing Flat
Plotting Oscillatory Pressure
Pressure
Plunging Oscillation K82
Point Distribution Pivotal
Flow Stagnation
Liquefication
Location of Sonic
Pivotal
Pressure Stagnation
Rear Stagnation
Separation
Sonic
Stagnation
Stalling

Point Strips Crossing
Pointed Body J24
Poiseuille Flow N3
Polar Coordinates Spherical
Polhausen Method ZB19
Solution N68
Polygon Cross-Section H90
Polymer (Teflon Type) X91
Portion Downstream
Position Q90
Boundary Layer Separation
Transition
Divergence Shock Wave
Exit*
Separation
of Separation Spanwise
Shock
Streamline
Terminal Shock
Vertical
Vertical Nozzle
Vortex Sheet
Positive Angle of Attack F55
Possio Integral Equation ZA70
Postbuckling W73
Potential Acceleration
Anti-Symmetric Velocity
Equations M85
Flow N50
Flow Eddy F95
Flow Eddy Formation F96
Flow Theory N51
Nonsteady Perturbation
Perturbation Velocity
Symmetric Velocity
Theory ZA7
Velocity
Powell Theory W95
Power Duration
Requirements Z75
Spectra Stress
Practical Calculation ZA13
Prandtl Integral Equation ZA71
Prandtl-Meyer Region Q77
Number U54
Precipitation Flutter
Prediction ZA2
Impact (Newtonian) Theory
in Flight Y90
Motion
Theoretical
Prescribed Pressure Distribution T9
Velocity Distribution G36
Pressure S65
Base
Blowing
Centre
Coefficient Stagnation
Coefficient S93
Constant
Decay Oscillatory
Determination T20
Difference T13
Distribution S97
Distribution Body
Distribution Chordwise
Pressure Distribution Longitudinal
Prescribed
Radial
Sinusoidal
Surface
Travelling
Wing
Divergence T14
Divergence Dynamic
Drag S27
Drag Normal
Fall
Field S92
Field Oscillating
Flight Stagnation
Fluctuations T13
Free Stream Static
Gradient S98
Gradient Static
Tangential
Vanishing
Zero
Induced
Jet Stagnation
Static
Total
Kink
Load S65
Loading Random
Local Surface
Measurement T21
Base
Static
Mixing Constant
Nozzle
Nozzle Total
Pickups V93
Plotting T22
Plotting Model
Plotting Oscillatory
Profile S97
Ratio S94
Characteristic
Compressor High
Free Stream
Bursting
Jet
Nozzle
Static
Peak
Total
Recovery T17
Recovery Reduction T18
Reduction T15
Rise T19
Saturation Vapour
Separation
Shock Reflection of
Shroud
Solar Radiation
Spanwise Centre of
Stagnation
Stagnation Point
Static
Surface
Survey Impact

Pressure Survey Static
Tapping T24
Taps G99
Total
Trailing Edge
Tunnel Wall
Two-Dimensional Base
Variation T13
Prewhirl
Principle Variational
Primary Gas 037m
Shock Q70
Shock Mach Number Range of
Principle of Biot Variation
Probe Sounding
Space
Vehicle A47
Vehicle Configuration A47
Vehicle Short
Problem Aerodynamic
Blasius
Boundary Value
Eigenvalue
Hydrodynamic
Low Speed
Rayleigh
Thermodynamic
Procedure Systematic
Process Mixing
Transport
Product Gas Combustion
Production* ZB84
of Species Q24
Profile Air Density
Boundary Layer
Circular Arc
Concentration
Cylinder Joukowski
Dissociation
Drag Coefficient S21
Hub
Hub Shroud
Leading Edge
Linear Velocity
Mach Number
Mass Flow
Momentum Deficiency
Pressure
Temperature
Velocity
Programme* ZB26
Progressive Rotating Stall G20
Stall G18
Projection of Jet T33
Prolate Model H67
Promotion Transition
Propagating Oscillation Fast
Oscillation Slowly
Propagation Sound
Propellant Impeller Rocket
Liquid
Rotor Rocket
Solid
Propelled Vehicle Rocket
Propeller E61
Propeller Blade Surface F67
Propeller Model
Stall Flutter E63
Property J38
Constant Material
Equilibrium Shock Layer
Flow
Material
Thermodynamic
Transport
Variable
Propulsion Light Wave
Rocket
System A59
System Rocket
Propulsive Jet P42
Jet Exhaust P36
Jet Exit P68
Jet Hot
Jet Sonic
Jet Wake Q19
Protection Shield Quartz
Proximity to Ground T76
Pump Design Equation Simplified*
Method* E86
Impeller E80
Rotor E81
Pure Translational Motion N50
Quality Handling
Quantitative* ZB65
Quartz Protection Shield X94
Quasi-Conical Flow* N28
Field N29
Theory* N30
Velocity Field U41
-One-Dimensional Flow N13
-One-Dimensional Flow Equation N14
Radial Flow Compressor E65
Flow Turbomachine E65
Maldistribution of Flow G10
Pressure Distribution T5
Radiation L1
Absorption Ultra-Violet
Back
Cooling X83
Effects X85
Electromagnetic
Heat Transfer Y22
Pressure Solar
Solar 20 cm.
Surface
Radiative Disequilibrium Y68
Emissivity High
Radiator Acoustic
Radioactive Isotope A71
Radius of Curvature J5
Leading Edge
RAE-101 Section W46-W48
Ramp-Type Vortex Generator C48
Random Disturbance ZB39
Pressure Loading W60
Range of Operation G45
0-30 Degree Angle of Dihedral
0-75 Degree Angle of Sweep
Elastic
0-10 Degree Incidence

Range Missile Long
Plastic
of Primary Shock Mach Number Q93
Transonic Speed
Weight Flow
Wide
Rankine-Hugoniot Shock Relation Q72
Rarefied Gas Condition L33
Gas Flow L46
Rate Ablation
Aerodynamic Heating
Arbitrary Pitching
of Change J82
of Change with Time J78
Constant Y43
of Contraction J76
Convective Heat Transfer
Convergence
of Decay J79
of Dissociation Y42
Finite
Flow
of Flow of Fluid H14
of Heat Addition Small
Heat Transfer
Heating
Laminar Aerodynamic Heating
Large Gross Heat Transfer
Local Heat Flow
Local Heating
of Movement Q55
Net Mass
of Recombination Y57
of Removal X52
of Reaction Y58
Small Net Heat Transfer
Spin
Sublimation
Surface Heat Transfer
Ratio ZB63
Aspect
Blockage
Body Diameter
Bursting Pressure
Characteristic Pressure
Chord
Compressor High Pressure
Density
Displacement
Equivalence
Free Stream Pressure
Interaction Force
Jet Diameter
Jet Pressure
Lift Drag
Low Aspect
5-1 Major/Minor Axis
Mass
Maximum Lift Drag
Model Density
Model Weight
Nozzle Pressure
Parameters 1.10 - 1.67 Specific Heat
Peak Pressure
Plate Thickness
Pressure
Ratio Specific Heat
Specific Heat Exhaust
Static Pressure
Taper
Thickness Chord
Total Pressure
Weight
Wing Finite Aspect
Wing High Aspect
Wing Infinite Aspect
Wing Low Aspect
Wing Vanishing Low Aspect
Wing of Very Small Aspect
Zero Aspect
Rayleigh Oscillation Mode V51
Problem ZA80
Type Analysis
Reacting Gas L40
Gas Chemically
Reaction Blade Form Constant
Blading F22
Chemical
Controls Jet
Exothermic
Influence Surface
Jet P45
Measurement
Normal Force R26
Rates of
Type Jet Controls T34
Real Gas L30
Gas Effect L31
Rear C12
Shock Wave Q53
Stagnation Point T95
Rearward Turbulent Separation N98
Reattachment O10
Boundary Layer
Reciprocal Relations V87
Recombination Atomic
Chemical
Molecular
Rate
Record Photographic
Recording Manometer Photo
Recovery Enthalpy X70
Factor X73
Pressure
Reduction Pressure
Temperature X12
Rectangular Model J15
Planform Wing B21
Tunnel Closed
Vortex P4
Wing B21
Wing Slender
Reduced Frequency V66
Temperature X15
Reduction ZB89
of Circulation U63
Drag
Model Elasticity V37
Pressure
Pressure Recovery
Re-Entrant Angle Greater than $\frac{1}{2}\pi$ J1
Re-Entry Atmospheric

Re-Entry Body A30
Body Graphite
Configuration Blunted
Delta Wing
Glider
Lifting
Sweptback Wing
Earth Atmosphere J59
Glider A37
Configuration A37
Configuration Lifting
Configuration Winged
Hypersonic
Planetary
into Planetary Atmosphere J53
Vehicle A30
Vehicle Blunt
Vehicle Surface A45
Velocity M55q
Reference Material V89
Reflected
from Contact Surface Q37
Head Q45
Shock Q71
Shock Attenuation
Shock Tunnel Z20
Wave Q36
Reflection T74
Interference Wave
Multiple
of Primary Shock R13
Shock
Regime First Collision
Flow
Free Molecule Flow
Incipient Merged Layer
Merged Layer
Navier Stokes
I Stagnation Region
Subsonic*
Transitional Layer
Viscous Layer
Region Axisymmetric Stagnation
Behind the Shock Q78
Region Eddy
Expansion
Initial Expansion
Nose
Prandtl-Meyer
Regime I Stagnation
Separated
Shock Layer Luminous Gas
Stagnation
Supersonic Expansion
Regression Node Line
Relation Basic Aerothermodynamic
Non-Linear
Rankine-Hugoniot Shock
Reciprocal
Relationship ZB61
Relative Blade Surface Velocity Maximum
Stream Surface G35
Upstream Velocity G38
Variation with Height M25
Velocity Slip Exit
Relaxation Effect H16
Relaxation Method ZB9
Phenomena H16
Time Effect T82
Relay Servos ZB40
Release Heat
Reliability K14
Engine
Removal of Damping Plate Z83
Rate of
Removed Material
Representation R59
Requirement Engine Performance
High Vacuum
Power
Structural
Trajectory Velocity
Vehicle
Research Y76
Reservoir Temperature Z84
Resistance Atmospheric
Resonance Compression Wave
Phase
Shear Wave
Resonant Vibration V13
Response Coefficient D17
Dynamic*
in Lift Frequency
in Lift Indicial
in Moment Frequency
in Moment Indicial
Model
Total Lift
at Rest L14
Restart Capability K27
Resultant Drag S33
Result Y95
Altitude
Density
Experimental
Transonic Wind Tunnel
Transpiration Cooling
Tables
Retarding Force R35
Retrorocket K52
Simulated
Supersonic
Reversal Method Sodium Line
Pitching Moment
Sodium Line
Spectrum Line
Reversed Flow N49
Reversibility Theorem Drag
Revolution of Body
Decrease Satellite Orbital Period of
Elliptical Body
Period of
Semiellipsoid Body of
Smooth Surface of
Slender Body of
Surface of
Tumbling Body of
Vehicle Blunt Body of
Yawed Body of
Reynolds Number U55
(for individual numbers see U56 abc)

Reynolds Number Diameter
Flow High
Flow Low
Jet
Local Mesh
Low
Roughness
Richardson Method ZB5
Second-Order
Riemann Wave Q34
Rigid Airfoil A94
Body J28
Boundary Working Section with
Drive External
Drive Internal
Model Z59
Mode Oscillating in
Wing B37
Rigidity Torsional
Rigidly Attached Sheet H34
Rigorous Theory* ZA6
Rise Drag
Head
Maximum Adiabatic Temperature
Parameter Head
Pressure
Stage Temperature
Rocket P37
Arc Heating
Chamber C78
Chemical
Electrical
Engine Multiple
Engine Performance K22
Exhaust P34
Exhaust Jet P34
Jet P37
Jet Firing Q8
Jet Interference Q11
Jet Location P72
Jet Thrust K35
Measurement M2
Mid-Course
Nozzle G68
Propellant Impeller E84
Propellant Pump E84
Propellant Rotor E84
Propelled Vehicle A61
Propulsion A61
Propulsion System A61
Solar Heating
Supersonic
System Five-Stage
System Sold-Fuel
System Sounding
Thrust Q29
Vehicle A61
Rod Blunted
Roll Control Bang-Bang
Control Non-Linear
Missile Oscillating
Steady
Rolling Derivatives K76
Moment S57
Oscillation K73
Wing B82
Rooftop Section W42
Room Temperature X9
Root Bending Moment C14
Section C13
To Tip F9
Rotary Derivative T48
Rotating Atmosphere Oblate
Blade Row F26
Stall G19
Stall Progressive
Wing B83
Rotation W53
about Axis K90
Atmospheric
Centre
Earth
of Satellite Mode
Rotational Flow N53
Force F17
Mode W54
Speed G41
Stiffness W75
Rotor Axial Inlet
Blade F19
Mixed Flow
Pump
Rocket Propellant
Roughness Band Distributed
Band Material O48
Band Technique O47
Element O42
Height Critical
Leading Edge
Location O57
Reynolds Number O55
Shape O58
Rounded-Entrance Flowmeter G89
-Entry Venturis G90
Rounding Off Rule R93
Routine Method ZA12
Routt-Hurwitz Criterion ZA56
Row Blade
Inlet Blade
Multiple
Rotating Blade
Rudder Deflection C29
Deflection Differential
Running Time Z76
Time Short*
Safety Margin
Sail Solar
Salt X35
Sandpaper O46
Satellite A16
Artificial
Discover
Earth
Gauge
Mode of Rotation
Observation L99
Orbit J69
Orbit Change K2
Orbit Perigee Motion of
Orbital Period of Revolution
Decrease J83
Period J81

Satellite Vehicle A16
Saturation Vapour Pressure D98
Scale Effect ZA33
Generator
Height M4
Height Density
Scaling Law Dissociation
Model
Scavenging Phenomena Jet Viscous
Schlichting Theory Tollmien
Waves Tollmien
Schlieren Photograph Z91
Season M33
Variation
Seasonal Density Variation M18
Second Method of Lyapunov ZB35
-Order Interference T62
-Order Richardson Method ZB6
-Order Solution ZA27
-Order Theory ZA5
Secondary Vortex P1
Section Central
Characteristic F49
Closed Throat Working
Closed Tunnel Working
Contracting
Convex Cross
Cross
Lift R81
Lift Curve R84
Middle
Midspan
NACA 65 A004
With Open Jet Working
Peaky
Percentage of Solid Cross
RAE - 101
With Rigid Boundary Working
Rooftop
Root
Shape W44
Size Working
Slotted Working
Test
Thickness W45
Wall Test
Working
Sectional Lift Slope R84
Shape W44
Shape Cross
Size Cross
Seeded Gas L37
Segment Circular Cone
Elliptic Cone
Hemispherical
Nose Modified Spherical
Nose Spherical
Spherical Body
Selected Mode V52
Self Excitation Electrical
Induced S99
Semiellipsoid Body of Revolution H48
-Infinitive Cylinder H87
-Infinitive Plane A96
-Infinitive Plate H28
major Axis J97
10 degree Semivertex Angle Cone H60
Semimajor Axis Change J98
Sensor Ablation-Rate
Separated Flow M8
Region 06
Separation N90
Boundary Layer
Boundary Layer Flow
Conical Shock
Corner E45
Delay Boundary Layer
Eddy
Flow
Flow Severely
Flow with
of Forward Flow N97
Induced Unsteady Effect M92
Laminar Boundary Layer
Leading Edge
Low Speed Boundary Layer
Onset 03
Point 08
Position 05
Position Boundary Layer
Pressure 09
Rearward Turbulent
Shock Induced
Shock Induced Boundary Layer
Shock Wave Induced Boundary Layer
Spanwise Position of Transitional Boundary Layer
Turbulent Boundary Layer
Vortex Type Boundary Layer
Servo Relay
Series Asymptotic
Taylor's
Time
Setting Tail
Severe Velocity Gradient G37
Severely Separated Flow N9
Shadowgraph Measurement Z93
Study Z92
Shape of J3
Aircraft
Airfoil
Arbitrary
Arbitrary Blade
Blade
Blunt Nose
Contraction
Cross Sectional
Jet Boundary
Leading Edge
Lifting Surface
Mode
Optimum Nozzle
Roughness
Section
Sectional
Shock Wave
Shroud
Wing
Shaped Blade Parabolic
Sharp Edged E42
Body J25
Gust Penetration of
Normal Gust Penetration

Sharp Edged Wing B45
Leading Edge M14
Leading Edge Wing P46
Nosed Cone H63
Nosed Leading Edge E15
Shear U88
Flow M1
Nosed
Stress Surface

Sheet Elastic
Position Vortex
Rigidly Attached
Uniform Thickness
Shield Quartz Protection
Teflon Heat
Shielding Mechanism X90
Shock Q48
Across Bow
Angle Wedge
Attentuation of Reflected
Behind Normal
Bow
Curvature Q84
Cylindrical
Detachment Distance Q91
Displacement R18
Equilibrium Temperature Q97
Exit
-Expansion Method T79
Flow Field Behind
Front Nitrogen
Front Oxygen
Geometry Bow
Incident
Induced N93
Induced Boundary Layer
Separation N93
Induced Separation N93
Initiated by Strong
Layer* Q98
Layer Detached
Layer Luminosity R5
Luminous Gas Region R6
Property Equilibrium
Theory Thin
Thin
Mach Number Q92
High
Low
Range of Primary
Position Q87
Position Terminal
Primary
Reflected
Reflection R12
Reflection of Primary
Region Behind
Relation Rankine-Hugoniot
Separation Conical
Spherical
Standoff Distance Q91
Strength Q86
Transition Zone R20
Tube Z17
Tube Constant-Diameter
Experiment

Shock Tube Hypersonic
Nozzle G69
Tunnel Experiment Z18
Hypersonic
Reflected
Straight Through
Test Hypersonic
Velocity Air
Wave Q48
Ahead of
Angle Exit
Angle Jet
Apex Location Jet
Argon
Attenuation of
Bow
Detached
Development R10
Flow Behind
Formation R8
Forward
Generated
Hypersonic
Induced Boundary Layer
Separation N93
Infinitesimally Thin
Interaction R21
Interaction Boundary Layer
Location Q87
Movement R11
Nitrogen
Normal
Oblique
Outboard
Oxygen
Pattern Q81
Position Divergence Q89
Rear
Resonance O34
Shape Q83
Strength Q86
Strong
Structure Q82
Surface R4
System Attached
System Oblique
Terminal
Thickness Q85
Tip
Upstream of
Short Probe Vehicle A48
Running Time* Z77
Shroud Between Hub
Contour Arbitrary Hub
Design Improved
Pressure F83
Profile Hub
Shape F80
Surface F82
Side Force R33
Jet P65
Slip K88
Wash U17
Silica Skin Fused
Similarity Solution ZA28
Similitude Hypersonic
Simple Planform Wing* B5

Simple Solution ZA22
Simplified Pump Design Equation* E87
Simply Supported Plate H31
Simulated Flight Test Y87
Retrorocket P40
Turbojet Nacelle C74
Simulation Y94
Helium
Hypersonic*
Jet
Single Light Beam X30
Span Beam J44
Stage Compressor E72
Stage Stall F11
Wedge Aerofoil A87
Singly Mounted Gauge M30
Singular Equation ZA39
Sink Heat
Method Source
Sinking K83
Motion K83
Motion Indicial
Oscillation Sinusoidal
Speed K85
Velocity K85
Wing B84
Sinusoidal Gust S45
Oscillation Displacement V9
Pressure Distribution T6
Sinking Oscillation V1
Vertical Oscillation V4
Six Degrees of Freedom Equation ZA40
Size
Body C10
Cross Sectional
Fuselage
Grain
Jet
Model
Orifice
Particle
Working Section
Skewed Parabolic Blading F40
Skin Continuous
Continuous Fuselage
Flexibility C72
Friction Coefficient Average
Friction S23
Friction Drag S23
Fused Silica
Mild Steel
Structure Thick
Structure Thin
Temperature C71
Thick Outer
Thickness C70
Skip Vehicle A44
Slab Body J29
Composite
Slender Body J30
Body of Revolution H49
Body Theory J31
Channel* G59
Cone-Cylinder Flare J17
Rectangular Wing B22
Wing B54
Slender Wing Theory B55
Slightly Blunted Nose C96
Slip G48
Exit Relative Velocity
Factor G49
Flow M98
No-Surface
Slipstream External
Slope Body
Change
Distribution
Lift
Lift Curve
Normal Streamline
Sectional Lift
Width Jet
of Wing C2
Slot Blowing O37
Configuration C42
Slotted Liner Z42
Wall Wind Tunnel Test Z31
Working Section Z37
Slowly Oscillating Wing B79
Propagating Oscillation U97
Slug Flow N59
Small Air Jet P50
Aspect Ratio Wing of Very
Disturbance Infinitely
Disturbance Theory T56
Disturbance Theory Hypersonic
Disturbance Theory Inviscid
Eccentricity Orbit J74
Flow Disturbance T54
Net Heat Transfer Rate Y31
Perturbation Theory T56
Spanwise Curvature A99
Rate of Heat Addition O37q
Wing Sweep
Smooth Surface of Revolution D37
Sodium Chloride X35
Iodide X36
Line Reversal X32
Line Reversal Method X32
Soft Material E57
Solar Activity M26
Sail A78
20 C.M. Radiation M28
Heating Rocket A76
Radiation Pressure J89
Solid H37
Blockage T69
Body H37
Construction Wing B40
Cross Section Percentage of
Displacement
Finite
Fuel Rocket System A66
Propellant A66
Wall Tunnel* Z30
Wall Wind Tunnel Z30
Wall Wind Tunnel Test Z30
Solution ZA20
Accurate
Analytical
Approximate
Approximate Analytic

Solution Asymptotic
Classical Wave Equation
Exact
Finite Difference Numerical
Integrating
Iterative
Iterative Numerical
Jeffery-Hamel
Kinetic Theory
Linear Viscosity Temperature*
Method
Numerical
Polhausen
Second-Order
Similarity
Simple
Theoretical
Sonic Convergent Nozzle G77
Flow M53j
Jet P63
Jet Nozzle G70
Leading Edge Nearly
Nozzle G83
Nozzle Jet P59
Point Q90
Point Location Q90
Point Location of
Propulsive Jet P43
Speed M53j
Throat Velocity G9
Sound Propagation V57
Speed
Wave V53
Sounding Probe A49
Rocket System A49
Source Distribution O85
Nuclear Energy
Sink Method O81
Sink Method Von-Karman
Space Phase
Probe A47
State
Vehicle A15
Spacing Between Grains O60
Maximum Streamline
Meridional Streamline
Streamline
Span Beam Single
Finite
Load Subsonic
Load Total
Model Half
Part
Vortice Location of Part
Wing Finite
Wing Infinite
Spanload Distribution W84
Spanning B93
Spanwise W21
Centre of Pressure S85
Coordinate R28
Curvature Small
Direction Q5
Hole Pattern E48
Lift Distribution R94
Loading R51
Spanwise Loading Uniform
Outflow U18
Position of Separation O7
Vortices P3
Wire O45
Species Continuity
Production of
Specific Gas Constant X78
Heat X37
Heat of Jet P95
Heat Exhaust Ratio
Heat Ratio O37i
Heat Ratio Parameter 1.10- 1.67 X38
Heat Variation X40
Impulse O37s
Specimen Test
Spectra Stress Power
Spectrum Line Reversal X28
Speed Aircraft High
Boundary Layer Separation Low
Computer High*
Control K45
Critical Flutter
Escape
Flow Low
Flutter
Flutter High
High
High Subsonic
Hypersonic
Impeller Tip
Inlet Flow
Low Subsonic
Low Supersonic
Performance Characteristic Intermediate
Pitch-Line Blade
Problem Low
Range Transonic
Rotational
Sinking
Sonic
of Sound M53k
Stability K47
Subsonic
Super-Satellite
Supersonic
Transonic
Tunnel
Wing
Sphere H64
Spherical Body H64
Body Segment H65
Pendulum Z96
Polar Coordinate ZB10
Segment Nose C91
Segment Nose Modified
Shock Q68
Spherically Symmetrical Atmosphere L89
Spheroid Model H66
Spike Length J27
Spiked Body J26
Spin Rate K87
Splitter F29
Vane F29
Vane Surface F30
Spoiler Trailing Edge

Spring Pivot Crossed
Sputnik I A25
Sputnik II A26
Sputnik III A27
Sputnik V A28
Square Hole Pattern E49
Stability T35
Aerodynamic
Asymptotic
Boundary Layer
Characteristic Dynamic
Characteristic Static
Control T49
Derivative T45
Derivative Dynamic
Derivative Static
Directional
Flow
Hydrodynamic
Lateral
Longitudinal
Non-Aerodynamic* ZB55c
Pitch
Speed
Static
Yaw
Stabilization* T49a
Stable Attitude Statically
Region ZB36
Stage* E89
Characteristic E90
Compressor Single
Efficiency E91
Flow Coefficient F2
Inlet
Interaction F4
Loading F14
Matching E93
Performance E91
Stacking E95
-Stacking Analysis E96
Stall F5
Stall Single
Stall Type of
Stalled First
Temperature Rise E99
Unstalled Front
2 Uprating
Stagger Blade
Inlet Guide-Vane
Staggered Hole Pattern E50
Stagnation Air Flow T90
Boundary Layer N77
Condition T96
Enthalpy Flight
Flow T89
Gas State T97
Jet
Point T94
Point Flow T94
Point Heating T100
Point Pressure S81
Point Rear
Pressure S81
Pressure Coefficient S82
Pressure Flight
Stagnation Pressure Jet
Region T91
Region Axisymmetric
Region Regime I T93
Region Regime II T93a
Streamline 068
Temperature T98
Temperature from 2400° - 3800°F T99a
Temperature High
Temperature Nozzle
Stall Abrupt
Complete Compressor
Flutter Propeller
Leading Edge G24
Limit Line
Progressive
Progressive Rotating
Rotating
Single Stage
Stage
Type of Stage
Stalled First Stage N91
Flow G15
Stalling
Mode of* G23
Point M27
Standard Flux Q91
Stand-Off Distance R66
Standoff Distance Shock
Starting Lift
State Distribution Steady ZA57
Equation of R41
Space U90
Stagnation Gas S69
Static Aerodynamic Characteristic S74
Aeroelasticity S73
Pressure S72
Pressure Distribution S71
Pressure Free Stream S70
Pressure Gradient T37
Pressure Jet T38
Pressure Measurement T39
Pressure Ratio V42
Pressure Survey K62
Stability H93
Stability Characteristic ZB32
Stability Derivative 097
Testing W94
Statically Stable Attitude F20
Stationary Cylinder U11
System M82
Vortex Pair M84
Statistical Superposition Y26
Stator Blade M86
Steady Downwash Condition K75
Flow W85
Flow Theory B91
Heat Transfer
Motion Characteristic
Roll
State Distribution
Wing
Steel Skin Mild
Step Finite
Stiffner Panel A63
Stiffness Bending

Stiffness Derivative V63
Derivative Aerodynamic
Material
Model
Rotational
Wing Arbitrary
Still Air L56
Sting Balance Measurement Q30
Stoichiometric Mixture Z13
Stokes Difference Equation Navier*
Equation Navier
Regime Navier
Stream Function Variable O80
Store Matrix External
External
Straight Channel* G60
Line Aerofoil A90
Through Shock Tunnel Z19
Wing B15
Stream Air
Ambient Supersonic
Cocurrent
Dissociated
Dissociation Free
Enthalpy X71
Evaporating Main
Filament Theory O78
Flow Free
Flow Main
Free
Function O79
Function Variable Stokes
In N47
Injected Gas
Jet
Mach Number U48
Mach Number Free
Mach Number Main
With Mach Numbers Near Unity Free
Nonequilibrium
Parallel
Pressure Ratio Free
Static Pressure Free
Subsonic Free
Supersonic
Surface Relative
Temperature Local
Streamline O66
Flow
Position O69
Slope Normal
Spacing G35a
Spacing Maximum
Spacing Meridional
Stagnation
Wall O77
Streamtube O65
Streamwise ZB67
Street Karman
Strength Main Vortex
Parallel With
Shock
Shock Wave
Vortex
Stress Blade Bending
Distribution W82
Stress Frequency Distribution W83
Maximum
Power Spectra W92
Surface
Surface Free of
Surface Shear
Thermal
Stratford Method Extension of
Stringer Panel C61
Supporting
Strip J40
Analysis Modified
Crossing Point J41
Type Vortex Generators Twisted
Strong Shock Initiated By
Shock Wave Q49
Surface Cooling X82
Structural Damping V74
Requirement K15
Twist Matrix W90
Structure Aircraft
Fixed
Jet
Shock Wave
Thick Skin
Thin Skin
Study Analytical
Oil Flow
Photographic
Shadowgraph
Theoretical
Wing Flow
Subcritical Mach Number M46
Subjected To V55
To Heat Transfer Surface
Sublimation Erosion X48
Indicator O52
Rate X49
Subsonic Air Jet P47
Compressor E74
Edged Wing B47
Flow M44
Flow High
Flow Low
Flutter Derivative V23
Free Stream M71
Leading Edge E19
Lifting Surface Theory D46
Mach Number M46
Regime* M45
Span Load R53
Speed M44
Speed High
Speed Low*
Turbomachine E74
Successive Approximation ZA94
Overrelaxation Method ZB12
Suction at Knee O39
Distributed
Leading Edge
Trailing Edge
Sudden Change K86
Sun Perigee Angle Between
Superposition Doublet
Statistical
Super-satellite Speed M55s

Supersonic Air Jet P48
Convergent-Divergent Nozzle G82
Doublet Equation O84
Edged Wing B48
Engine Intake K23
Expansion Region Q76
Flow High
Flight J46
Flow M54
Flow Local
Flow Low
Interface D90
Jet P64
Jet Nozzle G71
Leading Edge E22
Mach Number High*
Mainstream M76
Model A51
Nozzle G84
Nozzle Jet P60
Nozzle Ordinate G85
Retrorocket P39
Rocket P35
Speed M54
Speed Low
Stream M54v
Stream Ambient
Trailing Edge E39
Turbomachine E75
Vehicle A50
Wind Tunnel Z7
Support Gear Z56
System Interference T65
Supported Plate Simply
Supporting Stringer C62
Surface D9
Ablation X51
Adjacent Flat
Afterbody
Allmovable Control
Combustion D66
Condition D43
Contact
Contribution Leeward
Control
Cooling Strong
Curvature D70
Curved
Cylinder
Dissipative Flexible
Downwash D55
Drag D54
Elastic
Exposed D25
Flat*
Flat Plate
Flat Wing
Flexibility* D15
Flexible
Flow D49
Flow Pattern D50
Free of Stress D28
Heat Transfer Distribution D67
Heat Transfer Rate D68
Homogeneous
Hub
Impeller Blade
Surface Isobar D57
Isotropic
Interior
Intersecting
Lifting
Main Blade
Material D72
Non-Ablating
Non-Catalytic Body
Non-Dissipating
Non-Dissipative Flexible
Insulated
Oil L23
Oil Flow Pattern Z88
Pressure D56
Pressure Distribution D58
Pressure Local
Radiation D69
Reaction Influence
Re-Entry Vehicle
Reflected From Contact
Relative Stream
of Revolution D36
of Revolution Smooth
Roughness O41
Shape Lifting
Shear Stress D53
Shroud
Slope Body
Splitter Vane
Stress D52
Subjected to Heat Transfer D26
Tab Control
Tail
Temperature D61
Temperature Adiabatic
Temperature Equilibrium
Temperature Maximum
Theory Lifting
Theory Subsonic Lifting
Thin
Two-Dimensional
of Uniform Thickness D30
Unswept Tail
Upper
Upper Lifting
Velocity Blade
Velocity Maximum Relative Blade
Velocity Trailing
Wave D51
Wing
Wing Flat
Surge U24
Compressor
Line G28
Survey Flow
Impact Pressure
Static Pressure
Sustaining Leading Edge Heat
Sweep W7
Angle W7
Range 0-75 Degree Angle of
Small Wing
79.5° Sweepback W11
Sweepback Angle of
Angle 55° W9a
Angle 60° W10

Sweepback 53.5° Leading Edge
Swept Wing B6
Wing Highly
Sweptback Delta Wing B12
45° Tail C19
Wing B9
Wing 45° B10a
Wing 50° B10b
Wing 60° B11
Wing Model B10
Wing Re-Entry Configuration A35
Sweptforward Wing Tip B14
Wing B13
Symmetric Nozzle Jet Axially
Velocity Potential U34
Symmetrical Atmosphere Spherically
Airfoil A93
Body H43
Flow N21
Loading R55
Wing B27
Wing Thickness B28
System Attached Shock Wave
Dynamic
Five-Stage Rocket
Interference Support
Linear
Non-Linear
Nonstationary
Oblique Shock Wave
Optimization Control
Propulsion
Rocket Propulsion
Solid Fuel Rocket
Sounding Rocket
Stationary
Telemetering
Vortex
Systematic Procedure V84
Tab Coefficient Oscillatory
Control Surface
Table ZA9
of Results Y97
of Values ZA10
Tabulation ZA9
Tail C15
Allmovable
Horizontal
Setting C23
Spanload C24
Surface C21
Surface Unswept
Vertical
Boom Airplane A8
Tailless Air Plane A7
Tailplane C22
Tangent Wedge Method B96
Tangential Force R34
Pressure Gradient T10
Taper Ratio W14
Taper Ratio .333 W14a
Tapered Wing B29
Wing Model B30
Tap Pressure
Tapping Pressure
Target Planet Approach J50
Taylors Series ZB12b
Technique Bump
Complete Aerofoil
Half Aerofoil
Teflon Heat Shield X93
Material X92
Nose Piece C88
Type Polymer
Telemetering System Y89
Temperature X6
Adiabatic Surface
Adiabatic Wall
Air High
Ambient
Coefficient F1
Constant
Constant Wall
Dependent Value X16
Distribution X20
Distribution Transient
Elevated
Equilibrium
Equilibrium Surface
Flame
Flow High
Gas High
Gradient One-Dimensional
Gradient Transverse X24
Gradient Wall
Gradient Zero
High Stagnation
History X20
Inversion X17
Jet High
Law Viscosity*
Linear Gradient X25
Local Stream
Maximum
Maximum Surface
Measurement X27
Nozzle Stagnation
Profile X20
Recovery
Reduced
Reservoir
Rise Maximum Adiabatic
Rise Stage
Room
Shock Equilibrium
Skin
Solution Linear Viscosity*
Stagnation
Surface
Transient
Uniform X11
Variation X18
Wall
Tension W62
Load W62
Phase J61
Shock Position Q88
Shock Wave Q54
Test Y82
Cascade Tunnel
Choked Wind Tunnel
Coupon

Test Data Y95
Data Flight
Experimental
Experimental Flight
Flight
Flutter
Gas Z47
Hypersonic Shock Tunnel
Medium Hypersonic*
Model
Section Z34
Section Wall Z39
Simulated Flight
Slotted Wall Wind Tunnel
Solid Wall Wind Tunnel
Specimen W96
Vehicle A46
Vibration
Testing Flutter
Ground
Static
Time Z78
Time Experimental
Time Theoretical
Vibration
Theodorsen Alternating Lift Function S11
Theorem Drag Reversibility
Theoretical Analysis ZA88
Calculation ZA14
Investigation Z98
Method* ZA86
Prediction ZA2
Solution ZA26
Study Z98
Testing Time Z79
Work* Z98
Theory Z98
Approximate
Automatic Control
Boundary Layer
Chapman-Enskog*
Conical Flow
Continuum Flow
Generalized
Hypersonic Small Disturbance
Incompressible Flow
Inviscid Small Disturbance
Kinetic
Kirchoff Discontinuous Flow
Liapunov's
Lifting Surface
Linearised
Linearised Wing
Modified Newtonian
"Not-so-Slender" Wing
Perfect Gas
Piston
Potential
Potential Flow
Powell
Prediction Impact (Newtonian)
Quasi-Conical Flow*
Rigorous*
Second-Order
Slender Body
Slender Wing
Theory Small Disturbance
Small Perturbation
Solution Kinetic
Steady Flow
Stream Filament
Subsonic Lifting Surface
Thin Shock Layer
Tollmien Schlichting
Transonic Flow
Two-Dimensional Flow
Vorticity-Interaction
Zero Order
Thermal Conductivity X41
Conductivity Coefficient of
Distribution X59
Equilibrium X5
Expansion Coefficient
Stress W64
Thermally Thick Wall D80
Thin Wall D81
Thermodynamic Equilibrium* X62
Problem X60
Property X61
Thick Boundary Layer* O25
Outer Skin X96
Skin Structure C68
Trailing Edge E37
Wall Thermally
Wing B57
Thickened Trailing Edge E38
Thickening of Boundary Layer N85
Artificial
Thickness W15
Boundary Layer
Boundary Layer Displacement
Boundary Layer Momentum
Chord Ratio W16
Chord Ratio (for numbers see W16cdef)
Cylinder of Finite
Displacement
Distribution W17
Effect ZB55
Laminar Boundary Layer
Momentum
Ratio Plate
Section
Sheet Uniform
Shock Wave
Skin
Surface of Uniform
Symmetrical Wing
Wall
Wall Finite
Wing
Thin Body J30
Shock Layer R2
Shock Layer Theory R3
Shock Wave Infinitesimally
Skin Structure C69
Surface D31
Wall Thermally
Wing B54
Three Dimensional Aerofoil A84
Body H45
Boundary Layer N78
Disc O44

Three Dimensional Equation* ZA38
Flow N18
Motion N19
Flow Theory N20
Wing B50
Threepoint Boundary Condition ZA82
Throat Diameter Nozzle
of Flow Nozzle H4
Velocity Sonic
Working Section Closed
Through Nozzle Flow
Passing
Shock Tunnel Straight
Thrust K31
Augmentation K40
Coefficient K42
Coefficient Jet
Gross
Jet
Loss K41
Rocket
Rocket Jet
Vector Control K36
Thwaites Jet Flap C38
Time Actual
of Appearance R9
Dependent W80
Dependent Boundary Condition ZA83
Effect Relaxation
Experimental Testing
Ideal
Motion Duration
Optimum Control ZB44
Rate of Change With
Running
Series ZA73
Short Running*
Theoretical Testing
Testing
Variation J78
Variation of Perigee Distance With
Tip Blade
Bluntness E13
Deflection Wing
Impeller
Initial
Panel Unfolding Wing
Planform Wing Curved
to Root
Shock Wave E58
Speed Impeller
Sweptforward Wing
Vortex E60
Tollmien Schlichting Theory 033
Wave Q35
Torque W74
Torsional Oscillation V7
Rigidity W78
Stiffness W77
Total Downwash U9
Drag S19
Drag Coefficient S20
Enthalpy X64
Equivalent Length G95
Head Measurement S67
Heat Transfer Y24
Total Lift Coefficient S6
Lift Response R97
Pressure S66
Pressure Jet
Pressure Nozzle
Pressure Ratio S68
Span Load R54
Trailing Edge E35
Edge Airfoil Blunt
Flap C40
Pressure E40
Spoiler C45
Suction E41
Supersonic
Thick
Thickened
Surface Velocity F58
Vortex 089
Trajectory J62
Correction K55
Flight
Generalized
Transfer
Velocity Requirement K29
Transfer Boundary Layer Heat
Coefficient Heat
Convective Heat
Distribution Laminar Heat
Distribution Surface Heat
Frozen Heat
Heat
Interplanetary Orbit
Radiation Heat
Rate Convective Heat
Rate Heat
RateLarge Gross Heat
Rate Small Net Heat
Rate Surface Heat
Steady Heat
Surface Subjected to Heat
Total Heat
Trajectory J63
Transient Heat
At Wall Heat
Transformation Fourier
Lorents
Transient Behaviour ZB37
Conduction Y16
Electrical Flow N55
Flow N54
Heat Conduction Equation Y19
Heat Transfer Y25
Lift R67
Matrix W51
Temperature X10
Temperature Distribution X21
Transition ZB80
Boundary Layer
From Tumbling Body...Motion J55
Natural*
Position Boundary Layer
Promotion
Zone Shock
Transitional Boundary Layer N88
Boundary Layer Separation N99
Layer Regime N99
Translation W52

Translation Vertical
Translational Motion Pure
Transonic Flow M53
Flow Attachment R17
Flow Theory M53h
Leading Edge E21
Speed M53
Speed Range M53a
Wind Tunnel Z4
Wind Tunnel Result Z5
Transpiration Cooling X86
Cooling Result X87
Transport Coefficient Y73
Process Y74
Property Y75
Transverse Temperature Gradient
Travelling Pressure Distribution T8
Traverse Boundary Layer
Triangle Variation Unit
Triangular Plate H29
Wing B16
Wing Flat
Wing Near
Wing with Twist B20
Trim Attitude K59
Lift Coefficient S7
Truncated Afterbody D4
Tube Z17
Blunt Nosed Pitot
Constant Diameter Shock
Driving
End of
Experiment Shock
Hypersonic Shock
Length
Manometer Multiple
Nozzle Shock
Shock
Wall
Tumbling Body Motion Transition From H51
Body of Revolution J56
Cessation J54
Entry H23
Flat Plate
Tunnel Arc Discharge Wind
Choked*
Choked Wind
Circular
Closed Octagonal
Closed Rectangular
Constraint D95
Data Wind
Determination Wind
Experiment Shock
Experiment Wind
Hypersonic Gun
Hypersonic Shock
Hypersonic Wind
Hypervelocity Wind
Interference Effect Wind
Investigation Wind
18" x 14" NPL Wind
Measurement Wind
Reflected Shock
Result Transonic Wind
Solid Wall*
Solid Wall Wind
Tunnel Speed Z74
Straight Through Shock
Supersonic Wind
Test Cascade
Choked Wind
Hypersonic Shock
Slotted Wall Wind
Solid Wall Wind
Transonic Wind
Turbulence Degree of
Variable Density Wind
Wall Z40
Wall Pressure Z81
Wall Wind
Weight To Z73
Wind
Working Section Closed
Tungsten Y1
Turbojet Nacelle Exit C73
Nacelle Simulated
Turbomachine Axial Flow
Mixed Flow
Radial Flow
Subsonic
Supersonic
Turbulence Degree of Tunnel
Turbulent U23
Boundary Layer N73
Boundary Layer Flow N73
Boundary Layer Separation O1
Flow M80
Flow Field M81
Jet Mixing Q23
Mixing T88
Separation Rearward
Turning Angle F53
Twist W18
Matrix Aerodynamic
Triangular Wing With
Wing With Parabolic
Twisted Strip Type Vortex Generator C49
Wing B34
Two Dimensional Airfoil A83
Base Pressure S78
Body J11
Flow N15
Flow Field N16
Flow Theory N17
Flutter Derivative V22
Jet P56
Nozzle Jet P58
Surface D41
Wing B49
Wire O43
Type Analysis Rayleigh
Boundary Separation Vortex
Flutter Bending
Jet Control Reaction
of Stage Stall
Vortex Generator Twisted
Ultra Violet Radiation Absorption M22
Unbounded Flow N2
Uncambered Wing B33
Uncontrolled Vehicle* A43
Uncoupled Vibration Mode V46
Underwater L21
Undissociated Gas Initially

Unfolding Wing Tip Panel A41
Unheated Hydrogen Driving Air Z21
Undirectional Motion N46
Uniform Angle of Attack W2
Flow M87
Flow Duration M88
Spanwise Loading R52
Temperature
Thickness Sheet H35
Thickness Surface of
Velocity With U31
Unit Triangle Variation X19
Unity Free Stream with Mach Numbers Near
Unstalled Front Stage
Unstalling Hysteresis G26
Unsteady Effect Separation Induced
Flow M89
Lift R71
Lift Distribution* R72
Lift Function S9
Load R61
Unswept Tail Surface C20
Wing B15
Untapered Wing B31
Upper Atmosphere L92
Atmosphere Extreme
Lifting Surface D48
Surface D32
Uprating Stage 1 E97
Uprating Stage 2 E98
Upstream Exhaust P73
Flow Whirl F94
Influence O20
of Nozzle Entry Z45
of Shock Wave Q78
Velocity Relative
Upwash Distribution U16
Field U15
Vacuum Requirement High
Value Problem Boundary
Table of
Temperature Dependent
Vane F28
Adjustable Inlet Guide
Splitter
Surface Splitter
Vortex Generator C53
Vaneless Diffuser F84
Vanguard I A29
Vanishing Load R62
Low Aspect Ratio Wing B59
Pressure Gradient T11
Vaporization X57
Vapour Pressure Saturation
Variable Capacitance Sensor X54
Conductivity X42
Density Wind Tunnel Z32
Medium V31
Property ZB49
Stokes Stream Function
Vorticity
Variation ZB77
in Acceleration K49
Across Channel G65
Arbitrary
From Day to Night M19
Variation of Density M17
Density
Diurnal
Diurnal Density
With Height Relative
of Latitude M24
Latitude
of Perigee Distance with Time J93
Pressure
Seasonal Density
Specific Heat
Temperature
Time
Unit Triangle
Velocity
Weight Flow
Principle of Biot ZA98
With Season M18
Variational Principle ZA97
Vector Control Thrust
Lift
Moment
Velocity
Vehicle A10
Air Breathing
Arrow Wing
Attitude K57
Ballistic
Blunt Body of Revolution
Blunt Nose
Blunt Re-Entry
10° Blunted Cone
Configuration Probe
Conical Afterbody
Flat Base
Glide
Glider
Hypersonic
Orientation K57
Probe
Re-Entry
Requirement K10
Rocket
Rocket Propelled
Satellite
Short Probe
Skip
Space
Supersonic
Surface Re-Entry
Uncontrolled*
Velocity U25
Air Shock
Blade Surface
Blowing High
Distribution U37
Distribution Prescribed
Escape
Exhaust
Field Quasi-Conical
Flight
Gas Flow
Gradient U38
Gradient Severe
Induced
Maximum

Velocity Maximum Relative Blade Surface
Measurement U42
Potential U33
Anti-Symmetric
Perturbation
Symmetric
Profile U39
Profile Linear
Re-Entry
Relative Upstream
Requirement Trajectory
Sinking
Slip Exit Relative
Sonic Throat
Trailing Surface
Uniform
Variation U37
Vector J75
Vertical
Vertical Induced
Venturi Rounded-Entry
Vertical Acceleration S1a
Axis D38
Induced Velocity U28
Nozzle Position H6
Oscillation Sinusoidal
Plane Control T30
Position W5
Tail C18
Translation N52
Velocity U29
Very Small Aspect Ratio Wing of
Vibration Free
Mode Uncoupled
Normal Mode
Resonant
Testing V88
Test V88
Vibrational Mode V45
Vibrationally Frozen Flow Approaching
Viscid Flow N36
Viscosity U84
Coefficient
Effect Boundary Layer
Temperature Law* U85
Temperature Solution Linear*
Viscous N36
Drag S26
Effect U87
Flow N36
Fluid L9
Fluid Motion N37
Force S26
Interaction T64
Layer Regime L50
Motion N37
Scavenging Phenomena Jet
Volume K11
Von-Karman Source Sink Method O82
Vortex O87
Blade Form Free
Blade Form Half
Bound
Chordwise
Co-Rotating
Counter-Rotating
Vortex Discrete Horseshoe
Displacement Main
Distribution Elementary Horseshoe
Flow P7
Formation P8
Generator Air Jet
Ramp-Type
Twisted Strip Type
Vane
Wedge-Type
Wing-Type
Growth P11
Horseshoe
Individual
Location of Leading Edge
Location of Part Span
Main
Movement P12
Pair Stationary
Path P20
Path Location P21
Pattern of Horseshoe
Rectangular
Secondary
Sheet Position P22
Spanwise
Strength P25
Strength Main
System O92
Tip
Trailing
Type Boundary Layer Separation O2
Vorticity U64
Contour P24
Distribution P17
Interaction Domain P15
Interaction Theory P16
Variable P23
Wagner Indicial Lift Function S10
Wake U19
Blockage T70
Development of Circulating
Flow U19
Interference Effect T63
Propulsive Jet
Width Divergence U20
Wall D73
Boundary Layer N69
Channel
Composite
Condition D91
Constraint D95
Copper
Divergence* Z41
Finite Thickness
Flow Past Parallel
Heat Flux History E3
Heat Transfer
Homogeneous
Inconel
Interference D93
Non-Parallel
of Open Area
Plane
Pressure Tunnel
Streamline

Wall Temperature D62
Temperature Adiabatic
Temperature Constant
Temperature Gradient E1
Test Section
Thermally Thick
Thermally Thin
Thickness D76
of Tube Z40
Tunnel
Tunnel Solid*
Wind Tunnel
Wind Tunnel Solid
Wind Tunnel Test Slotted
Wind Tunnel Test Solid
Ward Extension J32
Warren 12 Planform B36
Water Flow L17
Wave Ahead of Shock
Angle Exit Shock
Angle Jet Shock
Apex Location Jet Shock
Argon Shock
Attenuation of Shock
Bow Shock
Compression
Detached Shock
Development Shock
Drag S29
Equation Solution Classical
Expansion
Flexural
Flow Behind a Shock
Formation Shock
Forward Shock
Generated Shock
Hypersonic Shock
Induced Boundary Layer Separation Shock
Infinitesimally Thin Shock
Instability L19
Interaction Boundary Layer Shock
Interaction Shock
Kelvin Helmholtz
Location Shock
Longitudinal
Mach
Movement Shock
Nitrogen Shock
Normal Shock
Oblique Shock
Outboard Shock
Oxygen Shock
Pattern Shock
Position Divergence Shock
Propulsion Light
Rear Shock
Reflected Q36
Reflection Interference Q38
Resonance Compression
Riemann
Shape Shock
Shock
Sound
Strength Shock
Strong Shock
Structure Shock
Wave Surface
Terminal Shock
Thickness Shock
Tip Shock
Tollmien Schlichting
Upstream of Shock
Wavelength Jet
Weakening W71
Wedge O18
Aerofoil Single
Airfoil A86
Airfoil Double
Angle J13
Blunted
Method Tangent
Shock Angle J14
Type Vortex Generator C50
Weight Engine
Flow F99
Flow Characteristic Equivalent
Flow Maximum
Flow Overall
Flow Range G4
Flow Variation G5
Molecular
Ratio K16
Ratio Model
Tunnel
Wing with Concentrated
Weissenger Method W86
Whirl Inlet
Upstream Flow
Wide Range G46
Wing B52
Width Band
Divergence Wake
Infinite
Jet Slot
Wind Speed L67
Wind Tunnel Z1
Arc Discharge
Choked
Data Y96
Determination Z3
Experiment Z2
High Enthalpy*
Hypersonic
Hypervelocity
Interference Effect D94
Investigation Z2
Low Density*
Measurement Z3
Result Transonic
Solid Wall
Supersonic
Test Z2
Test Choked
Test Slotted Wall
Test Solid Wall
Transonic
Variable Density
Wall Z40
18" x 14" NPL
Windward Body J34
Edge E9
Wing B1
Wing Airplane

Wing Arbitrary Planform
Arbitrary Stiffness
Beneath
Body B1
Body Arrangement A97
Body Combination A97
Body Interference A98
Cambered
Chord B99
Circular Planform
with Concentrated Weight B68
Curved Tip Planform
Cantilevered
Clipped Delta
Cropped
Delta
Differentially Deflected
Elastic
Elliptic
Elliptical
Finite
Finite Aspect Ratio
Finite Span
with Flap B69
Flat
Flat Plate
Flat Surface
Flat Triangular
Flow Pattern B94
Flow Study B94
Flutter Cantilever
Fluttering
Fuselage Interference A98
Half
Harmonically Oscillating
High Aspect Ratio
Infinite Span
Laminar
Lift B97
Lifting
Loaded
Long
Low Aspect Ratio
Model B3
Model Half
Model Sweptback
Model Tapered
Narrow
Near Triangular
Nonlifting
Oscillating
With Parabolic Twist B35
Perforated
Pitching
Plane of
Planform B94
Pressure Distribution B95
Rectangular
Rectangular Planform
Re-Entry Configuration Delta
Re-Entry Configuration Sweptback
Rigid
Rolling
Rotating
Shape B4
Sharp Edge

Wing Sharp Leading Edge
Simple Planform*
Sinking
Slender
Slender Rectangular
Slope
Slowly Oscillating
Solid Construction
Steady
Straight
Subsonic Edged
Supersonic Edged
Surface C4
Surface Flat
Sweep Small B8
Swept
Sweptback
Sweptback Delta
Sweptforward
Symmetrical
Tapered
Theory "Not-so-Slender"
Theory Linearized
Theory Slender
Thick
Thickness C1
Thickness Symmetrical
Thin
Three-Dimensional
Tip C8
Tip Deflection C9
Tip Panel A39
Tip Panel Unfolding
Tip Sweptforward
With Twist Triangular
Triangular
Twisted
Two-Dimensional
Type Vortex Generator C51
Uncambered
Unswept
Untapered
Vanishing Low Aspect Ratio
Vehicle Arrow
of Very Small Aspect Ratio B60
Wide
Yawed
Winged Missile A12
Re-Entry Glider Configuration A38
Wire Anemometer Hot
Measurement Hot
Spanwise
Two-Dimensional
With Feedback Autopilot
Within Jet Location
Without Corner Cylinder
Wood Model Compreg
Work Theoretical*
Working Section Z34
Closed Throat
Closed Tunnel
With Open Jet Z35
With Rigid Boundary Z36
Size
Slotted
$0^{\circ}$ Yaw K77

| | |
|---|---|
| 30° Yaw | K78 |
| Yaw Control | K81 |
| Stability | K79 |
| Yawed Body of Revolution | H52 |
| Wing | B87 |
| Yawing Derivative | K80 |
| Zero Angle of Attack | V96 |
| Aspect Ratio | W13 |
| Boundary Constraint | D96 |
| Gravity | K99 |
| Lift | R70 |
| Model Incidence | V97 |
| Order Theory | ZA4 |
| Pressure Gradient | T12 |
| Temperature Gradient | X23 |
| Zone Expansion | |
| Shock Transition | |

## APPENDIX 5.6

## CONTROLLED TERM VOCABULARY

Terms marked with an asterisk represent terms used in the collection of 200 documents (Document Subset 1 of Appendix 3E), and are therefore comparable with the terms in the concept schedules (Appendix 5.4) and rotated index (Appendix 5.5). The remaining terms were used in the additional 150 documents that make up Document Subset 2.

These terms were based on those which appear in the Thesaurus of Engineering Terms of the Engineers Joint Council. Terms which do not appear in this Thesaurus are preceded by a cross.

+ Ablating materials*
Ablation*
Absorption*
Acceleration*
+ Accommodation height*
Accuracy*
Actual time*
Adiabatic conditions*
Adjustment*
+ Aerodynamic balance*
+ Aerodynamic center*
+ Aerodynamic characteristics*
+ Aerodynamic configurations*
+ Aerodynamic forces*
Aerodynamic heating*
+ Aerodynamic loads*
+ Aerodynamics*
Aerothermodynamics*
+ Afterbodies*
Agents*
Ahead*
Ailerons*
Air*
Aircraft*
Air flow*
Airfoils*
Airframes*
Airplanes*
Air resistance*
Airspeed*
Altitude*

Aluminium alloys*
Ammonium compounds
Amplitude*
Analogies*
Analogue computers
Analyzing*
Angle of incidence*
Angles*
Annuli*
Antennas
Applying
Approaches
Approximation*
Arcs*
Area*
Argon*
+ Arrow wings*
Asbestos
Aspect ratio*
Atmosphere
Atmosphere Extra-terrestial*
Atmosphere Terrestial*
Atmosphere Entry*
Atomic properties*
Atoms*
Attenuation*
Attitude*
Attitude control
Automatic control*
Autopilots*
+ Axial distribution
+ Axial flow
+ Axial forces*
Axial flow pumps*
Baffles*
Balances*
Balancing
Ballistic missiles*
Balsa woods*
Bands*
+ Base pressure*
Bases*
Bearing*
Beams (Radiation)*
Beaming*
Bearing (Direction)*
Behaviour*
Bending*
Beveling
Binary systems
Blades*
+ Blasius equation*
Bleeding*
Blocking*
Blowers*
Blowing*
Blunt bodies*
+ Blunt cones*
Blunt cylinders
+ Blunt leading edges*
+ Blunt trailing edges*
+ Bluntness*
+ Boat tails*
Bodies of revolution*
Bombers
Booms*
Booster rockets*
Boundaries*
Boundary layer*
Boundary layer control*
Boundary layer transition*
Braking
Bridging*
Buckling*
+ Buffeting*
Buoyancy*
Bursting*
Calibration
Camber*
+ Cantilever structures*
Cantilever wings*
Capacity
Caps
Carbon Dioxide*
Carbon arcs*
Carbon tetrachloride
+ Cascades*

Catalysis
Catalysts*
Cathode-Ray oscilloscopes
Centre of Gravity*
+ Centre of pressure*
Centres*
Centrifugal compressors*
Centrifugal force*
Ceramics
Chamber*
+ Channels (Fluid flow)*
Characteristics*
Charge
Charged particles*
Chemical equilibrium*
+ Choking*
+ Chord*
Circuits*
+ Circular arc*
+ Circular cone*
+ Circular cross section
+ Circular cylinder*
Circulation*
Clamping
+ Closed throat*
Clouds
Coefficients*
Cold gases*
Combustion*
Commercial planes
Compatability
Components*
Composite materials*
Compositions*
Compressed air*
Compressibility*
Compressible flow*
Compressing*
Compressor blades*
Compressors*
Computation*
Computers*
Concentrating*
Concentration
Condensing
Conduction*
Conductivity*
Conductors
Cones*
Conics
Constraining
Constraints*
Constrictions
Construction*
Contingency*
Continuity equation*
Continuous beams*
+ Continuous panels*
Contraction*
Control surfaces*
Control systems*
Convection*
Convection heating*
Convergence*
Conversion
Coolants
Coolers
Cooling*
Co-ordinates*
Copper*
+ Corners*
Correction*
Correlation*
Corridor
+ Couette flow*
Cracking
Criteria*
Critical Mach No.
Critical velocity*
+ Crocco's equation
Cross flow*
Cross sections*
Crossings*
Curvature*
Curves*
+ Curvilinear co-ordinates
Cycles*
Cylinders*
Damage
Damping*
Data*
Data reduction
Day*
Decay*
Deceleration*
Deceleration rate*
Deflection*
Deformation
Degrees of Freedom*
Delay time*
Delta wings*
Density*
Density ratio*
Depth
Derivation*
Derivatives*
Design*
Detaching*
Detection
Determination*
Development*
Diameters*
Diaphragms*
+ Diatomic gases
Dielectrics
Differences*
Differential equations*
Diffuser*
Diffusion*
Dimensionless numbers*
Dimensions*
Discharge*
Discontinuity*
Disks*
Dispersion*
Displacement*
Dissipation*
Dissociation*
Distance*
Distortion*
Distribution*
Diurnal variations*
Divergence*
Dividers*
Documents*
+ Downstream*
+ Downwash*
Drag*
Driers*
Drilling*
Drive*
Driving*
Drum*
Dry gas*
Ducts
Dynamic characteristics*
Dynamics*
Earth*
Eccentricity*
Eddies*
Edges*
Efficiency*
+ Eigen Functions*
Elasticity*
Electric arcs*
Electric arc heaters

Electric fields*
Electric heating
Electric potential*
Electric propulsion*
Electrical filters
Electrical properties
Electricity*
Electromagnetic induction*
Electromagnetic waves*
Electrons
Electrons density
Electrostatics
Elements*
Elevators
Elevons*
Elimination*
Ellipses*
Elliptic functions*
Emission*
Emissivity*
Energy*
Engine*
Engine noise*
Enthalpy*
Entropy*
+ Entry angle
+ Entry corridor
Environment*
Equations*
Equation of Motion*
Equation of State
Equilibrium*
Equipment*
Equivalence*
Equivalent weight*
Erosion*
Errors*
+ Escape velocity*
Estimation*
Ethylene*
Evaluation*
Evaporation*
Exchanging*
Excitation*
Exhaust gases*
Exhausting*
Expansion
Experimentation*
Exponents*
Exposure*
Expressions*
Extension*
+ Faces*
Failure*
Feedback*
Field
Fighters
Filling*
Filtration*
+ Fineness ratio
Finite difference theory*
+ Finite span*
Fins
Firing*
Fixtures*
Flames*
Flaps*
Flat plate models*
Flatness*
Flaw
Flexibility*
Flexing*
Flight*
Flight paths
Flight testing*
Flow*
Flow equations*
Flow measurement
Flow meters*
Fluctuation
Fluid flow*
Fluid mechanics*
Flux*
Folding*
Fog
Force*
+ Forebodies*
+ Form drag*
Formica
Forming*
Formulas*
Foundation*
Fourier transforms*
Fractions*
+ Free flight models
+ Free molecule flow*
+ Free stream*
Freezing*
Freon*
Frequencies*
Frequency response*
Friction*
Fuel consumption
Fuels*
Functions*
Gas flow*
Gas Injection*
Gases*
Gears*
Generators
Geometry*
Glass
Glass Fibres
Gliders*
Gradients*
Grain size*
Graphite*
Graphs
Gravitation*
Green Function*
Ground effects*
+ Ground height
+ Ground pressure
+ Ground reflection*
+ Ground resonance
Growth*
Guidance*
Guide vanes*
Gust loads*
Gyroscopes*
Hall effect
Harmonics*
Head*
Heat*
+ Heat of ablation*
+ Heat absorption*
Heat shields*
Heat sinks*
Heat transfer*
Heat transfer coefficient*
Heat Transmission*
Heating*
Height*
Helium*
Hemispheres*
High pressure*
High temperature*
+ Hinges*
History*
Holding*
Holes*
Homogeneity*
Homogeneous flow*
+ Hot gas
Hot wire anemometers*
Humidity*

Humidity control
Hydrocarbons*
Hydrodynamics*
Hydrogen*
Hyperbolas
Hyperbolic functions
Hypersonic flight*
Hypersonic flow*
Hypersonic planes*
Hysteresis*
Ideal fluid*
Ideal gas*
Ideal gas law
Ignition*
Impact*
Impedance
Impellers*
Inconel*
Increasing*
Increments*
Indicators*
+ Induction (Aerodynamics)*
Inertia*
Initiation*
Injectant
+ Injected gases*
+ Injected liquids*
Injection
Injectors
Inoculation*
Inorganic salts
Instrumentation*
Insulation*
Intake system*
Integral equations*
Integrals*
Integration*
Intensity
Interference*
Interplanetary flight*
Intersection*
Iodides*
Ion propulsion*
Ionization*
Ionization gages*
Ionosphere*
Ions*
Isobars*
Isolation
Isotropy*
Iteration*
Jet*
Jet Engines*
Jet nozzles*
Jetstreams*
Joining*
Joists*
Jupiter
Junctions
+ Karman-Polhausen approximation
+ Karman Street
Kinetic energy
Kinetic theory*
+ Kirchoff theory*
+ Knees*
Knudsen flow
Kussner function*
Laminar boundary layer*
Laminar flow*
Laminates*
+ Lateral stability*
Latitude*
Launching
Layers*
+ Leading edges*
Legendre polynomials
Length*
Life*
Lift*
Lift dependent drag*
+ Lifting*
Light*
Linear equations*
Linear differential equations*
Linear systems*
Liners*
Lines*
Line spectra*
Liquefaction*
Liquid flow*
+ Liquid injection*
Liquid propellants*
Liquids*
Loading*
Loads*
Logarithms*
+ Longitudinal Jets
+ Longitudinal stability*
Longitudinal waves*
Losses*
+ Low density*
+ Low Reynolds No. *
Luminosity*
+ Lyapunov method*
+ Mach cone*
+ Mach Number*
Magnesium*
Magnetic fields*
Magnetic flux*
Magnetic properties*
Magnetohydrodynamics*
Magnification*
Magnitude*
+ Main stream*
Man
Mars*
Mass*
Mass flow*
Mass transfer
+ Mass transfer cooling
Matching*
Materials*
Materials testing*
Mathematical analysis*
Mathematical models
Matrices*
Maxima*
Mean*
Mean free path*
Measurement*
Measuring instruments*
Mechanics*
Melamine
Melting
+ Merged layer*
Meteorites*
Methane*
Midcourse guidance*
Minima*
Minimization
Missiles*
Mixing*
Mixtures*
+ Modal analysis*
Mode*
Models*
Modulation
Modulus of elasticity*
Molecular weight*
Molecules*
Molybdenum*
Moments*
Momentum*
Momentum transfer
Motion*
Mounting*
+ Multiple*

Multiplier phototubes*
+ Nacelles*
+ Navier-Stokes equation*
+ Negative lift
+ Newtonian flow
Night*
Nitrogen*
Nitrogen compounds
Nodes*
Noise*
+ Non-Equilibrium flow*
Non-linear systems*
Non-uniform flow
+ Normal force*
+ Noses*
Nozzles*
Nuclear fusion*
Nuclear propulsion*
Numerical analysis*
Observation*
Ogives*
One-dimensional*
Openings*
+ Open Throat*
Operations*
Optimization*
Orbits*
Ordinates*
Orientation*
Orifices*
Orthogonal functions*
Oscillations*
Oscillographs*
Outlets*
Output*
Oxygen*
Panels*
Parabolas*
Parameters*
Partial differential equations*
Particles*
Payloads*
Pendulums*
Penetration*
Performance*
Periodic variations*
Permeability*
Perturbation*
Perturbation theory*
Phase*
Phase angle*
Phenolic resins*
Photographs*
Physical property*
Pine wood*
Pipe*
Pipe flow*
Pistons*
Pitch*
Pitot tubes*
Pivots*
Plane geometry*
Planets*
+ Planforms*
Plasma*
Plasticity*
Plastics
Plates*
Plotting*
+ Pointed bodies*
Points*
+ Polar co-ordinates*
Polyamide resins
Polygons*
Polymethyl methacrylate
Polystyrene
Polytetra Fluoroethylene*
+ Porous cone
Porous materials
Position*
Potential energy*
+ Potential flow*
Power*
Power series
Prandtl No. *
Predictions*
Preservation*
Pressure*
Pressure distribution*
+ Pressure drag*
Pressure drop
Pressure gradient*
+ Pressure jumps
Pressure measurement*
Pressure pumps
Pressure reduction*
Prevention
Procedures*
Production*
+ Profile drag
Projectiles
Projection*
Propagation*
Propellers*
Properties*
Propulsion systems
Proving
Pumps*
Purity*
Qualitative analysis
Quartz*
Radar
Radiation*
Radiation effects*
Radioactive decay*
Radioisotopes*
Radii*
Randomization*
Range*
Ratios*
+ Rayleighs Problem*
Reactions (Chemical)*
Reaction kinetics*
Recombination reactions*
Recovery*
Rectangles*
Reduction*
Re-Entry*
Re-entry vehicles*
Regression*
Reflection
Refraction
Reinforced plastics*
Relaxation*
Relaxation method*
Relaxation time*
Reliability*
Relieving*
Removal*
Repeater*
Research*
Reservoirs*
Resistance*
Resistivity*
Resonant frequency*
Response time*
Retarding*
+ Reversal of control
Revisions*
Revolution*
Reynolds No.*
+ Rigid airfoils*
+ Rigid bodies
+ Rigid wings*
Rigidity*

Rocket*
+ Rocket chambers*
Rocket engines*
+ Rocket gliders*
Rocket nozzles*
Rocket planes*
Rocket propellants*
Rocket propulsion*
Rods*
Roll*
Roofs*
Rotation*
Rotor blades*
Rotors*
Roughness*
Rudders*
Safety factor*
Satellites*
+ Satellite velocity*
Saturation*
Scale*
Scattering*
Scavenging*
Screens
Seasonal variations*
Sensors*
Separation*
Series*
Servomechanisms*
Shadow photography
Shape*
Shear flow*
Shearing*
Shear stress*
Sheet*
Shells
Shock*
Shock tubes*
Shock waves*
+ Shroud*
Sides*
+ Sideslip*
+ Sidewash*
Silica*
Silicon carbide*
+ Similarity*
Similarity laws*
Simulation*
+ Sinking*
Sinusoidal functions*
Skewness*
+ Skin*
Skin friction*
+ Skipping*
+ Skip rockets
Skip vehicles*
Slabs*
+ Slender bodies*
+ Slender cones*
+ Slipstream*
Slope*
Slots*
Sodium*
Sodium carbonate
Sodium chloride*
Solar heating*
Solar phenomena*
Solar radiation*
Solar sails*
Solid propellants*
Solids*
Sound waves*
Sounding*
Sounding rockets*
Sound propagation
+ Sources*
Spacecraft*
Space probes*
Spacing*
Span*
Specific heat*
Specification*
Specific impulse*
Spectra*
Specular reflection*
Spheres*
Spikes*
Spirals
Spoilers*
Spreading
Springs*
Squares*
Stability*
+ Stages*
Stagnation point*
+ Stall*
+ Stanton No.
Starting*
Static characteristics*
Static pressure*
Static tests*
Stationary processes*
Statistical methods*
Stator blades*
Steady flow*
+ Steady forces
+ Steady pressure
Steady state*
Steels*
Stiffening*
Stiffness*
+ Sting*
Stopping*
Stoichiometry*
Straightness*
Strain gages
+ Stream function*
+ Streamlines*
Strength*
Stress concentration*
Stresses*
Stretching
Strip*
+ Strip theory
Structures*
Subcritical flow*
Sublimation*
+ Subsonic flow*
Sun*
Supersonic flow*
Supersonic planes*
Supports*
Surfaces*
+ Surface combustion*
+ Surface radiation*
Surface temperature*
Surges*
Surveys*
+ Sweep*
Sweepback*
Swept wing*
Swirling*
Symmetry*
Systems*
Tables*
Tabs*
Tabulation*
+ Tails*
Take off*
Tangent*
+ Taper ratio*
+ Tapered wing
Taylor's Series*
+ Teflon*
Telemetry*
Temperature*
Temperature control
Temperature distribution*

Temperature inversions*
Tensions*
Terminal guidance
Test facilities*
+ Test section*
Testing*
Testing equipment*
Testing machines*
Theories*
Theorems*
Thermal conductivity*
Thermal expansion*
Thermal diffusivity
Thermal insulation
Thermal stresses*
Thermodynamics*
Thickening*
Thickness*
Thin layer
+ Thin wings*
+ Throats*
Thrust*
Thrust vector control*
Time*
Time constant
Time series analysis*
+ Tips*
Titan*
Torque*
Torsion*
+ Total drag*
+ Trailing edges*
Trajectory*
Transferring*
Transformation*
Transition point*
+ Transitional layer*
Transonic flight*
Transonic flow*
Transpiration*
Transverse waves*
Triangles*
Trips*
Tumbling*
Tungsten*
Turbine blades
Turbines*
Turbocompressions*
Turbojet engines*
Turbulence*
Turbulent boundary layer*
Turbulent flow*
Twisting*
+ Two-dimensional*
Two-phase flow*
Ultraviolet radiation*
+ Undershoot
Uniform flow*
+ Uniform pressure*
Unsteady flow*
+ Unsteady lift*
Unsteady state*
Upper atmosphere*
+ Upwash*
Vacuum*
Vanes*
Vaporising*
Vapors
Vapour pressure*
Variability*
Variables*
Variations*
Vectors*
Velocity*
Venturi Meters*
Venus*
Vibrations*
+ Vibrational equilibrium
Viscosity*
Viscous*
Viscous flow*
+ Viscous fluids*
+ Visualisation
Volume*
Vortex*
+ Vortex filament
Vortex generators*
Vortex sheet
+ Vorticity*
+ Wake*
Walls*
Water
Water flow*
Wavelength*
Wave propagation
Waves*
+ Wedges*
Weight*
+ Whitham Theory
Wind*
Wind tunnel*
Wind tunnel models*
Wind tunnel nozzles*
Wind velocity*
Windows
Wing-body configurations*
+ Wing-body-tail configurations*
Wings*
Wires*
Wood*
Yaw*

APPENDIX 6.1

## EXAMPLES OF VARIOUS COMPUTER PRINT-OUTS

### Original I.B.M. Tape arrangement

The indexing information is arranged in document order, resulting in a linear file of 1,400 documents. The information transferred from the index sheet is recorded in two separate 'blocks' as follows:-

1. List of themes and the concepts which make up each theme, as given in the index sheet.
2. Lists of the concepts, giving the code letter and terms in each concept. The weight is assigned to each term in the concept, but since these weights have been transferred from those assigned to the single terms, the highest weight that any term has received will appear in all its concepts.

e.g. Concept F = Turbulent (10) Flow(9) Field(9)
Concept L = Transonic(8) Flow(9)

The tape was prepared from 80-column punched cards, with the information punched on each line as follows:-

Column 1. Punched with figure 1 or 2. This indicates whether the index information given in columns 6-80 refers to Block 1 (themes) or Block 2 (Concepts)

Columns 2-5 The four-figure document reference number.

Columns 6-80 The index information:

If Block 1,
a. A comma indicates the start of each theme.
b. The themes are identified by a two figure number, and are punched in order 01, 02, 03, etc.
c. The concepts which make up each theme are listed by their two-letter code.
d. An asterisk indicates the end of the final theme.

If Block 2
a. A comma indicates the start of each concept.
b. The concepts are identified by a two-letter code and are listed in the following sequence:- blank A to blank Z, AA, BB, CC, etc.
c. The terms making up each concept are punched in full
d. Each term is followed by the weight number, enclosed by slashes //
e. An asterisk indicates the end of the final concept.

```
11419,01 A B C,02 A D E F J,03 A D E G J,04 A D E H J,05 A D E I J*
21419, ASTIFFENED/10/WEB/10/PLATE/10/, BSHEAR/10/LOADING/10/, CINTERMEDIATE/9/
21419VERTICAL/9/STIFFENER/10/DESIGN/9/, DINTERMEDIATE/9/VERTICAL/9/STIFFENER/10/
21419, ESHEAR/10/BUCKLING/8/STRESS/8/, FSTIFFENER/10/FLEXURAL/8/RIGIDITY/8/
21419, GSTIFFENER/10/SPACING/8/, HSINGLE/6/SIDED/6/STIFFENER/10/, IDOUBLE/6/
21419SIDED/6/STIFFENER/10/, JTEST/7/*
11420,01 A C D E F G,02 A C D H I G,03 A C D J G,04 A C D K G,05 A C D L M
11420,06 A C D N K,07 A C D O,08 A C D P,09 A C D Q S G,10 A C D Q T G
11420,11 A C D Q U G,12 A C D R S G,13 A C D R T G,14 A C D R U G,15 B C D E F G
11420,16 B C D H I G,17 B C D J G,18 B C D K G,19 B C D L M,20 B C D N K
11420,21 B C D O,22 B C D P,23 B C D Q S G,24 B C D Q T G,25 B C D Q T G
11420,26 B C D R S G,27 B C D R T G,28 B C D R U G*
21420, ASWEPT/10/WING/10/HIGH/9/ASPECT/9/RATIO/9/, BNARROW/9/DELTA/10/WING/10/
21420, CSHARP/10/EDGED/10/, DHIGH/9/ANGLE/9/ATTACK/9/, EUPPER/9/SURFACE/9/
21420, FTURBULENT/10/FLOW/9/FIELD/9/, GWIND/9/TUNNEL/9/EXPERIMENT/9/, HROOT/8/
21420SECTION, ICONICAL/8/FLOW/9/FIELD/9/, JVORTEX/8/SHEET/8/POSITION/7/
21420, KVORTEX/8/PATH/8/LOCATION/8/, LTRANSONIC/8/FLOW/9/, MDRAG/8/RISE/8/
21420, NLEADING/8/EDGE/8/SEPARATION/8/, OVORTICITY/8/, PSTALLED/8/FLOW/8/
21420, QPRESSURE/8/DISTRIBUTION/8/, RVELOCITY/8/DISTRIBUTION/8/, SSWEEP/8/
21420ANGLE/9/, TANGLE/9/ATTACK/9/, UREYNOLDS/8/*
11421,01 A D F G H,02 B C D F G H,03 A E F G H,04 B C E F G H,05 A D I G H
11421,06 B C D I G H,07 A E I G H,08 B C E I G H,09 A D F J G H,10 B C D F J G H
11421,11 A E F J G H,12 B C E F J G H,13 A D I J G H,14 B C D I J G H
11421,15 A E I J G H,16 B C E I J G H,17 A D F Q S,18 A E F Q S,19 A D I Q S
11421,20 A E I Q S,21 A D P Q R,22 A E P Q R,23 K C D F G H,24 K C E F G H
11421,25 K C D I G H,26 K C E I G H,27 L C D F G H,28 L C E F G H,29 L C D I G H
11421,30 L C E I G H,31 M C D F G H,32 M C E F G H,33 M C D I G H,34 M C E I G H
11421,35 N C D F G H,36 N C E F G H,37 N C D I G H,38 N C E I G H,39 O C D F G H
11421,40 O C E F G H,41 O C D I G H,42 O C E I G H*
21421, ABLUNT/10/NOSED/10/LONG/9/BODYOFREVOLUTION/10/, BBLUNT/10/NODE/8/
21421, CLONG/9/CYLINDRICAL/10/AFTERBODY/10/, DHYPERSONIC/9/AIR/9/FLOW/9/
21421, EHYPERSONIC/9/HELIUM/10/FLOW/9/, FINDUCED/10/PRESSURE/9/, GTHEORETICAL/9/
```

Tape arrangement at Harvard Computation Laboratory.

The indexing information is arranged in document order, and includes only the indexed concepts, ignoring the themes. Each concept consists of the constituent single terms, terminated by a stop; each concept is treated in the same way as the sentences in the full text normally processed by the SMART system, with the running totals of concepts indicated in a right-hand column. The weights assigned at Cranfield are incorporated by repeating the concepts; three levels are recognised, concepts weighted 10 and 9 are recorded three times, concepts weighted 8 and 7 are recorded twice, and concepts weighted 6 and 5 once.

A copy of the print-out for the same document as shown on the previous page, namely 1420, is printed below.

```
HIGH ASPECT RATIO SWEPT WING . HIGH ASPECT RATIO SWEPT WING .                1
HIGH ASPECT RATIO SWEPT WING . NARROW DELTA WING SHARP EDGED .               3
 NARROW DELTA WING SHARP EDGED . NARROW DELTA WING SHARP EDGED               5
. HIGH ANGLE ATTACK . HIGH ANGLE ATTACK . HIGH ANGLE ATTACK                  6
. UPPER SURFACE FLOW FIELD TURBULENT . UPPER SURFACE FLOW FIELD              9
TURBULENT . UPPER SURFACE FLOW FIELD TURBULENT . WIND TUNNEL EXPERI-         11
MENT . WIND TUNNEL EXPERIMENT . WIND TUNNEL EXPERIMENT . ROOT /              13
SECTION, ICONICAL FLOW FIELD . ROOT SECTION, ICONICAL FLOW FIELD             16
. POSITION VORTEX SHEET VORTEX PATH LOCATION . POSITION VORTEX               17
SHEET VORTEX PATH LOCATION . TRANSONIC FLOW . TRANSONIC FLOW                 19
. DRAG RISE LEADING EDGE SEPARATION . DRAG RISE LEADING EDGE SEPARAT-        21
ION . VORTICITY . VORTICITY . STALLED FLOW PRESSURE DISTRIBUTION             23
 . STALLED FLOW PRESSURE DISTRIBUTION . VELOCITY DISTRIBUTION                26
. VELOCITY DISTRIBUTION . SWEEP ANGLE . SWEEP ANGLE . ANGLE                  28
ATTACK . ANGLE ATTACK . ANGLE ATTACK . REYNOLDS . REYNOLDS                   32
                                                                             36
```

Tape arrangement at Cambridge Language Research Unit.

This follows more closely the information on the original tapes, with two sections for each document, the first covering themes, and the second giving the concepts and terms.

An example pf the print-out, for document 1420, is shown below; the description of the print-out is as follows.

Section 1

Line 1. Document number; Section 1 digit; half-word count for document.
Line 2. Theme count; Half-word count for themes.
Line 3. Theme number; Concept letter count; Half-word count for concept letters; Concept letters.

.....
.....

Line n. Section 1 terminator.

Section 2

Line 1. Document number; Section 2 digit.
Line 2. Concept count; Half-word count for concepts.
Line 3. Concept letter; Word count; Half-word count for words; weight number; Half-word count for word; Word.

.....
.....

Line n. Section 2 terminator.

```
1420 1   +270
28 +82
 1         6 + 3   A C D E F G
 2         6 + 3   A C D H I G
 3         5 + 3   A C D J G
 4         5 + 3   A C D K G
 5         5 + 3   A C D L M
 6         5 + 3   A C D N K
 7         4 + 2   A C D O
 8         4 + 2   A C D P
 9         6 + 3   A C D Q S G
10         6 + 3   A C D Q T G
11         6 + 3   A C D Q U G
12         6 + 3   A C D R S G
13         6 + 3   A C D R T G
14         6 + 3   A C D R U G
15         6 + 3   B C D E F G
16         6 + 3   B C D H I G
17         5 + 3   B C D J G
18         5 + 3   B C D K G
19         5 + 3   B C D L M
20         5 + 3   B C D N K
21         4 + 2   B C D O
22         4 + 2   B C D P
23         6 + 3   B C D Q S G
24         6 + 3   B C D Q T G
25         6 + 3   B C D Q T G
26         6 + 3   B C D R S G
27         6 + 3   B C D R T G
28         6 + 3   B C D R U G
/
```

```
1420 2
20 +186
A  5 +14        (10)+ 5 SWEPT          (10)+ 2 WING          ( 9)+ 2 HIGH      ( 9)+ 3 ASPECT
                ( 9)+ 3 RATIO
B  3 + 9        ( 9)+ 3 NARROW         (10)+ 3 DELTA         (10)+ 2 WING
C  2 + 7        (10)+ 3 SHARP          (10)+ 3 EDGED
D  3 + 9        ( 9)+ 2 HIGH           ( 9)+ 3 ANGLE         ( 9)+ 3 ATTACK
E  2 + 7        ( 9)+ 3 UPPER          ( 9)+ 3 SURFACE
F  3 +10        (10)+ 4 TURBULENT      ( 9)+ 2 FLOW          ( 9)+ 3 FIELD
G  3 +10        ( 9)+ 2 WIND           ( 9)+ 3 TUNNEL        ( 9)+ 4 EXPERIMENT
H  4 +15        ( 8)+ 2 ROOT           ( 8)+ 5 SECTION=ICONICAL      ( 9)+ 2 FLOW      ( 9)+ 3 FIELD
J  2 + 8        ( 8)+ 4 VORTEZSHEET    ( 7)+ 3 POSITION
K  3 + 9        ( 8)+ 3 VORTEX         ( 8)+ 2 PATH          ( 8)+ 3 LOCATION
L  2 + 7        ( 8)+ 4 TRANSONIC      ( 9)+ 2 FLOW
M  2 + 5        ( 8)+ 2 DRAG           ( 8)+ 2 RISE
N  3 +10        ( 8)+ 3 LEADING        ( 8)+ 2 EDGE          ( 8)+ 4 SEPARATION
O  1 + 5        ( 8)+ 4 VORTICITY
P  2 + 6        ( 8)+ 3 STALLED        ( 8)+ 2 FLOW
Q  2 + 8        ( 8)+ 3 PRESSURE       ( 8)+ 4 DISTRIBUTION
R  2 + 8        ( 8)+ 3 VELOCITY       ( 8)+ 4 DISTRIBUTION
S  2 + 7        ( 8)+ 3 SWEEP          ( 9)+ 3 ANGLE
T  2 + 7        ( 9)+ 3 ANGLE          ( 9)+ 3 ATTACK
U  1 + 4        ( 8)+ 3 REYNOLDS
*
```

## NAME INDEX

Aitchison, J. 118
Altmann, B. 15, 119
American Institute of Chemical Engineers. 56
Armed Services Technical Information Agency. 9
Bourne, C. 4, 5, 118
Brandhorst, W.T. 119
Bureau of Ships. 9
Cambridge Language Research Unit. 17, 106
Cuadra, C. 114
David Taylor Model Basin. 73
Documentation Inc. 9, 11, 13-14
Eckert, P.F. 119
Engineers Joint Council. 7, 9, 84-88, 120
Euratom. 15
Farradane, J.L. 49, 71, 119
Gibb, M. 119
Gull, D.C. 10, 118
Harvard Computation Laboratory. 8, 17, 73, 113
I.B.M. (U.K.) Ltd. 106
Jones, K. Sparck. 120
Jonkers, F. 119
Katter, R.
Kessler, M.M. 23, 107, 110, 119
Kuhns, J.L. 119
Lancaster, F.W. 9, 118
Maron, M.E. 55, 119
Metcalfe, J. 10, 119
Montague, B.A. 118
National Science Foundation. 91, 106
Needham, R.M. 17, 106, 120
O'Connor, J. 17, 91, 119, 120
Rees, A. 114
Richmond, P. 6, 8, 118
Salton, G. 3, 13, 17, 73, 106, 115, 119
Swanson, D.R. 1, 16, 33-34, 36, 118-119
Taube, M. 11, 16, 119
Thorne, R.G. 10, 118
Vickery, B.C. 7, 71, 118
Western Reserve University. 1, 5, 8, 15, 16, 33-34, 36, 56, 61, 114
Whelan, S. 119

## SUBJECT INDEX


Alphabetical collateral search programme. 82
Alphabetical rotated index.. 77-79, 312-364
Alphabetical subject headings index. 6
Analytical cataloguing. 53
Appurtenance operators. 49
Associative indexing. 46, 52
Author-title catalogues. 40
Authors of research papers. 19-21, 23, 24, 31, 32, 121-132, 204-207
Bibliographic coupling. 23, 25-28, 31, 40, 46, 52, 107, 110-112
Citation habits of authors. 30
Citation indexing. 40, 107-110
Classes. 40, 41, 44
Classes, Single-term. 58
Code dictionaries. 50
Code terms. 7
Computer searching. 91, 106, 372-4
Concept hierarchy. 62, 74-77, 291-311
Concept indexing. 2, 5, 17
Concept languages. 73, 100
Concept searches. 105
Concepts. 52, 53, 57, 58, 73
Concepts, alphabetical rotated index. 78-80, 312-364
Controlled term vocabulary. 100, 365-371
Coordinate search programme. 65, 81
Coordination. 42, 47, 52, 97
Cranfield I conclusions. 1-2
Cranfield test method. 33
Distributed relatives. 52, 75, 77
Document collection. 21, 21, 113, 133-184
Document subsets. 73, 201
Effort (user criteria). 5
Evaluation of operational systems. 114
Exhaustivity. 2, 5, 48-9, 54, 97, 100
Facet classifications. 6, 45, 56, 69
Facet schedules, Cranfield. 74
Facets. 74-76
Firm subject language. 116
FROLIC. 73
Generality ratio. 18, 113, 116
Generic search programme. 65
Genus/species relationship. 44
Hierarchical linkage. 43, 46, 48, 52, 64, 82
Hierarchical linkage, Generic. 46
Hierarchical linkage, Multiple. 77-8
Hierarchical linkage, Non-generic. 43, 46, 49
Hierarchical vocabulary reduction. 62, 64, 251-290
Hierarchy, One-place. 65
Hierarchy, Concept. 62-5, 74-7, 291-311
Hierarchy, Single-term. 69, 71, 100, 117, 251-290
Index, Physical form. 90
Index language devices. 7-8, 11, 17, 41, 113
Index languages. 58-89
Index terms. 7
Indexers. 2
Indexing, Exhaustivity. 2, 5, 48, 54, 97, 100
Indexing, Specificity. 44, 48, 50, 61, 64
Indexing procedures. 40-57
Indexing Sheet, Master. 52
Interfixing. 52, 57, 102, 105
Inverse relationship of recall and precision. 2-3
Inversion of subject heading. 48
KWIC Index. 41
Lead-in terms. 7
Lead-in vocabulary. 6
Lexical elements. 49, 50, 58
Links. 42, 47, 52, 53, 57, 61,
Literary warrant. 64
"L'Unite" system. 64
Machine indexing. 40
Machine-readable indexing. 91, 106, 372-374
Management criteria. 4
Mushy subject language. 116
Natural language terms. 90, 105
Notation. 62, 74
Obligatory reduction of vocabulary. 61
Obligatory search programme. 65
Paradigmatic relations. 52, 56, 59
Partitioning. 53, 55, 57, 102
Peek-a-Boo type index. 90-91
Permissive search programmes. 65
Permuted title index. 41
Pilot test. 90
Postcoordinate indexing. 1, 52, 90
Precision devices. 8, 42, 61, 102

Precision ratio. 2, 5, 11, 13, 15, 100
Precoordinate indexing. 1, 47, 52, 53 88
Presentation (user criteria) 5
Quasi-synonyms. 62, 68, 97-98, 237-250
Question indexes. 100
Question starting term card. 93
Question subsets. 201
Question-title match. 34, 36, 38-9
Question weighting. 23
Questions. 13, 16, 19, 21, 29, 32-33, 93, 100, 113, 185-200
Recall devices. 7,8,41,61
Recall ratio. 2, 5, 15
Reduced vocabularies. 58, 61, 62, 64
Relational devices. 58
Relevance. 11, 13, 16
Relevance assessments of documents. 14, 21-24, 28-31, 100, 114, 116, 131, 208-219
Results sheet. 100
Role indicators. 43, 47, 52, 56-8, 88
Scan-column index. 91
Score sheets. 100
Search programmes. 44, 50, 65, 76, 80-82, 105
Search programmes, selective. 61
Search rules. 98, 100, 102
Search sheets. 93, 97-98
Search terms. 32
Searches. 98
Semantic factoring. 48
Single term index language. 58-73, 220-290
SMART system. 3, 17, 73, 106, 116
Source documents. 11, 33, 36
Sought terms. 7
Specificity of indexing. 44, 48, 50, 61, 64
Starting terms. 93, 100
Subject language , firm. 116
Subject language, mushy. 116
Subject language precision. 116
Subordinate search programmes. 65
Substantive terms. 49
Superordinate search programmes. 65, 81
Syndesis. 45, 48, 66
Synonyms. 43, 47, 52, 61-62, 67, 80, 97, 98, 105, 237-250
Syntactic devices. 58
Syntactical elements. 49
Syntagmatic relations. 52, 56, 59
Systematic collateral search 81
Term frequencies. 58, 64
Test design. 9
Testing techniques. 80-105
Themes. 53, 55, 58
Thesaurus of Engineering Terms. 46, 58, 83-85, 365-371
Time (user criteria) 5
Title-question match. 34, 36, 38-39
Universal Decimal Classification. 1, 6, 8, 77
Uniterms. 1, 6, 9, 48
User criteria. 4-5
Vocabulary reduction. 58, 61, 62, 64
Vocabulary reduction, hierarchical. 62, 64, 251-290
Weighting of indexing. 42, 49, 52-55, 58, 91
Weighting of the questions. 24
Word endings, Confounding of. 43, 47, 52, 61, 68, 97, 237-250
Zipf distribution. 58