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

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 consider-ations 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.

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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.		A	B	C	D
	ASSESSMENT Question				
1.	Clarke, J.F. Flow of chemically reacting gas mixtures. College of Aeronautics Report 117.	5	1	5	3
2.	Clarke, J.F. Linearized flow of a dissociating gas. Jnl. Fluid Mech., 7, 1960, pp 577-595.	5	1	5	5
3.	Griffith, W.C. and Kenny, A. Jnl. Fluid Mech. 3, 1957, p.268.	5	5	1	5
4.	Lighthill, M.J. Survey in Mechanics, Ed. by G.K. Batchelor and R.M. Davies, Cambridge University Press, 1956.	2-3	3	1	5
5.	Lighthill, M.J. Dynamics of a dissociating gas. Jnl. Fluid Mech., 2, 1957, pp 1-32.	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 aero-
elastician. 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 hyper-
sonic 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.

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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 cavity 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.

1088 CRAMER,K.R. Magnetohydrodynamic free-convection pipe flow. J. Ae. Scs. 28, 1961, 736.

1089 CHARWAT,A.F. An investigation of separated flows, Part I: The pressure field. J. Ae. Scs. 28, 1961, 457.

1090 STONECYPHER,T.E. Periodic temperature distributions in a two-layer composite slab. J. Ae. Scs. 27, 1960, 152.

1091 CAMPBELL,W.F. Periodic temperature distribution in a two-layer composite slab. J. Ae. Scs. 27, 1960, 633.

1092 CHRICHLOW,W.J. and HAGGENMACHER,G.W. The analysis of redundant structures by the use of high-speed digital computers. J. Ae. Scs. 27, 1960, 595.

1093 Van DYKE,M.D. The supersonic blunt body problem - Review and extensions. J. Ae. Scs. 25, 1958, 485.

1094 PROBSTEIN,R.F. and ELLIOTT,D. The transverse curvature effect in compressible axially symmetric laminar boundary layer flow. J. Ae.Scs. 28, 1956, 206.

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1096 DRYDEN,H.L. Review of published data on the effect of roughness on transition from laminar to turbulent flow. J. Ae. Scs. 20, 1953, 477.

1097 CROCCO,L. and LEES,L. A mixing theory for the interaction between dissipative flows and nearly isentropic streams. J. Ae. Scs. 19, 1952, 649.

1098 MILLSAPS,K. and POHLHAUSEN,K. Heat transfer by laminar flow to a rotating plate. J. Ae. Scs. 19, 1952, 120.

1099 Von KARMAN,T. Fundamentals of statistical theory of turbulence. J.Ae.Scs. 4, 1937,131.

1100 TAYLOR,E.S. and BROWNE,K.A. Vibration isolation of aircraft power plants. J. Ae. Scs. 6, 1938, 43.

1101 LEES,L. Laminar heat transfer over blunt nosed bodies at hypersonic flight speeds. Jet Prop. 26, 1956, 259.

1102 SOBEY,A.J. Advantages and limitations of models. J. R. Ae. S. 63, 1959, 646.

1103 SPALDING,D.B. Theory of mixing and chemical reaction in the opposed jet diffusion flame. A.R.S. Jnl. 31, 1961, 763.

1104 REEVES,B.L. Similar solutions of a free convection boundary layer equation for an electrically conducting fluid. A.R.S. Jnl. 31, 1961, 517.

1105 STEWARTSON,K. The asymptotic boundary layer on a circular cylinder in axial incompressible flow. Q.App.Math. 13, 1955, 113.

1106 CAMPBELL,I.J. The transverse potential flow past a body of revolution. Q.J.Mech.App.Math. 9, 1956, 140.

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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 fatigue 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 fatigue 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 <u>nonequilibrium</u> chemical constituents in the <u>viscous</u> 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

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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

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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* 1658*
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, 2258, 2394 2395		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

Question No.	Base Document	Relevance 1	Relevance 2	Relevance 3	Relevance 4
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
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209	1953		2031, 2032, 2035		2037
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271	1545		1229*	1191, 1600, 1601 1433*, 1782*	
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